Developing a Climate-based Recreation Management System in a Mediterranean Island: Evidence from North Cyprus

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ABSTRACT

This study intends to develop a climate-based recreation management system in the Mediterranean island of North Cyprus where the climate is one of the most important tourism resources. A knowledge-based management system was applied for transformation of meteorological data to the wisdom management in tourism activities. Suitability of the climate for tourists was calculated using Tourism Climate Index (TCI). TCI values were calculated for all meteorological stations of North Cyprus and were interpolated through Geo-statistical techniques (Kriging) in Arc GIS software. Apart from monthly TCI map, risk assessment of tourism climate was prepared through coupling Information Diffusion Model (IDM) in TCI. Recreation Management System (RMS) calendar was designed based on temporal analysis of TCI maps, TCI risk maps, environmental as well as socio-economic issues in the context of Ecological Modernization Theory (EMT). RMS calendar is an innovative idea that can be implemented as a chapter of tourism master plan. Reducing environmental degradation, distribution of tourism benefits, promoting tourism marketing, proposing an adaptive approach towards climate change and seasonality are the main implications of RMS calendar. A Tourism Weather Insurance (TWI) framework was developed to enhance the functionality of RMS calendar to promote marketing of the island's tourism in terms of seasonality and variability of the climate time and space. Evaluation and monitoring process enables the proposed model to be adjusted to the RMS in the island based on the changes of potential natural and human factors. Limitations, managerial implications and research pathways for future studies were elaborated.

Key Words: Tourism Climate Index, Risk Assessment of Tourism Climate, Information Diffusion Model, Recreation Management System, Ecological Modernization Theory, Tourism Weather Insurance, North Cyprus.

ÖZ

Bu çalışma iklimin en önemli turizm kaynaklarından biri olduğu Akdeniz'deki Kuzey Kıbrıs adasındaki iklim temelli bir rekreasyon (dinlenme ve eğlendirme) yönetimi sistemi geliştirmeyi amaçlamaktadır. Meteorolojik verilerin Turizm faaliyetlerindeki akıllı yönetime dönüştürülmesi amacıyla bilgi tabanlı bir yönetim sistemi kullanılacaktır. İklimin turistler için sürdürülebilirliği Turizm İklim İndeksi (Toursim Climate Index – TCI) kullanılarak hesaplandı. TCI değerleri Kuzey Kıbrıstaki tüm meteroloji istasyonları için hesaplandı ve interpolasyonu Arc GIS yazılımındaki jeoistatistiksel teknikler kullanılarak gerçekleştirildi. Aylık TCI haritası yanısıra, Turizm ikliminin risk değerlendirmesi Bilgi Dağılım Modeli (Information Diffusion Model – IDM)'nin TCI ile birleştirilmesiyle hazırlandı. Rekreasyon Yönetimi Sistemi'nin (Recreation Management System – RMS) takvimi; TCI haritalarının zamansal analizleri, TCI risk haritalarının yanısıra, Ekoloji ve Modernizasyon Teorisi (Ecological Modernization Theory – EMT) kapsamındaki çevresel ve sosyo-ekonomik konular baz alınarak tasarlandı. Yenilikçi bir fikir olan RMS takvimi turizm master planının bir bölümü olarak uygulanabilir. Çevresel yozlaşmanın azaltılması, turizmin faydalarının yayılması, turizm pazarlamasının teşvik edilmesi, iklim değişimine ve mevsimselliğe uyarlanabilir yöntemler önerilmesi RMS takviminin ana içeriğidir. RMS takviminin işlevinin adada turizim, mevsimsellik, yer ve zaman göre iklim değişimi açılarından pazarlanması amacıyla, bir Turizm Hava Durumu sigortası (Tourism Weather Insurance TWI) çerçevesi oluşturulmuştur. Potansiyel doğal ve insan unsurlarındaki değişimler temel alınarak, değerlendirme ve izleme süreci, önerilen modelin adadaki RMSe uyarlanmasına olanak sağlar. İleriki çalışmalar için; kısıtlamalar, yönetimsel çıkarımlar, araştırma konuları incelenmiş ve geliştirilmiştir.

Anahtar Kelimeler: Turizm İklim İndexi, Turizm Ikliminin Risk Değerlendirmesi, Bilgi Difuzyon (Yayılma) Modeli, Rekreasyon Yönetim Sistemi, Ekoloji ve Modernizasyon Teorisi, Turizm Hava Durumu Sigortası, Kuzey Kıbrıs.

To My Family

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INTRODUCTION

1.1 Conceptualization

This chapter includes statement of problem, purpose, and contributions of the study to the current knowledge of tourism climate.

Tourism plays key role within the global economic system. It has become a significant global phenomenon socially, culturally, economically, and environmentally (Amelung & Nicholls, 2014). Environmental concerns and climate change are becoming elements of uncertainty in terms of the sustainability of tourism as a socio-economic force. Global environmental change, especially climate change, increases the possibility of disturbing occurrences, with consequences for the tourism sector.

Clearly, uncertainty and randomness are two characteristics of climate change that can affect the well-being of tourists while they are at their destinations, especially if they are there for the purpose of 3S (sun, sea, and sand) tourism. Since tourists expect a favorable climate, occurrences such as high winds, heavy precipitation, and inordinately high temperatures will negatively impact their satisfaction (De Freitas, 2003; De Freitas et al., 2008; Hernández-Lobato et al., 2006; Jeuring & Becken, 2013).

Climate is one of the key attractions, especially in 3S tourism, and an important factor in determining length of stay, satisfaction, and loyalty, as well as in affecting the feasibility of locations as tourist destinations (De Freitas, 2014; Denstadli et al., 2011; Romão et al., 2014). Climate, as one of the destination image attributes, is also highly influential in tourists' destination choices, as well as in their behavior during and after visiting their destinations (Botzen et al., 2009; Kajan & Saarinen, 2013; Zhang et al., 2014).

According to Gómez Martín (2005), there is a consensus among geographers and planners that climate is a major determinant of tourist site selection, decisions on infrastructural development, encouragement of investors, temporal tourism activities, and tourists' intentions to return.

Tourism industry faces various human-induced threats (e.g., socioeconomic and political instability) and natural risks (e.g., climate change, floods, and earthquakes) (Chew & Jahari, 2014). Two main sources of risk in tourism are a lack of knowledge about the destination and future conditions ranging from weather to social circumstances (Chang, 2009). Identifying and mitigating risk factors are important because risk has a significant impact on the behavioral responses of tourists (Kozak et al., 2007).

Apart from contributions of tourism development to the destinations, crowding of the area or deterioration of the environment (e.g., physical and biological characteristics of the natural resources) negatively affect the social acceptance level of the hosts and the attitude of the tourists that can cause irreversible damage to the ecosystem. Gunn and Var (2002) addressed this issue in the context of *development-resources relationship*.

Hall conducted a survey that found that tourist visitation damaged the vegetation cover of Sherwood Forest in England (Hall & Page, 2014). Similarly, Filimonau et al., in an assessment of the carbon impact of short-haul tourism, revealed that tourism significantly escalates the global carbon footprint (2014).

It is agreed that tourism is one of the main contributors to global warming and climate change. Such adverse impacts of tourism can be minimized through knowledge-based management (Ackoff, 1989; Cooper, 2006; Hunter, 1997; Perkins et al., 2013), the application of technology and financial sources (Huber, 2000), and the participation of stakeholders (Fleskens & Stringer, 2014; Huber, 2000; Imran et al., 2014). This notion is consonant with the principles of Theory of Ecological Modernization (TEM), a school of thought in the social sciences heralded for addressing environmental issues through application of technology in developing innovative plans (Fisher & Freudenburg, 2001). The environmental impact of tourism is a foregone conclusion (UNWTO, 2013). However, the level of impact is different regionally and is highly dependent on concentration of tourists flow in time and space (Gössling et al., 2012). For instance, when it comes to water consumption by tourism sector, it becomes a formidable challenge, especially in the case of Mediterranean, and more so in the case of North Cyprus which is located in a water stressed basin (Arnell, 2004).

Overall, international tourism water consumption may be less than 1% for national water use; however, in the case of North Cyprus the rate increases to 4.8% due to tourist arrivals (Gössling et al., 2012). It is anticipated that chronic water shortage will occur in North Cyprus and many other island states by year 2050. Potential conflict between residents and tourists over water consumption is addressed by numerous authors (Al Haija, 2011; Becken, 2014; Cole, 2014; Gössling et al., 2012; LaVanchy & Taylor, 2015).

In the context of climate change scenario, conflict is exacerbated by “forecasted impacts of global climate change on the spatial and temporal variability of precipitation- particularly as it relates to recharge of surface and groundwater in regions all around the world” (LaVanchy & Taylor, 2015, p2). If adequate adaptation policies are not in place to mitigate the conflict, the ramification will have a direct bearing on the environmental quality, socio-economic wellbeing, and sustainability of the tourists’ destinations, especially in island states (Al Haija, 2011; Cole, 2014).

