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13 Sustainable Tourism Growth and Climate Change Impacts: Case of Tunisia

Introduction

Tourism and travel are vital contributors to global economy and especially important for many developing countries. Being victim of several crises, the tourism sector has been weakened or even damaged especially by the recent health crisis, COVID-19.

The UNWTO defines sustainable tourism as "Tourism that takes full account of its current and future economic, social, and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities" (UNWTO & UNEP, 2005). The sustainability of tourist activities is usually linked to six issues: the role of tourism demand, the nature of tourism resources, the imperative of intra-generational equity, the role of tourism in promoting sociocultural progress, the measurement of sustainability and forms of Sustainable development (Zhenhua, 2003). To ensure a sustainable growth for the tourism sector (destinations and private actors), it is of paramount importance that strategies and policies are in accordance with the SDGs (United Nations Sustainable Development Goals), especially SDG 8 Decent work and economic growth, Responsible consumption and production, and SDG 14 Life below water (UNWTO & UNDP, 2017).

In Tunisia, tourism recorded an important upturn in 2019 compared to 2018. Indeed, the country welcomed 9.4 million tourists, i.e., +13% compared to 2018. In terms of overnights, the country recorded 30 million overnights (i.e., +10% compared to 2018). Tunisia offers 244,000 beds spread over 17 tourist areas scattered throughout the territory. The occupancy rate recorded in 2019 was 44.7% (ONTT, 2019). According to the National Institute of Statistics (INS), tourism directly employed 158,000 persons in 2019.

Over the 17 touristic regions considered by the Tunisian National Tourist Office, nine are dedicated to beach tourism. Tunisia totals 2290 km of coastline divided in 68% continental, 20% island linear and 12% artificial linear (APAL, 2015). Thus, there are about 80 kilometres allocated to tourist-real estate complexes which represent 6 to 7% of the entire coastline.

It is crucial to adopt an eco-systemic approach of space and resources taking into consideration environmental, economic and social issues involved by tourism activity concentrated on the Tunisian coast. This challenges us to a better understanding of the specificities of existing (or possible) interactions between nature and the different actors of tourism projects on the seaside.

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Today, tourism is a pillar of the Tunisian economy, but it is also a weakened sector with possible mutation in terms of tourist flows and activity diversification. This tourist destination is characterized by tourism focused on beaches and all-inclusive packages. Moreover, the sustainability of the sector was a transversal axis in Tunisian tourism conferences carried out by the concerned ministry in 2017. Characterized by the vulnerability of jobs, Tunisian tourism started an administrative restructuration (Ministry of Tourism & Handicraft, 2017).

As climate leads to extend tourism seasons, affects tourism operations and influences environmental conditions that both attract and deter visitors, the sector is considered to be highly climate sensitive. The effects of a changing climate will have considerable impacts on tourism and travel businesses. That is why the need to implement sustainable tourism has become more felt with the amplification of the phenomenon of climate change and its very serious impacts on the sector. In some parts of the world, these impacts are increasingly becoming evident (Cabrini, Simpson & Scott, 2009). In Tunisia, we experienced this climate impact in 2018 during Nabeul Flood. This phenomenon has been irritated in recent years by the increasingly visible impacts of climate change: sea level rising, extreme weather, erosion and biodiversity degradation.

In this chapter, I study the impact of climate change as an environmental variable which can tackle the growth of Tunisian tourism, especially since the country has suffered, for several decades from negative pressures of mass tourism, the default mono-product. From these considerations, this chapter proposes some solutions to mitigate these impacts. Such solutions could spring from three main fields: governance, marketing, and innovation.

Scope and Methods

This chapter aims at suggesting solutions to mitigate impacts of climate change on both tourism sector in Tunisia and at demonstrating the importance of these impacts in order to create a collective awareness of this phenomenon. By doing this, it provides, in the following sections, a context analysis aimed at giving a portrait of the five main dimensions in which climate change can threaten the development of the tourism sector:

- The disruption of coastal tourism due to sea level rise
- The decrease of biodiversity
- The degradation of ecosystems and landscapes
- The increase of operating expenses
- The health risks

The analysis of climate change impacts is essentially based on literature review, which carried out over the period 2016–2018. However, the expert panel was carried out in May-June 2020 for two purposes: first, validate that the impacts are still unchanged; second, exploring the panel discussion in order to analyse possible solutions leading to mitigate these impacts on Tunisian tourism.

In order to define the possible solutions for climate change impacts on tourism industry in Tunisia. Interviews have been organized with an expert panel. The experts were chosen mainly depending on their involvement in the tourism sector but also in the management of natural ecosystems. Thus, they belong to both official authorities and the private sector, as you can see in the Table 13.1.

Table 13.1: Composition of the expert panel.

Ref Expert	Organization	Quality
E1	Ministry of tourism and handicraft	Minister
E2	National Tunisian Tourism Board	General director
E3	Real Estate Tourism Agency	General director
E4	General Direction of forests	Director
E5	National Agency for protection of Environment	CEO
E6	Ministry of Environment	Responsible of the relationship with NGOs
E7	National Agency of coasts Protection	CEO
E8	Tunisian Travel Agency Association	President
E9	Tunisian Hotels Association	General Secretary
E10	Tunisian Guides of tourism association	President
E11	National Institute of Meteorology	Head of Department Weather Forecast

The panel discussion was conducted through interviews with open questions to allow the team members express themselves more freely on the phenomenon of climate change affecting, consequently, various technical and socio-economic aspects. Interviews have been conducted through phone calls, Skype videoconferences, WhatsApp calls, and survey via Google forms. It is important to highlight that due to COVID-19 measures, it was not possible to make a face-to-face interviews with the panel team in May and June 2020.

Context Analysis

The Mediterranean area is the first tourist region in the world with more than 256 million arrivals in 2017. It represents 46,000 km of coastline distributed among 21 countries and the region stands for one-third of world tourism. The number of international visitors may increase from 58 million in 1970 to 500 million in 2025 (Plan Bleu, 2018). Tourism activity is mainly concentrated on the coast and is strongly seasonal as it is focused on the seaside product.

For countries on the southern coast of the Mediterranean, tourism is a strategic fundamental sector for economic development. It directly employs 2.5 million people (4.4% of total employment) in 2017 and is likely to grow by 1.9% on yearly average by 2028. Tourism activities are the main reason for coastline urbanization. This is why mass tourism exacerbates many of the problems that exist in urban areas: water resources consumption, land use, rural exodus and extinctions of animal and plant species.

The Tunisian tourism development model was based on the creation of seaside resorts on the coast, which led to a sharp increase in bed capacity. This model has also caused a strong dependence on foreign tour operators. The Tunisian tourism strategy and the several studies carried out (World Bank- JICA) have emphasized the importance of the diversification of tourism products as well as the transition to more sustainable tourism after having concluded the disastrous impacts of the current model. The location, the natural and socio-cultural heritage of Tunisia confer some advantages in tourism: Tunisia had 850 hotel properties in 2019, spread over 17 regions with a capacity of 244,000 beds but only 180.000 of them are exploited (ONTT, 2019). However, this activity has shown its limits in many ways, including the disparity of economic impact on the social and geographic imbalance and growing dependence on global phenomena (economic crises and concentration of flows by large transnational tour operators).

Climate change is one of the threats hampering the development of the tourism sector in Tunisia. In fact, during the last decade we noticed several changes both in demand and in offer. In 2019, Tunisia welcomed 9.43 million tourists, with an increase of about 13% compared to 2018 and +20% compared to 2010 (ONTT, 2019) See figure 13.1. However, this improvement hides important details concerning the structure of the inbound markets.

