

Impact of Climate Change: Vulnerability and Adaptation Tourism

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I. INTRODUCTION

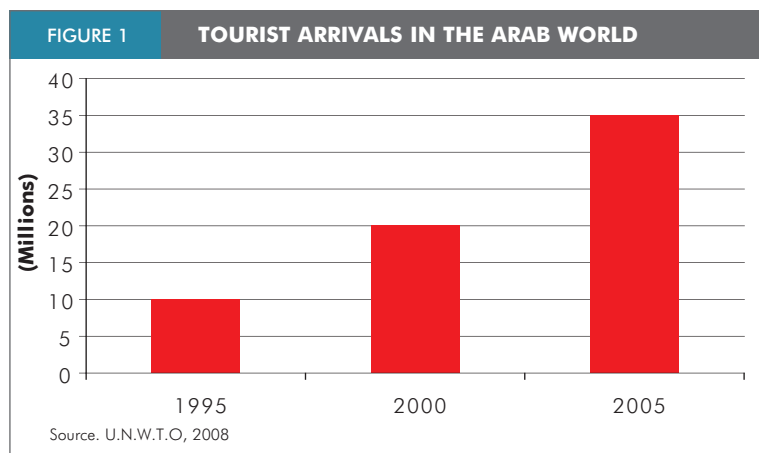
Tourism in the Arab world is becoming increasingly important given the natural, cultural and historic tourism potential of the region's countries. Tourism can be considered as a driving force for local economies and a source of foreign currency, particularly for countries whose energy resources are limited such as Morocco, Tunisia and Lebanon. Tourism could also be a lasting substitute for those countries that have economies based on non-renewable energy resources. However, like most other sectors of economic activity, the tourism sector is vulnerable to climate change impacts and might also contribute to or exacerbate it.

In fact, tourism is regarded as one of the economic sectors most sensitive to the potential impacts of climate change, as are the agricultural, environment and water sectors (Wilbanks et al., 2007).

This chapter highlights some issues related to tourism and climate change in the Arab world, and how these might impact these countries' economies. It also suggests some mitigative and adaptive actions which need to be taken either in the short, medium and long term, to lessen the vulnerability of this sector.

II. TOURISM IN THE ARAB WORLD

According to statistics compiled by the World Tourism Organization (2008), international tourist arrivals at the borders of the Arab countries in 1995, 2000, and 2005 were as depicted in Figures 1 and 2.



Five Arab countries are among the top 50 most visited countries in the world. Saudi Arabia is ranked 21st, followed by Egypt (23rd) and Morocco (31st). Tunisia occupies the 34th position and Bahrain the 45th position. As Saudi Arabia is ranked the first destination in the Arab region, we have to clarify that the visitors to Saudi Arabia are almost exclusively pilgrims.

Figures from the World Tourism Organization on the evolution of international tourism receipts in the Arab countries are given in Table 1.

Five Arab countries are also among the top 50 in terms of tourism receipts. The first among them is Egypt which occupies the 27th position, followed by Morocco (31st) and Saudi Arabia (38th). Lebanon ranked 41st and the UAE occupies the 42nd position.

III. THE TOURISM SECTOR AND THE CHALLENGE OF CLIMATE CHANGE

The relationship between tourism and climate has been studied for a long time, but it is very complex and remains difficult to define. The interest in the connection between tourism and climate change is quite new in the literature, but has been getting special attention in the last two decades, as the sector is simultaneously very vulnerable to climate change and is among the major sources of greenhouse gas (GHG) emissions. This duality refers on one side to the mitigation challenge and on the other side to vulnerability and adaptation issues.

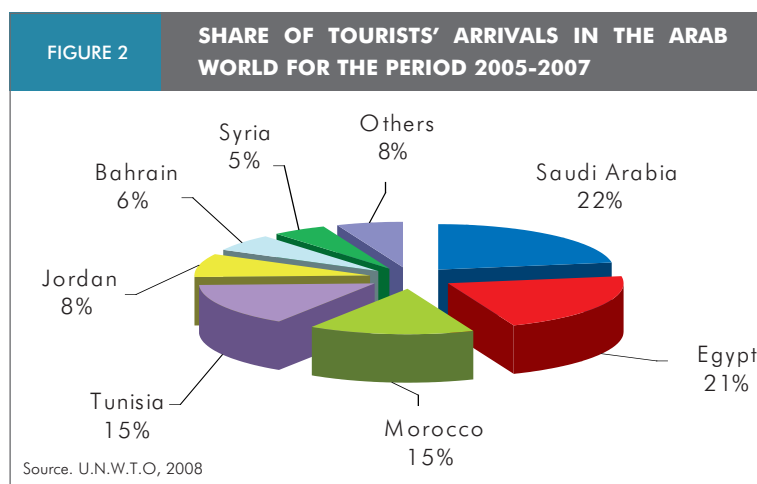
The climate is a fundamental attribute of a tourism destination. It is a strong factor of motivation and satisfaction. However, the relationship between climate and tourism is very complex: the perception of what constitutes 'good weather' depends among others factors on the destination, the type of activity envisaged, and the tourist (age, health, etc.).

