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IMPACT OF CLIMATE CHANGE ON ECONOMIC VULNERABILITY IN THAILAND:
A SOCIO-ECONOMIC-ENVIRONMENTAL STUDY

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ABSTRACT

The purpose of this paper is to study the impact of climate change on Thailand's economic status, focusing on Thailand's tourism industry. Thailand has been identified as being extremely vulnerable to climate-related changes and impacts, and the natural resources of Thailand support economies for the people who live there and beyond. Weather conditions in the country encourage tourists to visit. Significant factors of the climate affecting tourism include, but are not limited to, temperature, precipitation, cloudiness (haze), air quality, pattern of winds, and humidity. Additionally, the ability for visitors to be safe and have easy access are dual conditions under which Thailand can benefit from increasing tourism. As a result, the unique combination of socio-economic, environmental, and political factors puts Thailand in a precarious situation regarding the impacts of climate change. The consequences of climate change in Thailand have changed how humans will now experience the impacts of global climate change. The impacts of accelerated rising sea levels and increasing extreme heat on coastal areas such as Bangkok are threatening to destroy all elements of the economy of Thailand. The government has to develop and implement a strong strategy to mitigate the impacts of climate change and contribute to preventing any further harm to the economy of Thailand, or risk suffering the consequences of multiple significant climate-related disasters.

Keywords: *Climate change; Global warming; Natural calamities; Tourism industry.*

1. Introduction

Climate change impacts how we live every day. Melting ice and snow are causing sea levels to rise, which means that many ecosystems and livelihoods are being put under a lot of strain. Not only are agriculture and industry affected, but also Thailand's tourism sector, which is a key part of Thailand's economy. Climate change is already having serious negative consequences on people's health and daily habits. Changing temperatures, erratic precipitation, rising seas, and increasing occurrences of disasters will all affect the future of tourism. These effects will affect the way people live and how they maintain their health. According to studies done by Sungkaew (2020) and Kaosa-ard (1994), these effects are real and getting worse. Climate change will continue to alter weather patterns globally. With each passing year, we are seeing further evidence of how travel, agriculture, and natural resources are affected by climate change. Heat waves are causing extreme stress in coral reefs, which can lead to widespread bleaching of corals. Many important ecosystems provide Thailand with economic stability and support daily life in the coastal towns of Thailand. Damaged habitat and disappearing resources threaten jobs related to nature. The countries in Southeast Asia that consistently rank among the most vulnerable to climate change are generally the same countries that will be hardest hit by climate-related disasters. Rising sea levels, irregular weather patterns, and increased storms have put additional strain on already vulnerable communities in

Southeast Asia. Quick action can minimize the impact of climate change on people and industries in Southeast Asia (Wongtada, 2017).

Climate change threats are real and increasing daily. Thailand is ranked the 13th country in the world for the risk posed by climate change; it is also the second-largest producer of carbon dioxide in Asia. Despite having a strong economy, Thailand's marine resources are particularly at risk from climate change. The warming of our planet is apparent through rising global air temperatures and sea temperatures, as well as an increase in sea level. The coastal areas generally suffer most from the effects of climate change, because they are isolated, have large populations, rely on coastal areas for their economy, and also have so many natural resources (Chon et al., 1993). Additionally, those who rely on tourism for their livelihood may face considerable risk as a result of the increased impact of climate change. Thus, these communities' income may experience downward pressure as a result of changing weather conditions and deteriorating environmental conditions.

Local economies suffer due to climate change. This happens by reducing the income from tourism and degrading the environment. Climate change also leads to job losses in the fishing and marine trade when either sea temperatures increase or there are increased storms. Many people live in flood-prone areas or have suffered from soil erosion. Where there are plans to adapt to the changing environment, there is slow adjustment and limited resources in some locations. Increased risk from weather changes occurs as weather continues to evolve unexpectedly. Travel decisions are based on the conditions of the weather, wealth of the area, and health of the public. For many years, cooler temperatures and beautiful scenery found in the mountains of northern provinces have attracted Thai tourists. Coastal areas have attracted foreign tourists who relax on beaches with white sand surrounded by vibrant sea life. Tourism reacts strongly to climate change. The government of Thailand has worked hard to ensure its position in the global economy is strong by providing for both regional stability and community wellness (Shafiai & Rashid, 2021).

