

The Vulnerability of Tourism Sector Under Scenario of Climate Change: Case Study Sousse

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Abstract

Current literature has addressed the relationship between tourism business and climate change; however, much focus is placed on global strategic orientations, with a strong emphasis on the mitigation of climate change impacts. Few researches have studied the impact of climate change effects on tourism sector; tourism industry may be positively or negatively affected by climatic conditions. This research analysis the vulnerability of tourism sector towards climate change in Sousse; through developing a tourism vulnerability index. The tourism vulnerability index (TVI) helps identifying factors contributing to vulnerability of tourism sector in the region. TVI was developed for the region of Sousse, which represents one of the most important touristic destinations in Tunisia. Results have broad implications to tourism business and have also repercussions for the government and policy makers.

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Keywords: Vulnerability Index, Adaptation, Climate Change, Tourism Sector

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1 Introduction

Climate change has observable impacts on the environment, some of the most dangerous consequences of climate change are the following: longue and more intense heat waves, loss of sea ice, sea level rise, this is in addition to the impacts on biodiversity and water availability. According to the IPCC, the extent of climate change effects on populations varies over time from region to region, according to different societal and environmental systems of climate change mitigation and adaptation.

Climate change effects have several repercussions on the different economic sectors. Climate

change deeply influence tourism industry, it affects the length of tourism season, and impacts the availability of natural resources, which will affect the quality of tourism services (Smith, 1993). Furthermore, global climate change may affect tourism sector by increasing heat waves, the risk of flood and coastal degradation, that disturb tourists and may contribute to the degradation of the destination's image (Schmidt-Thome and Greiving, 2013).

Tourism literatures lack a vulnerability assessment towards climate change. This research studies the vulnerability of tourism sector in Sousse to climate change, through developing a tourism vulnerability index towards climate change effects.

2 The Vulnerability of Tourism to Climate Change in Tunisia

Tunisia has a strategic geographical position, rich cultural heritage and important natural assets. These characteristics give the country a competitive advantage, and make it a very attractive tourist destination especially to European visitors (Poirier and Wright, 1993). Weather in Tunisia plays an important role in attracting tourists. The geographical position of Tunisia gives the country a high tourism potential, but it also increases the vulnerability of the country to climate change (Vicente-Serrano, 2006). Due to the increased temperature caused by global warming, the impacts of climate on the tourism industry should be taken into consideration while planning for tourism development. Therefore, tourism authorities should consider the effects of climate change on tourism regions in order to keep the potential of tourism sector in the country.

Climate change causes global warming, that generates the raise in temperature specially in the south of Tunisia. By 2100, the increase of temperature is expected to range between 1.3°C and 2.5°C, and the sea level rise will increase from 38 cm to 55 cm (Parry, 2007), which will affect various economic sector. Global warming will also lead to severe environmental problems and serious social

troubles. It is suggested that Tunisia will be one the most affected North African countries by global warming, in terms of economic and social impacts (Dasgupta et al., 2007).

Furthermore, tourism in Tunisia is a seasonal activity; the majority of tourists come to the country during summer. The country will face more hot summers; accordingly, the increase in temperature will cause the decrease of tourists flow during summer season (Becken and Hay, 2007). Knowing that Tourism in Tunisia is mainly seaside tourism, 80% of tourism infrastructure is located along the coast, which increases their vulnerability to coastal erosion and sea level rise. A study on tourism and climate change in Tunisia conducted by the Tunisian Ministry of Environment in collaboration with the GTZ Gesellschaft für technische Zusammenarbeit », showed that the most marked effects of climate change in Tunisia are the increase in temperature, sea level rise (50 cm by 2050), pressure on water resources and coastal erosion.

3 Vulnerability to Climate Change

Vulnerability concept has been used in different area. Multiple authors, for instance (Janssen et al., 2006; Füssel and Klein, 2006; Ahsan and Warner, 2014), proposed a definition of vulnerability to climate change. Vulnerability to climate change is the degree to which a community can adopt and deal with climate change effects following a sustainable approach (Adger, 1999). In the same context, vulnerability to climate change is defined as the exposure of a system to climate impacts and the capacity to cope and recover from the harm (Hebb and Mortsch, 2007). Another definition was proposed to the vulnerability to climate change, which is the capacity of a community to anticipate, adopt and recover from impacts caused by climate change (Blaikie et al., 2014).

According to IPCC vulnerability to climate change can be summarised in three words “Exposure”, “Sensitivity” and “adaptive capacity”. IPCC proposed the most known and used definition for vulnerability to climate change. It is defined as the extent to which a system and/or a community are exposed to climate change and its capacity to adapt to a certain hazard caused by climate change impacts. Almost all proposed definitions agree that this concept is based on “Exposure”, “sensitivity” and “adaptive capacity”; vulnerability to climate change is the function of the three dimensions. The present research uses the three vulnerability dimensions to develop a tourism vulnerability index for the region of Sousse.