Several more or less successful initiatives aimed at modelling this relationship have been developed, one of which is the index of tourism comfort. It combines data on the average temperature, the maximum temperature, precipitation, sun and wind conditions, and humidity, to assign an index to a site, which reflects the degree of cli-

matic comfort that a tourist feels at a given site (Billé, 2007).

With reference to the evolution of the climate in the Arab region, several reports tend to highlight a trend of warming associated with a reduction in precipitation for most of the Arab countries. This trend is accompanied by intensification of extreme weather events such as droughts, storms, and heat waves (FAO, 2008). In Morocco, for example, it is expected that the arid part of the country will expand towards the north and northeast as was shown by the aridity index of De-Marton, computed on a set of stations all over the country for two different periods 1961-1985 and 1986-2005 (DMN, 2008) and a Statistical Downscaling Model of IPCC scenarios A2 and B2. Data showed increases of mean temperature, drought lengths, and the number of hot days, as well as a diminishing rate of rainfall (Driouech and Kasmi, 2008).

Moreover, according to the predictions of the IPCC (2007), the rate of climate change will 'most probably' accelerate with the continuation of GHG emissions at current or higher rates. Even using the most optimistic estimates, the annual volume of rainfall will decrease by 30% by the year 2050, the ocean average surface temperature will increase by 1.8°C to 4.0°C by the end of the 21st century, and the mean sea level will rise by approximately 3.1mm annually (IPCC, 2007).



The biological and physical reactions to this continuous warming of the oceanic temperatures, to water deficiency and to sea level rise can reflect on the index of climatic comfort (Ceron and Dubois, 2008).

Many Arab countries, including those belonging to the top 50 most visited countries in the world may witness the numbers of tourists diminishing and by consequence their tourism receipts decreasing, with Saudi Arabia being a likely exception as most of the tourists are pilgrims and are motivated by religious duty rather than touristic attractions.

Vereczki (2007) has shown the potential implications of climate change on Mediterranean desti-

TABLE 1 INTERNATIONAL TOURISM RECEIPTS IN THE ARAB COUNTRIES

Country	International tourism receipts (billion U.S dollars)				
	1995	2000	2005	2006	2007
Saudi Arabia	-	-	5.4	4.961	5.228
Egypt	2.7	4.345	6.9	7.591	9.303
Morocco	1.3	2.039	4.6	5.967	7.264
Lebanon	-	-	5.5	5.000	-
United Arab Emirates	0.6	1.100	3.2	5.000	-
Tunisia	-	1.682	-	2.275	2.555
Bahrain	-	0.573	-	1.048	1.105
Jordan	-	0.723	-	2.060	2.312
Sudan	-	-	-	0.252	0.262
Kuwait	-	0.098	-	0.203	0.222

Source: U.N.W.T.O, 2008

TABLE 2 EFFECTS OF CLIMATE CHANGE ON MEDITERRANEAN DESTINATIONS

Climate change effects at the place of destination	Implications for the destination	Possible reactions of the market
<ul style="list-style-type: none"> • Winters milder and wetter • Summers warmer and drier • Changes more pronounced in the Eastern Mediterranean • Increase of heat index • More days above 40°C • More arid landscapes • Impacts of sea level rise exacerbated by the low tides 	<ul style="list-style-type: none"> • More severe risks of droughts and fires • Increasing water shortages • Increased personal exposure to heat • Beach degradation and loss of habitats due to sea level rise • More vulnerability to tropical diseases (e.g. malaria) • More flash flooding • Poor air quality in cities 	<ul style="list-style-type: none"> • Improvement of summers in Northern Europe generates more domestic holidays • Less incentive to spend summer holidays in the Mediterranean • Increased incentive for spending holidays in the Mediterranean during the intermediate seasons • Increased incentive for southerners to travel to the North

Source: Adapted from Vereczi, 2007

nations which involve a large portion of the Arab world. Table 2 gives some of the implications identified and how the market will react to adapt. There also exists a high sensitivity of coral reef ecosystems to climate change and for some areas in Egypt and Jordan, for example, this may have grave negative implications for these popular tourist attractions.

