The Effects of Climate Change on Kenya's Social Economics Development

By: Mwambire Teddy[1] & Joseph Elly[2]

Faculty of Business & Management Sciences;

University of Nairobi, Nairobi-Kenya [1] Email: mwambireteddy@gmail.com

Abstract

Climate change and natural disasters have disrupted the socio-economic development of Kenya, witnessed through the concurrent drought seasons, flooding seasons and the changes in the rainfall and temperature variation. These effects have tremendously affected the socioeconomic developments within the county levels as key economic pillars such as agriculture, tourism, mining and industrial sectors which depend mainly on climatic factors being affected. These are mainly attributed to the country's overdependence on rain-fed agriculture hence exposing the country to food insecurity as the majority of the economic pillars sectors are climate sensitive. Kenya has been significantly affected by climate change catastrophe with droughts and floods taking centre stage. According to statistics, the 1997/1998 El Nino floods and the 1999/2000 La Nina drought is estimated to have cost at least 14% of Kenya's GDP each year and it is predicted to have a negative impact in the near future if nothing is done to mitigate and adapt to future climate change events. This study examines the socioeconomic impacts of climate change in Kenya, key challenges facing climate change mitigation and adaptation in the country and analyses how climate change has hindered major socio-economic development at the grassroots level. The study theoretical analysis is premised on the assumption of organisation, individuals and even countries to work on the good of the society at large by protecting the eco-system. This is geared towards the efforts of the government to educate the masses on the need to protect the environment and to implement workable environmental policies. The qualitative results have shown that Kenya's socio-economic development is heavily influenced by climatic conditions in almost all sectors, having a negative trend in the growth and development of the country. Human socioeconomic activities such as deforestation, poor farming patterns, destruction of water catchment areas and emission of GHG are the key contributors to climatic changes. The key findings have indicated that Kenya socio-economic development is heavily influenced by changes in climatic conditions, evident through the over-dependence on rain-fed agriculture, with agriculture being the main socio-economic driver of the country. Moreover, the findings indicated that there is little/no knowledge about climate change adaptation within the public, hence the continuous environmental degradation. This is mainly attributed to the inactive role taken by the government towards mitigating and adapting to climate change, and also a lack of a proactive institution to champion for the same. Organisations and climate change stakeholders both regionally and internationally should take an active role in championing for climate change adaptation and mitigation.

Keywords*:* socio-economic development, socioeconomic activities, socio-economic driver, deforestation, key economic pillars

Introduction

In the recent years impacts of climate change have been felt and have been very devastating especially in the socio-economic development of countries like Kenya. This has been evidenced by the increased frequency of extreme weather events ranging from La Nina and El Niño phenomena, frequent cycles of droughts and floods. The rainfall pattern has also been affected over the years with late onset and early/late cessation. The distribution of this rainfall both temporally and spatially has also been observed to be very poor.

The 2010 National Climate Change Response Strategy (NCCRS) acknowledged the importance of climate change impacts for Kenya's socio-economic development. The National Climate Change Action Plan of 2012 was the logical steps of enabling Kenya reduce vulnerability to climate change and therefore improving the country's ability to take advantage of opportunities that climate change offers. Ways to mitigate and adapt to the impacts of climate change is the key indicator determining the survival and sustainability of all the living creatures on the face of the earth.

The socio-economic development of Kenya which is guided by Kenya Vision 2030 aims at transforming the country into an industrial, middle income economy with a clean and secure environment. This can only be achieved if this action will address sustainable socio-economic developments with a key focus on climate change. Kenya is dependent on rain fed agriculture and as such a shift in the normal distribution of the weather patterns implies a major cost implication which has a tremendous effect on the socio-economic development of the country.

Kenya can overcome the challenges of weather related hindrance by adapting to both rain fed and irrigation agriculture in counties with fertile land that can support agriculture such as Kilifi County which has fertile land, with heavy rainfall during months of March, April and May , and short rains October, November and December characteristic that is a favorable climatic conditions for agriculture. Building for such possibilities will enable the country improves on its socio-economic activities to ensure it produces to its capacity thereby adding to the breadbasket of the country.

