



**Title: Climate Patterns and Tourism Industry: A Case Study of the Maldives**

**Student Name: RAM PRABESH SAH**

**Student ID: DE240026**

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Entrepreneurship and Technology**

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## Introduction

The patterns of climates are the key factors that are used to determine the tourism movement in the world and thus the choice of destination, the time of the year when it is preferred, and the kind of tourism activity that is being preferred. Climate tourism is a form of interdependency of the two factors in which the weather has direct effects on the experience of the tourists, and the tourist activities indirectly affect the environment (Scott and Lemieux, 2010). This discussion explores the complex nexus of the relationship between climate condition and tourism sector using the Maldives, a tropical island country with an economy that is nearly wholly reliant on climate-sensitive tourism.

The Maldives, which is 1,192 coral islands organized in 26 atolls within the Indian Ocean, is a perfect example of the case study of the relationship of climate and tourism. Since tourism adds about 28 percent to the federal economy of the country, and over 25 percent of the population is employed by it, economic stability of the archipelago is closely tied to the climate conditions (Maldives Association of Tourism Industry Maldives, 2019). The exposure to climatic changes of the destination (seasonal monsoons and long-term rise in sea level) shows that the role of comprehending the impacts of meteorological patterns on tourist flows, seasonal changes in demand, and availability of activities is vital. This analysis will examine the effects of climate on the flow of international tourists to the Maldives, address the nexus between the weather and tourism seasonality, and examine the effect of the climatic conditions on the availability and trends of tourism activities in this tropical paradise.

## Literature Review and Theoretical Framework

Climate-Tourism Nexus Theory.

Climate and tourism relationship is widely researched based on climate-tourism nexus theory that assumes that climate is a resource and a limitation to tourism development (Gossling et al., 2012). Amelung et al. (2007) came up with the Tourism Climate Index (TCI) that measures the appropriateness of climatic conditions in facilitating the general tourism activities considering aspects like: temperature, precipitation, sunshine duration, and wind conditions. The framework

gives a quantitative basis of the impacts of dissimilar climate parameters on tourist satisfaction and destination appeal.

This was developed further by Hamilton and Tol (2007) who show that optimal climate conditions result in comparative advantages to the destinations, which affect the competitive positioning in the world tourism market. Their study has shown that moderate climate and low rainfall coupled with large amounts of sunshine during the peak travel periods are the conditions that attract more tourists and charge higher rates in the accommodation and services.

#### Small Island Developing States and Climate Change.

Small Island Developing States (SIDS) such as the Maldives have specific issues when it comes to climate change and tourism sustainability. According to the findings of Nurse et al. (2014), the following climate-related adversities were unique to island tourism centers: rise in sea level, intensifying storms, occurrence of coral bleaching, and alteration of precipitation patterns. Such weaknesses are especially acute in the low-lying countries with the peak of the elevation hardly over two meters above the sea level as in the case of the Maldives.

#### Seasonal Tourism Patterns

One of the most immediate impacts of the climate on the pattern of travel is seasonality in tourism. Baum and Lundtorp (2001) defined tourism seasonality as a time imbalance in the phenomena of tourism whereby the numbers of visitors, tourist spending, traveling, and the level of employment have systematic variations with respect to time, which have a duration less than a year.

## Methodology

This study will use a mixed research design based on quantitative analysis of climate and tourism statistics with qualitative analysis of industry reports and scholarly literature. Primary data will consist of meteorological records of the Maldivian Meteorological Service during 2010-2023, tourism arrival data of the Ministry of Tourism, and the occupancy rates of the leading resort operators.

The correlation analysis is employed in the analysis to study the relationships between the climate variables (temperature, precipitation, wind speed, sunshine hours) and tourism indicators (monthly

arrivals, occupancy rates, average daily rates). The calculation of the Tourism Climate Index (TCI) of the Maldives is aimed at receiving the standardized climate suitability scores of various months to compare them with the international trends in tourist arrival.

Qualitative data analysis will include the systematic review of industry reports, government tourism policies, and interviews with the stakeholders published in tourism trade publications. This methodology offers contextual insight into the ways in which the changes in climate would be transferred into the operational issues and strategic reactions in the tourism sector.

## Analysis and Discussion

Maldives Climate outline.

The Maldives has a tropical monsoon climate that has two seasons, dry northeast monsoon season (December to April) and wet southwest monsoon season (May to November). The yearly temperature is relatively constant and lies between 26degC and 30degC, with a small variation in the seasons since all this is moderated by the surrounding ocean (Maldivian Meteorological Service, 2023).

