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Research Article

The Impact of Climate on The Tourism Industry in Aqaba Governorate

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Abstract

This study aimed at analyzing the impact of climatic elements on the tourism industry, as well as the months that may be used to promote tourism in the Aqaba Governorate. The tourism climate indicators methodology was used in the study, which included the temperature and humidity indicator, the Baker wind cooling indicator, and the tourist climate indicator. The study found that there are months that are very suitable for carrying out tourism activities, despite differences in geographical location between the two stations of Aqaba Airport and the port station, which are October, November, March, and April, while the rest of the months are not suitable for activities, and it was discovered that there is a strong correlation between the number of tourists and climate indicators. The tourism climate variables explained between 70 and 90 percent of the climatic impact on tourist movement in the Aqaba Governorate.

Keywords

Climate; Tourism Industry; Aqaba Governorate

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Introduction

Geographical studies aim to find a variety of solutions to the problems that face spatial development processes, as it is one of the most essential pillars in supporting the economy for various sectors in various countries around the world, including the tourism sector, which is one of the most important sectors with high support for the national economy in many countries around the world. The climate, in all of its aspects, is one of the most important controls in the establishment and development of tourism in any region, as any tourist or recreational project can only be established after an integrated study of the conditions of tourist attractions, including the climate, as well as being a factor in determining the nature of the region's appropriateness in terms of attracting visitors. Man, and his natural surroundings, particularly the vegetation cover and forms of the earth's surface that can be cultivated and turned into tourist attractions, thus climate must be included in any tourism planning process for spatial development considerations, in addition to identifying the dangers that may arise as a result of the climate, including storms, torrential rains, and climatic extremes.

Problem of the Study

One of the most critical steps in scientific research is defining and outlining the study problem. As a result, the problem is detected by asking the following questions:

1. Do climate characteristics play a role in the tourism industry in the Aqaba Governorate?
2. What are the specific indicators of the tourist climate's characteristics?
3. Is there a seasonal relationship between climate characteristics and tourist attraction movement in the governorate?
4. What are the best ways to encourage tourism development in the Aqaba Governorate based on the current climate?

Objectives of the Study

The purpose of this study was to achieve the following goals:

1. Recognize the impact of climate elements on the tourism industry.
2. Identify the tourism elements in the Aqaba Governorate.
3. Identify the months that may be used to promote tourism in the Aqaba Governorate, allowing for the integration of facilities and services that are necessary for prosperity.
4. To determine the extent of compatibility between climatic elements and tourism movement in the Governorate of Aqaba.

Hypothesis of the Study

1. The climate in the governorate of Aqaba has a role in the governorate's tourism industry.
2. The characteristics of the tourist climate in the governorate of Aqaba are determined by a variety of indicators.
3. There is a seasonal relationship between the characteristics of the climate and the movement of tourist attractions in the governorate.

Significance of the Study

The study is important for the following reasons:

1. Identifying the tourist climate characteristics in Aqaba Governorate in order to determine the best time to engage in tourism activities.
2. The possibilities of developing the tourism sector in light of current climate conditions and making it one of the industry's pillars.
3. Developing plans to improve the tourism situation in the Governorate of Aqaba.

Methodology of the Study

The study used a comparative approach to compare the preference of the months of climate for tourism activity in the governorate of Aqaba, as well as an analytical approach to apply the indicators of the tourism climate and extract the correlation and its significance with the governorate's tourism activity. The results of the Temperature Humidity Indicator (THI), the Presumption of Wind Postal for Baker (CP), and the Tourist Climate Indicator (TCCI) were extracted using data from the Aqaba Airport and Aqaba Port Station stations for the period 1982-2019, based on meteorological data, and data from the Agency's website. To compensate for the lack of data, the US NASA used the link (https://power.larc.nasa.gov/data-access-viewer) to identify the most suitable months for human and tourist activity in the study area, determine the correlation with the number of tourists per month, and determine the impact of these indicators on tourism activity.

Previous Studies

The literature has studied the issue of climate change's impact on tourism from a variety of perspectives, the most important of which are:

(Abu Hashish, 1994) investigated the climate of Aqaba and found that it is one of the city's tourism attractions, particularly during the winter season. It stands apart from the rest of Jordan's cities due to its moderate climate, with little rain and calm winds, which has helped it attract a large number of tourists, both Jordanians and foreigners, as well as being Jordan's only beach city.

According to Zureikat (1999), Jordan's climatic regions differ from one place to another from one season to the next. It also showed how significant it is to provide climatic information about the places for tourism movement and attract tourists to the Kingdom. It was also discovered that the weather has a positive and negative impact on tourist travel decisions.

