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POTENTIAL IMPACTS OF CLIMATIC CHANGES ON THE TOURISTIC ACTIVITY SECTOR IN LIBYA: A REVIEW AND FUTURE RESEARCH

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Abstract

This study showed the effect of climate on tourism sector especially for the beach, nature and winter sport tourism segments. Climate change at tourist destinations and generating countries can significantly affect the tourist's comfort and their travel decisions. Changing demand model and tourist flows will have impacts on tourism industry, host communities and knock off effects on related sectors, like, agriculture, handicrafts or construction. There is a need for local, region and global cooperation so that the businesses and individuals in the tourism sector will be able to adapt to weather changes. The tourism industry has to adopt measures so that natural resources are protected. These measures should also contribute to the protection of the global environment. The vast lands of Libya have been settled by many civilisations across its history, including the Phoenicians, Greeks, Romans and Arabs amongst others. They have left some amazing ruins of their ancient cities, most notably the Roman ruins at Leptis Magna, one of the most impressive such sites in the world. Away from the lush Mediterranean coast lie the harsh but dramatic landscapes of the Libyan Desert, with the picturesque Acacus Mountains and Ubari Sand Sea as well as ancient desert towns and fascinating rock art paintings. Libya is well off the main tourist trails of North Africa and receives only a fraction of the visitors of its neighbours which, combined with its many attractions, makes it an ideal travel destination. These factors make Libya a centre of tourism in Middle East. There is now a wider recognition of the urgent need for the tourism sector to adapt to the climate changes and to take preventive actions for future effects, as well as to mitigate tourism's environmental impacts contributing to climate change.

Keywords: *Touristic activity, impacts of climatic changes, Libya, economic sector.*

1. INTRODUCTION

Tourists are attracted to Libya's climate, extensive long beaches on the Mediterranean Sea, and the wonderful Greek and Roman ruins. Globally, the tourism sector is one of the largest and fastest growing global industries and is a significant contributor to national and local economies around the world. Because tourism is strong connected with the natural environment, it is very sensitive to climate change. The tourism sector has a key role to play in confronting the challenges of climate change. Climate change can affects the touristic sector especially in mountain and coastal regions. Also, the tourism sector is contributing to greenhouse gas emissions (GHG) through the transport of tourists.

The tourism sector is characterized by large diversity and a fragmented structure. While varied conceptualizations of the subsectors e.g., transportation, accommodation, food and hospitality services, travel agents and tour service operators, visitor attractions and tourist focused retail or service suppliers. Touristic operators differ in terms of ownership, size and

purpose and also they have adapted to provide tourism services in every climatic zone from deserts and high mountains to the Tropics and Polar Regions. Due to these variations, there are extensive varied in the nature of climate sensitivities and abilities of global touristic operators to incorporate climate services into decision-making.

2. CLIMATE CHANGE AND TOURISM SECTOR

This study review shows the impacts of climatic change on tourism based on reports of the World Tourism Organization (UNWTO), the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO), the information for the 2nd International Conference on Climate Change and Tourism (Davos, Switzerland, 13 October 2007). The study offers the impacts of climate change on the global tourism sector, likely suggestions for tourist request, current stages and trends in GHG emissions from the tourism sector. The Intergovernmental Panel on Climate Change (IPCC) [1] showed that 'warming of the climate system is unequivocal.' The global mean temperature has increased approximately 0.76°C between 1850–1899 and 2001–2005 and the IPCC [1] mentioned that most of the recognized increase in global average temperatures since the mid of the 20th century and the result of human activities that are increasing GHG concentrations in the atmosphere. The impacts of human activities influences on climate, including ocean warming, continental average temperatures, temperature extremes and wind patterns [1]. The general drops in glaciers and ice tops and warming ocean surface temperature have contributed to raise the level of sea of 1.8 mm/year from 1961 to 2003, and roughly 3.1 mm/year from 1993 to 2003. The IPCC proved that the pace of climate change is accelerated with continued GHG emissions at or above current rates, with the best estimate that globally be around surface temperatures will raise by 1.8°C to 4.0°C by the end of the 21st century [1]. The magnitude of climate change probable for the 21st century on the environmental and economic risks of is featured obviously in recent international policy discussions [2-4]. It is clear that the climate change will become gradually as changing subject which influencing the tourism development and management [5-10].

Gössling [11] mentioned that the biological response to this continued warming and sea level rise (Figure 1) would continue for several centuries [1] one of the Libyan coast. With the close relations between the environment and climate, tourism is imitated to be a highly climate sensitive economic division similar to agriculture, insurance, energy, and transportation [12]. The tourism sector is a non-negligible contributor to climate change through GHG emissions resulting from the transport and accommodation of tourists [9, 13].

