LUISS

Joint Degree Program in International Relations, with China Foreign Affairs University

Course of Mediterranean Governance

Tourism in Egypt and the Challenges of Climate Change

Prof. Mohammed Hashas

SUPERVISOR

Prof. Maria Rita Testa

CO-SUPERVISOR

Shangjun Yang ID 652412

CANDIDATE

Academic Year 2022/2023

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Acknowledgement

I have been studying at LUISS for two semesters. Looking back on the past year, many things have happened. As my first time abroad, I am delighted to be able to come to LUISS in Italy to study. I have made many new friends and also met many excellent teachers here. They have generously helped me when I was confused. I would like to thank my two supervisors, Professor Hashas and Professor Testa, who are very friendly, helpful, and knowledgeable, I also want to thank Dr. Capat who gave me advice and helped me deal with my confusion in study when I was lost and encountered difficulties in the exam. I also want to thank Ms. Elena, who helped us international exchange students solve various difficulties in school and Her enthusiasm and care left a deep impression on me. I also want to thank the other staff members of the school and strangers who have helped me but I can't name them during my stay. Finally, I also want to thank my parents, even though I'm far away from home, their care and love can still make me feel warm.

Introduction

Egypt is a country with an ancient civilization, rich cultural heritage, a long coastline, the warm sunshine of the Mediterranean climate and plenty of beautiful beaches. For various reasons, Egypt has become an ideal tourist destination, attracting hundreds of thousands of international tourists visiting here to spend their holidays every year. Egypt's tourism industry is so developed that it once accounted for 15% of its GDP.

However, Egypt's tourism industry is also vulnerable. It will lose a large number of tourists due to the political turmoil, social instability, the epidemic, the negative influence of appalling ecological damage and continuous global climate change, which makes it the most unstable part of the national income.

This thesis argues that Egypt, as a country with rapid tourism development that extremely relies on tourism income has too much vulnerability in the face of climate change. It tries to analyze the challenges and crises encountered by Egypt's tourism industry now and in the future under the background of the fact of global climate change, and tries to discuss whether Egypt can cope with these crises well. And how to cope better.

The first chapter of this thesis will comprehensively analyze the connection between the tourism industry and the climate change, and provide typical cases of many countries except Egypt to demonstrate the important interaction between climate change and the tourism industry. The third chapter will specifically discuss the severe problems of Egyptian tourism when faced with climate change. The fourth chapter will try to analyze whether Egypt has handled the problems effectively during the climate change crisis and whether it has the ability to regulate the relationship between the two sectors. The fifth chapter will put forward some theoretical methods on how to solve the problems encountered by this sector in the era of climate change.

1. Tourism Industry in Egypt

1.1. Overview

We often talk about tourism, most people think of tourism as leisure and vacation, but the tourism industry is more complicated than most people think. According to the classification of the United Nations, any travels that have connections with religion, conference, business, family visits, health and education are included in the tourism statistics.[1] Tourism, therefore, as an area of analysis, refers to a phenomenon, which has economic and social characteristics, and whose participants include tourists, the tourism market, government and civil (non-governmental level), international organizations and the places that constitute tourist destinations.[2]

Global tourism started to revive after the biggest war ever in human history since 1950s, especially transnational tourism. As a way for people to relax and interact with the world, tourism is a cultural, economic and social phenomenon for business, personal or other purpose which started to rise quickly after the World War II. People in different countries who decide to move away from their original environment choose their desired destinations under the era of globalization. For many European people, the Mediterranean basin is a huge attraction. As for Egypt, this ancient and mysterious kingdom has attracted too much attention from the world.

Egypt straddles two continents, with the Red Sea in the east, the Mediterranean Sea up in the South, the Suez Canal as the core, connecting the two seas. In the northeast, Egypt borders with Israel and Palestine. In the west, Egypt borders with Libya and in the south, Sudan. Most of the parts in Egypt are located in the northeast Africa. Only the Sinai peninsula, the remote area in the northeast, is located in the

[1] United Nations World Tourism Organization (UNWTO). UNWTO technical manual: collection of tourism expenditure statistics. 1995.

[2] Hall, C. Michael, and Alan A. Lew. Understanding and managing tourism impacts: An integrated approach. Routledge, 2009.

southwest of Asia. The land of Egypt covers an area of 1,011,450,000 square kilometers. Although the country is large, most of the area is covered by desert, 95% of the land is desert, only 5% of the country's arable land, while Egypt has a very long coastline, the total length of 2,900 km, it is also the gathering place of many diving enthusiasts around the world, unique climatic conditions and matters of temperature make this place become the winter Europeans The unique climatic conditions and matter of temperature make this place the first choice for Europeans to go south for vacation. The Nile, which is hailed as the "River of Life" travels through Egypt from the very south to the north, irrigating the rich land of the Nile Delta. With the narrow, slender, spindle shaped canyons alongside, the delta that flows into the sea on both sides of the Nile are the richest areas of Egypt, and although they cover only 4% of the country, they are home to 99% of the country's population. If the regions of Egypt are divided according to geography, Egypt can be divided into four main plates, the vast Libyan desert in the west, the Arabian Desert in the east, the Sinai Peninsula in the northeast and the Nile Delta region top in the north.

Egypt may not have the classical and elegance of Europe, the modernity and mechanization of the United States, or the atmosphere of China, but this does not affect the unique charm of Egypt. The entire territory is dry with little rainfall, the subtropical Mediterranean climate are mainly seen in the Nile Delta and the northern coastal, while most of the other parts Egypt have the tropical desert climate, while most of the rest of the country has a tropical desert climate. Egypt is known for its unique ancient cultural and natural landscapes, including the famous and historic Giza Pyramids, the Temple of Karnak and the outstanding costal shores. The vast desert landscape also appeals hundreds of thousands of tourists across the globe every year. The great Pyramid, located in the outskirts of Cairo, are a series of ancient landscape, which have been standing in the desert for more than 4,500 years. Its rich archaeological value is amazing to the world. Many temples in the south of Egypt, with a thick history, deep cultural precipitation and unimaginable architectural magic,

let too many tourists linger. Sharm El Sheikh province in the north is located on the coast of the Red Sea and the south end of the Sinai peninsula, attracting countless tourists with its modern leisure resort character. The Egyptian tourism industry is relatively mature after decades of good operation, and its competitive prices are one of the most attractive advantages of the Egyptian tourism industry, for example, the cruise in southern part of Egypt has become a major tourist feature. Tourists only need to spend less than $500 per capita to get a round-trip train ticket from Cairo to Aswan with two meals included, stay in a luxury cruise suite, guided tours and full transfer for 6 days 5-night itinerary. That may be a lot of money for local residents, but it's still quite affordable for Western tourists. Standing out as two of the most popular and attracting tourism spots, the Mediterranean Sea and The Red Sea have always been considered as the most promising tourism resources in Egypt. The long Red Sea coastline with soft sand on the beaches become tourists' dream land where the sun shines all day long, the turquoise Red Sea is calm and warm. Sharm El Sheikh and the famous beautiful coral reefs and various fish in the underwater world of Horgdah have unlimited charm for tourists. The magical desert and the colorful mountains along the Red Sea also create a strong desire to explore. the desire to explore. In order to take advantage of these resources, the Egyptian tourism sector is constantly introducing new tourism programs, including archaeological tours, Nile rafting, desert trekking, etc. These include archaeological tours, Nile rafting, desert hiking tours, exhibition tours, event tours, yacht tours, etc. The healing tours launched in recent years because Some of the deserts in Egypt have many hot springs containing sulfur and many minerals, which are more therapeutic than those in other parts of the world. These hot springs are more therapeutic than those in other parts of the world and can treat many diseases such as joint pain, skin diseases, kidney diseases and gastrointestinal diseases, kidney and gastrointestinal diseases. As more and more desert caves are discovered in the Avenat Mountains and the greater Jalaf area, archaeologists are discovering that the caves contain a variety of minerals.

Archaeologists have discovered a large number of ancient murals dating back thousands of years, and the Picasso-esque simplicity of these murals is striking. The caves have been discovered by archaeologists to contain a large number of ancient frescoes from thousands of years ago, which also have a stunning Picasso-style simplicity.

Drawing on the recent data from the World Bank, during 2019, international tourism of Egypt saw more than 13,000,000 arrivals, the direct expenditures of which rose to about 2.58 billion. The uproar of tourism industry had shown a good sign of recovery after stagnation in economy and political setback Egypt government faced since 2011[1]. In this outstanding number of arrivals, most of the tourists are from Europe. According relevant data, European tourists is the largest part of foreign arrivals in Egypt. In 2019, the Arab Republic of Egypt has a total of 7.8 million tourists coming from Europe[2], which accounted for around 60% of all the tourists that year. Taking the example of 2019, Egypt's receiving of around 13 million tourists in 2019 assured that Egypt ranked 19th in the world over the number of receiving tourist arrivals . Besides, in 2020, Egypt raked in around 4.87 billion US dollars in the tourism industry alone, which accounts for nearly 12% of GDP. In 2020, Egypt, alone, gathered approximately 47% of all international tourism receipts in Northern Africa.[3] Tourism is one of the core sources of fiscal revenue in Egypt[4]. Based on the data, we can clearly see the the splendid and colorful human and natural landscape in Egypt provide consistent attraction for tourism in Egypt, appealing thousands of tourists all over the world which is mostly contributed to by European tourists. Although the data doesn't focus on one specific European country, it is apparent that Europeans have a strong interest in Egypt and Egypt deserves the most popular tourist destination in the Mediterranean region and even in the world.

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[1] https://data.worldbank.org/indicator/ST.INT.ARVL?locations=EG

[2] https://www.egypttoday.com/Article/6/89481/60-of-tourists-visiting-Egypt-in-2019-came-from-Europe

[3] https://www.worlddata.info/africa/egypt/tourism.php

[4] https://tradingeconomics.com/egypt/tourism-revenues

1.2. The Development History of Egypt Tourism

So the question now is how Egypt manage to construct the tourism empire from scratches to where it is today. In order to have a more comprehensive understanding of Egypt's tourism industry, we are supposed to try to obtain the answer in its history.

It is obvious that Egypt's tourism industry did not get to where it is today overnight. Egypt could be the oldest country in the world, like China. It holds so many incomparable treasure on one hand and many beautiful shorelines and natural landscapes on the other hand. in the book of *National Geographic Traveler – Egypt*, Humphreys praised the great view in Egypt that cannot been seen else where. His overwhelming praise bring the readers to the “lively initiation into the Arab world”.

In 1951, tourism is not the same important sector in Egypt as it is now, with only around 0.1 million arrivals for traveling. It was not until 1975 when the visa facilitation was implemented in Egypt that tourism industry started to uproar. In 1976, the Egypt government has decided to include the tourism into its yearly plan. As a consequence, 12% of the state budget that year was given to tourism industry and other indirectly related sectors. For example, hotels, public transport, airport construction were all heavily invested. A staggering sum of money was invested in private sectors as well. In the late 70s, the tourism was brought into the field of academy and so many scholars in college started to pay attention to this region. More and more international magazines and columns were found to give space to Egypt beautiful landscapes. More and more money was invested in various related fields, which was a sign that the Egyptian tourism industry was shaping into a phenomenon, and Egypt continued to create its own territory in the tourism industry. Egypt was determined to get a large share under the fierce competition in the international tourism industry.

The arrivals for tourism have seen a rapid increase from 1981 of 1.8 million to 2000 5.5 million in Egypt as a result of booming development of tourism industry. In

2010, the milestone was recorded by Egypt government that about 12.5 billion dollars of income was achieved that year.

Since 2010, the tourism industry was heavily affect by political instability. The so-called Arab Spring swept over nearly all Mediterranean countries. Egypt, as one of them, was haunted by terrorist attacks, societal tension, political upheaval, and economic inequality. The undesirable atmosphere declared a death sentence for the Egyptian tourism industry. The revolution of 2011 led to hundreds of thousands of tourists avoiding Egypt as the final destination mostly because of their safety cannot be secured. The scene of people demonstrating, police cars whizzing by, and the streets in shambles terrifies any tourist who had ever wanted to travel to Egypt. As a result, the number of tourists dropped immediately. Even in 2014, three years after the upheaval, the number of tourists of the first half of which decreased by 25% over the same period of 2013" [1].

We can see that Egypt, as a single country, attracts most of the people visiting Mediterranean area. But if we dig deeper into where the tourists coming from, we can simply gain the data that most of the people are from Ukraine, United States, Italy, Germany, England, Russia, France, etc. The tourists are mostly interested in two aspects of traveling in Egypt. One is for enjoying a holiday where they can have a leisure time and interact with the Mediterranean cultures (For example, get tanned on the beaches, go scuba diving, etc.). The other one is for visiting cultural sites (Pyramids, Luxor's Temples & Tombs,Abu Simbel, etc.). According to the data from OECD, in 2016, the number of international tourists in Egypt saw a record-breaking low figure since 2000 because of the crash of the airplane to Russia in 2015. However, around 5.4 million tourists still paid the visit to Egypt. About 36% tourists were from Arab countries, 19% from Western Europe, 15% from Eastern Europe and 12% from

[1] Smith M, "Egypt tourist numbers to rise 5-10 pct in 2014 - minister," *Reuters*, October 9, 2014, https://www.reuters.com/article/egypt-tourism-idUSL5N0RC3CF20140911

Germany.[1] Tourists from various European countries often consider Mediterranean countries as an ideal tourist destination because of their excellent geographical location, competitive tourism programs, characteristic Mediterranean climate conditions, and the fact that Mediterranean tourism has more attractive price advantages. A comfortable summer trip in Egypt could be more desirable for some of the tourists as they do not need to bear the expensive expenses like going to Switzerland to enjoy the same excellent services and local specialties, which gives Egypt an edge due to the more attractive price advantage.

Egypt, as one of the closest Mediterranean countries to the developed countries in Europe, has natural geographical advantages and good tourism resources, pocketing a lot of tourism revenue every year. And as a country so close to Europe, it naturally becomes the most advantageous area for tourism development. In terms of the benefits of tourism, we can see that it not only satisfies the travel needs of European tourists, but also, according to the relevant data, Egypt's strong development of tourism has brought a tremendous boost to the national economy and increased employment. In 2014, the number of people working in tourism-related industries reached 1.8 million, contributing to more than 6% of the total labour force and more than 7% of total employment in Egypt. The contribution of tourism in Egypt to employment from 2014 to 2021 is 1.03 million, 0.98 million, 0.82 million, 1.1 million 1.14 million, 2.42 million, 1.89 million and 2.16 million. After suffering the blow of the Arab Spring in 2011, the Egyptian tourism industry had declined and tourism revenues and employees were the most affected, and the direct contribution of tourism to employment in Egypt dropped to 820,000 people in 2016 between 2012 and 2018, after which it improved slightly but kept its position until 2019, when the direct contribution rose to 242 million people. It then declines to 1.89 million after experiencing the global outbreak of the new crown epidemic COVID-19 in 2020. It

[1] OECD, Egypt, in "OECD Tourism Trends and Policies 2018," *OECD Publishing*, March 3, 2018, https://doi.org/10.1787/tour-2018-en

rebounded to 2.16 million in 2021. At the same time, tourism, one of Egypt's most important industries, has brought the world's attention to Egypt while bringing a steady stream of economic, cash and employment to the country and the region, and the Egyptian government realized as early as the last century that tourism would be an extremely important driving force for Egypt's national development. According to the data from the OECD, we can see that almost 75% of the people dedicated in the tourism industry in Egypt work full time and 26% work part time or on a temporary basis. The Egyptian Ministry of Tourism has always been a strong supporter of the tourism industry and has been the overall manager of all sectors of the Egyptian tourism industry, while being primarily responsible for establishing a legal, compliant, regulated and orderly tourism market in Egypt. The Egyptian Ministry of Tourism consists of two important branches, one is the Tourism Development Authority and the other is the Egyptian Tourism Authority. Each department has its own role to play in the financial, policy, information transparency, and industry facilitation based on the support of the relevant practitioners. These factors have ensured the good development of Egypt's tourism industry over the years.

There is no doubt that tourism in Egypt is extremely important in that it contributes a lot to Egypt, the most significant impact of which is its contribution to the Egyptian economy and the provision of employment. Even after being plagued by the COVID19 epidemic in 2020, the tourism industry rebounded strongly in the years that followed. In order to get a detailed view of Egyptian tourism and the role it plays in economy, let us look at a few sets of data; the share of tourism in Egypt's GDP has been high since the beginning of the 21st century, reaching a record high of nearly 17% of Egypt’s GDP in 2007, before declining around 2011, and in 2013, 2014, 2015, and 2016 at only 7.4%, 7.3%, 6.8%, and 6.2%, and then began to rebound after that, in 2017, 2018, and 2019 to 9.3%, 9.8%, and 8.5%. Behind such a beautiful economic ledger is the great benefit of tourism to the country's economy and employment. In fact, tourism and the tourism market is an extremely labor-intensive market, and

because of the close relationship between tourism and other industries, it often leads to the development of other industries, such as more gas stations and infrastructure built to make transportation easier, and more wasteland cleared to provide more hotels to create more people-friendly measures. According to earlier official reports by EMTA, Egypt's labor market once saw nearly 13% of jobs provided by the tourism industry[1]. Egyptian officials have spoken out about their desire to have one person in every family working in the tourism industry, as part of an ambitious plan to develop a more resilient and sustainable industry through structural reforms to promote its global competitiveness. The government has never stopped at promoting tourism, and the Egyptian Tourism Reform Program adopted in November 2018 clearly states that improving the quality and standards of accommodation and enhancing competitiveness in the international market will be a key national decision[2]. besides, the core of the Egyptian Tourism Reform Program is a policy that aims to reshape the national tourism industry in a more systematic, comprehensive and efficient way to better support the innovative development of the Egyptian tourism industry and make it more sustainably competitive in the future tourism market.The Egyptian government is also actively working with the United Nations Tourism Organization these years to improve its hospitality standards, an attempt aimed to improve the level of service and accommodation that has been forgotten in Egypt for many years, which means that the improved hotel and accommodation industry will bring in more labor resources, a larger job market, and more external capital,which will lead Egypt tourism to internationalization and standardization. The new face of the Egyptian tourism industry is expected to be further enhanced. In the future, we will see more and more new investments in the Egyptian tourism industry, which will bring better services, attract more tourists, and drive more industries. But like all tourism

[1] El Shazly A., and Soliman S., "Egypt Experience in Developing the Human Resources in Tourism Sector." *Egyptian Ministry of Tourism*. https://www.comcec.org/wp-content/uploads/2021/07/1-Egypt.pdf.

[2] "Egypt Tourism Reform Program." https://egypt.travel/media/2338/egypt-tourism-reform-program.pdf.

industries, the development of tourism in Egypt is affected by many other factors, which seems to be a topic that all tourism industries around the world can't get around, so let's now take a look at what are the things that can affect the Egyptian tourism industry in the process of its development.

1.3. The Tortuous Development of Tourism in Egypt

For Egyptian tourism industry, one of the most severe challenges is to handle the issue of security. Like all major tourist countries, once the basic safety of travelers is not guaranteed, it will greatly destroy the interest of foreign tourists in the destination. In Egypt, terrorism is always the first security issue that comes to mind as one of the biggest blows to tourism, and it is true that a horrific terrorist attack will take a very long time to heal the wounds left in people's hearts. on February 26, 1993, more than 20 people were killed in a bombing of a cafe in the largest square in downtown Cairo, and on March 16 5 tourist buses were bombed in the parking lot in front of the Egyptian Museum of History and the Hilton Hotel; and on June 8, a roadside bomb attacked on a tourist bus in Cairo, killing 2 Egyptians and injuring 22, including 5 British tourists[1]. According to incomplete statistics, there were six months of recorded terrorist attacks resulting in casualties in 1993 alone, which also increased tensions in the international tourism industry that year. Worse still, there were 12 terrorist attacks in 1994. The following decade saw three of the most horrific terrorist attacks against tourists in Egypt in recent years, with six heavily armed terrorists firing at tourists in Luxor in November 1997, killing 60 foreign tourists on the spot, killing four Egyptians and injuring 25 others, and the Jewish holiday of Sukkot on October 7, 2004. "On the last day of the Jewish holiday of Sukkot, 35 Israeli tourists were killed and 124 injured in car bombings at a Hilton hotel and two other tourist resorts in the Sinai Peninsula, and 83 people were killed and more than 200 injured in a series of

[1] 张金平．中东恐怖主义的历史演进〔M〕．昆明：云南大学出版社 2008：95．96.

terrorist bombings in the tourist resort of Sharm el-Sheikh in the early hours of July 23, 2005. Among the dead were Egyptians, Britons, Dutch, Qataris, Israelis, Russians and others[1]. Almost all terrorism in recent years has occurred in tourism-related restaurants, hotels, cafes, and travel vehicles, and terrorists have often resorted to planting explosives or shooting to cause direct harm to tourists, causing much damage to Egypt's international image. The Egyptian government has made many attempts to prevent and defend against terrorist attacks, but with little success. The infrastructure and buildings damaged by terrorist attacks may be repaired, but the natural ecological resources damaged by terrorist attacks cannot be restored artificially, and the confidence in Egypt's tourism industry destroyed by terrorist attacks is difficult to restore. For Egypt's most valued tourism industry, terrorist attacks often have a greater impact than any other impact. In 2005, for example, China and Egypt had planned to take advantage of the 50th anniversary of the establishment of diplomatic relations to continue to increase Chinese investment in Egypt, but after the bombing, many Chinese business representatives showed a cautious wait-and-see attitude toward going to Egypt, resulting in the two sides eventually missed many agreements that should have been reached. For travelers, the most basic need to travel to a destination is safety, if safety can not meet, the best scenery can not keep tourists. Since the terrorist attack that killed the first foreign tourist from the UK in 1992, Egypt's tourist numbers have been dynamic, and the main reason for this phenomenon is the terrorist attack.

In addition to terrorism, another factor that has an impact on Egypt's tourism industry is political issues. This phenomenon received the most significant attention in 2011, when the Arab Spring, which swept through almost all Mediterranean countries, also wreaked havoc in Egypt. As the Arab Spring movement landed in Egypt and ousted President Mubarak, a decline in tourist arrivals followed, with international tourist arrivals falling by nearly a third in 2011 compared to 2010. Visitor numbers

[1] 刘晶， 恐怖主义对埃及旅游业的影响及政府的应对措施. 内蒙古民族大学学报 2011. 03.030

rebounded briefly in 2012, but fell again in 2013 when President Morsi was also forced out of office. Thus, it can be seen that there is a strong correlation between tourism and political issues in Egypt. In terms of specific revenues, Egypt's tourism revenues plummeted in 2011 due to political unrest, for example, pyramid-related tourism revenues fell by 95%, overall national tourism revenues fell from a record high of $12.5 billion in 2010 to $8.8 billion in 2011, a 30% year-on-year decline, the number of overnight stays by tourists was 141 million, a 24% year-on-year decrease. The number of overnight stays decreased by 24% to $141 million, and per capita tourist spending decreased to $72 from $85 in 2010. Total visitor arrivals fell from 14.7 million in 2010 to 9.8 million[1]. Apart from terrorist attacks and political instability and turmoil, there are many other factors affecting Egypt's tourism industry, For example, the issue of climate change, which has been increasingly mentioned in recent years, is also a major challenge. This is one of the most important topics that is most easily talked about, but most easily forgotten. Climate change is so common that everyone seems to be affected by it, and it is ubiquitous, However, few of us have studied specifically how much impact it will have on ourselves. Now let's analyze what climate change could do to tourism industry.

[1] "The drop of tourists in Egypt," cjn, accessed March 2, 2023, http://news.cjn.cn/gjxw/201201/t1604835.htm.

2. The Impact of Climate Change on Tourism

The rapid development was induced after the industrial revolution. However, a series of social and environmental problems also arose following it. Tourism, which has seen an unprecedented growth in the 20th century while the aviation was booming at the same time, has soon become one of the largest new industries around the world. However,as it was skyrocketing, it started to be influenced by the climate change more and more. Technically, in the field of expertise, climate change refers to the observable changes that can last for a specific time in the global average climate state observed over a period of 10 years or more. The IPCC was established to monitor the characteristics of climate change across the globe, to compile statistics on the status of climate change, and to assess the potential influence of climate change on society, the economy, politics, and human society as a whole, as climate change was found out to have a series of impacts on humanity. We can see that since the publication of the United Nations Framework Convention on Climate Change(UNFCCC) in 1992, mankind has made a lot of efforts to protect the earth and curb the negative effects of climate change on the earth.

Since the 1980s, the research of climate change has become one of the most popular and fastest developing regions of science. At the beginning, only the basic rules of the climate system were paid attention to, but as human life has been increasingly affected by climate, the research has evolved into a series of areas that are closely related to human life. The comprehensive influence of climate change on politics, economics and society in general is gradually being studied. The tourism industry, which we are examining here, is a typical example of a sector that is affected by its sensitivity and dependence on climate change. In the 1980s and beyond, the tourism industry, a sector that is more dependent on climate change, began to draw more attention and discussion in the context of the continuing global concern about climate change. According to the Fifth Assessment Report of the IPCC, it is not

arguable that global warming is occurring. Even since the 1950s, some newly obserbed changes have been unprecedented by related reports. In the mean time, it is more than obvious to observe the influence of climate change on marine and terrestrial environment, water resources, agriculture, rural and urban areas, human health and safety and people's livelihoods. The tourism industry is highly dependent on climatic conditions and the natural environment, and its relationship with meteorological factors is very close. Suitable climatic conditions and unique natural environment are prerequisites for smooth tourism activities, and naturally, tourism destinations become sensitive and vulnerable areas to climate change. At the beginning, the close relationship between climate change and tourism did not receive a great deal of attention, but as more and more extreme weather and meteorological disasters began to be noticed over time, the bigger scope of influence it expanded to, and the safety of human life and property and daily activities were affected to a greater extent, calls began to be made to pay attention to the negative impact of climate change on tourism.

As a form of industry, tourism has received more attention. Due to the fact that it is closely related to climate, a suitable climate may attract more tourists, while a bad climate, such as unseasonable temperatures, may lead to the postponement or cancellation of tourism activities. A prime example of this is the huge drop in the overall number of summer tourists received in Mediterranean countries today due to global warming, with travelers gradually choosing to postpone their travel season until later, such as autumn. Another example is a study like the one by U Koening et al. that found three consecutive snow-deficient winters in the late 1980s as a major blow to the Swiss winter tourism industry. Their exploration showed that a skiing resort in lower parts of Switzerland was hit the hardest, while the skiing resort at higher altitudes saw the increased number of skiers, which was observed as a form a transfer of tourism industry under the climate change.[1] The impact of climate change

[1] Koenig U, and Abegg B,"Impacts of Climate Change on Winter Tourism in the Swiss Alps", *Journal of*

on tourism can be seen everywhere, as Daniel Scott et al. conclude in their study of the influence of climate change on the distribution of tourism resources in the United States, that the number of cities with "excellent" or "desirable" climate indices for tourists in the US in winter is likely to increase, with increasing competition for winter sunbathers in southern Florida and Arizona compared to Mexico. This is also due to regional temperature changes caused by climate change, which has a significant impact on travelers' choices of where and when to travel.[1] In addition, the direct ecological impacts of environmental changes, such as the negative impacts on biodiversity caused by climate change and the potential long-term effects of rising water temperatures on aquatic plants and animals, should not be overlooked, such as the potential damage to the global ecological chain and biological survival. For example, the tourism industry, that uses the natural landscape to attract tourists like the Great Barrier Reef of Australia does, is facing the crisis of disappearing due to climate change, and it is urgent to take action against climate change.

Ignoring the climate change, more extreme events will be observed. For example, typhoons, heavy precipitation and rising temperatures can all do a heavy damage to tourism infrastructures. The relative cost of operating the tourism industry will also increase. For example, some itineraries will be canceled due to unsuitable weather condition. In Nepal, for example, the terrible natural disasters are more observed entering into 21st century, and the changing rainfall patterns and rising temperatures are doing more and more severe damage to local people and its vulnerable tourism market. The degradation of the forests and disappearing fertile lands are worsening the condition of tourism-dependent districts.

In order to better distinguish and summarize the connection between climate change and tourism, we can classify the impacts from a macro perspective into direct

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Sustainable Tourism 5, no. 1 (1997), pp.46-58.

[1] Scott Daniel, Geoff McBoyle, and Michael Schwartzentruber, "Climate change and the distribution of climatic resources for tourism in North America," *Climate research* 27, no. 2 (2004), pp.105-117.

impacts of climate change on tourism, indirect impacts of climate change on tourism, and conversely, the impact of tourism on climate change.

2.1.1. The Direct Impact of Climate Change on Tourism

2.1.1.1. The Destruction of the Landscape by Climate Change

There is no doubt that a large portion of the tourism industry and tourism projects are directly based on viewing the unique climate itself, drastic changes in climate may can be disruptive to the tourism experience or even directly affect the survival of a tourism project. Many tourists visiting high latitude areas tend to appreciate the glacial scenery of polar regions. However, recently, due to the influence of significant greenhouse gas emission, a large portion of glaciers have started to melt, directly threatening the existence of major glaciers. Tourists have fewer opportunities to see large glaciers. In addition, the melting of a large number of glaciers directly affects the survival of polar organisms, such as polar bears. Research has found that climate warming poses an extremely tough challenge to the survival of polar bears. Polar bears that drown every year due to glacier melting and unable to find a landing site are continuously observed, and the reduction of sea ice and early spring will translate directly to a continuous drop in the number of surviving polar bears. The sharp decrease of polar bears from an estimated 1194 to 935 was detected in the western part of Hudson Bay from 1987 to 2004, a decrease of approximately 22%.[1] It is speculated that by the end of late period of ice years (or mild ice years) in the future, the mortality caused by offshore swimming could have risen to the most important factor causing unexpected death for polar bears.[2] Polar bears will become less attractive to tourists as their numbers decline. As can be seen, climate change, on top

[1] Regehr E.V., Lunn N.J., Amstrup S.C. and Stirling I. (2007) Effects of earlier sea breack up on survival and population size of polar bears in western Hudson Bay. J. *Wildl. Manage*, 71. 2673–2683.

[2] Monnett C., and Gleason J.S. (2006) Observations of mortality associated with extended open-water swimming by polar bears in the Alaskan Beaufort Sea.Polar Biol., 29, 681–687.

of the impact on tourism, is directly causing damage to biodiversity, which may in turn cause further damage to tourism, a worsening cycle that is difficult to break.