Andrea et al. (2006) investigated the influence of climate change on domestic and international tourism, finding that climate change will shift tourism trends to higher latitudes, with domestic tourism doubling in cooler nations and decreasing by 20% in warmer countries (compared to baseline without climate change). International tourism, on the other hand, triples in certain countries while halving in others, and is more important than domestic tourism in colder (warmer) regions.

Furthermore, (Al-Tarawneh, 2007) investigated the impact of tourism on the development of economic resources in the Aqaba Governorate. It was discovered that natural and climatic elements in the Aqaba Governorate play a role in affecting tourism types, visitor mobility, and length of stay.

(Hamad, 2011) investigated the impact of climate on the tourism industry, and discovered that from the beginning of March to the end of November, there is a great opportunity to exploit the Mosul climate for various types of tourism, such as water tourism, using maps of Iraq created with THI coefficients. Visit the Prophet Yunus Mosque, the site of the cities of Nimrud and Ashur, and other religious, archaeological, and therapeutic sites along the banks of the Tigris River and the Mosul Dam.

Dejan et al. (2016) examined the influence of climate change on mountain tourism development planning, concluding that climate change will provide a challenge and have a significant impact on mountain tourism development planning in the future. Its consequences have become increasingly noticeable in recent years, particularly in mountainous areas, as climate change in the coming decades may result in a significant decrease in the number of winter mountain tourist centers and an increase in the number of mountain centers dominated by the region's summer tourist offer.

(Jennifer et al, 2017) was used to apply the Tourism Climate Indicator (TCI) to climate data on 18 sites across South Africa, and modest variances in average yearly climate appropriateness were discovered between each research site, as well as seasonal fluctuations.

According to Al-Zogoul (2019), the most suitable months for tourists are represented by the level of (complete comfort P), which are: May, June, July, and September, and the least suitable months are represented by the level of (a bit chilly comfort - P), which are: March, April, October, and November. The months that annoyed travelers were December, January, and February, while August was quite hot (H+).

(Al-Daajneh, 2019) investigated the impact of climate on tourism development in the West Bank and discovered that, despite the region's low tourism potential, the climate played a significant

role in the Jordan Valley and the Dead Sea's weak tourist movement during the summer. This is due to the region's high summer temperatures, which make it a winter tourist destination; on the other hand, tourism movement in the central highlands decreases in the winter.
This is study is considered as one of the most important climate studies, relying on a set of empirical indicators that has been used in applied climate studies in the tourism field.

Study Area

The Hashemite Kingdom of Jordan's Aqaba Governorate is located in the far south of the country, some 324 kms of Amman, and extends between latitudes 19°, 29° and 45°, 30° north, and longitudes 57°, 34° and 47 35° east (Al-Tarawneh, 2007). It is bordered on the west by occupied Palestine, on the east by Saudi Arabia, and on the south by the Gulf of Aqaba, (Figure 1) and it covers approximately 6905 km2, or 7.8% of the Kingdom's total territory (Department of Statistics, 2019). The Qasbah of Aqaba District, which contains Wadi Araba District, and the Al-Quwaira District, which includes Al-Disah District, are the two administrative and judicial districts of the Aqaba Governorate.
The Governorate of Aqaba has gained strategic importance because it is Jordan's only sea port and because it is located at the head of the Gulf of Aqaba, which connects Jordan to the rest of the world. It also has a number of sea, air, and land ports and crossings, the most important of which are (https: /moi.gov.jo/Default/Ar):

• Land crossing (Wadi Araba Crossing): This is known as the Southern Crossing and connects Jordan and occupied Palestine. It is around 2 km away northwest of the city of Aqaba.
• Land crossing (Durra border center): It connects Jordan and Saudi Arabia and is about 26 kms south of the city of Aqaba.
• Sea port: Located south of Aqaba, it connects Jordan to the Egyptian port of Nuweiba.
• Airport: King Hussein International Airport.

Elements of Tourism in Aqaba Governorate

The governorate of Aqaba is distinguished by numerous tourist attractions that make it deserving of being one of the most important Arab and international tourist cities, the following are some of the most prominent of these elements (Al-Tarawneh, 2007):

Natural elements: Aqaba's natural environments play an essential part in attracting tourists, as the climate is moderate in winter with little rain, and hot and dry in summer, making it an ideal destination for those seeking sun and warmth. It is also known for its beautiful beaches, one of which is located in the north with a sandy nature, where tourism activities such as hotels, private beaches for tourism, and water sports clubs are located, and the other is located in the southeast with a rocky nature, dominated by coral reefs of multiple bright colors, and these gatherings constitute a unique point in terms of location and the many types of coral and fish and other aquatic life, It is an important attraction frequented by scuba diving enthusiasts.