It is acknowledged that tourism has negative environmental impacts on Mediterranean islands, which are intensified by the fragility of the environment, human pressure and lack of spatial planning (Calvo et al., 2012; Cantasano & Pellicone, 2014; Cori, 1999). Vehbi and Doratli (2010) in their assessment of environmental impacts of tourism in the coastal cities of the northern part of the island witnessed deterioration and reduction of green fields, loss of natural landscape, loss of open space, sea water and air pollution, noise pollution, waste and visual pollution, which mostly attributed to tourism development.

The negative impact of tourism development is particularly strong in the coastal areas where the surface area is highly susceptible to erosion and pollution (Szefer, 2013). The coastal geology and their profiles are also affected by climate change (Samaras &

Koutitas, 2014). In respect of the case of north Cyprus, there is an interrelationship between coastal regions as the main resources for tourism, climate change and its ramifications, and proposed RMS toward adaptability and management.

Lack of RMS can be also witnessed in the context of lack of landscape planning and spatio-temporal recreation mismanagement in the study area. About 75 percent of the island hotels have been built on the northwest shoreline (See Figure 6). However, Vehbi & Doratli (2010) noted that natural beauty, historical heritage and the traditional urban pattern are reasons that make northwestern cities (e.g., Kyrenia), as the leading tourist destination in the Mediterranean Basin since 1930s. Furthermore, Kyrenia possesses developed infrastructure, easy access to the airport and capital city, access to harbor and shipping lines that attracts investment, especially in luxury hotels construction.

The concentration of tourism activities, regardless of carrying capacity issue, is associated with excessive exploitation of natural resources, water pollution and water scarcity, solid and hazardous wastes, erosion and soil degradation, air pollution, and loss of biodiversity (See Figure 4).

The consequences of this improper Recreation Management System (RMS) are combined with a complex set of political, social, and cultural issues (Vehbi & Doratli, 2010). For example, as a result of economic leakage and land mismanagement, there is hesitation about the pro-poor role of tourism in improving the livelihood and welfare of residents on the island (Szefer, 2013).

Moreover, seasonality results in large differences in tourist arrivals and revenues in the winter and summer seasons in Mediterranean islands (Amelung & Viner, 2006; Truong et al., 2014). To address this problem, an adaptive management system is needed to cover multifaceted interactions between human and environment with respect to political, social, ecological, and geographical characteristics of the island (Cantasano & Pellicone, 2014).

Nevertheless, a comprehensive perspective is required to develop the RMS, which ought to involve views of local communities, planners and decision makers, business sector and scientists. Therefore, tourism scholars can effectively contribute to tourism management through generating knowledge and sharing innovative ideas. The gap between theory and practice can be reduced by proposing technical approaches that developed by application of scientific tools (e.g. GIS).

1.2 Problem Statement

The nexus between tourism and climate change is gaining more attention and generating further discussion in the literature in terms of its impact on and the role it plays regarding one of the most pressing challenges of 21st century-the climate change. For tourism sector, one of the urgent issues that demand an extensive research and evaluation is how to confront such a challenge and adapt to its inevitable consequences. One should bear in mind that tourism has been evolved and adapted to changing social and economic structures from the time of its subjugation to *laissez-faire* approach until recently planned and controlled approach under *sustainable* development approach (Mieczkowski, 1985; Ridderstaat et al., 2014; Rutty et al., 2014; Saarinen, 2014).

Therefore, adaptation to climate change based on innovative models should not come as a surprise.

The recent discourse /notion on “climate change skepticism and denial in tourism,” (Hall et al., 2014; Shani & Arad, 2015), the tourism industry is beginning to take notice of and concern with how to best respond and adapt to persistent characteristics of weather (i.e., its randomness and uncertainty) in the short term and long term (Amelung & Nicholls, 2014; Rosselló-Nadal, 2014).

Nevertheless, innovative approaches are needed to reduce the risk of climate change and enhance the adaptability of tourism industry. This empirical study attempts to fill the gap through developing a recreation management system with a focus on the case of North Cyprus, where the climate is one of the main sources of tourism. Regarding the complexity of integration of tourism and climate, which is an under-researched topic, the aim is to contribute to knowledge building in this area of research (De Freitas et al., 2007; Denstadli et al., 2011; Scott & Lemieux, 2010).

1.3 Purpose of the Study

This study aims to propose a system for spatial and temporal distribution of tourism activities based on attractiveness of climate, which covers natural (tourism climate risk), environmental (de-concentration of tourism actions), social-economic (diversifying and redistribution of tourism products/services) elements. Considering these comprehensive perspectives, the aim is to develop a system that can have practical policy implications for reducing environmental degradation, redistribution of tourism benefits, marketing, seasonality issue, and adaptation to climate change. Tourism weather insurance introduced as an innovative tool to ensure the functionality of the proposed implications. In fact, the qualities of tourism development are highly correlated with land management strategies considering the principals of sustainability, conservation, cooperation, learning, appreciation, responsibility, and respect for the resources.

To prepare a scientific framework for a RMS, attributes of different resources can be digitized in a GIS setting to produce materials for spatial analysis that provide graphical guidance for policy makers. Turner recommended this procedure for landscape planning which acted as an interface between social and environmental issues (Turner, 1989).

Monitoring and evaluation step empowers the model to calibrate the RMS calendar based on change of natural (e.g. climate change, seasonality) and anthropogenic (e.g. pattern of tourists' origin culture with different preferences) factors.

1.4 Contributions to the Current Knowledge

The present empirical research has potential to contribute to current knowledge in several ways. Firstly, this is the first study that analyzes the risk of destructive parameters of the climate (e.g. precipitation) based on mathematical approach, which is an integration of Tourism Climate Index (TCI) and the Information Diffusion Model (IDM).

McBoyle et al. (1986) identified the risk of climate change toward ski-based tourism in North America. Scott et al. (2008) reassess the impact of climate change on the ski industry of eastern part of North America and found that business sector overcomes to the risk through application of technology that helps them to make snow artificially by

IDM is a mathematical model for assessment of probability of occurrence of risky factors. It is used in analyzing of damaging events in various fields such soil erosion (Xu et al., 2012), pollution in chemical industrial parks (Meng et al., 2014), the grassland biological disaster (Hao et al., 2014), natural hazards such as floods (Mouri et al., 2013), meteorological drought (Zhang et al., 2008), agricultural drought (Kocheva et al., 2014), water crisis (Feng & Huang, 2008; Feng et al., 2009), earthquakes (Chen & Hawkins, 2009), and grassland fires (Liu et al., 2010).

TCI is a popular index that frequently used for estimation of well-being of tourist in relation to the destination climate (Amelung & Nicholls, 2014; Deniz, 2011; Mailly et al., 2013; Scott et al., 2004; Rosselló-Nadal, 2014). In this study, risk of precipitation, as a destructive factor to well-being of tourist, calculated based on IDM. Then, IDM values entered to the TCI to estimate risk of tourism climate for all meteorological stations of North Cyprus.

The second contribution of the study is developing a recreation management system (RMS) that considers effective indicators, such as technical assessment results (e.g. TCI and risk of tourism climate), environmental and socio-economic issues, in the context of Theory of Ecological Modernization (TEM). RMS conforms to the knowledge-based management system (Ackoff, 1989) that stresses on wise managerial actions based on knowledge, rather than the raw data (e.g. meteorological data). The necessity of proposing such model in the management of tourism in the island (especially, in the coastal areas) suggested by Vehbi and Doratli (2010, p 1052) as they noted:

> Innovative planning strategies together with integrated and comprehensive approaches can help minimize or even eliminate altogether negative natural and man-made impacts of the tourism. Such strategies could lead to sustainable tourism, which would confer long-term benefits to both locals and visitors without damaging the environment of the destination.

Third, there are few empirical studies that explore application of weather insurance in tourism industry. Surprisingly, among common source of travel risk, most of the research focused on health issues in travel insurance (Gaines et al., 2014; Keystone et al., 2012; Leggat et al., 1999; Leggat & Leggat, 2002) and to the best of the authors' knowledge, there is no empirical study that investigate functionality of tourism weather insurance. This study is the first to initiate the *tourism weather insurance* during the climatic uncertainty with respect to its business implications. Furthermore, a practical framework for operationalization of tourism weather insurance is developed that is required for implementation of implications of RMS calendar.

1.5 Organization of the Study

This study consist of six chapters including introduction; literature review, theoretical framework, profile of study area; methodology (i.e., research design, data collection , data analyses); findings; discussion and conclusion.

In the next chapters, review of studies pertaining to the tourism climate nexus, risk assessment of natural phenomena (especially climate), and tourism weather insurance is provided. Theoretical background of Tourism Climate Index (TCI), Information

Diffusion Model (IDM), and Theory of Ecological Modernization (TEM) are elaborated.