In addition, due to climate warming, some of the most popular coastal resort cities and beaches in the Mediterranean area start to become increasingly hot in summer, which directly leads to changes in their tourist season. A large number of European tourists begin to choose countries such as northern Europe to escape the summer heat, while the number of tourists in the spring and autumn season starts to rise. At the same time, tourist attractions using rare resources, such as coral reefs as attractions are finding that many reefs are beginning to face a crisis as temperatures rise, and the option of farmed coral is emerging as an alternative approach.[1]

In addition to the impact on the direct appreciation of the landscape, climate change is also causing damage to artificial tourism projects that rely on the environment. For example, due to the global warming effect, winter temperature has been significantly affected, and snow sports affected by sufficient snow amount and appropriate snow time have become more and more vulnerable. Where snow and ice tourism is located, the loss of snow and ice caused by global warming is forcing ski resorts to move to higher elevations or latitudes. A study carried out by Japanese researchers over the change of the number of skiers at seven ski resorts in Japan showed that nearly all of the resorts, except the northern regions and plateau regions, would see a 30% decrease in skiers if air temperatures increased by 3 degrees Celsius.[2] While the number of skiers at lower altitudes and latitudes declined, the number of visitors at higher altitudes increased significantly.

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[1] Becken, Susanne, and John E. Hay. Tourism and climate change: Risks and opportunities. Vol. 1. Multilingual Matters, 2007.

[2] Fukushima, T., M. Kureha, N. Ozaki, Y. Fujimori, and H. Harasawa. "Influences of air temperature change on leisure industries – case study on ski activities – ." Mitigation and Adaptation Strategies for Global Change 7 (2002): 173-189.

2.1.1.2. Interference of Climate Change on Human Activity in Winter

The second International Conference on Climate Change and Tourism (Davos, Switzerland, October 2007) delivered a clear message for actions to be taken to tackle the problems of global climate change in which, the heavily affected tourism industry in underdeveloped and developing countries has been put forward, and the post-meeting document summarizes the features of tourism industry under climate change: First, the impact of climate change on the tourism sector will become more and more obvious; Second, changes in travel patterns will be observed in some areas; Third, coastal and mountain areas of underdeveloped regions and developing countries featured by small islands may be particularly vulnerable.[1]

Obviously, the tourism industry is getting more and more attention across the globe because of the impact of climate change. In the major global climate forums, people are not only concerned about the climate change issues to the detriment of the environment and biodiversity, but are also beginning to realize the fact that a large number of developing and underdeveloped countries are extremely dependent on the development of tourism. One way or another, actions should be taken in the fact that the future survival of some climate -vulnerable countries loom large under worsening climate change. It is no doubt urgent to make a difference as the risk is rising that small island countries, such as the Maldives, may be directly submerged by rising sea levels, and the fact that some countries heavily relying on the development of tourism, such as Egypt and Greece, of which economic development will face great challenges.

2.1.2. Indirect Effects of Climate Change on Tourism

What is more serious and widespread than the direct effects of climate change is

[1] Scott, Daniel, Bas Amelung, Susanne Becken, Jean-Paul Ceron, Ghislain Dubois, Stefan Gössling, Paul Peeters, and M. Simpson. "Climate change and tourism: Responding to global challenges." World Tourism Organization, Madrid 230 (2008): 1-38.

its indirect effects. For example, climate change affects the environmental resources that the tourism industry depends on most, such as water resources, thus forming potential threats to the tourism industry; The impact of extreme weather caused by climate change on human travel activities; Climate change impacts the tourism industry as a whole, leading to a decline in overall revenue, and ultimately has an impact on the national politics and economy of major tourism countries. And the impact on the income of workers in related industries; In the long run, a slump in the tourism industry will bring about the loss of domestic labor force and therefore, significant emigration of people dedicated to work in the tourism industry, looking for other jobs abroad.

2.1.2.1. The Impact of Climate Change on Water Resources

It is an indisputable fact that climate change will have an impact on regional water resources. The long dry season caused by climate warming will directly lead to the decrease and depletion of river water level. However, the delay or advance of seasonal alternations caused by climate change will disturb the seasonal alternations of drought and flood, which will directly lead to the longer dry season and the delay of rainy season. For hundreds of years, competition for water, a resource essential to human survival, has been a flashpoint between nations. Water is still so important that conflicts still erupt in the Middle East from time to time. However, the reduction of water resources caused by climate change worsens the problem of water acquisition and utilization. In addition to direct impacts on water-vulnerable industries such as agriculture, tourism and other related industries will also be indirectly affected. The lack of water resources will pose the threat of water scarcity for residents and hinder the development of related water industries such as tourism. Countries with a thriving tourism industry are often affected by water problems. Greece's beautiful tourist destination, Mykonos Island, located in the vast Aegean Sea, has colorful island scenery, attracting tourists from all over the world. But recent studies have found that

island water scarcity is increasing, as climate change looms large, unsustainable way of utilizing water by tourism, and unresponsiveness of policy makers, placing additional pressure on already restricted water exploiting availability in arid or semi-arid regions. This forced the government to start building a large number of desalination plants, but this did not solve the immediate problem, because the water problem caused by climate change has not been fundamentally solved, and water pollution is still serious.[1]

Chinese scholars have carried out rainfall analysis on Jialing River and its related basins in China, and found that Due to climate change, the Jialing River Basin, which flows through four provinces, has a total population of nearly 50 million, 90% of which are located in Sichuan Province and Chongqing Municipality, providing a reliable guarantee for a large number of urban residents' living and agricultural planting. However, due to climate change, the uneven temporal and spatial distribution of rainfall in the Jialing River basin results in frequent drought and flood disasters. The extreme rainfall in Jialing River Basin is becoming more frequent, leading to frequent geological disasters. Since 2007, the annual runoff in the basin has been gradually increasing. Last heavy rainfall: Heavy rainfall in the Jialing River Basin in October 2021 resulted in the largest October flood volume in the Fujiang River Basin and the Jialing River Basin since records began. As the pressure of water resources regulation and flood disaster prevention continues to rise, water security faces severe challenges. It is urgent to correctly understand the response path and mechanism of runoff in Jialing River basin to future climate change and land destruction, and optimize the allocation of water resources in Jialing River Basin.[2]

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[1] Atay, Itri, and Òscar Saladié. 2022. "Water Scarcity and Climate Change in Mykonos (Greece): The Perceptions of the Hospitality Stakeholders" Tourism and Hospitality 3, no. 3: 765-787. https://doi.org/10.3390/tourhosp3030047

[2] 沈敬雄. 嘉陵江流域径流对土地利用及气候变化的响应研究[D]. 四川农业大学, 2022.DOI:10.27345/d.cnki.gsnyu.2022.000235.

2.1.2.2. Climate Change Leads to More Extreme Weather Conditions

Climate change is also likely to bring about extreme weather conditions. Extreme high temperature and extreme rainfall at short notice are obstacles that threaten human normal life and travel. Martinique, the northernmost of the Windward Islands in the Lesser Antilles, was once described by Christopher Columbus as "the most beautiful country in the world." Researchers gathered visitors' perceptions over the outbreak of extreme weather on the Caribbean island of Martinique and found that sustained heavy rainfall negatively affected the experience and rate of repeat visits. Regarding future trips and return visits to Martinique, the results showed a clear number (17%) of respondents would not want to return to the same island after experiencing heavy rains. Although it is not clear if this negative perception will last for a long time, it is apparent that extreme weather events are quite important to the perception of visitors, and could rise to a more severe challenge as the extreme weather outbreaks become more frequent.[1] According to International Monetary Fund, the surface temperature of the global average since 1880 has increased by 1.1℃, and the possibility of extreme weather outbreaks and major natural disasters have increased in unprecetended speed globally. In the mean time, the average sea level of ocean has seen a fast rise by 21-24cm, around a third of which has occurred in the past 25 years. Although causation may not be a simple task to trace, it is apparent that climate change has contributed a lot to it. Looking ahead, it is foreseeable that the extreme weather issues are to be worse as the fact that there are strong estimations of global average temperature rise of 4℃ annually within the next century. Meanwhile, the sea level is probably to experience a fast rise of 30cm compared to 2000 levels. As one of the most severe challenges in this century, the economic damage brought about by the climate change could be easier to be felt. Meanwhile, for some countries that are highly relying on the tourism industry for employment and attracting foreign

[1] Hübner, Anna, and Stefan Gössling. "Tourist perceptions of extreme weather events in Martinique." Journal of Destination Marketing & Management 1, no. 1-2 (2012): 47-55.

investment and those sectors that are at the most vulnerable level to climate change (for example, sectors managing the environment protection and tourism issues) are at the highest risk of suffering from the impact of extreme weather and climate change behind it.[1]

2.1.2.3. The Economic Impact of Climate Change

In addition, in fact, climate change may have a greater impact on the economy, because it directly affects the interests of relevant practitioners and countries. Whether a big tourism country can achieve its economic goals in that year may directly depend on the prosperity of tourism, while whether a small tourism country can survive the national financial crisis may completely depend on the development of tourism. The negative influence of climate change on tourism revenue may not be obvious in the short term, just as climate change itself is a continuous process. However, in the long run, climate change will eventually have more or less impact on tourism, no matter the impact is positive or negative (facts prove that it has more negative effects in the long run), it is worth further research and thinking. Studies show that tourism stands as an vital source of foreign exchange earnings for many least developed countries(LDCs).[2] It is estimated that between 1995 and 2007, international tourism in emerging and developing markets grew twice as fast as in industrialized countries, and the United Nations World Tourism Organization, the World Trade Center, the World Economic Forum, and International Development Organizations have cited international tourism as a proper approach to alleviate poverty and to achieve the UN Millennium Development Goals. However, every coin has two sides, some less developed countries or regions have doubt over the strategy because they are among

[1] Cevik, Serhan, and Manuk Ghazanchyan. "Perfect Storm: Climate Change and Tourism." Journal of Glo balization and Development 12, no. 1 (2021): 47-61.

[2] Gössling, Stefan, C. Michael Hall, and Daniel Scott. "The challenges of tourism as a development strategy in anera of global climate change." Rethinking development in a carbon-constrained world. Development cooperation and climate change (2009): 100-119.

the most vulnerable under climate change.

For example, Guangxi of China, a region highly dependent on tourism, is located in the coastal area, with many hills and mountains, and most scenic spots are characterized by ecological environment and species diversity. It is susceptible to and highly dependent on climate change. On the one hand, climate change will affect the tourism resources and environment system of Guangxi. It mainly includes the impact on tourism resources, tourism products, tourism ecological environment and other aspects, and indirectly causes economic losses. Weizhou Island will be affected by storm surge and sea level rise, and the ships to Weizhou Island will be suspended whenever climate change is unstable, and Weizhou Island will be inaccessible. Climate change causes bleaching and death of large coral reefs along the coast of Guangxi, gradual disappearance of sea grass beds and decline of mangrove tree species, which has caused serious damage to the ecological tourism resources in the coastal region of Guangxi. Meanwhile, climate change, on the other hand, will lead to changes in tourism activities and tourists' behaviors, especially the seasonal tourism in spring and winter in Guangxi. The average annual temperature of Guangxi is higher than that of many Chinese cities, and the sunshine duration is relatively longer. Especially in autumn and winter, the temperature is very pleasant, which is an important reason to attract a large number of tourists to visit China's annual National Day (October 1 each year). Meanwhile, Guangxi is a coastal region, and coastal tourism has always been the most important part of Guangxi's economic development. In recent years, the extreme climate change phenomenon caused by climate fluctuation directly leads to the decline of the number of tourists in the beach and other scenic spots, which causes serious economic losses to the seaside tourism practitioners. In 2008, extreme weather and climate events detected by Guangxi Meteorological Bureau occurred frequently: At the beginning of the year, Guangxi was hit by the rare low-temperature rain and snow freezing weather process. The disasters covered a wide range, high intensity and lasted for a long time, affecting the

industries of power, transportation, agriculture, forestry and other industries as well as all aspects of people's production and life. The direct economic loss was 32.175 billion yuan, more than the loss caused by any similar disasters since the founding of the People's Republic of China. From June 8 to 18, heavy rainfall occurred in Guangxi, causing flash floods, water levels of some rivers and serious floods. In early November, rare heavy rainfall occurred in Guangxi, leading to flood disaster in Yongjiang River and upstream areas.[1] The direct economic loss has caused great difficulties to the urban economic development in Guangxi which is extremely dependent on the tourism market. According to statistics, from January to mid-February 2008, low temperature rain, snow and ice caused damage to more than 40 tourist roads and traffic signs in the western district of Guangxi. More than 80 water supply facilities, 60 power facilities, 40 communication facilities and 30 tourist houses were damaged to varying degrees due to the ice and snow. 53 scenic spots were closed for a time. In just one month, the economic and tourism industry of the region suffered a loss of nearly 600 million yuan.[2] Statistics show that the tourism market revenue of Guilin, the most famous tourist city in Guangxi, dropped by more than 30% in 2008 due to extremely rare weather disasters in Guangxi[3].

As mentioned above, it can be seen that the temperature rising or changes caused by climate change will directly lead to extreme climate problems, and extreme weather will break out at uncertain times, which will directly threaten the safety of life and property in the region, and disturb and interrupt the attempt of normal tourism developing, which is an incredibly bad situation for government management and regional economic development that relies heavily on tourism income. Taking Guangxi as an example, many case studies show that vulnerability to climate change is highly correlated with regional poverty and economic underdevelopment. In terms

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[1] 周美丽,陆甲,黄雪松,李艳兰.广西 2009 年气候特点及其影响评价[J].广西农学报,2010,25(06):35-38.

[2] 同上

[3] 严芳芳. 气候变化对广西经济的影响及适应对策研究[D].广西师范学院,2016.

of geographical and spatial distribution, economically backward areas and ecological and environmental fragile areas have a high consistency, and economically underdeveloped areas are more influenced by climate change. Climate change, through its impact on agriculture, tourism, coastal zones, water resources and other aspects, increases the vulnerability of the region's ecosystem and natural environment, and negatively impacts economic development and growth. At present, compared with the eastern regions of China, Guangxi's economic development is relatively slow, the development degree is relatively backward, the degree of regional industrialization is not high, and the regional industry has long been dominated by agricultural economy. The region has many mountainous areas and beautiful natural scenery, and the development of the region is relatively dependent on tourism. Tourism revenue has always accounted for more than 10% of the government's fiscal revenue. Even with the impact of COVID-19 in 2020, Guangxi received 661 million tourists and spent 726.753 billion yuan on tourism in 2020 alone. The loss of tourism due to climate problems could have a direct impact on government revenues. In 2019 and 2020, Guangxi was again hit by heavy rainfall, which once broke records, resulting in the destruction of a large number of tourist facilities in the region, complete paralysis of the bus system, power cuts, roads and Bridges destroyed, and tourists stranded at airports for days. In 2022, the Guangxi government Information Office reported that six rounds of heavy rains hit the region again, affecting 3.755 million people and causing direct economic losses of 12.484 billion yuan. Guangxi authorities evacuated 240,000 people to safety and relocated 197,000[1].

In the face of the power of nature, people can do little, people use the beauty of nature to develop tourism, and it as a means of economic development, but often in the process of development, people ignore that this development is difficult to continue, because it will be interfered by many processes. The example of Guangxi tells us how vulnerable a region that relies heavily on tourism is to severe climate

[1] https://m.gmw.cn/baijia/2022-06/25/1303015100.html

problems. Whether tourism can flourish depends almost entirely on whether the local climate supports tourism at the time.

This is an example of how extreme climate change issues can hit tourism, and let's look at how climate change affects other countries. However, while China is indisputably a large country, and some of its regional governments do not just rely on tourism for revenue, but can also on other sources of revenue to ease the financial crisis when the impact of climate change hits, minimizing the damage at best, the same conclusion cannot be made for maritime island nations, many of which derive the huge part of their government revenue from tourists and industries related to it.. This is particularly true for Caribbean islands, many of which are highly sensitive to climate change, where tourism accounts for 20 to 90 per cent of GDP. Tourism accounts for an average of 30% of total employment in these areas, and annual hurricanes (which are almost impossible to see inland) during the Atlantic storm season can wreak havoc, causing irreparable economic damage to countries[1]. For these countries, what they need to face is not so simple as one or two rainstorms. Many buildings and houses in these countries are built on the coast or even on the sea. Once the weather changes dramatically, it will directly affect the normal life in these areas. Throughout the Caribbean, small countries that depend on tourism for their livelihoods are almost invariably tested each year by a combination of changes in ocean temperature, sea level, air temperature and air currents. Every year, hurricanes and sea-level climate disasters cause numerous casualties and damage to infrastructure. Coupled with the changeable weather at sea, it is often impossible to predict weather changes in advance, unlike in landlocked countries, where good temperature and climate conditions are supported by advanced weather observation technology, satellite 24h monitoring and a large number of professionals. Dramatic changes in the climate can often be predicted in advance, allowing people to prepare

[1] Rhiney, Kevon. "Geographies of Caribbean vulnerability in a changing climate: Issues and trends." Geography Compass 9, no. 3 (2015): 97-114.

well in advance for major extreme weather events, with the result that loss of life and economic damage is minimized. Unfortunately, islands do not have the same conditions and infrastructure, and extreme weather conditions are more severe for them. The Caribbean is the most typical example, because Nearly all of their accommodation facilities and resorts are on the sea or along the sea in coastal areas, which naturally suffer the most damage when hurricanes come. In this way, the basic life of tourists can hardly be guaranteed, let alone the prosperity and development of tourism. islands can be categorized to different sizes. Small islands are those hold less than 1.5million residents. Although the landscape could be fascinating, they are nearly all extremely vulnerable to natural disasters and unexpected extreme weather change. For example, in the Caribbean, the Hurricane Ivan in 2004 has caused a total damage to Dominica as high as 148 percent of the GDP that year. Besides, Hurricane Maria in 2017 brought about a bigger disaster to Dominica that was as high as 260 percent of its GDP. This is a good example that shows the climate change are doing the biggest harm in terms of economy to some small island countries that are vulnerably relying on tourism. Therefore, for the small island countries located in the ocean, the climate problem caused by climate change is the most direct and well-known problem, which needs to be solved urgently. In recent years, hurricanes and other extreme weather at sea have become increasingly frequent, which has aroused the concern of the governments of relevant countries. What is certain is that as climate change becomes more dramatic, these countries will be hit harder. In addition to the threat to many island economies from more extreme weather events as a consequence of climate change, there are long-term impacts of climate change, such as rising sea levels; The scarcity of water resources and the environmental problems caused by the destruction of coral reefs all threaten the small tourism industry on the island and thus the economic development in the long term.

Empirical analysis shows that across the Caribbean, climate change is so vulnerable that it is apparently negatively correlated to the revenue from tourism. For

example, even after controlling for many relative aspects, whether at conventional macroeconomic level or social factors level, for example, income levels, relative prices, crime rates and government management level, every 10% increase in the vulnerability under climate change could translate to 9% of decrease of tourism revenue. That is to say, since the revenue in the Caribbean is uneven distributed, with the revenue gap between the countries earning the highest and the countries earning the lowest reaching up to nearly 20%, the vulnerability to different countries also show a lot of difference. The countries that have the lowest revenue of 18% less are those who are 20% more vulnerable to climate change than the other Caribbean countries. these results demonstrate the vital importance of different conditions in terms of Ecology and environment can shape the tourism, traveler's behaviour and, thus, the economic performance, which will be more critical as the increasing frequency and severity of climate impacts are to be observed.[1]

Moving back to the Mediterranean, climate change certainly has a negative influence on industries and national economies in countries around the Mediterranean that rely on beaches, sunshine and other features to attract tourists. Studies have found that rising temperatures could lead to significant reductions in economic growth in developing countries. The greater effects of exposure to a given temperature are more common in poor areas, and further warming will exacerbate inequalities, especially across countries. And economic development alone is unlikely to reduce damage as much as is often assumed, with warming estimated to have cost the US and the EU at more than $4 trillion in lost output since 2000, and caused tropical countries more than 5% poorer than they would have been without such warming[2]. Mediterranean countries are typical developing countries, and they are extremely dependent on tourism. For the governments of countries in this region, promoting tourism

[1] Cevik, Serhan and Ghazanchyan, Manuk. "Perfect Storm: Climate Change and Tourism" Journal of Globalization and Development 12, no. 1 (2021): 47-61. https://doi.org/10.1515/jgd-2020-0015

[2] Burke, Marshall, and Vincent Tanutama. Climatic constraints on aggregate economic output. No. w25779. National Bureau of Economic Research, 2019.

development is often the best solution to solve the domestic employment problem. However, as mentioned above, when developing tourism in less developed countries, many of them will suffer a negative influence on economic development when faced with excessive temperature. For example, Egypt, Monaco, Tunisia and so on are the most famous countries in the Mediterranean region and also the most dependent on tourism. There are many beautiful beaches and seascapes on this land of the southern Mediterranean. Climate change will cause the continuous rise of beach temperature in summer, which will directly drive away a large number of tourists. Summer beach-goers may switch their visits to spring and winter, when temperatures will be more favorable. This will directly lead to the change of tourist season, national tourism development pattern will probably change, non-summer tourism income may increase, but at the same time the summer quarter economic development may be hit. Some scholars have even combined climate problems with economic development to find a relationship. Their research has found that almost all landlocked countries in the world are poor, and sub-Saharan Africa, the poorest region, has almost one characteristic: land is highly concentrated in the tropics[1].

In addition to the direct changes in tourist behavior caused by climate change, which ultimately lead to the impact on economic income, environmental damage caused by climate change will also indirectly lead to the damage of tourism in a country or region. Let's take the Mediterranean again. A new study led by teams from the University of Barcelona's School of Biology, the Institute for Biodiversity Research (IRBio) and the Institute of Marine Sciences in Barcelona (ICM-CSIC) shows that Marine heat waves associated with the climate crisis are reducing coral populations in the Mediterranean Sea, whose biomass has suffered huge cuts in recent years, Studies of Paramuricea clavata and Corallium rubrum, the most representative corals in the area, have found that in recent years it may not recover from repeated

[1] Gallup, John Luke, Jeffrey D. Sachs, and Andrew D. Mellinger. "Geography and economic development." International regional science review 22, no. 2 (1999): 179-232.

effects of these extreme events due to heat waves, as water temperatures rise for days or even weeks, compared to 2003, Between 2017 and 2018, the density of two Mediterranean coral species declined by 71 percent and 67 percent, respectively[1]. Now, evidence is mounting that habitat-forming organisms are declining across the ocean under the influence of climate change, with many tropical coral reefs, kelp forests and seagrass meadows suffering unprecedented losses after ocean heat waves.[2] The Mediterranean area is a paradise for divers. Many divers come to enjoy the shipwreck sites and the beauty of the sea near the Mediterranean Sea every year. The destruction of coral reefs may lead to the decrease of divers and the destruction of biodiversity, either of which has a negative influence on coastal tourism.

The influence of rising temperatures and destruction of coral reefs is only a small part of the story. As we can see from the above cases, climate change will cause a lot of economic damage to the Mediterranean countries, which are extremely dependent on tourism. Perhaps the damage has not yet appeared, but climate change itself is a long-term impact. Its impact on human beings can not be observed in a short time. The impact on economy may need more observation objects and time to discover. There have even been studies showing that a rise in temperature at a lower latitude has made tourist attractions at higher latitudes more hospitable to tourists and thus boosted local economic growth. Some researches have carried out and found the impact of temperature on the global economy is actually a nonlinear process, and the direct rise of temperature in some areas will not be linearly reflected in the level of economic development[3]. So it seems that climate change (in this case, the changes

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[1] Gómez-Gras D., et al, "Population collapse of habitat-forming species in the Mediterranean: a long-term study of gorgonian populations affected by recurrent marine heatwaves." Proceedings of the Royal Society B 288, no. 1965 (2021): 20212384.

[2] Hughes, Terry P., James T. Kerry, Mariana Álvarez-Noriega, Jorge G. Álvarez-Romero, Kristen D. Anderson, Andrew H. Baird, Russell C. Babcock et al. "Global warming and recurrent mass bleaching of corals." Nature 543, no. 7645 (2017): 373-377.

[3] Burke, Marshall, Solomon M. Hsiang, and Edward Miguel. "Global non-linear effect of temperature on economic production." Nature 527, no. 7577 (2015): 235-239.

brought about by rising temperatures) will hurt some people and benefit others, but we should not ignore that this change is not what everyone wants to see. People just make adjustments to adapt to new changes, and during this adjustment process, some people enjoy relative temporary gains at the expense of others.

From the above discussion, we find that one of the most intuitive or realistic concerns about climate change for human beings is the negative impact on economic growth, which is a very realistic problem. No one wants to lose his job because of climate change. Tourism, as an industry closely interacting with the environment, The livelihood of too many practitioners will be threatened by climate change, from a country's thriving tourism industry and the contribution of related industries to national GDP to a small boatman driving a boat for tourists. With the passage of time and the continuous evolution of climate change, people may pay more attention to this field in the future.

2.1.2.4. Climate Change Leads to the Migration of Tourist Areas

Next, we will analyze migration resulted from climate change and its relationship with tourism. We have analyzed before that climate change has caused the survival crisis of many countries that are extremely dependent on tourism, such as Maldives, Malta, Cyprus, Caribbean island countries, etc. These countries do not have many effective measures to deal with climate change. On the one hand, their economic base determines that they are extremely dependent on tourism, the core industry. On the other hand, if tourism is affected by external factors, the country's economy and development will face major challenges, such as climate change, which is expected to gradually engulf some of the beautiful islands of the Maldives in the near future, then the question arises as to how the people of these countries should cope with the decline and recession of tourism, the wealthy industry that used to have the best employment rate. One option is exit, or emigration. Due to climate change, many indigenous people in Maldives have been displaced, and they have lost the tourism

industry and their homes, for example, after the tsunami in 2004, Maldives lost its few freshwater lake islands (kulhi), which were salinized by the tsunami. At the same time, the tsunami inundated most areas of Maldives, and many small islands were completely destroyed. Some islanders chose to leave, some islanders chose to rebuild it[1].

In this sense, climate change has caused the mass migration of population and the migration of indigenous people. Whether it is to find another way to make a living or to find a more suitable working and living environment - in the case of Maldivian residents, migration is due to the destruction of their homes and the loss of livelihood jobs - migrants are often passive. This indirect effect of climate change is easy to overlook in research, but it is important. Now let's analyze the fact that immigration will bring about many problems of sanitation, such as health threats and the spread of infectious diseases, viruses and bacteria. People forced to relocate to other places under threat from climate change can be jointly called climate refugees. By definition: Climate refugees are people who are forced to leave their homes or countries due to the impact of serious climate issues, which expose them to insecurity and force them to search for refuge in other areas or foreign countries. They have no choice but to rebuild their lives elsewhere, in spite of the poor living condition they found themselves in[2]. These climate refugees who leave their homes because of climate incompatibility or drastic changes - and here we're talking mainly about migrants who live and work in tourist areas due to climate change-induced damage to tourism, loss of jobs or direct destruction of their homes - often have to travel across mountains and rivers to a whole new region, This is no small test for anyone, and certainly no small test for the people of the receiving countries and regions. Global navigation is

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[1] Kelman, Ilan, Justyna Orlowska, Himani Upadhyay, Robert Stojanov, Christian Webersik, Andrea C. Simonelli, David Procházka, and Daniel Němec. "Does climate change influence people's migration decisions in Maldives?." Climatic change 153 (2019): 285-299.

[2] Berchin, Issa Ibrahim,et,al. "Climate change and forced migrations: An effort towards recognizing climate refugees." Geoforum 84 (2017), 147-150.

considered the easiest way to spread diseases and pathogens. For example, it is thought to facilitate the rapid spread of methicillin-resistant Staphylococcus aureus from the United Kingdom and North America to Europe and then to Asia.[1] Many viruses and bacteria that are isolated from each other across continents are better able to spread quickly among people due to the boom in aviation, and climate change is rapidly increasing the health risks associated with the annual migration of more and more climate refugees. At the same time, there is also evidence that rising temperatures are associated with significant increases in antibiotic resistance in common pathogens[2]. Therefore, climate change will not only increase the number of climate refugees fleeing their homes each year and may lead to pathogens that have never existed before. It will also dramatically increase the chances of pathogens surviving rising temperatures, which will greatly test the health efforts of recipient countries and local governments.

2.1.3. The Impact of Tourism on Climate Change

Now, let's look at the impact of tourism, conversely, on climate change. Although, yes, to some extent, the impact of climate change on tourism is the topic that researchers are most concerned about. It seems that all climate change will only affect tourism, as if tourism industry has become the most difficult industry and the first victim. Few people will take the initiative to think about the fact that the impact of tourism industry on climate change can not be ignored as well. For example, the Mediterranean Sea is one of the most popular tourist resorts. Throughout the year, a steady stream of tourists come from all over the world to enjoy the natural scenery, sunshine and beaches, as well as the unique geographical and cultural features.

[1] Molton, James S., Paul A. Tambyah, Brenda SP Ang, Moi Lin Ling, and Dale A. Fisher. "The global spread of healthcare-associated multidrug-resistant bacteria: a perspective from Asia." Clinical infectious diseases 56, no. 9 (2013): 1310-1318.

[2] MacFadden, Derek R., Sarah F. McGough, David Fisman, Mauricio Santillana, and John S. Brownstein. "Antibiotic resistance increases with local temperature." Nature Climate Change 8, no. 6 (2018): 510-514.

According to statistics, the Mediterranean Sea make up about 30% of the world's international tourists, and it is also the second largest cruise destination in the world. As a consequence, the Mediterranean tourism is closely related to local jobs and employment, and promotes local economic growth by 11%. The Mediterranean is not surprisingly one of the world's most popular tourist destinations. Around 60% of all travels within Europe are taking place in the Mediterranean region with at least four average overnights stays by the sea. This makes sense as researches conclude that proper weather and scenery are the main motivations for choosing destinations for tourists.[1] Therefore, it's obvious to observe the bidirectional relationship between them. In fact, a growing body of research have suggested that the close connection between climate change and tourism is twofold. While climate change is affecting tourism, tourism is also affecting climate change. Here we can take tourism in the Mediterranean as the background.