4 Case Study: Establishing a Tourism Vulnerability Index for Sousse

The present study is an attempt to build a vulnerability tourism index for Sousse. The city is located in the central-east of Tunisia. It is known for its rich cultural assets, Mediterranean climate and multiple tourist attractions; which make it an important tourism destination (Bouallègue-Godet et al., 2005). The tourism vulnerability index (TVI) was developed through aggregating several indicators. This study focuses on the development of the TVI and the significance of this result to the tourism industry in Sousse. The table below presents the criteria followed to identify the set of indicators used to establish the TVI.

Table 1: Set of criteria for the selection of indicators

	Criterion	Explanation
Validity	Well-founded	Based on a tested framework
	Accurate	Really measuring what it should
Use	Non-ambiguous	Agreement on the direction of influence between the indicator and vulnerability
	Comprehensible	Relatively easy for users to understand Applicable to many geographic and economic conditions
Type	Relevant	Can be influenced by action
	Responsive to changes	Yes/No indicators, and preferably actual performance data instead of model-based data
Data	High information content	Data that is publicly and easily available Data that is collected homogeneously, making it suitable for international comparisons
	Available Homogenous and Periodical data	

Source: (Perch-Nielsen 2010)

Based on three vulnerability dimensions (according to IPCC) three types of indicators have been identified. Exposure indicators, reflecting the changes on climatic conditions that affect the tourism sector, Sensitivity and adaptive capacity indicators. Due to the lack of data few indicators were identified for each dimension. Exposure indicators were identified based on the tourism climate index (TCI) of (Mieczkowski, 1985), Which combines several exposure indicators. Only two indicators were adopted (the amount of sunshine duration and the average annual rainfall). For the present study no exposure indicator for sea level rise was found; this was supported by the research of (Perch-Nielsen, 2010), which demonstrated that “ the alternative of using the global average rise has also no value as an indicator, since it is naturally the same for each country”. The indicator sea temperature measured the vulnerability of marine biodiversity to climate change. The exposure indicator for water can be identified by different proxies average river discharge, average soil moisture, ground water level and average precipitation (“CESR”, 2010). In this research the exposure indicator is measured using the average rainfall. Concerning the sensitivity indicators, three types of sensitivity were identified; Physical sensitivity, environmental sensitivity and economic sensitivity (Saurí et al., 2013). The selected indicator for the physical sensitivity is the tourist infrastructure, which is measured by the proxy number of hotel’s beds in each tourist area. Water consumption was identified as indicator for physical sensitivity. Because of the lack of data, no economic indicator was found.

Several researchers attempted to develop a list for Adaptive capacity indicators towards climate change for the tourism sector. Four determinants for adaptive capacity were diagnosed: institutions and networks, infrastructure, economic resources and technology information (Jennifer Ellis, 2014). Another list of adaptive capacity indicators was identified based on three aspects: the availability of economic resources, which is measured by the GDP per capita for tourism industry for this research, and the Available technology for tourists to be informed about the impacts of climate change; that can be measured by the number of hotels with free Internet access (Brooks et al., 2005). After collecting indicators and developing tourism sub-indexes for the three vulnerability dimensions, the tourism vulnerability index for the region of Sousse was established through the combination of the three sub-indexes. The TVI is calculated using the Formula below:

$$TVI = \frac{EI + SI + (1 - AI)}{3}$$

EI= the exposure subindex, SI= the sensitivity subindex, AI= the adaptive capacity sub index

This study represents an attempt to develop a tourism vulnerability index towards climate change for the tourism sector in Sousse. The TVI will help policy makers planning for a sustainable tourism sector while considering climate change impacts on the industry. The tourism vulnerability subindexes range between 0 (the least vulnerable) and 1 (the most vulnerable). Tourism vulnerability to climate change in Sousse for the year 2013 is 0.21, which is relatively low (< 0.5). Although the region is highly sensitive to climate change impacts (0.7) the vulnerability of the region is low, and this can be explained by the fact that the adaptive capacity of the region is high.

5 Conclusion

TVI is a simple and effective tool to evaluate the vulnerability of a country or a city to climate change impacts for the tourism sector. While developing the TVI, some limitations were faced in relation to data collection and subindexes construction. Due to data limitation, the development of this index was based on a small number of vulnerability indicators. The selection of these indicators was based on literature review and the opinion of tourism and environmental experts. The vulnerability index proposed in this work is an important tool that can help decision makers, and can be used for several cities in Tunisia and for other countries with comparable climatic conditions.

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