Figure 3 shows that there will likely be a decline of the index of tourism comfort in the Arab world in the coming decades. The areas currently classified as “good”, “very good” or even “excellent”, will be either “marginal” or “unfavourable” categories by the year 2080.

IV. VULNERABILITY OF THE TOURISM SECTOR TO THE EFFECTS OF CLIMATE CHANGE IN THE ARAB WORLD

The direct potential consequences of climate change will be increases in average temperatures of the sea and the air, of the sea level, of the frequency and intensity of heat waves, of droughts, and of extreme temperatures, and a decrease in precipitation. The indirect consequences will be coastal erosion, submersion of coastal zones, increased stress on ecosystems, salinity of the underground water table, droughts, soil erosion and landslides.

The vulnerability of the tourism sector to direct

and indirect climate change effects will be different from one part of the world to another, and will vary also with tourism practices. The climate determines the length and the quality of the tourism season and plays an important role in the choice of the destination and the expenditure of tourists (Scott, 2006).

In the Arab world, the direct impacts of climate variation on the tourism sector will be important (Becken, 2007), mainly because this region will be subject to an increase in the frequency of extreme weather events (e.g. droughts, heat waves) (IPCC, 2007), and the tourism sector is very sensitive to the variability and change of the climate.

The climate has effects on many environmental resources which constitute important assets for tourism development, such as biodiversity, landscape, level of water quality and quantity, snow conditions, etc. (Gossling and Hall, 2006). In many Arab countries, tourism is closely associated to these natural assets, some of which are severely impacted in various ways by climate variability and change. In coastal areas of northern Africa and the Middle East, there are also land and sea interactions that magnify dangerous heat conditions (Diffenbaugh et al., 2007). Summertime sea surface temperatures in the Mediterranean are expected to increase and make the region more suited to tropical cyclone development (Gaertner et al., 2007).

Water resources

North Africa and the Middle East are almost universally recognized as the driest and least endowed with water resources regions of the world (Constantino, 2009). This situation consequently affects the economic and social development of the majority of the countries of this region. The average availability of water per capita approaches 7,000 m³ annually per capita at the global level, whereas it is less than 1,000 m³ annually per capita in this region (El Naggar, 2007).

The expected potential evolution of the climate would have a significant impact on both the demand and supply sides of water.

The aggregated consumption of water for the tourism sector is not precisely known, but it is well recognized that the per capita consumption of water of a normal tourist is higher than that of a permanent resident. The tourism sector is one of the most demanding for water consumption, either for drinking and sanitation or for sustaining other services such as swimming pools, golf courses, and green spaces. This consumption varies according to the type of tourism activities and the level of comfort demanded.

The way in which this sector could be constrained and impacted by the regressive evolution of water resources and water scarcity could be felt at different levels of value chain. The pressure of tourism development on water resources can lead to conflicts of uses, mainly when diverting water from agriculture which ensures food security for local dwellers to an industrialized tourism activity, which is mostly profitable to tour operators and big companies.

The reduction of water flows and water stocks in lakes will lead to diminishing water quality by eutrophication and pollution. This situation will induce diminishing recreational value and will also lead to an increasing risk of water-borne diseases. With temperatures changing, new viruses or microbes will have a potential for development in the new environment, and this might affect the tourism flow and the economic importance of the sector.

Projections based on observations since the beginning of the 20th century in the northeast of

Morocco point out a further increase of water scarcity due to climatic and human pressures; sustainable long term development seems to be a challenge, in particular with regard to water availability and coastal tourism (Tekken et al., 2009).

Coastal zones and sea level rise

The speed of sea level rise is neither uniform in the world, nor within the Arab world. Observations and future projections established on the basis of climatic models created by many researchers, including the IPCC (2007), indicate a potential increasing sea level in the Mediterranean by about 88 cm between the years 1990 and 2100.