Research Problem

Kilifi county was significantly affected by the recent major droughts and floods that ravaged the country i.e. the 1983/1984, 1991/1992, 1999/2000,2004/2005 and finally the 2009 drought. Major flooding occurred in 1982, 1985, 1997/1998, 2002, and 2006 which greatly affected the coastal part of Kenya including Kilifi, and had a major impact on the economy of Kenya. As much as coast province and therefore Kilifi is not majorly affected by droughts as other parts of Kenya this extreme event has a major impact on the rainfall temporal and spatial distribution of Kilifi therefore affecting the planting patterns of the residents. This continuous droughts and changes in the weather patterns affected agricultural activities, which led to hunger.

Diseases such as typhoid and cholera were rampant as drying up of wetlands and water sources implied that residents had to source for water from contaminated drying rivers sources.

Kilifi's economy being highly dependent on climate sensitive sectors such as agriculture, tourism and energy, climate change therefore potentially poses a great risk for the county and Kenya at large if the proposed vision 2030 has anything to go about.

If adaptive measures for mitigating climate change are not found, future impacts of climate change will gravely affect key sectors of the county's economy. This is due to a given fact that it has a higher vulnerability and lower adaptive capacity. Impacts could threaten past development gains and constrain future socio-economic progress.

This study therefore examines the socio-economic impacts of climate change on Kenya's development agenda with a key focus on Kilifi County and how it impacts various key sectors that hugely add to the country's economy.

It is thus the purpose of this study to question, "How does climate change affect socio-economic development in Kenya and in Kilifi County?"

Research Objectives

The broad objective of this study is to determine the relationship between climate change and socio-economic development in Kenya with a focus on Kilifi County. This was achieved through analyzing the following sub objectives:

I. To provide an overview of socio-economic impacts of climate change in Kenya.
II. To discuss key challenges facing climate change adaptation and mitigation in Kenya.
III. To analyze major climatic changes and the posed socio-economic developmental issues in Kilifi County

Research Hypothesis

This study is premised on the assumption;

1. Climate change has detrimental negative effects on Kenya's socio-economic development.
2. Climate change has significantly impacted on Kilifi County's socio-economic development.

Conceptual Literature

Entrepreneurial Marketing Strategies

According to Schneider et al., the aggregate of Climate Change is highly uncertain.

This is mainly attributed to the ever-changing global activities that impact differently on the economy. The effects of climate change on the economy are a potential shift on the way global actors relate on the international scene.

Desanker et al in his literature assessment concluded that climate change in Africa, coastal facilities would result in sea-level rise, coastal erosion, saltwater intrusion and flooding. Thus he predicted that these changes would have a significant impact on African communities and their economies.

Smith et al argue that climate change can be measured as an economic cost. He concluded that climate change would increase income inequalities between and within country, as he said a small

increase in the global mean temperature (up to 2 degree Celsius measured against 1990 levels) would result in net negative market sector impacts in many developing countries and net market sector impacts in many developed countries.

Stern et al on the other hand argue that climate change is the greatest and widest ranging market failure ever seen, presenting a unique challenge for the economy. Stern review highlighted a 5% loss of global gross domestic product (GDP) each year, now and forever and the loss may rise further to 20% if the effects of climate change are not mitigated on time.

The review proposed that 1-2% percent of the global GDP per annum should be invested to mitigate effects caused by climate change in order to enhance the economy of the universe. Africa is greatly affected by the effects of climate change as compared to other regions in the world, because most countries in the continent are prone to recurrent droughts, and drought episodes particular in Southeast Africa. Inappropriate policies, high population growth rates and lack of a significant investment methods and a highly variable climate have made it difficult for several countries to develop livelihood pattern that would reduce pressure on the natural resources base.

The United Nations Framework on Climate Change

The United Nations framework Convention on Climate Change (UNFCCC) and the Kyoto protocol have set a significant precedence as a way of solving long term international environmental problem. In a way to mitigate on the effects brought about by climate change, the Kyoto Protocol has stimulated national and international policies and has enhanced establishment of new institutional mechanisms that are tailored to enhance an international platform for combating climate change.