By referring to other economic aggregates such as the trade deficit coverage rate or the National tourism receipts, we can deduce other conclusions which confirm the change undergone in recent years by Tunisian tourism industry. In fact, tourism contributed to the trade deficit coverage rate within 98% in 1988. Today, this rate is around 25% according to the latest report from the Central Bank (Tunisian Central Bank, 2020) See figure 13.1.

There is a direct relationship between the sustainability of the current offer and the impact of climate change. Indeed, more this offer is diversified, focused on the

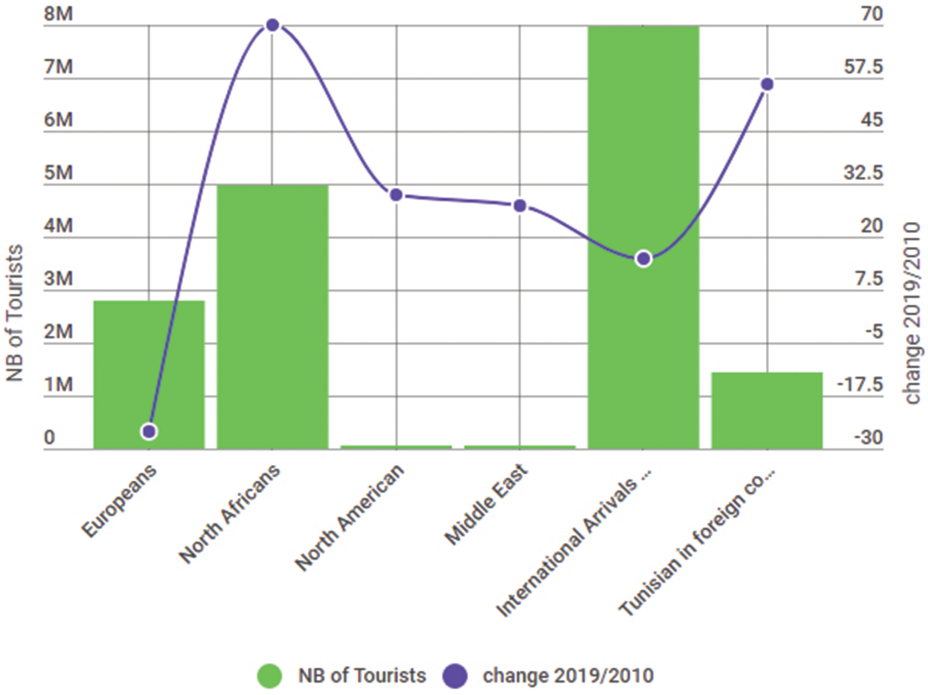

Figure 13.1: Arrival insights 2019.
Source: Data collected from ONTT

principles of sustainable tourism (certifications), and dispersed far from the coasts which are overexploited: more the impact will be mitigated.

As Table 13.2 shows, major transformations have taken place in the offer of accommodation. Since 2013, the new laws led to the appearance of new forms of sustainability-oriented accommodation based in non-coastal regions.

In 2019, almost 90% of beds were based in coastal zones, which prove that tourism industry is mainly attached to the sea. We also note that the number of beds in classified accommodation dropped by 66.27% from 2010 to 2019. This is strongly due to the various economic crises experienced by the sector during this decade. The weak development of the tourism offer in non-coastal regions demonstrates the failure of the diversification strategy of tourist products adopted since 2010. This has led to deterioration in the positioning of the destination as a low-cost one in the Mediterranean. However, moving away from the coast and opting for alternative accommodation reflects awareness among stakeholders of the importance of natural heritage and the development of other types of tourism.

Tourism sector decision-makers need to know the links between tourism and the natural and cultural environments, including the effects of environmental factors on and the impacts of tourism on the environment. Responsibility requires knowledge.

Table 13.2: Dispatching of beds by category and by Region.

	Classified Hotels	Non classified Hotels	Appart Hotel	Host Rooms	Resorts	Time share	Charming Hotels	Rural residences	Family pensions	Camping	Total
Coastal Zones											
2010	166.478	2.290	0	0	10.154	0	0	0	9.777	0	188.699
2019	187.393	10.237	6.648	299	5.749	1.175	50	106	3.282	0	214.939
Non-Coastal Zones											
2010	52.573	724	0	0	0	0	0	0	150	0	53.447
2019	17.730	2.369	238	93	200	0	163	136	270	1.480	22.679
Total											
2010	219.051	3.014	0	0	10.154	0	0	0	9.927	0	242.146
2019	205.123	12.606	6.886	392	5.949	1.175	213	242	3.552	1.480	237.618

Source: Data collected from the ministry of Tourism 2010–2019

Using existing and newly gathered data, changes in environmental, social and economic conditions can be detected. This piece of information, in turn, enables the status of issues relevant to a destination's sustainability to be gauged on an ongoing basis. Decision making in tourism planning and management can, therefore, be improved. The objective is to reduce future risks to both tourism industry and to destinations (UNWTO, 2004).

It is important to point out that there are large gaps in the raw data collected from several other components of the offer such as natural parks whose entries are free and generally not counted. This creates difficulty in monitoring and developing the offer. We can summarize the sustainable tourism via this SWOT analysis as shown in Table 13.3.

The Impact of Climate Change on Tunisian Tourism Industry

According to a study carried out by the World Bank (Dasgupta, Laplate, Murray & Wheeler, 2009), Tunisia was identified among the top 12 developing countries that are both highly exposed and vulnerable to coastal threats of sea level rise. The study found out that approximately 5% of the population would be impacted by 1m rise in sea level. The report identifies Tunisia among seven of the most vulnerable coastal countries worldwide, in terms of the percentage of population exposed to SLR impacts. In the interim, a non-linear increase in sea level is expected with a 20cm increase by 2040 and a 60cm increase by 2080 (with a mean of 74mm) (IPCC, 2014b). Moreover, according to research by Dasgupta et al (2011), the combined effects of 10% intensification of storm surges in addition to 1m sea level rise (in line with expected global maximum predictions of the IPCC Fifth Assessment Report, AR5) will highly impact Tunisia in terms of proportion of land area, GDP, urban land area agricultural area and wetland exposed.

The study revealed that most economically important areas (accounting for more than 25% of GDP) are prone to storm surges in Tunisia (Dasgupta et al, 2009). A subsequent study by Milano et al. (2013) confirmed these predictions and noted that combined with climate change, pressure on water resources is projected to place catchment areas of Tunisia at very high levels of water stress. It is expected that the ratio of annual water withdrawals to annual renewable water resources will be greater than 80% by 2050.

Analysing the vulnerability of the tourism sector refers to three major risks which must be taken into account when developing the Integrated Coastal Zone Management strategy: the impact of climate change, over tourism and excessive coast urbanization and the degradation of biodiversity.

Table 13.3: SWOT Analysis.