Archaeological and Historical Monuments

Aqaba is rich in historical landmarks and buildings that have helped it become a tourism and cultural governorate, the most famous of which are:

The Wadi Rum region, which is one of Jordan's most natural and touristic places, and is a popular location for photography artistic, cultural, and sporting events due to the sand dunes, multicolored rocks, and natural plants that it contains, adding to the region's beauty. Restaurants and hotels are among the tourism services accessible in the area. The number of tourists that visited the region in 2018 was 243,447, and it is expected to rise to 36,4230 in 2019. (Ministry of Tourism and Antiquities, 2021).
Aqaba Castle, Tal Khalifa, Tell Al-Maqs and Sharif Al-Hussein House.

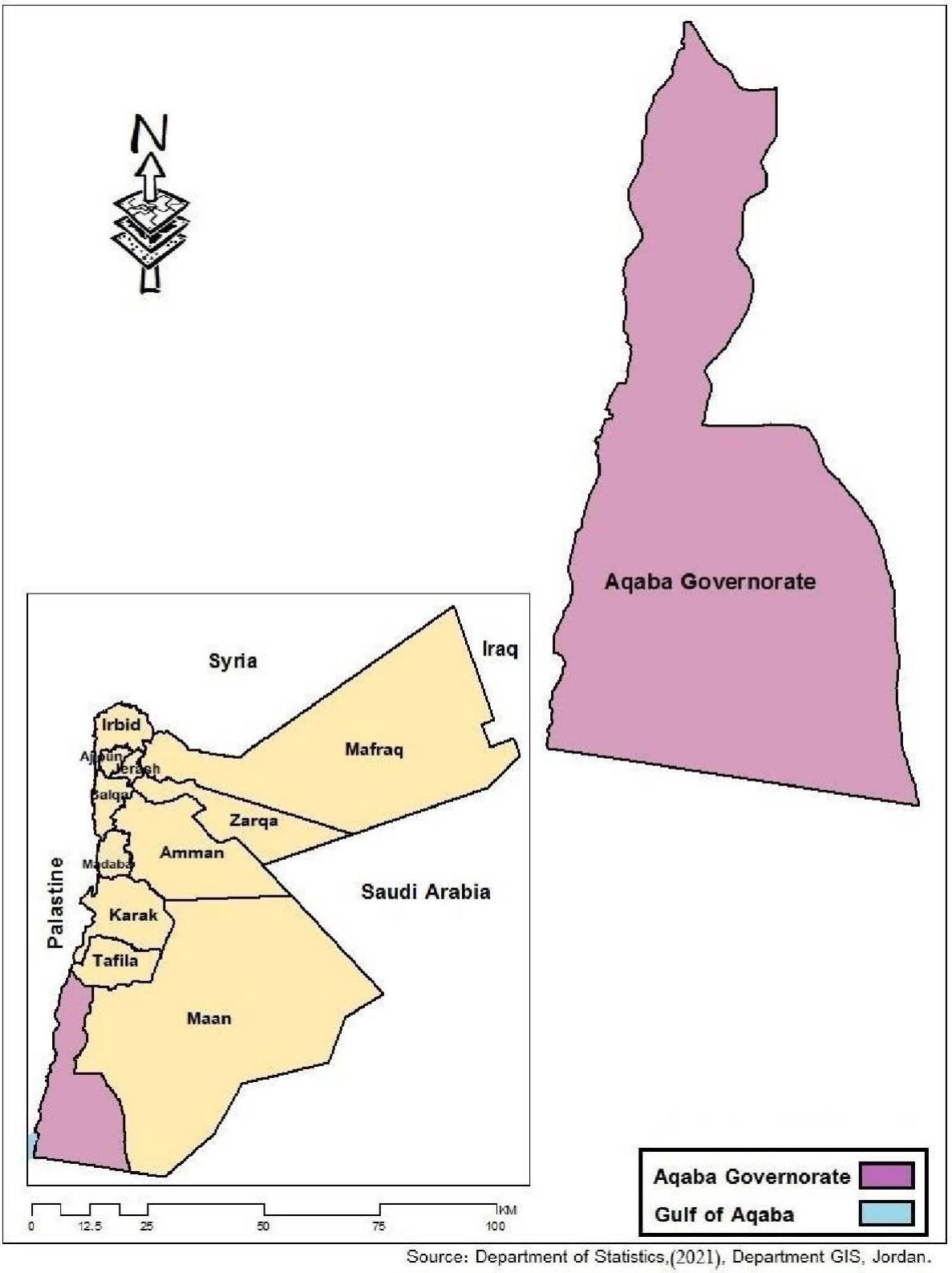

Figure 1. Study Area

Cultural elements: Visitors' activities, plastic arts, and archaeological museums that reflect customs and traditions are examples of cultural elements.
Modern elements: they relate to the development of civilization and contribute to the resurrection of the tourism movement, such as big projects with a financial impact, such as Aqaba's port and airport.
Tourism services: As one of the most essential means in the tourism process, tourism demands a great deal of attention to various tourism services and their preparation to attract tourists. Among the most important of these services:

Hotels: The growth of the tourism industry in the Aqaba governorate has been accompanied by the creation of numerous hotels of various types, particularly in the city of Aqaba and the Rum region. Aqaba had 84 hotels, while Rum had 16 hotels, accounting for 14% and 2.6% of the total, respectively. Jordan Hotels (https://www.mota.gov.jo/AR/List) for 2019. This shows Jordan's Aqaba Governorate's historic standing.
Tourist restaurants. In Aqaba, there are 46 tourist restaurants, while Rum has one.
Car rental offices: There are about 13 car rental offices in the city of Aqaba, most of which are located near the Corniche, due to its proximity to hotels and the port.
It can be said that the elements of tourism in the Aqaba Governorate can be considered to be directly or indirectly related to the climate, because the major goal of tourism is to enjoy the climate, whether for enjoyment or treatment...etc.

Some Climate Characteristics of The Aqaba Region

Due to its location within the northern semi-tropical widths, the climate of Aqaba Governorate is characterized by hot dry climates, which are characterized by high annual rates of temperatures (Appendix 1 and 2), as their rates reached (26.48 ° C) in the Aqaba port station, and (26.13 ° C) at the airport station, and the highest temperatures were recorded during the month of July to reach (36.15 °C) at the port station. While the lowest temperature was recorded at the airport station (35.4 °C) in January, with temperatures reaching (16.10 °C) at the port station and (15.2 °C) at the airport station. The geographical location of the stations accounts for the difference in temperature rates. The temperature between (18-35°C) is the optimum temperature for human comfort and its various activities, and such temperatures are not available throughout the year except in areas of the tropical highlands whose altitude ranges between (500-2000 meters), and the highest temperatures are from (28 °C) and less than (15 °C) is a hindrance factor for tourism, and the disability increases with the increase in thermal extremism, especially the extremism in its height above the average, which is thermally unsuitable for tourism, which the tourist feels and resulting from the heat generated in their bodies as a result of the metabolic process, which increases with movement (Al-Moussawi,2016) .
The highest average maximum temperatures were recorded in July, reaching (43.60 °C) at the port station and (42.8 °C) at the airport terminal, while the lowest minimum temperatures were recorded in January, at a rate of (10.7 °C) in the port of Aqaba and (9.9 °C) at the airport. Due to the study area's desert nature and its location within the northern semi-tropical offers, which are marked by cloudless skies, dry air, and lack of humidity, the study area has a high annual temperature range that reaches (20.5 °C) at the port station and (20.2 °C) at the airport station. The hours of solar brightness reach their maximum levels during the summer months, exceeding 12 hours every day. The highest rates of relative air humidity were recorded during February, reaching (58.1 %) in the port of Aqaba and (57 %) at the airport terminal, due to the drop in temperatures and rainfall, and studies in this aspect indicate that air humidity that ranges between (40-60 %) is the most suitable for the human body, but if it exceeds (70 %) during the cold or hot (Al-Moussawi and Abu Rahil, 2011).

Results and Discussions

A set of empirical evidence used in applied climate studies in the field of tourism to determine the suitability of the climate for human and tourist activity was adopted for its applicability to the climate of the study area, including:

Temperature Humidity Indicator (THI)

The scientist (Thom, 1959) devised a connection based on temperature and relative humidity or dry temperature, wet temperature, and dew point to determine the degree of human comfort under given climatic conditions, it has been formulated follows (Thom, 1959):

$$[\boldsymbol{THI(DI) = 0.4(T + Tw) + 4.8}]$$

Whereas:

THI: Temperature and Humidity Indicator
DI: Discomfort Indicator
T: Dry Temperature (°C)
TW: Wet temperature (°C)