First of all, for most tourists to the Mediterranean Sea, the preferred mode of transportation is by air. However, for air transportation, the most criticized point is its negative impact on the greenhouse effect and global warming. The main greenhouse gas is CO_2, which is mainly responsible for the human aviation industry and global warming. Airplane has become the best choice for almost all short-term trips due to its fast and convenient features, while traditional cars and railways are often taken as alternatives due to distance restrictions, time cost considerations and inaccessible reasons. Although the major contributor of CO2 emissions in transport sector are from road transport, it is the aviation that has drawn much more attention in public debates because it is always blame to causing a lot of energy waste and pollution. In this case, the extreme high energy intensity is to blame. Although the fact is that aviation only accounts for around 12% of carbon dioxide emission in the sector of transport, it's not

[1] Leidner, Rüdiger. The European tourism industry: a multi-sector with dynamic markets: structures, developments and importance for Europe's economy. Vol. 727. Office for Official Publications of the European Communities, 2004.

just CO_2 emission in aviation, along with other greenhouse-gas emissions -- such as high levels of methane and nitrogen oxides, and the different effects of various emissions planes emit at different altitudes -- is widely blamed for global warming[1].

Although we see that global warming is still going on and relevant parts are increasing to promote the aviation industry to be closer to the environmentally friendly direction, the aviation industry seems not to have been fundamentally changed. At present, the aviation industry is still developing rapidly. Due to the deepening of globalization, air transport is the most convenient and quick means to connect the global village in today's society. In the future, it will become the most convenient means of transportation for people to go abroad for vacation, international business travel, migration, visiting relatives and friends. Studies have pointed out that although the industry of aviation is barely regarded as a sustainable or environment-friendly system, it contributes enormous economic value to society in through forms such as fast and leisure travel, creation of a variety of related jobs, facilitation of business communication, trade and services[2]. It is almost impossible to completely leave the aviation industry in today's society. For tourism, international travel would be difficult to achieve without adequate flight support, so it is not hard to understand why the Mediterranean region, one of the most famous tourist regions across the globe, has become one of the busiest for aviation. As a result, environmental pollution has become more severe and more widespread. Therefore, there are not many solutions for the air pollution in the Mediterranean Sea, the contribution of aviation to the global warming, which is affecting the whole world, and the potential environmental threat posed by climate change, but it is good to see that relevant airlines and governments have recognized the problem and actively made changes. We'll talk about better ways to deal with climate change in a later

[1] Transport, Energy. "Co2: moving towards sustainability." International energy agency (2009): 44.

[2] Cowper-Smith, Allan, and Danuta De Grosbois. "The adoption of corporate social responsibility practices in the airline industry." Journal of sustainable tourism 19, no. 1 (2011): 59-77.

chapter.

Second, for tourists, living environment and travel experience are the most important points to pay attention to during vacation. In addition to the contribution of air travel to carbon emissions after climate warming, there is another point to pay attention to is the carbon emissions related to housing. The most carbon emission is mainly in star-rated hotels. The vacation activities carried out by tourists in the destination will inevitably be accompanied by accommodation and catering. Both of these activities will produce a large amount of carbon dioxide emissions, although not as obvious as the aviation industry, but energy waste and uncontrolled carbon emissions will also cause the aggravation of greenhouse effect. For accommodation, the carbon emissions produced by different accommodation environments are often different, such as luxury hotels, ordinary hotels, B&Bs, motels, camps, etc. The energy consumed without accommodation environment is very different. Some scholars have analyzed the passengers in New Zealand and found out various levels of energy intensity and different amount of CO_2 produced by passengers in different accommodation conditions every night. The results published in 2002 showed that a passenger staying in a hotel uses 155 MJ of energy every night and produce carbon dioxide with a carbon dioxide factor of 7895; As a contrast, a passenger in a motel uses 32 MJ of energy per night and the carbon dioxide factor decreases to 1378; For passengers who use the least amount of energy per night were those who camped, with an energy expenditure per night of 25 MJ and a CO2 factor of 1364 per person[1]. This fully shows that tourists tend to consume more energy and produce more carbon dioxide emissions when they stay in star-rated and high-end hotels with better infrastructure, which is also logical. We will give more details on how to achieve low-carbon emission and green travel in tourism in the last chapter.

What we propose here is not to call for a ban on tourism, but to draw a

[1] Becken Susanne, and Murray Patterson, "Measuring national carbon dioxide emissions from tourism as a key step towards achieving sustainable tourism," Journal of Sustainable tourism 14, no. 4 (2006), pp.323-338.

conclusion that tourism itself will also have an impact on climate through induction and analysis, so as to break the long-standing prejudice that only tourism is seriously affected by climate change. But the fact is just as analyzed, tourism itself in different forms also contributes to climate change.

3. The Gravity of Egypt's Climate Problem and Its Impact on Tourism

Egypt is certainly one of the countries vulnerable to the impact of climate change. As a country located in the gold coast of the Mediterranean, the convenient geographical location has greatly promoted the country's booming tourism industry. However, as a major tourism country, Egypt also suffers from the problem of climate change. The research has showed the greenhouse gas emissions of Egypt account for nearly 0.6% of the world.[1] For a country with a relatively small economic size, its greenhouse gas and tourism are highly correlated. The large number of international tourists and their visits to Egypt each year directly or indirectly contribute to Egypt's greenhouse gas emissions. Egyptian hotels and restaurants also account for a considerable share of the greenhouse gas emissions. As the hottest topic in recent years, the greenhouse effect has attracted the world's attention. Its influence mainly lies in the almost irreversible impact on ecology and climate in the long run. As the tourism industry, which is extremely dependent on favorable weather conditions, may suffer from sustained adverse effects in the long term, it may also suffer from many invisible, negative and indirect challenges in the short term. For example, the temperature continues to rise in summer (peak season for tourism) caused by climate change. As a result, tourists will change their travel track and time. The final number of tourists could also be affected, dealing a direct blow to tourist destinations.

Besides the potential impact of long-standing greenhouse effect, climate change will also cause great damage to Egypt's ecology. Once such damage occurs, it is often devastating, such as the devastation of coral reefs, tourism resources and tourist attractions in coastal areas. The important reason for attracting tourists to visit Egypt's coastal areas is its unique natural scenery and beautiful Mediterranean seascape. A

[1] Nakhla, Dalia Adel, Mohamed Galal Hassan, and Salah El Haggar. "Impact of biomass in Egypt on climate change." (2013).

worsening ecological problem would hit directly at the base of Egypt's appeal to international tourists. Besides, the final performance of the tourism industry under the impact of climate change will be observed in the economy. Egypt, a country extremely dependent on tourism, will eventually risk the economic foundation of the country if it does not pay attention to environmental protection and control of the negative influence of climate change. For individuals, the huge tourism market provides extensive and adequate employment, which, if the challenges from climate change is not handled and addressed properly, may eventually lead to potential unemployment, which may eventually lead to greater social conflicts unrest.

3.1. The Impact of Climate Change on Water Resources in Egypt's Tourism Industry

MENA is not only region that has the lowest water resources per capita in the world, it is also the area that has seen the significant decrease in water resources. Rainfall in these areas is often less than 100 millimeters per year. The problem is most acute in the coastal areas, especially during droughts, which pose a real threat to Egypt because of its growing population in recent years, its own agricultural development, and its booming tourism industry. Egypt is a major agricultural country in the Middle East, with agriculture making up more than 10% of the country's GDP each year.[1] Among them, the most important demand is the large demand for water resources. Agriculture is almost the industry with the most water shortage and the most need for water supply among all the industries in Egypt. Every year, a small amount of water resources are used for agricultural production. It is not only related to the survival needs of the Egyptian people, the needs of the national economy, but also related to the needs of all walks of life in Egypt. Therefore, it can be concluded that

[1] El-Raey, Mohamed. "Impacts and implications of climate change for the coastal zones of Egypt." Coastal zones and climate change 7 (2010): 31-50.

Egypt is a highly water-sensitive country facing extreme water shortage.

As for tourism, it is a service-based industry, which is often accompanied by high consumption and energy consumption. A large number of hotels and catering industries require a large amount of water supply. However, for Egypt, a country with a huge demand for water resources, water supply and transportation are a big problem. And because water supply is very tight, the development of tourism will be directly affected by water problems. By the end of 2022, Egypt has a huge population of around 100 million and is considerably a populous country. It is located in the furthest lower reaches of the Nile River basin, where the climate is extremely dry, which makes it a country with severe water shortage. The shortage of per capita drinking water resources in Egypt is reflected in the economic development, which is a huge restriction on the economic development. The Sinai Peninsula in Egypt's Red Sea, as the most famous tourist resort in Egypt, has always been widely visited by international tourists, but it is also the most geographically short of water and one of the most seriously affected areas in Egypt by water shortage recently. As economy and population has surged in this region, the phenomenon of water shortage and insufficient water supply capacity began to appear more frequently. Since the supply of traditional surface water and groundwater resources is limited, the water supply in this region is often solved through seawater desalination, and then through long-distance pipeline transportation or tanker transportation. Recently, authorities have alleviated the water problem to some extent by building sewage and fresh water treatment plants. But as more and more new hotels break ground each year in Egypt's coastal resorts, so does the increasing water consumption (restaurants, supermarkets, bars, staff housing, irrigation, hotels), most of which comes from tourism and tourists. Studies have shown that in tourism-focused coastal areas, water demand is directly proportional to hotel room occupancy, which varies at different times of the year and with each hotel's marketing efforts. Besides, no precise regional or national attempts were made to obtain the water use statistics, and surveys of water use concerning

tourism remain relatively rare. In general, the presence of tourism leads to an increase in global water consumption, as visitors consume much more water during their travels than during the course of their daily lives in residence. The average visitor uses a lot of water, so the equivalent per bed varies from 300 to 850 litres per day, depending on the facilities and services of the individual hotel, as well as the occupancy rate.[1] Research data shows that each tourist in the resort consumes average 300L water per day, which is more than that at home (160L). The average stay time of tourists in Egypt is 6 days, and each tourist consumes about 400L of fresh water every day. Tourists in Egypt's coastal areas consume more fresh water from 400L and 500L per tourist, and from 1410 to 2190 L per room.[2]

So what does climate change mean for Egypt, which is so water-scarce and so dependent on its tourism industry? Forecast models produced by the relevant committees show that many of the Mediterranean areas will experience a noteworthy decrease in precipitation in 2050 (10 to 20 percent, depending on seasonal conditions in 2050) due to rising temperatures (about 1.5℃ to 3.6℃ on average).[3] Agricultural production and residential water, tourism water will face greater challenges. some projections concerning climate change also demonstrate the increasing possibility that drought and increased variability of precipitation would have directly hampered the water resources access in space, intensity and time.[4] On top of that, apart from the water shortage resulting from reduced rainfall, Egypt is also likely to face a severe imbalance in the distribution of water between big cities and small towns, between tourist attractions in developed areas and remote areas. Therefore, for Egypt's tourism

[1] Lamei, A., P. Van der Zaag, and E. Von Münch. "Basic cost equations to estimate unit production costs for RO desalination and long-distance piping to supply water to tourism-dominated arid coastal regions of Egypt." Desalination 225, no. 1-3 (2008): 1-12.

[2] Gössling, Stefan, Paul Peeters, C. Michael Hall, Jean-Paul Ceron, Ghislain Dubois, and Daniel Scott. "Tourism and water use: Supply, demand, and security. An international review." Tourism management 33, no. 1 (2012): 1-15.

[3] Change, IPCC Climate. "Impacts, adaptation and vulnerability." Part A: global and sectoral aspects. Contribution of working group II to the fifth assessment report of the intergovernmental Panel on Climate Change 1132 (2014).

[4] Kerr, Richard A. "Confronting the bogeyman of the climate system." Science 310, no. 5747 (2005): 432-433.

industry, the negative influence of climate change on water scarcity is considerable. Without access to water for tourists, Egypt's vast hotels, restaurants and entertainment facilities will be unable to function. In summary, Egypt can be counted as one of the most exposed and fragile countries in terms of water resources. It is located in an extremely arid region and is the furthest downstream of the Nile River basin. For areas located along the Nile, the pressure of accessing water has already increased. The more disadvantageous tourist areas are the coastal areas of the Red Sea, where people can't access fresh and healthy water all the time. In South Sinai, along the Red Sea, tourism-related market stands as the dominant industry, and the source of water is either desalination of seawater or brackish water, or water from pipes or trucks coming from the Nile. Apart from the water shortage, it is not common to see water reusing and proper treating of wastewater.[1] In the future, the impact of climate change on water resources and the utilization of water resources by tourism may become more and more serious.

3.2. Climate Change Damage to the Tourism Ecosystem in Egypt

For tourism industry, in addition to the negative damage created by climate change upon the utilization of water resources and the normal operation of its market, as mentioned in the previous chapter, the most direct damage caused by climate change on the tourism market is also reflected in the damage to the ecological environment.

First let's take the Red Sea as an example. Egypt's most famous sea area, the Red Sea, is a popular place for tourists to visit every year. It is on the Egyptian side of the coast, and it is very narrow. The coast is made up of a lot of bays, small beaches.

[1] Lamei, Aya. A technical-economic model for integrated water resources management in tourism dependent arid coastal regions: the case of Sharm El Sheikh, Egypt. CRC Press Inc., 2010.

Throughout this region there are coral reefs, and splendid schools of Marine life, the most beautiful gifts of nature, stretching into the depths of most of the region, scattered with villages, small or large, and resorts, where visitors are drawn by the Red Sea's most famous coral reef and mangrove communities, the most diverse in the world. The Red Sea is well-known for its spectacular marine environment, such as seagrass beds, mangroves and coral reefs. They are all critical resources and treasure for people living along the coast: food, protection and stability of the coastline, and the economic benefits of tourism. As mentioned above, Egypt is a country that is developing fast and highly dependent on tourism, and the Red Sea has become Egypt's main source of income for tourism. Most of the tourists visiting the Red Sea are those who want to enjoy its unique natural resources. In the past two decades, Egypt's tourism industry has made great progress. Tourist resorts along the Red Sea coast have been developed one after another, and various new forms of tourism have been vigorously promoted. Ecological tourism in the Red Sea region has been widely promoted, among which coral tourism is the most popular way for tourists. The Red Sea is well deserved the best scuba diving sites in MENA for many tourists, and the website "Scubatravel "lists 13 Egyptian diving sites as one of the 100 best in the world.[1] A large number of tourists come to Red Sea to dive every year to enjoy the unique and beautiful coral reefs.

Then let's take a look at some of the coral features that tourists like most. Coral reefs are the largest living structures and most complex systems on Earth, according to the National Oceanic and Atmospheric Administration. Coral reefs are the most dominant ecosystems in the ocean, with far more species diversity than any other Marine environment. [2]It's been called the rainforest of the sea. Although coral reefs occupy less than 0.2 percent of the ocean, they account for nearly 30 percent of all Marine biodiversity. Coral reefs are best in the tropics because of the optimum water

[1] “scubatravel” https://www.scubatravel.co.uk/

[2] “What are Coral Reefs” https://www.coris.noaa.gov/about/what_are/

temperature and salinity. In general, coral reefs need to grow in brine at 22 to 26℃. The ideal brine concentration is between 32 and 38.[1] For surviving, it is also necessary to provide high water clarity, high ambient light and extremely low nutrient concentrations(which are due to the single-celled algae living inside coral cells that photosynthesize, use solar energy and carbon dioxide to produce 90% carbohydrate nutrients and transfer nutrients to their hosts in a symbiotic relationship[2]). And off the Red Sea coast of Egypt, we see amazing coral reefs on a massive scale. The Egyptian coastline are among the regions that have the highest biodiversity of coral reefs in the world. The Red Sea coastline is now found to contain 3,800 km^2 of coral reefs, stretching 1,800 km long. These figures are higher than the Caribbean record and comparable to the Indian Ocean, and many coral reef species are found only in Egypt.[3]

Let's then focus on Egypt's Red Sea coral reefs and the threats they're facing from climate change. The Red Sea is Egypt's biggest tourist magnet, accounting for 90% of the Egypt's revenue of tourism.[4] However, coral reefs are one of the most sensitive groups in the sea to environmental changes. In recent years, under the influence of tourism development, environmental deterioration, climate change and temperature rise, coral reefs in the Egyptian Red Sea began to appear more and more bleaching and disappearing. The tourism in Red Sea is very sensitive and vulnerable to the environment surrounding it. The water, sanitary, quality of beaches, soft sand, seasonal temperatures are all of vital importance. They are highly sensitive to tourism activities, and the lack of government control in the region makes it hard to take comprehensive and timely protection measures, which is a huge test for coral reefs

[1] Porter, James W., and Jennifer I. Tougas. "Reef ecosystems: threats to their biodiversity." (2001): 73-95.

[2] Dubinsky, Zvy, and Noga Stambler, eds. Coral reefs: an ecosystem in transition. Springer Science & Business Media, 2011， 552 p.

[3] Wilkinson, C. "Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre." Townsville 296 (2004). pp. 67-78.

[4] El-Raey, Mohamed. "Impacts and implications of climate change for the coastal zones of Egypt." Coastal zones and climate change 7 (2010): 31-50.

that are extremely dependent on good living conditions. The diversity of the coral reefs in the Red Sea are among the best on the earth and are also among the most vulnerable to natural and human damage. Data show that the degradation of coral reefs in the Red Sea has increased greatly over the past several decades, especially along the seashore, and increased human disturbance and their Improper interaction with natural resources are to blame.[1] At the same time, the study found that coral reef degradation in Egypt has become more frequent over the course of development in recent decades, possibly because coral reef communities have been subjected to increasing anthropogenic pressures and natural environmental degradation. Other studies have linked increased outbreaks of coral disease events to environmental stress and climate change.[2] Specifically, the most immediate and greatest threat to Red Sea coral reefs is rising water temperatures. Corals are particularly fragile to rising sea surface temperatures, and water temperature is one of the determining factors for the existence of coral reef communities. Excessive water temperature can lead to the deterioration of the symbiotic relationship between corals and algae, resulting in coral bleaching.[3] Corals reefs may recover slowly from small and sudden bleaching. However, if the bleaching lasts for a long time, the situation and damage will be permanent and irreversible. As a consequence, the death will be unavoidable. In addition to water temperature, another problem is that with the intensification of the greenhouse effect, the increasing concentration of CO_2 in the atmosphere will lower the ph of seawater, which will reduce the calcification and formation of corals[4],

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[1] Ali, Abdel-hamid AM, Mohamed A. Hamed, and Abd El-Azim. "Heavy metals distribution in the coral reef ecosystems of the Northern Red Sea." Helgoland marine research 65, no. 1 (2011): 67-80.

[2] Lesser, Michael P., John C. Bythell, Ruth D. Gates, Ron W. Johnstone, and Ove Hoegh-Guldberg. "Are infectious diseases really killing corals? Alternative interpretations of the experimental and ecological data." Journal of experimental marine biology and ecology 346, no. 1-2 (2007): 36-44.

[3] McWilliams, John P., Isabelle M. Côté, Jennifer A. Gill, William J. Sutherland, and Andrew R. Watkinson. "Accelerating impacts of temperature‐induced coral bleaching in the Caribbean." Ecology 86, no. 8 (2005): 2055-2060.

[4] Collingham, Yvonne C., and Brian Huntley. "Impacts of habitat fragmentation and patch size upon migration rates." Ecological Applications 10, no. 1 (2000): 131-144.

and also have a negative effect on coral restoration and growth. Studies have shown that the growth rate of coral reefs in the Red Sea has been slowed due to the greenhouse effect,[1] raising alarm bells about their future disappearance.

There are many coral reef species in the Red Sea, with a total of about 50 coral genera threatened by external disturbances from human activities and climate change. Loss of biodiversity will pose many threats and eventually cause managerial, economic, scientific and social consequences.[2] In environmental terms, the continued deterioration of coral reefs has severely disrupted Egypt's coastal ecosystems, leading to coral death and a decline in fish that depend on the reefs, death of invertebrates, increased algae growth, and an increase in planktivorous, herbivorous and detritivorous fishes[3]. Climate change heat stresses and ocean acidification are expected to put nearly 90% of the Middle East's coral reefs under threat by 2030, while these problems due to climate issues alongside local mismanagement will leave all Egyptian coral reefs in a threatened state by 2050.[4] Research predicts that due to the degradation of coral reefs caused by high temperatures, Egypt's tourism industry will suffer a loss of 19 billion Egyptian pounds by 2030, and 85 billion Egyptian pounds by 2060.[5]

Therefore, in terms of the impact of climate change on the popular Egyptian Red

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[1] Cantin, Neal E., Anne L. Cohen, Kristopher B. Karnauskas, Ann M. Tarrant, and Daniel C. McCorkle. "Ocean warming slows coral growth in the central Red Sea." Science 329, no. 5989 (2010): 322-325.

[2] Crosby, M. P., A. Abu-Hilal, A. Al-Homoud, J. Erez, and R. Ortal. "Interactions among scientists, managers and the public in defining research priorities and management strategies for marine and coastal resources: is the red sea marine peace park a new paradigm?." Environmental Challenges (2000): 581-594.

[3] Khalaf, M. A., and M. Kochzius. "Changes in trophic community structure of shore fishes at an industrial site in the Gulf of Aqaba, Red Sea." Marine Ecology Progress Series 239 (2002): 287-299.

[4] Burke, Lauretta, Katie Reytar, Mark Spalding, and Allison Perry. Reefs at risk revisited. Washington, DC: World Resources Institute, 2011.

[5] Smith, Joel, Leland Deck, Bruce McCarl, Paul Kirshen, James Malley, and Mohamed Abdrabo. "Potential impacts of climate change on the Egyptian economy." Report of a study implemented under the UN Climate Change Risk Management Joint Programme funded by the UN MDG Fund and the Finnish Government, prepared for the United Nations Development Programme (UNDP) with the Government of Egypt, UNDP, Cairo, Egypt (2013).

Sea coastal tourism, the most direct example is the destruction of ecosystem. As a major tourist country, whether Egypt can better handle the contradiction between ecology and tourism development is a key point.

3.3. Impact of Sea Level Rise Due to Climate Change on Tourism in Egypt

In addition to the potential impact of climate change on water and natural resources, let's look at another threat that Egypt's most popular seaside resort is most vulnerable to: the threat from the rise of sea level.

Among all of the threats, the most influential one due to climate change could be the sea level rise (SLR). Its impact is being felt on a global scale and is already doing harm nowadays, let alone the future. The changes in sea level are mainly caused by several natural phenomena. There are three of them: the thermal expansion of the oceans, the melting of glaciers in polar regions such as Antarctica, and changes in land storage. The better known of the three causes is the effect of melting ice in Antarctica, but scientific evidence suggests that thermal expansion of the oceans is the dominant factor in SLR and is likely to continue to revise sea heights through the end of the century.[1] Dealing with this real threat is a very daunting challenge for policy makers, for society, for industries. Although the world has made considerable efforts to control the emission of greenhouse gases, the situation is still not optimistic. A large number of coastal beaches and coastlines are threatened by SLR. It will directly change the environmental conditions of the coastline, destroy the coastal ecology, flood the coastal areas, erode the coastline, and cause coastal disasters to varying degrees. And is becoming a major threat to beaches[2]. Between 1961 and 2003, the

[1] Dasgupta, Susmita. The impact of sea level rise on developing countries: a comparative analysis. Vol. 4136. World Bank Publications, 2007.

[2] Toimil, Alexandra, Pedro Díaz-Simal, Inigo J. Losada, and Paula Camus. "Estimating the risk of loss of beach recreation value under climate change." Tourism Management 68 (2018): 387-400.

average rate of global SLR was below 2 mm/year, and between 1993 and 2003, the rate increased to 3.1 mm/year on average. According to the UN Panel on Climate Change, sea levels will rise by 18 to 59 centimetres by the end of the 21st century.[1] On current trends, this growth is unlikely to slow down any time soon, and resulting from the vertical movement of the Earth's crust, topographic and wave-climate studies show that the influence of SLR are uneven across the globe. The most vulnerable areas include a range of slope coastal features such as estuaries, beaches, coral reefs and deltas. The most threatened countries are mainly low-lying countries: eastern England, the Ganges-Brahmaputra river in Southeast Asia, eastern Sumatra and the Nile Delta in Borneo, Egypt.[2]

The negative influence of SLR on Egypt, especially the Nile Delta region, has been a topic of great interest. In fact, many countries and cities around the world are built in low-lying coastal areas. The impacts of SLR include inundation of low areas, coastline erosion, intrusion of saltwater into aquifers, loss of coastal wetlands and disappearance of mangrove areas, as well as the impact on biodiversity[3]. These threats and challenges affect some countries and regions at the national level. But the challenge is particularly daunting for Egypt, which is considered one of the five countries in the world most influenced by a 1-meter rise in sea levels,[4] in which the Nile Delta is the most typical area. The Nile Delta is formed when the main Nile River enters northern Egypt and spreads out near Cairo to join the Mediterranean Sea. With Cairo as its apex, Alexandria in the west and Port Said in the east, the coastline stretches for 230 kilometers, covering an area of about 24,000 square kilometers,

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[1] IPCC (2007) Climate change 2007: synthesis report. Contribution of working groups I, II and III to the fourth assessment report of the Intergovernmental Panel on Climate Change. In: Pachauri RK, Reisinger A (eds) Core writing team. IPCC, Geneva, p 104

[2] Schwartz, Maurice, ed. Encyclopedia of coastal science. Springer Science & Business Media, 2006, pp. 678-684.

[3] Church, John A., N. J. White, J. R. Hunter, and K. Lambeck. "A post-IPCC AR4 update on sea level rise." Antarctic Climate & Ecosystems CRC (2008).

[4] Dasgupta, Susmita. The impact of sea level rise on developing countries: a comparative analysis. Vol. 4136. World Bank Publications, 2007.

making it one of the largest deltas in the world. Fertile and densely populated, the Nile Delta is the birthplace of ancient Egyptian civilization and has one of the highest physiological population densities in the world. The Nile Delta region has always been a tourist resort in Egypt. Its natural and good coastal ecology and the warm sunshine of the Mediterranean blend together, attracting tourists from all over the world. After decades of rapid development, the tourism market has become quite mature.

On the other hand, for the topography and structure of the Nile Delta, its most prominent feature is its low-lying coast, which makes it extremely vulnerable to land subsidence, tectonic activities and erosion. As long as the sea level rises by one meter, the havoc will be wreaked on the Nile Delta, with more than 6 million people to be displaced and the vast loss of land of more than 4000 square kilometers.[1]

The scientific consensus, for example, is that the Delta area and its neighboring city, Alexandria, one of the top 10 cities in the world for exposing its population and lowland nature, will eventually be submerged because of the continuing impact of climate change.[2] As a relevant example, Alexandria has experienced decades of rapid growth and a maturing tourism industry, becoming a traditional must-visit destination for millions of Egyptian summer vacationers. Resorts and roads have been built, and various supporting infrastructure has been put into use. But on the other hand, due to the impact of SLR, more and more resorts and beaches are beginning to be threatened by sea inundation, which is a major challenge and the most severe issue for the local tourism industry. Erosion and inundation of beaches may have a lasting impact on the tourism appeal of some coastal destinations. Studies have analyzed that if no action is taken, approximately 30 percent of Alexandria will be inundated, around 2 million

[1] Dasgupta, Susmita. The impact of sea level rise on developing countries: a comparative analysis. Vol. 4136. World Bank Publications, 2007.

[2] Nicholls, Robert J., Susan Hanson, Celine Herweijer, Nicola Patmore, Stéphane Hallegatte, Jan Corfee-Morlot, Jean Château, and Robert Muir-Wood. "Ranking port cities with high exposure and vulnerability to climate extremes: exposure estimates." (2008), p10.

people will lose their houses and more than 190,000 jobs will be destroyed with huge direct economic loss which is estimated to reach $3.5 billion over the next century. The worst affected sectors will be agriculture, industry and tourism.[1] The vulnerability of Alexandria, Egypt's second largest city and a favorite tourist destination for Egyptians and foreigners alike, to rising sea levels has been laid bare.

We can also look at other areas that are most at risk from rising sea levels in Egypt, such as Port Said Governorate, which is located in the northeast Nile Delta and covers an area of 1,351 square kilometers in five districts with a population of about 500,000. The average population density is about 391 person/km^2.[2] Port Said Governorate is a typical port area of which main sources of income are Suez Canal related income, income from free trade zones and industrial activities, and income from tourism, because of Port Said's advantageous position as the entrance/exit of the Suez Canal. So it became an important port trading location and the largest and busiest economic center of the Sinai Peninsula near the Mediterranean Sea. Port Said is a typical Mediterranean climate and a famous tourist resort. Some studies estimate the losses suffered by land area, urban area, industrial area, population and employment in Port Said through the situation of SLR of different heights. The study uses the scenario of SLR of 0.5 m, 0.75 m and 1.25 m respectively to estimate the losses in various fields. The results showed that the beach area suffered the most damage. Therefore, tourism and the coastline areas were the most affected part, followed by urban areas. In the scenario of 1.25 m of SLR, around 70,000 people are expected to leave their homes and a 16,700 job loss will be observed.[3]

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[1] El-Raey, Mohamed, K. R. Dewidar, and Mamdouh El-Hattab. "Adaptation to the impacts of sea level rise in Egypt." Mitigation and adaptation strategies for global change 4 (1999): 343-361.

[2] El-Raey, Mohamed, Omran Frihy, Samir M. Nasr, and K. H. Dewidar. "Vulnerability assessment of sea level rise over Port Said Governorate, Egypt." Environmental Monitoring and Assessment 56 (1999): 113-128.

[3] El-Raey, Mohamed, K. R. Dewidar, and Mamdouh El-Hattab. "Adaptation to the impacts of sea level rise in Egypt." Mitigation and adaptation strategies for global change 4 (1999): 343-361.