The 4th Assessment Intergovernmental Panel on Climate Change (IPCC) report clearly highlights that the mixed effects of climate change is continental and the most affected countries are the developing nations, with Africa bearing the greatest risk because their economies rely more on climate-sensitive activities. In Africa today, tropical forests and rangelands are under constant extinction because of population pressure and other system of land use. These effects have exposed Africa to loss of biodiversity, rapid deterioration in land cover and depletion of water catchment sources, which has impacted negatively on the socioeconomic developments of Africa nations. Agriculture accounts to almost 55% of total value of African exports, and most farming activities entirely depends on rain fed agriculture making Africa to be more vulnerable to climate change hence posing a potential food security crisis.

Kenya's modalities to curb climate change impacts.

Kenya's current population is 45,010,056 million, with an average per capita income of US$3, 138 and is ranked 147 out of 187 countries in the UNDP's Human Development Index. The World Bank estimates that 42% of income is controlled by less than 10% population while a majority of 45.9% of the population survive on less than $1

per day. Major socio-economic developments have been focused on major urban towns such as Nairobi and Mombasa. Areas stretching across the Rift valley, Mount Kenya and Lake Victoria have developed due to fertile densely populated highlands that support agriculture. 80% of land in Kenya is arid and semi-arid (ASAL)10 as in Fig 1.1 (left panel) below.

While the ASAL areas are prone to drought, western Kenya where Kilifi County is situated is prone to flooding as seen in Fig 1.1 Right Panel.11 According to the report released by Stockholm Environmental Institute on the economic costs of climate change in Kenya, in their assessment they found that existing climate variability has significant economic costs in Kenya which is brought about by periodic floods and droughts which impacts on the socio-economic developments in Kenya.

Recent major drought witnessed in 1998-2000, 2004/05, 2009 and 2011 and major floods that occurred in 1997/98, 2006 and 2010 impacted negatively on the socio-economy developments in Kenya.

The economic costs brought about by drought in the period of 1998-2000 was estimated to have cost the country $2.8 billion from the loss of crops, livestock, forest fire, damage to fisheries, reduced hydro-power generation, reduced industrial supply and reduced water supply, affecting key sectors that are the backbone to the Kenyan economy. Subsequent drought events witnessed in 2004, 2005 and the recent 2009 affected millions of people leading to restrictions on water and energy. The 1997/98 floods affected almost 1 million people and had an estimated total economic costs of $0.8 to $1.2 billion arising from damage to infrastructure such as roads, buildings and communication apparatus, effects on public health like water borne diseases and fatalities and loss of crops.

Therefore, the continued burden for these catastrophic events implies large economic costs will be incurred thus limiting long term socio- economic growth. Kenya and its counties like Kilifi are not adequately adapted to deal with existing climate risks because of a higher vulnerability and lower adaptive capability mainly brought by socioeconomic trends such as increase in population, urbanization, increased value of assets in flood prone areas, changes in the terrestrial system such as deforestation and loss of natural floodplain storage. Therefore, in the absence of adaptation measures, these extreme events are likely increase the economic costs by five folds come the year 2030 hence impacting tax payers close to $5-$10 billion .

Thus, Kenya's key priority ought to increase the resilience to cope with these extreme events in order to mitigate impacts associated with climate change in the foreseen future to protect its population from these extreme events. This is because despite Kenya having a draft disaster management policy, it lacks an official policy or legal framework to guide on disaster management.

The dominant floods in Kenya are riverine floods which mainly affect both rural and urban areas in form of flash and urban floods. Perennial floods in Kenya affect low lying regions of Kenya, the coastal strip. The Lake Victoria basin

in western Kenya and Tana River basin in south-eastern Kenya are the most prone flooding regions in Kenya, the Budalangi and Kano flood plains in western Kenya and Tana River floods are the worst affected areas by floods during both the short and long rain seasons of March-May and October-December respectively.

Coastal Kenya is highly vulnerable to flooding patterns because of high poverty rates, poor land use patterns, deforestation, settling and cultivating along river banks, low education and illiteracy level and poor infrastructural levels.

Hence this highlights Kenya's higher vulnerability and lower adaptive capability therefore highly prone to be affected by effects of climate changes and this poses a potential risk on the socio-economy developments in the near future.