2. Literature Review

Gibbons and Fish (1988) discovered that in the last twenty years, a record growth of the global economy had occurred, which has had a positive impact on the national development plan of Thailand, that has been able to generate a lot of revenue from attracting many tourists. The report by Shepherd (2002) has also examined the relationship of tourism and ecotourism, and whether the two industries are compatible or mutually exclusive. The primary focus of the Tourism Authority of Thailand is to promote tourism in Thailand. The administrative aspect of the Tourism Authority mainly focuses on business registration and tourism-related operators. That is to say, there are no laws governing specific esoteric aspects of tourism. Henderson (2010) concluded from his research that Thailand is believed to be more resilient than Indonesia due to Thailand's strong image, good infrastructure, and stable economy and economic climate; whereas Indonesia has the added problems of social and political turmoil to contend with. Wongtada (2017) stated that Thailand should attempt to distance itself from its neighbouring countries, in an effort to eliminate tourism from coming from one distinctive demographic and/or cultural group within tourism arrival patterns.

According to Choibamroong (2017), Chinese tourists use agencies to plan their trips, whereas more elite/challenging Chinese tourists travel individually. As a result, many elite travellers encounter issues when crossing the border or interacting with local authorities when travelling in Bangkok. Nevertheless, both types of tourists are equal in terms of their satisfaction with how beautiful the area is as well as the accommodations they stay in. This research offers a possible guide for either the Thai government or the

owners of the Thai tourism industry, regarding how to improve tourism in Thailand. According to Boonying (2018), the majority of those completing his survey reported they were concerned about communication barriers when visiting Thailand. They also indicated that food and other products were very expensive and the majority of them lost a large amount of money during their travels. Most Chinese tourists wanted advanced technologies in their hotel and wanted to work with travel agents in China because they did not want to rely on someone else to manage their travel experiences. Jermsittiparsert and Chankoson (2019) analysed the state of environmental trends in regional tourism in Thailand. They found that there is a significant effect on the Thai tourism industry from the amount of carbon emissions produced through manufacturing and construction, and through other industries.

The responsibility of managing solid waste in tourist destinations is with the local municipalities, as stated in Jotaworn and Nitivattananon's report (2021). The issues related to waste management at tourist sites are primarily due to the vast quantities of waste generated as well as the continual transformation of the sites. According to Fuchs' report (2022), there are significant gaps in how principles to assist stakeholders with effective management of the tourism sector during the COVID-19 pandemic are established, thus providing avenues for potential multidiscipline research on this issue in the future. In addition, Prasongthan (2024) has illustrated in his report how rural tourism can be used to benefit local people, develop plans for future tourism development, ensure community development, and create opportunities for managing rural tourism.

3. Objectives

The data collected for the objectives studied will be used to achieve three major goals:

(i) To evaluate the impacts and vulnerabilities of climate change on the Thailand economy;

(ii) To evaluate how climate change affects the sustainability of the tourism industry; and

(iii) To evaluate the Government's plans and policies regarding mitigating climate change effects.

4. Data and Methods

Study Area

Southeast Asia's Kingdom of Thailand occupies 513,115 square kilometres, bordered by Myanmar, Laos, Cambodia, and Malaysia. Thailand consists of five main areas: the central part and the north, northeast, east, and south. About 49% of Thailand's area consists of agricultural land. In the last four years, Thailand has transitioned rapidly from a low-income to a high-income nation through its economic growth in agriculture, trade and services, and tourism for its approximately 69.8 million people in 2020. The rapid growth of its economy has increased the number of urban residents compared to the number of people who live in Thailand's rural areas. In the Gulf of Thailand, coastal erosion is a significant issue, in comparison to the Andaman Sea, for both the fishing communities and for the major commercial ports and centres along the coast. Climate change and extreme weather will impact new development in Thailand, and an increase in the number of people living along the coast will increase the risk of damage from rising sea levels, flooding, and changing climate conditions, making agriculture and business less viable in the future.