Chapter 2

LITERATURE REVIEW AND THEORETICAL BACKGROUND

2.1 Overview

Climate is a free, non-substitutable, and unique tourism resource (Gómez Martín, 2005) that is prone to risk due to the occurrence of unfavorable climatic incidents (Becken & Hay, 2007; Fuchs & Reichel, 2011; Roehl & Fesenmaier, 1992; Sheng-Hshiung et al., 1997; Williams & Baláž, 2013; Witt & Moutinho, 1994).

Global environmental changes have increased the randomness and uncertainty of weather, which varies in a wide range of spatial and temporal scales (UNEP, 2008). In addition to the inherent uncertainty of weather, tourists' perception of risk in destinations increases the complexity of the tourism–weather nexus (Chew & Jahari, 2014; Lo, 2013). As a weather-dependent industry, tourism is strongly affected by climate change and seasonality (Amelung et al., 2007).

Recently, an argument has risen between key researchers on tourism climate (Hall et al. 2014; Shani & Arad, 2015) regarding climate change skepticism and denial in tourism industry. Nonetheless, it is time to develop adaptive and mitigating strategies toward interaction of climate and tourism that will extend beyond the present discourse. However, evidences of ramifications of climate change on various industries (e.g.

tourism) are inevitable. Randomness and uncertainty of weather in different time and space provide a rational justification for proposing and implementing new ideas rather than fixation on corroboration or falsification of factual evidences regarding climate change (IPCC, 2014).

From the supply side perspective, climate influences tourism site selection, the efficiency and application of infrastructure, benefits of investment in the sector, and the schedule of tourist activities (Gómez Martín, 2005). However, climate is also a significant indicator of demand-side (tourist) behaviors (De Freitas, 2014). Tracey (2010, p. 87) notes that

> As tourists are becoming more educated and increasingly sophisticated in their consumption patterns and as they demand better quality tourism products and experiences, travel and tourism firms will need to respond with more creative marketing strategies based on better quality products and more informative and trustworthy advertising messages.

Consequently, creative and adaptive strategies must be applied to mitigate the undesirable consequences of weather (Kaján & Saarinen, 2013; Weaver, 2011). It is logical that the proposed approaches in addressing the negative consequences of climate change and tourism nexus should focus on enhancing knowledge about climate change (Line et al., 2012), preparation of data bank (Scott & Lemieux, 2010), preparation of adequate models (De Freitas, 2003), informing tourists how to behave in severe weather conditions (Jeuring & Becken, 2013), and imposing a carbon tax on international air travel (Mayor & Tol, 2007).

2.2 Information Diffusion Model (IDM)

Most of the natural phenomena (e.g. climate, earthquake, flood…etc.) attached with two properties, namely, randomness and fuzziness. Randomness refers to uncertainty due to occurrence of the phoneme and fuzziness is caused by lack of knowledge regarding strength and incomplete sample (Li et al., 2012).

Tourism climate, as a natural phenomenon, consists of five meteorological parameters that have both randomness and fuzziness properties. Assessment of risk of such phenomena entails application of fuzzy approach that addresses aforementioned characteristics (Li et al., 2012).

The IDM is one of several methods used for risk analysis of the phenomena proposed by Huang et al. (1997). It employs fuzzy set methodology in disaster risk assessment to improve probability estimation.

> The information diffusion theory will then help to extract as much as possible underlying useful data and thus improves the accuracy of system recognition. Therefore, the technology can also be called the fuzzy information optimized processing technology. Information diffusion is a process of fuzzy mathematics that deals with the samples using the set numerical method. A single-valued sample can be transformed into a set numerical-valued sample through this technology (Feng et al., 2010, p 214).

This model has been utilized in other disciplines such as natural, social, and medical sciences (Feng & Luo, 2008; Liu et al., 2013; Shang et al., 2004). The IDM was employed to estimate the exceeding probability distribution of multi-hazard risk to human life by using natural hazard disaster life loss data in China (Liu et al., 2013). The IDM was considered as theoretical background of a practical project to investigate the linkage of prevalence rates between coronary heart disease and relevant risk factors (Shang et al., 2004).

It was reported as a practical tool for risk assessment of environmental issues like pollution in chemical industry park (Meng et al., 2014) and the grassland biological disaster (Hao et al., 2014). Furthermore, this approach is frequently applied to risk analysis of natural hazards and disasters such as floods (Feng & Luo, 2008; Mouri et al., 2013), meteorological drought (Zhang et al., 2008), agricultural drought (Kocheva et al., 2014), agricultural insurance (Lou & Sun, 2013), water crisis (Feng & Huang, 2008; Feng et al., 2009), earthquakes (Chen & Hawkins, 2009), and grassland fires (Liu et al., 2010).

In accordance with Weaver (1993), 3S tourism products are perceived in terms of two subsections (beach resorts and cruise ship activity) as applied to the industry in small islands. Furthermore, the detrimental effect of rainfall, which is proposed by De Freitas et al. (2008), emphasized the destructive role of rainfall on climate well-being for beach users. Nevertheless, the rain as a factor can eclipse the suitability of other climate factors which can lead to abandonment of the beach by tourists.

Amengual et al. (2014) and Bafaluy et al. (2013) stressed on overriding properties of rainfall in climate attractiveness not only for beach-based tourism, but also for other types of tourism activities in the Mediterranean islands. Regardless of the complexity of the tourism climate system, the precipitation parameter of the TCI has been identified as a decisive factor to estimate tourism climate risk. Such a supposition was employed for risk assessment of soil erosion and water shortage by Xu et al. (2012) and Feng and Luo (2008), respectively. In addition to such methodological concern, when compared to other TCI factors, variation of rainfall had a high probability in making the climate unfavorable for tourists, especially in the case of North Cyprus (Amelung & Viner, 2006).

This study fully takes into full consideration the uncertainty of precipitation/rainfall based on the IDM coupled with the TCI. This can be addressed through a combination of both the risk analysis and genetic analysis techniques (Parmesan, 2006).

2.3 Tourism Climate Index (TCI)

To provide an accurate assessment of (changes in) temporal and spatial variations of climatic suitability for tourism, a number of methods and metrics have been developed and applied.

Generally, two main approaches in the estimation of favorability of climate for tourism activities are expert-based index proposed by Mieczkowski (1985) in relation to the TCI and user-based indices developed by De Freitas et al. (2008) in relation to Climate Index for Tourism. Furthermore, Beach-users Climate Index proposed by Morgan et al. (2000), functions based on tourist’s response.

De Freitas (1990) conceptualizes climate as the thermal, physical, and aesthetic facets of on-site atmospheric conditions in the context of tourism, which together influence the enjoyable pursuit of tourism activity. A range of studies have focused exclusively on the thermal aspect; applying several sophisticated thermal indices for assessing human comfort pertinent to tourism (see e.g. Cegnar & Matzarakis 2004; Ibarra, 2011; Matzarakis et al., 1999). Predicted Mean Vote (PMV) and Physiologically Equivalent Temperature (PET) are examples of indices that have been successfully applied. Other studies have used more integrated and multifaceted indices for climate assessments in the context of tourism (see e.g. Amelung et al., 2007; Becker, 1998; Deniz, 2011; Perch-Nielsen et al., 2010). The most commonly used index in this type of analysis is the Tourism Climate Index (TCI) proposed by Mieczkowski (1985).

An important strength of the TCI is that it incorporates all three of De Freitas' (2003) facets of tourism climate. A number of weaknesses have also been identified, however, including an inflexible weighting and rating system, failure to consider the potential overriding effects of rain and other weather elements, and a lack of empirical validation of the index (De Freitas et al., 2008; Moreno & Amelung, 2009; Morgan et al., 2000). Index values based on self-reported tourist preferences are known to be more reliable indicators for climate attractiveness than those solely based on expert judgment. To improve on this point, Morgan et al. (2000) used survey results on climate preferences to adjust the weighting and rating scheme of Mieczkowski's index. The surveys were administered on beaches in Wales, Malta and Turkey. Differences in climate preferences were reported, but not specifically linked to culture.

De Freitas et al. (2008) took a more radical approach. They proposed a new generation of tourism climate index that addressed some major deficiencies of past indices. At the heart of this Climate Index for Tourism (CIT) typology matrix, this integrates the thermal, aesthetic, and physical aspects of weather conditions, while considering the overriding effects of some weather aspects. The rating of the various weather types is based on empirical information, and can therefore be easily adapted to specific activities or locations.

