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# Employing the enhanced Regional Tourism Sustainable Adaptation Framework with a case study of climate change vulnerability in Mombasa, Kenya

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## Abstract

This paper attempts to provide an empirical application of the enhanced Regional Tourism Sustainable Adaptation Framework using a case study of Mombasa Kenya. Climate variability is a challenge to tourism destinations, especially coastal and Island destinations, categories under which Mombasa, our study site falls under. Mombasa has limited capacity to adapt to climate change considering its socio economic conditions and weak institutions, thus making it necessary to explore the possible sustainable pathways for the city using the enhanced Regional Tourism Sustainable Adaptation Framework. Earlier frameworks for tourism adaptation to climate change lacked focus on regional dynamics as well as sustainability aspects, and their implementation pose the risk of mal adaptation to some extent. Using secondary data and data from interviews with tourism stakeholders in Mombasa, the enhanced Regional Tourism Sustainable Adaptation Framework guides our assessment of vulnerability and resilience of the destination, as well as identification of region specific adaptation options for the city within the context of sustainable practice. Based on climate change perceived impacts, risks and vulnerability various adaptation options are presented and discussed as provided in literature. The usefulness of the framework in guiding regional tourism destination managers and policy makers in their pursuit for a regional adaptation options within the tourism sector in order to reduce destinations vulnerability, increase resilience and take advantage of opportunities presented by climate change is underscored.

## Keywords

Tourism adaptation, climate change, Kenya, Mombasa, Regional Tourism Sustainable Adaptation Framework

## Introduction

Tourism exhibited growth for the past six decades and showed resilience during the 2008–2010 economic recession and it projected to post a 1.8 billion in international arrivals in 2030 (UNWTO, 2013). Thus far it is considered the fastest growing industry with a

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promising 3–4% growth in the next two decades (UNWTO, 2014). Despite these remarkable growth and pessimism, tourism is faced with challenges of changing climate regime. This is because tourism is climate sensitive (Simpson et al., 2008). Climate largely determines the type, place and length of a tourist activity.

Climate change has both direct and indirect impacts on tourism including impacts associated with changes on the environment which is an important pull factor for tourists including: infectious disease, bushfires, insect, water-borne pests and extreme weather events (Simpson et al., 2008). Mountainous ski dependant tourism and coastal tourism are said to be the most threatened forms of tourism (Simpson et al., 2008) and the tourism sector must adapt urgently (Parry, 2007). Mombasa is popular destination in Kenya, and its Island status within the Indian ocean, where small island destinations are envisaged to be particularly affected by adverse impacts of climate change (Hoti et al., 2005), coupled with the fact that ‘climate change conditions the sustainability of coastal destinations’ (see Lacueva et al., 2017: 1) makes it an ideal case for our inquiry.

Since tourism came into the limelight of global policy, researchers have advanced search for the best way possible to adapt to climate change through models and/or frameworks to guide tourism stakeholders through a step-by-step process (Njoroge, 2014). There are several proposed frameworks for adaptation in tourism. For instance, Simpson et al. (2008), present sequenced steps for adaptation process while involving major stakeholders. Scott et al. (2006), detail forms of adaptation in tourism including behavioural, technical and business management. However, prior the year 2010 none of the frameworks focused on regional adaptation. Jopp et al. (2010) proposed the first ever Regional Tourism Adaptation Framework (RTAF). This framework provides tourism stakeholders with a tool that would guide them through the adaptation process. RTAF is a two-phase guide for practical adaptation to climate change by actors in tourism regions. First, it involves assessing the vulnerability and resilience of the destination, and then proceeds to a second phase where adaptation options are identified, implemented and evaluated. Although the RTAF has been criticised for failing to consider the basic principles of sustainable adaptation (see Njoroge, 2014), an enhanced framework for regional tourism sustainable-adaptation has since been proposed (Njoroge, 2014). The framework is informed by the need for collective local action as recommended by a number of researchers (see Ratter et al., 2016). We therefore, attempt to apply the framework for the case of Mombasa Kenya to demonstrate how the

enhanced framework can be applied in a real case scenario. In this framework, the vulnerability and resilience of tourism regions, as well as adaptation options are assessed within confines of sustainability checks.

### *Tourism, climate change impact and adaptation*

Tourism is faced by both direct and indirect impacts of climate change (Scott et al., 2012). These impacts include: (1) warmer temperatures which have implications for travel demand patterns, cooling costs, changes in biodiversity, infectious diseases and decreased snow. (2) Increased frequency and intensity of extreme storms which is a risk for tourism infrastructure damage, increased cost of insurance and business interruption. (3) Reduced precipitation which has implications for increased risks for wildfires, water shortage, desertification and increase in food costs. (4) Increased precipitation leads to flood damage to tourism assets and infrastructure. (5) Sea level rise, leading to coastal erosion and loss of beach area. (6) Sea surface temperature rise leading to coral bleaching and loss of marine resources, and (7) changes in ecosystems leading to loss of aestheticism of a destination (Simpson et al., 2008). Despite these negative impacts, climate change is said to produce opportunities that tourism can capitalise on. Such opportunities include a positive shift in demand for tourism products, as occasioned by climate change. For example, research by Koberl et al. (2016: 1039) finds out that there is ‘a potential for climate induced tourism revenue gains especially in the shoulder seasons during spring and autumn’.

In order to avoid the vulnerability of the industry to these impacts and for the destination to be able to capitalise on the opportunities presented by climate change, there is an urgent need for adaptation (Field, 2012). Adaptation in this context is defined as:

...adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. This term refers to changes in processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate. It involves adjustments to reduce the vulnerability of communities, regions, or activities to climatic change and variability. (Intergovernmental Panel on Climate Change, IPCC, 2007: 881)

Adaptation is an important strategy alongside mitigation (Ratter and Kannen, 2015; Weaver, 2011). However, due to the trapped Green House Gases (GHG) in the atmosphere, the mean global temperatures will continue

to rise (Barker, 2007; McCarthy et al., 2001). It is therefore important for governments, regions, communities and social economic sectors, including tourism, to adapt (Adger, 2007).