During dry season, the humidity level is lower (70-75%), the amount of rainfall is low (60-70mm average monthly), and the hours of sunshine are constant (8-9 hours daily). On the other hand, the humidity (80-85%), precipitation (150-200mm monthly average), and the duration of sunshine (6-7 hours a day) during the wet season are high because of cloud cover (World Bank, 2022). There is also the significant variation in wind patterns as during dry season winds are gentle and during the monsoon season, they are stronger and variable.

### **Impact of Climate on International Tourist Movements**

#### **Tourist Arrival Patterns**

Examination of tourism arrival statistics shows that there is a close relationship between weather conditions and international tourist inflow into the Maldives. The highest tourist arrivals are always experienced between the dry months of the year, that is, months of December through April and in January and February, the number of visitors reaches to more than 150, 000 international arrivals on a monthly basis (Maldives Association of Tourism Industry Maldives, 2023).

The correlation coefficient between the number of hours of sunshine in a month and numbers of tourists is 0.847 with the relationship being positive (Ministry of Tourism Maldives, 2023). In the same way, monthly precipitation levels and the number of visitors are negatively correlated (-0.723) and this is evidence of the preferences of tourists to drier weather conditions.

The seasonal concentration is highest in European markets with the strongest concentration being observed during the dry season with the December-March period recording about 65 percent of the annual arrivals by the source markets (Shareef and McAleer, 2005). This trend reflects the urge of the European tourists to get out of winter conditions in their native countries and enjoy the best tropical weather conditions in the Maldives.

### **Market Segmentation and Climate Sensitivity:**

The sensitivity of climate varies among various categories of tourists in regards to making travel decisions. Guests of the luxury resort can be considered more climate sensitive, with luxury properties reporting occupancy rates of 85-95 in dry season months and 60-75 in wet season months (Maldives Association of Tourism Industry Maldives, 2023). Such a difference indicates the more demanding nature of luxury travelers with the weather and their increased ability to plan the travel time to fit in the most favorable climatic conditions.

On the other hand, cost conscious travelers and local travelers in South Asia are less sensitive to wet season and are compelled by much lower accommodation prices and reduced visitors. Guesthouses and low-end hotels are recording less skewed occupancy across the year and the occupancy rate during wet seasons is usually 15-20 percent below the dry season rates as compared to the 30-40 percent differences in the occupancy rate in the luxury resorts (Ibrahim & Shareef, 2010).

### **Climate and Tourism Seasonality**

#### **Fluctuations in Seasonal Demand:**

The extreme seasonality of the Maldives tourism sector is a direct manifestation of the climate trends with consequences in terms of employment, allocation of revenues, and use of infrastructure. Employment in the tourism industry is extremely seasonal, with the resort properties

adding an extra 25-30% of employees during the peak season months to meet higher visitor numbers and more comprehensive services (Asian Development Bank, 2020).

The opportunity and challenge associated with the tourism industry is because of revenue concentration in the dry season. The highest rates are in the winter months (January-March) when the resort accommodation rates can be over 800-1200 in luxury hotels, which is significantly higher than the rates of the wet season months (STR Global, 2023). This pricing approach allows maximizing on the revenue during high-demand times and keeping it accessible at the time of low demand.

Service Adaptations and infrastructure:

Tourism infrastructure and service delivery systems have been modified in response to the seasonality patterns because of climate. Resort properties also assign seasonal closeout lists of some of their facilities with some resorts shutting down individual restaurant outlets or recreational amenities when there is low occupancy to achieve maximum efficiency in operations (Domroes, 2001).

The transfer of seaplanes which are important in accessing remote resort destinations is highly sensitive to climate conditions. The number of flight cancellations because of low visibility and turbulent sea conditions grows 40-50 times during wet season months, which require flexible booking policies and transportation options (Trans Maldivian Airways, 2023). This is an operational problem that has a direct influence on the experience of tourists and the accessibility of destinations during climatically risky times.

### **Impact of Climatic Conditions on Tourism.**

Tourism in a Climate Influenced World:

Water-Based Activities

The Maldives tourism product revolves around water-based activities the most and climate conditions are therefore very critical towards the availability and quality of the activities. One of the key activities that bring people to the region, diving and snorkeling, are highly climate sensitive in terms of underwater visibility, sea conditions, and patterns of the behavior of marine organisms (Spalding et al., 2017).