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Kilifi County's Modalities to Curb Climate Change.

Kilifi County a town in the north coast region of Kenya has a total population of 1,400,000 and covers an area of over 12 Million square kilometers according to Kenya National Bureau Of Statistics (KNBS). It is located north of Mombasa and has seven sub counties: Kaloleni, Magarini, Kilifi, Ganze, Malindi, and Rabai. Residents of Kilifi mainly get water supply for livestock use and irrigation from rainwater harvesting. Crop production is primarily dependent on the heavy rains in March, April and May. The short rain season experienced in October, November and December is essential to the hinterland for pasture regeneration and water recharge. The county is divided into five Agro-Ecological Zones (AEZ), defining areas with similar Production related characteristics such as annual mean temperatures, vegetation and humidity.

These zones include:-

Coconut-Cassava Zone: This zone covers the coastal uplands and the low-level coastal plains and has the highest potential for crop production in the county. The major farming activities in this area include fruit tree cropping (mango, citrus, cashew nut and coconut), vegetable farming (chili, brinjals, okra) and food cropping (maize, bananas, cowpeas, upland rice, green grams). Dairy farming also does well in this zone.

Cashew Nut-Coconut zone: This zone stretches northwards along the coastal plain up to Arabuko Sokoke forest. The area has agricultural potential with the same crop types as the coconut-Cassava zone but with slightly less production.

Livestock-Millet Zone: The zone has lower agricultural potential with annual precipitation ranging from 700mm to 900mm. The area is suitable for dryland farming supporting drought tolerant crops and ranching activities.

Lowland Ranching: This zone varies in altitude from 90m to 300m with annual mean temperature of 27 degrees celsius and annual precipitation of 350mm to 700mm. The significant activities within this zone are ranching with cattle, sheep and goats as the main livestock kept by the farmers.

Coconut Cashew Nut – Cassava Zone: This zone is mainly found in Kilifi South and North Constituencies and is the smallest of all the zones. The area has a similar potential for the crops found in the coconut-cassava and cashew-nut cassava zones.

These agro ecological zones allow agribusiness activities to run efficiently

as they largely influence the inhabitant's livelihood in the county. The activities ensure there is sufficient money to support the economy of Kilifi. Other agribusiness activities include bee-keeping for honey production and aquaculture that involves freshwater fish farming.

Kenya Climate Innovation Center (KCIC) through the Agribiz programme is already assisting agripreneurs in the county to progress in various fields. The Agribiz programme has already enrolled farmers in dairy production, milk value addition and coconut oil production among other fields. This in return is changing the shape of agriculture in the region as more production is being achieved. The recently launched Kilifi Business Incubation hub by the Agribiz Programme is the ultimate game-changer for agribusiness in the entire region. The hub will provide support services and initial funding for agriculture value chains, SMEs, CBOs and start-ups. It will also cater for agripreneurs in the broader Mombasa, Lamu, Tana River, Taita Taveta and Kwale counties. This will be an excellent boost for agripreneurs in the region.

Gap in the Literature

As noted from the literature review, efforts to enhance climate change mitigation and adaptation in Kenya and Kilifi County as the study area in an aim to enhance socioeconomic development in the country is still wanting.

This is mainly attributed to poor climate change action plan implementation policies and lack of climate change champions both nationally and in the county levels. As much as adaptation is needed to address the potential variability of future climate change, Kenya and therefore Kilifi county can only be able to mitigate the socio-economic impacts of climate change if it starts by educating its population on the need to preserve the environment, allocate supplementary budget to facilitate expanding of institutions that facilitates for early capacity building and early warning systems in the county levels, improve the living standards of the population by creating job opportunity and empowering her people, improve on the infrastructure and mode of technology both in rural and urban regions and more so come up with friendly environmental policies and advocate for the county authorities to enhance its formulation in the grass root level. This study therefore attempts to fill this gap by examining the socio-economic impacts of climate change on Kenya and Kilifi County developments.

Justification of the Study

This study will be done to highlight the importance of preparing for future climate change scenarios with respect to understanding the socio-economic impacts it has on Kenya and Kilifi county developments. As much as it is not easy to predict with certainty, there is need to put up mitigation and adaptive measures and strategies to prepare for future, rather than using uncertainty as the reason for inaction.