Hypothesis

H01: There is no relationship between the number of tourists visiting Thailand and the country's Gross Domestic Product; and

H1a: There is a positive correlation between the number of tourists to Thailand and the country's GDP.

Design and Approach

This study has been designed as qualitative in nature. It has employed secondary data from government agencies, Thailand's Tourism Authority, international associations, research publications, and peer-reviewed scholarly journal articles.

Data Analysis

Qualitative data analysis methodologies, including descriptive and analytical content analysis (also known as textual analysis), and various other approaches were used to identify the full range of available strategies for addressing climate change and its effect on the tourism sector in particular.

5. Results

Thailand has made significant progress in commerce in recent years. However, the nation faces multiple natural threats: flooding, tsunamis, heavy rainfall, inundation, landslides, wildfires, and epidemic outbreaks. Hydrological events (flooding) and droughts are two of the biggest threats to Thailand. Since the 2004 Indian Ocean tsunami, Thailand has experienced one of the largest natural disasters in human history. Storms are less of a threat in northern Thailand. Furthermore, Thailand's lengthy coastline, varied agricultural systems, and assumptions about severe weather due to climate change all contribute to its vulnerability. Rapid growth in Thailand's economy creates a resulting increase in energy demand. Consequently, the economic disadvantages of geography are expected to have a major effect on Thailand because of the anticipated effects of climate change. Thailand was ranked as the ninth most at-risk country according to the Germanwatch Global Climate Risk Index. Thailand is the second-largest economy in Southeast Asia, after Indonesia. Crop agricultural growth has played an essential role in transitioning Thailand from an agriculture-based economy to an industrial economy since the 1960s. The most vital crop is rice. Thailand also exports a range of other crops including, but not limited to, shrimp, coconuts, maize, rubber, soybeans, sugar, and cassava. Thailand is also the third-largest seafood exporter in the world.

Thailand's top export is electronics and electrical appliances. Due to the effects of climate change, agriculture is also affected, leaving Thailand's farmers and agriculture extremely vulnerable. Farmers are having difficulty keeping up with the increasing temperatures, unpredictable or erratic rainfall patterns, and an increase in severe weather conditions, all due to the worsening effects of climate change. The impact of climate change varies on agriculture within Thailand, with rice being the most affected as it is Thailand's primary crop. Increasing temperature causes rice to grow quicker than it normally would, which leads to shorter growing seasons, thereby subsequently reducing the total number of water resources available to irrigate. These factors will lead to a decrease in output and productivity. Although Thailand is a tropical Southeast Asian tourist destination, it faces great risks to its economy from climate change.

The entire economy of the country is affected by climate changes, including agriculture, trade, and commerce. Some evidence has shown that temperature has changed throughout Thailand since the mid-1950s. Recent studies have shown that these climate changes are primarily responsible for a number of major disasters that have occurred in Thailand, such as heavy rains, flooding and drought, and rising sea levels along the coasts of the country. Flooding is one of the biggest disasters to happen in the country, with the largest economic and humanitarian damage, as Thailand is one of the ten countries in the world with the highest flood risk. Flooding and inundation of farmland affects farmers every year, leading to lost agricultural production, low productivity, large debts, and low incomes.