In tourism, the urgent call for adaptation has given rise to scholars to pursue research in tourism-adaptation (Njoroge, 2014). Themes in tourism adaptation research include Business, consumer, destination and policy-and-frameworks focused themes. However, it is already noted that tourism is behind in climate change research by about 5–7 years (Wolfsegger et al., 2008). As theme on sustainable-adaptation is emerging (Njoroge, 2014), we explore adaptation options for our study site based on a sustainable adaptation framework.

### *Sustainable adaptation*

Sustainable adaptation is an emerging theme which is being advanced in the fields of social and economic development. It has been brought into focus following revelations that not every adaptation is a good one (Eriksen et al., 2011). It has also been noted by Weaver (2011) that adaptation is being advanced in a ‘business as usual’ fashion. It is therefore important to adapt sustainably (Eriksen and Brown, 2011; Eriksen and Kelly, 2007; Eriksen et al., 2011).

Studies have revealed how certain adaptation may lead to mal-adaptation at other levels where the social justice and environmental integrity are jeopardised. See Eriksen et al. (2011) for selected case studies. This has led for the need for researchers to advance their understanding of sustainable adaptation in policy development.

But what is sustainable-adaptation? Sustainable adaptation lacks an agreed definition (Njoroge, 2014). However, it borrows the concepts of sustainability to its guidance. A few commentators have attempted to define sustainable adaptation. O’Brien and Leichenko (2007) argue that sustainable adaptation is derived from two words ‘Sustainability’ and ‘adaptation’. Sustainable adaptation is defined as

approaches that aim at reducing vulnerability of an individual, community, system, etc. and increasing resilience without jeopardising its economic viability, social justice and environmental integrity (Brown, 2011; Eriksen and O’Brien, 2007; Eriksen et al., 2011). To operationalise sustainable adaptation, Eriksen et al. (2011) highlight key principles of adaptation (see Box 1).

### *Adaptation models and/or frameworks*

Earliest attempt to provide a tool for adaptation is the work of Scott et al. (2006) who enlists adaptation types specifically for the tourism industry. However, their proposal did not provide a step by step guide for adaptation. Simpson et al. (2008) provide the earliest framework for climate change adaptation which is tourism specific. This framework provides crucial ingredient to future frameworks. However, it has been criticised for not considering the ‘tourist’ as part of the adaptation stakeholder despite advocating for inclusiveness (Jopp et al., 2010). Becken and Hay (2007) take a risk approach in presenting a framework for profiling risks but this approach finds limited application in tourism due to the complexity and high degree of uncertainty in tourism (Jopp et al., 2010).

Jopp et al. (2010) attempt to develop a framework for regional adaptation which is the first of its kind that is tourism specific, providing a step by step guide and regional in focus. However, the framework has been criticised for being business oriented, lacks explicit adaptation options assessment, limited in community opinion and lacks feedback from local and global processes (Njoroge, 2014). This led to an enhancement of the RTAF model to produce an enhanced Regional Tourism Sustainable Adaptation Framework (RTSAF). For more detail and critique, see Njoroge (2014).

### *Adaptation options in tourism*

Adaptation policy and research has gone a notch high. Tourism takes practical approach in adaptation

Box 1. Key principles for sustainable adaptation.

- Key principle 1:* Recognise the context for vulnerability, including multiple stressors: Climate change impacts vary depending on the characteristics of the region’s social, economic, institutional and cultural conditions.
- Key principle 2:* Acknowledge that different values and interests affect adaptation outcome. Different individuals and groups have different interests and values which must be considered during adaptation decisions.
- Key principle 3:* Integrate local knowledge into adaptation response: Adaptation is an ongoing process which produces learning among individuals, group and/society whose relevance is contextual.
- Key principle 4:* Consider potential feedback between local and global processes: Local adaptation decisions may have global implication especially in overall GHG emissions and adaptation at one level may lead to mal-adaptation at another level.

Source: Adapted from Eriksen et al. (2011: 11–15).

(Kaján and Saarinen, 2013). Frameworks have been proposed to aide in guiding adaptation (Njoroge, 2014). Adaptation actions can be taken before an impact is observed (anticipatory adaptation), after it has been observed (reactive adaptation) or can be taken spontaneous as the impact occurs. Any of these actions can take many forms ranging from; technical, policy, legal, economic, institutional, planning and behavioural (Scott et al., 2012).

While tourism adaptation to climate change will become increasingly important for the survival of social-economic systems including the tourism system, it should be noted that not all adaptation responses are environmentally sustainable nor do they necessarily enhance social justice and equity (Eriksen et al., 2011; Scott et al., 2012). Some result to maladaptation. Barnett and O'Neill (2010) categorically point out five criteria for maladaptation to include:

1. If the intervention increases GHG emissions,
2. Disproportionally burden the most vulnerable,
3. Bares high opportunity cost compared to available alternatives and,
4. Decreases incentives to adapt or increases dependence.

The next table enlists a number of adaptation forms and how they can be used in responding to specific climate change impacts. These interventions can be adapted in a mix of options and be implemented both at individual/organisational or national levels (see Table 1).

In addition to this list of possible interventions, other factors are important for enhancing adaptation. Tompkins et al. (2005) in a handbook on guiding strategy formation and implementation emphasise on the need to consider eight key elements of an adaptation strategy including: Risk Management, Linking with other planning processes, Legislation and enforcement, Support networks, Financing adaptation, Information and good science, Education and communication and Responsibility for development as shown (See figure 1) fig. 1.

## Methodology

The aim of this paper is to provide a conceptual descriptive application of the RTSAF to underpin its application and usefulness. Secondary data and research findings on perceived climate change impacts, risks and vulnerability are used in identifying possible response strategies.

This study takes a case study of Mombasa Kenya. Mombasa is a coastal city and a popular tourist

destination in East Africa (Akama and Kieti, 2007). The choice of case study approach is based on Yin (1994) who presented the application of case study in four situations including (a) a case is used to explain a causal link in real life phenomena, (b) to explore the situation where the phenomena occur, (c) to describe the phenomena and, (d) to explore the situation in which the phenomena under study have sets of outcome which are unknown. This study fulfils the need for application of a case study (Yin, 1994). The study aims at explaining the casual link of climate change and the tourism destination (Mombasa), by exploring the context where climate change impacts are under study and, to describe the implications of climate change on the sector where the implication of climate change impacts is unknown.