Early adaptation can reduce the socio-economic costs of climate change on the development. Kenya being a developing country is predicted to have greater impacts on climate change given the fact that it has a higher vulnerability and lower adaptive capability. Climate change impacts could threaten past

developments and have an adverse effect on future socio-economic development, keeping in mind that some regions in Kenya have a high vulnerability. Kilifi County despite being located in the more ;pw lying coastal region of Kenya having a favorable weather conditions still faces a high risk of being affected because of lower adaptive capabilities to the changing weather patterns. Therefore timely adaptive measures and strategies ought to be implemented in order to be more proactive when it comes to issues related to climate changes hence reducing its effects on the socio-economic development of county.

Theoretical Framework

This study is premised on the social responsibility theory, which is an ethical theory that entitles organisation, individuals or even countries to act for the benefit of the society at large in order to maintain a balance between the economy and the ecosystem.

This theory propagates for individuals, organisations and even state as an entity to take into account the welfare of the society and the environment in order to limit the effects that these entities subject to the environment. The engagement can be either passive by avoiding engaging in social acts that affect the environment or be active by performing activities that directly benefit and advance on the social and environmental acts. This theory goes hand in hand with this study, as it enhances individuals, organisations and countries to give back to the society where it's due, by ensuring that their deeds do not impact on the environment and the society in general. Social responsibility theory propagates for corporate social responsibility (CSR) whereby companies and organisations try to create a positive niche to the society while doing its businesses in a way to give back to the society. CSR as defined by Lord Holmes and Richard watts is just a virtue of "making good business sense"

According to this study, the government should come up with proper ways to propagate this social responsibility theory on those entities that are the key culprits in subjecting inhumane acts to the environment, by coming up with adaptive and mitigating measures which should be followed by these entities. This is because, law is a command and it has to originate from a superior entity in which this case the government is the superior entity. Thus this theory applies to all states as they are the sovereign entity from whom the commands originate from.

This theory is important in my study as it advocates for individuals, organisations and even countries to act on the benefit of the society by ensuring that any activities that they engage in does not have a negative implication on the environment. The theory propagates for CSR to be enforced by organisations to give back to the society, philanthropic activities for individuals such as planting trees, collection of garbage's and ensuring a conducive environment to all aimed at conserving the environment and for countries, to ensure it enforces laws and measures aimed at mitigating and controlling environmental pollution to both individuals, organisations and to other countries. Social Responsibility Theory complements well with my study, as it makes every human being duty to safe guard and protect the environment, by

giving back to the environment where it is due.

The theory advocates for communal efforts towards conservation of the environment through proper waste disposal, afforestation where necessary, conservation of water catchment towers and forest reserves, zero tolerance to GHG emissions and so on , in an attempt to enhance a greener environment hence fully utilizing the benefits of nature.

Research Methodology

The study used qualitative research methods that drew information from both primary and secondary sources. Primary data was derived from structured questionnaires that guided the researcher in data collection. The researcher employed Focus group discussions (FGDs) in collecting Primary data, which brought together different partners in the business community who are affected mostly by climate change.

The researcher identified five actors from different ten FDGs and administered an open-ended questionnaire to each one of them to fill.

The researcher analysed the findings from their understanding of impacts of climate change on the socio-economic development of Kenya.

According to the findings, four out of five respondents from the different ten FDGs argued that Kenya socio-economic development is heavily influenced by changes in climatic conditions, as they attributed the over-dependence on rain-fed agriculture to spur our agricultural sector, hence this tend to affect the food security which in turn affect the country's socio-economic development. They argue that climatic impacts have negatively affected the Country's socio-economic development, as frequent droughts and floods havocs have led to loss of lives, destruction of properties, damage in infrastructure sector hence hindering growth and development.

A majority of the respondent argued that human related activities such as deforestation, poor land use patterns and GHG emissions have been the key contributor to the drastic changes in climatic conditions. The respondents believe that all this is due to the inactive role played by the government in educating the public on the need to protect and safeguard our environment. Although some of the respondent argued that the government is doing a proactive role in encouraging planting of trees, protection of water catchment areas like the Mau, karura and Embobut forest and coming up with policies aimed at mitigating and adapting to climate changes.