Strengths	Weaknesses
– Adoption of the sustainable development concept through the new constitution (2014) and the regulation of the solidarity and social economy (2020). A national strategy for the green economy is formulated on the basis of an integrated approach including a short-term goal to create green jobs (2016–2020) in many sectors such as Tourism, Transportation. – Adoption of the National strategy on climate change since 2012 in Tunisia with a section dedicated to the Tourism sector. – Hydraulic infrastructure development has been coping with droughts and floods during the last decade. Today, available water resources are already mobilized at a rate exceeding 80% in Tunisia. This could provide the Tourism industry with the required quantity of water especially in summer – The funding of several sustainability certification programs by the State or by certain donors for the benefit of tourism stakeholders contributed to a better management of waste and the rational consumption of natural resources in hotels but also to conserve a lot of natural sites in rural regions favoring wider involvement of local populations in tourism activity	– The coastal regions are suffering from land degradation with many factors: soil erosion, vegetation removal, salinization, compaction, pollution. This land degradation contributed to decreasing the attractiveness of the destination – The water scarcity is more important in coastal regions due to rainfall averages but also the increase of domestic and industrial (including tourism) consumption. – Lack of institutional coordination regarding natural resources management, ecotourism strategy implementation and climate change adaptation (in charge of the Ministry of Environment) – Lack of mainstreaming climate change into tourism legislation and regulations (such as hotels classification criteria) – Repetitive incidents of poaching in natural parks sometimes organized by travel agents in addition to climatic factors represent serious threats to biodiversity – The high cost of modern energy-saving or low-water consumption equipment tackles hotel renovation investments, especially in the presence of debts

Opportunities	Threats
– International cooperation and climate funds ratification of the United Nations Framework of climate change convention and the Kyoto protocol by Tunisia – the decline in mass tourism and the disappearance of several large TOs in the world following the Coronavirus crisis appears favorable to the development of other more sustainable and more sensitive tourism models to environmental factors – The integration of tourism among the sectors which are subject to climate change in studies carried out by major world institutions (IUCN, UNWTO, WTTC, among others). The majority of these studies are open source and can benefit decision makers to design their future strategies for tourism industry	– Difficulties in implementing regulatory and institutional reforms due to political factors and accelerate change of Tourism Ministers in the last years. For the same reasons, the foreign investments in the tourism industry are falling down – Lack of studies applied to impacts of climate change on tourism industry and on the sensibility to environmental issues among decision-makers – Education and training in tourism sector is not in line with the new needs of emerging markets. They are also focused on archaic and obsolete programs not taking into account the new challenges of climate change and sustainability needs – Droughts in rural areas associated with water scarcity enhance push-factors for migration into cities. This will aggravate socioeconomic conditions in urban regions but also create a shortage in qualified skills in rural regions for the tourism industry – Tourism is strongly influenced by international and regional factors that contribute to a contrast in managing a long-term strategy and which makes the destination more exposed to risks (political, security, health, etc.) – Tunisia is highly exposed to an accelerate rise in sea level, the cost of which, in terms of economic loss, is estimated at 0.3% of tourism GDP's contribution until 2050 and the disappearance of 1000 jobs yearly (GIZ, 2013)

Universal awareness about the tourism sector vulnerability to climate change started at the end of the 1990s. The triggering of this dynamic was made by the signature of Kyoto Convention (1997), confirmed by Djerba (2003), consolidated by Davos (2007) and reached its peak by the devoting a year of sustainable tourism by the United Nations dealing in part with the relationship between tourism and climate (2017).

The tourism sector is one of the strategic development sectors that will also be affected by sea level rise and coastal erosion. Tourism infrastructure could be damaged and will have to be elevated or reinforced. Decommissioning of some hotels may be leading to job losses (Ministry of the Environment and local affairs, and UNDP, 2013).

This vulnerability was unanimously recognized by member countries at the United Nations World Tourism Organization in Djerba during the international conference on tourism and climate change (IPCC, 2014a):

This was confirmed by Davos Declaration which clearly states:

> The climate is an essential resource for tourism, as this sector is extremely sensitive to the consequences of climate change and global warming, many of which are already being felt, and it is estimated that it contributes around 5% to global CO2 emissions

Several studies over impact of climate change on tourism show that the Mediterranean region is among the most exposed areas to this phenomenon. A warming of 1 °C to 3 °C will be suffered by the countries of this region by the 2020 (IPCC 2016).

Potential risks are:

- The amplification of the erosion process
- The sea level rise which will have a negative impact on coastal ecosystems and hotel facilities as well as on beaches
- The increasing of water problems with an increasingly remarkable scarcity of water
- The recurrence of extreme weather events such as drought, floods, destructive storms, etc.

These risks will generate not only huge material losses but also disruptions to the functioning of the tourist value chain and will concretely lead to the following consequences:

- Regression of the quality of tourist services, especially the degree of comfort;
- The disruption of coastal tourism due to sea level rise;
- Increased operating expenses for the hotels (energy and water supply costs);
- Possible conflicts over natural resources use and increased tension on food supply;
- Decrease in biodiversity and degradation of the ecosystems and of marine and terrestrial landscapes that are real assets for the development of alternative tourism products;
- Increased health risks as well as risks associated with extreme events

Compounding Tunisia's vulnerability is the fact that its coastal zone is characterized by fast growing urbanization and construction boosted by tourism and real estate development. An increase in infrastructure-heavy investments in "hard" shoreline protection measures intended to reduce erosion (such as groins, seawalls, breakwaters, levees, etc.) have been found to trap sediments and accelerate erosion processes. In parallel, over-abstraction and inefficient use of ground water, especially in agriculture has resulted in more active intrusion of seawater and soil salinization. Agriculture and industry along the coasts have also increased the pollution/degradation of lagoon systems, floodplains and wetlands.

Regression of the Quality of Tourist Services

The increase of temperature and decreasing of precipitation under climate change are expected to have a significant impact on the attractiveness of tourist destinations and their competitiveness through a seasonal and spatial redistribution of tourist flows. Seasons should be extended and regions suitable for tourism should include new territories and sites in order to affect positively tourism flows. This trend is expected to increase with climate change and urban sprawl, strongly impacting the tourism sector. Warming, extreme rainfall and erosion, combined with other factors, could lead to disaffection of tourist destination, unless this activity crucial to the country's development is redesigned.

Schematically, climatic variables recognized as having an impact on tourism are classified into different categories: temperatures, climate, precipitation, wind and humidity, safety, pleasantness (sunshine, daily distribution of diurnal precipitation) and comfort (thermal, hydrological, climatological-pathological). The categorization of these variables makes it possible to highlight the parallel evolutions of destination resorts and origin of tourists. It is therefore important not to consider only the climatic determinants of tourism at the destination place. The climate at the point of departure is also decisive in the evolution of a market. This is the case, for instance, in the European senior market (especially in Eastern Europe and Russia) which increases in winter given the significant fall in temperatures (in Russia it can reach −30°C). It is obvious that looking for comfort and a fair price to quality ratio is a goal shared by all tourists going to a tourist destination. This evidence is questioned by the disastrous effects, in some cases, of climate change.

In Tunisia, hotels are affected by several structural problems (the main one is indebtedness) added to the natural phenomena, still uncontrolled. This led to the revision of classification for a considerable number of establishments. Indeed, according to figures from the Tunisian Ministry of Tourism, the number of uncategorized hotels increased from 8 units in 2014 to 194 units in 2018. It is important to note that 50 units have been definitely deprived of their stars.

Torrential rainfall in record time can cause startling floods and is an ordinary illustration of climate change. This was experienced by Tunisia in September 2018 in the governorate of Nabeul. The seaside resorts have been victims of these events and the material losses of the tourist sector amount to a few hundreds of millions of dinars (Tunisian Trade Authority, 2018).

The Disruption of Coastal Tourism Due to Sea Level Rise

The Ministry of Environment and Land Planning projected that sea level is expected to vary between 0.38m and 0.55 m by 2100 (Ministry of Environment and Sustainable Development [MEDD] & UNDP, 2012). The IPCC's Fifth Assessment Report (AR5) (IPCC, 2014) considers new evidence of climate change which suggests that future sea level rise may be significantly higher with up to 0.98m through the next century with a rise of 12cm by 2050. It is generally accepted that rising sea levels are the most crucial aspect of Tunisia's vulnerability to climate change (Ministry of Environment and Sustainable Development, 2012a) and already instances of sea levels rising up to four times higher than the world average have been reported in some areas (in combination with subsidence) (from AAP, 2009).

The impacts of climate are likely to have significant socio-economic implications, for example Tunisia's Second National Communication (SNC), indicated that a scenario of 0.5 m sea level rise would result in a loss of 10,000 hectares of agricultural land and 53% of coastal fresh aquifer, a total damage to natural and infrastructural productive capital worth US$2.6 billion (10% of GDP in 2006), annual economic losses of US$126 million (with 65% in the tourism sector) and approximately 35,000 lost jobs (1% of the total active population).

