



A Review of the Future of Tourism in Coastal Kenya: The Challenges and Opportunities Posed by Climate Change

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Abstract

The Kenyan economy highly depends on agriculture and tourism. The performance of the two sectors of the economy are however very vulnerable to the effects of climate/weather variability. The main tourist attractions along the coastal Kenya are the historical and heritage sites such as the Vasco Da Gama Pillar, ruin of Gedi and the Fort Jesus, the coastal beaches, rainforests and marine parks.

Climate variability and climate change is experienced globally; the changes and its impacts however vary both spatially and temporally. This study reviewed the future changes in climate over coastal Kenya and its effects on the tourism sector in the region. It employed both desk top review of literature in the two fields; tourism and climate changes and statistical analysis.

The temperature, precipitation and floods are projected to increase in Kenya at large. These are likely to lead to sea-level rise that is expected to cause flooding and inundation of coast lines. This is a potential threat to coastal environment: low-lying coastal plains, islands, beaches, coastal wetlands and estuaries. These in turn lead to problems such as destruction of infrastructure and some tourism sites along the coast. This will hamper tourism at the coast reducing the revenue collection for Mombasa county and national governments.

The study recommends that both the national and county governments sensitize several sectors on the causes and implications of climate change, and explore and develop non-nature-based tourism products and services.

Keywords: Coastal Kenya; Climate change; Tourism

Introduction

The Kenya Coast is endowed with a variety of resources that support livelihoods and economic development in the region and Kenya as a whole in addition to maintaining the health and function of marine and coastal ecosystems. The resources include mangroves and other coastal forests; estuaries; coral reefs; marine species; and open sea marine resources among others.

Tourism is one of the leading foreign income earners in Kenya; indeed, the sector contributes about 27% of foreign exchange which represents 12% of the country's national Gross Domestic Product (GDP) [1]. Kenya is among the popular tourism destination in Africa attracting millions of tourists over the past years [2]. The country's blueprint Vision 2030, aims at making the country among the top 10 overhaul tourist destinations in the world. The key tourist attractions along the Kenyan coast include beaches, cultural heritage and marine based habitats [3]. According to Kenya Tourist Board (KTB), of the tourists coming to Kenya, about 65% visit Kenyan Coast making tourism an important part of the city's economy.

Weather and climate are among the important factors in tourists' decision making and also have great influence on the successful operation of tourism businesses. Studies [4,5] identified climate as a

key driver for tourism and an important destination attribute. Climate change affects a wide range of environmental resources such as wildlife, biodiversity and water which are key tourist attractions. Variability and changes in climate thus negatively impacts tourism.

Despite the growing recognition of the impact of climate change on tourism, there remain many aspects of this complex correlation which have not been understood. As an example, Scott et al. [6] acknowledged the need for more interdisciplinary approach in order to recognize the complexity of climate change and tourism. The impact of climate change can be looked in different ways [7] first, impact of climate change on tourism, secondly, the effects of regulatory measures to mitigate the impact of climate change on tourism and thirdly, the impact of tourism on climate change. A change in demand patterns and tourist flow will directly impact on tourist businesses and related sectors such as agriculture and handicrafts. Outdoor events, infrastructures and communication are equally adversely affected by weather which in turn affects recreational activities. According to IPCC [8], climate change could place tourism at risk, particularly in coastal zones and mountain regions.

Mombasa just like many cities located on low lying ocean coast is susceptible to the impact of climate change particularly the sea level rise and storm events.

Although modeling climate changes as well as human behaviour, in particular personal preferences, choices and other factors, is

exceedingly complex, the aim of this study is thus to review the future state of weather and climate in the coastal region of Kenya and assess how it is likely to influence tourism in the areas and Kenya at large.

Area of study

Kenya lies on the eastern portion of the African continent bordering the Western Indian Ocean (Figure 1). The country has 640 km of coast line and thus has the potential to be adversely affected by changes in the ocean. Mombasa is the largest international seaport in Eastern Africa and has more than 650,000 inhabitants as well as an important role in the national and regional economy.