3.4. Disruptions to Egypt's Tourism Industry Due to Rising Temperatures

The change of temperature will affect people's subjective feelings, the development of agriculture and the normal operation of the whole ecology on the earth. Since the beginning of the 21st century, the tough challenge of climate warming caused by greenhouse effect has been a hot topic of discussion. Too high or too low temperature is bad for human beings and society. For example, studies have shown that crops in Egypt are increasingly negatively affected by increased temperatures and extreme weather events, as the temperature rising in Egypt will have reduced the production of agriculture by up to nearly 20%.[1]

In addition, warming will significantly increase the chances of extreme heat in human global ecosystems, with human influence on the climate system already contributing to a global temperature increase of 1.2℃ since the pre-industrial era (1850-1900). There are, times of extreme disasters all over the world, with wildfires in Canada and the United States becoming more frequent each year, floods in China, and droughts in Brazil, all directly linked to global warming. More than 85% of the world's population has been forced to involved in this unprecedented temperature rising and increased extreme weather events. According to studies, 87% of all natural disasters since the 1980s have been linked to climate problems. Some academics estimate that climate change could cost the economy $1 trillion a year by 2050.[2]

For tourism, the reason why it is affected by weather and temperature to a large extent is that it directly affects the time and length of tourism season and tourists' choice of destination,[3] and tourists' travel arrangements and activities are also directly

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[1] Olefs, M., H. Formayer, A. Gobiet, T. Marke, W. Schöner, and M. Revesz. "Past and future changes of the Austrian climate – Importance for tourism." Journal of Outdoor Recreation and Tourism 34 (2021): 100395.

[2] Elsayed, Mona Rabea Abd Elfattah. "The Impact of Climate Change on International Tourism: Evidence from Egypt." International Journal of Energy Economics and Policy 13, no. 2 (2023): 379.

[3] Scott, Daniel, Geoff McBoyle, and Michael Schwartzentruber. "Climate change and the distribution of climatic

affected by weather, temperature and humidity. For tourist destinations, the negative influence of climate change varies from place to place, and the relationship between climate and tourism is also very complicated. However, it cannot be denied that with global warming, the climate on the earth is changing to an unprecedented degree and speed, and the global temperature will rise to an unimaginable height by the end of the 21st century. Studies have already shown that tourism is a very sensitive sector to temperature rising.[1] The fact of decrease in the number of urban visitors has already been observed in a high temperature environment.[2]

Besides, the development of tourism is inseparable from a clean environment and favorable weather conditions. An increase in temperature will lead to the relocation of some previously attractive tourist areas to more suitable temperature areas, and the high temperature will increase the management costs of resorts. High temperatures can also put pressure on tour operators and shorten the duration of their Tours. For example, in summer, the continuous rise of temperature may lead to a drop in the number of tourists in the original beach tourist attractions, and tourists may switch to other tourist activities, choose places away from the high temperature or even cancel their original plans, which could pose a huge threat to seasonal tourism. An overly hot summer could lead to cooler autumn and winter trips, creating new seasonal travel patterns. Studies have confirmed that due to global warming, the climate conditions of some regions will be improved and become more suitable, which will increase the attraction of tourists, while other places will be significantly less attractive to tourists, which is mainly reflected in the changes of tourism patterns and the number of tourists. For example, studies show that in the coming decades, due to global warming,

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resources for tourism in North America." Climate research 27, no. 2 (2004): 105-117.

[1] Olefs, M., H. Formayer, A. Gobiet, T. Marke, W. Schöner, and M. Revesz. "Past and future changes of the Austrian climate – Importance for tourism." Journal of Outdoor Recreation and Tourism 34 (2021): 100395.

[2] Liu, Jiandong, Guangsheng Zhou, Hans W. Linderholm, Yanling Song, De-Li Liu, Yanbo Shen, Yanxiang Liu, and Jun Du. "Optimal strategy on radiation estimation for calculating universal thermal climate index in tourism cities of China." International Journal of Environmental Research and Public Health 19, no. 13 (2022): 8111.

Northern European countries are likely to see a sharp improvement in summer temperatures, heralding more visitors from southern Europe and a rise in domestic tourism, while summer resorts such as Spain, Greece and Turkey, which traditionally draw tourists with sun and sand, become less comfortable due to high temperatures. This shift means that the travel time of visitors to these locations is likely to shift from summer trips to autumn and winter trips.[1] So it can be said that temperature changes will directly affect tourism and tourists' behavior. It is similar in the Mediterranean region. In the case of Egypt, studies have shown that the number of tourists visiting the country is expected to decrease by about 20% by 2060, which directly leads to a 13-17 billion Egyptian pound drop in annual tourism revenue.

3.5. Climate Change Raises Health Risks for Egyptian Residents and Tourists

The rise in temperature may also pose a threat to the health of local residents and tourists in some climate-fragile areas. The Nile Delta, for example, is one of the world's three "extremely vulnerable areas" that will be more vulnerable in the future due to rising sea levels, water scarcity and land degradation, to which we now add its vulnerability to climate change. One of the most typical examples are Alexandria, an unique ancient city along the coast, attracting hundreds of thousands of tourists every year as an economic and tourist center. Specifically, there is a stretch of 60 kilometers of seashore and some beaches and ports. Its industrial output accounts for about 40% of Egypt's total.[2] A series of problems brought by global warming have begun to seriously impair the lives of residents, and therefore the tourism industry and tourists.

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[1] Amelung, Bas, Sarah Nicholls, and David Viner. "Implications of global climate change for tourism flows and seasonality." Journal of Travel research 45, no. 3 (2007): 285-296.

[2] Darwish, K. H., M. Safaa, A. Momou, and S. A. Saleh. "Egypt: land degradation issues with special reference to the impact of climate change." Combating desertification in Asia, Africa and the middle east: proven practices (2013): 113-136.

Firstly, soil erosion and dust increase caused by climate warming lead to dust pollution in the air, which has a direct negative impact on the health of tourists and residents; At the same time, scientific research has already demonstrated that temperature rise is directly related to the spread of diseases and the generation of allergic diseases.[1] With the coming and going of international tourists from all over the world, diseases are more likely to spread under the background of rising temperature. For example, studies have found that whether COVID-19 can break out in a large scale in a region is directly related to its temperature and geographical latitude, and is consistent with the behavior of seasonal respiratory viruses.[2] It can be found that there is a direct correlation between temperature and disease. With the rise of temperature and the increasing number of international tourists, the risk of disease transmission is magnified.

In summary, it can be found that the main impact of global warming on Egypt is mainly in summer. As we found above when we used Alexandria as an example to analyze the impact of climate warming on Egypt's tourism industry, the impact of rising temperature on Egypt is almost negative and Egypt is a warm tourist destination in winter, the impact of climate change mainly observed in the hot summer months. With the impact of water shortage caused by increasing summer temperature and decreasing precipitation, tourists may face higher temperature in summer, greatly reducing their comfort and experience. Meanwhile, health and hygiene problems caused by increasing prevalence of infectious diseases may further harm tourists' health in the future. The rising temperature may also lead to the transfer or disappearance of traditional tourist destinations and the change of seasonal tourism,

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[1] Rothenberg, Marc E. "The climate change hypothesis for the allergy epidemic." Journal of Allergy and Clinical Immunology 149, no. 5 (2022): 1522-1524.

[2] Sajadi, Mohammad M., Parham Habibzadeh, Augustin Vintzileos, Shervin Shokouhi, Fernando Miralles-Wilhelm, and Anthony Amoroso. "Temperature, humidity, and latitude analysis to estimate potential spread and seasonality of coronavirus disease 2019 (COVID-19)." JAMA network open 3, no. 6 (2020): e2011834-e2011834.

which may attract some tourists from traditional tourist destinations to new tourist destinations. Generally speaking, climate warming has a subtle influence on tourists' choice of travel time and destination.

3.6. Impact of Climate Change on the Egyptian Economy

Now let's take a look at the economic effect of climate change on tourism in Egypt. As mentioned in the first chapter, tourism in Egypt is a fundamental source of revenue, which directly provides millions of jobs and more than 10% of the total GDP of the country. Every year, Egypt receives a large number of international tourists and collects a large amount of foreign exchange, through which the government can use to develop the economy and buy foreign goods. Despite the disruption of the Arab Spring in 2011 and the COVID-19 epidemic in 2020, Egypt's tourism industry is still recovering quickly. For example, since 2020, Egypt's tourism industry has been depressed after the huge impact of COVID-19. However, with the passage of the epidemic and the arrival of economic recovery, It's been a new spring in Egypt's Tourism industry. According to the Minister of Tourism and Antiquities, Egypt received more than 12 million visitors in 2022. More surprisingly, tourism in the first two months of 2023 increased by more than 35%t. Meanwhile, Egyptian administration has made an huge effort to attract more tourists in 2023, implementing a more accommodative visa policy to permit more tourists to get tourist visas on arrival.[1]

At the same time, Egypt's tourism industry, like agriculture, is also very sensitive to temperature changes and climate changes. With the frequent occurrence of climate problems such as extreme weather and temperature rise in recent years, it has suffered the most direct impact. The Nile Delta region accounts for the lion's share of Egypt's

[1] “Egypt Records 36% Increase in Number of Tourists in 2023” https://top50women.com/egypt-records-36-increase-in-number-of-tourists-in-2023-minister/#:~:text=Egypt's%20tourism%20surged%20by%2035,by%20the%20end%20of%202023.

agricultural production, with less than 3 percent of Egypt's land area carrying more than two thirds of Egypt's agricultural output, which is the basis of Egypt's economic development. Suffering alongside agriculture is Egypt's tourism industry. OECD has conducted a comprehensive case study of Egypt for the Climate Change Project, an activity overseen by the Global and Structural Policy Working Group (WPGSP) and the Environment and Development Cooperation Network (Environet). Egypt was included as a case study in the overall goal of integrating and guiding the response to climate change into economic development planning and aid policies.[1] It can be seen that Egypt, as the most sensitive country to climate change, has been studied as a case study, which also hints at the increasing negative influence of climate change in Egypt in the future. One study predicts that Egypt's tourism revenue will decline by 8.4% in 2030 and 19.7% in 2060 due to a combination of climate change and external factors.[2] Among them, the development of coral-related tourism, the most important source of tourism income, will be severely affected, according to the analysis. The study predicts that at the rate of coral destruction since 1990, 20-35% of Red Sea reefs will be wiped out by 2030, and 50-80% by 2060, if this rate continues.[3] Coral reef-related coastal tourism is Egypt's most lucrative sector for tourism, and the future loss of coral reefs could be devastating for Egypt's tourism. Projections show that Egypt's tourism income will decrease by at least 14.73 billion Egyptian pounds by 2030 and 67.1 billion Egyptian pounds by 2060, including 3.312 billion Egyptian pounds and 14.51 billion Egyptian pounds in reef-related recreation expenditures. Total annual tourism losses are projected to peak at 106 billion Egyptian pounds in 2060.[4]

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[1] Agrawala, Shardul, Annett Moehner, Mohamed El Raey, Declan Conway, Maarten Van Aalst, Marca Hagenstad, and Joel Smith. "Development and climate change in Egypt: focus on coastal resources and the Nile." Organisation for Economic Co-operation and Development 1 (2004): 1-68.

[2] Nakicenovic, N., J. Alcamo, G. Davis, B. De Vries, J. Fenhann, S. Gaffin, K. Gregory, A. Grubler, T. Y. Jung, and T. Kram. "A special report of Working Group III of the Intergovernmental Panel on Climate Change." Emissions Scenarios 570 (2000).

[3] Cantin, Neal E., Anne L. Cohen, Kristopher B. Karnauskas, Ann M. Tarrant, and Daniel C. McCorkle. "Ocean warming slows coral growth in the central Red Sea." Science 329, no. 5989 (2010): 322-325.

[4] Bigano, Andrea, Jacqueline M. Hamilton, and Richard SJ Tol. "The impact of climate change on domestic and

More attention has been paid to the impact of climate change in Egypt on agricultural development. Admittedly, agricultural production, which is affected by weather, precipitation, SLR and soil alkalinity, is more vulnerable to climate problems and suffers the most economic losses. But this does not mean that tourism, the second biggest potential victim after agriculture, should be ignored. As a matter of fact, tourism is the most employable industry in Egypt, and its prosperity and good operation will directly affect the rise and fall of Egypt's national economy. Since the outbreak of COVID-19 in 2020, Egypt has been forced to close many tourist attractions and international air routes, which has dealt a major blow to international trade and tourism. The number of tourists dropped instead of rising that year. By the end of 2020, only 3.5 million foreign tourists had visited Egypt, down 73% from 13.1 million in 2019. Tourism revenue fell directly to $4 billion, down nearly 70% from 2019 when tourism revenue exceeded $13 billion.[1]

In fact, the economic effect of climate change on Egypt's tourism exists in all aspects, not only the destruction of coral reefs, rising sea level, rising temperature and other problems (as mentioned above, almost eventually will lead to economic damage). Tourism is a national policy for Egypt, and it is an important engine to promote Egypt's economic development. It's also paradoxical (as we'll see in a later chapter), but it's very unusual that the Egyptian government, despite its emphasis on the development and protection of the tourism industry, has had very limited success in terms of handling climatic issue. But even before the Arab Spring in 2011, there was very little discussion about the impact of climate change in Egypt. Since the Arab Spring, the Egyptian government has focused on resolving domestic political and social conflicts. This short-sighted approach directly ignores other environmental and climate change issues that are equally important to the future development of its tourism. Even if the aftermath of the Arab uprising didn’t cause political volatility or

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international tourism: a simulation study." (2006).

[1] https://baijiahao.baidu.com/s?id=1688128239203214291&wfr=spider&for=pc

instability in Egypt, the ability and effectiveness of the Egyptian government to respond to climate change would still be extremely limited, which we will examine in the next chapter. What we can point out here is that when facing climate change in Egypt, almost every field will have an impact on the economy. Compared with the long-term consequences of temperature rise and environmental damage, the economic impact can often be reflected in the most direct data and can be directly felt by people. So the economic consequences are the most immediate and visible impact of climate change on Egyptians at the national and individual levels.

At the same time, the economic losses caused by the impact of climate change on tourism have some different characteristics. For example, the impact of climate change on the economy is fundamentally different from the economic losses caused by the financial crisis. For the economic damage caused by the failure of financial speculation, the monetary and fiscal measures taken by the state and the government can usually be more or less effective in a short time. And then through a long period of market regulation can slowly recover after many years or even beyond. However, the economic damage caused by climate change is not easy to recover in a short period of time. For instance, as mentioned above, the direct loss of tourism industry is caused by the destruction of water resources and coral reefs, and the frequent occurrence of extreme weather. The decrease in the number of tourists, the transfer of tourism locations and the change of tourist season are not formed in a single day. It is the consequence of long-standing climate change, which will be very difficult to manage and repair, and which in the long run will be even more harmful to a society by damaging the economy. First, because it happens slowly, and second, once it has accumulated enough to cause significant damage, it is difficult to repair it.

In addition, since tourism is considered as a fundamental industry for employment in Egypt, hiring a huge amount of people, the long-standing impact of climate change could potentially endanger the job market in Egypt, leading to increased unemployment and the outbreak of related social problems.

For example, the most direct example is the relationship between Egypt's hotel industry and tourism industry, because every year, many international tourists from all over the world come to Egypt to travel, Egypt's hotel industry is developing very well. Egypt is one of the largest global brand hotel hubs in Africa, with the largest hotel capacity on the continent. Regionally, Egypt's hotel and motel industry has accounted for 7% of the hospitality industry in MENA by the end of 2020. UK-based market data and insights provider MarketLine estimates the sector generated USD 1 billion in revenues during 2021, a 65% YoY increase over 2020’s record-low USD 612 million.[1] However, once Egypt is affected by various political upheavals (2011 Arab Spring), economic crisis, and public safety incidents (COVID-19), the hotel and catering industry in Egypt will suffer direct losses. As a persistent and long-standing impact, the consequences of climate change may not become serious soon. However, since the income source of the hotel and catering industry almost comes from tourists, the issue of climate change cannot be ignored for the long-term economic development of Egypt. In fact, this is also an important and thorny issue that the Egyptian government has encountered in the development of hotels and catering. The Egyptian government tends to focus only on the economic benefits of tourism and address issues such as resource scarcity, while ignoring other consequences. It also fails to address the practices of low wages, high working hours and low security in the hotel and catering industry.[2] Climate change, as a more difficult to perceive factor, has not been clearly seen in the relevant policies of the Egyptian government. This is not just a government problem. Even hotel managers and hotel owners are not paying as much attention to it as they should. They are building hotels and facilities without considering the extent to which reducing greenhouse gas emissions and climate change are likely to affect hotels. Many hotel managers interviewed said that climate

[1] “Hospitality Rebounds” https://www.amcham.org.eg/publications/industry-insight/issue/54/hospitality-rebounds

[2] Sobaih, Abu Elnasr E. "Hospitality employment issues in developing countries: The case of Egypt." Journal of Human Resources in Hospitality & Tourism 14, no. 3 (2015): 221-243.

change is still an unclear issue as no guidance has been provided to hotels on climate change. And from their perspective, hotels cannot devote staff and time to dealing with environmental issues like global warming, which in their view is an unproductive activity.[1] As it can be seen, for Egypt's hotel industry today, if timely action is not taken to address the increasingly significant issue of climate change, it may create more and more challenges in the future.

For Egypt, a developing country, pro-poor tourism can also help people get out of poverty and improve their living standards. The Fayoum region of Egypt, for example, is one of the poorest and most ancient parts of Egypt. It has been largely marginalized in social and economic development for the past century. Its residents have the lowest literacy and school enrollment rates in Egypt. At the same time, the residents of Fayoum are lacking of knowledge of how to make the best use of tourism assets. On the contrary, the unchecked waste and meaningless over-exploitation of natural resources is helpless for local development. In addition, their poor use of natural resources leads to a very low participation in the tourism process of Fayoum.[2] But Fayoum, while suffering from poverty, deteriorating environmental conditions and inadequate education, is rich in local community resources and economic assets. Such as the reserve rich in paleontological, archaeological and geographical heritage, Cullen Lake, Wadi Rayan, etc. Therefore, Egypt has created tourism areas and protected areas here, and established pro-poor tourism to connect such an ancient and isolated protected area with other areas, so that residents can get new jobs and better employment opportunities through tourism. Pro-poor tourism tourism not only contributes economically to local communities, but also improved non-economic benefits such as access to infrastructure, empowerment, capacity building, mitigation

[1] Radwan, Hatem Radwan Ibrahim. "The phenomenon of climate change and the hospitality industry in Egypt." Transport 985: 75.

[2] Spenceley, Anna, Ritah Tusabe, Straton Habyalimana, and S. N. V. Rwanda. "Tourism in transfrontier protected areas and poverty reduction." Transboundary Protected Areas Research Initiative Teleseminar. December 10 (2010).

of the environmental and socio-cultural impacts of tourism on the poor. Pro-poor tourism can also help to reform policies and processes by establishing a more supportive policy and planning framework, which can involve more of the private sector and facilitate local participation.[1] Therefore, it can be seen that tourism has always been a unique driving force for Egypt's economic development.

On the other hand, it can be found that Fayoum region is located in a hot desert area with a dry climate and water shortage. Climate warming will seriously interfere with the normal ecological environment, resulting in insufficient precipitation, air pollution, land cracking, tourist experience decline and other consequences. Scholars have also suggested building more eco-huts with improved ventilation, lighting and air circulation to improve the experience of staying in Fayoum.[2] If the local government and practitioners do not take appropriate measures to adapt to climate change in Fayoum, there will be more problems in the future, such as agricultural development caused by climate change and farmers suffering economic losses, the spread of malaria in Fayoum caused economic and human losses, and various social problems caused by water problems. Malaria, in particular, is a persistent problem in Fayoum. Although Egypt has largely eliminated the malaria epidemic in most governorates in recent years, recent studies suggest that malaria is re-emerging in the country, with cases reported in several governorates since 2014, and Fayoum still experiencing an epidemic of mosquito-borne malaria.[3] And rising temperatures have a noteworthy effect on the spread of malaria, and studies have shown that rising temperatures are conducive to the emergence of malaria parasites, which can lead to the re-emergence of malaria problems that have disappeared in the region.[4] The

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[1] Ashley, Caroline, Charlotte Boyd, and Harold Goodwin. "Pro-poor tourism: Putting poverty at the heart of the tourism agenda." (2000).

[2] بسيوني, ياسمين, مسعد جيهان, and هاني نرمين. "Eco-lodging as a Solution for Sustainable Ecotourism Development in Al-Fayoum Egypt: Indoor Air Quality Simulation." الجميلة الفنون لكلية العلمية الدورية 9, no. 2 (2021): 31-51.

[3] Dahesh, Salwa, and Heba I. Mostafa. "Reevaluation of malaria parasites in El-Fayoum Governorate, Egypt using rapid diagnostic tests (RDTS)." Journal of the Egyptian Society of Parasitology 45, no. 3 (2015): 617-628.

[4] Fischer, Lena, Nejla Gültekin, Marisa B. Kaelin, Jan Fehr, and Patricia Schlagenhauf. "Rising temperature and

outbreak of diseases will have a direct negative effect on the health of residents, but also have a negative impact on local tourism. Tourists may avoid places with high infectious diseases and threats to their own safety as tourist destinations, and local poverty alleviation tourism projects may be directly challenged.

Whats' more, there is also the economic impact of water problems. Non-nile Delta tourist sites, which have less developed tourism infrastructure and tourism, are more sensitive to climate change. Egypt itself is extremely water scarce, and projections show a decrease in water availability in 2025 compared with 2012 in all provinces except the Red Sea Province, where water availability is on the rise.[1] Fayoum region has always been famous for its desert scenery and climate. If climate change continues to worsen in the future and rainfall and water resources continue to decrease, insufficiency of water resources will further threaten the normal development of local catering, hotel and tourism.

Therefore, it can be summarized that tourism is affected by climate change in many aspects, but in the final analysis, the most direct impact lies in the economic level, which is the most directly felt by people. Therefore, from this level, the economy is the most fragile aspect to climate change. At the same time, we find that the economic losses caused by climate impact and other factors (such as financial crisis, political turmoil) are often long-term and difficult to detect, their importance and problems are easy to be ignored, and once accumulated serious consequences will be difficult to recover.

3.7. Egypt's Tourism Industry Worsens Global Warming

Finally, let's take a look at the impact of Egypt's tourism on climate change. On

its impact on receptivity to malaria transmission in Europe: a systematic review." Travel medicine and infectious disease 36 (2020): 101815.

[1] Luo, Pingping, Yutong Sun, Shuangtao Wang, Simeng Wang, Jiqiang Lyu, Meimei Zhou, Kenichi Nakagami, Kaoru Takara, and Daniel Nover. "Historical assessment and future sustainability challenges of Egyptian water resources management." Journal of Cleaner Production 263 (2020): 121154.

the surface, it seems that the tourism industry can only be affected by climate change. However, As demonstrated in the chapter above, the tourism industry is affected by climate change and also exerts a subtle influence on the climate, sometimes even in a very exaggerated form. A typical example is the CO_2 emission in tourism. International tourism has a trillion-dollar scale and has a significant impact on the environment. Past quantitative studies on the carbon footprint of tourism have estimated that carbon emissions from tourism account for 2.5 to 3 percent of global greenhouse gas emissions, but these estimates generally do not take into account the carbon emissions generated by transport and catering, infrastructure and retail services in the destination country.[1] Egypt is a very typical example, because Egypt is a big tourism country, developed in air transportation and transportation related to tourism areas, and the number of overnight stay days in Egypt is low (overnight stay means that tourists stay overnight in hotels), so the typical problem that may result is that the carbon emission capacity related to Egypt's tourism industry is very significant compared with other industries and other countries.

In fact, in recent decades, the global tourism industry has experienced tremendous development. The degree of change is so rapid that, coupled with the popularity of aviation industry and the opening of visa application, international tourism has become a very important part of personal life and even national economic development. Tourism is also considered among the fastest expanding sectors in the world. Statistics show that from the 1950s to 2019, the number of international tourists Egypt received skyrocketed from less than 3 million to 1.5 billion, with an average annual growth rate of an exaggerated 6 percent. If we compare it to the growth of national GDP, this sustained high growth rate for several decades has never been recorded in any country. Then we can take a look at the performance of North Africa, because Egypt's tourism is a very typical representative of North Africa's

[1] Lenzen, Manfred, Ya-Yen Sun, Futu Faturay, Yuan-Peng Ting, Arne Geschke, and Arunima Malik. "The carbon footprint of global tourism." Nature climate change 8, no. 6 (2018): 522-528.

tourism, and there are relatively few empirical studies on Egypt's carbon emissions and related tourism, we can take a look at the performance and characteristics of the whole North Africa to better understand Egypt. From the region as a whole, from 1950 to 2019, the number of international tourists in North Africa has seen a huge growth, with an annual average growth rate of 10%, far exceeding the world average level. Egypt has the most developed tourist in North Africa, regarding tourism as an fundamental source of revenue as well as industry and agriculture. In fact, we can find that the tourism market of North African countries represented by Egypt plays a role as a barometer of the world economy to some extent. A lot of information can be obtained by the number of international arrivals and relevant data every year. At the same time, tourism, as the most flexible sector in the economic sector, can do many things that other sectors cannot do. For example, in times of economic crisis and political turmoil, tourism is a major economic source for the society and the country, which can help the national economy out of difficulties. For example, Egypt, a typical representative of North African tourism, has been vigorously promoting tourism after the political turmoil in 2011. The government even directly issued a slogan telling international tourists that travel is very safe and there is no need to worry about security and social problems. For another example, the epidemic in 2020 caused damage to the tourism industry in North Africa, but compared with other sectors, Egypt's tourism industry is almost the fastest to recover. In 2021, Egypt received 8 million tourists, and in 2022, nearly 12 million tourists, an increase of more than 46.2%. The number of tourists is expected to increase by 28% to 15 million by 2023. In an interview, Prime Minister Madbouly was outspoken about the fact that tourism is an indispensable part for the Egyptian economy and the government has been doing everything it can to revive it as soon as possible, such as extending visa on arrival to 180 countries in January 2023.[1] At the same time, as mentioned above, tourism has

[1] “46% increase in Egyptian tourist numbers in 2022” http://eg.mofcom.gov.cn/article/slfw/202303/20230303399138.shtml

created a large number of jobs in the fields of leisure, accommodation, catering and transportation, and has become the most important source of foreign exchange in the North African region represented by Egypt. Therefore, it can be concluded that tourism in Egypt has made outstanding contributions to the improvement of the Egyptian national economy and the living standards of the Egyptian people.

However, we want to put forward a contrary argument here, while the rapid development of tourism, there are many links ignored, such as tourism will promote the greenhouse effect and global warming, a large amount of energy consumption and waste, tourism brings ecological pollution and air pollution. For example, we can find that areas with prosperous tourism tend to have a large amount of electricity consumption. Although they promote economic growth, a large amount of electricity is wasted in the process of use because it does not exist in a form of energy saving, leading to a large amount of unnecessary consumption. In this regard, let's take a look at the situation of Egypt. The result of Egypt's highly developed tourism industry is directly reflected in the carbon dioxide emissions. The statistics of Egypt's tourism department found that tourism-related greenhouse gas emissions accounted for 8% of the country's total emissions.[1] For a country that is less industrialized and developed than the developed countries of Europe, such a high CO2 emission ratio from tourism is enough to illustrate the huge impact of tourism in contributing to global warming and climate change. In fact, the tourism industry all over the world has the potential trend of high energy consumption and energy waste, because there are few regulations clearly indicating how much energy consumption must be controlled within the tourism industry. Moreover, the tourism industry is highly variable, and it is difficult to manage at all levels, which will be covered in the following chapter. Here we must admit that for Egypt and other North African countries, Its most important tourism industry is not only a victim and sufferer of climate change; it is also a major

[1] Lenzen, Manfred, Ya-Yen Sun, Futu Faturay, Yuan-Peng Ting, Arne Geschke, and Arunima Malik. "The carbon footprint of global tourism." Nature climate change 8, no. 6 (2018): 522-528.

contributor to global climate change, and nowhere is this more evident than in its tourism industry. Statistics show that between 1980 and 2014, Egypt's per capita income and electricity consumption have shown a significant upward trend. Over the past 30 years, Egypt's per capita income has increased by 2.6% annually, which is higher than Algeria (0.8%), Morocco (2.5%) and Tunisia (2.2%) in the same period. Egypt's electricity consumption has grown at an average annual rate of 4.5%, Algeria 4.3%, Morocco 4% and Tunisia 3.8%. At the same time, Egypt's CO2 emissions increased by 2.6% a year, Algeria 0.2%, Morocco 2.3% and Tunisia 1.7%.[1] Studies have clearly demonstrated that tourism growth in Egypt has a significant negative relationship to environmental quality, while in Tunisia and Morocco there is no negative impact. Studies have also found an inverted U-shaped relationship between CO2 emissions and income levels in Egypt.[2] Some scholars conducted panel data analysis on 18 Mediterranean countries from 1995 to 2010 to study the relationship among CO_2 emission, energy consumption, economic growth and tourism. The research results also show that tourism in the southern Mediterranean region has a significant and huge negative impact on carbon dioxide emissions.[3] The harsh truth is that while Egypt is developing its economy through tourism, its environmental status is a cause for concern. According to Yale University's 2022 Environmental Performance Index (EPI), Egypt ranks 127th out of 180 countries in the world, down from 94th in 2020, and performs well below other Middle East and North African countries. It can be seen that environmental problems in Egypt in recent years are seriously significant.[4]

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[1] El Menyari, Younesse. "The effects of international tourism, electricity consumption, and economic growth on CO2 emissions in North Africa." Environmental Science and Pollution Research 28, no. 32 (2021): 44028-44038.

[2] Sghaier, Asma, Asma Guizani, Sami Ben Jabeur, and Mohammad Nurunnabi. "Tourism development, energy consumption and environmental quality in Tunisia, Egypt and Morocco: A trivariate analysis." GeoJournal 84 (2019): 593-609.

[3] Gao, Jing, Wen Xu, and Lei Zhang. "Tourism, economic growth, and tourism-induced EKC hypothesis: evidence from the Mediterranean region." Empirical Economics 60 (2021): 1507-1529.