Sandy beaches, which represent close to 35% of Tunisia's coastline and which underpin 80% of the tourism industry, are particularly threatened and predicted to disappear at an accelerated rate as a result of climate change (e.g., sandy beaches on the Island of Djerba are likely to be completely lost under a 1m sea level rise). The loss of beach amenity value will have huge implications for revenue generated from tourism which will also be directly affected by damage to infrastructure and changes in the length and quality of climate-dependent tourism seasons (Simpson et al., 2008; Steyn & Spencer, 2012).

Since tourism is largely seaside in Tunisia, the coastline constitutes a fundamental tourist resource. The acceleration of sea level rise is therefore a major threat to this sector. Tunisia risks a 50 cm rise from now to 2100 which will cause the submersion of 18,000ha of the littoral. In addition, the SLR will manifest itself by phenomena of erosion and salinization of aquifer.

Marine erosion is a real threat for Tunisian coast and for the tourism sector. In total 8% (127 linear kilometers) of the coastline is affected by erosion. Signs of beach erosion have already been observed and are becoming pronounced on heavily anthropogenic

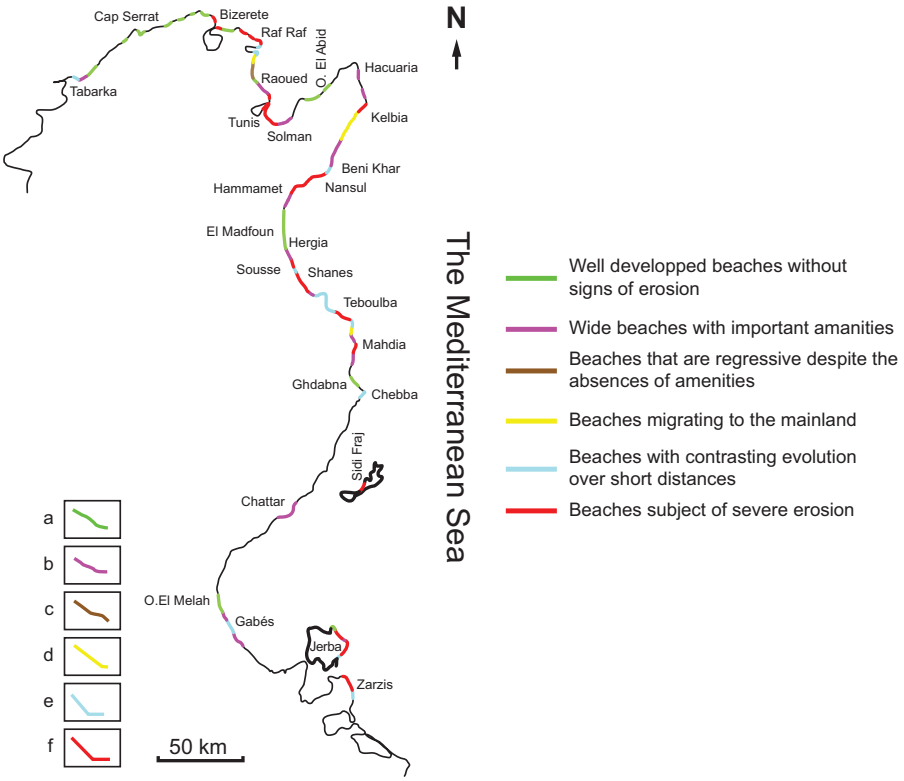

Figure 13.2: Impacts of climate change on Tunisian beaches.
Source: Ministry of Environment Tunisia (2008)

shores. Shoreline retreat often reaches speeds of 0.5mto 1.5 m/y, but can reach 7 m/y, affecting many tourist destinations. Nearly 440 km of coastline (26.6% of the Tunisian coastline) have been assessed (MEDD, 2007) as having a very high vulnerability to marine submersion and erosion, especially on the gulfs of Hammamet (40% of its total beaches), Tunis (30% of its total beaches), and at a lesser degree on the islands of Djerba and Kerkennah (respectively 24% and 14% of their total beaches). However, it is crucial to remember that seaside tourism, the basic product of the tourism industry in Tunisia, benefits from a very important coastal linear, in particular on the island of Djerba and in the Gulf of Hammamet. Consequently, a tourist linear loss estimated at 41.6 km until 2100 may occur unless adaptation measures are implemented immediately.

This impact will not only affect hotels, whose facilities are very expensive and highly endangered, but also marinas and ports. Seven marinas exist over the entire coastline: Sidi Bou Said, Hammamet, Elkantaoui, DjerbaHoumet-Souk, Bizerte, Tabarka and Monastir. Yachting is a Tunisian tourist product with high added value

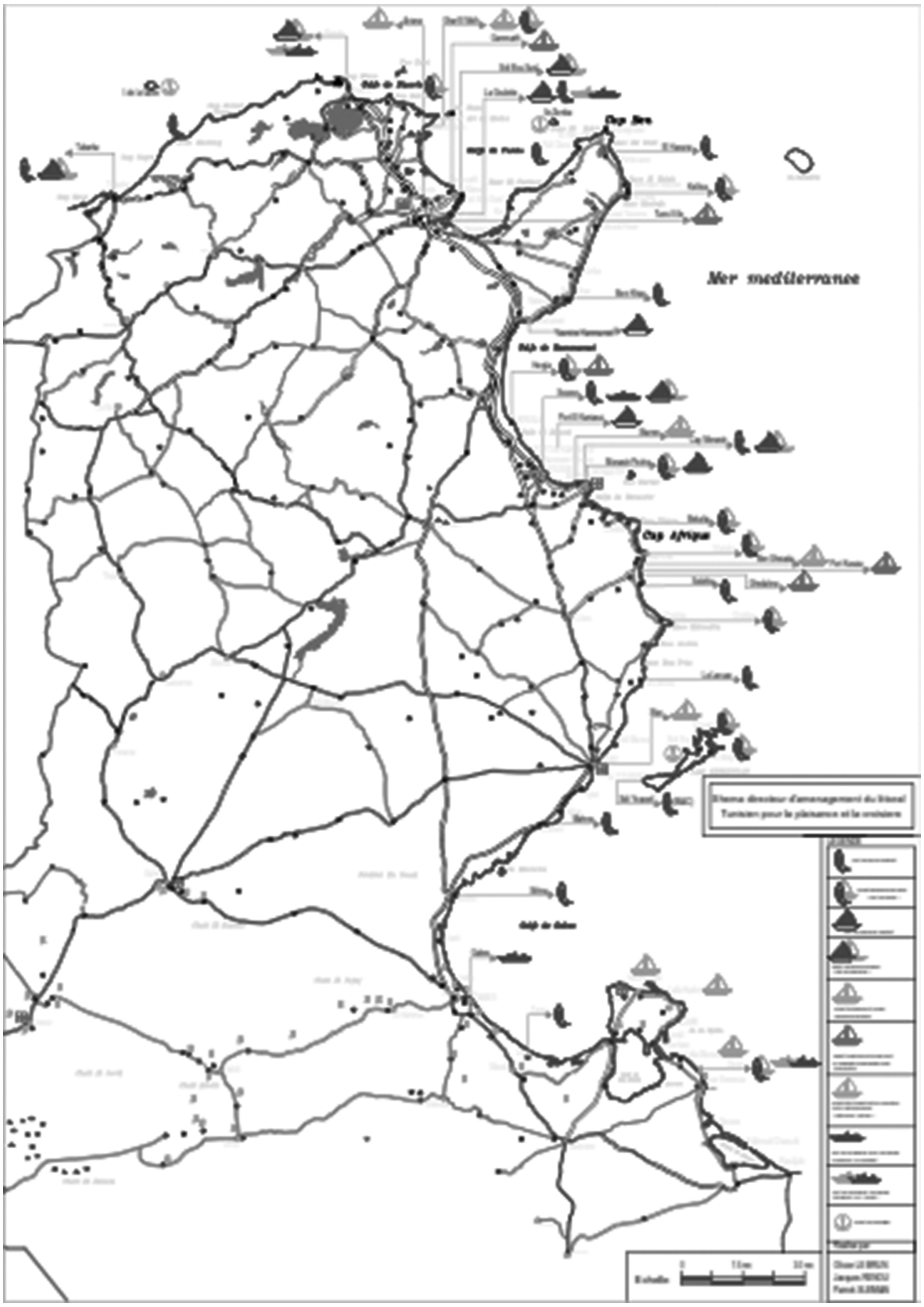

Figure 13.3: Concentration of ports and marinas on the Tunisian coast.
Source: Master plan for the development of the Tunisian coast for yachting and cruising