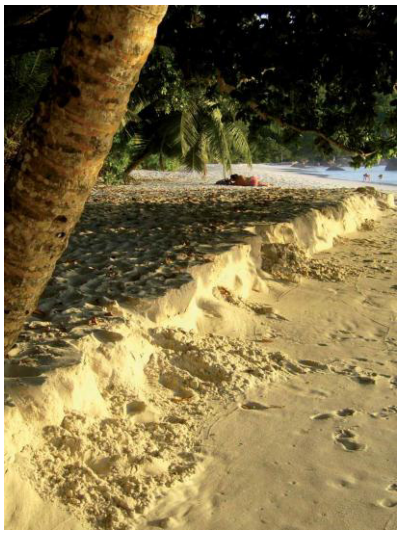

Figure 1. Coastal Erosion can be Caused by Sea Level Rise, Environmental Change or a Combination of Both'. Sourse: Gössling, S. (2008). Hypermobile travellers. In Gössling, S. and Upham, P. (eds) Climate Change and Aviation. Earthscan, to appear 2008. [11]

Tourism must seek to significantly decline its GHG emissions in harmony with the 'Vienna Climate Change Talks 2007' [14]. The UNWTO and UNEP convened the 1st International Conference on Climate Change and Tourism in Djerba, Tunisia in 2003. This event was a crisis in terms of raising awareness about the inferences of climate change within the international tourism community. The Djerba Declaration documented the complex inter-linkages between the tourism sector and climate change and established a framework for future research and policy making on adaptation and mitigation [5].

A number of individual tourism industry associations and businesses have also shown leadership on climate change, voluntarily adopting GHG emission decrease targets, appealing in public education operations on climate change and supporting the governmental law of climate change.

3. IMPACTS ON TOURISM PURPOSES

Climate changes a wide range of the environmental resources that are critical attractions for tourism, e.g., snow, wildlife productivity and biodiversity, water levels and quality. Climate has an important impacts on environmental conditions that can prevent tourists, including infectious disease, wildfires, insect or waterborne disease. There are many broad groups of climate change influences tourism and its competitiveness and sustainability such as:

Direct climatic impacts: Tourism has an important influence on operating costs, such as heating, cooling, etc. Thus, changes in the length and quality of climate dependent tourism seasons could have considerable implications for competitive relationships between purposes and the profitability of tourism enterprises [15-17].

Indirect environmental change impacts: Changes in water availability, biodiversity loss, compact landscape beautiful, changed agricultural production, increased natural hazards, coastal erosion and inundation, damage to infrastructure and the increasing rate of vector borne diseases will all influence tourism to changing grades. Mountain, island, and coastal destinations are considered mostly sensitive to climate change [2, 5-8]. UNESCO has identified several World Heritage Sites that are critical tourist destinations; to be weak to climate induced environmental change [18].

Impacts of mitigation policies on tourist mobility: local or global mitigation policies have an impact on tourist flows and lead to an increase in transport costs and may foster environmental attitudes that lead tourists to change their travel outlines [19-21].

Indirect societal change impacts: Climate change is supposed to pose a possibility to future economic growth and to the political stability of some nations [22]. Climate change is a reflected as a national and international security risk that will steadily intensify under greater warming circumstances [23-25]. Tourists are averse to political instability and social unrest [26, 27] and the negative tourism demand repercussions for the climate change security hotspots 6 are very evident.

Destination Vulnerability Hotspots: The inferences of climate change for any tourism business or purpose will depend on the impacts on its competitors. The impact on the tourism sector may strongly parallel that of the global economy, where a 1ºC temperature rise may result in a net benefit for the global economy, but it shows net declines [4].

Destination Level Adaptation: Destination communities and tourism operators with large investment in permanent capital effects have the least adaptive capacity. The dynamic nature of the tourism industry and its ability to manage with a range of recent major shocks, including SARS, terrorism attacks in a number of nations, or the Asian tsunami, suggests a relatively high adaptive capacity within the tourism industry overall. Simpson et al. [28] mentioned that the capacity to adapt to climate change (Figure 2) is thought to vary substantially between subsectors, destinations, and individual businesses within the tourism industry [29, 30].