[4] Wolf, M. J, Emerson, J. W., Esty, D. C., de Sherbinin, A., Wendling, Z. A., et al. (2022). 2022 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law & Policy. epi.yale.edu

A closer examination of the reasons for this reveals that Egypt's financial gain is traditionally based on mining (especially oil and oil processing) and private entities (mainly including tourism revenue and services gain from Suez Canal), which do not provide widespread employment. So employment is widely absorbed by other industries such as tourism, construction, and private enterprises.[1] At the same time, it can be found that there is an obvious relationship between Egypt's outstanding economic achievements and energy use. While Egypt continuously increases the utilization of fossil fuels to promote its economic development, and its dependence on oil and gas is increasing year by year. The expanding energy demand makes Egypt the country that has the largest share of natural gas use and the biggest oil consumer in Africa. In terms of oil use, Egypt alone accounts for 20% of Africa's oil consumption and more than 40% of its natural gas consumption, which has led to a dramatic increase of CO_2 emission throughout the country.[2] In fact, the Egyptian government is very concerned about the emission intensity of carbon dioxide, and the government has formulated emission reduction policies in 2030, hoping to reduce the carbon dioxide produced by burning fossil fuels by 10% before 2030. However, as mentioned above, environmental protection is often sacrificed in front of the economy and interests, and people often pay insufficient attention to it. Tourism is one of the most neglected, not least because there are few studies and no reliable, accurate calculations to determine the link between carbon dioxide and tourism. In 2023, researchers from the National University of Malaysia estimated Egypt's CO2 emission and fossil fuel consumption using a new test method. The results showed that a 1% increase in fossil fuel consumption would lead to a 1.02% increase in CO2 emission. In addition, the study also showed that for every 1% increase in tourism activity, In

[1] Al-Riffai, Perrihan, Julian Blohmke, Clemens Breisinger, and Manfred Wiebelt. "Harnessing the sun and wind for economic development? An economy-wide assessment for Egypt." Sustainability 7, no. 6 (2015): 7714-7740.

[2] Raihan, Asif, Monirul Islam Pavel, Dewan Ahmed Muhtasim, Sadia Farhana, Omar Faruk, and Arindrajit Paul. "The role of renewable energy use, technological innovation, and forest cover toward green development: Evidence from Indonesia." Innovation and Green Development 2, no. 1 (2023): 100035.

the long run, carbon dioxide emissions will increase by 0.57%, which clearly indicates a certain quantitative relationship between tourism and CO_2 emission. Although the accelerated expansion of tourism promotes the growth in terms of economy, it reduces environmental quality and directly leads to the increase of CO_2 emission.[1] In the long run, it is unfavorable to the environment, ecology and national development. Through quantitative research, researchers have found a highly positive correlation between tourism and carbon emissions in Egypt. The more tourists go to Egypt every year, the more serious the ecological environment will be destroyed and greenhouse gas emissions in Egypt. The large arrivals directly contributes to the aggravation of climate change. Some scholars directly take the hotel as a case study to explore the relationship between the hotel and catering industry and carbon dioxide in Egypt's tourism industry. For example, Tsai and other scholars took Egyptian hotels as a case study and found that star-rated hotels and hotels with higher service quality in Egypt produced more carbon dioxide,[2] which is also consistent with logical cognition. Star-rated hotels often have more perfect hardware equipment, adequate lighting system and perfect services. A modern five-star hotel has a luxurious pool, gym, elevator, lighting, air conditioning and heating systems, which are big producers of carbon dioxide. The hotel industry is an important aspect that causes the tourism industry to produce a lot of carbon dioxide. A recent hotel research report by the Sustainable Hotel Industry Alliance shows that by March 2023, the global hotel industry's carbon emissions far exceed the global average level. For hotel industry, it is necessary to reduce the absolute carbon emissions by 66% before 2030 and 90% before 2050 to secure the decoupling between the economic growth of hotel industry and CO_2 emission and thus to achieve sustainable development.[3]

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[1] Raihan, Asif, Said Ibrahim, and Dewan Ahmed Muhtasim. "Dynamic impacts of economic growth, energy use, tourism, and agricultural productivity on carbon dioxide emissions in Egypt." World Development Sustainability 2 (2023): 100059.

[2] Tsai, Kang-Ting, Tzu-Ping Lin, Ruey-Lung Hwang, and Yu-Jing Huang. "Carbon dioxide emissions generated by energy consumption of hotels and homestay facilities in Taiwan." Tourism Management 42 (2014): 13-21.

[3] "Sustainable Hospitality Alliance – Advancing responsibility" https://sustainablehospitalityalliance.org/

Therefore, to sum up, the content of this section is that Egypt's tourism industry is not only directly challenged by climate change as mentioned in the previous chapters, but also the source of climate problems. Its influence is mainly reflected in climate impacts such as carbon dioxide emission. Tourism is a major carbon dioxide emitter in transportation, catering, hotel services and other aspects. However, due to its economic promotion effect, it is often more or less ignored.

4. Obstacles to the Development of Tourism in Egypt in the Context of Climate Change

In this chapter, we will analyze the dilemmas faced by the Egyptian tourism industry and tourism market in the face of climate change and the difficulties in dealing with related issues. One might wonder that as a big tourist country, Egypt should be experienced in dealing with problems affecting tourism and should handle them well, because Egypt has the second largest tourist arrivals in Africa (after Morocco). The fact is that the Egyptian authorities often have a lot of difficulties in dealing with problems directly affecting tourism development. These problems are often difficult to solve. Therefore, before we analyze the specific problems facing the Egyptian tourism market in the context of climate change, it is important to take a look at how the Egyptian tourism industry is facing and dealing with problems in other related areas.

First of all, we can take a look at the terrorist attacks mentioned in the previous chapter, which is the most typical example. Every year, terrorist attacks intermittently impact Egypt's tourism revenue and foreign exchange revenue. The Egyptian government is very upset about this but can do nothing about it, because the Egyptian government has been fighting against terrorist attacks for many years. But the shadow of terrorism has always hung over Egypt, and terrorist attacks in Egypt in recent years have tended to target international tourists indiscriminately, which has further reduced the number of international tourists and Egypt's attractiveness as an international tourist destination. In 2017, for example, a typical period in recent years, the Egyptian government announced a moratorium on all tourism activities due to a number of serious terrorist attacks, including the bombing of a church in Cairo, an attack in the Sinai Peninsula and an attack in Luxor, among others. In the attack in the Sinai Peninsula, terrorists bombed a tourist bus, killing three Korean tourists and injuring 14 others. The Egyptian extremist group Jerusalem Supporters issued an "ultimatum"

on the Internet, asking foreign tourists to leave Egypt by February 20. Otherwise they would launch more attacks.[1] The attack on foreigners, the first since the ouster of President Mohamed Morsi, has dealt a new blow to Egypt's tourism industry, which had been showing signs of recovery as the country stabilized and improved after a period of political turmoil. These incidents have resulted in a large number of casualties among innocent people and tourists, which has aroused widespread attention and condemnation from the international community, which has also caused panic among a large number of tourists. Analysts point out that these terrorist attacks directly target the tourism industry, terrorists in order to tarnish the image of Egypt indiscriminately attack any target, and unarmed tourists have become their best targets. In order to ensure the safety of tourists and better restore social and market order, the Egyptian government directly announced the suspension of all tourist activities for that year.

However, on the contrary, what the Egyptian government can do is extremely limited. For example, after the serial bombing attacks on two churches on April 9, 2017, Egyptian President Abdel Fattah al-Sisi made a televised speech on the evening of April 9, announcing that Egypt would immediately enter a 3-month state of emergency.[2] The move was decided after the anti-terrorism meeting of the National Defense Committee and the meeting of the House of Representatives. Discussing the reasons for the imposition of the state of emergency and the current situation, Prime Minister Ismail said in an interview that under the state of emergency decree, the government and state agencies will have more flexibility in confronting terrorists and will make more efforts until the criminals are punished. He added that the punishment of the terrorists who carried out the terrorist act and the masterminds behind it is coming. This is not the first time that a state of emergency has been imposed after a

[1] "Bus Attack Near Egypt's Border with Israel Kills South Korean Tourists" https://www.wsj.com/articles/SB10001424052702303945704579386700257233222

[2] "Egypt Cabinet OKs state of emergency after Palm Sunday church bombings" https://edition.cnn.com/2017/04/10/middleeast/egypt-church-explosion/index.html

terrorist attack. However, aside from comfort work, rescue work and a state of emergency after each terrorist attack, the Egyptian government can do very little to deal with terrorist attacks. The Egyptian government forces have had many battles with terrorists, but still with little success. Back in 2015, when an international airliner full of Russians was shot down by Egyptian terrorists, there was an international backlash, but subsequent efforts to hunt down the terrorists did not have the desired effect. It can be seen that Egypt is unable to guarantee national governance and basic security, which highlights that the government has a great lack of executive power and decision-making power in dealing with major national security issues. When terrorist attacks pose a great threat to the national situation and all walks of life, basic issues such as security cannot be guaranteed. Tourism -- the most vulnerable sector is the one that needs good word of mouth, service and quality experience. Egypt's tourism industry has hardly been immune from terrorist attacks since the 1990s.

In addition, as mentioned in the previous chapter, Egypt's political instability is also an important factor that causes damage to the tourism industry. Since the Arab Spring in 2011, Egypt's political situation has been in turmoil. The internal political struggle of the government and the intervention and interference of external forces have again severely hit the country's tourism industry. Egypt bore the brunt of the popular uprisings across North Africa in 2011. Street uprisings and unrest have put a damper on the arrival of international tourists. Tourism revenue in Egypt shrank from $12.5 billion in 2010 to about $9 billion in 2011, a drop of more than 30%.[1] The direct factor leading to the decline of tourism income is the political instability at the beginning of the year and the ongoing large-scale nationwide riots in Egypt. Before the crisis, tourism could bring in more than 10 billion dollars of foreign exchange income every year, absorb nearly 4 million domestic employment, and indirectly affect more than 10 million employment. As a direct result of the unrest in North

[1] “Egypt 2011 tourism revenues seen down by a third” https://www.reuters.com/article/uk-egypt-tourism-id USLNE7BC03720111213

Africa in 2011, Egyptian visitors plummeted to 9.8 million from 14.8 million the year before. Due to the unrest in Egypt, various countries have issued warnings against tourism in Egypt, the survival and development of a large number of workers dependent on tourism is directly threatened, while tourists leave, the macroeconomic situation in Egypt is also continuing to deteriorate.

In order to alleviate this crisis, the Egyptian government has been focusing on the recovery of the tourism industry as the main task. The Egyptian government has made a lot of efforts to attract tourists, including the promotion of hot air balloon tourism project. However, due to the management level, this project caused a major accident on February 26, 2013, when a hot air balloon accident occurred in the famous tourist spot Luxos. It killed 23 people, including nine Chinese tourists, making it the deadliest hot-air balloon accident in history. In addition, cultural heritage sites such as the pyramids, one of Egypt's most popular tourist attractions, are also suffering. Thefts and excavations of land around Egypt's World heritage sites have been on the rise since the country's unrest began in late January 2011, prompting some archeologists and administrators to worry about the fate of the country's cultural monuments. The National Tourism Administration said such acts were "impossible to prevent". Despite the government's efforts to promote the recovery of tourism, ordinary Egyptians have not enjoyed the fruits of economic policies, inflation remains in the double-digit growth rate, and the purchasing power of the minimum wage has been declining. Due to the devaluation of the Egyptian currency, the purchasing power of 1200 Egyptian pounds was 174 dollars in 2013, only 68 dollars in 2018, shrinking by half. Unemployment remains stubbornly high, at 11.9%. As a consequence of the removal of energy subsidies and austerity policies, the price of diesel, gasoline, natural gas and other energy sources in the country has skyrocketed, driving up the cost of transportation, and as of 2018, 28% of Egyptians were living below the poverty line.[1] It can be seen that although Egypt is trying to overcome the

[1] “Egypt: seven years after the Arab Spring: Hope nurtured in security threats” https://www.sohu.com/a/23

negative impact of political turmoil and national instability on tourism after 2011, many social problems have accumulated and cannot be returned due to the long-standing economic, social and distribution problems of the country itself.

In addition, we can also find out the vulnerability of Egypt's tourism market to such events from the COVID-19 epidemic in recent years. As the most serious public health security event since the 21st century, the COVID-19 epidemic has brought a devastating disaster on the global tourism industry. As mentioned in the previous chapter, Egypt has almost no power to fight back during the epidemic. Like other countries, Egypt's border closure has led to a total collapse of the country's tourism industry. Some scholars estimate that the loss of the country's GDP may reach 0.8% per month, while the absence of tourists leads to a loss of about 1.5 billion US dollars per month[1], while the government loses 1 billion US dollars per month and the COVID-19 epidemic has affected at least 2.49 million people employed in tourism.[2] Egypt's tourism industry, a booming sector that accounts for more than 10% of the country's total employment, has fallen to its lowest level in decades. Academics have calculated how much each household in Egypt will suffer financially during COVID-19. For each month the crisis lasts, household income is estimated to fall by 153 Egyptian pounds (less pessimistic) and 180 Egyptian pounds (more pessimistic), which is between 9 and 10.6 percent of monthly household income per person. The most striking point is with the slump of the tourism, the decrease in Egypt's tourism income accounted for more than half of the decrease in the income of all household types during the duration of the pandemic.[3] On this basis, even if the pandemic lasted only three to six months, the cumulative damage would have a negative impact of

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[1] Breisinger, Clemens, Abla Abdel Latif, Mariam Raouf, and Manfred Wiebelt. "Economic impact of COVID-19 on tourism and remittances: Insights from Egypt." IFPRI book chapters (2020): 56-59.

[2] OECD. (2020). The COVID-19 Crisis in Egypt, Organisation for Economic Co-operation and Development, Paris, France.

[3] Breisinger, Clemens, Abla Abdel Latif, Mariam Raouf, and Manfred Wiebelt. "Economic impact of COVID-19 on tourism and remittances: Insights from Egypt." IFPRI book chapters (2020): 56-59.

2.1% to 4.8% on GDP in 2020. As early as March 19, 2020, the Egyptian president made a decision to suspend all regular international commercial passenger flights until the end of September 2020 due to the worsening of the novel coronavirus in several countries.[1] Later, the number of international flights only decreased but did not increase, which dealt a fatal blow to Egypt's tourism industry.

Then let's take a look at how Egypt responded to this crisis. The Egyptian government initially faced this crisis with a certain amount of confidence, given that Egypt has successfully dealt with various crises in the past: The financial crisis of 2008, the Arab Spring of 2011 and subsequent uprisings and political unrest (not a total success, but at least a return to relative political stability), and the bombing of a Russian airliner in 2015, the worst attack on tourists. After all this, the Egyptian tourism authorities have learned how to quickly get rid of and solve a crisis when it comes. They are ready to promote the increase of domestic tourists and take measures to gradually return foreign tourists. Specifically, in response to the most serious public health security crisis in Egypt's history, the Egyptian government and the relevant tourism authority developed a plan to support the development of the industry and maintain jobs, approved the postponement of the payment and schedule of debts and receivables, and in this way, Workers will be able to exchange electricity, water and gas for tourists, hotels and private airlines for a period of six months, while the government and the oil minister have approved a reduction in the price of jet fuel to as low as 10 cents per gallon, and the central bank has decided to reduce the interest rate on operational loans from 8 to 5 percent. It also decided to reduce real estate taxes for hotels and tourism organizations for six months, and to defer payment of all dues for tourism and tourism organizations for three months and waive fines or deferred benefits. Egypt may regard this crisis as a new challenge but also a new opportunity,

[1] AlAshry, Miral Sabry, and Majid AlKhudari. "The Impact of COVID-19 Pandemic on Egypt's Tourism. New Challenges for Media Houses to Make Awareness for Safety to Travel." Journal of Environmental Management & Tourism 12, no. 8 (2021): 2251-2262.

through which it can adjust tourism-related policies and establish new marketing strategies to rebuild its tourism industry.[1] However, statistics do not lie. The results of the study show that even if Egypt took corresponding actions, Egypt's consolidated national GDP decreased by 0.7% to 0.8% (36 billion to 410 Egyptian pounds) per month during the duration of the global pandemic, and Egypt's tourism revenue was $4 billion in 2020, according to consolidated data. Tourism revenue plunged nearly 70% from more than $13 billion in 2019. A total of 3.5 million foreign tourists visited Egypt in 2020, down 73% from 13.1 million in 2019. Egyptian hotel occupancy rates are only about 10 percent of what they were in 2019. It is reported that even in 2021, when the epidemic began to improve, Egypt's tourism revenue only reached $890 million, more than double that of 2020, but still not recovered from the pre-pandemic figure of $1.3 billion in 2019.[2]

What the Egyptian government can do in the face of the sudden outbreak of the epidemic is to provide some financial support and concessions. However, there is not much the Egyptian government can do to deal with the winter of tourism caused by the spread of the epidemic virus. Moreover, the effectiveness of this policy actually depends on whether the tourism market can recover from the epidemic. As Egypt and the world liberalized its tourism market, Egypt's economic performance also recovered somewhat.

Generally speaking, Egypt's tourism industry is vulnerable in the face of external unexpected factors and adverse conditions. The tourism market is often in a passive position, and it is difficult to make timely and effective responses.This is especially true in the context of climate change in Egypt. As mentioned above, the impact of climate change on tourism is more subtle, subtle and long-term, and it is easier for the

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[1] AlAshry, Miral Sabry, and Majid AlKhudari. "The Impact of COVID-19 Pandemic on Egypt's Tourism. New Challenges for Media Houses to Make Awareness for Safety to Travel." Journal of Environmental Management & Tourism 12, no. 8 (2021): 2251-2262.

[2] “Egypt wants to triple its tourism revenues within three years”https://enterprise.press/stories/2022/09/12/egypt-wants-to-triple-its-tourism-revenues-within-three-years-80912/

government, private enterprises or individuals to ignore its long-term and long-term impact when dealing with it. If the long-term threat brought by climate problem cannot be identified in time and sufficient attention should be paid to it, For Egypt as a whole, this important industry, which accounts for more than 10% of Egypt's GDP every year, is a ticking time bomb in the future. So let's take a look at how Egypt as a whole has responded to the challenges of climate change, and the challenges and dilemmas that Egypt is or will face in dealing with the problems that climate change is causing to tourism or in preventing future problems. How does Egypt, a less developed developing country, cope with climate change, which is a headache for the whole world?

4.1. The Conflict between Tourism Development and Environmental Protection

First of all, let's take a look at the first problem encountered by the national authorities in the process of developing tourism: climate change and environmental issues, which, as mentioned above, directly relate to the basis of tourism - tourist landscape and tourist environmental experience. Let's jump to the conclusion that Egypt's tourism industry has done a very bad job in terms of environmental governance and environmental protection in the context of global climate change. Why is this so? We can first analyze the Egyptian government's policies in terms of environmental protection. In fact, for the research on this aspect, the fact is that few researchers and literature directly focus on the implementation of a specific tourism policy by the government of a country or a region for the problem of climate change, because in the world, except for a few countries that rely heavily on tourism development -- for example, Maldives, the direct contribution of tourism revenue reaches 30% of the national GDP. Few countries have developed a tourism policy specifically to deal with global climate change, except for indirect income of more

than 60%. Therefore, there is not much research data on this, but we can still find some examples in the Egyptian government's sustainable development documents, media interviews, related reports, and environmental governance measures in recent years.

The Egyptian government has begun to realize the importance of environmental protection in many years of practice. As early as the 1990s, the Egyptian government began to take serious measures in environmental protection. At the United Nations Conference on Environment and Development (UNCED) in 1992, the Egyptian Government agreed to adopt the principles of Agenda 21 and became one of the major countries committed to realizing sustainable development strategies. Later, with the assistance of the World Bank, Egypt has successfully developed the National Environmental Action Plan (NEAP), which is considered to be a comprehensive document reflecting the Government's position on environmental protection. The objectives of the NEAP are briefly described as follows: firstly, a comprehensive assessment of the relevant issues using prior available tools and data information; Secondly, projects and planning programmes are identified and priorities are set to address these issues.[1] In summary, Egypt has adopted two major strategies to achieve the goal of environmental protection: legislation and the establishment of specialized agencies and organizations. In 1994, Egypt adopted Law Document No. 4, which aims at managing and organizing the use of natural resources and ensuring their sustainable development and not being threatened by degradation. In 1992, Egypt established the Bureau of Technical Development, the Bureau of Environmental Affairs in 1994, and the State Department of Environmental Affairs in 1997. In the process of developing tourism, Egypt has not forgotten the importance of sustainable development, and has constantly improved its legislation and specialized agencies for

[1] Gomaa, Salwaa Sharawi. "Environmental policy making in Egypt." In Roundtable on Land and Water Management: proceedings, Cairo, 13-15 Dec. 1993. IDRC, Regional Office for North Africa and the Middle East, Cairo, EG, 1994.

environmental protection. One of the core ideas is that the Egyptian government has long realized the importance of sustainable development, and announced in its tourism policy that sustainable development principles should be taken into account in all future tourism planning. Although the climate issue does not occupy too much content in Egypt's tourism policy, it is also mentioned. But that doesn't mean it's not important (and as mentioned above because its impact is likely to be more visible in the future) because it's a key factor in improving the environment, and what you can see over the years is that the Egyptian Tourism Development Board has become a key player, both as a policy maker and as a supervisor of policy implementation, This combination of power and responsibility makes tourism supervision more efficient and reliable. But design is design, practice is another matter, and this policy can only be implemented better if the Tourism Board is able to function within its jurisdiction and is supported by a solid and comprehensive legal document. The fact is that there is very little that Egyptian tourism managers can do about tourism in the more remote natural areas outside the city limits. It is difficult to monitor such tourism behaviour, and even more difficult to change it. In many cases, efforts to implement sustainable development plans are undermined by the lack of key documented environmental protection and assessment policies to manage and protect the natural assets of tourist areas. Therefore, environmental protection in tourism policy should be regarded as a secondary policy to the main tourism policy and play a pivotal role between the fundamental tourism policy and the environmental strategy.

A prime example is the Red Sea Sustainable Tourism Initiative (RSSTI), implemented by the Egyptian Tourism Development Authority (TDA) and funded by USAID. Its main tasks include best practices, Red Sea environmental influence assessment and testing, environmental management systems, and sustainable tourism awareness.[1] The project is fully funded by the United States. Scientific planning for

[1] TDA (2003) Red Sea Sustainable Tourism Initiative. Egyptian Tourism Development Authority. http://www.tda.gov.eg/MainPages/HomeEn.aspx

improvements in tourist areas has been sought in new ways and, in a rare step, guidelines have been taken into account to mitigate the effect of the private sector on the environment. However, the results of the project are still not satisfactory. For example, although the system mentioned that it pays attention to the environmental problems and sustainable development of the Nile, it failed to notice that a large number of cruise ships operating on the Nile all year round have caused harm to the water quality and natural resources of the Nile, and there is a gap between the planning and implementation of the project. At the same time, the operation of tourist sites is directly undertaken by many tourism industry practitioners. The government lacks an overall publicity on environmental protection, and the environmental awareness of local personnel and local environmental management are weak and loose. If the Egyptian government wants to improve the local environmental protection situation, it needs to strengthen local management. Thirdly, from the perspective of government documents and technology, the country does not have a special policy to determine how to evaluate environmental problems and how to implement a set of protection processes, which is poorly documented. For example, for tourism activities in Hurghada Tourism Resort, the government does not have a complete set of waste management programs and environmental audit programs or protocols to carry out environmental assessment.[1] It can be seen that the lack of policies is a huge loophole in the environmental protection of Egypt's tourism industry. The reason may be that Egypt, like other developing countries, lacks professional management knowledge in resource management and tourist management. A large number of natural resources are overused and the carrying capacity of tourist attractions is ignored. This is a problem that needs to be faced by developing countries.

As for climate change, it is the same. The beauty of the environment and the

[1] Helmy, Eman. "Towards integration of sustainability into tourism planning in developing countries: Egypt as a case study." Current Issues in Tourism 7, no. 6 (2004): 478-501.

comfort of the climate are important attractions of Egypt's tourism industry. As mentioned in the previous chapter, climate change will cause long-term and potential damage to Egypt's tourism resources. The Egyptian government mainly makes general statements through the overall environmental protection documents and decrees, which further leads to the lack of attention paid by Egypt to the impact of climate change on tourism. In 2016, Egyptian President Abdel Fattah al-Sisi put forward the ambitious vision of Egypt 2030, which identified three important axes centering on economy, society and environment. To achieve better development of Egypt on the basis of meeting the UN Sustainable Development Goals and the 7-year Sustainable Development Strategy for Africa. It mentioned that Egypt would seek to safeguard the rights of future generations in a safer and more proper way through the rational use of resources, while protecting development and the environment. Egypt is determined to realize the goal by coping with the impacts of climate change, improving the resilience of ecosystems and the capacity to handle natural disasters, switching to more renewable energy sources and adopting sustainable consumption and production patterns.[1] climate change on the destruction of the environment problem is mentioned in it, though, but not as the most important single out discussion. The fact is much more attention are paid in the discussion of economy. Obviously, in terms of the present, The impact of climate change on the environment and economy is not the same at the national level, and as with the other causes of environmental nonsense mentioned earlier, governments are unable to solve all aspects of the problem.

Therefore, to sum up, in terms of tourism policies, the Egyptian government has many shortcomings in dealing with climate change. Just like the destruction of environmental problems caused by other factors, the Egyptian government is unable to deal with climate change effectively due to the following reasons: Firstly, the lack of management expertise makes it impossible to effectively deal with environmental

[1] “Egypt Vision 2030” https://mped.gov.eg/EgyptVision?lang=en

protection problems in professional industries; secondly, the lack of systematic and comprehensive documents leads to the inability to effectively implement environmental protection measures in specific fields; thirdly, the lack of effective assessment and audit processes, and the lack of a set of processes and plans to deal with environmental problems urgently. These problems have resulted in Egypt's tourism industry not being able to properly protect the fragile environment in the context of climate change. Without ecological protection in the future, some small problems may be difficult to solve when the climate problems become more serious.

4.2. The Close Linkage with the Economy Leads to Difficulties in Managing Healthy Tourism Development

This point is very obvious and easy to understand. As a developing country whose economy is driven by tourism, Egypt's national development directly benefits from the development of tourism, and a large number of direct or indirect jobs and job opportunities are directly generated by tourism. Aviation, transportation, service, catering, accommodation and many other industries are more or less related to tourism. Egypt, as a developing country, is favored by its natural advantageous geographical location and has become a great potential tourism power. Egypt is the largest country in Africa. As a country bordering the South Mediterranean Sea, Egypt connects three continents, Europe and Africa and is close to Europe, where people can quickly travel from the Atlantic Ocean to the Indian Ocean. It can also quickly reach some countries in Europe and Asia through Europe. It is a kingdom that occupies a unique geographical location and receives millions of visitors from Europe every year.

Egypt's tourism industry is so indispensable to the country's economic development that it has become one of the core of the country's development, raking in tens of billions of dollars in foreign exchange every year. There is no doubt that the Egyptian government will do its best to promote tourism and address the obstacles to

development. The best example is the case of COVID-19. In 2019, the year before the outbreak of COVID-19, Egypt's tourism income reached a historical peak of 13 billion yuan. Later, it experienced the impact of the epidemic, and the world's tourism industry suffered the biggest winter since the 21st century. Egypt's tourism industry was not spared, and it fell to the bottom of the rock unprecedentedly. The decline was more than two-thirds. Almost every industry related to tourism was shut down: airlines, restaurants, hotels, services, shops. But then we saw how suddenly it all happened. Observing Egypt's economic development before the epidemic, the data showed that Egypt's economic reform still had a good momentum by 2019. By 2019, Egypt's economic reform had achieved good results, and macroeconomic indicators showed a steady and positive trend, with GDP growth rising from 4.3% in 2016 to 5.5% in 2019. It reflects the development trend of GDP growth before and after the COVID-19 pandemic. The national savings rate has risen in line with GDP growth, bottoming out at 6.2% after falling to a near 15-year low of 1.8% in 2017. The labor market has rebounded sharply, with the unemployment rate falling from 12.6% in the first quarter of 2017 when the reform was introduced to 8.1% in the third quarter of 2019.[1] But everything changed after the outbreak of COVID-19 in 2020. Egypt, as the second largest economy in Africa and the largest tourist GDP income country, After the impact of COVID-19, tourism revenue fell by at least $5 billion in FY2019/2020, GDP growth slowed to 3.5% for the whole year (not bad for one of the few countries in the world with positive GDP growth) and foreign exchange revenue fell by 30%. In order to tide over the difficulties, the Egyptian government was forced to make up for the foreign exchange gap through borrowing. In May 2020, the Egyptian government issued 5 billion dollars of international bonds. In May and June 2020, the International Monetary Fund provided emergency loans of 2.8 billion dollars and standby credit facilities of 5.2 billion dollars respectively to help Egypt

[1] World Bank Group. Egypt Economic Monitor, July 2019: From Floating to Thriving – Taking Egypt's Exports to New Levels. World Bank, 2019.

tide over the difficulties. The comprehensive epidemic prevention and control measures in Egypt have led to an increase of 3.6 percentage points in the domestic fiscal deficit to GDP. Besides the severe impact on the economy, the COVID-19 epidemic has also caused a negative effect on the economic reform.

Egypt then tried to reopen tourism to revive its ailing economy. After a complete shutdown of Egypt's tourism industry following Egypt's decisive "state closure" in March 2020, Egypt resumed international flights on July 1 of that year and gradually began to accept international tourists. Cairo International Airport had 153 flights taking off and landing on August 27, with a total of over 180,000 people entering and leaving the country. This is the first small spike in international tourism since the Egyptian government resumed international flights in early July, and the country has managed to recover some of its losses before the end of the year. One of the most important measures to attract foreign tourists is Egypt's decision to abolish visas on arrival for foreigners visiting the country's tourist provinces from July 1 to October 31. To encourage the opening of routes, Egypt's civil aviation Ministry is also offering international airlines a 50% discount for landing and parking fees as well as a 20% discount on ground services. In order to encourage the arrival of international tourists, the Egyptian government specially filmed a video of the Egyptian government carrying out comprehensive disinfection work in tourist attractions during the epidemic period, aiming to tell the world that Egypt is still a safe, reliable and beautiful country and welcomes tourists from all over the world. This video has received tens of millions of views in a short time on YouTube. Meanwhile, Egypt finally opened all its museums and archaeological sites to tourists on September 1, and the mayor of Sharm el-Sheikh, a popular Red Sea resort, recently hosted the first group of tourists from Ukraine, while the Egyptian government is desperately trying to persuade more countries to resume international flights to Egypt. Under the unremitting efforts of the government, Egypt managed to achieve a small tourist recovery by the end of 2020, with annual tourism revenues reaching $4 billion.