Mombasa County was chosen for this case because Mombasa is a coastal region which is vulnerable to climate change direct and indirect impacts such as sea level rise temperature changes, coral bleaching, flood risks, drought, storm surges, water stress and loss of biodiversity. The region also has limited capacity to adapt to climate change considering the social economic, technological conditions and weak institutions.

The next section employs the RTSAF (Njoroge, 2014), in order to explore the possible sustainable pathways for the coastal city of Mombasa, Kenya. The outcome will be a development of a list of adaptation portfolio for Mombasa tourist destination. Discussions are also provided on various ways to enhance successful adaptation strategy.

## Employing the Regional Tourism Sustainable Adaptation Framework

The RTSAF suggests two phases of climate change adaptation process (see Figure 2). The first phase involves an assessment of the vulnerability and resilience of the destination and the second phase involves developing adaptation options.

### *Phase one: Assessing the vulnerability and resilience of the destination*

We first develop an adaptation portfolio for Mombasa by assessing the vulnerability and resilience of the destination. We achieve this by identifying the tourism system, evaluating vulnerability of the system, risks, opportunities and resilience of the destination.

*Defining the tourism system.* The first step to assessing the vulnerability and resilience of a destination is to understand the tourism system as demonstrated by the RTSAF. After identifying the key elements and the wider picture of the tourism system, the risks and



**Table 1.** Adaptation options in tourism.

Types of adaptation	Tourism operators/businesses	Tourism industry association	Governments and communities	Financial sector (investors/insurance)
Technical	<ul style="list-style-type: none"> <li>• Snow making</li> <li>• Slope contouring</li> <li>• Rainwater collection and water recycling systems</li> <li>• Cyclone-proof building design and structure</li> </ul>	<ul style="list-style-type: none"> <li>• Enable access to early warning equipment (e.g. radios)</li> <li>• To tourism operators</li> <li>• Develop websites with practical information on adaptation</li> <li>• Measures</li> <li>• Snow condition reports through the media</li> <li>• Use of short-term seasonal forecasts for the planning of marketing activities</li> <li>• Training programmes on climate change adaptation</li> <li>• Encourage environmental management with firms (e.g. via certification)</li> </ul>	<ul style="list-style-type: none"> <li>• Reservoirs and desalination plants</li> <li>• Fee structures for water consumption</li> <li>• Weather forecasting and early warning systems</li> </ul>	<ul style="list-style-type: none"> <li>• Require advanced building design or material (fire resistant) standards for insurance</li> <li>• Provide information material to customers</li> </ul>
Managerial	<ul style="list-style-type: none"> <li>• Water conservation plans</li> <li>• Low season closures</li> <li>• Product and market diversification</li> <li>• Regional diversification in business operations</li> <li>• Redirect clients away from affected destinations</li> </ul>	<ul style="list-style-type: none"> <li>• Snow condition reports through the media</li> <li>• Use of short-term seasonal forecasts for the planning of marketing activities</li> <li>• Training programmes on climate change adaptation</li> <li>• Encourage environmental management with firms (e.g. via certification)</li> </ul>	<ul style="list-style-type: none"> <li>• Impact management plans (e.g. 'Coral Bleaching Response Plan')</li> <li>• Convention/event interruption</li> <li>• insurance</li> <li>• Business subsidies (e.g. insurance or energy costs)</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust insurance premiums or not renew insurance policies</li> <li>• Restrict lending to high risk business operations</li> </ul>
Policy	<ul style="list-style-type: none"> <li>• Hurricane interruption guarantees comply with regulation (e.g. building code)</li> </ul>	<ul style="list-style-type: none"> <li>• Coordinated political lobbying for GHG emission reductions and adaptation mainstreaming</li> <li>• Seek funding to implement adaptation projects</li> </ul>	<ul style="list-style-type: none"> <li>• Coastal management plans and set back requirements</li> <li>• Building design standards (e.g. for hurricane force winds)</li> </ul>	<ul style="list-style-type: none"> <li>• Consideration of climate change in credit risk and project finance assessments</li> </ul>
Research	<ul style="list-style-type: none"> <li>• Site location (e.g. north facing slopes, higher elevations for ski areas)</li> </ul>	<ul style="list-style-type: none"> <li>• Assess awareness of businesses and tourists, as well as knowledge gaps</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring programs (e.g. predict bleaching or avalanche risk, beach water quality)</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme events risk exposure</li> </ul>
Education	<ul style="list-style-type: none"> <li>• Water conservation education for employees and guests</li> </ul>	<ul style="list-style-type: none"> <li>• Public education campaign (e.g. 'Keep Winter Cool')</li> </ul>	<ul style="list-style-type: none"> <li>• Water conservation campaigns</li> <li>• Campaigns on the dangers of UV radiation</li> </ul>	<ul style="list-style-type: none"> <li>• Educate/inform potential and existing customers</li> </ul>
Behavioural	<ul style="list-style-type: none"> <li>• Real time webcams of snow conditions</li> <li>• GHG emission offset programmes</li> </ul>	<ul style="list-style-type: none"> <li>• GHG emission offset programs</li> <li>• Water conservation initiatives</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme events recovery marketing</li> </ul>	<ul style="list-style-type: none"> <li>• Good practice in-house</li> </ul>

Source: Adapted from UNWTO-UNEP-WMO (2008).

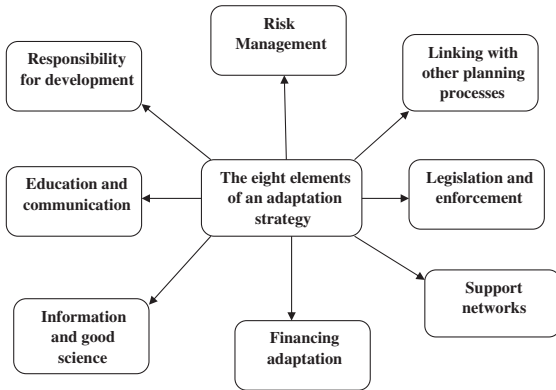


Figure 1. Surviving climate change in small islands, Tompkins et al. (2005), cited in Simpson et al. (2008).

opportunities are identified. Furthermore, we identify the factors that limit or enhance the vulnerability of the destination (i.e. adaptive capacity).