The respondent argued that Kenya still has a long way to go in terms of adapting to climate change calamities. This is due to lack of enough climate financing to enhance climate related researches to facilitate quick and rapid preparedness to climate change calamities. The public lack proper information about climate change awareness, hence the continued environmental pollutions. With the only response mechanism as of now being in the form of policy, nothing much has been operationalized practically as these policies are just paper works hence the repeated changes in climatic conditions witnessed through the periodic floods, droughts and famine in the country year in year out. The secondary data was mainly sourced from special collection and review of published and

unpublished material, journals, periodicals, academic papers, government papers, electronic and print media. The study employed content analysis as means of analysis.

Design of the Study

Introduction

This chapter is based on socio-economic impacts of climate change that has tremendously affected Kenya's socio-economic developments. In addition, this chapter examines the impacts that climate change has on the key sectors which are important for the country's growth and development and will also shed light on the possible solutions and ideas tailored at offering a mitigation and adaptive solution to minimize the effects brought about by climate change in the country's socio-economic developments. Kenya is highly vulnerable to impacts of climate change, as only 20% of the territorial surface area in the country is classified as highly potential area receiving high amounts of rainfall to support agriculture productivity. The largest part 88% is arid and semi-arid lands (ASALs) having a minimal annual rainfall ranging from 200-850mm. Over 80% of the total population live within the potential areas while only 20% of the population lives in the vast ASALs comprising of ecological zones.

2.1 Sectoral Impacts of Climate Change in Kenya.

In recent years, Kenya has witnessed its share of climate-related impacts which have greatly impacted on the socio-economic activities of its people. These climate-related impacts have ranged from prolonged droughts, frost in some of the productive agricultural hub, hailstorms, extreme flooding, receding lakes level impacting on the fishing industries, drying of rivers and other wetlands, leading to large socio-economic losses impacting directly on the food security. These extreme climate events have led to displacement of communities, resulting in conflict over natural resources, competition of scarce resources which has led to human-wildlife conflicts and so on.

Kenya is vulnerable to climate change related impacts as witnessed recently with the (2010-2011)horn of Africa drought crisis. This provided the country with appropriate measures to develop response strategies and activities aimed at empowering the country to overcome climate-related impacts.

Kenya has a complex existing climate, with wide variations across the country having a strong seasonality. Average temperatures show strong differences between the narrow and coastal strip, arid and semi-arid lands and temperate highland plateau. Rainfall is viable, having an annual cycle of bimodal, with two wet seasons; the long rains (March-may) contributing 70% of the annual rainfall and the short rains (October-December). The Western highlands and the coastal areas also receive rainfall during September –June. These complex patterns of climate variability brought about by factors such as El Nino and La Nina have huge effects on the country's key sectors including; agriculture, tourism, infrastructure, forestry, energy, health and water.

Agriculture sector

The agricultural sector is the pillar of the Kenyan economy contributing directly 24% of the GDP with a total value of KES

342 billion, and another 27% indirectly valued at KES 385 billion, having 65% exports earnings. The sector accounts for 65% of informal employment in rural areas, and accounts for 80% of livelihoods and food security of the population.

The main cash crop grown in Kenya is maize, although foodstuffs such as cassava, sweet potatoes, millet, rice, wheat, sorghum, vegetables, bananas just to name a few are planted in the country.

Kenya depends on the 16% high and medium agricultural potential land mass, with the remaining 84% being ASALs predominantly used for ranching, agro-pastoralism and game parks. Due to this, Kenya has laid down Agricultural Sector Development Strategy (ASDS) in its Vision 2030 covering the period from 2009-2020, aiming at positioning the sector in the lead to deliver a 7% annual growth rate that will boost the rest of the economy into two digits (10%) as envisioned under the economic pillar of Vision 2030. Despite these efforts, Kenya still grapples with food security challenges, brought about by over dependence on rain-fed agriculture for food production.