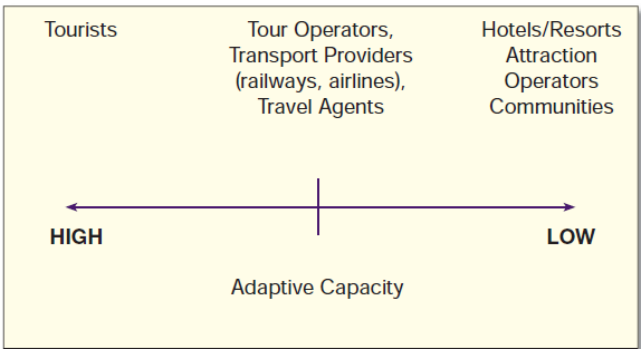

Figure 2: Relative Adaptive Capacity of Major Tourism Sub-sectors
Sourse: Simpson, M.C., Gössling, S., Scott, D., Hall, C.M. and Gladin, E. (2008) Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices. UNEP, University of Oxford, UNWTO, WMO: Paris, France. ISBN - 978-92-807-2921-5 [28]

Climate change is gradually entering into decision-making of a range of tourism stakeholders. Studies examined the climate change risk appraisal of local tourism officials and operators have consistently found relatively low levels of concern and little evidence of long-term strategic planning in anticipation of future changes in climate [28, 30, 31-34]. There is some evidence that tourism operators may be overestimating their adaptive capacity. The incorporation of adaptation to climate change into the collective minds of private and public sector tourism decision-makers remains several steps away. Consequently, there is a real need for effective communication between the climate change science community and tourism operators at the regional and local scale, particularly with respect to the development of climate change scenarios and indicators catered toward local tourism decision-making.

Specific requests were made for training events focussing on adaptation and mitigation techniques, tools and methods. UNEP and UNWTO aim to bring efforts on climate change and tourism into their mainstream environment activities, building on the Davos Declaration [35] and demanding action to adapt tourist businesses and destinations to climate change and to mitigate the impacts of tourism on climate change. In addition it builds on the Bali Strategic Plan to enhance the provision by UNEP of capacity building assistance to developing countries and countries with economies in transition [36] and broader concerns over the need for global institutional leadership with respect to tourism-related climate change adaptation and mitigation activities, as expressed in the Helsingborg Statement on Sustainable Tourism [37].

4. INNOVATION STRATEGIES

Tourism firms themselves have a major role to play in adaptation to climate change as part of systems of innovation. The notion of adaptation as a form of innovation that is understandable in the context of tourism business practice has not been well articulated, but it is an essential component of understanding the capacities of destinations to adapt and respond to the challenges of climate change [38]. Much of the focus of climate change adaptation is on technical responses to climate change. However, the development and transfer of innovative technology is only a small element of what constitutes innovative tourism business practice [39]. Research on innovation in tourism and similar service firms indicate that there are a range of other measures that firms can adopt to respond to external stimuli and stresses, such as those brought about directly and indirectly by climate change, in order to survive and, ideally, maintain or even increase profit margins. Innovating at all the various levels of tourism will bring greater potential returns and enhance the likelihood of survival; it will also contribute to the resilience of the destination as whole. Moreover the ability to innovate represents a capacity to adapt and attract new markets in light of the turbulence that climate change is anticipated to bring to tourism patterns and flows. Heymann [40] believed that the tourism industry will still be a growth engine in the world, experiencing average annual increases of around 3.5% to 4% in

international tourist arrivals through 2020, but he forecasts substantial changes in tourist flows by region and within regions of the world based on a comparative scoring model developed by DBR. The DBR model compares the most important countries in the mainstream tourism sector to 2030. The model is based on four quantitative and qualitative parameters:

1. Consequences of climatic changes, including substitution effects;
2. Consequences of regulatory measures to slow climate change and/or mitigate its negative effects;
3. Possibility of adaptation to the changing conditions opens to individual regions;
4. Economic dependence of tourist destinations on tourism.

Nearly all European regions are anticipated to be negatively affected by some future impacts of climate change and these will pose challenges to many Economic sectors [41]. According to a research carried out by UNWTO [42] CO_2 emissions from international tourism including all forms of transport accounted for just under 5% of the world total or 1,307 million tonnes in 2050.

Weather and climate information provide input into a several decision-making contexts for tourism developers, operators and destinations. Scotta and Lemieux [43] mentioned that the historic climate information can be used for strategic planning of tourism infrastructure, including location analysis for new resorts, architectural and landscape design and construction scheduling in remote locations (Figure 3).