a. *The tourist*: Tourists are persons travelling from their usual home environment for at least one night for leisure. Leiper notes that without the tourist there would be no tourism (Leiper, 2004). Tourists engage in different types of tourist activities that interests them. These activities largely depend on the destinations characteristics which is a major pull factor for tourists. According to Kenya Institute of Public Policy Research and Analysis economic report of 2013, 75% of the tourists visiting Kenya for holiday purpose, 8% for business and 3% for conferencing (GoK, 2013). At least a third of these tourists end up in Mombasa region which is

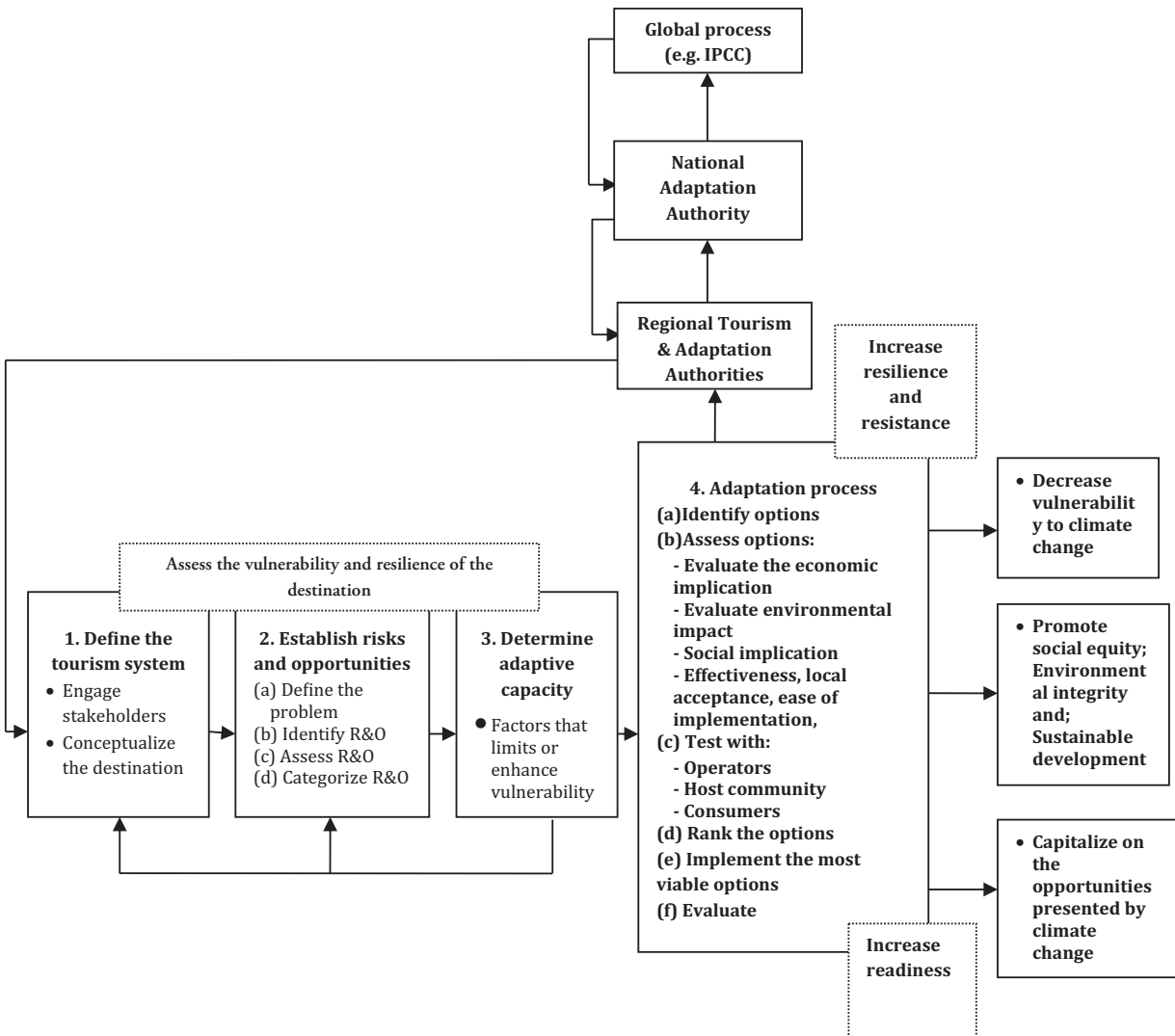
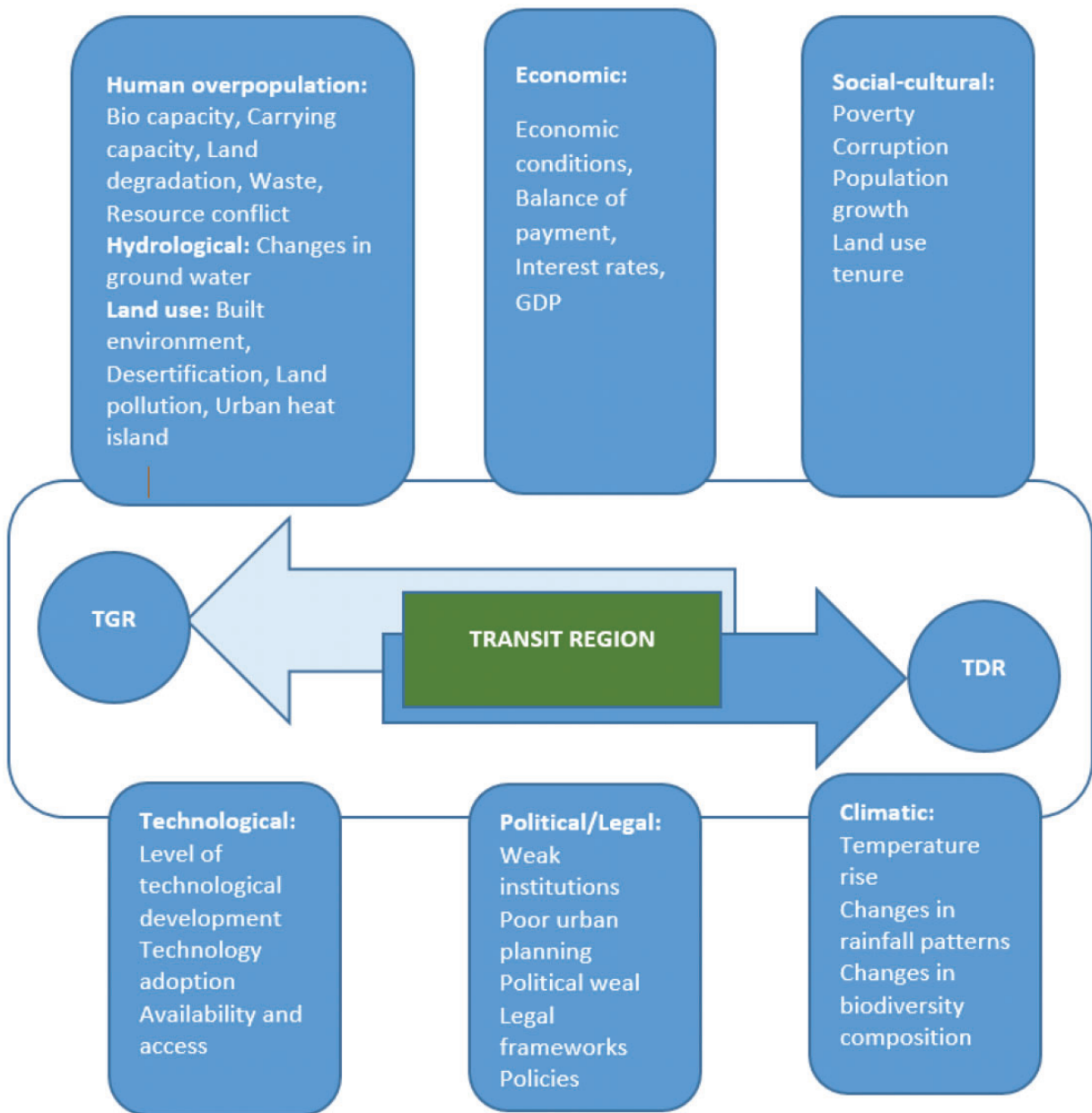