Table 1. The Long-Term Climate Risk Index (CRI): The 10 Countries Most Affected from 1999 to 2018 (Annual Averages)

CRI 1999–2018 (1998–2017)	Country	CRI Score	Deaths (total)	Deaths / 100,000	Losses (m US$ PPP)	Losses / GDP %	No. of Events (1999–2018)
1 (1)	Puerto Rico	6.67	149.90	4.09	4,567.06	3.76	25
2 (3)	Myanmar	10.33	7,052.40	14.29	1,630.06	0.83	55
3 (4)	Haiti	13.83	274.15	2.81	388.93	2.38	78
4 (5)	Philippines	17.67	869.80	0.96	3,118.68	0.57	317
5 (8)	Pakistan	28.83	499.45	0.30	3,792.52	0.53	152
6 (9)	Vietnam	29.83	285.80	0.33	2,018.77	0.47	226
7 (7)	Bangladesh	30.00	577.45	0.39	1,686.33	0.41	191
8 (13)	**Thailand**	**31.00**	**140.00**	**0.21**	**7,764.06**	**0.87**	**147**
9 (11)	Nepal	31.50	228.00	0.87	225.86	0.40	180
10 (10)	Dominica	32.33	3.35	4.72	133.02	20.80	8

Source: Eckstein, D., Künzel, V., Schäfer, L., & Winges, M. (2020). Global Climate Risk Index 2020, p. 9.

According to the Climate Risk Index published by Germanwatch, Thailand ranks among the most susceptible nations to climate change. The Global Climate Risk Index, which measures the extent of damages caused by extreme weather conditions based on quantifiable criteria, illustrates that changes in regional weather patterns can affect agricultural viability and disrupt businesses from the time they plant to when they harvest their crops. Increased temperatures and humidity can lead to an increase in insect populations, including two types of grubs. The white grub will destroy potatoes, and the brown grub will usually eat crops that are planted in the rainy season. Since Thailand produces the majority of the world's rice and cassava, and a large percentage of the population is dependent upon the agricultural industry, any damage to the agricultural industry due to climate change will have a significant financial impact at every level of the economy. Other key sectors in Thailand that are impacted by climate change are water supply and management, food security, health care, tourism, real estate development, and the maintenance of human peace and security. Climate change will continue to be one of the most significant issues for Thailand because it affects all aspects of the economy and continues to impact the lives of all people living in Thailand.

Less than 1% of global emissions come from Thailand; however, it is one of the top ten countries impacted by climate change, including deforestation and fragmentation of national parks, which will be at risk from increasingly higher temperatures. In addition, Bangkok and its neighbouring provinces are at risk of flooding (due to higher precipitation and dam construction) within the Chao Phraya River Basin. Parts of the world will have unpredictable effects from climate change and will differ according to region. Low-income populations are likely to have a greater challenge moving out of high-risk areas as compared to high-income individuals. The rising sea levels associated with climate change will be one of the significant threats to Thailand.

According to the Department of Marine and Coastal Resources of the Thai government, tropical ecosystems are especially susceptible to change because most tropical organisms have evolved to cope with fluctuating temperature changes, and they cannot adjust to increases in temperature. Climate change has had a very significant impact on the tourism industry in Phuket, Thailand. The combination of economic expansion in the area, a large population of people living in Phuket, along with a significant number of visitors, has resulted in a water shortage within the area (as demand for water has surpassed supply). Small islands, like Phuket, are also at risk due to the impact that sea level rise can have on local coastal regions and on the

tourism industries present within those coastal regions. The impacts to the global environment caused by climate change are all connected to the same factors: an increase in global temperatures, an increase in global sea levels, an increase in the frequency of changing weather and precipitation patterns, and an increase in the number of weather events that have a direct impact on regions frequented by tourists, like Phuket.

Table 2. Arrivals of Tourists in Thailand

Year	Number of Tourists	Year	Number of Tourists
2015	29.90	2020	06.70
2016	32.50	2021	00.43
2017	35.59	2022	11.07
2018	38.18	2023	28.15
2019	39.80	2024	36.10

Source: https://www.statista.com/ · Note: Tourist numbers in millions.