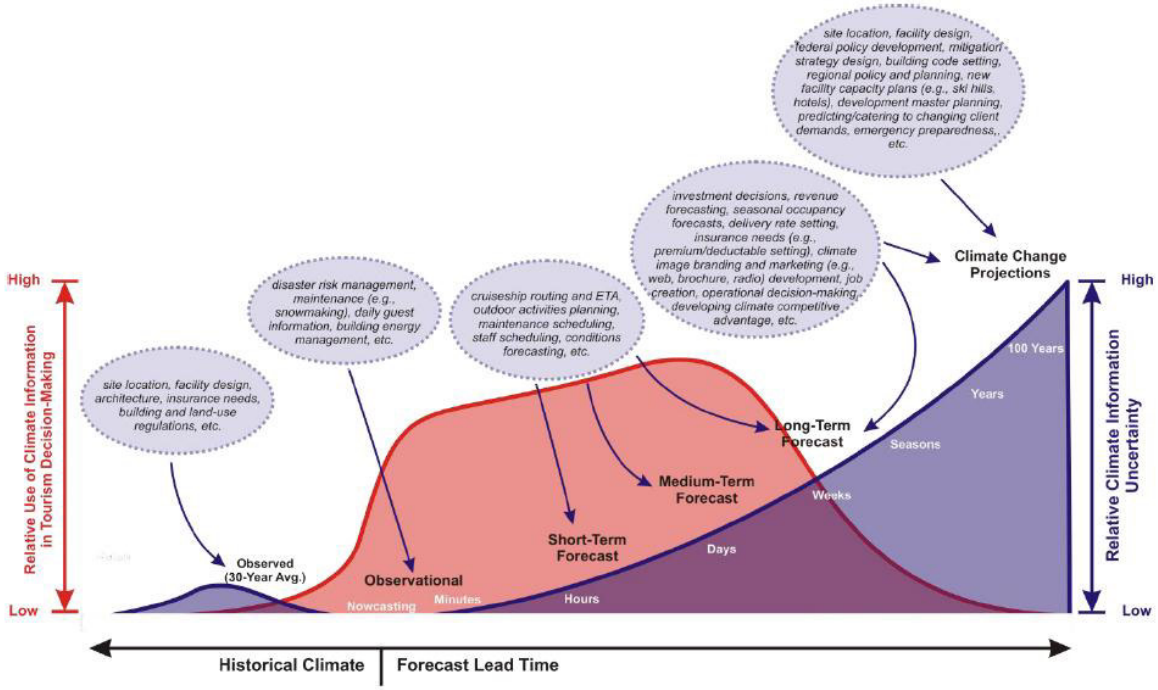

Figure 3. The uses of weather and climate information by tourism operators and destinations. Source: Scotta D., Lemieux C. (2010). Weather and climate information for tourism. Procedia Environmental Sciences 1 (2010) 146–183. doi:10.1016/j.proenv.2010.09.011 [43]

The link between climate change and tourism implies complex interactions and can be described as a two-way relationship. On the one hand, tourism activity contributes to climate change [44]. The UNWTO [45] estimates that emissions from global tourism, including transport, accommodation and tourism activities subsectors make up 5% of total CO_2 emissions.

The major contributor is the private automobile and air transport [46], followed some way off by other forms of transport and the accommodation subsector [45]. In 2005, CO_2 emissions originating from transport accounted for 75% of tourism-based emissions, with the most of this attributed to air transport. This means that air transport is responsible for between 2.5% and 3.5% of total anthropogenic emissions causing global warming [47].

Tourism depends on natural resources, such as water, coastlines, landscapes, biodiversity, etc. These influence the potential attraction of destinations. However, climate change threatens the loss of some of these relevant natural resources [48].

Therefore, these two facts, the contribution of tourism to economic growth and the complex two-way relationship between tourism and climate change, suggest that research on the implications of climate change on the tourism industry and vice versa is of significant interest and relevance.

5. CLIMATE CHANGE IMPACTS ON COASTAL CITIES

Coasts are highly dynamic and geo-morphologically complex systems, which respond in various ways to extreme weather events. Coastal floods are regarded as among the most dangerous and harmful of natural disasters [49]. It is well known that the urban areas adjacent to the shorelines are associated with large and growing concentrations of human population, settlements and socio-economic activities. Considering the fact that 21% of the world's population lives within coastal zones [50], the potential impacts of sea-level rise are significant for the wider coastal ecosystem [51].

There is a need for a readily calculated and easily understood method to calculate flood vulnerability in such areas. Balica et al. [52] build on earlier work on a flood vulnerability index in river basins to establish a flood vulnerability index using a composite method. This index can then be used to identify the most vulnerable coastal cities, develop adaptation measures for them and assess the effects of future change scenarios. Climate change is expected to cause accelerated sea-level rise with elevated tidal inundation, increased flood frequency, accelerated erosion, rising water tables, increased saltwater intrusion, increasing storm surges and increasing frequency of cyclones. Apart from this, population growth and increasing urbanisation cause marine and coastal degradation [53]. Coasts are dynamic systems, undergoing adjustments of form and process (termed morphodynamics) at different time and space scales in response to geo-morphological and oceanographical factors [54, 55]. Human activity exerts additional pressures that may dominate over natural processes. Coastal landforms, affected by short-term perturbations such as storms, generally return to their pre-disturbance morphology, implying a simple, morphodynamic equilibrium [56].

Balica et al. [57] are focused on large urban areas situated in deltas. Deltas are biologically rich and diverse systems with waterfowls, fish and vegetation, and they support a large economic system based on tourism, agriculture, hunting, fishing, harbour and industry development [58].