It is determined that if the temperature-relative humidity indicators are less than (15), then the entire population will feel discomfortable with colder weather, and if the indicator is between (15-18) the entire population will feel comfortable. In some cases, some people feel uncomfortable when the indicator values are (18-20), while the feeling of discomfort increases when the indicator values are (20-23). However, all people feel uncomfortable when the indicator value is (23) and above. Table (1) shows the following results: There is a difference in temperature and humidity indicator readings between the port of Aqaba and the airport. It indicates that the months of November and April are characterized by an ideal climate for climatic comfort, with temperature-humidity indicator values of (15.97, 15.33) within the (P) classification at the Aqaba port station and the airport, respectively, while the month of May recorded the comfort limits at the airport station. Due to the effect of water bodies that increase humidity levels, which leads to a feeling of relative discomfort, it reached (17.89) in the classification (P*), while it reached (18.72) in the port station for the same month, which is within the sub-comfortable limits (P-). Similarly, in June, the indicator values reached (19.96) in the airport station, which is in the category below comfortable (P-), while it was recorded for the same month (20.83) in the port station, which is in the warm and uncomfortable category (H) for the same reason. While the months of June to October experienced uncomfortably warm weather, with the exception of August, which experienced uncomfortably hot weather, the indicator values within the port station reached (23.26), (H -), indicating that the weather is uncomfortably warm for five months, beginning in June and ending in October, due to high temperatures and humidity whose indicator values ranged between (20-22). While the weather is uncomfortable and warm (H) during the months of July, August, and September, as the tourist activities in the airport are limited, the month of October recorded a less comfortable, not warm, and annoying state, as the indicator value reached (19.64). (P-), the months in which discomfort was reported due to cold are also different between the two stations, with the months from December to March being uncomfortable due to coldness as a result of the desert nature of the location and its surrounds with heights that lower the temperature values. However, because the airport station is located in an open region, the temperature was quite cold in February, with the indicator reaching (11.56) (C-), but this does not prevent tourists from visiting, especially during daytime hours, and taking care by wearing appropriate clothing.

Becker Wind Cooling Indicator

It was invented in 1972 based on the difference between human body temperature, air temperature, and wind speed (Farajzadeh & Matzarakis, 2012), and it is usable in all locations of the world without any constraints: it has been formulated as follows:

CP= (0.26+0.34*V) 0.622) *(36.5-Ta) macal / cm2
CP: Environmental Cooling Power
Ta: temperature (°C)
V: Wind speed km/h
Constants: (0.26, 0.34, 0.622, 36.5).

The feeling condition was divided into several categories based on the wind cooling indicator. It would be an inappropriate hot feeling if the cooling power was (4 cp or less), while the cooling power between (5-9 cp) was acceptable warm, and the cooling power (10-19) was regarded ideal. Cooling power (20-29 cp) is cold, cooling power (30-39) is colder, cooling power (40-49) is extremely cold, and cooling power (50 and more) is very cold (Farajzadeh and Matzarakis, 2012). Table (2) shows that the (B2) moderation is most noticeable in the airport during the months of October, November, and April. The values of wind cooling were (11.50, 18.24, 17.05), and they were only available between November and April.

Table 1
Monthly averages of Thom physiological comfort results for the port of Aqaba and its airport during 1982 - 2019

the month	Port of Aqaba	indication	type	AirPort of Aqaba	indication	type
September	22.66	H	uncomfortable warm	22.11	H	uncomfortable warm
October	20.65	H	uncomfortable warm	19.64	P-	without comfort
November	15.97	P	Ideal	15.33	P	Ideal
December	13.45	C*	Uncomfortable more cold	12.85	C*	Uncomfortable more cold
January	12.00	C*	Uncomfortable more cold	12.54	C*	Uncomfortable more cold
February	12.18	C*	Uncomfortable more cold	11.56	C-	Uncomfortable too cold
March	13.81	C*	Uncomfortable more cold	13.01	C*	Uncomfortable more cold
April	15.79	P	Ideal	15.93	P	Ideal
May	18.72	P-	without comfort	17.89	P*	comfortable territory
June	20.83	H	uncomfortable warm	19.96	P-	without comfort
July	22.83	H	uncomfortable warm	22.05	H	uncomfortable warm
August	23.26	H-	uncomfortable hot	22.63	H	uncomfortable warm

Source: Based on the data of Annex (1 and 2).

The wind chill at the port station was (14.93, 11.56) respectively, and these months see a lot of tourists, thus there are a lot of tourist activities like water sports, boat tours, sand dunes safaris, and so on. The cold months (C) extended from December to March for the two stations to participate in, if the wind cooling values in them varied between (20-27), while the permissible warm months (B1) reached two months at the port station, that is: October and May. The wind cooling indicators were (8.88, 7.32), respectively. While the acceptable warm month at the airport was limited to May, with an indicator value of (5.94), this contrast between the two stations is due to their geographical location and the difference in temperature values and wind speed between them, especially since the port station's location is near water bodies, and the two stations shared that the months of June, July, August, and September are uncomfortable hot months for both stations.