According to Table 2, there was an upward trend in tourist arrivals to Thailand from 2011 until 2019, but there was a decline in 2020 and 2021 due to the effects of the COVID-19 pandemic on tourism in Thailand. There are many attractions that appeal to tourists throughout Thailand, including sandy beaches and palm-tree-lined islands in the south, misty hillsides and temple-ridden mountains in the north, and the constant noise and neon signs of Bangkok alongside its ancient ruins. Many tourists prefer to visit Chiang Mai over Bangkok, primarily due to its slower pace. In addition to its beautiful temples, Bangkok offers tourists a wide variety of restaurants, bars, and nightclubs. According to media reports, Thailand has over 1,400 islands; therefore, only a few have gained international notoriety, such as Koh Phi Phi Island in the Andaman Sea. Koh Phi Phi is made up of two islands, Phi Phi Don and Phi Phi Leh, both of which are known for their natural beauty and world-class diving and nightlife. While Thai tourism is somewhat disproportionate with respect to tourist attractions, the majority of tourists prefer to visit southern Thailand, including the islands and coastal areas. Furthermore, while some visitors may select Ayutthaya, Sukhothai, and Chiang Mai for cultural heritage tourism, the uneven distribution of tourists places significant pressure on the resources of selected locations.

Table 3. Number of Domestic Tourist Arrivals in Thailand, 2023

Month	Number	Month	Number
January	21.92	July	19.79
February	20.34	August	20.14
March	20.36	September	19.51
April	21.41	October	20.75
May	19.73	November	21.62
June	19.18	December	24.32

Source: https://www.statista.com/statistics/1140514/thailand-number-of-domestic-tourists/ · Note: Tourist numbers in millions.

Tourism in Thailand is vital both economically and socially, but it also has negative impacts on the environment. Within the country and globally, it contributes to air pollution (by cars, etc.) and degradation of our oceans (mostly from the tourism industry). Cultural effects from tourism have also been noted, with many areas of Thailand losing their authenticity because of developments related to tourism. All of these issues have led Thailand to gain a better understanding of climate change and how it will affect the country over time. For example, in 2020, there was reduced water availability and food shortages due to climate change. Because they will be unable to withstand such extreme weather events, tourism in Thailand will

suffer economically. In July 2020, a strong tropical storm held up trade and slowed down the local economy. Many tourists cancelled their visits to Thailand because of these changes. This will have a significant impact on the economy of Thailand as well as other areas of the world if we continue to experience severe weather events like this for many years to come.

Table 4. Revenue from Multiple Segments of the Tourism Industry in Thailand

Year	Camping	Cruises	Hotels	Package Holidays	Vacation Rentals	Total
2017	30.76	19.62	1265.00	895.40	391.80	2602.58
2018	34.17	20.17	1285.00	943.10	421.80	2704.24
2019	37.50	20.74	1313.00	999.70	956.40	2827.34
2020	2.17	4.77	624.00	482.40	234.10	1347.33
2021	5.08	1.51	860.60	654.80	249.40	1771.39
2022	30.56	11.84	1142.00	922.00	454.10	2560.50
2023	31.60	17.96	1342.00	1146.00	607.10	3144.66
2024	32.93	19.04	1438.00	1298.00	679.20	3467.17

Source: https://www.statista.com/outlook/mmo/travel-tourism/thailand#revenue · Note: Revenue in million USD.

The previous table discusses the revenue generated by various sectors involved in Thailand's tourism industry. The continuing increase of revenues experienced by the tourism industry will likely have a positive impact on Thailand's economy, but this trend may not hold true for the years 2020–21 due to the effects of the COVID-19 pandemic. Tourism to Thailand will likely not return to pre-pandemic levels for several years. Coral reef bleaching and extended droughts are already impacting the possible growth of Thailand's tourism industry. All three areas—Thailand's Maya Bay, Malaysia's Sipadan Island, and the Philippines' Boracay Island—have already been affected by tourism development, as have many other areas in these countries that no longer allow tourists to visit certain parts while they allow the hardest-hit areas time to recover. Global warming is probably going to affect the number of tourists who are able to travel to Thailand in the summertime.

Table 5. Total Value of Tourism's Contribution to GDP in Thailand

Year	Revenue	Year	Revenue
2017	2825.19	2020	883.03
2018	2964.69	2021	356.11
2019	3028.78	2022	1258.12

Source: https://www.statista.com/statistics/1143427/thailand-value-of-tourism-gdp/ · Note: Value of tourism's GDP in billion Thai baht.