In the context of the TCI, Mieczkowski (1985) did weigh out five meteorological parameters, namely, temperature, relative humidity, precipitation, wind speed, and hours of sunshine to estimate a categorical tourism climate index ranging from unfavorable (-20) to excellent (100). The TCI has several drawbacks such as ignoring non-thermal aspects of weather and climate (Moreno & Amelung, 2009), overriding the effect of precipitation and wind (De Freitas et al., 2008), and lack of empirical validation due to the expert-based approach (Perch-Nielsen, 2010). Nevertheless, it frequently has been employed to estimate favorability of climate for tourism activities and investigation of climate change (Amelung & Nicholls, 2014; Deniz, 2011; Mailly et al., 2013; Scott et al., 2004; Rosselló-Nadal, 2014). However, even though some researchers simply use meteorological parameters; there is still a multifarious association between weather and tourism, which is exemplified by Becken et al. (2014, p 4) as:

> … The impacts of the weather on tourism were complex. Rain, for example, was directly detrimental to tourism as some activities or events are unable to proceed in the case of rain. Rain also resulted in issues of access (e.g., because of flooded rivers), higher operational costs (e.g., leakage in buildings), structural damage to infrastructure (e.g., bridges and tracks), and increased snowmelt. At the same time, rain increased the business of indoor attractions and resulted in a shift of guests from campgrounds to other accommodation.

In a way, meteorological factors can function as a double-edged sword, where one edge is for and the other is against tourism activities. As noted by Becken et al. (2014), some tour operators considered the lack of precipitation cause for the disappearance of river-based activities. In contrast, empirical results of Førland et al.'s (2013) study indicated that tourists do not like frequent rain and low visibility during recreation and leisure time.

In this respect, increasing rainfall was regarded as one of the negative consequences of global warming (Heltberg et al., 2009). Regardless of the impact of climate change, in most cases, precipitation was considered as a destructive factor in tourism and climate nexus (Day et al., 2013; De Freitas et al., 2003, 2008, 2014; Jeuring & Becken, 2013; Scott et al., 2004).

Georgopoulou et al. (2014) utilized the TCI to calculate physical risk of climate change in the banking sector (hospitality industry regarded as a subsector). Georgopoulou et al. (2014) have also used the TCI to estimate the change of 'attractiveness' of locations in tourism by combining climatic parameters (minimum/maximum temperature, humidity, precipitation, sunshine and wind speed) to determine thermal comfort for tourists. In this context (i.e., in respect to TCI), and with regard to climate change, the choice of destinations can be affected significantly with anticipated ramification for tourism. One should not overlook some of the non-meteorological parameters that can affect the destinations as well (e.g., infrastructure, economic growth, population etc.).

In this research, precipitation was regarded as a negative factor for tourism activities. The probability of rainfall based on the IDM can be calculated by using the TCI to analyze the risk of tourism and climate nexus. This is also in accordance with Xu et al.'s (2012) research that assessed risk of soil erosion in different precipitation scenarios using the RUSLE model (i.e., model for the estimation of soil erosion), which was embedded in the IDM. Furthermore, drought risk analysis in China was performed using the IDM and drought indices using precipitation data (Zhang et al., 2008).

Empirical findings reported by Lou and Sun (2013) and Jiquan et al. (2012) verified the capability of the IDM and GIS in mapping risk assessment of natural phenomena by providing practical implications for decision-makers, planners, and insurance firms.

2.4 Recreation Management System (RMS)

Recreational Management System (RMS) is a calendar designed based on spatio-temporal patterns and variations of tourism climate index (TCI), environmental concerns, and socio-economic issues that exhibits characteristics of each tourist zone where climate is one of the most important resources for tourism planning and development, especially in the case of island states. Notwithstanding the existence of sophisticated approaches such as the Recreational Opportunity Spectrum (Clark & Stankey, 1979) and Limits of Acceptable Change (Ahn et al., 2002); however, the proposed model has great potential to be used in the regions where climate is the major tourism resource.

RMS will provide the facilitation of five practical managerial implications in the destination as follows:

- Overcoming the seasonality problem,
- Equity in distribution of the economic benefits,
- Reduction of pressure on the ecosystems,
- Proposing an adaptive approach to climate change, and

- Tourism marketing.

The aforementioned process is in line with Wong et al. (2014) who emphasized the importance of evaluations of the policy environment for climate change adaptation in tourism, as well as, continuous monitoring process that is imbedded in the proposed model. Wolfsegger et al. (2008) examined the perception of stockholders toward risk of climate in Ski tourism. Interestingly, respondents claimed that negative effects of climate change on Ski tourism can be addressed by implementing innovative plan and new technologies (e.g. snowmaking). Pertinent to evaluation and monitoring in adaptive coastal management, Jacobson et al. (2014, p 51) stated that 'monitoring involves activities that measure the effectiveness of actions, whereas evaluating involves the interpretation of that information'.

One of the advantages of RMS is that it is structured upon knowledge-based management system, proposed by Ackoff (1989), which is very important for managers to make decision based on knowledge not raw data. See the following descriptive model:

[(Meteorological data (raw data) → TCI (information) + IDM (risk of precipitation) → spatio-temporal analyses of TCI and IDM values + considering environmental and social concerns/potentials in the context of TEM → RMS calendar (knowledge) → implementation of managerial implications (wise actions)].

The proposed model conforms to the transformation of "data" into "wisdom" in the context of tourism management. In other words, meteorological data are used to create information (TCI value), tourism climate maps, and risk of tourism climate maps. They are produced using spatial analysis in GIS software. A synthesis of the spatial patterns of TCI over 12 months (temporal analysis) contributes to proposing a guideline for RMS based on climate attractiveness and other considerations. This guideline is the RMS calendar. Accordingly, planners and decision-makers will have access to sufficient knowledge to manage tourism activities wisely in regions where climate is one of the most important tourism resources. Notwithstanding the environmental fragility of the study area, the tourism industry is highly dependent on the favorability of the climate, which can be mapped as a useful factor in tourism planning. There are two bases for the selection of climate as a main resource for RMS:

First, climate is an effective factor in RMS that affects human activities and the ecosystem (Ma et al., 2008; Li et al., 2009; Yospin et al., 2014; Zhang et al., 2014). Second, climate is frequently reported as one of the most valuable natural resources in tourism development (Gómez Martín, 2005; Saarinen, 2014) that affects tourists' decision-making in the selection process of a destination (Ridderstaat et al., 2014; Mieczkowski, 1985). Furthermore, climate not only contributes to the suitability of the resorts, but it also significantly influences the calmness of the sea and stability of the beach, which are considered unique tourism assets (Amengual et al., 2014).

Mapping climate change (i.e., using spatio-temporal analysis) raises awareness of tourists and helps stakeholders to properly plan tourism development and management (Becken et al., 2014, Wolfsegger et al., 2008) by providing a realistic image of the destination's weather for tourists (Assaker, 2014; Denstadli et al., 2011; Matzarakis, 2006). This will have also implication for tourism marketers to incorporate the RMS in tourism holiday package and advertisements. Therefore, tourism planners and business sector need to take notice “as tourists are becoming more educated and increasingly sophisticated in their consumption patterns; and they demand better quality tourism products and experiences. [Therefore], travel and tourism firms will need to respond with creative marketing strategies based on better quality products and more informative and trustworthy advertising messages” (Tracey, 2010. p 87).

In addition to the advantage of favorability of climate in the selection of a tourist destination, it also positively boosts tourists’ loyalty to revisit a place (Gómez Martín, 2005). Empirical evidence from Scandinavia revealed that the relationship between tourist’s perception and his/her intention to return was influenced by lack of access to clear information regarding the weather (Denstadli et al., 2011). Therefore, tourism climate map, that illustrates the temporal and spatial variability of the climate-related well-being for tourists, is one approach that can close the probable gap between tourist’s expectation and actual experience.

Wan et al. (2014) made a linkage between the spatial variation of water quality and land management. Hence, tourism climate map will assist planners and decision-makers to design RMS that not only controls tourists’ access to vulnerable natural areas, but also addresses the seasonality of tourist activities. This will also facilitates the equitable distribution of tourism expenditure throughout the island by dispersing tourists to for instance, hinterland and away from coastal zones which are under stress. Furthermore, it will also decrease local’s dependency on the natural resources (Eagles, 2014).

Concentration of tourism activities in coastal cities (i.e., based on S3 tourism), has led to adverse environmental impacts such as land deterioration due to land use change, soil and beach erosion, water scarcity, air, water, and noise pollutions, degradation of flora and fauna habitats, and exploitation of fragile natural resources (Newsome et al., 2012; Vehbi & Doratli, 2010).

RMS as an implementable approach, not only mitigates negative environmental and social impacts of tourism, it also provides a guideline to manage the density of tourism locations, as well as, an assessment of carrying capacity. It can also contribute to sustainability through diversifying tourism products/activities, improvement of infrastructure and poverty alleviation, especially in remote areas (Schmallegger & Carson, 2010) where mass tourism has not trickled down. In addition to RMS's environmental advantages through creation of spatio-temporal decentralization, RMS's social and environmental implications are also in line with the TEM (Fisher & Freudenburg, 2001).