See figure 13.3. Its turnover is estimated at 20 million dinars, divided between port revenues (4MD), professional services (6MD), and local expenses of foreign boaters (10 MD). Despite these low figures, yachting has great potential for development given the saturation of marina in the north part of the Mediterranean Sea and rising prices for wintering. Sea level rise and thunderstorms constitute the major risks for this activity.

Globally, the vulnerability study that was led by the Deutsche Gesellschaft für-InternationaleZusammenarbeit (GIZ, 2012) estimates the loss of economic capital to 3.5 billion dinars (10% of GDP) of which nearly 2 billion dinars are incumbent on the tourism sector. For tourism, these losses will be recorded mainly in coastal cities: Nabeul (444 million dinars), Sousse (723 million dinars), and Gabes-Medenine (768 million dinars). Sea level rise will cause an average annual loss of 0.3% of GDP from now till 2050 (the equivalent of 101 million dinars) and the loss of nearly 1000 jobs.

Increase in Hotel Operating Expenses

Climate change will primarily affect hotel energy consumption (water and electricity). Secondly, the food supply will also be disrupted, which can be directly reflected in the competitiveness of tourist establishments.

Tourism industry consumes 430 million KW representing 5.47% of high and medium voltage electricity sales (INS, 2017). The transition to solar energy is slow in the tourism sector because of the structural crisis and the weight of debt close to 50%. This cash crisis hit several aspects related to the exploitation such as the difficulties to set up a re-lamping plan (acquisition of bulbs and LED spotlights), replacement of machines and equipment by others with low energy consumption, more expensive maintenance of boilers, and lack of investment in energy saving equipment (presence detectors in common premises, smart faucets, new generation air conditioners).

Regarding water consumption, tourism has been on an upward trend since 2012, rising from 14.1 million cubic meters to 16 million cubic meters in 2016. Although the sector consumes only 3.6% of total water consumption in Tunisia, it is spread out on a very short period (June, July and August), characterized by low rainfall and acute household consumption. However, the demand for water also focuses on areas that are naturally yet poorly endowed with drinking water resources (coastlines, islands, oases). In addition, tourist activity often relies on equipment which consumes a lot of water, such as golf courses, swimming pools or aquatic centers. As a sector standard, the average consumption per tourist in a hotel must not exceed 300 litres per night. This average is often far behind and the estimated ratio for 2016 is 520 litres/night (INS, 2016).

For the hotel industry, the issues are not only quantitative but also qualitative. Indeed, for most seaside hotels, the high salinity of water is a problem both in terms of irrigation of green spaces and in terms of use in the kitchen and in the rooms. This is why tourism sector is allowed to produce water by desalination. Some large

resorts already have their own desalination plant. Nevertheless, this very expensive adaptation option is not feasible for smaller and financially fragile structures. Due to the scarcity of available water resources for the tourism sector, the operating cost of the hotels is very negatively impacted. The intensification of heat periods should also affect hotels in their energy management, especially linked to air conditioning, to ensure the ambient temperature comfort of tourists. It increases the operating cost of hotels where general expenses (energy, insurance) represent 20% to 27% of all operating expenses.

Climate change will also have an impact on the availability of certain food products and their sales prices. The transformations imposed on the agriculture sector because of the scarcity of water and global warming will constitute an additional constraint for the programming of the dishes and the gastronomic offer. Irregularities in supplies will be more and more frequent and buffets will be more expensive. Thus, the ratio of food consumption (Food Cost) which represents between 30% and 35% of sales may slide to an upper bracket ranging from 40% to 45% contributing to increase the financial fragility of hotels.

Degradation of Ecosystems and Landscape

The diversification of tourism offers and the opening up of the inland are both a priority in the Tunisian tourism strategy. The National Tourism Strategy is inspired from a study elaborated by Roland Berger Consultancy firm in 2019. The products of alternative tourism (ecotourism, Sahara tourism, agritourism) that respond to the principles of sustainable tourism as reported by the United Nations World Tourism Organization and the United Nations (Sustainable Development Goals, Millennium Development Goals), will be viable only with a strategy for safeguarding biodiversity and marine and terrestrial ecosystems. For tourists seeking alternative tourism products, the beauty of landscape and the environmental educational component are the essential motivations for traveling.

Climate change induced by human activity affects the distribution of plant and animal species. According to the Intergovernmental Panel on Climate Assessment (2019) 20% to 30% of plant and animal species assessed would be threatened by extinction if the global average temperature increased from 1.5º to 2 °C.

Biodiversity is crucial for the development of tourism activity and its sustainability. Thus, it is crucial to take into account four fundamental elements that soften the interaction between tourism activity and the preservation of biodiversity, especially under the pressure of climate change:

– The great transformation of grounds and the conversion of agricultural land or forests into tourism projects. It concerns mainly the wetlands based directly on the littoral, but also the reserves and natural parks. The agritourism projects must

take into consideration this element at different stages of the project (design, construction, operation, closure);
- Invasive species: native species artificially introduced into the green spaces of hotels or golf courses. These species can be a hazard on the ground as well as on local vegetation.
- Overexploitation: the use of species, nutrients, water and other biological resources in an abusive way which can lead to a rapid decline in biodiversity.
- Pollution: uncontrolled discharge of wastewater, lack of a solid waste recovery program, overuse of pesticides and chemical fertilizers, air pollutants, can all cause threats to individual species, and ecosystems in general.

Increased Health Risks

The damage caused by climate change can have serious health consequences. The appearance of viruses and epidemics on a tourist destination is destructive of its brand image and represents a brake on tourist influxes. In several destinations, World Health Organization and World Tourism Organization acted to underline the emergence of epidemics such as Ebola. Obviously, tour operators and the big tourist groups will follow such restrictions and will desert the destination until the restrictions are lifted. According to a study made on the relationship between risks and the choice of tourist destination (Croutsche & Roux, 2005), hygiene and epidemics come respectively in third and fourth places, just after wars and terrorism like brakes when buying a trip for tourists.

Table 13.4: Types of Risks.

Average Rating based on a scale of 1 (low perception) to 5 (high perception)			
Wars	4.24	Events	3.63
Terrorism	4.09	Transportation Risks	3.42
Hygiene	4	Natural disaster	3.3
Epidemic	3.93	Pollution	2.99
Security, theft	3.92	Accommodation Risks	2.97
General insecurity	3.7	Drug	2.96

Working in an anticipatory manner and preparing contingency plans upstream can mitigate the impact of climate change that can refer to health risks. This work cannot be done in an occasional way but rather regularly (team or permanent cell), on the macroeconomic scale (destination) or on the microeconomic scale (the hotel).