In Thailand, the overall worth of tourism added to GDP is a subject of discussion in Table 5. It shows that the industry has continued to rise, but it did see a decline between 2020 and 2021 as a result of the coronavirus pandemic. Coordinating and integrating several activities, developing and supporting environmentally-sound technologies, and developing infrastructure are critical aspects of establishing stability and impact. Local government involvement through decentralised shared climate governance is paramount in addressing climate change in the future. To address global warming, it cannot be done just with national policy solutions; consumer behaviours need to change in order for an economy to be 'green.' Producers need to respond when market mechanisms are in place.

Table 6. Linear Regression between Gross Domestic Product of Thailand and Tourist Inflow*

Year	Tourist Arrivals	Gross Domestic Product
2015	29.90	40129.62
2016	32.50	41336.42
2017	35.59	45635.68
2018	38.18	50675.42
2019	39.80	54395.67

*Source: https://www.statista.com/ · Note: Tourist arrivals in millions; GDP in crores USD. * Pre-COVID-19 pandemic analysis.*

Table 6(a). Summary Output — Regression Statistics

Regression Statistic	Value
Multiple R	0.976639639
R Square	0.953824985
Adjusted R Square	0.938433314
Standard Error	1507.996323
Observations	5

Source: Calculated by author.

Table 6(b). ANOVA Analysis

	df	SS	MS	F	Significance F
Regression	1	140923516.4	140923516.4	61.9702	0.00427096
Residual	3	6822158.731	2274052.91		
Total	4	147745675.1			

Source: Calculated by author.

Table 6(c). Regression Coefficients

	Coefficients	Standard Error	t Stat	P-value
Intercept	-5159.543873	6588.638848	-0.783097085	0.490701845
Tourist Arrivals	1465.991529	186.2258683	7.87211542	0.00427096

Source: Calculated by author.

According to Table 6(a), the value obtained for R Square was determined to be 0.9538, which indicates a strong correlation between the independent variable X (tourist arrivals) and the dependent variable Y (GDP). Furthermore, as stated in Table 6(b), the p-value (0.004) is less than the critical value at a 5% level of significance ($p < .05$), resulting in the rejection of the null hypothesis of no relationship between tourist arrivals and GDP in Thailand. Thus, it can be concluded that there is a relationship between tourist arrivals and GDP in Thailand.

6. Discussion

Assessing Thailand's vulnerability to three climate change-related hazards (heat, drought, and floods) has been used to create a Climate Risk Map for Agriculture and Food Security. The map also considers the possibility of climate security and regional inequities. The most vulnerable provinces in Thailand for heat stress are Nakhon Ratchasima, Ubon Ratchathani, Buriram, Khon Kaen, Sisaket, Surin, and Roi Et. These provinces are located in northeastern Thailand, with Nakhon Ratchasima being one of the hottest provinces in the country and regularly experiencing extreme temperature, climate, and flooding. The impacts of climate change are felt at all levels of Thailand's society and include impacts on health, public services, and

buildings. The increasing number of climate change disasters caused by the increasing level of water scarcity affect not only the livelihoods of those living in affected areas, but also lead to the loss of biodiversity and increased levels of environmental pollution through the water supply, as well as decreased yields of agricultural production.

Thailand has been subject to the erosion of its coastlines. The most impacted provinces are Chiang Mai and Ubon Ratchathani. There are large coastlines, with rural agriculturally dependent communities along with major population concentrations in flood-impacted cities. Due to insufficient rain, poor land management practices, and limited water supply, Thailand suffers from drought. Parts of Thailand's north-eastern provinces are among the highest poverty areas, and climate change will have a serious effect on agricultural production in this region as well as other affected regions. Climate change has negatively impacted agriculture—and agriculture is responsible for the second-most greenhouse gas emissions in Thailand. Also vulnerable to the effects of climate change are water, food security, health, tourism, infrastructure management, and human resources in Thailand.