The agriculture sector is very sensitive to climate change, therefore agriculture systems in Kenya need to adapt to the ever-changing climatic changes to ensure provision of adequate food for a growing population, while increasing export crop production to generate foreign earnings hence boosting the economy. Agriculture in Kenya is a large sector and a growing GHG emitter, responsible for about 30% of Kenya's emissions. The Intergovernmental Panel on Climate Change (IPCC) has concluded that poorest countries would be hardest hit with effects of climate change on the agricultural sector, brought about by decreased water availability and increased GHG mainly attributed with lower adaptive capabilities.

The changing rainfall patterns have affected the planting system hence affecting farmers who mainly depend on rain-fed agriculture. In some regions such as the Coastal parts of Kenya, the changing pattern of rainfall has affected the bi-annual planting system hence having implications on the countries food security.

Climate-related impacts such as rising temperatures have led to increased evapotranspiration, resulting in reduced soil moisture hence affecting the soil moisture content. Rising temperatures have also led to greater destruction of crops and fruits trees by pests which thrive best in hot temperatures thus reducing quality and reliability of agricultural yields. Kenya over the years has experienced socio-economic impacts of climate change brought about by environmental degradation due to urbanization, over-population, and adoption of modern technologies, dumping and deforestation which has impacted on the agriculture sector leading to food insecurity.

Over ten million Kenyans suffer from chronic food insecurity and poor nutrition, and between two to four million people require emergency food assistance at any given time.

Results and Discussions

Introduction

This chapter presents findings of the study which have been discussed under thematic and sub-thematic sections in line with the study objectives. The thematic areas included costs of production, extent to which agricultural services influence production, extent to which demographic characteristics influence fish production and how accessibility to credit facilities influence fish production among small scale farmers .

Conclusions and Recommendations

Summary of Key Findings

The overriding purpose of this study was to determine impacts of climate change on Kenya's socio-economic development. To accomplish the goal of this research, it was essential to identify the causes of climate change in Kenya and how it adversely affect major socioeconomic development within different regions in the country with a major focus being on Kilifi County. Therefore in order to reach an understanding of the topic, it was critical to understand the relationship that climate change has on the socio-economic development of the country, and how any negative impact on the climate change would impact to the country's economy. Once these fundamental steps were achieved, the research was able to go forward.

Hence, this chapter will report the findings, conclusion and try to come up with relevant recommendation tailored to meet the needs of other researcher's in the field, various stakeholders in the climate change related spheres and the government at large.

The data used for this research was mainly derived from secondary and primary sources, which involved the use of in-depth information gathering and document analysis, surveys and questionnaires. The finding of this study suggest that at the national level, the efforts aimed at mitigating the impacts of climate change on the socio-economic development are on wayward low, hence impacting on the various county government as they depend on the national government for assistance.

Therefore this study highlighted that Kenya as a country is highly vulnerable to impacts of climate related calamities because of its low adaptive and high dependency ratio hence little to no focus is subjected at ensuring climate change related activities are mitigated. Thus the combined efforts of poor land use patterns, increased climatic uncertainty will have much more implication on the people and the ecosystems throughout the country in the future years to come.

Key Findings

According to this study finding, there has been some form of influence from the international community aimed at enhancing climate change adaptive and mitigation policy in Kenya with an aim at reducing the future expected climate change related catastrophe in the country, Africa as a continent and the entire world. Climate financing an effort aimed at financing climate resilient development by the World Bank has been fostered to enhance nations to be climate resilient by financing their efforts in mitigating and adapting to climate related changes.

The world bank has enhances a strategy for climate resilient development in sub Saharan Africa aimed at adaptation and disaster risk reduction aimed at creating climate variability through adaptive measures of floods and droughts, mitigation and adaptation synergies aimed at fostering better land, water and forest management, enhance use of green energy, advocate for knowledge, capacity building and new technology aimed at improving climate knowledge and scaling up financial support. However, the study found that Kenya is highly vulnerable to climate change related impacts because of lack of vibrant institutions championing climate change adaptation and mitigation, poor urban-rural planning, poor land use methods, lack of climate knowledge sensitization mechanism, rapid population increase and poor government policies regarding climate change.