Climate Tourism Guide (TCCI)

It is one of the most effective criteria for dealing with climatic data, as well as the constraints of thermal comfort, or the lack thereof. The following mathematical formula is used to calculate it (Anđelković, 2016) :

TCCI=TM+0.5ATM+0.1(Sm-Um)-nrd)

TCCI: Tourism Climatic Comfort Guide
TM: Normal air temperature °C
Constants: (0.5, 0.1)
ATM: The difference between the maximum and minimum temperature °C
Sm: Average hours of actual sunshine hours/day
Um: relative humidity %
nrd: The ratio of the number of rainy days in a month %

Table 2
The monthly averages of the results of the Baker's Indicator for wind cooling in the stations of Aqaba port and its airport during 1982-2019

the month	Port of Aqaba	indication	type	Air Port of Aqaba	indication	type
September	4.33	A	Inappropriately hot	3.34	A	Inappropriately hot
October	8.88	B1	Acceptable warm	11.50	B2	Ideal
November	14.93	B2	Ideal	18.24	B2	Ideal
December	20.62	C	cool	24.90	C	cool
January	24.40	C	cool	25.12	C	Cool
February	26.09	C	cool	27.28	C	cool
March	20.21	C	cool	25.39	C	cool
April	11.56	B2	Ideal	17.05	B2	Moderate
May	7.32	B1	Acceptable warm	5.94	B1	Acceptable warm
June	3.56	A	Inappropriately hot	-0.57	A	Inappropriately hot
July	1.85	A	Inappropriately hot	-2.54	A	Inappropriately hot
August	1.71	A	Inappropriately hot	-3.02	A	Inappropriately hot

Source: Based on the data of Annex (1 and 2).

According to the guide's findings, it is classified as too cold is unacceptable if it reaches (zero) or less, making it suitable for skiing activities; from (0-20) it is classified as unacceptable cold, making it suitable for short excursions; from (20-24) it is appropriate for all activities except skiing; (24-30) is also very appropriate for tourist activity; and (30-40) is classified as unacceptable hot. Tourist activities on the coasts and water sports are preferred, and temperatures above (40) are too hot is unacceptable. Beach sports and entertainment are preferred (Anđelković, 2016). Table (3) shows that there is a disparity between the port and airport stations during the months that are appropriate for tourist activity, which are November, March, and April. The indicator values varied between (21-26), which is appropriate for all tourism activities, and the number of months at the airport station increased to four; which are October, November, March, and April, all of which are extremely appropriate for tourist activity. Its indicators are less than (20), and it is best to go on a walk only during daylight hours. The months with inappropriate high temperatures begin in May at the port station and in September at the airport station, where the value of the index exceeds (30) and rises in some months more than (40), which are: July at the port station, and June and July at the airport station, and this rise is due to the nature of the desert area and its surroundings with highlands, which raises the temperature, but such values do not prevent tourism activity based on beach sports and recreation.

Analysis of the Correlation Between Tourism Climate Indicators and Tourist Numbers

Tourism activity is generally linked to the presence of an appropriate climate for human activity, particularly a comfortable and appropriate atmosphere for the physiological comfort of the human body, as it can engage in all of its vital activities in an environment that is suitable for these activities, particularly tourism activity. The number of tourists visiting Aqaba Governorate was subjected to a statistical test to see if there was a correlation between the number of tourists and

climatic comfort indicators. Through analyzing the data in table (4) and figure (2), it is clear that there are clear monthly changes in tourist numbers, which have been linked to the indicators for changes in tourism climate indicators shown by the results of Table (5).

Table 3
The monthly averages of the results of the TCCI Climate Tourism Guide, Aqaba port and airport during 1982-2019

the month	Port of Aqaba	type	Air Port of Aqaba	type
September	38.31	Unacceptably hot	33.55	Unacceptably hot
October	32.16	Unacceptably hot	23.94	appropriate and acceptable
November	23.31	appropriate and acceptable	20.00	appropriate and acceptable
December	18.81	Unacceptably cold	-0.67	Too cold is Unacceptably
January	14.07	Unacceptably cold	14.93	Unacceptably cold
February	17.31	Unacceptably cold	19.18	Unacceptably cold
March	21.11	appropriate and acceptable	24.73	Very acceptable and appropriate
April	26.66	Very acceptable and appropriate	30.00	Very acceptable and appropriate
May	34.97	Unacceptably hot	37.7	Unacceptably hot
June	38.15	Unacceptably hot	40.76	Too hot is unacceptable
July	41.16	Too hot is unacceptable	40.33	Too hot is unacceptable
August	39.69	Unacceptably hot	37.91	Unacceptably hot

Source: Based on the data of Annex (1 and 2).