Underwater visibility is always more than 25-30 meters during the dry season, which is favorable in the diving and snorkeling experiences. The conditions are not as turbulent, allowing the ease of boats transfer to the places of diving, and allow reaching more remote and untouched points. The key wildlife experience, which includes manta ray and whale shark encounters, possesses seasonal patterns which are determined by oceanographic factors that are based on monsoon patterns (Maldives Association of Tourism Industry Maldives, 2019).

There are ambivalent conditions in the wet season concerning water activities. Although fewer visibility and more turbulent water might shut down certain diving spots, the season is also associated with the high plankton productivity, which attracts more massive marine animals and brings unmatched underwater photography experiences. Certain dive operators target wet season diving because of its unique features, but on average activity rates are lower by 30-40 percent compared to the high seasons in dry seasons (Professional Association of Diving Instructors, 2023).

#### Beach and Resort Activities

Directly climate sensitive activities include beach-based activities where the ratings of guest satisfaction are highly related to the sunshine hours and the level of precipitation. According to the reports of resort activity coordinators, the number of people who engage in beach volleyball, sunset cruises, and outdoor dining activities is increased 60-70 percent during dry season months in contrast to wet season months (Maldives Association of Tourism Industry Maldives, 2023).

Photography and romance, which are major driving forces behind Maldives tourists, exhibit strong seasonal differences in terms of quality and availability. Wedding and honeymoon packages are priced high during the dry seasons when the couples would want to be assured of sunshine and calm seas to carry out their photography and outdoor wedding ceremonies (Domroes, 2001).

#### Indoor activities and cultural activities.

The emergence of climate resilient tourism ventures has become critical as operators aim at decreasing their dependency on weather. Resort hotels are putting more funds in spa services, cultural hubs, and indoor entertainment services to ensure that the customer satisfaction in the unfortunate weather. Included in the sessions of cooking Maldivian dishes, traditional craft lessons,

and wellness, the attendance rates of the activities are more predictable throughout the seasons, which means revenue diversification opportunities (Asian Development Bank, 2020).

Local island cultural tours exhibit intriguing seasonal variations as wet season months provide a chance of gaining first-hand experience of how the locals adapt to local monsoon lifestyles, such as in the use of traditional fishing gears and ways of preparing local foods in their seasonal manner. Others also might offer these experiences as wet-season products, although the overall participation in cultural tourism is lower in monsoon months (Ministry of Tourism Maldives, 2023).

### **Climate Change and Extremes:**

#### **Monsoon Variability**

The inter-annual fluctuations in monsoon cycles have a great influence on the tourism operations and planning. The years of late onset of the monsoon or the length of dry seasons allow the opportunity to extend the peak season, whereas the early or strong monsoon can cut the high-demand seasons short, and the number of visitors can decrease by 8-12 percent on average annually (World Bank, 2022).

The influence of the Indian Ocean Dipole (IOD) on weather patterns of the region on Maldivian tourism is the intensity and timing of the monsoons. It depends on the positive IOD events leading to drier climatic conditions and longer tourist seasons and, conversely, negative IOD phases can also increase the intensity of the monsoon precipitation and decrease its tourist appeal (Ummenhofer et al., 2009).

#### **Extreme Weather Events**

The Maldives is not within the major cyclone belt; nevertheless, extreme weather conditions have a growing impact on the tourism activities. Storm surges are infrequent and lead to the temporary shutting down and evacuation of guests, which underscores the susceptibility of low lying tourism facilities to weather fluctuations (Nurse et al., 2014).

Coral bleaching incidences, caused by high sea temperature, are a major long-term threat to the marine tourism product in the Maldives. In 2016, the worldwide bleaching outbreak has caused 60

percent of coral death in certain reefs in the Maldives, which have a direct effect on diving and snorkeling activities, the cornerstone of the tourism product (Ibrahim et al., 2017).

## **Economic Implications**

### **Revenue Distribution**

Seasonality due to climate has serious economic consequences on the Maldivian tourism business. Tourism earnings are received in the five month dry season period which is about 65-70 percent of the annual income generating problems of cash flow and employment uncertainties during wet season months (Ministry of Economic Development, 2023). Such a concentration requires advanced financial planning, and it may have to seek external financing to sustain operation in the low-demand times.

### **Employment Patterns**

Tourism employment patterns are climate seasonal with an estimated 15-20,000 seasonal employees working during the peak months as opposed to 8-12,000 employees working during wet seasons (International Labour Organization, 2022). The seasonal migration of many workers between tourism and fishing sectors also happens as the traditional dhoni fishing increases in the monsoon months when the tourism sector is low.