Figure 2. An enhanced Regional Tourism Sustainable Adaptation Framework (RTSAF) (Njoroge, 2014).



**Figure 3.** The tourism system.

Source: Adapted from Leiper (2004).

TGR: Tourist Generating Region; TDR: Tourist Destination Region.

the leading tourist destination in Kenya. (See figure 3)

b. *Tourist Generating Region:* The TGR is the region where the tourists journey starts and ends (Leiper, 2004). It is basically the region where the tourists originate from. These regions have traditionally been high income countries whose population have some disposable income enabling them to engage in travelling and leisure activities. Europe commands the largest share of TGR for Kenya at 43%, followed by Africa (24%), Americas (13%),

Asia (12%), Middle East (5%) and Oceanic (3%) (GoK, 2013). Whilst there are no data available on the exact number of tourists spending in Kenya, Mombasa region being the leading tourist destination in Kenya takes a large share of visitor expenditure (GoK, 2013).

c. *Tourist Destination Region:* The TDR is the region where the tourist spends his/her time engaging in tourist activities associated with leisure. The TDR is normally rich in tourism resources and tourism infrastructures that facilitate tourism activities. The



attractiveness of a destination is an important element that motivates potential travellers to actually travel, i.e. the 'pull factor'. Mombasa is endowed with natural resources that the tourism sector is built on. It is located in the Eastern coastline of Kenya bordering the Indian Ocean. The beach line provides a perfect location for the traditional sun sand and sea tourism related activities including swimming, sun bathing, beach sports, deep sea fishing and other water sports activities such as scuba diving and sailing. In addition to these natural attractions, Mombasa offers a rich cultural experience of the Swahili and the Miji Kenda people which has been largely influenced by historical occupancy of the Portuguese, Arabs and British settlers. These occupiers have influenced the local people's way of life and visibly the architectural design of buildings in Mombasa.

Historically, Mombasa was founded under two rulers namely Mwana Mkisi and Shehe Mvita. The later established the town in the Island of Mombasa which is seen as the main point where the city started to grow from Old town of Mombasa. Although currently the city represents a mix of multiple cultures drawn as far from inland Kenya and other earlier Arabic and Indian settlers, the wider Mombasa *The Nashara Taiifa* (Twelve Nations) is said to be the indigenous people of Mombasa. However, these later rulers were a succession of previous occupiers especially the Portuguese.

Mombasa city is said to have been established in 900 AD and later became a fully fledged trade centre in the 12th-century. It became an important trading point for spices, gold, ivory, millet, sesamum and coconut. Later in the pre-colonial occupation in Kenya, between late 1890s and mid-1950s, Mombasa became an important entry and exit point for British settlers. The current famous Kenya-Uganda railway built in the 1900s facilitated movement of goods, commodities and slaves from and/or into the greater East Africa region. Therefore, Mombasa is a clear melting pot for both west and east interactions which have produced rich culture and way of life of the local people that is sought by cultural enthusiasts visiting the destination.

d. *Transit Region*: The TR is the place where the tourist passes by between TGR and TDR. This region facilitates the arrival departure and arrivals from and/or to TGR and TDR. Access to Mombasa from international inbound tourists depends on the choice of the airline and the region of origin. For example, most European departures to Kenya using the National carrier KQ connections via

connection Paris and Amsterdam which are serviced twice a day. Other operators also provide charter flights to Mombasa which has been popular for tourists originating from the German market.

The main means to reach Mombasa is by air and road depending on the itinerary of the tourist. A typical tourist visiting Kenya with intentions for doing a safari and a beach holiday may involve arrival in Nairobi by air and travel to the intended game park or reserve for a safari. Access to some park may be by both road and air. After the safari, the tourist would head to the coast region where Mombasa is located 500 km from Nairobi city, this could be by road or air as well. In this kind of arrangement, a tourist would gain entry in Nairobi's Jomo Kenyatta International Airport and Exit through Moi International Airport, Mombasa, but this still depending on the itinerary of the tourist. Other typical arrivals would be through charter flights operated by international airlines. Although there has been a decline on Charter flights to Mombasa due to recent security related issues facing Mombasa, there have been weekly charter flights also dominated by the German market and now the Chinese and other countries of the East have recorded arrivals through charter flights.