The Coastal geomorphology consists of a mixture of sandy beaches, creeks, muddy tidal flats, coral reefs and rocky shores [9]. The coastal towns of Kenya have other historical and cultural sites in Lamu, Gedi, Mombasa, and Shimoni.

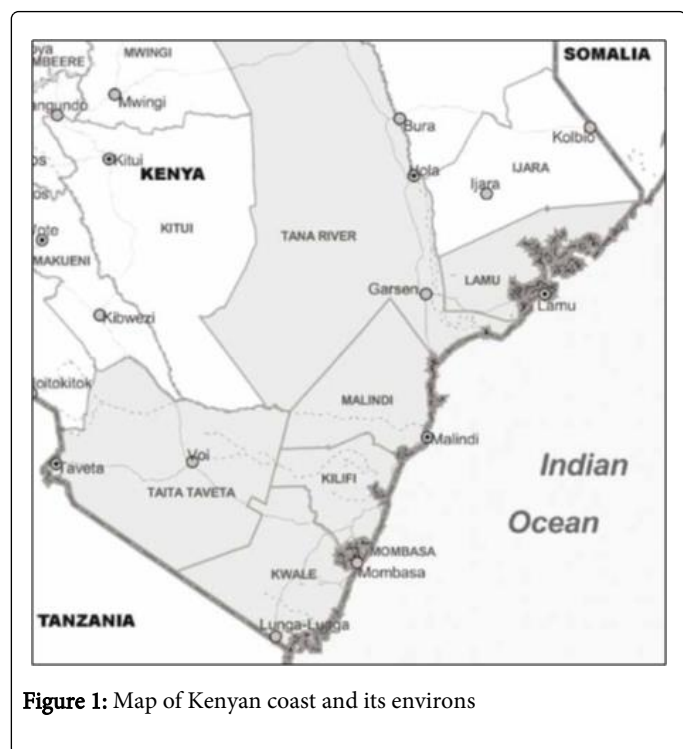


Figure 1: Map of Kenyan coast and its environs

The Annual rainfall pattern at the entire Kenya coast is influenced by the south eastern and north eastern monsoon winds with the main rains coming between late March and early June and decreasing from August. The short rains come in October and November decreasing rapidly to a minimum in January and February. During the rain seasons the coastal strip receives the highest amounts of rain with the amount decreasing inland.

The coastal lowlands experience the constant high temperatures and humidity associated with equatorial latitudes, Mombasa for instance has an annual mean temperature of 26°C.

Problem statement and justification of the study

Weather and climate play an important role in daily activities of the societies across the globe and any shift in the two may be advantageous or may pose a negative impact to life, infrastructures and economy. Understanding the magnitude and frequency of extreme events related

to weather and climate is paramount especially when building societal resilience. Global warming; an evidence of climate change for instance, affects the coastal people by increasing the sea level and change in rainfall patterns among others. The Performance of the tourism sector is highly vulnerable to the effects of climate change.

People living along the Kenyan coast mainly depend on tourism which is being affected by the changes in weather and climate.

Methodology

The Review objects of this study are articles on the relation between climate change and tourism. The review was carried out purely through desktop review of journal databases, search engines on the web and United Nations World Tourism Organization (UNWTO) Library.

Results and Discussion

The coastal region contributes considerably to Kenya's national wealth. Mombasa supports 8.6% of the national population with a population growth rate of 2.9% per annum [10] (Figure 2). The increase in population together with human activities such as water abstraction and alteration of hydrological regime are likely to enhance the effect of sea level rise.