Degradation of the Biodiversity

Natural resources represent for many developing countries an undeniable competitive advantage in the promotion of their tourist destinations and an asset in terms of attractiveness. However, tourism sometimes threatens the very biological resources on which it depends. Biodiversity is a complex system of species and ecosystems that make up our planet. However, this teeming diversity is being degraded at an alarming rate. A real asset for the tourism industry, biodiversity is also a factor of sustainability of the sector. According to the Mediterranean Wetlands coastal Program (MedWetCoast) program, 35% of species would be threatened on the coast of Tunisia. Concreting, anthropization of natural beaches, overcrowding, nocturnal activities and trampling beaches, are possible causes of the loss of biodiversity on the Tunisian coast.

This observation is not too different from what happens in other seaside resorts. According to the WWF, vertebrate populations (mammals, birds, fish, reptiles and amphibians) have been reduced by 60% since 1970 (WWF, 2018). In fact, some estimation indicates that global financial needs for biodiversity conservation range from US $150 billion to US $440 billion a year.

According to the latest report on trends in the ecological footprint in the Mediterranean (Global Footprint Network, 2012), the region currently uses almost two and a half times more natural resources and ecological services than its ecosystems can ensure. However, when the development of tourism lacks planning or good governance, it can cause irreversible effects on ecosystems by exerting considerable pressure through the uncontrolled expansion of infrastructure and polluting activities (transport, construction, waste generation and discharges of wastewater).

Table 13.5: Synthesis of the impact of tourism on Biodiversity.

Spaces	Sites/Houses	Origins of impacts
Wildlife underwater	National Park of Zembra and Zembretta	Spearfishing
Caouanne Turtle	Iles Kuriat	Boating
Avifauna and bat	Nature Reserve of El Haouaria	Over frequentation and hunting
Avifauna	Lagoon of Borj Kastil	Over frequentation
	Salines of Thyna	Touristic urbanization
	Beaches and Dunes of Zouraa, Nefza and Dar Chichou	Cabana

Source: Impact of tourism on marine and coastal biodiversity of the Mediterranean (PAS-BIO – P59)

If Tunisia succeeded relatively in safeguarding its natural wealth, it would partly due to their supervision in the 17 national parks, 27 nature reserves, 256 wetlands and six sites inscribed on international lists (including United Nations Educational Scientific and Cultural Organization).

We also may underline that with the emergence of new forms of tourism in Tunisia (ecotourism, hiking and camping) practiced by groups, often with few supervisions, the level of harassment of wildlife in nature reserves and forest environments is more remarkable. The use of wetlands as recreational sites (e.g., for hiking, bird watching, cycling, angling) is becoming more common. Wetland habitats are important for many water birds not only for breeding but also for wintering and migration during the winter months. Human disturbance may prevent birds from reaching their breeding sites, and access to food supplies or perching areas, temporarily or for extended periods of time. Moreover, sandy beaches are breeding grounds for sea turtles, such as the Caretta-caretta, which is considered to be endangered in the region. Many of their sites have been spoilt or disturbed by the influx of tourists on the beaches.

Solutions and Mitigation

According to the expert panel, to mitigate the impacts of climate change on tourism sector, especially in coastal regions, it is necessary to work on three essential aspects: redefining the governance model of the sector, adapting the marketing strategy and improving aspects related to the environment. These components are complementary and strongly correlated. Thus, implementing a strategy to tackle climate change impacts depend on the synergy between the above mentioned aspects.

The Governance of the Sustainable Tourism

Since the first post-independence government considered tourism as a strategic development opportunity for the national economy, the governance of the sector has become a mechanism shared between the public sector and private actors.

Nowadays, we should highlight that the Tunisian authorities remain the only responsible for land regulation and development policy and is also the responsible for the use of public funds in the promotion of tourism. However, private stakeholders represented by the Hotels association (FTH), the Travel Agencies association (FTAV), the Tourism Interprofessional Association (Fi2t) and some others are participating to decision making and strategy elaboration, underlined E8, E9, and E10. The Panel team confirmed that the current governance model with the large multiplicity of stakeholders demonstrates many limits and introduces great slowness in decision-making or the

creation of a consensus around common strategic orientations. That is why it looks evident to work closely on resolving the problems linked to institutional agreements between public players on the one hand, but also between public and private players on the other hand.

To have a more efficient governance model based on sustainable tourism values and able to give tangible results in terms of mitigating the effects of climate change on the Tourism industry, the expert panel estimates necessary to:

- Reduce the involvement of the administration in management but maintain respect of the regulation and the strategic choices;
- Directing the future investments towards projects located far from the coast and preserving the environment. Such projects must benefit from tax advantages compared to mass tourism projects;
- Giving more decision-making autonomy to territories and local authorities, especially with the new regulation which aims at decentralization. Thus, reconfiguring tourism in the regions according to the wishes of the local populations can contribute to better performance and more viable projects. This should be in harmony with the national strategy of sustainable tourism;
- Create a commission in the Tourism Ministry responsible for solving administrative problems, especially when this problem involves several public actors and slows down investment;
- Provide financial and tax advantages concerning the use of new technologies or ecological equipment that allow better water consumption or the use of clean energy in tourism accommodation projects;
- For any tourism project, a special chapter on the possible impacts of climate change must be required as part of the environmental study currently required by the law. A plan of mitigation should be also provided in case of the impacts will be considered as medium or high levelled;
- Creating a fund which will be supplied through an additional tax on turnover and which will be used to ensure the continuity of the activity in the case of an incident resulting from climate change (unexpected floods, fire in forests or gardens belonging to a tourist project, the extinction of biodiversity for a natural park).

Adapting of the Marketing Strategy

The current strategy is inspired by the study carried out by the Roland Berger firm in 2009. Results from panel discussion shows that majority consider sustainable tourism as a transversal axis and requires, the diversification of tourist products by moving towards alternative products far from the coast and the mass product. This strategy is not completely focused on sustainable tourism which requires a specific strategy based on market studies with a spot-on customer behavior and especially the importance given to environmental and social criteria in the destination choice

or the product purchase. The expert panel believe that any marketing strategy adaptation should review the 4Ps: price, product, promotion, and place.

Adapting the Product

For the current product which is intended for a mass clientele and represents the main component of the tourist offer in Tunisia, it would be appropriate to adapt it to a demand increasingly concerned with respect for the environment and respect for the hygiene. Most of expert panel believe that it would be appropriate to reduce properties investments on the capacity extension (more beds) to direct them towards the purchase of equipment to save energy and to reduce water consumption. They believe that the rise in sea level as well as the amplification of the erosion on the coast threatens this product in the long term and substitute solutions must be found. For E2 and E8, innovating in the concept of the classic hotel industry starts from ecological constructions to sales (restaurants, bar, shops), including rooms and common places. Otherwise, abandoning the all-inclusive formula will allow customers to reduce their dependence on hotel amenities and go out to immerse themselves in the local population which may reduce the use of beaches for example.

According to E1, E2, and E3, it is necessary that properties based on the coasts affiliate to a sustainable development certification programs such as Travelife, Green Globe, or Green Key. They confirm that stakeholders as well as the State can set up actions to encourage and support such a program.

Adapting the offer is also encouraging diversified accommodation such as guest houses, charming residencies, rural residencies, and any other categories different from classic hotels. However, these categories of accommodation should be located away from coasts and destined to customized clientele. Most of expert panel believe that the development of alternative tourism products is able to mitigate the impact of tourist activity on the coasts and the pressure exerted on urban cities while offering a different experience fact to the customer. According to E9, this will require new regulation and especially new tax policies.