Fisher and Freudenburg (2001) argued that TEM becomes functional as a practical interface between social (i.e., cooperation of decision-makers and stakeholders), and environmental (i.e., RMS as spatio-temporal climate data/map). Correspondingly, Burns (2004) proposed TEM as a model for addressing ecological problems in "tourism master-planning" to justify how ecological problems should be integrated into democratic politics.

Belle and Bramwell (2005) employed TEM to examine tourism managers' and policy-makers' perspectives on climate change in a small island. Since there is a comprehensive consensus among researchers (e.g., Amelung & Viner, 2006; Deniz, 2011; Hamilton et al., 2005) about the key role of climate in tourism, climate data can be a useful tool for tourism management in the context of TEM.

2.5 Tourism Weather Insurance (TWI)

Humans' exposure to various kinds of threats and risks such as health problems, financial losses, and natural hazards are some examples of tangible risk. Risk has been defined by several scholars that depicted in Figure 1. Insurance is a wise approach for managing the systems that have potential to induce risk (Gollier, 2003; Salman, 2014).

The history of insurance refers to 3000 B.C. when Chinese insured the ships commodities as well as insuring people by Iranians in the period of Persian Empire (Salman, 2014). Nowadays, diversity of insurance services have increased, and well-established in various sectors.

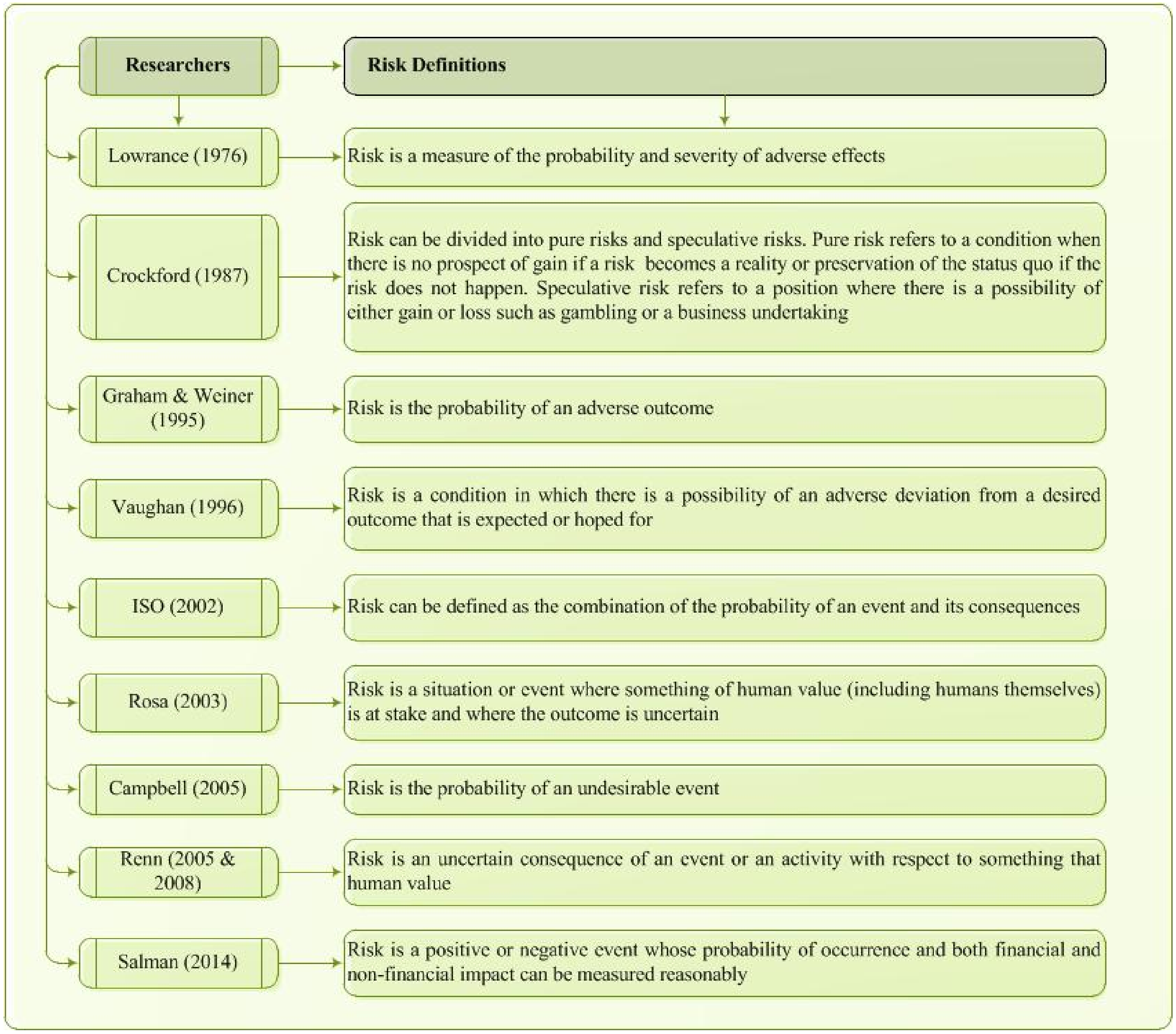


Figure 1. Chronological evolution of risk definition (Source: Salman, 2014)

Numerous kinds of insurance services are presented to meet needs of their customers. Auto insurance, life insurance, gap insurance, travel insurance, health insurance, accident, sickness, and unemployment insurance, casualty insurance, burial insurance, property insurance, liability insurance, credit insurance, insurance financing vehicles, closed community self-insurance are various types of insurance products (http://en.wikipedia.org/wiki/Insurance).

Tourism, like many other industries that employ and adopt insurance schemes (e.g. life insurance), needs to assess various kinds of risky factors (Lepp & Gibson, 2011) in order to develop mechanisms to render a peace of mind to its customers by operationalization of well-structured insurance system (Ejye Omar & Owusu-Frimpong, 2007).

The necessity of expansion of insurance services in tourism industry was highlighted by Williams and Baláž (2014). This is because tourism is an industry that is influenced by different uncertain attributes on both the demand and the supply side. For example, in a recent study, demand for assurance of public tourism services in public tourism activities in china demonstrated that tourists were concerned about tourism infrastructure, local soft environment, and tourism safety (Xu & Sun, 2015). Public and business sectors responded to such demands by providing “travel insurance” service. The coverage types of travel insurance risk are depicted in Figure 2.

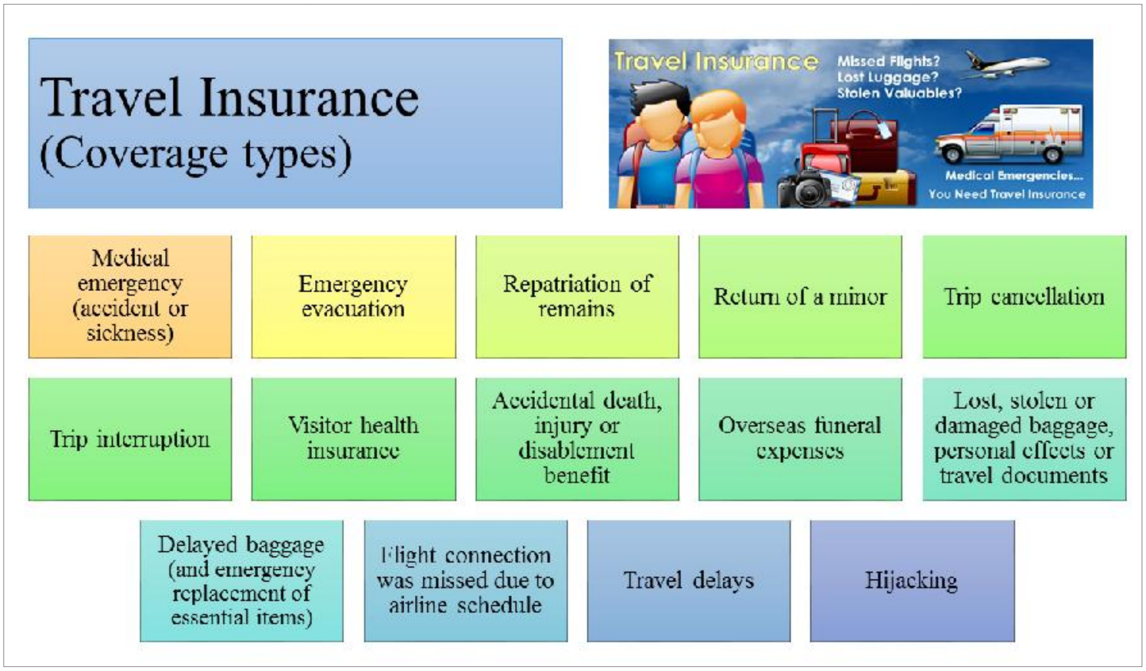


Figure 2.Common kind of risks covered by travel insurance
(*Reproduced from* http://en.wikipedia.org/wiki/Travel_insurance)

From both supply and demand sides perspective, climate influences tourism in several ways such as selection of touristic sites, scheduling tourist activities, revisit intention and recommendation of the destination to others (De Freitas, 2014; Gómez Martín, 2005).