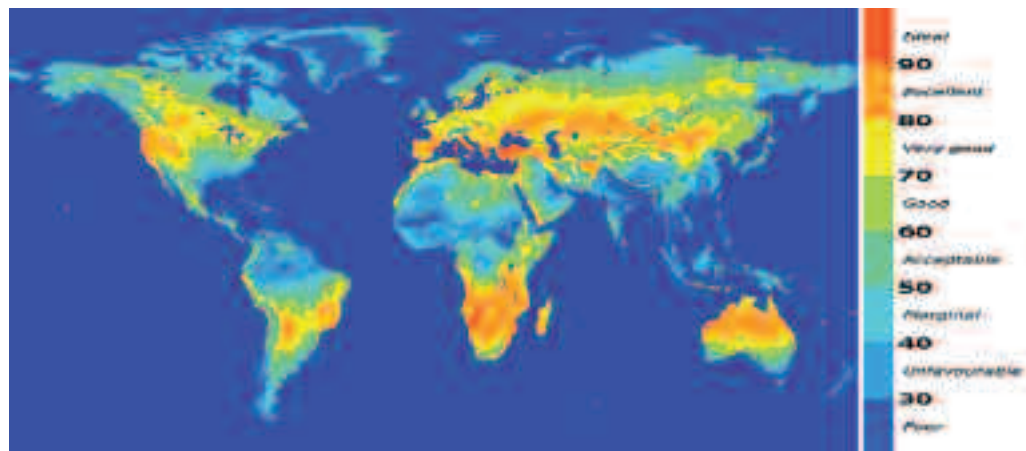
Therefore, the Arab world countries located on the Mediterranean coast will be strongly threatened by sea level rise which could be accelerated by high tides and violent storms. Large coastal areas would disappear because of sea water immersion and coastal erosion (for example of the Nile delta and all low topography zones), and the salinity of coastal aquifers and rivers would increase (Fiona, 2004).

Letizia et al. (2008) have shown through a meteorological marine analysis of the Moroccan Mediterranean coast that the prevalent waves coming either from 270°N or 60°N can hit the coast at heights approaching 5m. The most threatened zones in the area include coastal wetlands, sandy beaches, a river mouth, basic infrastructure, harbours, a leisure port, habitations and one important seashore tourism resort comprising more than 27,000 beds.

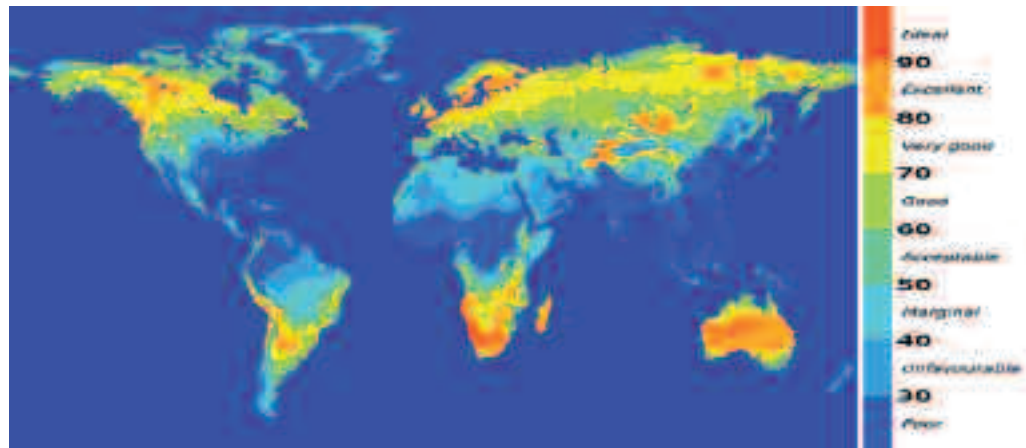
The vulnerability of the Arab world's tourism sector is obviously related to that of the beaches and the infrastructure which constitute the basis of most presently promoted tourism in the area, mainly for the North African countries.

Analysis of shoreline evolution on the Eastern Mediterranean coast of Morocco, using aerial photos, has shown that in two pilot sites, the beaches were subject during the last two decades to continuous erosion at an average rate of 0.5 m/year (Amini et al., 2008). Each of the two sites contains a wetland of international importance. These ecosystems are vulnerable either to beach

FIGURES 3(a,b) THE EVOLUTION OF THE INDEX OF TOURISM COMFORT IN THE WORLD



a) Index of tourism comfort - Summer 2008



b) Index of tourism comfort - Summer 2080

Source: Ceron and Dubois, 2008

erosion or to sea level rise (Amini, 2008; Bellaghmouch, 2008). Boubekraoui (2008) and Ezzaher (2008) have evaluated the cost of the potential loss by immersion by sea level rise using the IPCC A2 scenario and have shown that most of the existing infrastructure and human settlements including the biggest newly built tourism resort in Morocco are at risk.