Mombasa also has a good road network linking it through the southern coast stretch into North Eastern side of Tanzania at Lungu Lungu border. This is an important route by road for tourists doing safaris between Tanzania side and Mombasa. Moreover, Mombasa is accessible by sea especially cruise ships that dock Mombasa port. The city has a functional docking zone for such needs.

e. *Tourism industries*: Mombasa is a mature tourist destination. It is characterised by wide range of tourism facilities and services provided by the tourism industries. They range from high class hotels to bed and breakfast facilities. The tourism industry represents amalgamation of tourism service providers who provide both direct and indirect services. They include tourism hotels, travel agencies, insurance brokers, tour operators, tourist attraction management companies among others. While Magical Kenya is the organisation responsible in listing various national players in the tourism sector, Mombasa and Coast Tourist Association (MCTA) is the umbrella body that represent local players in the tourism sector. They have a portfolio of all tourism service providers and their associates. The local government also has an office that supplies the tourists with relevant information about tourism resources and activities for the destination.

**Table 2.** Impact of climate change and their effect on the tourism sector.

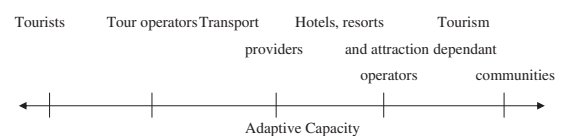
Impact	Perceived impact	Effect on tourism operation
<i>Temperature</i>	Change in temperature	
Increased temperature	- 'too hot' season	<ul style="list-style-type: none"> <li>• Increase in energy costs</li> <li>• Coral bleaching and destruction of ecosystems</li> </ul>
Decreased temperatures	- 'too cold' seasons	<ul style="list-style-type: none"> <li>• Changes in tourist behaviour</li> <li>• Changes in length and quality of tourism seasons</li> <li>• Altered destination's aesthetic value</li> </ul>
<i>Precipitation</i>	<i>Change in precipitation</i>	
Increased precipitation	Flooding	<ul style="list-style-type: none"> <li>• Flooding in the resort facilities</li> <li>• Destruction of roads, nature trails and infrastructure</li> </ul>
Decreased precipitation	Risk of vector-borne disease outbreaks	<ul style="list-style-type: none"> <li>• Decreased attractiveness</li> <li>• Increased food cost due to failed crop seasons</li> <li>• Loss of biodiversity and destruction of ecosystems</li> <li>• Increased insurance costs</li> <li>• Tarnished destinations image</li> <li>• Destruction of the aggregate destination's tourism product</li> <li>• Increase in water scarcity</li> </ul>
	Long drought seasons	<ul style="list-style-type: none"> <li>• Beach erosion</li> </ul>
<i>Storm surges</i>	- Increased storm surges and high tides	
<i>Sea level rise</i>	- Coastal erosion	<ul style="list-style-type: none"> <li>• Reduced beach area</li> <li>• Reduced beach attractiveness</li> </ul>
	Inundation	
<i>Indirect impacts</i>	- Increased crime due to tourism dependency	
	- Loss of livelihood and increase in poverty	

*Establishing climate change risks and opportunities.* Mombasa is an important destination which contributes to the overall image of Kenya's tourism product. It is noted that about a third of tourists visiting Kenya end up in Mombasa. Like many coastal destination, Mombasa is vulnerable to climate change impacts. According to the contribution of Working Group II to the Fourth Assessment of the IPCC, coastal zones are experiencing adverse effects of climate change hazards (Parry, 2007). Coastal zones are vulnerable to extreme events such as storms, heat stress, coastal inundation, erosion and ecosystem losses which may vary from region to region depending on the adaptive capacity (Gerkenmeier et al., 2018; González-Riancho, 2017; Njoroge, 2014; Petzold et al., 2018). Mombasa is no different and some of these impacts have been reported by a few local studies as shown in Table 2 (Awuor et al., 2008; Kebede et al., 2012; Kithiia, 2011, 2015; Kithiia and Dowling, 2010).

We aggregate these perceptions to include: changes in temperature, variation of precipitation, storm surges, sea level rise and other indirect impacts. These impacts have an implication for the tourism sector which includes increase in energy costs; coral bleaching and destruction of ecosystems; changes in

tourist behaviours; changes in length and quality of tourism seasons; altered destination's aesthetic value; destruction of roads, nature trails and infrastructure; altered beach structure, etc. (Njoroge, 2015).

*Determining the adaptive capacity.* Scott et al. (2006) demonstrate relative adaptive capacity among tourism stakeholders, where the tourists are viewed to have high adaptive capacity. This is dependent on money, time and knowledge. With the three factors at their disposal, tourists have very flexible trip schedules, and therefore are able to avoid destinations with high vulnerability risks. On the other side, tourism suppliers are seen to have lower adaptive capacity due to immobility of their infrastructure. However, suppliers with limited self-owned infrastructure have better adaptive capacity as compared to those who own the infrastructure.



Relative adaptive capacity of tourism sector (Scott and Jones, 2006)

**Table 3.** Mombasa demographics.

Variable	Statistics
Population (persons)	939,370 (2009)
Area (km <sup>2</sup> )	218.86 (2009)
Population density (persons/km <sup>2</sup> )	4292.09 (2009)
Crude birth rate (per 1000 population)	35.1 (1999)
Unemployment rate, 15–64 years (%)	22.8 (1999)
Number of households	268,700 (2009)
Poverty rate (%)	37.6 (2006)
Population with fever/malaria (%)	48.0 (2006)
Gross attendance ratio, primary school (number)	149033.8 (2006)
Gross attendance ratio, secondary school (number)	82971.3 (2006)
Pupil teacher ratio (%):	35.7 (2000)
Primary school enrolment	111,372 (2011)
Secondary school gross enrolment	3234 (1999)
Infant mortality rate (deaths per 1000 live births):	59.3 (1999)
Under-five mortality rate (deaths per 1000 live births)	112 (1999)

Source: Adapted from Kenya Bureau of Statistics (1999, 2009); Knoema database ([www.knoema.com](http://www.knoema.com)).

Adaptive capacity is defined as:

The ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

(McCarthy, 2001)

The adaptive capacity can be evaluated through vulnerability analysis of a system (Parry, 2007). This analysis can be done by examining indicators that can constrain or promote adaptation capacity (Eriksen and Kelly, 2007; Schneiderbauer et al., 2013). These indicators include: income, wealth, education, institutions, knowledge and technology (Bohle et al., 1994; Parry, 2007).