Many people in deltas are already subject to flooding from both storm surges and seasonal river floods, and therefore, it is necessary to develop further methods to assess flood vulnerability of coastal cities. Large populations are found in coastal areas where the exposure to coastal floods is high [59]. Smith and Ward [60] showed that rising sea levels will raise flood levels; it is also estimated that the number of people flooded in a typical year by storm surges would increase 6 times and 14 times given a 0.5- and 1.0-m rise in global sea levels, respectively [61].

This increase in the sea level can expand throughout the beach and can affect the touristic activities and industries in the coastal cities like in case of Libya. The most important touristic cities are present at the sea coast.

6. ATTRACTIONS OF LIBYA

Libya's strategic, geographical position and profound history make it a vital link between the eastern and western parts of the Arab world, and between Europe and Africa. The country has known its ups and downs, but the historical monuments are a testimony of the great Libyan civilization of old. Libya can be divided into three regions: (west) Tripolitania, with the capital,

Tripoli; (east) Cyrenaica (Barqa, in Arabic), with its main city of Benghazi; and (south) Fezzan with its main city of Sabha.

The map of Libya demonstrates the defining feature of the country: the long, open coastline with no natural geographical barriers on land except for the Sahara Desert. The Sahara, which occupies most of the country, is the dominant geographical feature. Narrow strips of fertile land along the western and eastern coasts contain most of the human population.

The cities of Jarma, Zakakra, and Sabha are in the south, and the historical city of Ghirza in the centre. Libya has played host too many civilizations, and has enriched civilization in its turn, with writings, drawings and engravings in the caves of Tadrart Mountains, and archaeological treasures from Ataft.

The Phoenician, Roman, and Byzantine ports were at Tripoli, Sabratha, Shah's, Susah, Tukrah, and Talmitha. The old Islamic cities such as Sirt, Darnah, and Ajdabiya, and other cities were found in the heart of the desert, including Ghadames, Zuwayla, Jalu, Aujla, Ghat, and Fezzan. Not forgetting the places and fortresses of Gharyan, Mizdah, Al-Qaryat, Yifran, Jadu, Nalut, Misallatah, and Awinat. The first site most tourists visit is Tripoli.

Libya has two thousand kilometres of splendid beaches, and some beautiful small cities each with its typical architecture and special characteristics, like Auwarah, Tubruq, Misratah, Az-Zawiyah, Al-Khums, and Zlitan. Explore Libya's desert in Wadi Ash Shati, the plain of Awaynat, Brak, Murzuq, and the oasis of Al Kufrah, Zallah and Bazimah. Then cool off in Al-Bayda or near Al-Marj, or on the plain of Darnah. In desert, there are waves and waves from the great sand sea, but then there are the refreshing oases.

The history, the monuments and tales told by the locals make this place unique. It is a feast for the senses. The jewel of the desert is Ghadames, a mélange of natural beauty, important monuments and a distinctive architectural style for which it is famous. Libya may be the land of ancient civilizations, but it also looks to the future. It is a country of peace.

7. THE MAJOR MOUNTAIN REGIONS IN LIBYA

The highest mountains in Libya are the Bikku Bitti (2,266 metres), on a spur of the Tibesti Mountains in far southern Libya, an extremely inaccessible area near the Chad border and the isolated Jebel Uweinat (1,934 metres) in the extreme south-east, on the border with Egypt and Sudan. In Libya, There are six major mountain regions (Figure 4).

Figure 4. There are six major mountain regions

In the northern part of the country there are the Jebel Akhdar area (Green Mountain range) in the north-west, and the Jebel Nafusa area in the east, which forms the southern boundary of the Jifara plain (also known as Al-Jebel Al-Gharbi: the Western Mountain). These volcanic remnants, 600–1,000 metres high, capture significant rainfall, creating a fertile environment for cultivation, particularly of olives. In the south-west there is the massif of the Acasus Mountains (Tadrart Acacus, in Berber), in Fezzan, near Ghat on the Algerian border. It is a region of more than 250 km^2, with an extraordinary variety of desert scenery: dunes isolated stone towers emerging from the sand that have been eroded into strange shapes, rock arches, and canyons that were the beds of ancient rivers. This was once a wet region and contains a rich store of rock art and inscriptions dating to between 12,000 BCE and 100 CE and a large quantity of ceramics and stone tools. It was named a World Heritage Site in 1985.

8. CLIMATE IN LIBYA

In the coastal lowlands, where 80% of the population lives, the climate is Mediterranean, with warm summers and mild winters. The climate in the desert interior is characterized by very hot summers and extreme diurnal temperature anges. Summer temperatures in the north of Cyrenaica range from 26.7°C to 32°C. The Mediterranean and the Sahara together have a large influence on the climate (Figure 5) [62].