The study finding has estimated the potential for low carbon growth in Kenya, with the largest emitting sector being agriculture, mainly from livestock emissions, followed by energy consumption primarily from consumption of oil products in transport and industry. However, emissions are expected to increase by 60% by the year 2030, this is mainly attributed to the strong growth plan as projected in the vision 2030 blueprint, as well as other changes from population and urbanization. The study finding has shown that the country is faced with poor policy implementation hence hindering climate change related policies from being implemented in the grass root level. Despite Kenya's commitment under the United Nations Framework Convention on Climate Change (UNFCCC) process by ratifying the Kyoto Protocol in 2005, and contributing to continental and regional climate change initiatives, the country lacks the technical manpower to advance the objectives in the United Nations Convention in the grass root level hence exposing the country to mirage effects of climate change catalyzed by the frequent environmental degradations.

Recommendations

Kenya faces a potential high risk climate change impacts which if not mitigated on time will have a huge environmental catastrophic for the future if not the current generation. Excessive environmental degradation witnessed in recent time in the country is key evidence for mirage effects of climate change if not mitigated and adapted on time. Therefore this study has outlined a number of recommendations and future priorities aimed at advancing climatic mitigation and adaptive measures for the government, researchers and future scholars.

First, there is the need for the government to get ready and act now if anything to do with current or future climate change mitigation and adaptation is to be achieved. Most importantly, the government has to establish and empower institutional and policy development facilities aimed at forecasting, advancing and fostering climate change related agenda within the country and the East Africa region at large.

This can be achieved through empowering existing climate change related institutions such as Kenya Meteorological services, NEMA, Kenya Agricultural Research Institute (KARI) and revisit further on analyzing vision

2030 to advance for low carbon growth paths in the face of industrial growth and revolution in the country and the predicted increase in population. Secondly, there is need for regional collaboration towards climate change mitigation and adaptation. This can be achieved through having a common agenda towards climate change within the East African community, Common Market for Eastern and Southern African Nations aimed at mitigating and adapting to current and future impacts of climate change.

Kenya being the centre for United Nations Environmental programmes (UNEP) should be at the forefront in spearheading regional collaboration towards climate change adaptation hence having a common goal towards climate change mitigation hence cost sharing towards on climate financing thus reducing on carbon emissions and securing our future generations. Thirdly, there is need for periodically sourcing for climate financing from relevant climatic sensitive institutions such as world meteorological organisation, United Nations and so on to finance on projects tailored at mitigating climate related impacts in the country.

This can only be achieved if there will be equal representation on the usage of the funds in relations to climatic risks and accountability should be paramount to enhance transparency in the usage of the funds hence enhancing more funding from relevant willing bodies. Lastly, there is need for the government, climate sensitive institutions and learning institutions to enhance research activities tailored at advancing climate change related ideas which will be instrumental in advocating for future methods of adapting to climatic changes at the same time coming up with new mitigation methods. Currently, Kenya has a weak mechanism for collecting information on climate change, with an unconsolidated and scattered agencies and departments tailored at enhancing the fight against climate change.

This fragmented framework makes it difficult for key stakeholders to track progress, share results and access information. Therefore, the government, higher learning institutions and climate sensitive institutions should enhance a holistic and adequate resourced monitoring system aimed at enhancing a free flow of information through research based initiatives.

Conclusions

Climate change is a major hindrance towards socio-economic development both nationally and in the county levels which require a high level political goodwill and support to effectively address the risks associated with climate change impacts and more so maximize on the opportunity present that climate change comes forth with. For Kenya, adaptation to climate change remains the top priority to reduce vulnerability and enhance resilience of the socio-economic developments especially for the vulnerable communities and groups within the country.

The country should enhance mitigation actions that will deliver sustainable socio-economic development tailored at enhancing a national socio-economic development as set out in the Vision 2030 and still instil the virtue of low GHG emission in an aim of enhancing climate smart strategies by promoting

use of clean energy technology for improved and sustainable livelihoods.

Climate change stakeholders too should be encouraged to mainstream climate proofing and climate change responsive activities in their daily routine activities to enhance climate change awareness and preparedness in the face of future climate related catastrophe. Therefore for climate change to be addressed effectively, a collected effort from the government, climate change stakeholders, public and private sectors stakeholders and the general public should be harmonized to enhance climate change mitigation and adaptation.

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