Kenya is a developing country with a large population living under US\$1 a day. Mombasa represents one of Kenya's cities with a big population of urban poor. According to Kenya National Bureau of Statistics, 37.6% of Mombasa population lives under US\$1 a day (GoK, 2009). While wealth and income plays part in determining adaptive capacity, it may be a strong indicator of destination's vulnerability to climate change. Table 3 provides a snapshot of Mombasa demographics.

The IPCC Fourth Report points out that cities with high adaptive capacity are those that are well managed

(Satterthwaite, 2007). Such urban areas have a network of systems that support absorbing of impact, e.g. good efficient drainage systems, health care systems, emergency response programmes and services. Cities in developing countries like Kenya are highly populated. Such countries have limited resources to develop a good working network of systems and services to support extreme event response. These systems are achieved over a long period of time and since developing countries have a multitude of social economic problems to address, their governments are constrained and more often than not have to make critical decisions on resource allocations.

Looking at the social security and health systems in Kenya, there is no mandatory health insurance for the general public. Insurance is only accessible to the employed population. This situation makes the larger population very vulnerable to slightest changes in the ecological systems like sea level rise and flood risks (Kebede et al., 2012). This has been observed in unplanned settlements where perennial floods have affected them in the past (Awuor et al., 2008) (see Figure 5). As the tourism industry is an integral part of the social-economic system, the vulnerability of these systems eventually has a trickling effect on the industry.

Previous studies, although scarce, they have established Mombasa as very vulnerable to climate change (Awuor et al., 2008; Kebede et al., 2012; Kithiia, 2011, 2015; Kithiia and Dowling, 2010; Njoroge et al., 2017). Other government and multinational reports (e.g. GoK, 2013; SEI, 2009, 2012) also have underscored the vulnerability of Mombasa.

### *Phase 2: Increasing resilience and readiness*

It is noted that in order for the destination to increase its resilience and readiness to response to climate change, it must adapt. The next sections elaborate the adaptation process. The IPCC (2007) explains the adaptation process as shown in figure 4.

*Adaptation process.* After assessing the vulnerability of the destination, adaptation options or pathways are proposed and if implemented they would enhance destination's ability to cope with externalities of climate change and enhance resilience (Jopp et al., 2010). However, there is one critical issue to consider in this phase:-the sustainability of adaptation options.

In order to achieve this, a six step process must be followed including: identifying adaptation options, evaluating the options, testing the options, ranking the options and evaluating the viability of the options (Njoroge, 2014).

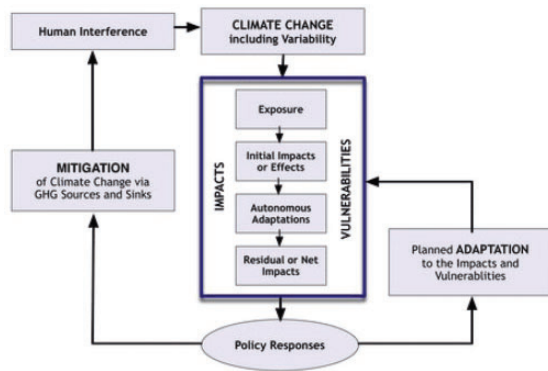


Figure 4. Adaptation in IPCC assessment, IPCC (2007).



Figure 5. A resident trying to unblock a drainage system to allow water to pass under, Nation Media Group photo.

- a. *Identify options:* A basic approach in gathering a list of adaptation options is by considering each climate change risk individually. At this point, it is vital for stakeholders involvement in ‘brainstorming’ the possible adaptation options available. The process should be inclusive not only to promote acceptance and ownership of interventions, but to get cases of ‘good practice’ that may not be in the lime light that could be efficient and cost effective. Focus groups, questionnaires, Delphi-process, interviews and public forums (locally referred to as *baraza*) may be used to gather information (Brown, 2011; Jopp et al., 2010; Simpson et al., 2008).
- b. *Assess options:* After identifying the wide range of adaptation options available, it is important that

the options be evaluated wisely. The generally agreed criteria include: net benefit, timing of benefits, distribution of benefits, consistency with development needs, consistency with government policies, cost, spill-over effects, capacity to implement, social-economical and technological barriers (Scott et al., 2012) and not limited to sustainability principles because not every adaptation is a good one (Eriksen et al., 2011). All options must undergo a thorough evaluation on their suitability in promoting sustainability (Njoroge, 2014). The three pillars of sustainability are: social, economic and environmental sustainability. In addition, they must be evaluated against their effectiveness, local acceptance, and ease of implementation and distribution benefit (Jopp et al., 2010; Scott et al., 2012).

- c. *Test with stakeholders:* The third step is testing the options to understand the perceptions of tourism stakeholders. A major critique of the Jopp et al. (2010) framework was the recommendation that the adaptation options should be tested with the tourism business operators which Njoroge (2014) criticises for being business oriented and would promote business-as-usual adaptation policies (Weaver, 2011). The testing should be as inclusive as possible (i.e. operators, host community, policy makers and consumers). The adaptation options must be in line with local cultural norms, acceptability and promote social justice among the locals. The options should be able to ensure business sustainability without compromising environmental and social wellbeing. This can be an important input in future product development.
- d. *Rank the options:* The options that have passed sustainability test are ranked at this stage. A score is given against all the variables stated earlier in this section. Depending on resource availability, destination stakeholders may find themselves at crossroads in considering what options to implement.
- e. *Implement the most viable options:* After evaluating and deciding what is good as a response to local impacts, the options may be implemented. The implementation of these options should be integrated in the local/regional and National plans.
- f. *Evaluate viability of the options:* Monitoring of the adaptation options should be done constantly because unintended eventualities may occur in the process, e.g. conflicts. Early detection would enable early quick and efficient resolution of such eventualities. An efficient feedback process may be used to share information among stakeholders. And finally, it should be noted that for maximum results, adaptation should be a collective action and all stakeholders should be engaged.