Climate affects tourists' destination decision-making process, length of stay, comfort, satisfaction, and loyalty (De Freitas, 2014; Denstadli et al., 2011; Jeuring & Becken, 2013; Romão et al., 2014). Tourists tend to evaluate the climate attractiveness of a destination based on real situations at low level of uncertainty (Becken & Hay, 2007; Chew & Jahari, 2014).

As highlighted by many researchers, tourism weather insurance can serve as an adaptive strategy to mitigate the risk of unpredictable weather patterns (Becken & Hay, 2007; Day et al., 2013; Gómez Martín, 2005; Heltberg et al., 2009; Oliver-Smith, 2014).

Tourism weather insurance provides peace of mind to tourists concerned about climate disconfirmation at their destination (Mills, 2005). Furthermore, tourists' behavioral intentions (e.g., return intention and recommendation) have been influenced by perceived risks (e.g. weather risk) and mismatches between expectations and experiences about destination climate (Denstadli et al., 2011; Fuchs & Reichel, 2011; Oliver & Burke, 1999; Ross, 1975).

The relationship of perceived risk and weather insurance has been investigated in environmental (Lo, 2013) and agriculture research (Lou & Sun, 2013), resulting in practical implications and insights for operationalizing weather insurance in these sectors. Although researchers agreed that weather is an influential factor that increases tourists' level of perceived risk (Fuchs & Reichel, 2011; Roehl & Fesenmaier, 1992; Sheng-Hshiung et al., 1997; Williams & Baláž, 2013; Witt & Moutinho, 1994), none have empirically applied the topic to the role of weather in tourism.

2.6 Theory of Ecological Modernization (TEM)

As a backdrop to this study, TEM is initiated as a discourse in response to ecological problems; this is because sustainable development, notwithstanding its grand goals, is perceived as vague and difficult to operationalize (Eder, 1996). However, this is not meant to undermine the credibility of the sustainable development paradigm.

In fact, it has been a major force in the transformation of environmentalism into the ecological discourse that is resulted in the birth of TEM (Giddens, 1998; Hajer, 1996). Such a transformation, Giddens noted, is reflected in the fact that the "countries most influenced by the idea of ecological modernization are the cleanest and greenest of the industrial nations". In Eder's (1996, p210) words, "Its transformation into a new ideological master frame provides the possibility of a way out, legitimating social institutions by means of environment-related ethical frames." The focus of this study is to propose RMS based on spatio-temporal variations of climate for tourism actions on a Mediterranean island in the context of TEM.

TEM has captured the attention of numerous scholars around the world. More so in Western Europe (i.e., Germany, the Netherlands, the UK, Denmark, and Sweden), the United States, and, more recently, in newly industrialized countries such as Malaysia and Thailand, the concept has been molded into an epistemological/paradigmatic framework (Hajer, 1996; Mol et al., 2009). Anyhow, "Joseph Huber (from Germany) should be acknowledged as the father of ecological modernization theory due to his theoretical contributions to the environment and society from the 1980s onward" (Murphy, 2000, p2).

TEM has also been employed to justify shifting the institutional structures of solid waste management and improving its system in Malaysia (Saat, 2013); and/or reforming the planning system in Australia's island-state (Castles & Stratford, 2014). Nevertheless, the paradigmatic structure of TEM is rooted in a process of production and consumption (i.e., the decoupling or delinking of material flows from economic flows) and institutional transformation, especially in the public sphere (Eder, 1996; Mol, 2002). The crux of the theory was initially established when: The social dynamics behind these changes that are the emergence of actual environment-induced transformations of institutions and social practices in industrialized societies are encapsulated in the ecological modernization theory. This theory tries to understand, interpret and conceptualize the nature, extent and dynamics of this transformation process (Mol, 2002, p93).

In Giddens' words, "Ecological modernization implies a partnership in which governments, businesses, moderate environmentalists, and scientists cooperate in the restructuring of the capitalist political economy along more environmentally defensible lines" (Giddens, 1998, p57). Giddens (1998) reference to 'moderate environmentalists' meant to be a reference to proponents of TEM, who are neither market fundamentalists (i.e., who believes nature has restorative properties that go well beyond any impact human beings might have on the environment), nor radical ecologists (i.e., whose ideologies deployed in pursuit of 'de-industrialization and de-marketing (Buttel, 2000). In a way, moderate environmentalists' attitude, as proponents of TEM, is a reaction to the anti-modernist views of fundamentalists and radical ecology in managing the processes of production and consumption without dismantling the market system and opting for mitigating environmental impact (Buttel, 2000; Mol, 1996).

In the case of North Cyprus, TEM has not been recognized as a policy framework due to lack of commitment to establish political infrastructure (including political will) essential to implementation of TEM agenda. One of the pillars of TEM is close cooperation and consensus among numerous stakeholders (Rajkobal, 2014), especially the involvement of knowledge-based institutions for the purpose of innovation. This aspect of TEM requires structural changes in institutions and social practices (Mol, 2002), which is absent in North Cyprus. TEM is highly conducive to integrating new tourism policy towards adaptation to climate change.

The main purpose of this research is providing a Recreation Management System (RMS) based on TEM. This objective is embedded in RMS (Figure 7), where knowledge generation and sharing by the scientists (transforming meteorological data to RMS calendar) and its implementation with contribution of all stakeholders (action plan in the context of tourism master plan) are in accordance with precepts of TEM.

Thus, RMS is a loud call to planners and politicians who have promoted 3S tourism solely for the short term economic purpose without having any measure/policy in place towards protection of coastal zones and reduction of environmental impacts in North Cyprus (Vehbi & Doratli, 2010).

Chapter 3

CASE STUDY: NORTH CYPRUS

3.1 Study Site Profile

North Cyprus has been an active tourism destination way before mass tourism explosion in the 1960s (Yasarata et al., 2010). However, in the aftermath of Turkish intervention in 1974, tourism trajectory took a dramatic twist as the island was partitioned to Turkish and Greek enclaves. Nevertheless, both sides are blessed by suitable climate that generates calm sea and stable beaches. In the meantime, long and dry summers with the distribution of precipitation within a few months in the mild winter, renders a perfect conditions for so called 3S (Sea, Sand and Sun) tourism (Andronikou, 1987).

Geçitkale and Nicosia are two populated cities inland that are not considered part of coastal zones (See Figure 4). The land use types that dominate the island are dense to separate forest, sparse forest and brush, cultivated and garden crops, and irrigated areas. The main agricultural and horticultural productions of the island are wheat, barley, vegetable, olive and citrus fruits.

North Cyprus's main economic base is composed of small and medium-size enterprises (SMEs) with minor contribution to the economy. However, in the last two decades policy makers have focused on making this part of the island a university hub, as well as, a refreshed attention to restructuring tourism sector. Presently, there are more than 10 universities in North Cyprus accommodating over 40,000 international students (http://www.studyinnorthcyprus.org/?page_id=3652).

3.2 North Cyprus Tourism

The tourism sector remains to be crucial source of GDP as well as the main source of job creation. The sector employed over 12000 in the year 2013. The ratio of net tourism income to the trade balance is 39%. And the net income from tourism reached 616, 1 million $US in the year 2013.

The number of arrivals reached 1,366.077 in the year 2014. In comparison to 30 and 10 years ago, tourist arrival achieved an increase of 2815% and 94%, respectively (Farmaki e al., 2015). North Cyprus has been selected as a tourism destination by visitors who come from Turkey, Russia the UK, Iran, Poland, Syria, Germany, Nederland, Kazakhstan, and Azerbaijan. North Cyprus has a very rich history and following Figure represents some important historical heritages.

Figure 3. Historical heritages of North Cyprus

3.3 Sun, Sea and Sand (3S) Tourism in North Cyprus

Regardless of historical, cultural, and growth of educational tourism in recent years, 3S tourism is still the dominant attraction in the whole island, more so in North Cyprus (i.e., main destination for coastal tourism in the Mediterranean) (Onofri & Nunes, 2013). Nevertheless, determinants of 3S tourism, which is also known as 'beach' or 'coastal' tourism has its own complexity including the variable of 'climate'. In the meantime, demand for 3S tourism is also different in relation to the type of tourists (i.e., international and domestic). In Figure 4, some tourism attraction in North Cyprus has been illustrated.

Figure 4. Examples of tourism attractions in North Cyprus

In the case of North Cyprus, both domestic and international tourists have different expectations from so called coastal tourism industry. Such expectations are highly relevant to climate/ tourism nexus. With the prospect of climate change, and relationships between climate and tourism demand, it is agreed that climate change will affect tourist's behavior spatially-by shifting them to a higher altitudes and latitudes (Onofri & Nunes, 2013; Weaver, 2011). This will have grave implications for destination such as North Cyprus which is highly dependent on coastal tourism.