Table 4
The Average number of tourists in Aqaba and Wadi Rum in 2019

the month	number of tourists
September	15603
October	23106
November	20269
December	11482
January	6224
February	7580
March	19578
April	27552
May	17225
June	9315
July	8962
August	10673

Source: Ministry of Tourism and Antiquities, unpublished data.

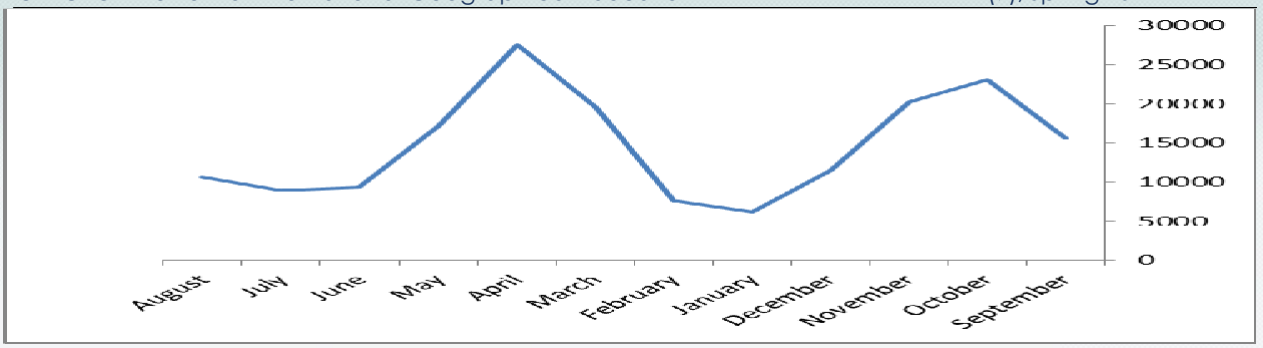

Figure 2. The monthly tourist's arrivals in the Governorate of Aqaba for the year 2019
Source: Ministry of Tourism and Antiquities, unpublished data.

Table 5
The results of a statistical analysis of the indicators of the tourist climate and the number of tourists to Aqaba.

station	Multiple R		R Square		significance	
	Port of Aqaba	Air Port of Aqaba	Port of Aqaba	Air Port of Aqaba	Port of Aqaba	Air Port of Aqaba
THI-Indicator	0.97-	0.97-	0.94	0.94	0.02	0.02
K- Indicator	0.78	0.71	0.60	0.50	0.04	0.04
TCCI- Indicator	0.95-	0.92-	0.91	0.91	0.02	0.02

Using the Spss program, calculate the correlation coefficient and its significance, as well as the t-test for the following correlations:

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum(X_i - \bar{X})^2 \sum(Y_i - \bar{Y})^2}}$$

. This can be calculated using the following equation:

$$\bar{R}^2 = 1 - (\frac{n-1}{n-k})(1 - R^2)$$

R2: is the modified coefficient of determination, which is formed by squaring the correlation value coefficient.
n: is the variable's number of observations (sample size).
k: the number of estimated coefficients.

While the t-test was used, the following equation: (Das and Selvamuthu, 2018 .).

$$t = R\sqrt{\frac{n-2}{1-R^2}}$$

Table (5) and Figure (2) show that there is a clear curve for the change in the number of tourists per month in the Aqaba Governorate, as it turns out that there are two peaks for the rise in the number of tourists during the autumn and spring seasons, and decreases during the winter and summer seasons, coinciding with thermal changes, and in general, the preferred range falls globally for levels of thermal comfort within temperatures between (18.5-29.5°C).Olgyoy believes that the maximum limit for human endurance is heat stroke, and the lowest limit is freezing, and that the limits of feeling comfortable are between (21-27.5 °C) in summer and between (20-25 °C) in winter. Although temperature is the most essential factor in defining thermal comfort, other factors such as radiation, humidity, and air movement have an impact on the final consequence of the sense of thermal comfort. All of these factors have an impact on thermal comfort, both individually and in relation to one another (Al-Mousawi and Abu Rahil, 2011). The statistical study revealed that there is a very significant inverse correlation between the temperature-humidity

indicator and the number of tourists at the Aqaba port and airport terminals, with a value of (-0.97), suggesting a very high significance at a confidence level of (5%) and explaining (94%).The number of tourists every month in the study region is affected by changes in the degree of comfort. The correlation value between the number of tourists and the wind cooling index was (0.78 and 0.71), which is a medium correlation, and the interpretation coefficient values were (60 % and 50), respectively, confirming the existence of a correlation between the ability of wind to cool the human body. Also, there is a high correlation between tourist and economic tourism activity.