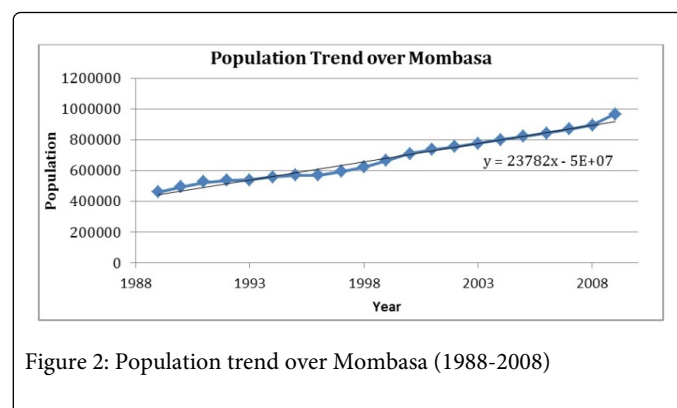


Figure 2: Population trend over Mombasa (1988-2008)

Sea level rise

In as much as literature reviews on the impact of climate change on sea level in Africa are very limited [11], the continent is however considered to be particularly vulnerable to climate change-induced effects largely due to lack of financial, institutional and technological capacity [12]. A rise in sea level, for instance, may create conditions of flooding, erosion, saltwater intrusion and increased storm surges [13,14]. The extent of the sea level will vary from place to place and will be affected by geology, topography and other human activities.

According to IPCC [8], climate models show that, over the next several decades, sea level is expected to continue to rise. The rate of thermal expansion is projected to be 1.3 ± 0.7 mm per year during 2000 to 2020. The projected global average sea level rise at the end of the 21st century is 0.21-0.48 m compared to the 1980 to 1999 period.

In Mombasa, a considerable population and economic assets are estimated to be located within the low-lying coastal zone. Awuor et al. [15] estimates that, a 30 cm increase in sea level could cause 17 percent of the city which lies up to 10 m above Mean Sea Level (MSL) to be submerged.

The rise in sea level therefore will pose a large economic threat. For instance, Kebede et al. [16] using population growth scenarios 1 estimated that more than 480,000 people and assets worth over US \$4.8 billion will be exposed within the low-lying coastal zone by 2050.

The city has a long history of frequent natural disasters associated with extreme climatic events, most recently the severe flooding in October 2006. This event, caused by intense precipitation, affected approximately 60,000 people in the city and caused damage to important infrastructure. The analysis shows that coastal flooding from sea level rise is estimated to affect 10,000 to 86,000 people a year by 2030 (across the scenarios), as well as leading to coastal wetland loss and coastal erosion [17]. Regions surrounding Watamu and Sabaki river estuaries are reported to be most susceptible though low lying areas are spread along the whole coast.

The sea level rise coupled with changes in frequency and intensity of extreme weather events such as storm surges are expected to increase incidence inundation of low lying areas, shoreline erosion and salt water intrusion leading to salinity in estuaries and coastal aquifers. This will in turn shape the islands, beaches, estuaries and coastal wetlands thus influencing the coastal ecosystems and therefore tourism. Moreover such process will affect tourist services such as infrastructures, fishing, agriculture, water resources and marine parks. Warm sea surface temperatures, more extreme weather events, and sea-level rise will lead to the destruction of coral reefs, which are crucial for coastal protection [18]. Mangroves which are tourist attractions at Kenya coast are at threat from deforestation, coastal erosion and extreme weather and have been identified as one of the most vulnerable species to sea-level rise and inundation [18]. Noteworthy are other impacts of climate change such as increased storminess, reduced precipitation and changes in sedimentation from Tana and Athi Rivers will have a considerable impact to Kenyans coast.

Temperature rise

Temperatures have been rising globally by about 0.74°C on average in the last 100 years [8]. The average global surface temperature has warmed 0.8°C in the past century and 0.6°C Africa has warmed by 0.7°C in the 20th century and general circulation models project warming across Africa ranging from 0.2°C per decade (low scenario) to more than 0.5°C per decade (high scenario) [18,19]. The climate models scenarios show an increase in future mean annual temperature with projections from 1° to 3.5°C by the 2050s [17]. A recent study report a rise of about 1°C by 2030 to around 1.5°C by 2050 for a mid range emission scenario. Based on the Multi-Model-Dataset (MMD) of 21 global models and on the A1B-scenario, the projections for East Africa indicate that the median near-surface temperature in the 2080 to 2099 period will increase by 3°C to 4°C compared to the 1980 to 1999 period [8].