Climate change is an increasingly global concern, and its effects are already beginning to affect Thailand. Climate change is affecting the weather of Thailand by causing a variety of issues: temperature increases, increased air pollution, and changing rainfall patterns. All of these weather changes will continue to exacerbate issues in Thailand in the future, which will have major economic, environmental, and social impacts. The tourism industry contributes a large portion of the total gross domestic product of Thailand, with tourism contributing around 20% to 22%. Climate change has contributed to the loss of both cultural and tourist sites. The major cities of Bangkok, Chiang Mai, and Phuket create the largest tourism revenues for Thailand; therefore, they are also at the highest risk from climate change. Climate change impacts and complicates access to clean water, housing, and public services, which affects millions of citizens living in Thailand's urban communities. Bangkok, Nakhon Ratchasima, Samut Prakan, and Khon Kaen are the four provinces that are more at risk from climate change than any other provinces in Thailand. Climate change could also lead to the return of respiratory illnesses, malnutrition, and infectious diseases that were previously treated or eliminated. Climate change affects all of us, but addressing it requires cooperation at the regional, national, and global levels.

Local and foreign tourists have flocked to Thailand as an incredible vacation spot in the past; however, Thailand continues to be subjected to significant threats, security issues, and major risks as climate change grows more severe. Conflicting dangers and risks include sea level rise, flooding, increased temperatures, droughts, and coral bleaching. If these challenges and risks are not dealt with appropriately, local and national economies will struggle. Thailand's economy relies on tourism, which consists of 21% of its GDP, with more than one million international visitors visiting Thailand each year. Climate change impacts regions and people differently, with some groups suffering much more than others. Those workers who are particularly impacted are in occupations with higher levels of vulnerability to climate change and do not have adequate plans or resources available to appropriately address climate-related issues. Impacted communities include low-income workers, communities located in disaster-prone areas, and businesses that depend on the climate and/or natural resources for their livelihoods.

In Thailand, the increase in temperature and years of increased rainfall have resulted in more intense and more frequent flooding. There are effects across all industries throughout the entire Thai economy, including tourism, public health, and national governance. Some businesses will lose their culture and/or natural resources because of these impacts. Some health officials may expect to see the return of diseases within Thailand. Attention should be paid to the agriculture industry, as it has been one of the most severely

affected industries relating to climate change. Approximately 12 million people currently work in agriculture in Thailand; it is one of the most vital occupations in the country. Farmers will continue to face greater challenges as climatic conditions vary (temperature, precipitation) and expose them to multiple risks. For example, when flooding occurs during the monsoon season, rice can be lost, and when rice is grown at high elevation (highland or hill rice), it is at risk of drought during the harvest period. Extreme temperatures during aquaculture (fish, crabs, and shellfish) have the potential to cause mortality as a result of high temperature and/or high humidity. Animal health, growth, and development can also be greatly affected by climatic conditions.

As such, the tourism sector in Thailand is a fully developed industry, and climate change is affecting it negatively. Flooding, storms, heat waves, and drought can contribute to making tourists feel unwelcome and less able to travel. Coastal flooding and coastal erosion threaten the integrity of beaches and tourist destinations. Climate change is having an effect on the flora and fauna that are essential to tourism. Extreme weather events can damage infrastructure that supports tourism. Water scarcity caused by climate change can result in competition for water between tourism and other uses.

In response to climate change, Thailand has set a target of achieving carbon neutrality by 2050 and net-zero greenhouse gas emissions by 2065. One important step to realise this ambitious target is to identify the types of local, regional, and corporate long-term and short-term projects, key investments, and climate initiatives needed to achieve reductions in greenhouse gases. The Department of Tourism has worked closely with both local and international experts to prevent climate change from affecting the future of the country and the tourism industry as a whole. The path toward net zero and carbon neutrality is going to be very difficult but will require a significant amount of will.