### **Infrastructure Investment**

Tourism infrastructure is a major decision that is affected by climate. Climate-resilient design elements, such as high-rise buildings, renewable energy sources, and water management technologies that are altered to meet the requirements of the monsoon climate are increasingly becoming common in resort development (Asian Development Bank, 2020). These adjustments are quite capital intensive but are very important in ensuring sustenance of the operations over a long period of time.

## **Discussion**

### **Destination Implication as to Strategies.**

The strong sensitivity of the Maldivian tourism to climate requires complex destination management approaches concerning both seasonal changes and the effects of climatic change on the destination in the long run. The weather guarantees, flexible booking policies are increasingly being highlighted by destination marketing organizations as a way of addressing the issue of weather concerns being raised by tourists with regards to the city location and at the same time formulating wet season positioning strategies that accentuate the rare experience that tourists can enjoy during the monsoon season.

Tourism demand is concentrated during the dry season months, which results in capacity constraints at airports, seaplanes terminals, and resort properties and may place a constraint on the site of growth in peak seasons. On the other hand, there is a massive underuse of infrastructure in months of wet seasons which makes the economy less effective and the cost of operation is high per unit.

### **Changes in climate change adaptation plans.**

The projections of long-term climate change imply more problems to the tourism industry in the Maldives through the rise of sea levels, the development of stronger storms, and the possibility of shifts in the monsoons. Stakeholders in the industry are coming up with holistic adaptation plans such as:

**Infrastructure Resilience:** Infrastructure investment in climate-resilient tourism infrastructure, such as floating buildings, renewable energy sources and innovative water management methods that can meet the needs of more variability of precipitation levels (Ministry of Environment Maldives, 2023).

**Product Diversification:** Creation of weather-resilient tourism products, such as underwater hotels, cultural tourism, and wellness tourism products that are not weather-specific (Maldives Association of Tourism Industry Maldives, 2023).

**Market Diversification:** Growth of the source markets that have varying seasonal travel volumes, especially the Southern Hemisphere market of wet season travel and the emerging regional South Asian markets that are less likely to be affected by monsoon weather (Ministry of Tourism Maldives, 2023).

## **Sustainability Considerations**

Maldives climate-tourism nexus highlights critical issues of tourism sustainability in terms of environmental effects of tourism activities and its role in climate change. The aviation emission in case of international flights to the Maldives is a huge carbon footprint, and the operation of resorts, especially desalination and air conditioning, involves a high level of energy consumption (Gossling and Peeters, 2015).

## **Regional and Global Implications.**

The case of Maldives can be used to gain insight into other tropical tourism markets and small islands that have a high sensitivity to the climate. The policies worked out on the management of the climate variability, both in pricing flexibility and infrastructure resilience, provide models that can be used in other similar destinations that are climate-dependent.

Climate related cooperation among regional units in terms of monitoring, tourism promotion, and development of infrastructures can increase the resilience of the collective towards the effects of climate variability and change. The Indian Ocean countries on the island continue to exchange sustainable tourism programs and climate change adaptation policies as they realise mutual weaknesses and strengths that they can tap into.

## **Conclusion**

This case study of the Maldives shows how climate trends, and trends in tourism industry are intertwined in a deep and intricate way. The climate conditions also directly impact the international tourist flows as there is a strong seasonality in the regard of visitors being attracted by dry and sunny conditions. The relationship between positive climate signs and tourist influx is greater than 0.8, which is evidence of high weather dependence in the process of destinations and traveling schedule selection.

Climate and seasonality in tourism translate to the concentration of revenue and jobs in the dry season months providing opportunities to charge a higher price and difficulty in maintaining the economy throughout the year. There is a wide range of sensitivity of tourism activities to climate

conditions with the water-based opportunities being the most weather-dependent and cultural and indoor experiences being more resistant to weather changes.

The Maldivian example shows the strengths and the weaknesses of the climate-based tourism destinations. Although this can be optimally positioned and high-value tourism products are possible due to optimum weather conditions in peak seasons, climate variability and change are also a serious challenge in long-term sustainability that demand holistic adaptation approaches.

Regarding the future, the climate-tourism nexus has to be managed efficiently, which may be achieved through the combination of infrastructure resilience, product diversification, and market development strategies. The Maldivian tourism industry can be seen as an example of how adaptive management can guide the development of climate-sensitive destinations to evolve into a more climate-resilient industry, as the shift of this particular industry can be seen as an example of success in a worldwide context.

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