Biodiversity, desertification and ecotourism

The landscape as well as environmental assets and amenities are essential for the sustainable development of the tourism sector. However, climate change could have an immense effect on the region's natural ecosystems and might worsen their state as a result of changes in tempera-

ture and precipitation which are expected to affect considerably the growth, strength, function and survival of these ecosystems (Laouina, 2008).

Moreover, vulnerability of the semi-arid and arid environments of the Arab world to the change induced either by climate or by land allocation, is expected to be critical and will be accompanied by an increase of the hydraulic stress and ecosystems degradation leading to desertification (Coelho et al., 2000). According to the 2008 AFED annual report, Arab Environment: Future Challenges, the cost of environmental degradation, including effect of climate change, in the Arab world will be around 5% of its GDP (AFED, 2008).

The Metap program (2006) of the World Bank

has estimated the cost of environmental degradation in coastal zones of four Arab countries, Algeria, Egypt, Morocco and Tunisia. In making the calculations, the local GDP per person at the local level was considered equivalent to the national average. This study concluded that the total annual cost related to environmental damage of a coastal zone in Egypt (Alexandria bay) is around \$232-355 million, which is 5.0 to 7.5% of the total GDP of the study area; in Morocco, it was estimated to be \$14-18 million, which is 3.7-4.7% of GDP in the region where the study was conducted (Lagoon of Nador area); in Algeria it was found to be \$22-53 million, which amounts to 3 to 7% of the GDP of the Algiers bay; and in Tunisia it was assessed to be \$38-72 million, or 1.3-2.3% of the GDP of the Soussa region. Some of these costs were attributed to a loss in tourism activity resulting from environmental degradation.

Some plant flora and fauna species of the Arab world may not be able to adapt to the accelerating rate of climate change which is exacerbated by the changes induced in ecosystems by the over-harvesting of natural resources or by various types of pollution. Some species might respond by migrating either in latitude or in altitude, but some might be condemned to extinction.

It is known that a change of the average temperature by only one degree will imply a radical disturbance of natural ecosystems. This will be due not only to the direct effect of temperature increase but also to the hydrous stress and other phenomena which may result from this temperature variation such as forest fires and intensive evapotranspiration (IPCC, 2007). The integrity of all types of biodiversity (genes, species, ecosystems and landscapes) will be impacted significantly, potentially even leading to chaotic situations. The ecotourism and in fact any tourism based on the natural environment in the Arab world will therefore be affected by climate changes.

Tourism and local products

A number of tourism activities in Arab countries are dependent on local products derived from the exploitation of natural resources. Climate change can, beyond a certain threshold, lead to the re-faction of these resources, and might lead to

changes of local and indigenous practices for the production of local goods.

V. ADAPTATION TO CLIMATE CHANGE

To date, there are only a few exploratory studies related to the relationship between tourism in the Arab world and the potential impacts of climate change. Research initiatives remain limited and it is necessary to better prepare this economic sector to face the challenges of climate change. There is the need to address many essential points which encompass a deep knowledge of tourism requirements and needs for climate and environment, and weather conditions; how different tourism products and services are sensitive and vulnerable to climate change; and a mapping of potential risks and threats with respect to climate change scenarios in different regions of the Arab world. This last point includes downscaling of IPCC scenarios, vulnerability assessment and adaptation options.

VI. CONCLUSION

The Arab world's tourism sector is closely related to the landscape, environmental and cultural characteristics of the area and is by its nature strongly sensitive to the variability and change of the climate, either directly or indirectly. Destinations and preferences might be influenced by potential modifications from the normal conditions (hotter summers and winters, droughts, dryness and droughts, extreme weather events, scarcity of water, ecosystems degradation, etc.). The potential disturbances of tourism flows and destinations will result in large economic losses, primarily for countries whose economies are tourism-based. It must be noted that the exact trajectory of the changes and impacts is related to large uncertainties about tourists' behaviour. Serious efforts should be expended in order to identify other sustainable means of tourism which might be less sensitive to climate change and its effects such as cultural tourism. The capacities for adaptation of tourism destinations and actors will be highly variable (Ceron and Dubois, 2008) from one area to another and integrated and inclusive planning is a must for enhancing the chances of success for any course future tourism development might follow.

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