Adapting the Price

As mentioned above, the expert panel think that the all-inclusive formula is not far suitable and should be substituted by the dynamic packaging. This can give more flexibility to the customer to design his travel, to personalize it and to make it profitable as well. So that, it can reach more actors in the sustainable tourism value chain and generate more receipts. According to panel team, the price reduction exercised more and more by Tunisian tourism players has contributed to the deterioration of its strategic positioning on the Mediterranean region. This is why they should no

longer use the price as a tool to attract customers. Instead, it will be appropriate to innovate the offer. It is also important to deploy revenue management tools with the use of new technologies to optimize prices in real time in parallel with the variation in demand.

Adapting the Distribution Channel

Currently, sales are strongly dependent on foreign tours operators. This provides guaranteed and easy gains without marketing efforts. However, this model contributes to a major risk related to the international context. The current COVID-19 health crisis is a perfect illustration of this weakness. E1 and E2 underline the importance of enhancing the presence of tourism actors on booking engines. This will let them generate direct incomes but also target tourist worldwide. For E8, it will be appropriate to encourage Tunisian stakeholders set up their own tour operators outside the country and work on promoting national destination. The current and future players should be aware of the importance of sustainable tourism and participate in the promotion of innovative projects within this framework.

It is important to facilitate the participation of small actors (MSME) in the international fairs of tourism and especially in those focusing on sustainable tourism. According to E2, E8 and E10; the launch of reservation platforms specific to every region can contribute to the spread of the tourist season and increase the occupancy rate. This can also benefit other players in sustainable tourism such as guides, craftsmen, sellers of bio-cosmetics.

Adapting Promotion

Most of the promotional campaigns made by the Tunisian tourist office are oriented towards seaside tourism. Furthermore, participation in international trade fairs is mainly focused on traditional European markets. Today, professionals rely heavily on the presence of their products in the various tours operators brochures to be sold. It is an outdated communication policy, when customers increasingly resort to OTAs (Online Tours Operators) and make their decision online. According to E1 and E2, the upcoming campaigns must ever more promote other tourist products while highlighting aspects of sustainability, local products, and handcraft. The annual budget allocated by the ministry of tourism to marketing is 50 million dinars (18 million Euros), thus, E8, E9 and E10 consider that this budget is weak and must be reviewed by granting more facilities to SMEs to be able to participate in international tourism fairs and target other non-traditional market niches specializing in sustainable tourism products. A recent survey made by Expedia Group (n.d) shows that travelers are turning to OTAs throughout the purchase journey. In fact, along with insights into

destination, accommodation and travel preferences, the research shows travelers are turning to a variety of resources for trip inspiration, planning, and booking, including online travel agencies (OTAs). Nearly half of respondents turn to an OTA for inspiration, 73% for planning, and 93% would use an OTA to book travel in this environment, illustrating an opportunity for travel brands to drive awareness and demand with a highly qualified audience. Consequently, for Tunisian tourism professionals, it is recommended to work closely with international OTAs, convert classic travel agencies to OTA and ensure greater visibility on online communication channels with dynamic and merchant websites.

Improvement of the Environment

Reducing Pollution

According to most of the interviewees, pollution is reducing attractiveness of Tunisia as a tourist destination. In the last decade, the country has experienced an unprecedented deterioration in environmental aspects. E5 and E6 believe that the industrial waste dumped, in an uncontrolled manner, on the coasts, besides, the spectacular quantities of plastic visible in public places and the discharge of untreated grey water into the seas are all alarming factors that have contributed to this degradation. That is why they recommended the implementation of a national program which could reduce this type of pollution. Government decree n° 32 of January 16, 2020 announced the ban on the production, import, distribution and possession of plastic bags, starting from March 01, 2020.The application of this decree will be gradual, on March 01, 2020 for supermarkets and pharmacies, and January 01, 2021 for producers and importers of plastic bags. This new regulation could help reduce the use of plastic and the generated waste. However, E5, E6 and E7 think that the government should pay more efforts and investment to protect coasts from industrial waste that is considered as dangerous for ecosystems and wildlife. According to E4, the protected areas based in the coasts (wetlands) are now more threatened than ever. The threats come, on the one hand, from the effects of climate change and on the other, from pollution. Additional budgets devoted to the safeguard of these areas will be necessary in addition to a colossal work of sensitization of the local populations. Coercive aspects are also important and penalties must be higher to stop crimes against the environment, according to most of interviewees.

A great work to encourage promoters to launch their own companies for recycling and collecting waste is highly recommended by E6, E9 and E10 as well. Besides, they highlight that today, several sectors of this value chain are lacking and municipalities are increasingly unable to manage the quantities of waste with their own means.

Conserving Biodiversity

E4, E5 and E6 believe that sustainable tourism should contribute to conserve biodiversity especially in protected areas. Activities such as ecotourism depend on the landscape attractiveness and the biodiversity availability. However, they confirm that the number of poaching incidents has increased considerably in recent years. Thus, involving the local population, via sustainable tourism activities, can consolidate the efforts of the State to conserve biodiversity. According to panel team, developing outdoor tourism activities (such as biking tours and hiking) can lead to the enhancement of the natural and cultural heritage of the country, generate additional income for the locals and provide a more interesting experience for tourists. It remains important to devote part of the receipts to maintaining natural sites and conserving biodiversity.

Climate Change Mitigation

According to panel team, stopping the erosion on the Tunisian coast and saving the beaches depend on reducing tourist activities. This depends necessarily on diversifying tourist products in internal regions. E11, E4 and E5 confirm that the climate change impacts will be felt more over the next few years, especially with regard to the phenomenon of global warming or even extreme weather conditions. To this end, professionals in the tourism sector as well as the authorities must set up a monitoring department which will have among its tasks monitoring the evolution of these impacts and defining plans for their mitigation.

Nevertheless, E1 and E2 validate that collaboration between the Tourism Ministries and the National Institute of Meteorology is not yet established. For E10, E8 and E9 a specific fund should be set up to finance the continuity of tourist activities after crisis, including natural crisis resulting from climate change. Such a fund can be supplied via a tax levied on annual turnover and consolidated by donations from international donors or subsidies granted by foreign states.

Conclusion

Sustainability is seen as a factor that contributes to improve the competitiveness of destinations and tourism stakeholders in Tunisia. That is why reference to sustainable tourism growth is now taken into consideration in most strategic tourism planning documents. However, it is important to understand the complex role of sustainability that affects destination competitiveness. To reach this goal a strong theoretical background for managerial decision-making is needed, in order to give

destination managers a range of tools with which we could analyse and increase the success factors related to the sustainability process implementation (Crouch & Brent, 2003).

Currently, there are several institutions and programs working on global goals and frameworks which have direct and indirect implications for both climate change impacts and tourism growth. These include the IPCC – AR6 (expected for 2021), the Sendai Framework for Disaster Risk Reduction, the 2030 Agenda for Sustainable Development (SDGs) including a climate goal and many others.

The last scientific report (IPCC, 2014b) alarmed about the continued emission of greenhouse gases that will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks. Besides, it insisted on the fact that adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change.

This chapter has considered the possible impacts that could be produced for instance: the regression of the quality of tourism services, the disruption of coastal tourism due to sea level rise, the increase of operating expenses, the degradation of ecosystems and landscapes, the increase of health risks, and excessive urbanization of the coast and the decrease of biodiversity. All these risks or impacts are more intense when – as it happens in Tunisia – the destination depends on a mono-product, in this case mass tourism, which is too closely linked to the coasts. In fact, Tunisia is a tourist destination that is highly exposed to climate change, whose impacts can threaten the sustainability of tourism activity in the medium and long terms. These impacts can affect tourist infrastructures, influence negatively the foreign investments in this sector, or even reduce the tourist attractiveness of certain sites or territories. That is why adopting a tourism development strategy based on the principle of sustainability is necessary. In order to tackle the climate change impacts on tourism industry, especially in the coastal regions, it is recommended to follow three major emergency exits: acting on marketing, on the environment or even on governance methods.