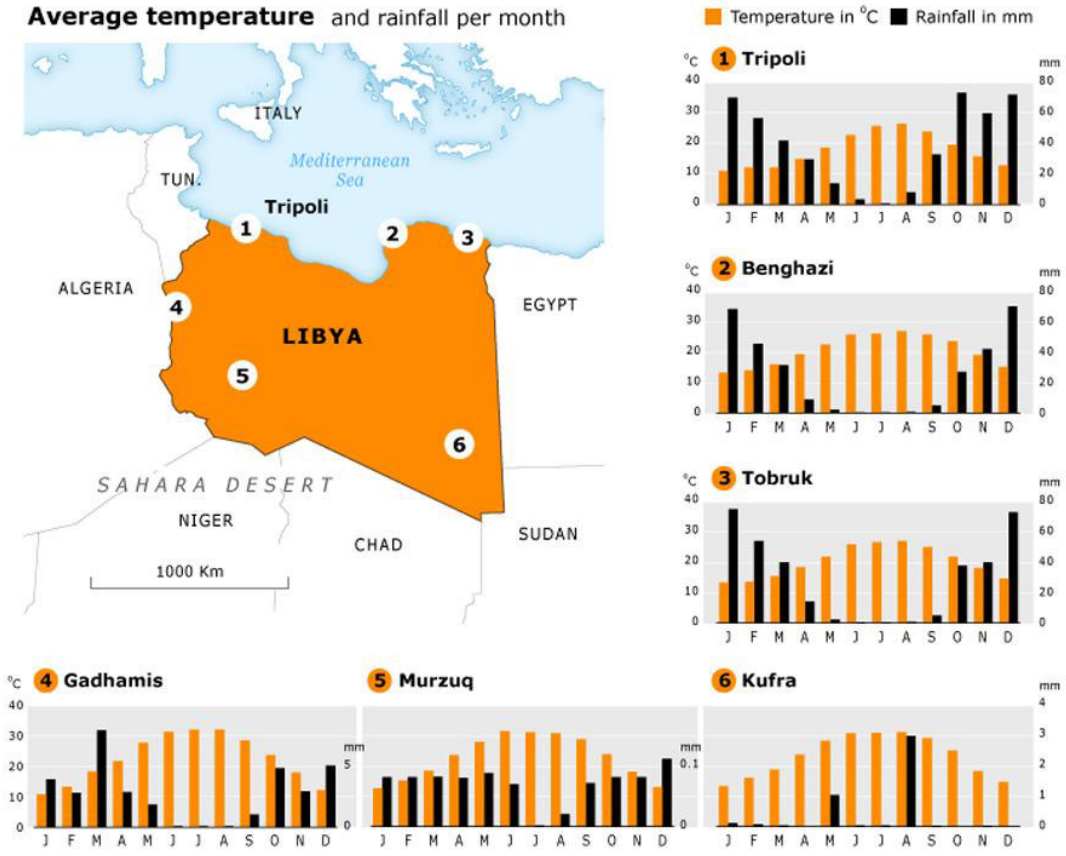

Figure 5. Climate in Libya. Source: Fanack Home / Libya / Geography, October 24th, 2018 [62]

The Greek historian Herodotus wrote, in the 5th century BCE: 'In the higher parts of Libya it is always summer', and this is still true. Along the coast there is a Mediterranean climate with hot summers and mild winters. Tripoli has an average winter temperature of 14°C. In early summer temperatures reach 30°C, with high humidity. In July and August the temperature can reach 40°C. From October till March, rain falls along the coast.

The highlands, such as Jebel Nafusa and Jebel Akhdar, are generally cooler. In winter, the temperatures sometimes fall below freezing. Snow falls occasionally; Jebel Nafusa was snow-covered in 1994. In the interior, the climate becomes dryer, and the desert is extremely arid. Temperatures can reach 50°C in summer, and night-time temperatures drop drastically. On the coast, the wind usually blows from the north-east or north, hot in summer and colder in winter. In spring and fall, the ghibli, a hot, dry, dust-laden desert-wind, which can last one to four days, can change temperatures by 17°C to 22°C in both summer and winter.

This south wind lasts from one to four days, and the dust storms and sandstorms it raises often affect the countries north of the Mediterranean. The winds have eroded the Libyan mountain ranges, as exemplified in the Tibesti Mountains. Precipitation ranges from light to negligible. Less than 2% of the country receives enough rainfall for settled agriculture. The Jabal areas of the north receive a yearly average of 381 to 508 millimetres. Other regions get less than 203 millimetres.

Rain usually falls during a short winter period and frequently causes floods. Winters can be bitterly cold, with temperatures below 0°C. Frost and snowfalls sometimes occur in the mountains. Evaporation is high, and severe droughts are common.