3.4 Threats to North Cyprus's Tourism

Attributes of coastal tourism renders various functionality with dependency on climate, environment, biodiversity, as well as, susceptibility to anthropogenic pressures (Praveena et al., 2015; Weaver, 2011). In the case of Mediterranean Island State, anthropogenic pressure, which is manifested in coastal development and cultural activities, demands specific policies/strategies for coastal protection.

It is here that environmental degradation is highly possible as the pressure of tourism impact is concentrated on the coastal regions away from hinterland. Such pressure has been noticed by the tourism planners in south Cyprus, which resulted in a moratorium on new tourism projects in coastal areas and shift to hinterland through incentives for rural tourism (Katircioglu, 2014; Sharpley, 2002).

Katircioglu et al. (2014, p638) explored that "tourist arrivals are a catalyst for energy consumption and therefore climate change in the long term of the Cyprus economy. When the Cypriot government sets measurements for environmental protection (controlling climate changes), the international tourism sector should be seriously taken into consideration". As in the problem statement section (1.2) elaborated, North Cyprus suffered from lack of pro-environmental actions (Figure 5) and spatial recreation management system (Figure 6).

Tourist litter

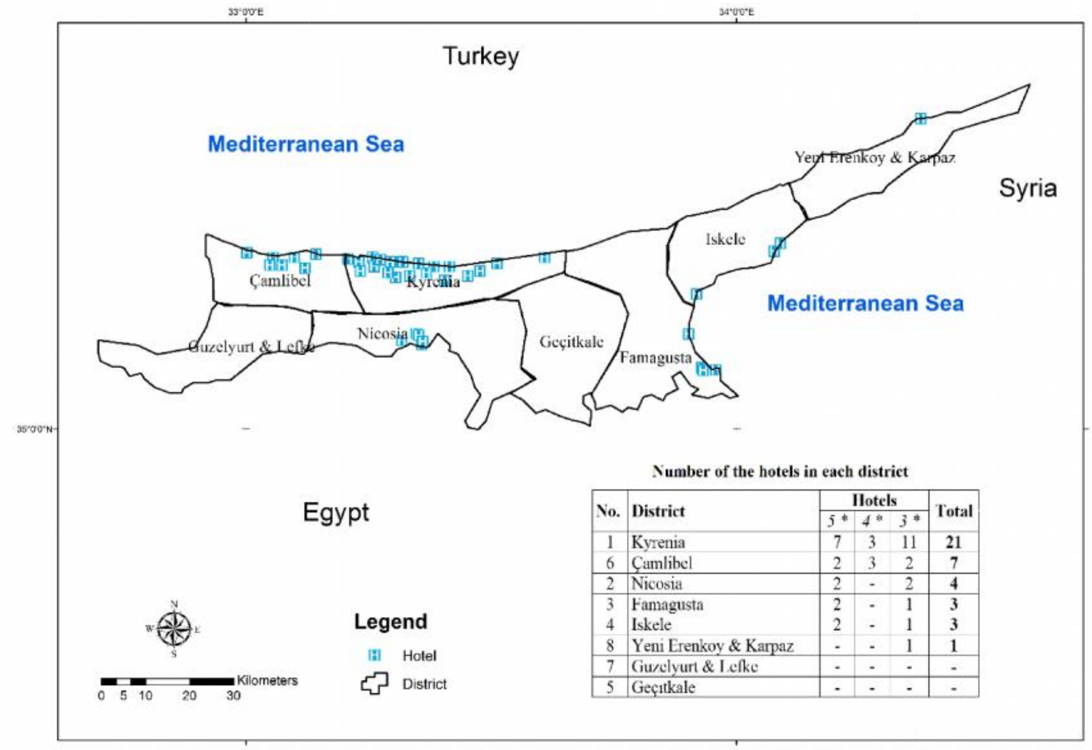
Waste water treatment in Bafra

Death of turtle

Deforestation and land use change

Source:
http://haberkibris.com/cevre-temizligi-seferberligi-basliyor-2013-07-07.html
http://www.kpdailynews.com/index.php/cat/35/news/748/PageName/CYPRUS_LOCAL_NEWS
http://www.kibristoday.com/cevreyi-kirleten-89-kisiye-ceza.html
http://www.kibris.net

Figure 5. Evidences of environmental degradation in North Cyprus



No.	District	Hotels			Total
		5 *	4 *	3 *	
1	Kyrenia	7	3	11	21
6	Çamlibel	2	3	2	7
2	Nicosia	2	-	2	4
3	Famagusta	2	-	1	3
4	Iskele	2	-	1	3
8	Yeni Erenkoy & Karpaz	-	-	1	1
7	Guzelyurt & Lefke	-	-	-	-
5	Geçıtkale	-	-	-	-

Figure 6. Lack of proper recreation management system in North Cyprus (imbalanced spatial tourism development)

The issue of rural tourism, agro-tourism, and ecotourism are raised in the context of sustainable tourism which is a dominant concept and concern over the relationship between tourism and environment. These forms of tourism, along with several others, are categorized under the so called 'alternative' to mainstream/mass tourism that has been criticized for being inconsiderate environmentally, socially, ethically and politically.

Ecotourism projects have been established in different rural areas and remote villages of North Cyprus. However, these projects can be restructured in a way to allow a collective participation of all the stakeholders including local public sector institutions, business people, commercial sector, non-profit organizations and ecotourism entities. Implications of these projects will be effective if a collective approach is practiced.

What is missing in these projects that undermine the effectiveness of management and stakeholder's participation is the lack of collective approach in one hand and dominant centralized decision making in another hand. This is not just in the case of North Cyprus, rather a rampant practice in most of the developing economies. As Larson and Poudyal (2012, p924) stated:

> A heavy emphasis on centralized decision-making orchestrated by powerful government elites, not governance that involves a full range of invested individuals and organizations, has been a major constraint for developing countries trying to promote community participation in the tourism industry.

The main purpose of this research is providing a Recreation Management System (RMS) based on TEM that considers technical-natural (TCI coupled in IDM), socio-economic, and environmental issues. This objective is embedded in RMS (Figure 7), where knowledge generation and sharing by the scientists (transforming meteorological data to RMS calendar) and its implementation with contribution of all stakeholders (action plan in the context of tourism master plan) are in accordance with precepts of TEM.

Thus, RMS is an innovative and implementable plan that does not force planners and business sector to cease development of tourism in North Cyprus (as Limits of Acceptable Change Approach does). It is offered that use the tourism resources (mainly climate) wisely based on natural (TCI), technical (IDM), environmental, and socio-economic considerations, which integrates principles of sustainable tourism development.

Chapter 4

METHODOLOGY

4.1 A Descriptive and Analytical Approach

The research model, as shown in Figure 7, illustrates RMS's development and operationalization processes based on the well-being of tourism climate.

Knowledge-based management system and TEM are paradigms utilized as theoretical framework for designing the model. The model also depicts the process of development and application of RMS in tourism planning by flowing stream that begins with calculation and ends with action/implementation. This process is embedded in the context of data calculation which ends in wisdom. Both flowing process correspond with each other, as shown in Figure 7.

The utility of TCI value and TCI map with eventual production of RMS calendar, are paramount to design RMS and achieve preparing a tourism master plan. In fact, this model illustrates that how climate as a unique, free, and non- substitutable resource, can be used in tourism planning (Figure 7). It also means that RMS calendar is a technical assessment that can be a guideline for the preparation of tourism master plan.