The main issues of this work consist in demonstrating the major impacts of climate change on the tourism sector. Such impacts are highly felt at the level of the offer which has witnessed a spectacular deterioration in recent years but also identified via the evolution in tourist behavior and a structural change in demand. However, the expert panel conducted in this project allowed knowledge about the degree of awareness among stakeholders and officials of climate change, whether or not they have adopted solutions to mitigate the possible impacts, and the several categories of solutions.

References

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva, Switzerland, 151 pp.

APAL. (2015). *The New statistics of the Tunisian coasts*. Tunis: Official Print Press of Tunisia.

Berriane, M. (1995). Tourism development, Mediterranean coast urbanization and development. *MEDIT N°2*, 19–27.

Billé, R., & Magnan, A. (2010, Avril). Tourism and climate, the case of the nothern mediteranean coasts. *Grande Europe N 19*, p. 25.

Cabrini, L., Simpson, M., & Scott, D. (2009). *From Davos to Copenhagen: Advancing Tourism's Response to climate change*. Madrid: UNWTO.

Crouch, G. I., & J.R Brent, R. (2003). *The competitive destination: A sustainable perspective*. CAB International.

Croutsche, J. J., & Roux, M. (2005). *Risks and tourism: Towards a causal model for assessing the impact of risks on tourist behavior*. France: Teoros.

Dasgupta, S., Laplante, B., Murray, S., & Wheeler, D. (September 24, 2009). Climate Change and the Future Impacts of Storm-Surge Disasters in Developing Countries. Center for Global Development Working Paper No. 182, Retrieved from SSRN https://ssrn.com/abstract=1479650

Dasgupta, S., Laplate, B., Murray, S., & Wheeler, D. (2009). *Sea Level Rise and Storm Surges: a comparative analysis of impacts in developing countries- World bank Policy Research Working Paper 4901*. Washington DC, 43pp.

Dubois, G. (2005). *Tourism, the mediterranean and sustainable development*. Marseille: Plan Bleu.

French Ministry of economy and finance. (2005). *Development scheme of the Tunisian coast for cruises and boating activity*. Tunis: ONTT.

GIZ. (2012). *Evaluation of vulerability of climate change impacts and adaptabion assessments in Tunisia*. Tunis: Ministry of Environment Tunisia.

Hardy, A., J.S. Beeton, R., & Pearson, L. (2002). Sustainable Tourism: An overview of the concept and its position in relation to conceptualisations of Tourism. *Journal of Sustainable Tourism*, 475–496.

INS. (2017). *Statistics Barometer 2012–2016*. Tunis: INS Edition.

INS (National Institute of statistics). Retrieved 2020 April, 23, from http://www.ins.tn/.

IPCC. (2014). *the IPCC's Fifth Assessment Report (AR5)*. IPCC.

IPCC. (2018). Summary for Policymakers. In Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.). *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*.

IUCN. (2008). *Biodiveristy, my Hotel acts. Guide for sustainable use of biological resources*. IUCN Edition.

Kacem, M., Boumaiza, S., & Lassoued, B. (2016). *Ecotorism in Tunisian desertic natural Parks*. Tunis: Ministry of Environment Tunisia.

Ministry of Environment and sustainable Development (MEDD) & UNDP. (2012). *Study for the second National communication under the convention of the United Nations on climate Change, Phase III: Tunisia's Vulnerability to climate change*. Tunis.

Marianne Milano, Denis Ruelland, Sara Fernandez, Alain Dezetter, Julie Fabre, Eric Servat, Jean-Marie Fritsch, Sandra Ardoin-Bardin & Gaëlle Thivet. (2013). Current state of Mediterranean water resources and future trends under climatic and anthropogenic changes. *Hydrological Sciences Journal 58*(3), 498–518. DOI: https://doi.org/10.1080/02626667.2013.774458

Ministry of Environment and local affairs and UNDP. (2013). Third National Communication of Tunisia under the United Nations Framework Convention on Climate Change, P28–30 Ministry of Tourism and Handicraft. (2017). *The Tunisian Strategy of Tourism 2020*. Tunis: Ministry of Tourism.

MIO-ECSDE. (2012). *Tourism and Biodiversity in the mediterranean*.

ONTT. (2019). *Annual Tourism Baometer*. Tunis: Imprimerie Officielle Tunisia.

ONTT. (2017). *The tourism Barometer*. Tunis: ONTT.

Ouessar, M., Gabriels, D., Tsunekawa, A., & Evett, S. (2019). *Water and Land security in Drylands: Response to climate change. Springer*.

Oxford, U. o. (2008). *Climate change Adaptation and Mitigation in the Tourism sector: Franmeworks, Tools ans practices*. Paris: UNEP.

PAS -BIO, PNUE -GEF- PAM. (2003). *Tourism impact on Marine biodiversity and mediteranean coasts*. Spain: UNEP.

Plan Bleu. (2018). *Coastal Zones and terrotories dynamics Note#37*. Marseille: Plan Bleu.

Plan Bleu. (2018). *Coastal Zones, dynamic of territories. Note#37*. Marseille: Plan Bleu.

PNUE/PAM/PAP. (2001). *Management of coastal zones in the mediteranean region. Split, Priority Actions Program.* UNEP.

PNUE/PAM/PAP. (2008). *Protocol related to the integrated management of coastal zones of mediteranean region*. Barcelona: UNEP.

PNUE/PAM/PAP. (2012). *Statrgies of Integrated management of coastal zones for the mediteranean Region*. Barcelona: UNEP.

Simpson, M., Gössling, S., Scott, D., Hall, C., & Gladin, L. (2008). Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices.

Steyn, J.N., & Spencer, J.P. (2012 March 01). Climate change and tourism: Implications for South Africa and adventure. *African Journal for Physical Health Education, Recreation and Dance 18* (1): 1–19.

Sofield, T. H. (2003). *Empowerment for sustainable Tourism Development*. Elsevier Science LTD.

Tunisian Ministry of the environment. (2014). *The sustainable development strategy 2014–2020*. Tunisie: Official Print Press Tunisia.

Tunisian Trade Authority. (2018). Press Interview of the chairman of the Tunisian Union of Industry, Commerce and Crafts (UTICA), African Manager online revue, September 30th 2018. Retrieved from https://africanmanager.com/nabeul-cest-pas-quelques-millions-mais-des-centaines/

United Nations: Economic Commission for Africa. (2014). *The Green economy in Tunisia: An implementation tool of the new sustainable development strategy (2014–2020)*. Tunis.

UNWTO & UNDP. (2017). *Tourism and sustainable development goals- journey to 2030 Highlights*. Madrid: UNWTO

UNWTO and UNEP. (2005). *Making Tourism More Sustainable – A guide for Policy Makers*. Madrid: UNWTO.

UNWTO. (2003). *Declartion Of Djerba on climate change and Tourism*. Madrid: UNWTO.

UNWTO. (2010). *From Davos to Copenhage and Beyond: Advancing Tourism's Response to climate Change*. Madrid: UNWTO.

UNWTO. (2004). *Indicators of sustainable Development for Tourism Destinations: A Guidebook*. Madrid: First Printing.

UNWTO. (2020). *International Tourism Barometer*. Madrid: UNWTO.

UNWTO. (2011). *Tourism and Biodiversity*. Madrid: unwto.
WTTC. (2018). *Tourism Economic Impact in North Africa*. UK: WTTC.
WTTC. (2019). *Travel and Tourism: Economic impact 2018*. UK: wttc.
WWF. (2018). Living Planet Report – 2018: Aiming Higher. Grooten, M. and Almond, R.E.A. (Eds). WWF, Gland, Switzerland
Zhenhua, L. (2003). Sustainable Tourism Development: A critique. *Journal of Sustainable Tourism* 459–475.