Considering the improving summer temperatures in Europe, the Kenya's traditional tourist source, it is likely that the country will experience decrease in international tourist arrivals in summer. Further, as the average temperature increases, the demand for cooling will increase. Consequently, this will exert pressure on the national energy budget. Space cooling is already a major source of energy demand in cities along the tropics and subtropics even for middle income countries. According to Stockholm Environment Unit [11] there already exists a significant cooling demand in Mombasa. Using model-simulated baseline conditions the cooling demand for

Mombasa is estimated to rise to between 150 and 320 by the 2050s representing 240-340% rise in cooling burden.

Higher temperatures are also known to heat the surface of the sea causing it to expand thus exacerbating sea level rise. According to Bicknell et al. [14], a rise in sea level, can have significant impacts in low-lying coastal areas through flooding, erosion, increased frequency of storm surges, and saltwater intrusion. Climate change is expected to significantly alter Kenya coastal biodiversity as species struggle to adapt to changing conditions [20]. The warm sea surface temperatures, increase in frequency and intensity of extreme weather events, and sea-level rise will lead to the destruction of coral reefs, which are crucial for coastal protection [18]. Coral reef loss is a significant cause of coastal erosion and a major coastal management issue in both Kenya and Tanzania [21]. The potential impact of climate-change-induced ocean warming on coral reefs was clearly evidenced by the coral bleaching which followed the 1997/1998 extreme El Nino. During the incident, a 30% loss of corals resulted in reduced tourism in Mombasa and Zanzibar, and caused financial losses of about US \$12-18 million [8,22].

Precipitation

Precipitation in East Africa on the other hand is more variable; under intermediate warming scenarios, parts of equatorial East Africa will likely experience 5-20% increased rainfall from December-February and 5-10% decreased rainfall from June-August by 2050 [19]. The same observation; increase in rainfall has been reported by IPCC [8]. Generally, climatic changes of this magnitude will have far-reaching, negative impacts on the availability of water resources, food and agricultural security, human health, tourism, coastal development and biodiversity. The precipitation will affect the quality and quantity of food crop available for tourist resorts and hotels. Although, the crop yield projections varies from one study to another depending on model used, majority of global and regional scale studies points to yield decline especially to the staple food.

Conclusion and Recommendations

Climate change and variability presents a number of economic, social and environmental challenges and opportunities to Kenya that should be addressed and harnessed to avoid slowing development gains and realization of Vision 2030. The tourism industry has a high potential to provide continued economic growth and employment for the coastal region and Kenya at large, but much more needs to be done to mainstream climate change into its planning activities, particularly with regards to adaptation.

Climate impacts are eating into the economy; threatening water availability to sea-level rise and extreme weather impacts to coastal regions and tourism. African nations and other developing countries are the most vulnerable to the effects of climate change; this is attributed to the lack of economic, development, and institutional capacity [18].

Currently, there is a threat to tourism and the threat is likely to increase with time. According to climate projections; temperature, precipitation, extreme events are on increase. These are likely to result into sea level rise, destruction in the coastal ecosystem and the general infrastructure in the area such as the transport and communication lines. All these causes destroy tourism attraction destinations, reduces tourism activities and revenue collection consequently.

Although the threats posed by climate change to tourism present opportunities for alternative activities, the coastal people do not have the alternatives and thus have to see to it that the natural existing attraction sites are maintained. The study thus recommends:

- Creation of awareness of the impacts of climate change on tourism sector.
- Both the national and county governments should explore and develop non-nature-based tourism products and services
- Emphasis of alternative tourism development models that promote enhance environmental sustainability [23].
- Undertaking of case studies to provide more detailed local analyses included a case study on sea level rise in Mombasa, flood events, vulnerable groups and iconic ecosystems.

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