Then in 2021, thanks to widespread global vaccination and the reopening of tourism, Egypt managed to rebound in tourism revenues in 2021 alone, reaching $13 billion and returning to the pre-pandemic peak, a feat that no other large African country has been able to achieve. Egypt's GDP, up from $365.2 billion in 2020 from $404.1 billion in 2021.[1]

It can be seen from here that the Egyptian tourism industry is almost a barometer of the economy. During the epidemic period, the recovery of the Egyptian economy was extremely dependent on the development of tourism. In order to restore the normal development of the country, the national government and the Tourism Administration have launched corresponding policies to encourage and tax breaks for tourism-related industries, and strive to rely on tourism to drive the recovery of the national economy. In fact, Egypt's tourism industry has lived up to expectations, successfully recovering in 2021 and 2022, and is expected to continue growing rapidly through 2023.

Here, we take the epidemic as an example to illustrate that Egypt's tourism industry is highly dependent on its economy. In many cases, even though the Egyptian government is well aware that its tourism development strategy or policy may lead to more serious climate or environmental damage, it cannot resist the temptation of economic development. Because when tourism has become the industry with the largest employment and the best development prospect in Egypt, the Egyptian government can only see the benefits and less see the challenges and threats it may bring. For example, as mentioned before, in the process of rapid development of tourism, the environment is sacrificed and only sees short-term benefits while ignoring long-term benefits. Now tourism is the engine of the economic development of the whole country of Egypt. Compared with agriculture, industry and other industries, the influence of tourism on the economy fluctuates greatly, and its income and gains are the most changeable. In the face of emergencies, its growth or loss is

[1] “GDP (current US$) - Egypt, Arab Rep” https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=EG

also the most drastic. It is difficult to have a long-term vision, which leads to the fact that when facing the issue of climate change, the Egyptian government often does not have a clear policy and plan to change the negative impact of tourism, an industry with high energy consumption, high waste and low energy saving. The country's tourism development is almost focused on how to develop more and better tourism resorts in the future, rather than how to develop the tourism industry sustainably and control its damage to the climate and environment. The Egyptian government has vowed to achieve the ambitious assumption of receiving 30 million international tourists by 2028, but has not put forward the question of assessing the capacity of the resort after the expected reception of such a large number of tourists and the corresponding government documents and management policies. It can be seen that Egypt's fanatical pursuit and extreme dependence on tourism often make the country and the government shortsighted, unable to see the huge economic benefits at the same time as it brings negative effects and potential problems, which, if not solved, will cause more serious harm in the future.

4.3. Lack of National Governance Capacity and Experience

In addition, let's take a look at one of the weaknesses of Egypt in dealing with these issues, which is that they don't pay enough attention to it. We will see that although the Egyptian government has had some policies and measures to deal with the challenges of climate change and promote a sustainable way of development, generally speaking, the Egyptian government has not paid enough attention to sustainable development such as environmental damage, the threat of global warming and the impact of tourism development on ecology. Folk tourism operators, direct or indirect tourism practitioners and tourists generally do not pay enough attention to it.

Egypt's total greenhouse gas emissions rose from around 130 million tons of CO2 equivalent in 1990 to 352 million tons of CO2 equivalent in 2019, accounting for 0.73% of global emissions. The country's greenhouse gas emissions increased by

nearly 44 percent between 2005 and 2019, much faster than the world average of 24 percent and bucking the trend of emissions reductions across the 27-nation European Union. Egypt is also a relevant party in UNFCCC and has already ratified the Paris Agreement.[1] Egypt belongs to the Annex I group of developing countries, for which the requirements of the UNFCCC are often less stringent.[2] It is entitled to the support of more developed countries listed in Annex I of the Convention. In the framework treaty, there are clear provisions, Nationally Determined Contributions (NDCS) set out the changes that States parties must make in the coming days to meet agreed targets, and are updated every five years.[3] Let's take a look at Egypt in recent years. From 2005 to 2019, the carbon intensity of Egypt's economy decreased by 23%. In 2019, the carbon intensity of Egypt's economy was 884 grams of carbon dioxide per dollar, which is still much higher than the European Union level and 56% higher than the world average level. Egypt's carbon emissions have far outpaced growth in economic development. From 2005 to 2021, Egypt's one-off energy consumption has grown by 52%,[4] natural gas and oil consumption also maintain steady growth. With the recent discovery of the biggest natural gas field in the Mediterranean region along Egypt’s coast, its energy consumption shows no signs of decreasing in the foreseeable future.

In recent years, we have seen that the Egyptian government is also making efforts to address the issue of climate change. In recent years, the Egyptian government has begun to invest in some renewable energy sources. For example, in June 2022, Egypt updated its national development plan under the Paris Agreement. Egypt needs a rough estimate of $196 billion for climate change mitigation and

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[1] “The Paris Agreement” https://unfccc.int/process-and-meetings/the-paris-agreement

[2] “Parties & Observers” https://unfccc.int/parties-observers

[3] “Egypt’s First Updated Nationally Determined Contributions” https://unfccc.int/sites/default/files/NDC/2022-07/Egypt%20Updated%20NDC.pdf.pdf

[4] “Statistical Review of World Energy” https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

another $50 billion to adapt industries to climate change, an enormous amount of money for any country. As for renewable energy, the share of renewable energy in primary consumption in Egypt will reach 6.2 percent in 2021, up from 5.4 percent in 2005, but the increase is negligible, and the development of renewable energy sources such as solar, wind and hydrogen energy remains extremely slow. Since the beginning of the 21st century, Egypt's GDP growth has been maintained at around 4-5%.[1] In theory, the country's renewable resources should be popularized along with the development of the country's economy. However, in Egypt, we do not see more efforts for the development of renewable energy and climate change. The carbon intensity of Egypt's economy, though down 23% from 2005 to 2019, is still well above the European Union and the world average. On the other hand, the Egyptian tourism industry does not have a unified view of the climate issue in Egypt, and many people do not take climate change seriously. A typical example is that diving operators in the Red Sea often have a poor understanding of climate change. A researcher specifically interviewed more than 150 diving tourists and tourists in the Red Sea. The result shows that most diving operators are aware of the destruction of coral reefs and potential threat to their own tourism market caused by climate change. Few are willing to change. They are more likely to leave or move: about 25% of dive operators say they will close their operations if their main dive sites are severely damaged by climate change in the next five years. The remaining operators said they would continue their business (21 percent) or look for new reefs (25 percent). About 35% of operators said they would close their operations in the next 5-10 years in response to significant climate-induced damage to coral reefs.[2]

To sum up, for some developed countries, such as the United States, traditional

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[1] "GDP growth (annual %) - Egypt, Arab Rep"
https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=EG

[2] Marshall, Nadine A., Paul A. Marshall, Ameer Abdulla, Tony Rouphael, and Amr Ali. "Preparing for climate change: recognising its early impacts through the perceptions of dive tourists and dive operators in the Egyptian Red Sea." Current Issues in Tourism 14, no. 6 (2011): 507-518.

industries such as industry may be the industry that causes the most impact on climate change. However, in Egypt, apart from traditional industries such as industry, agriculture and construction, tourism in Egypt has always been the treasure that Egyptians cannot give up. It is so important and its market is so huge. But behind its savage growth, there are too many problems that are so ignored. There are two kinds of problems. One is the impact of climate change on tourism, and Egypt often does not pay enough attention when dealing with such problems. Then the resulting environmental and climate problems quietly pose a long-term threat to tourism; The second type is the reverse, the damage caused by tourism to the climate. Egypt's short-sighted view in the development of tourism-related industries is not limited to the government level. Many tourism practitioners will not consider the sustainable development and the impact on the environment and climate, but its economic benefits, when operating tourism projects. Even if tourism operators are aware of this prospect, they cannot make effective changes. Scuba diving is the best example. Even if tourism operators are aware that scuba diving will be affected by climate change, there are no good remedial measures to prevent it. In the context of climate change, improving the situation of Egypt's tourism industry requires further efforts by the Egyptian government, more efforts by tourism operators, and even more tourists to realize that their actions will contribute to climate change. At stake is not only the further health of Egypt's tourism industry itself, but also the ability of global tourism to survive climate change.

5. Measures Can Be Taken to Develop Tourism in Egypt under Climate Change

In the last chapter, we have seen the vulnerability of Egypt as a developing country in the face of climate change, its lack of management ability, and its inactive attitude towards climate change. In many cases, the government either cannot realize it or is aware of it but it is difficult to make changes. For ordinary tourism operators, Even recognizing that changes are needed to address climate change, there are limits to what can be done. Therefore, in this chapter, let's make a detailed analysis of how to take the right measures to deal with the threat of climate change from the perspectives of different subjects -- the state and government, tourism practitioners and tourists, and how to better use tourism to achieve economic development and control carbon dioxide emission in the future.

5.1. For Policy Makers

As the direct policy maker, every step taken by the Egyptian government will directly affect the development of all industries. If Egypt wants to protect tourism from the harm of climate change, it should introduce more feasible policies and programs.

One of the most important and feasible steps is to come up with a long-term plan to curb rising carbon emissions every year. In fact, the Egyptian government did make some attempts and achieved some results. In recent years, the Egyptian government has tried to put forward national development plans and energy conservation and emission reduction plans, such as in the updated National Development Plan (NDC). Egypt has set ahead of schedule 2030 emission reduction targets for several sectors, with the electricity sector seeking to reduce CO^2 emissions by 33% (i.e. 70 million tons of CO^2) compared to business as usual (BSU), oil and gas sector to reduce carbon

emissions by 65% (equivalent to 1.7 million tons of CO^2), and a 7% reduction in transport sector emissions (9 million tons of CO^2 emissions).[1]

In addition, the Egyptian government should step up its energy transition efforts and try to use more clean and renewable energy sources. The NDC clearly states the expansion of clean energy network, the development of biomass and cogeneration plants, and the replacement or upgrading of outdated technologies and energy plants, such as the upgrading of traditional fossil fuel plants, are essential for the upgrading of the energy system. You can see that Egypt has recognized the importance of this in recent years and increased its international cooperation, Egypt and Japan, for example, have proposed a potential project in 2022.[2] The aim is to increase the use of blue ammonia. Ammonia can be divided into different categories. The World Energy Council classifies ammonia into three categories: Ash ammonia prepared from fossil energy, blue ammonia prepared from fossilized raw materials and carbon capture and storage technology, and green ammonia prepared from renewable energy. Today, almost all ammonia in the world belongs to ash ammonia, 80% of which is used in agriculture as fertilizer. The large-scale industrial production of ammonia originated from the Haber Process.[3] Since the advent of the Haber process, agricultural yields have soared and the global food crisis has been averted, but the process of producing ammonia ignored the fact that huge amounts of carbon dioxide was emitted.[4] And then someone thought of storing the carbon dioxide for processing, and then the now and the future is very has the potential to produce blue ammonia, Its industrial cost is only 25% more expensive than ash ammonia, so it has considerable future use value.[5]

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[1] "Egypt's First Updated Nationally Determined Contributions" https://unfccc.int/sites/default/files/NDC/2022-07/Egypt%20Updated%20NDC.pdf.pdf

[2] "Toyota Tsusho Presents Blue Ammonia Projects Study to Egypt" https://egyptoil-gas.com/news/toyota-tsusho-presents-blue-ammonia-projects-study-to-egypt/

[3] "The Haber Process" https://chemistrytalk.org/haber-process/

[4] "Uses Of Traditional Grey Ammonia" https://fuelpositive.com/grey-ammonia/

[5] Saygin, Deger, Herib Blanco, Francisco Boshell, Joseph Cordonnier, Kevin Rouwenhorst, Priyank Lathwal, and Dolf Gielen. "Ammonia Production from Clean Hydrogen and the Implications for Global Natural Gas Demand." Sustainability 15, no. 2 (2023): 1623.

Blue ammonia is a low-carbon method that uses steam methane reforming to produce compounds and the principle of blue ammonia is to capture and store more CO_2 to produce pollution-free and carbon-dioxide free ammonia.[1] During the process, hydrogen is first derived as a by-product of carbon dioxide, which is then captured and stored for other industrial production. The resulting hydrogen is then combined with nitrogen under the conditions of high temperature, high pressure and catalyst (Haber Process) to produce ammonia. The combustion of ammonia does not produce any harmful gases and greenhouse gases. So it's another milestone in the future of new energy. Fritz Haber, a German Nobel laureate in chemistry in 1918, could never have imagined that his invention of a process to make ammonia from hydrogen and nitrogen, originally used for agricultural purposes, would one day be converted into a clean fuel for climate change, perhaps in another way.

In fact, hydrogen was originally thought to be the future. Since hydrogen is a clean fuel with no carbon emissions, interest in hydrogen fuel was ignited and a large number of experiments and commercial attempts were seen. However, due to its high manufacturing cost and extremely high transportation and storage requirements, the direct use of hydrogen as a fuel has not been widely marketized. Therefore, people turn to the second option of combining it with nitrogen to generate ammonia gas, which is easier to store and use and has lower cost. Ammonia gas can be converted into liquid gas at -10℃, greatly reducing the difficulty of transportation and storage. Ammonia is far better than hydrogen at this point. Ammonia produced in this way could become the most practicable energy source in the future as investment pours into the Gulf states and tourist countries of North Africa to develop blue ammonia, which is seen as an extremely important clean fuel for heating the power industry, heavy road transport and shipping. In addition, some countries have tried to use green ammonia, which is to produce hydrogen (in the form of electrolytic water, for example) through renewable energy and then react with nitrogen. Such green

[1] “What is blue ammonia?” https://www.thenationalnews.com/business/energy/what-is-blue-ammonia-1.1229125

ammonia is a complete decarbonization product, and it does not even need to use natural gas as raw material. The chemical reaction from beginning to end does not involve carbon element. The decarbonization of ammonia production is one of the most important components of contributing to the goal to realize net zero emission by 2050. In 2020, Saudi Arabia and Japan reached an agreement to complete the world's first shipment of 40 tons of high-grade blue ammonia from Saudi Arabia to Japan. It is believed that the blue ammonia will be transported to refineries for power generation. Olivier Thorel, senior vice president of chemicals at Saudi Aramco, said: "This is another milestone that highlights the possibility of low hydrocarbons and ammonia made from Aramco feedstock. Thus, it could potentially play a role in a low carbon future. Japan, relying heavily on imports of energy resources such as crude oil and natural gas plans to adopt ammonia as a new energy source of power generation and ship propulsion as an important part of its national goal of decarbonizing by 2050.[1] 2019, Saudi Aramco and Sabic Agri-Nutrients received an independent certification to produce blue hydrogen and ammonia products, and were the first company in the world to receive a certificate to produce blue ammonia products. The most recent commercial trade in blue ammonia took place in 2022, when Saudi Arabia exported another shipment of clean, certified blue ammonia to South Korea, according to Saudi Arabia's energy minister Abdulaziz bin Salman: "Through cooperation with the Saudi Basic Industries Corporation (SABIC) and Saudi Aramco, Saudi Arabia is striving to become the world's biggest producer and exporter of clean (blue) hydrogen gas by 2030.[2]

In addition to blue ammonia, hydrogen energy can also be a major investment priority. For example, Dubai is investing heavily in pilot hydrogen energy projects and plans to gain nearly 75% of its energy from clean energy sources by 2050. The

[1] “World’s first blue ammonia shipment opens new route to a sustainable future” https://www.aramco.com/en/news-media/news/2020/first-blue-ammonia-shipment

[2] “Saudi Arabia achieves clean energy milestone as first shipment of ‘blue’ ammonia reaches South Korea” https://www.arabnews.com/node/2216056/business-economy

UAE is developing a detailed road map to make sure it notch up the first position as a hydrogen exporter and tap into the potential of clean fuels. The company is conducting a review of its Green Hydrogen Demonstrator project for carbon-neutral fuel cells on buses in Masdar City and aviation fuel used by Etihad and Lufthansa.[1]

Therefore, the Egyptian government can learn from Saudi Arabia, the United Arab Emirates and other countries, and vigorously invest in clean energy and sustainable energy industry, among which blue ammonia is the new star of the future energy industry. The cooperation with Japan in 2021 is a good start. In the future, we should continue to make greater efforts to introduce appropriate policies to promote investment, and vigorously promote the manufacturing and use of blue ammonia in China by using the technology of developed countries, so as to make contributions to reducing the severe carbon emissions in China. In addition, Egypt should strive to promote the development of new energy sources such as wind power, hydrogen power and solar power. Such technologies should be widely introduced in a country where transportation and industrial emissions account for the highest carbon dioxide emissions in the country. The data show that from 2005 to 2019, Egypt's electricity and heat sector remains the largest emitter of greenhouse gases, with emissions increasing by more than 77 percent since 2005, followed by the transport sector, which is the second largest carbon emitter in Egypt, emitting a staggering 55.3 million tons, according to 2019 data. That is up 76% since 2005, with manufacturing and construction in third place.[2] It can be seen that Egypt's industry and transportation are still the most serious industries in terms of carbon emissions, and the growth of carbon emissions in the transportation industry is particularly astonishing. Since 2005, when the carbon emissions of the transportation industry exceeded that of the manufacturing industry and transportation industry, the transportation industry has

[1] ”Dubai launches pilot green hydrogen project as part of Expo 2020” https://www.thenationalnews.com/business/energy/dubai-launches-pilot-green-hydrogen-project-as-part-of-expo-2020-1.1225941

[2] ANDRE, M. & BRANISLAV, S., 2022. Egypt's climate change policies: State of play ahead of COP27, EPRS: European Parliamentary

occupied the second place in the national carbon emissions of Egypt, and it has not changed and is still growing. The fact that Egypt's transport industry continues to dump huge amounts of carbon dioxide into the atmosphere due to the carbon emissions of air transport and land transport every year must be changed. As mentioned above, the most direct and effective way is to start from fuel burning and clean energy use. The Egyptian government should vigorously promote clean energy and low-carbon travel. Starting with the worst greenhouse gas emitters, such as transportation, electricity and heat, will make it possible to achieve real energy savings, emissions reductions and even carbon neutrality in the future.

The Egyptian government should also push hard for international co-operation. Here again, we have seen some useful attempts by the Egyptian government. For example, in 2022, the Egyptian government hosted the United Nations Climate Change Conference (COP27) in the Red Sea resort of Sharm el-Sheikh. After a day and a night of extra time, The 27th Conference concluded on 20 November 2022. As a conference that emphasized "implementation", it finally adopted dozens of resolutions, among which the establishment of the Loss and Damage Fund, which will be used to compensate vulnerable countries for the damage caused by climate change, was one of the highlights.[1]During the meeting, the Egyptian government indicated that it is strengthening its efforts to improve the environmental situation in the country and to better transition to a low carbon economy. In his welcome speech, the Egyptian Environment Minister stressed Egypt's leadership role in the fight against climate change among African countries and called for the development of tools in finance and science. In addition, the most fascinating aspect of this UN climate change conference is the "loss and Damage "on the agenda. Reactions to the proposal have been mixed. While many low-income and climate-vulnerable countries are seeking compensation for damage caused by climate-induced extreme weather events and support the proposal, industrialised countries are wary of setting up a fund because of

[1] “COP27” https://cop27.eg/#/

the liabilities they may face.[1] Aboulmagd said Egypt, as the incoming COP chair, needed to "navigate" the different positions and had already appointed two ministers to develop plans on how to incorporate "loss and damage" into the formal COP27 agenda. The two ministers are Jennifer Morgan, Germany's Special envoy for International Climate Action, and Maisa, Chile's environment minister Rojas.[2]

We can also look at Egypt's Vision 2030 for a better future for the country. It is one of the few central government development documents that Egypt has put forward in recent years that embraces sustainable development and a commitment to green development. Egypt's President Abdel Fattah al-Sisi proposed the plan in 2016, which will guide the country's future through economic and political reforms. The government's strong investment in economic reform and green urban development has cleverly protected Egypt during the COVID-19 pandemic. The European Commission also praised Egypt's green transition as a good start. The success of Egypt's green transition depends on the effective promotion of green reform measures in the future. To be specific, Egypt vision in 2030 has power and the development of green measures including the sustainable development of various projects, control the Egyptian industry pollutant quantity and emission reduction measures, control, climate change, air pollution management in project.[3] The measures are aimed at reducing pollution in the transport sector and in the solid waste treatment sector, as well as boosting fuel conversion rates. Egypt has also issued a sovereign green bond, becoming the first country in the Middle East and North Africa to issue green bonds to fund green projects.[4]

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[1] Liselotte, Jensen. "Understanding Loss and Damage: Addressing the unavoidable impacts of climate chan ge." (2022).

[2] “Egypt working to prioritize 'loss and damage' at COP27” https://www.reuters.com/business/environment/e gypt-working-prioritize-loss-damage-cop27-2022-09-28/

[3] “Greater Cairo Air Pollution Management and Climate Change Project” https://projects.worldbank.org/en/p rojects-operations/project-detail/P172548

[4] “Supporting Egypt’s Inaugural Green Bond Issuance” https://www.worldbank.org/en/news/feature/2022/03/0 2/supporting-egypt-s-inaugural-green-bond-issuance

But looking back, we still have to realize that The Egyptian government's actions and measures are still insufficient. The Climate Action Tracker rated Egypt's climate policy level as "highly inadequate". Although Egypt, as the host of the United Nations climate Conference COP27 in 2022, submitted the first update document of the Paris Agreement targets at the conference, which added the part about emission reduction targets that had not been included in the NDC before, so it seems sincere this time, but the fact is that this update has not brought any substantial improvement. And because emissions continue to rise in absolute terms, even more than would be expected under the policies currently in place. As a result, as of August 8, 2022, The latest date for the assessment, The CAT rated Egypt's climate change efforts as seriously inadequate.[1] The evaluation on June 8, 2022 Egyptian CAT, lack of transparency in The NDC released at present due to Egypt can already without introducing any new policy of The new target of The so-called, But this kind of target is meaningless, because according to this policy, by 2030, Egypt's carbon emissions will be 50% higher than the current level. According to CAT's prediction, Egypt's carbon emissions will be controlled between 15-40% by 2030. Therefore, Egypt's energy conservation and emission reduction plan cannot help it achieve real emission reduction. At the basic level of policy, Egypt has already exposed big problems; At the same time, Egypt's stated new goal is conditional on international support, but does not specify the composition of unconditional elements, Egypt needs to further explain the details of its policy measures, rather than just an ambiguous framework, and it needs to put forward a clear and stronger target to truly achieve the requirements of the Paris Agreement. CAT also makes a sharp case that Egypt is moving in the right direction, but slowly and with weak willpower: it has abandoned plans to build coal-fired power and is looking to invest in renewable energy, but on a much smaller scale than in gas; In addition to slowly developing the new energy industry, Egypt is actually expanding its domestic use of fossil gas. As a country that accounts for more than one-third of

[1] “Climate Action Tracker on Egypt” https://climateactiontracker.org/countries/egypt/

the total consumption of fossil gas in Africa and the second largest natural gas producer on the African continent, Egypt clearly regards fossil gas as a "bridge fuel" and strives to get out of the transition to new energy. But what we see now is a growing dependence on fossil fuels and a very uncertain future. Even though Egypt joined the global methane pledge in 2022 and announced in the updated NDC that it will reduce emissions from the oil and gas sector to less than half of 2015 levels in the future.[1] But it is unclear whether these measures are sufficient to achieve in 2030 to meet 30% of reducing methane emissions global goal, especially given that Egypt's oil and gas production is still growing, And its biggest methane-emitting sector, the agricultural sector, is not yet included in the NDC.

In order to comply with the 1.5°C limit of the Paris Agreement, CAT recommends that Egypt should quickly come up with an unconditional target and policy to stabilize emissions at today's levels by at least 2030 and make them inclusive of all sectors and economic sectors, rather than simply limiting them to levels below BAU. Its conditional goal should be to reduce emissions by about 25 percent from current levels by 2030. Other ratings agencies have also shown the Egyptian government to be doing little on climate change. The Climate Change Performance Index (CCPI) also gives Egypt a middle-grade rating overall, with varying ratings in different categories, but overall it does not score well: very low on renewable energy, medium on climate policies, and particularly high on greenhouse gas emissions.[2]

Therefore, we can see that Egypt, as a major tourist and economic country in Africa, should play a more exemplary role. Although as a developing country, Egypt's carbon emissions are small compared with those of other developed countries, Egypt's carbon emissions rank second in Africa and remain high all the time, and its economic development is also third in Africa. Egypt should make more contribution to emission

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[1] “Global Methane Pledge” https://www.globalmethanepledge.org/

[2] “Climate Change Performance Index” https://ccpi.org/country/egy/

reduction within its own capacity. Although the government has taken some measures and plans to reduce emissions in recent years, it still cannot prevent the fact that Egypt's carbon emissions are still rising in recent years. Egypt should make greater changes. In addition, Egypt should introduce more transparent documents on promoting sustainable development in legislation and administration, not just general government policies, but more feasible policies on controlling carbon emissions from transportation and industry, as well as agriculture, which has not been mentioned. In addition, It is more encouraged to promote the development of more energy-saving industries, and to encourage scientific and technological innovation and industrial upgrading. These are more specific, comprehensive and transparent policies.

5.2. For Tourism Practitioners

Of course, national policies are the most important influence, which does not mean that when national policy makers try their best to realize energy-saving and emission reduction policies and reduce the damage of greenhouse gases to all industries, tourism practitioners can do nothing or simply accept the constraints of policies. As tourism practitioners, they need to have a long-term vision. They need to realize that they are directly involved in the first operation of the tourism industry, and that they are fully capable of making some changes accordingly, not only to protect the long-term development of the tourism industry and their own pocketbooks, but also for the better of the country and the world.

For example, as mentioned above, the hotel industry is the best example. From the perspective of climate change, the hotel industry is both a victim and a contributor. In the face of climate change, the hotel industry practitioners should not only rely on the efforts of the government but do nothing. Globally, the hospitality sector of tourism alone accounts for 5% of carbon dioxide emissions and 14% when other

greenhouse gases are taken into account.[1] If you look at the hotel industry alone, CO2 emissions can reach 21%.[2] Given that most of Egypt's hotel customers are tourists, the carbon footprint of Egypt's tourism industry should be taken seriously. In fact, for hotel managers in Egypt, they are also increasingly aware that as a major carbon emitter, the hotel industry has the responsibility and obligation to reduce carbon emissions. Some Egyptian scholars also conducted a questionnaire survey on industry practitioners, including the hotel industry, to check the attitude and cognition of relevant practitioners on climate change. The survey results show that, The majority of hotel managers interviewed (71.4%) agreed that climate change is a real problem and that they believe a potential solution is needed to address it. And 57.1% of hotel managers don't think climate change is an inevitable problem because of the way modern society works. 85.7% of hotel managers believe that the government should play its neglected role and allocate additional funds to manage climate change, that central government and the tourism sector always play a key role in identifying and promoting climate change action in the tourism sector, and that action should be implemented at the local level.[3] It can be seen that hoteliers have generally recognized that they, as participants in the tourism and hotel industry, directly influence the process of climate change. However, more people think that this is not a big problem, and it should be done by the government to deal with climate change. The survey also showed that the majority of hoteliers (57.1%) are not sure whether all types and types of hotels are ready to meet and manage the impacts of climate change, because climate change is not a priority for hoteliers, they are more concerned about profit. The government here should call for more publicity and directives to help hotel

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[1] Scott, Daniel, Bas Amelung, Susanne Becken, Jean-Paul Ceron, Ghislain Dubois, Stefan Gössling, Paul Peeters, and M. Simpson. "Climate change and tourism: Responding to global challenges." World Tourism Organization, Madrid 230 (2008): 1-38.

[2] Kyriakidis, A. L. E. X., and J. Felton. "Too hot to handle? The hospitality industry faces up to climate change." In The Travel & Tourism Competitiveness Report. Geneva: World Economic Forum. 2008.

[3] Mather, Sue, David Viner, and G. R. A. H. A. M. Todd. "Climate and policy changes: Their implications for international tourism flows." Tourism, recreation and climate change 22 (2005): 63-85.

operators adapt to climate change.[1] Since we have discussed above what governments can do to prevent climate change, we will not repeat it here. Taking hoteliers as an example, let's take a look at what the hotel industry, which has the closest relationship with tourism, can do to address climate change.

There is no doubt that society and all relevant sectors, including the business sector, will encounter varying degrees of difficulty in adapting to all possible climate changes. Therefore, there should be an initial solution, as government policy makers should play a guiding role, and formulate emission reduction plans for relevant hotel chains and hotel leaders. After the introduction of relevant mitigation programs and response programs, all hotels should strive to implement corresponding changes, mainly by changing their greenhouse gas emission patterns and setting targets and specific time frames to achieve them. The natural environment is an asset not only to the hotel business, not only to the tourism industry, but also to future generations. All hotel managers should be convinced that the changing climate is a reality and that there is a need to work together to reduce the impact of global warming by addressing the root causes. After the relevant publicity and requirements of the government are clear, hotel managers can do a lot of things, such as buying new technology or developing new technology to solve the problem of high energy consumption gas emissions, the core of which is to replace or update the old equipment, all kinds of old equipment is an important source of carbon emissions, especially kitchen appliances listed as high energy consumption. Hotel managers can introduce and improve better quality, more energy efficient kitchen equipment. Managers can also purchase environmentally compatible energy-efficient cars and new energy vehicles to transport tourists, in a responsible way to control daily unnecessary carbon dioxide emissions. The hotel can also use clean energy, such as wind and solar power, as an alternative to fossil fuels, although the use of renewable energy is very, very low in

[1] Becken, Susanne. "Harmonising climate change adaptation and mitigation: The case of tourist resorts in Fiji." Global environmental change 15, no. 4 (2005): 381-393.

Egypt. Lighting is also another key area that can effectively help hotels reduce their carbon footprint. Many high-end hotels have decorated their lobbies with splendor and splendor to attract customers, but the waste of carbon emissions caused by lighting is easily overlooked. On this point, Egypt can learn from other developed countries. Australia, for example, banned incandescent light bulbs in hotels and switched to fluorescent bulbs, which use less energy.[1] This type of light bulb uses the least energy and therefore produces fewer greenhouse gas emissions, whereas many hotels in Egypt still use incandescent and halogen bulbs introduced more than 100 years ago. Although these bulbs have a lower initial cost, they tend to have a short lifespan and need to be replaced once they have reached their lifespan. And they use more electricity than other energy-efficient bulbs to produce the same amount of brightness. In this regard, hotels in Egypt should learn from the hotel industry in other developed countries and use more energy-saving measures and equipment, which is the best way to tackle greenhouse gas emissions at source.