9. TOURISM IN LIBYA

Tourism in Libya is an industry heavily hit by the Libyan Civil War. Before this war tourism was developing, with 149,000 tourists visiting Libya in 2004, rising to 180,000 in 2007, although this still only contributed less than 1% of the country's GDP. There were 1,000,000 day visitors in the same year [63]. The country is best known for its ancient Greek and Roman ruins and Sahara desert landscapes. Cultural tourism is Libya's biggest draw as a tourism destination.

There are five UNESCO World Heritage Sites in the country, three of which are classical ruins. The Roman cities of Sabratha and Leptis Magna in Western Libya and the Greek ruins of Cyrene in the East are big tourist attractions. One of the attractions of Libya's archaeological sites, is that one located in the west south side of the country which called and known by The Jowely of the desert “The Old City of Ghadames” they are not as heavily populated by tourists as are other ancient sites in North Africa and southern Europe.

Libya is a hotspot for research into the human past. The Sahara, the largest hot desert in the world, was once green and hosted until a few thousand years ago the biggest freshwater lake on Earth [64].

Some depictions of crocodiles and cattle engraved and painted on the walls of rock shelters in the Sahara date back 9000 years. The desert is a laboratory for investigating links between past climate changes and developments in human history [65, 66]. These include the dispersal of modern humans across Africa about 130000 years ago [67], the oldest evidence [68] of milking in Africa around 5200 BC and the establishment of the first Saharan state [69] during the first millennium BC. Archaeological fieldwork in Libya is at a standstill. Libyan monuments have been seriously damaged, including the Karamanli mosque, built in 1738 in the capital, Tripoli, and Islamic tombs that date to between the 10th and 12th centuries at Zuwila, near the west-central town of Murzuq.

10. ARCHAEOLOGICAL SITES

Libya has an extraordinary archaeological heritage (Figure 6) [70]. There are important prehistoric sites, including some of the world's earliest rock and cave art, and underwater archaeological sites along the Mediterranean coast.

Libya is home to five World Heritage sites, designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO):

1. the ancient Greek archaeological sites of Cyrene;
2. the Roman ruins of Leptis Magna;

3. the Phoenician port of Sabratha;
4. the rock-art sites of the Acacus Mountains in the Sahara Desert; and
5. the old town of Ghadames, an oasis city that has been home to Romans, Berbers and the Byzantine civilization.

Figure 6. Map of Libya's principle tourist attractions (Source: http://www.shati-zuara.de/english/Libya/libya.html) [70]

Leptis Magna was enlarged and embellished by Septimius Severus, who was born there and later became emperor. Leptis Magna (Figure 7) was widely regarded as one of the most beautiful Roman cities and its excellently preserved remains make it one of the best Roman sites. Founded by the Phoenicians in the 5th century BC, Leptis Magna came under Roman control in the 2nd century BC.

Figure 7. Archaeological Site of Leptis Magna (Libya) ©UNESCO/Francesco Bandarin

It flourished under the reign of its native son, Septimius Severus, in the 3rd century AD who enlarged and embellished the city, becoming second only to Rome with a population of 100000. Among its many highlights are the Gladiator Circus, amphitheatre, marketplace, theatre (Figures 8 and 9), basilica and the many forums, baths, streets and arches (UNESCO World Heritage Site: Archaeological Site of Leptis Magna).

Figure 8. The theatre at Leptis Magna

Figure 9. The Arch of Septimius Severus and Market place

11. ARCHAEOLOGICAL SITE OF SABRATHA

Once a Phoenician trading-post that served as an outlet for the products of the African hinterland, was part of the short-lived Numidian Kingdom of Massinissa before being Romanized and rebuilt in the 2nd and 3rd centuries A.D. It prospered as a trading centre for gold, ivory, leather, spices and slaves brought to the Mediterranean from central Africa which saw the city rebuilt with many impressive monuments. Sabratha today has some excellently preserved Roman ruins in a beautiful (Figure 10) setting on the Mediterranean coast.

Most famously, its theatre has a capacity of 5000 and the stage area has been renovated with a three storey, marble-columned frons scena. Other features include the large forum surrounded by the temples of Liber Pater, Serapis, Hercules and Isis, the Christian basilica of Justinian and the Capitolium (UNESCO World Heritage Site: Archaeological Site of Sabratha).

Figure 10. Archaeological Site of Sabratha

Cyrene and Apollonia

A colony of the Greeks of Thera, Cyrene (Figure 11) was one of the principal cities in the Hellenic world.