To fulfil a commitment to reduce greenhouse gas emissions, Thailand is implementing a national carbon reduction strategy. The rapid economic growth of Thailand has led to an increased demand for energy, making it necessary for the country to establish both energy efficiency and demand-side management plans in order to reduce greenhouse gas emissions. Furthermore, the government of Thailand has taken action on climate change and will continue to do so as a top priority through the development of an effective climate strategy that will facilitate sustainable development and low-carbon economic growth through the year 2050. The government has spent a tremendous amount of money, staff, research, legislation, and political effort to reduce greenhouse gas emissions, preserve its environment, and combat climate change. In addition, Thailand established its National Climate Change Committee in 2007. Chaired by the Prime Minister and composed of members from the public, private, and educational sectors, the Committee is responsible for the development of Thailand's climate change policy.

7. Conclusion

Tourism has been impacted worldwide by global warming and climate change, particularly in Thailand. Many tourism destinations, particularly in the northern provinces, depend on the cold winter season to attract a higher volume of tourists. As a result, local economies are subject to the impact of international crises, and hot, short summers will hurt Thailand's tourism-related businesses. As a result of Thailand's rapid economic development, many environmental challenges are being faced, such as climate change, wildlife loss, deforestation, soil erosion, water shortages, and waste problems. Climate change has caused increased precipitation in most areas of Thailand, which has caused natural disasters such as floods, as well as more frequent flooding and the potential for even larger disasters, such as tsunamis. Droughts and floods

are the major environmental threats facing the country. Overall, temperatures in Thailand are rising, and the precipitation has resulted in many excess floods and higher severity of flooding.

Cultural and tourist attractions all around the globe are already suffering from climate change. The three most tourist-rich cities for Thailand, which generate the majority of income from tourism, should be considered as being at high risk from climate change (Bangkok, Chiang Mai, Phuket). Thailand's tourism industry and its economy, trade, and energy production are also affected by climate change due to rising temperatures, while the process for safely adapting to changing climatic conditions remains unclear. Thailand's tourism industry, as a result of the COVID-19 pandemic, lost almost all of its international visitors (more than 40 million in 2019 pre-COVID) and reported annual visitation levels of 6.7 million in 2020 and 428,000 in 2021. Some of the declines in international visitation were due to increasing costs and fewer long-term visitors who tend to stay longer and spend more.

Tourism in Thailand is now facing multiple challenges. Political instability, public health concerns, and a large supply of hotels are all contributing to the country's current economic issues. The Prime Minister's Office, the National Tourism Organization, and the private sector have all banded together to help rebuild Thailand's image and market Thailand as a vacation destination. The outlook for business within Thailand is very promising if there is political stability, government support, and collaboration between public and private organizations (Chon et al., 1993). Thailand is still a very good travel destination even if there are problems. The government is aware of the issues that Thailand has to deal with (mainly pollution and infrastructure issues) and is working hard to resolve them. Thailand has been fortunate enough to have a strong number of long-term hotel projects being built, such as Dusit Thani and the Oriental Hotel in Bangkok, as well as the Royal Cliff Resort in Pattaya (Glanzberg, 1993).

Therefore, creating climate change strategies is an important consideration for ensuring the continued viability of the tourism industry. The Government of Thailand has shown its commitment through a significant amount of investment. In order to minimize the adverse effect on both the business and industrial environment, the government will need to implement environmentally sustainable management practices. Climate change is also one area where there are significant opportunities for reducing agricultural emissions by taking advantage of carbon reduction strategies like recycling, or employing offset strategies like carbon capture and storage, in conjunction with the use of renewable energy.

8. Recommendations

To assist in the growth of the tourism sector, the following suggestions are offered:

1) Work with indigenous communities and obtain their feedback on strategic plans from the tourism department.
2) Promote all cultures equally; provide employment and spending opportunities by enabling communities to take advantage of tourism benefits.
3) Use renewable sources of energy, such as solar energy, and make it easier to do so through cost-effective usage of these resources.
4) Promote sustainable tourism; increase awareness among tourists regarding issues related to sustainability in tourism.
5) Collaborate on global connections that generate new energy and enable easy online travel planning.

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