It is encouraging to see that hotels in some parts of Egypt are already making changes and experimenting. For example, Sharm el-Sheikh, a world-famous tourist destination that will host the United Nations Climate Change Conference in 2022, established a green hotel certification system in 2022. Out of 137 hotels in Sharm el-Sheikh, only 24 are currently certified green. Only seven of them achieved the green 5-star certification, which covers 180 points: using and recycling single-use plastics, using solar and renewable energy to generate energy, improving air conditioning units and reducing their energy consumption. Although only seven of the hotels achieved the high level of green certification, this is a positive trend for Egypt, as it demonstrates the growing recognition among hoteliers that climate change is not just a matter for national policy makers, but for everyone.[2]

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[1] Kyriakidis, A. L. E. X., and J. Felton. "Too hot to handle? The hospitality industry faces up to climate change." In The Travel & Tourism Competitiveness Report. Geneva: World Economic Forum. 2008.

[2] "Egypt's Sharm El Sheikh hotels given 6 months to get green certification" https://www.thenationalnews.com/mena/egypt/2022/01/25/egypts-sharm-el-sheikh-hotels-given-6-months-to-get-green-certification/

Beyond hotels, there's transportation. Accommodation, transport and facilities are among the sectors that contribute most to climate change. The tourism sector is a major user of air transport and, at the same time, air transport is a major contributor to greenhouse gas emissions from the tourism sector, which is estimated to account for around 40% of CO2 emissions from the tourism sector. The aviation industry's emissions from burning fossil fuels are similar to those from other sources, but what is unusual in the aviation industry is that a large proportion of the greenhouse gases emitted by aircraft engines are at high altitude, raising important environmental concerns about their global impact.[1] The most important thing for EgyptAir to do now is to reduce the greenhouse gas emissions from the fuel consumption of its flights, and if conditions permit in the future, it should also use green fuel to travel. We see that airlines around the world, especially in Europe and North America, are striving to implement relevant emission reduction measures in the field of sustainable development. Egyptair, Africa's second-largest airline after Ethiopia, should set a good example. What EgyptAir can do now is to increase the use and reduce the cost of sustainable aviation fuel (SAF) and slowly make it mainstream in the future of aviation fuel. Egypt has tried similar things, such as in July 2019, a flight of EgyptAir from Washington to Cairo, in which Egypt made a new record of the longest flight using SAF as the power source. In order to achieve the UN's Sustainable Development Goals, a dedicated Commission on Sustainable Development was also established in 2019 to ensure that environmental goals are a core part of its services. In the exact words of the operator's chairman and CEO, Captain Amr Nabil, “EgyptAir is launching many awareness activities about its initiatives for sustainability such as the operation of the longest flight powered by 30/70 blend of Sustainable aviation fuel and conventional kerosene. At EgyptAir, we are committed to the sustainable development of the industry in conducting our business. Our fleet

[1] Hall, C. Michael, and James Higham. "Introduction: Tourism, recreation and climate change." In Tourism, recreation and climate change, pp. 3-28. Channel View Publications, 2005.

modernization plan contributed to reducing our fuel consumption by 20% and decreasing our total CO2 Emission."[1] Although Egypt's aviation emissions cut will certainly not happen overnight, But we are also pleased to see Egypt's aviation industry, one of the biggest contributors to greenhouse gas emissions, taking steps to tackle climate change. In the future, I believe that more passenger planes in Egypt will start to use sustainable green fuel, and the use of SAF will become more popular.

So to sum up, there are a lot of things that Egyptian tourism workers can do, not just those in the hotel and transportation industry, but all industries can make changes in their own fields. Climate change is not the business of developed countries, nor is it the business of a single country, let alone the business of the government. Every member of the tourism industry is an executive and a participant in reducing emissions. If every tourism operator can invest more in reducing energy waste, improving energy efficiency and using renewable energy, Egypt's tourism industry in the future will not be a drag on the country, but a benchmark industry to promote national emission reduction.

5.3. For Travelers

Finally, let's take a look at what the consumer in tourism, the tourist, can do in the context of global climate change. Although it has to be admitted that as a tourist, unlike the national government or tourism operators either have real power or directly participate in the operation of tourism, tourists can do very little, but this does not mean that as a tourist can not make a difference.

The first thing tourists can do is to choose a low-carbon way of travel, such as taking passenger planes with less carbon emissions, or taking trains, buses and other means of transport with less carbon emissions compared with air travel. From the perspective of tourists, this will have little impact on the carbon emissions of the

[1] “EgyptAir: Sustainability Is An Integral Part Of Our Mission” https://simpleflying.com/egyptair-sustainability-interview/

whole country or region. But if the use of low-carbon travel becomes fashionable, it may encourage the market to produce more green, environmentally friendly and low-carbon transport options. Just like the current electric vehicle market, no one would have thought that today's automobile market would see the sudden rise of electric cars 10 years ago, because now more and more people choose to buy electric cars to travel, which is the symbol of future emission reduction, environmental protection and green. In contrast, the same is true for air travel. However, due to some technical reasons and objective economic reasons, the aviation industry does not do enough in the application of renewable energy and sustainable development. In this way, more tourists need to take the initiative to realize that for their own travel, It may not be that much of a difference between a more powerful passenger jet and a small, environmentally friendly one, but if every traveler chooses an airline or flight that focuses on low-carbon development, each small choice could lead to a gradual transformation of the entire industry in the future, just like the development of electric cars. No matter how the technology develops and how the national policy supports it, only when consumers truly accept this alternative product in the automobile market can it enter the market and even become the mainstream of the market. It is hard to see any airline in Egypt implementing the low-carbon travel policy. The recent good news is that at the COP27 summit in 2022, Egypt's Minister of Civil Aviation confirmed that Egypt will transition from traditional energy to renewable energy, rational use of electricity and reliance on solar energy in the future. The second is the trend towards reducing aircraft emissions and the use of biofuels to achieve minimum carbon emissions, around which EgyptAir will develop in the future. Therefore, tourists will have more choices when they travel to Egypt in the future. Tourists will also have more opportunities to choose low-carbon and environment-friendly passenger planes that use SAF as fuel, which is of great convenience for Egypt to curb carbon emissions and reduce global greenhouse gases.

Secondly, tourists can also avoid unnecessary energy waste in daily travel, such

as turning off lights and choosing low-carbon transportation tools, such as buses instead of taxis. This is all voluntary, so it's hard to count the effects of climate change, but it's just presented here as a possible way to be an option when facing climate issues.

It is true that tourists cannot implement or participate in carbon emission planning like the national government and tourism industry. They can only change their behavior passively or voluntarily to reduce carbon emissions. But this is not important. What is important is whether the tourists are aware of the fact of climate change and whether their tourism is directly or indirectly affected by climate change. Their different tourism behaviors may eventually affect climate change itself, if the tourists can clearly know this, And willing to do their part to fight climate change, I think things will be a lot better. On this point, some scholars have conducted a survey on tourists' understanding of climate change, and the result is not so ideal. The result shows that most tourists as individuals do not want to make their own changes to the climate like other sectors of the society, even if it is just some simple things.[1] Similarly, other studies show that changing tourist behavior is the biggest challenge to reduce the carbon footprint of tourism industry in the short and medium term, because most tourists do not believe that they should pay for climate change behavior, and they generally believe that dealing with climate change should be mainly managed by the government, other operators of tourism industry or other relevant sectors of society. The data clearly shows which of the tourists think should bear the responsibility for tackling climate change: The tourists interviewed believed that the responsibility for tackling climate change should be borne by industrialized organizations (38.4 percent), national governments (33.3 percent) and local governments (15.4 percent), while the proportion of individuals in tackling climate change was lower (8.6 percent), followed by international organizations (4.3 percent).

[1] Radwan, Hatem Radwan Ibrahim. "The phenomenon of climate change and the hospitality industry in Egypt." Transport 985: 75.

Many domestic tourists said they had never received any information about climate change and environmental knowledge from the units where they worked.

To sum up, it can be seen that the awareness of improving tourists' attention to carbon emissions and controlling carbon emissions in the process of tourism is generally quite weak. In the future, if Egypt truly realizes the control of carbon emissions and the development of low-carbon tourism, it is closely related to whether tourists can realize low-carbon tourism.

6. Conclusion

To sum up the content of this paper, the first chapter of this paper firstly carries on a comprehensive review and introduction to the tourism industry of Egypt, and finds that Egypt is an ancient civilization with a splendid history and culture. Since the 20th century, with the development of industry, aviation and other transportation developed, the tourism industry has gradually been developed. In the 21st century, it has begun to accept more and more international tourists. It has become one of the most popular tourist destinations in the Mediterranean region.

Chapter 2 firstly introduces the possible damage and impact of climate change on tourism. With the continuous development of global industry and the outbreak of various industries with high energy consumption, carbon emissions are also rising. Tourism, an industry that often depends on beautiful scenery and good climate but has a huge market, has been affected to various degrees. Although this point is easy to be ignored in the last century or at present, with the intensification of global warming and greenhouse effect, climate problems will have further impacts on tourism in the future. The paper specifically analyzes the damage to natural environment caused by climate change, the interference to human tourism activities, the impact on water resources distribution, the migration of residents in tourist destinations caused by climate change, the occurrence of extreme weather induced by climate change, and the most important point is that climate change may cause damage to the economy. All of the above examples will cause disruption or shock to the tourism industry, which is a fragile industry. It also analyzes the fact that tourism itself may contribute to climate warming and become a participant in global climate change.

The third chapter introduces the impact of Egypt's tourism industry in the face of global climate change. The paper respectively discusses the facts of climate change on Egypt's water resources, ecological environment, promoting sea level rise, leading to temperature rise, increasing the risk of spreading infectious diseases in tourist

destinations, and the impact on Egypt's economy. This chapter comprehensively analyzes the challenges Egypt's tourism industry is facing in the face of the objective fact of climate change, and concludes that Egypt's tourism industry is actually quite vulnerable to the new challenges of climate change.

The fourth chapter mainly analyzes the obstacles Egypt encountered when taking measures to solve the problem under the background of climate change. The conclusion is that Egypt does not deal well with the relationship between tourism and other objective factors, which leads to the failure to make a good response to the problems caused by climate change. The main point is that, first, Egypt has done a poor job of protecting the environment, and that its behaviour shows its inability to deal with the longer term, more difficult "alternative" environmental problem of climate change, whether because of a lack of environmental expertise or some administrative means. In addition, the paper also analyzes that since tourism is an important means of economic development and an important source of national financial revenue, Egypt often needs to vigorously develop tourism, but the means are blind, high energy consumption, waste, and short-sightedness further worsens this phenomenon, leading to the continuous expansion of Egypt's tourism to the destruction of the environment and climate change problems. In the end, it is mentioned that Egypt, as a developing country, lacks the ability to govern and solve problems in response to international challenges. Even after joining the Paris Agreement of the United Nations to limit greenhouse gas emission, the emissions still cannot be well controlled in accordance with the agreement, and the greenhouse gas produced by fossil fuels still increases substantially every year. The country's sustainable development strategy is also rather thin and unsystematic, and Egypt has not made more effective and practical attempts to deal with climate change in the future.

The fifth chapter theoretically presents the measures Egypt can take in the face of the increasing threat of climate change. The paper discusses the relevant feasible

measures from the perspective of policy makers, tourism practitioners and tourists respectively. For policy makers, the Egyptian government needs to put forward more feasible, concrete and transparent guidelines and national plans to encourage sustainable development and renewable energy use in specific areas. For example, the use of blue ammonia or green ammonia is the most likely way to replace traditional fossil fuels as a pollution-free and sustainable energy source in the future. The Egyptian government should step up its investment and lead the way. Then, the paper analyzes the attempts that practitioners in the industry in direct contact with the tourism industry can make. Taking the hotel industry, which is a major carbon emitter in the tourism industry, as an example, it analyzes the ways that practitioners in the tourism industry can improve carbon emission equipment and operate hotels reasonably, energy-saving and efficiently to achieve emission reduction and low-carbon development. For example, improving lighting equipment, using energy-saving light bulbs, improving high-energy kitchen appliances, using green and energy-saving cars to transport tourists, etc. Finally, the paper also tries to consider how to reduce carbon emissions from the perspective of tourists, which is the most easily ignored link. People used to think that tourists can do little in the face of climate change, but the paper analyzes the fact that only when tourists have formed a good, sustainable and green travel concept, Only then can the tourism market truly realize the transformation from high energy consumption and high pollution to low energy consumption, green and sustainable.

Egypt's tourism industry, as an important source of the country's financial revenue, is also an industry that creates a large number of jobs. In today's world, under the background of increasing climate change, Egypt's tourism industry is faced with many new problems, which may never happen before, such as sea level rise, beach degradation, extreme climate, etc. Only by facing the problems we face and seriously thinking about solutions, Policy makers, tourism industry practitioners and tourists should be aware that they can contribute to climate change and be willing to

work for it, so that the future climate change problem in the world can be improved. Egypt, as a tourist destination, has a direct interest in this aspect and should make better changes and attempts before it is too late.

Bibliography

Books

United Nations World Tourism Organization (UNWTO). UNWTO Technical manual: Collection of tourism expenditure statistics. 1995.

Becken, Susanne, and John E. Hay. Tourism and climate change: Risks and opportunities. Vol. 1. Multilingual Matters, 2007.

Leidner, Rüdiger. The European tourism industry: a multi-sector with dynamic markets: structures, developments and importance for Europe's economy. Vol. 727. Office for Official Publications of the European Communities, 2004.

Change, IPCC Climate. "Impacts, adaptation and vulnerability." Part A: global and sectoral aspects. Contribution of working group II to the fifth assessment report of the intergovernmental Panel on Climate Change 1132 (2014).

Lamei, Aya. A technical-economic model for integrated water resources management in tourism dependent arid coastal regions: the case of Sharm El Sheikh, Egypt. CRC Press Inc., 2010.

Dubinsky, Zvy, and Noga Stambler, eds. Coral reefs: an ecosystem in transition. Springer Science & Business Media, 2011, 552 p.

Dasgupta, Susmita. The impact of sea level rise on developing countries: a comparative analysis. Vol. 4136. World Bank Publications, 2007.

Schwartz, Maurice, ed. Encyclopedia of coastal science. Springer Science & Business Media, 2006, pp. 678-684.

Dasgupta, Susmita. The impact of sea level rise on developing countries: a comparative analysis. Vol. 4136. World Bank Publications, 2007.

OECD. (2020). The COVID-19 Crisis in Egypt, Organisation for Economic Co-operation and Development, Paris, France.

World Bank Group. Egypt Economic Monitor, July 2019: From Floating to Thriving

– Taking Egypt's Exports to New Levels. World Bank, 2019.

Hall, C. Michael, and James Higham. "Introduction: Tourism, recreation and climate change." In Tourism, recreation and climate change, pp. 3-28. Channel View Publications, 2005.

Journal articles

Hall, C. Michael, and Alan A. Lew. Understanding and managing tourism impacts: An integrated approach. Routledge, 2009.

OECD (2018), “Egypt”, in OECD Tourism Trends and Policies 2018, OECD Publishing, Paris. https://doi.org/10.1787/tour-2018-en

张金平．中东恐怖主义的历史演进〔M〕．昆明：云南大学出版社 2008：95．96．

刘晶， 恐怖主义对埃及旅游业的影响及政府的应对措施．内蒙古民族大学学报 2011. 03.030

Koenig U, Abegg B,"Impacts of Climate Change on Winter Tourism in the Swiss Alps", Journal of Sustainable Tourism, Vol.5,No.1, 1997, p.46-58.

Daniel S, Geoff M et al.,"Climate change and the distribution of climatic resources for tourism in North America", Climate Research, Vol.27,No.2, 2004, p.105-117.

Regehr, E.V., Lunn, N.J., Amstrup, S.C. and Stirling, I. (2007) Effects of earlier sea breack up on survival and population size of polar bears in western Hudson Bay. J. Wildl. Manage., 71, 2673–2683.

Monnett, C. and Gleason, J.S. (2006) Observations of mortality associated with extended open-water swimming by polar bears in the Alaskan Beaufort Sea.Polar Biol., 29, 681–687.

Fukushima, T., M. Kureha, N. Ozaki, Y. Fujimori, and H. Harasawa. "Influences of air temperature change on leisure industries – case study on ski activities –." Mitigation and Adaptation Strategies for Global Change 7 (2002): 173-189.

Scott, Daniel, Bas Amelung, Susanne Becken, Jean-Paul Ceron, Ghislain Dubois, Stefan Gössling, Paul Peeters, and M. Simpson. "Climate change and tourism: Responding to global challenges." World Tourism Organization, Madrid 230 (2008): 1-38.

Atay, Itri, and Òscar Saladié. 2022. "Water Scarcity and Climate Change in Mykonos (Greece): The Perceptions of the Hospitality Stakeholders" Tourism and

Hospitality 3, no. 3: 765-787. https://doi.org/10.3390/tourhosp3030047

沈敬雄. 嘉陵江流域径流对土地利用及气候变化的响应研究[D]. 四川农业大学, 2022.DOI:10.27345/d.cnki.gsnyu.2022.000235.

Hübner, Anna, and Stefan Gössling. "Tourist perceptions of extreme weather events in Martinique." Journal of Destination Marketing & Management 1, no. 1-2 (2012): 47-55.

Cevik, Serhan, and Manuk Ghazanchyan. "Perfect Storm: Climate Change and Tourism." Journal of Globalization and Development 12, no. 1 (2021): 47-61.

Gössling, Stefan, C. Michael Hall, and Daniel Scott. "The challenges of tourism as a development strategy in anera of global climate change." Rethinking development in a carbon-constrained world. Development cooperation and climate change (2009): 100-119.

周美丽,陆甲,黄雪松,李艳兰.广西 2009 年气候特点及其影响评价[J].广西农学报,2010,25(06):35-38.

严芳芳. 气候变化对广西经济的影响及适应对策研究[D].广西师范学院,2016.

Rhiney, Kevon. "Geographies of Caribbean vulnerability in a changing climate: Issues and trends." Geography Compass 9, no. 3 (2015): 97-114.

Cevik, Serhan and Ghazanchyan, Manuk. "Perfect Storm: Climate Change and Tourism" Journal of Globalization and Development 12, no. 1 (2021): 47-61. https://doi.org/10.1515/jgd-2020-0015

Burke, Marshall, and Vincent Tanutama. Climatic constraints on aggregate economic output. No. w25779. National Bureau of Economic Research, 2019.

Gallup, John Luke, Jeffrey D. Sachs, and Andrew D. Mellinger. "Geography and economic development." International regional science review 22, no. 2 (1999): 179-232.

Gómez-Gras, D. et,al. "Population collapse of habitat-forming species in the Mediterranean: a long-term study of gorgonian populations affected by recurrent marine heatwaves." Proceedings of the Royal Society B 288, no. 1965 (2021):

20212384.

Hughes, Terry P., James T. Kerry, Mariana Álvarez-Noriega, Jorge G. Álvarez-Romero, Kristen D. Anderson, Andrew H. Baird, Russell C. Babcock et al. "Global warming and recurrent mass bleaching of corals." Nature 543, no. 7645 (2017): 373-377.

Burke, Marshall, Solomon M. Hsiang, and Edward Miguel. "Global non-linear effect of temperature on economic production." Nature 527, no. 7577 (2015): 235-239.

Kelman, Ilan, Justyna Orlowska, Himani Upadhyay, Robert Stojanov, Christian Webersik, Andrea C. Simonelli, David Procházka, and Daniel Němec. "Does climate change influence people’s migration decisions in Maldives?." Climatic change 153 (2019): 285-299.

Berchin, Issa et,al. "Climate change and forced migrations: An effort towards recognizing climate refugees." Geoforum 84 (2017): 147-150.

Molton, James S., Paul A. Tambyah, Brenda SP Ang, Moi Lin Ling, and Dale A. Fisher. "The global spread of healthcare-associated multidrug-resistant bacteria: a perspective from Asia." Clinical infectious diseases 56, no. 9 (2013): 1310-1318.

MacFadden, Derek R., Sarah F. McGough, David Fisman, Mauricio Santillana, and John S. Brownstein. "Antibiotic resistance increases with local temperature." Nature Climate Change 8, no. 6 (2018): 510-514.

Cowper-Smith, Allan, and Danuta De Grosbois. "The adoption of corporate social responsibility practices in the airline industry." Journal of sustainable tourism 19, no. 1 (2011): 59-77.

Becken, Susanne, and Murray Patterson. "Measuring national carbon dioxide emissions from tourism as a key step towards achieving sustainable tourism." Journal of Sustainable tourism 14, no. 4 (2006): 323-338.

Nakhla, Dalia Adel, Mohamed Galal Hassan, and Salah El Haggar. "Impact of biomass in Egypt on climate change." (2013).

El-Raey, Mohamed. "Impacts and implications of climate change for the coastal zones of Egypt." Coastal zones and climate change 7 (2010): 31-50.

Lamei, A., P. Van der Zaag, and E. Von Münch. "Basic cost equations to estimate unit production costs for RO desalination and long-distance piping to supply water to tourism-dominated arid coastal regions of Egypt." Desalination 225, no. 1-3 (2008): 1-12.

Gössling, Stefan, Paul Peeters, C. Michael Hall, Jean-Paul Ceron, Ghislain Dubois, and Daniel Scott. "Tourism and water use: Supply, demand, and security. An international review." Tourism management 33, no. 1 (2012): 1-15.

Kerr, Richard A. "Confronting the bogeyman of the climate system." Science 310, no. 5747 (2005): 432-433.

Porter, James W., and Jennifer I. Tougas. "Reef ecosystems: threats to their biodiversity." (2001): 73-95.

Wilkinson, C. "Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre." Townsville 296 (2004). pp. 67-78.

El-Raey, Mohamed. "Impacts and implications of climate change for the coastal zones of Egypt." Coastal zones and climate change 7 (2010): 31-50.

Ali, Abdel-hamid AM, Mohamed A. Hamed, and Abd El-Azim. "Heavy metals distribution in the coral reef ecosystems of the Northern Red Sea." Helgoland marine research 65, no. 1 (2011): 67-80.

Lesser, Michael P., John C. Bythell, Ruth D. Gates, Ron W. Johnstone, and Ove Hoegh-Guldberg. "Are infectious diseases really killing corals? Alternative interpretations of the experimental and ecological data." Journal of experimental marine biology and ecology 346, no. 1-2 (2007): 36-44.

McWilliams, John P., Isabelle M. Côté, Jennifer A. Gill, William J. Sutherland, and Andrew R. Watkinson. "Accelerating impacts of temperature‐induced coral bleaching in the Caribbean." Ecology 86, no. 8 (2005): 2055-2060.

Collingham, Yvonne C., and Brian Huntley. "Impacts of habitat fragmentation and

patch size upon migration rates." Ecological Applications 10, no. 1 (2000): 131-144.

Cantin, Neal E., Anne L. Cohen, Kristopher B. Karnauskas, Ann M. Tarrant, and Daniel C. McCorkle. "Ocean warming slows coral growth in the central Red Sea." Science 329, no. 5989 (2010): 322-325.

Crosby, M. P., A. Abu-Hilal, A. Al-Homoud, J. Erez, and R. Ortal. "Interactions among scientists, managers and the public in defining research priorities and management strategies for marine and coastal resources: is the red sea marine peace park a new paradigm?." Environmental Challenges (2000): 581-594.

Khalaf, M. A., and M. Kochzius. "Changes in trophic community structure of shore fishes at an industrial site in the Gulf of Aqaba, Red Sea." Marine Ecology Progress Series 239 (2002): 287-299.

Burke, Lauretta, Katie Reytar, Mark Spalding, and Allison Perry. Reefs at risk revisited. Washington, DC: World Resources Institute, 2011.

Smith, Joel, Leland Deck, Bruce McCarl, Paul Kirshen, James Malley, and Mohamed Abdrabo. "Potential impacts of climate change on the Egyptian economy." Report of a study implemented under the UN Climate Change Risk Management Joint Programme funded by the UN MDG Fund and the Finnish Government, prepared for the United Nations Development Programme (UNDP) with the Government of Egypt, UNDP, Cairo, Egypt (2013).

Toimil, et,al. "Estimating the risk of loss of beach recreation value under climate change." Tourism Management 68 (2018): 387-400.

IPCC (2007) Climate change 2007: synthesis report. Contribution of working groups I, II and III to the fourth assessment report of the Intergovernmental Panel on Climate Change. In: Pachauri RK, Reisinger A (eds) Core writing team. IPCC, Geneva, p 104

Church, John A., N. J. White, J. R. Hunter, and K. Lambeck. "A post-IPCC AR4 update on sea level rise." Antarctic Climate & Ecosystems CRC (2008).

Nicholls, Robert J., Susan Hanson, Celine Herweijer, Nicola Patmore, Stéphane Hallegatte, Jan Corfee-Morlot, Jean Château, and Robert Muir-Wood. "Ranking port cities with high exposure and vulnerability to climate extremes: exposure estimates." (2008), p10.

El-Raey, Mohamed, K. R. Dewidar, and Mamdouh El-Hattab. "Adaptation to the impacts of sea level rise in Egypt." Mitigation and adaptation strategies for global change 4 (1999): 343-361.

El-Raey, Mohamed, Omran Frihy, Samir M. Nasr, and K. H. Dewidar. "Vulnerability assessment of sea level rise over Port Said Governorate, Egypt." Environmental Monitoring and Assessment 56 (1999): 113-128.

Olefs, M., H. Formayer, A. Gobiet, T. Marke, W. Schöner, and M. Revesz. "Past and future changes of the Austrian climate – Importance for tourism." Journal of Outdoor Recreation and Tourism 34 (2021): 100395.

Elsayed, Mona Rabea Abd Elfattah. "The Impact of Climate Change on International Tourism: Evidence from Egypt." International Journal of Energy Economics and Policy 13, no. 2 (2023): 379.

Scott, Daniel, Geoff McBoyle, and Michael Schwartzentruber. "Climate change and the distribution of climatic resources for tourism in North America." Climate research 27, no. 2 (2004): 105-117.

Liu, Jiandong, Guangsheng Zhou, Hans W. Linderholm, Yanling Song, De-Li Liu, Yanbo Shen, Yanxiang Liu, and Jun Du. "Optimal strategy on radiation estimation for calculating universal thermal climate index in tourism cities of China." International Journal of Environmental Research and Public Health 19, no. 13 (2022): 8111.

Amelung, Bas, Sarah Nicholls, and David Viner. "Implications of global climate change for tourism flows and seasonality." Journal of Travel research 45, no. 3 (2007): 285-296.

Darwish, K. H., M. Safaa, A. Momou, and S. A. Saleh. "Egypt: land degradation

issues with special reference to the impact of climate change." Combating desertification in Asia, Africa and the middle east: proven practices (2013): 113-136.

Rothenberg, Marc E. "The climate change hypothesis for the allergy epidemic." Journal of Allergy and Clinical Immunology 149, no. 5 (2022): 1522-1524.

Sajadi, Mohammad M., Parham Habibzadeh, Augustin Vintzileos, Shervin Shokouhi, Fernando Miralles-Wilhelm, and Anthony Amoroso. "Temperature, humidity, and latitude analysis to estimate potential spread and seasonality of coronavirus disease 2019 (COVID-19)." JAMA network open 3, no. 6 (2020): e2011834-e2011834.

Agrawala, Shardul, Annett Moehner, Mohamed El Raey, Declan Conway, Maarten Van Aalst, Marca Hagenstad, and Joel Smith. "Development and climate change in Egypt: focus on coastal resources and the Nile." Organisation for Economic Co-operation and Development 1 (2004): 1-68.

Nakicenovic, N., J. Alcamo, G. Davis, B. De Vries, J. Fenhann, S. Gaffin, K. Gregory, A. Grubler, T. Y. Jung, and T. Kram. "A special report of Working Group III of the Intergovernmental Panel on Climate Change." Emissions Scenarios 570 (2000).

Cantin, Neal E., Anne L. Cohen, Kristopher B. Karnauskas, Ann M. Tarrant, and Daniel C. McCorkle. "Ocean warming slows coral growth in the central Red Sea." Science 329, no. 5989 (2010): 322-325.

Bigano, Andrea, Jacqueline M. Hamilton, and Richard SJ Tol. "The impact of climate change on domestic and international tourism: a simulation study." (2006).

Sobaih, Abu Elnasr E. "Hospitality employment issues in developing countries: The case of Egypt." Journal of Human Resources in Hospitality & Tourism 14, no. 3 (2015): 221-243.

Radwan, Hatem Radwan Ibrahim. "The phenomenon of climate change and the hospitality industry in Egypt." Transport 985: 75.

Spenceley, Anna, Ritah Tusabe, Straton Habyalimana, and S. N. V. Rwanda. "Tourism in transfrontier protected areas and poverty reduction." Transboundary Protected Areas Research Initiative Teleseminar. December 10 (2010).

Ashley, Caroline, Charlotte Boyd, and Harold Goodwin. "Pro-poor tourism: Putting poverty at the heart of the tourism agenda." (2000).

بسيوني, ياسمين, مسعد جيهان, and هاني نرمين. "Eco-lodging as a Solution for Sustainable Ecotourism Development in Al-Fayoum Egypt: Indoor Air Quality Simulation." الجميلة الفنون لكلية العلمية الدورية 9, no. 2 (2021): 31-51.

Dahesh, Salwa, and Heba I. Mostafa. "Reevaluation of malaria parasites in El-Fayoum Governorate, Egypt using rapid diagnostic tests (RDTS)." Journal of the Egyptian Society of Parasitology 45, no. 3 (2015): 617-628.

Fischer, Lena, Nejla Gültekin, Marisa B. Kaelin, Jan Fehr, and Patricia Schlagenhauf. "Rising temperature and its impact on receptivity to malaria transmission in Europe: a systematic review." Travel medicine and infectious disease 36 (2020): 101815.

Luo, Pingping, Yutong Sun, Shuangtao Wang, Simeng Wang, Jiqiang Lyu, Meimei Zhou, Kenichi Nakagami, Kaoru Takara, and Daniel Nover. "Historical assessment and future sustainability challenges of Egyptian water resources management." Journal of Cleaner Production 263 (2020): 121154.