**Table 4.** Sustainable tourism adaptation portfolio for coastal city of Mombasa.

Aspects of sustainability		Environmental	Economic	Social	Institutional
Types of adaptation	Management	<ul style="list-style-type: none"> <li>Risk management (analysis, assessment, control, and avoidance), minimisation, or elimination of unacceptable risks. An organisation may use risk assumption, risk avoidance, risk retention, risk transfer)</li> <li>Integrating climate in management in decision making</li> <li>Enhance disaster preparedness to extreme events</li> <li>Impact management plans (e.g. 'Coral Bleaching Restoration Plan')</li> <li>Promote good environmental practices among actors</li> </ul>	<ul style="list-style-type: none"> <li>Destination promotion</li> <li>Packaging coastal tourism to extend to wider terrestrial zones</li> <li>Integrating coast counties tourism circuit and regional branding</li> <li>Product diversification</li> <li>Promote surfing under safe tides</li> <li>Devoting more resource in supporting response programmes</li> <li>Short-term planning in marketing campaigns</li> <li>Introducing a special insurance for climate change related risk (force majeure events)</li> <li>Promotion of domestic tourism</li> <li>Promote eco-conscious behaviours</li> </ul>	<ul style="list-style-type: none"> <li>Risk management</li> <li>Integrating climate in management in decision making</li> <li>Enhance disaster preparedness to extreme events</li> <li>Training of tourism actors</li> <li>disaster preparedness and response techniques</li> <li>Encouraging collaborative efforts</li> </ul>	<ul style="list-style-type: none"> <li>Encouraging collaborative efforts</li> <li>Developing and implementing programmes at the local level</li> <li>Devoting more resource in supporting response programmes</li> </ul>
	Behaviour	<ul style="list-style-type: none"> <li>Avoidance of risky areas and population control.</li> <li>Crowd management</li> <li>Guiding tourists away from risky zones. Mombasa North is prone to water logging and consequently flooding during heavy rains, owing to its geology and geophysical nature. Guests should be cautious when visiting such zones, especially Bamburi, Likoni and Mishomoroni.</li> </ul>	<ul style="list-style-type: none"> <li>Detailing destination's climate guides and brochures</li> </ul>	<ul style="list-style-type: none"> <li>Raising awareness through education and training of destination operators, managers and policy makers on new strategies and technologies</li> <li>Promote eco-conscious behaviours</li> </ul>	<ul style="list-style-type: none"> <li>Developing of behaviour management strategies</li> <li>Promote behaviour management strategies for adaptation</li> </ul>
Education	<ul style="list-style-type: none"> <li>Information sharing to promote awareness</li> <li>Promoting local awareness and training on disaster response strategies</li> <li>Early warning systems training and management</li> <li>Promote good practice</li> <li>Water conservation education for employees and guests</li> </ul>	<ul style="list-style-type: none"> <li>Developing and promoting networks among destination stakeholders and encourage information exchange among them.</li> <li>Promoting private-public engagement</li> <li>Facilitating local climate change information exchanges</li> </ul>			

(continued)



**Table 4.** Continued

Aspects of sustainability				
Types of adaptation	Environmental	Economic	Social	Institutional
Political	<ul style="list-style-type: none"> <li>Integrating climate change aspect on regional planning and development (climate-proofing)</li> <li>Promote good practice in environment management</li> <li>Promote corporate social responsibility</li> <li>Political representation of actors in decision making</li> </ul>	<ul style="list-style-type: none"> <li>Enforcing coastal zone environmental management and laws</li> <li>Advocacy for insurance laws and regulations</li> <li>Funding adaptation programmes</li> <li>Lobbying for adaptation funding and projects</li> </ul>	<ul style="list-style-type: none"> <li>Enforcing coastal zone environmental management and laws</li> <li>Integrating climate change aspect on regional planning and development (climate-proofing)</li> <li>Compensation system</li> </ul>	<ul style="list-style-type: none"> <li>Early warning systems training and management</li> <li>Coordinating political advocacy</li> <li>Devoting more resource in supporting response programmes</li> <li>Promote wider democratic representation in regional decision making</li> </ul>
Technological	<ul style="list-style-type: none"> <li>Technical adjustment of tourism facilities and infrastructures</li> <li>Technical optimisation of office</li> <li>Rain water collection, storage and recycling systems</li> <li>Shielding techniques against ocean that ensures beach nourishment too</li> <li>Beach nourishment</li> <li>Energy efficient and saving technologies to reduce use and cost of operation</li> <li>Early warning system installation and monitoring</li> <li>Regional website on climate change adaptation resources</li> <li>Renewable resources</li> <li>Water recycling and saving systems</li> <li>Protection of historical and heritage sites against harsh climatic conditions</li> </ul>	<ul style="list-style-type: none"> <li>Technical adjustment of tourism facilities and infrastructures</li> <li>Carbon proofing infrastructures</li> <li>Energy efficient and saving technologies</li> <li>Adaptation funding</li> </ul>	<ul style="list-style-type: none"> <li>Provide shielding public places on the beach</li> </ul>	<ul style="list-style-type: none"> <li>Technical adjustment of tourism facilities and infrastructures</li> <li>Early warning systems training and management</li> <li>Regional website on climate change adaptation resources access to early warning systems collaboration with meteorological services</li> </ul>

Source: Authors.

### Phase 3: Communication and feedback

The final phase of adaptation for this model is communication and feedback. RTSAF is designed to encourage communication and feedback between local, national and global processes. The global process (IPCC) should be able to share global knowledge on climate change adaptation which shall be channelled through national institutions who would later trickle down the information to the local and regional level authorities. The local and regional processes should also be able to inform national authorities on the outcome of local adaptation which shall be shared with global processes. Exchanges and feed backs between these processes promote learning which is an important aspect in developing long-term resilience. Researchers may be involved to study and report 'best practices'.

### Discussion and conclusion

This paper aimed at demonstrating how the enhanced regional sustainable adaptation framework proposed by Njoroge (2014) can be employed in a real case. However, it should be noted that the researchers did not intend to implement the model fully especially the steps on the adaptation process because of financial and time constraints faced by the researchers. Nevertheless attempts were made to explore a wide array of sustainable adaptation options for the destination. In considering these interventions, it is important to note that thorough vetting process is needed in pursuing a workable sustainable adaptation.

While climate change research is still faced with uncertainty of projections and scenarios, it should be noted that this research faced the same challenges. Despite this, local studies on risks and vulnerability of Mombasa as a tourist destination, risk and vulnerability perceptions were further considered. However, these perceived risks may not necessarily represent the true vulnerability of the destination, but can be a good starting point for exploring destination's risks.

The model is easy to use and can be an important guide for tourism stakeholders forging regional adaptation plans and strategies. It will be of great benefit if regional actors to invest in more research in order to get more certain and accurate scenarios for the destination.

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