It was Romanised and remained a great capital until the earthquake of 365. A thousand years of history is written into its ruins, which have been famous since the 18th century. Founded as a Greek colony in the 7th century BC, Cyrene soon became one of the wealthiest and most important cities in the Hellenic world before coming under Ptolemaic and then Roman control. One of the most impressive and varied complex of ruins anywhere, Cyrene's highlights include the Temples of Zeus (Figure 12) and Apollo, the Acropolis and the Agora, as well as its baths, gymnasium and theatre. Its port at Apollonia lies 18 km away on the Mediterranean coast, with further Greek, Roman and Byzantine remains including a Greek theatre overlooking the sea (UNESCO World Heritage Site: Archaeological Site of Cyrene).

Figure 11. Archaeological Site of Cyrene (10/09/2007) ©UNESCO / Francesco Bandarin

Figure 12. The temple of Zeus in Cyrene, Eastern Libya

Libyan Sahara - UNESCO World Heritage Sites

Ghadames

Ghadames is an oasis town located some 550 km southwest of Tripoli. The site was an important stop along the old caravan routes across the Sahara. Ghadames is an historic town located in an oasis in the desert near the border with Tunisia and Algeria. Once known as the 'Pearl of the Desert', Ghadames was an important stopping of point in the trans-Saharan trade routes between Timbuktu and the Mediterranean and is renowned for unique layout and architecture. Buildings (Figure 13) were constructed from sun-baked clay bricks and connected together to form covered alleyways which linked the main streets and open air terraces at the top that formed rooftop 'streets'.

Figure 13. Old Town of Ghadamès (Libya) © Federica Leone

The lower streets were reserved for men and the rooftops for women during daylight. The old town is now deserted but the museum, traditional houses and mosques can be visited (UNESCO World Heritage Site: Old Town of Ghadames). The Old City, shown here, was organized spatially and socially into seven clans. Buildings are built (Figure 14) directly adjacent to each other, which insulates the streets and living spaces below from the beating sun.

Figure 14. The traditionally decorated mud brick architecture of Ghadames' Old City is designed for natural cooling.

Ubari Sand Sea

The Ubari Sand Sea (Figure 15) is a vast area of towering sand dunes in the desert notable for the 11 salt water lakes known as Ramlat Dawada. The lakes, such as Gebraoun and Umm al-Maa, are beautiful palm-fringed oases that appear miraculously amidst the harsh desert environment.

Libya has observed its annual Ghat Festival of culture and tourism in Ghat (Figures 9 and 10), about 1,360 km south of the Libyan capital, Tripoli. At the festival, currently in its 19th edition, Tuareg tribes, the primary inhabitants of the region, celebrate Tuareg traditional culture, folklore and heritage.

Figure 15. A lake in the Ubari Desert

Ghat

Ghat is the capital of the Ghat District in the Fezzan region of south western Libya. The annual festival: Camel racing forms a major part of the Ghat Festival (Figure 16) of this desert town, located on the border near Libya's border with Algeria, celebrates the essence of northern Africa's music and dance.

Figure 16. Tuareg men ride camels in the desert during Ghat Festival of Culture and Tourism

The Ghat Festival saw glory like the old days with tourists enjoying the local culture as exhibitions of traditional handicrafts and performances added to the festive fervour. Check out below the pictures from the latest edition of Ghat Festival in Libya (Figure 17).

Figure 17. Ghat Festival of Culture and Tourism

Conclusion

Climate is extremely important for tourism. The tourism sector must rapidly respond to climate change, within the evolving UN framework and progressively reduce its GHG contribution if it is to grow in a sustainable manner; this will require action to: 1. mitigate its GHG emissions, derived from transport, accommodation, etc. activities; 2. adapt tourism businesses and destinations to climate changes; 3 apply new technologies to improve energy efficiency; 4. secure financial resources to help poor countries. Actual impacts of climate change on tourist destinations are potentially much further reaching, as they affect the resource base of tourism, both directly and indirectly. Since the 1st International Conference on Climate Change

and Tourism, convened by UNWTO in Djerba, Tunisia in 2003, a growing body of knowledge has been generated addressing the complex relationships between the tourism sector and climate change with important research activities on this subject.

There is now a wide recognition of the urgent need for the tourism industry, national governments and international organizations to develop and implement strategies to face the changing climate conditions and to take preventive actions for future effects, as well as to mitigate tourism's environmental impacts contributing to climate change. Furthermore, such strategies should take into account the needs of all countries in terms of poverty alleviation and other Millennium Development Goals.

Libyan heritage is the expression of a shared memory of the country, and its respect represents a corner stone for long lasting national reconciliation. I therefore urge all parties, as well as the Libyan population, to commit to and act for its safeguarding. Parties should refrain from using cultural property and its immediate surroundings for military purposes likely to expose it to destruction or damage as well as to abstain from any act of hostility directed at such property. UNESCO has to invite the experts from both in- and out-side of Libya to urgently investigate the preservation of cultural heritage in the country, notably measures to safeguard cultural sites; prevent illicit trafficking, protect museums and strengthen cultural institutions.

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