Lenzen, Manfred, Ya-Yen Sun, Futu Faturay, Yuan-Peng Ting, Arne Geschke, and Arunima Malik. "The carbon footprint of global tourism." Nature climate change 8, no. 6 (2018): 522-528.

El Menyari, Younesse. "The effects of international tourism, electricity consumption, and economic growth on CO2 emissions in North Africa." Environmental Science and Pollution Research 28, no. 32 (2021): 44028-44038.

Sghaier, Asma, Asma Guizani, Sami Ben Jabeur, and Mohammad Nurunnabi. "Tourism development, energy consumption and environmental quality in Tunisia, Egypt and Morocco: A trivariate analysis." GeoJournal 84 (2019):

593-609.

Gao, Jing, Wen Xu, and Lei Zhang. "Tourism, economic growth, and tourism-induced EKC hypothesis: evidence from the Mediterranean region." Empirical Economics 60 (2021): 1507-1529.

Wolf, M. J, Emerson, J. W., Esty, D. C., de Sherbinin, A., Wendling, Z. A., et al. (2022). 2022 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law & Policy. epi.yale.edu

Al-Riffai, Perrihan, Julian Blohmke, Clemens Breisinger, and Manfred Wiebelt. "Harnessing the sun and wind for economic development? An economy-wide assessment for Egypt." Sustainability 7, no. 6 (2015): 7714-7740.

Raihan, Asif, Monirul Islam Pavel, Dewan Ahmed Muhtasim, Sadia Farhana, Omar Faruk, and Arindrajit Paul. "The role of renewable energy use, technological innovation, and forest cover toward green development: Evidence from Indonesia." Innovation and Green Development 2, no. 1 (2023): 100035.

Raihan, Asif, Said Ibrahim, and Dewan Ahmed Muhtasim. "Dynamic impacts of economic growth, energy use, tourism, and agricultural productivity on carbon dioxide emissions in Egypt." World Development Sustainability 2 (2023): 100059.

Tsai, Kang-Ting, Tzu-Ping Lin, Ruey-Lung Hwang, and Yu-Jing Huang. "Carbon dioxide emissions generated by energy consumption of hotels and homestay facilities in Taiwan." Tourism Management 42 (2014): 13-21.

Breisinger, Clemens, Abla Abdel Latif, Mariam Raouf, and Manfred Wiebelt. "Economic impact of COVID-19 on tourism and remittances: Insights from Egypt." IFPRI book chapters (2020): 56-59.

AlAshry, Miral Sabry, and Majid AlKhudari. "The Impact of COVID-19 Pandemic on Egypt's Tourism. New Challenges for Media Houses to Make Awareness for Safety to Travel." Journal of Environmental Management & Tourism 12, no. 8 (2021): 2251-2262.

Gomaa, Salwaa Sharawi. "Environmental policy making in Egypt." In Roundtable on Land and Water Management: proceedings, Cairo, 13-15 Dec. 1993. IDRC, Regional Office for North Africa and the Middle East, Cairo, EG, 1994.

Helmy, Eman. "Towards integration of sustainability into tourism planning in developing countries: Egypt as a case study." Current Issues in Tourism 7, no. 6 (2004): 478-501.

Marshall, Nadine A., Paul A. Marshall, Ameer Abdulla, Tony Rouphael, and Amr Ali. "Preparing for climate change: recognising its early impacts through the perceptions of dive tourists and dive operators in the Egyptian Red Sea." Current Issues in Tourism 14, no. 6 (2011): 507-518.

Saygin, Deger, Herib Blanco, Francisco Boshell, Joseph Cordonnier, Kevin Rouwenhorst, Priyank Lathwal, and Dolf Gielen. "Ammonia Production from Clean Hydrogen and the Implications for Global Natural Gas Demand." Sustainability 15, no. 2 (2023): 1623.

ANDRE, M. & BRANISLAV, S., 2022. Egypt's climate change policies: State of play ahead of COP27, EPRS: European Parliamentary

Liselotte, Jensen. "Understanding Loss and Damage: Addressing the unavoidable impacts of climate change." (2022).

Scott, Daniel, Bas Amelung, Susanne Becken, Jean-Paul Ceron, Ghislain Dubois, Stefan Gössling, Paul Peeters, and M. Simpson. "Climate change and tourism: Responding to global challenges." World Tourism Organization, Madrid 230 (2008): 1-38.

Kyriakidis, A. L. E. X., and J. Felton. "Too hot to handle? The hospitality industry faces up to climate change." In The Travel & Tourism Competitiveness Report. Geneva: World Economic Forum. 2008.

Mather, Sue, David Viner, and G. R. A. H. A. M. Todd. "Climate and policy changes: Their implications for international tourism flows." Tourism, recreation and climate change 22 (2005): 63-85.

Becken, Susanne. "Harmonising climate change adaptation and mitigation: The case of tourist resorts in Fiji." Global environmental change 15, no. 4 (2005): 381-393.

Radwan, Hatem Radwan Ibrahim. "The phenomenon of climate change and the hospitality industry in Egypt." Transport 985: 75.

News or magazine articles

Smith, M. (2014) Egypt tourist numbers to rise 5‑10 pct in 2014 ‑ minister. Reuters. Retrieved 9 October 2014. https://www.reuters.com/article/egypt-tourism-idUSL5N0RC3CF20140911

“Bus Attack Near Egypt's Border with Israel Kills South Korean Tourists” https://www.wsj.com/articles/SB10001424052702303945704579386700257233222

“Egypt Cabinet OKs state of emergency after Palm Sunday church bombings” https://edition.cnn.com/2017/04/10/middleeast/egypt-church-explosion/index.html

“Egypt 2011 tourism revenues seen down by a third” https://www.reuters.com/article/uk-egypt-tourism-idUSLNE7BC03720111213

“Saudi Arabia achieves clean energy milestone as first shipment of ‘blue’ ammonia reaches South Korea” https://www.arabnews.com/node/2216056/business-economy

“Egypt working to prioritize 'loss and damage' at COP27” https://www.reuters.com/business/environment/egypt-working-prioritize-loss-damage-cop27-2022-09-28/

Website content

https://data.worldbank.org/indicator/ST.INT.ARVL?locations=EG

https://www.egypttoday.com/Article/6/89481/60-of-tourists-visiting-Egypt-in-2019-came-from-Europe

https://www.worlddata.info/africa/egypt/tourism.php

https://tradingeconomics.com/egypt/tourism-revenues

El Shazly, A., & Soliman, S. (2014). Egypt Experience in Developing the Human Resources in Tourism Sector. Egyptian Ministry of Tourism. https://www.comcec.org/wp-content/uploads/2021/07/1-Egypt.pdf

Egypt Tourism Reform Program. https://egypt.travel/media/2338/egypt-tourism-reform-program.pdf

http://news.cjn.cn/gjxw/201201/t1604835.htm

https://m.gmw.cn/baijia/2022-06/25/1303015100.html

"scubatravel" https://www.scubatravel.co.uk/

"What are Coral Reefs" https://www.coris.noaa.gov/about/what_are/

"Egypt Records 36% Increase in Number of Tourists in 2023" https://top50women.com/egypt-records-36-increase-in-number-of-tourists-in-2023-minister/#:~:text=Egypt's%20tourism%20surged%20by%2035,by%20the%20end%20of%202023.

https://baijiahao.baidu.com/s?id=1688128239203214291&wfr=spider&for=pc

"Hospitality Rebounds" https://www.amcham.org.eg/publications/industry-insight/issue/54/hospitality-rebounds

"46% increase in Egyptian tourist numbers in 2022" http://eg.mofcom.gov.cn/article/slfw/202303/20230303399138.shtml

"Sustainable Hospitality Alliance – Advancing responsibility" https://sustainablehospitalityalliance.org/

"Egypt: seven years after the Arab Spring: Hope nurtured in security threats" h

ttps://www.sohu.com/a/239805121_774535

“Egypt wants to triple its tourism revenues within three years”https://enterprise.press/stories/2022/09/12/egypt-wants-to-triple-its-tourism-revenues-within-three-years-80912/

TDA (2003) Red Sea Sustainable Tourism Initiative. Egyptian Tourism Development Authority. http://www.tda.gov.eg/MainPages/HomeEn.aspx

“Egypt Vision 2030” https://mped.gov.eg/EgyptVision?lang=en

“GDP (current US$) - Egypt, Arab Rep” https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=EG

“The Paris Agreement” https://unfccc.int/process-and-meetings/the-paris-agreement

“Parties & Observers” https://unfccc.int/parties-observers

“Egypt’s First Updated Nationally Determined Contributions” https://unfccc.int/sites/default/files/NDC/2022-07/Egypt%20Updated%20NDC.pdf.pdf

“Statistical Review of World Energy” https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

“GDP growth (annual %) - Egypt, Arab Rep” https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=EG

“Toyota Tsusho Presents Blue Ammonia Projects Study to Egypt” https://egyptoil-gas.com/news/toyota-tsusho-presents-blue-ammonia-projects-study-to-egypt/

“The Haber Process” https://chemistrytalk.org/haber-process/

“Uses Of Traditional Grey Ammonia” https://fuelpositive.com/grey-ammonia/

“What is blue ammonia?” https://www.thenationalnews.com/business/energy/what-is-blue-ammonia-1.1229125

“World’s first blue ammonia shipment opens new route to a sustainable future” https://www.aramco.com/en/news-media/news/2020/first-blue-ammonia-shipment

”Dubai launches pilot green hydrogen project as part of Expo 2020” https://www.thenationalnews.com/business/energy/dubai-launches-pilot-green-hydrogen-pr

oject-as-part-of-expo-2020-1.1225941

“COP27” https://cop27.eg/#/

“Greater Cairo Air Pollution Management and Climate Change Project” https://projects.worldbank.org/en/projects-operations/project-detail/P172548

“Supporting Egypt’s Inaugural Green Bond Issuance” https://www.worldbank.org/en/news/feature/2022/03/02/supporting-egypt-s-inaugural-green-bond-issuance

“Climate Action Tracker on Egypt” https://climateactiontracker.org/countries/egypt/

“Global Methane Pledge” https://www.globalmethanepledge.org/

“Climate Change Performance Index” https://ccpi.org/country/egy/

“Egypt’s Sharm El Sheikh hotels given 6 months to get green certification” https://www.thenationalnews.com/mena/egypt/2022/01/25/egypts-sharm-el-sheikh-hotels-given-6-months-to-get-green-certification/

“EgyptAir: Sustainability Is An Integral Part Of Our Mission” https://simpleflying.com/egyptair-sustainability-interview/

Transport, Energy. "Co_2: moving towards sustainability." International energy agency (2009): 44. https://www.oecd.org/publications/transport-energy-and-co2-moving-towards-sustainability-9789264073173-en.htm

Summary

This paper observes the development characteristics of Egypt's tourism industry under the background of climate change, takes Egypt's tourism industry as the core, discusses some challenges and dilemmas it suffers under the macro background of global climate change, puts forward the difficult problems of Egypt's governance in the face of climate issues and puts forward the aspects that can be improved in the future. The paper can be divided into five chapters.

Egypt is one of the most famous ancient civilizations in the world. In the middle and late 20th Century, the tourism industry began to develop rapidly. Egypt has a favorable geographical position, spanning two continents: the Mediterranean Sea in the north, the Red Sea in the east, close to Europe in the north, Libya in the west and Sudan in the south. The northeast is bordered by Israel and Palestine. The Great Pyramid on the outskirts of Cairo is a must-see classic for many tourists. Many temples in the south of Egypt attract tourists from all over the world with its classical and profound historical deposits. Sinai Peninsula and the Red Sea are the most famous resorts in Egypt, with beautiful scenery and the world's richest natural coral diversity. It attracts thousands of tourists each year who come to soak up the Mediterranean's warm climate, sunbathe and explore scuba diving. Egypt's tourism industry is also a huge source of revenue for the country, reaching a record $13 billion for the first time in 2019, the year before the coronavirus outbreak. Tourism in Egypt has also brought a large number of jobs to Egypt. Millions of jobs have been created in the tourism industry. The government has set up the Tourism Development Board and the Egyptian Tourism Board to supervise the development and normal operation of the tourism industry.

However, the history of Egypt's tourism is not smooth sailing, the article introduces the Egyptian tourism in the development process actually encountered a lot of twists and turns. One big obstacle is the terrorist attacks that have plagued Egypt,

which have been getting more attention since a series of horrific terrorist attacks hit the headlines in 1993. For example, the outbreak of the Arab Spring in 2011 will directly affect the development of tourism in 2011. Compared with 2010, the number of international tourists in 2011 dropped by nearly one third, and then rebounded briefly in 2012. However, in 2013, President Morsi was forced to step down, and the number of tourists declined again. There is a strong correlation between tourism and political problems in Egypt.

This chapter mainly serves as the beginning chapter, describing the general situation of Egypt, such a big tourism country, its tourism development level, tourism income level, favored by international tourists, and easy to be disturbed by some external factors.

The second chapter focuses on climate change, which aims to describe the relationship between climate issues and tourism. Firstly, the paper discusses that climate change has become a real problem in modern society, and the problem is still aggravating. With the industrial revolution and human development, the emission of greenhouse gases began to attract the attention of more and more countries and scholars, and people began to discuss what new challenges the earth and mankind will encounter under the background of increasingly serious climate change.

Then the paper begins to discuss some impacts of climate change on tourism. Firstly, climate change damages the most important ecological landscape and scenery of tourism. Since a large part of tourism and tourism projects are directly based on the unique climate itself, drastic changes in climate may cause damage to tourism experience and even directly affect the survival of tourism projects. Such as glacier travel, beautiful seascapes, aurora viewing, etc.

Later, the article mentions the direct interference of climate change on human activities. In many cities, countries and areas that rely heavily on tourism, such as Maldives, people's normal life and work will be directly affected, people may be displaced, and tourism, national development, national economy and normal order

may be destroyed.

Then the paper further analyzes some indirect impacts caused by climate change, such as the negative impact on water resources. The depletion of water resources and the decrease of water level caused by climate problems are major challenges for many developing countries with drought and water shortage. Climate change directly worsens this problem, and the development of tourism needs a large amount of water resources as support. Water use for hotels, water sports, food farming and agriculture behind the catering industry are all likely to be affected. Coupled with the serious waste of water in tourism, water shortage is likely to become more prominent in the context of climate change.

Then the paper analyzes the extreme weather that climate change may cause. If climate change exists as a background or long-term effect that is sometimes too slow to be felt, sudden bursts of extreme weather are its most immediate impact. The article mentions the fact that small Caribbean island states in Latin America have experienced an increase in extreme weather and large-scale natural disasters since 1880, and cites the results of a survey of tourists after the island experienced extreme weather, which showed that some tourists did not want to return to the island. The article noted that the world is suffering from an increase in climate disasters caused by rising temperatures, and that tourism, a highly sensitive sector, is more vulnerable to extreme weather.

The article then goes on to talk about the more realistic problem, namely the economic problem, the impact of climate change on tourism will be directly reflected in the economic level. Here, the article gives an example of the Guangxi Region of China. As a province with large tourism industry in China, the annual tourism income of Guangxi accounts for a very high proportion of GDP. However, as a region prone to flood disasters every year, Guangxi has been increasingly disturbed by climate change, which is a good example. For example, the article cited the rare cold rain and snow disaster in Guangxi in 2008. The disaster covered a wide area, was of great

intensity and lasted for a long time. It affected the power, transportation, agriculture, forestry and other industries as well as all aspects of people's production and life, with a direct economic loss of 32.175 billion yuan. More than any other such disaster since the founding of China, data showed that the tourism market revenue of Guilin, Guangxi's most famous tourist city, fell by more than 30 percent that year due to frequent extreme weather disasters. To further illustrate the vulnerability of tourism to climate change and its devastating impact on the economy, the paper also lists a number of small island countries in the Caribbean, which are often classified as less developed countries by the United Nations. Unlike China, they do not have excellent national disaster prevention systems and economic resilience, making them more vulnerable to climate disasters. In these regions, tourism accounts for 20 to 90 per cent of gross domestic product. On average, tourism accounts for 30 percent of total employment in these regions. In the Caribbean, the damage caused by Hurricane Ivan to Grenada reached 148 per cent of GDP in 2004, and to Dominica by Hurricane Maria in 2017 reached 260 per cent. Extreme weather is devastating for these countries, and it has been proven that throughout the Caribbean, Vulnerability to climate change is already negatively correlated with international tourism revenues. For Mediterranean countries, climate change is also the most serious problem that damages tourism. Mediterranean countries are typical developing countries, and they are extremely dependent on tourism. Changes in temperature and humidity caused by climate problems will drive away a large number of tourists in the peak season, which will cause a huge blow to national economic development. At the same time, as mentioned above, climate change will cause long-term damage to the ecological environment. For example, the rise of sea water and the destruction of coral reefs caused by climate change will lead to the disappearance of tourist attractions and eventually damage the economy.

Later, the article also mentions a kind of neglected point, that is, the migration of people caused by climate problems, because the unsuitability of climate causes people

in the most affected areas to move to foreign countries. Many of the reasons for their migration are that their tourism-related jobs have been disrupted by climate problems, which has disrupted their job opportunities and normal life, so they have to go to foreign countries, such as Maldives, a pearl on the Indian Ocean, where the most important thing is tourism, and affected by rising sea level, more and more people begin to worry about their future livelihood. Large numbers of indigenous people are moving out of the Maldives every year.

Then, the last part of this chapter also mentions the possible impact of tourism on climate change. As a closely related whole, tourism is not only greatly affected by climate change, but also influenced by its own existence. One of the most well-known is the large amount of carbon emissions from the tourism industry, which has a very serious negative impact on the greenhouse effect and global warming. Among them, the transportation industry (mainly aviation) and the hotel industry make a huge contribution to the global greenhouse effect.

The third chapter specifically analyzes the seriousness of Egypt's climate problem and its impact on tourism. The research shows that Egypt is one of the countries vulnerable to the impact of climate change, and the development of agriculture and tourism in Egypt is closely related to climate change. As far as tourism is concerned, long-term climate problems will first worsen water resources in Egypt, which is one of the most water-scarce countries in the world. The entire Middle East and North Africa countries have the lowest water resources per capita in the world. Egypt's domestic water resources mainly depend on the Nile, and most of its residents and modern cities are located near the coast, at the lower end of the Nile. It is also one of the most developed areas for tourism. To the south of the Nile Delta is Cairo, the largest and most populous capital of Egypt, and to the upper part of the Nile Delta are Egypt's major cities and tourist resorts: Alexandria, Egypt's second largest city, Red Sea resort, Sinai Peninsula, Sharm el-Sheikh. While tourism is an industry that uses a lot of water resources, the article points out that tourists and tourist hotels have a

tendency to waste and excessive water resources. The average length of tourists' stay in Egypt is 6 days, and each tourist consumes about 400L of fresh water every day. Tourists in Egypt's coastal areas consume even more fresh water, from 400L to 500L per tourist. Each room is from 1410 to 2190L. Egypt has already experienced insufficient rainfall under climate change conditions, and the flow of the Nile has been significantly affected, so the normal use of water for tourism will face greater challenges in the future.

Then, the article analyzes the damage of climate change to Egypt's ecological environment. It especially mentions that coral reef, one of the most famous tourist attractions in Egypt, is now suffering serious damage caused by climate change. Egypt has one of the most diverse coral reefs in the world, attracting hundreds of thousands of divers from all over the world every year. It is also one of the most climate-sensitive undersea landscapes, as coral reefs need to grow in brine at 22 to 26℃. The ideal brine concentration is between 32 and 38 ℃ and requires high ambient light, high water clarity, and specific nutrient solution concentrations. Coral reefs are particularly sensitive to temperature changes, and the continuous rise of sea temperature caused by climate warming will directly lead to coral reef bleaching. Data show that in the past 30 years, the degradation of coral reefs in the Red Sea has increased dramatically, especially along the Red Sea coast of Egypt. According to the current data, it is estimated that Egypt's tourism industry will suffer a loss of 19 billion Egyptian pounds by 2030. By 2050, all of Egypt's coral reefs will be under threat.

Then we analyzed the impact of sea level rise caused by climate change on Egypt's tourism industry. The reason why Egypt's tourism industry is affected by sea level rise is that most of Egypt's tourism industry is located near the Nile Delta, which is also the most severely affected area of the world by sea level rise. the Nile Delta and the neighboring city of Alexandria is considered as one of the top 10 cities in the world for exposing its population and lowland nature, Studies show that if sea levels

rise by just one meter, 6.1 million people will be displaced and 4,500 square kilometers of arable land will be lost. Studies also show that if no action is taken, about 30% of Alexandria city will be flooded, 2 million people will be forced from their homes, 195,000 jobs will be lost. Direct economic losses are estimated at $3.5 billion over the next century. So the threat to Egypt from rising sea levels is real and serious.

The article also mentions that the daily temperature rise caused by climate change will interfere with tourism. The development of tourism cannot be achieved without a clean environment and favorable weather conditions. Rising temperatures will cause some previously attractive tourist areas to relocate to areas with more suitable temperatures. High temperatures will also affect the management costs of tourist sites, thus affecting tourism revenues. Summer temperatures in northern European countries are likely to rise sharply in coming decades as a result of global warming, research suggests, heralding more visitors from southern Europe and a rise in domestic tourism, while summer resorts such as Spain, Greece and Turkey, which traditionally draw tourists with sun and sand, are becoming less comfortable because of the heat. This shift means that travel times to these places are likely to shift from summer trips to autumn and winter trips. In the case of Egypt, studies have shown that the number of tourists visiting the country is expected to decrease by about 20% by 2060, which directly leads to a drop in annual tourism revenue of 13-17 billion Egyptian pounds.

In the following sections of this chapter, the paper discusses the increased health risks posed by climate change to residents and visitors in Egypt. The study concluded that there was a direct correlation between temperature and disease. With warmer temperatures and the arrival of large numbers of international tourists, the risk of disease transmission increases.

Finally, the paper discusses the impact of climate change on Egypt's economy and points out that Egypt, as a country sensitive to climate change, will have more

and more impact on Egypt in the future. Studies have shown that Egypt's tourism revenue will decline by 8.4% in 2030 and 19.7% in 2060 due to a combination of climate change and external factors. For example, the coral reef tourism project, which is most sensitive to temperature changes, is a typical example. In the future, the disappearance of coral reefs may cause a devastating blow to Egypt's tourism economy. Projections related to the impact of climate change on Egypt's tourism revenue show that Egypt's tourism revenue will decrease by at least 14.73 billion Egyptian pounds by 2030 and 67.1 billion Egyptian pounds by 2060, including 3.312 billion Egyptian pounds and 14.51 billion Egyptian pounds in reef-related recreation spending. Total annual tourism losses are expected to peak at 106 billion Egyptian pounds in 2060. In addition, when talking about the direct economic impact of climate change on Egypt's tourism industry, we also observed that the economic losses caused by climate change in Egypt have some different characteristics. For example, the economic losses caused by climate change are not easy to recover in a short period of time. Compared with the economic losses caused by financial crisis, it is longer term and more difficult to recover. The article also mentioned the hotel industry profitability, poverty alleviation tourism and other issues in the context of climate change may suffer setbacks.

Finally, the article briefly mentions the impact of Egypt's tourism industry on global warming. Statistics show that both per capita income and electricity consumption in Egypt showed a clear upward trend between 1980 and 2014. Over the past 30 years, Egypt's carbon dioxide emissions have increased by 2.6% a year, much higher than Algeria's 0.2%, Morocco's 2.3% and Tunisia's 1.7%, while electricity consumption in Egypt has grown by 4.5% a year, higher than Algeria's 4.3%, Morocco's 4% and Tunisia's 3.8%. Studies clearly show that tourism growth in Egypt has a clear negative correlation with environmental quality. The harsh truth is that while Egypt is developing its economy through tourism, its environmental status is alarming. According to Yale University's Environmental Performance Index (EPI)

2022, Egypt ranks 127th out of 180 countries worldwide, down from 94th in 2020. It performed much worse than other Middle Eastern and North African countries. It can be seen that in recent years, Egypt relies on tourism to develop its economy while ignoring environmental and ecological problems and emitting a large number of greenhouse gases.

The fourth chapter discusses the obstacles facing the development of tourism in Egypt under the background of climate change, aiming to analyze the difficulties and obstacles that Egypt has suffered in dealing with the problems affecting tourism under the background of climate change. Before analyzing the specific problems facing the Egyptian tourism market in the context of climate change, the article first analyzes the problems faced by the Egyptian tourism industry in dealing with other areas: terrorist attacks, political instability, COVID-19. All these problems are unstable factors that seriously disturb Egypt's tourism industry, reflecting that Egypt's tourism industry is often vulnerable in the face of external unexpected factors and adverse conditions, and the tourism market is often in a passive position. Meanwhile, for the Egyptian government, these problems are very difficult to deal with, and failure to deal with them will bring serious consequences to the development of tourism.

Later, the article describes in detail the conflicts and contradictions between tourism development and environmental protection in Egypt, which are reflected in the fact that the Egyptian government regards tourism as an important source of national government revenue, and often ignores or fails to achieve environmental protection in the process of development. In the face of the destruction of ecological environment, the Egyptian government has done very little. Despite the establishment of the National Environmental Action Plan NEAP and the establishment of the Environmental Affairs Bureau, environmental problems remain severe due to incomplete legislative protection, inadequate policy documentation, and the lack of an institutionalized environmental assessment and review system. For climate change, when climate change causes environmental damage, the Egyptian government cannot

effectively capture the problem, let alone quickly and effectively solve related problems. The government lacks professional knowledge in management for environmental protection and solving climate problems, lacks effective evaluation procedures, and has no specific documents and protection procedures for environmental damage caused by climate problems. These problems lead to Egypt sacrificing long-term ecological and environmental problems to achieve short-term economic benefits when developing tourism. Such behavior is neither desirable nor long-term. If the potential problems of climate change are not addressed, tourism development itself will be adversely affected in the future.

After that, the paper then analyzed that Egypt, unable to resist the temptation of high profits brought by Egypt in the development of tourism, promoted national efforts to develop tourism, and showed no serious attitude towards solving the problems brought by climate change. The country's attention to potential problems such as climate change was far less interested in attracting more tourists, building more 5-star hotels and attracting more investment. Egypt, for example, has set the ambitious goal of welcoming 30 million international tourists by 2028, but it has not addressed the issue of sustainable development after receiving such a large number of tourists, and the relevant government documents and management policies are lacking.

Then the article discusses Egypt's lack of national governance ability and experience when dealing with issues related to tourism. Although the Egyptian government has some policies and measures to deal with tourism, climate change and sustainable tourism development, in general, the Egyptian government does not have good results on sustainable development issues such as environmental damage, the threat of global warming and the ecological impact of tourism development, which can be seen from the rising carbon emissions in Egypt. Egypt does not seem to see climate change as a serious problem. Even after joining the Paris agreement, the country's greenhouse gas emissions increased by nearly 44 percent between 2005 and

2019, much faster than the world average of 24 percent. The country does not have good control over carbon emission and climate warming, and the proportion of fossil fuel burning in the country is still very high. In terms of meeting the requirements of the Paris Agreement and good governance of the country to make it green and sustainable development, Egypt is a failure. Its policy documents and national governance are ineffective and drag the world back. From the signing of the Paris Agreement until 2022, Egypt's carbon emission policy has not been updated, which shows that Egypt has no achievements and experience in managing climate issues.

From the perspective of policy makers, tourism practitioners and tourists, the fifth chapter puts forward some pertinent suggestions to better develop tourism and deal with climate problems under the background of climate change.

For policy makers, this paper argues that one of the most important and feasible steps for the Egyptian government is to show a firm attitude, come up with a long-term plan to curb the rising carbon emissions every year, and realize the transition to clean and green energy. The paper mentions blue ammonia and green ammonia, which are likely to be the next generation of green fuels in the future. The Egyptian government can continue to use new energy sources in the future and achieve carbon decoupling. At the same time, the article points out that Egypt should vigorously promote international cooperation, implement more transparent, specific and sustainable development documents under the supervision of international organizations and the United Nations, and strive to restrain its behavior from the institutional level.

From the perspective of the tourism industry practitioners, the article points out that it is not only the government and policy makers that should realize the healthy development of the tourism industry under the background of climate change. The tourism industry practitioners have the ability and responsibility to make some corresponding changes, which is not only for the protection of the long-term development of the tourism industry and their own wallets, but also for the good of

the country and the world. The article specifically cites the hotel industry, which has a very high carbon emission, as a good example of introducing and improving better quality and more energy efficient hotel equipment, such as switching to energy-efficient light bulbs and solar energy. It also cites the Green Hotel certification system in Sharm el-Sheikh in 2022 as a good example. This is a positive interaction between the government and the tourism industry. In addition, Egypt's aviation sector, as a major carbon emitter in the transportation sector, should also increase the use of sustainable aviation fuel (SAF) and reduce its cost. To its credit, EgyptAir's Boeing 787-9 delivery flight from Everett, Washington to Cairo, Egypt, in July 2019, set the record for the longest flight utilizing SAF. In the future, EgyptAir should make more beneficial attempts in carbon emission reduction.

And finally, individuals as tourists. It may seem like tourists can't make the same changes as national governments and hoteliers, but that's not the case. Even as a small tourist can make a difference. For example, the article points out that tourists can choose a more green and energy-saving way of travel, or at least choose to take a more low-carbon flight. Only when green travel becomes a new fashion and habit actively chosen by consumers, can the tourism market truly usher in a green and low-carbon spring. Therefore, tourists play an important role in guiding the market. Secondly, it is also mentioned that tourists should save energy and avoid unnecessary waste when traveling, such as turning off lights and taking more public transport instead of taxis. After all, whether Egypt can truly control carbon emissions and establish a low-carbon tourism market is closely related to whether tourists can embrace low-carbon tourism.

In short, Egypt's tourism industry, as one of the most important sources of income in Egypt, faces new problems and challenges under the background of climate change, such as sea level rise, coral reef destruction and other problems, which, together with traditional environmental damage, aggravate the difficulty of Egypt's governance. In order to solve these problems, not only the Egyptian government

should pay more attention, but also relevant practitioners and tourists in the Egyptian tourism industry should have the obligation and ability to make their own contribution to the realization of low-carbon and green tourism development. Only when the sustainable and balanced tourism and development are achieved, the future development of Egypt's tourism will be better.