The correlation coefficients between the number of tourists and the tourism climate indicator were (-0.95 and -0.92), respectively, indicating a very strong inverse relationship that explains (91%) of the climate impact on tourism activity and its monthly changes in the study area. This verifies the impact of climatic characteristics and human comfort on tourism activity movement in the study area, which increases during climatically comfortable months and decreases during uncomfortable months.

Conclusion

Based on the aforementioned, the study concluded the following findings:

1. The Aqaba Governorate has a suitable tourist climate during certain months of the year, namely spring and autumn, because the thermal rates are suitable for human activity, and the climatic conditions during the winter months do not prevent hiking and camping, especially during daylight hours, whereas the summer season is not suitable from a climatic perspective. Beach tourism is popular due to the high temperatures.
2. The temperature-humidity indicator was used to find a discrepancy in the temperature-humidity indicators between the port of Aqaba and the airport. It indicates that there are two months that are characterized by an ideal climate for climatic comfort, which are: November and April, where the values of the temperature-humidity index reached (15.97, 15.33), respectively at the Aqaba port station and the airport, while the month of May recorded comfort limits at the airport station of (17.89), while the same month at the port station reached (18.72), which is within the below comfortable limits because of the impact of water bodies that enhance humidity values, leading in a feeling of relative discomfort.
3. The wind cooling suggested that there are three months in the airport region that is characterized by moderation (B2): October, November, and April. The wind cooling indicators were (11.50, 18.24, 17.05), but they were only available between November and April in The port, where the value of wind cooling is (14.93, 11.56), and these are the best months for tourist activities.
4. According to the tourist climate guide, the months of November, March, and April are the best for tourist activities at the port station. The months of March and April are ideal for tourism activities.
5. There is a substantial association between the number of tourists visiting the study area and the feeling of comfort, as defined by tourist climate indicators, with a high level of significance, indicating the importance of the climate factor in tourist attractions.
6. There is a strong correlation between the number of tourists visiting the study area and the sense of comfort based on the tourist climate indicators, which are highly significant, indicating the importance of the climate element in tourist attractions.

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Appendix (1) Climatic data for Aqaba Port Metrological Monitoring during 1982-2019

the month	Min.temp	Max.temp	Average	Wet temp	Wind speed	Sun shine	Relative humidity
January	10.7	21.5	16.1	1.32	2.72	7.2	54.4
February	12.1	22.7	17.4	1.04	1.78	7.9	58.1
March	15.6	25.6	20.6	1.91	2.78	8.1	47.3
April	19.6	30.3	24.95	2.52	1.89	8.9	43.8
May	23.4	36.6	30.0	4.79	2.28	10.2	25.7
June	25.6	39.4	32.5	7.57	2.39	12.0	29.4
July	28.7	43.6	36.15	9.43	2.75	12.1	32.3
August	28.5	42.6	35.55	11.1	2.78	11.6	38.0
September	26.0	41.0	33.5	11.16	2.75	10.5	43.5
October	24.6	36.3	30.45	9.18	2.72	9.5	52.1
November	17.5	28.2	22.85	5.08	2.47	8.1	51.4
December	14.0	24.4	19.2	2.43	2.5	6.8	55.0
Average	20.53	32.68	26.6	5.63	2.48	9.41	44.25

Source: Jordan Meteorological Department, (2021), unpublished data.
- https://power.larc.nasa.gov/data-access-viewer

Appendix (2) Climatic data for Aqaba Airport Metrological Monitoring during 1982-2019

the month	Min.temp	Max.temp	Average	Wet temp	Wind speed	Sun shine	Relative humidity
January	9.9	20.5	15.2	0.23	2.72	7.2	54.4
February	11.2	22.7	16.95	-0.05	3.69	7.9	57.1
March	14.1	25.6	19.85	0.68	5.0	8.1	47.3
April	18.1	30.3	24.2	1.12	5.33	8.9	43.8
May	22.5	36.6	29.55	3.18	4.81	10.2	25.7
June	25.0	39.4	32.2	5.71	5.31	12.0	29.4
July	28.0	42.8	35.4	7.82	4.33	12.1	32.3
August	28.5	41.6	35.05	9.52	5.11	11.6	38.0

September	27.0	41.0	34.0	9.28	4.47	10.5	43.5
October	23.4	36.3	29.85	7.24	4.44	9.5	52.1
November	17.1	28.2	22.65	3.68	2.83	8.1	51.4
December	13.3	24.4	18.85	1.26	2.94	6.8	55.5
Average	19.84	32.45	26.15	4.14	4.24	9.41	44.17

Source: Jordan Meteorological Department, (2021), unpublished data.
- https://power.larc.nasa.gov/data-access-viewer