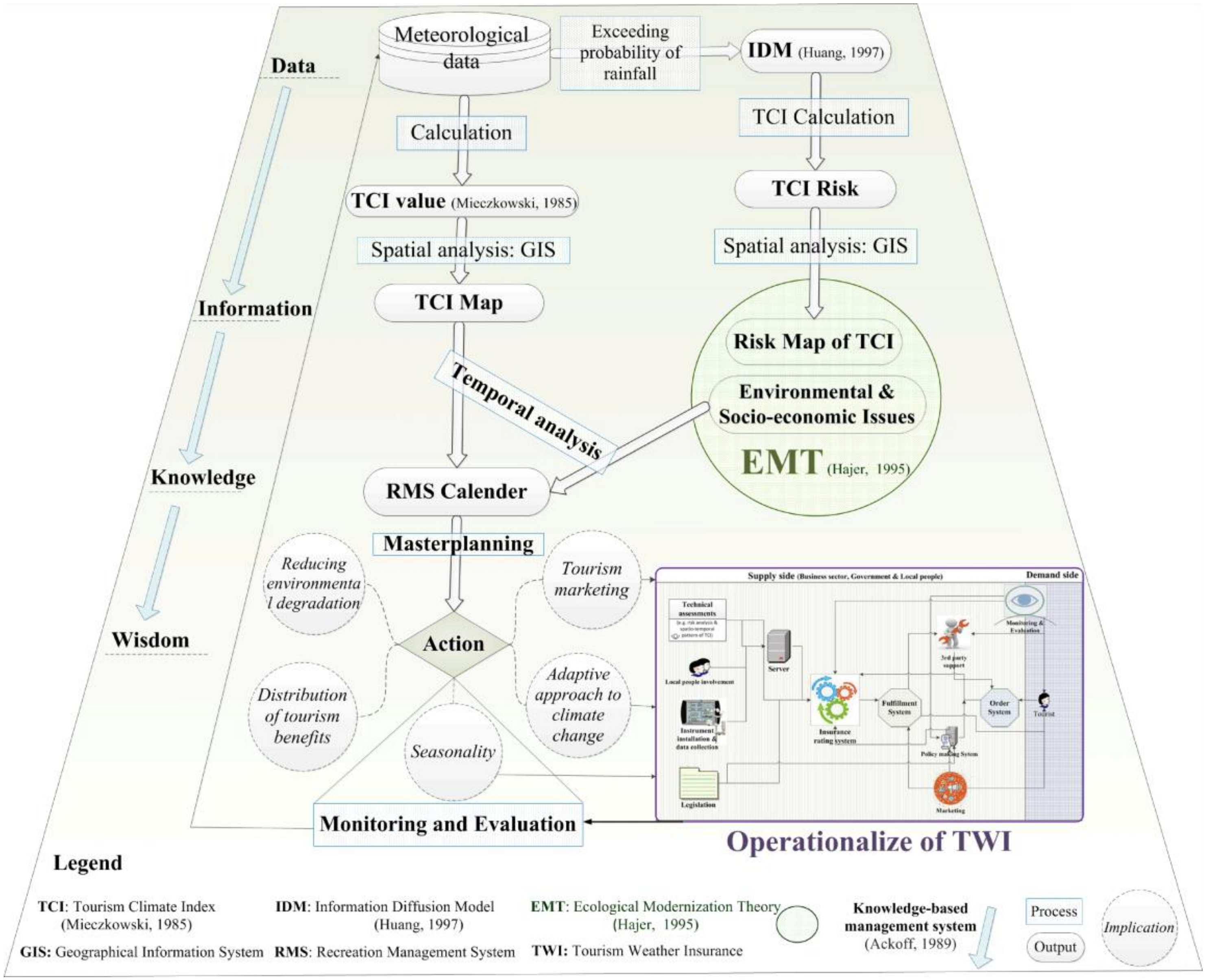


Figure 7. Research design

In other words, comprehensive technical assessment including evaluation results of socio-economic, hydrology, watershed management and geomorphology should be incorporated in master planning process. Hence, outputs of other assessments (e.g. information regarding water scarcity, land degradation and soil erosion) have been used as inputs/feedbacks for monitoring and evaluation steps in the model. Thus, monitoring and evaluation process insures adaptability of the proposed approach.

The application of knowledge-based management system is also useful to identify the objectives of a methodological approach. According to Ackoff (1989) and Reed et al. (2013), making the right decision in a complex system (e.g., destination management), allows planners/decision maker to use knowledge instead of raw data (Figure 7).

As mentioned earlier, the proposed model can be implemented in the context of TEM (Gouldson & Sullivan, 2012), which emphasizes knowledge generation and sharing (Perkins et al., 2013), as well as, the cooperation of decision-makers and stakeholders (Imran et al., 2014; Wolfsegger et al., 2008).

There is a consensus among proponents of TEM that researchers are required to produce knowledge and share it with stakeholders (Perkins et al., 2013; Reed et al., 2013). Furthermore, there are some evidences that postulate application of TEM in the integration of climate change and development in similar circumstances (Castles & Stratford, 2014; Gouldson & Sullivan, 2012; Saat, 2013).

Accordingly, exceeding probability of rainfall, as a risky factor to the attractiveness of tourism climate, entered to the IDM formulas (Equation 1 to 8). Then IDM values inserted to the TCI (Equation 9) to calculate risk of tourism climate in all stations of North Cyprus. Then, TCI values are digitized in a GIS setting using Arc GIS software. Spatial analysis of TCI risk is performed using geo-statistical techniques to create a TCI risk map, which represent which part of the island is under risk of rainfall that destruct the well-being of tourist.

Similarly, meteorological data are inserted into the TCI equation to calculate TCI values for each meteorological station (Table 1). After interpolating TCI values over the island using geo-statistical method (Kriging), TCI maps produced to illustrate which part/districts of the island has excellent climate during the 12 months of a year.

The next step is considering current environmental, socio-economic situation of the study area in spatial and temporal distribution of recreation activities. The inclusion of environmental, socio-economic, and natural factors (TCI risk) is in line with TEM that deliberate opportunities and threats in relation to tourism management, comprehensively.

The TCI risk maps; TCI maps; environmental and socio-economic issues (in the context of TEM) applied as input for designing the RMS calendar. Temporal analysis means that these outputs for each district have been evaluated for each month and the results of synthesis used for development of the RMS calendar. As explained before, this is an innovative idea that can be applied in master planning in the island where climate is one the most important tourism resource and environment is a significant pillar of sustainable tourism development; knowing the fact that they are under pressure and threatened by human activity. Gunn and Var (2002. P. 62) stated that ‘climate and weather are qualities of place that greatly influence the planning and development of tourism’

Furthermore, updating the outputs of the model with new meteorological datasets enables destination communities to better adapt to possible climatic change, which is a practical approach to move the tourism and climate change nexus from a descriptive problem-based issue toward a more affirmative, action-oriented discourse (Scott & Becken, 2010). The functionality of the proposed model entails continuous monitoring of climate change and patterns of tourists who visit the destination. Since the input of the system is meteorological data, the model ought to recalculate new data in order to design accurate recreation management calendar.

The proposed model encompasses cross-cultural properties of tourism climate through monitoring visitors based on their region of origin and culture. This means that optimal climate is perceived differently by for instance Russian tourists in compare to Chinese or Turkish Cypriots. It is observed that swimming season for Russian tourists begins in March in North Cyprus; whereas, the locals wait until early July to start swimming season. Therefore, RMS ought to be modified according to the change of visitor geographic location origin (geographic segment) (Gunn & Var, 2002) to avoid mismatch between expectation and experience toward destination with respect to climate change.

Nevertheless, the usage of long term data ensures reliability of the results of the proposed model. Three factors can be considered in recalculation of proposed model. First factor is the changing climatic parameters. Second is the changing tourist pattern in terms of cross-cultural characteristics. Third, as elaborated earlier, the implementation of RMS as an important principle in Tourism Master Plan. For instance, Master Plans are normally revised every five years. Therefore, it is suggested that TCI to be recalculated for all stations, and RMS calendar to be prepared every five years considering the change of climatic parameters and geographic patterns of tourists–geographic origin of tourists.

As illustrated in proposed model (Figure 7), the RMS calendar has four policy implications, namely, reducing environmental degradation, distribution of tourism benefits, tourism marketing, seasonality, and adaptive approach toward climate change. Implementation of the last three implications can be assured by operationalization of tourism weather insurance.

A framework for implementation of TWI has been developed. Our survey results has confirmed / revealed that tourists are willing to purchase tourism weather insurance as an item in their itinerary package. Finally, mechanisms for operationalization of TWI, considering contributors' perspectives (i.e., demand and supply) has been drawn. More details about data and the procedure are elaborated in the following sections.

4.2 Data

Data was collected from the meteorological stations of North Cyprus, covering a longitudinal data base for the periods between 1980 until 2013.

The data was obtained after a lengthy discussion with the head of the meteorological organization in Lefkosa, the capital city of North Cyprus. Permission to use the data was granted after the purpose of the research was explained. North Cyprus is located in the Eastern flank of the Mediterranean Sea, with climatic characteristics of warm and dry summers, mild winters, more than 3,300 hours of sunshine per year, and light-to-moderate wind. See Table 1.

Table 1. Location and meteorological parameters of the stations

Meteorological station	Geographical location*		A (m)	Meteorological parameters						
	X	*Y*		*AT*	*MAT*	*ARH*	*MARH*	*P*	*AWS*	*SH*
Kyrenia	35.3339	35.3339	170	20.2	24.1	69.2	54.3	470.5	8.1	2.5
Nicosia	35.1948	35.1948	256	19.2	26.3	61.3	35.0	305.8	8.7	3.4
Ercan	35.1506	35.1506	182	19.2	26.3	61.3	35.0	305.8	8.7	3.4
Geçitkale	35.2507	35.2507	97	19.4	26.1	64.2	39.3	328.4	2.7	3.4
Famagusta	35.1332	35.1332	137	19.7	24.9	70.9	50.8	330.2	8.2	2.9
Yeni Erenkoy	35.5164	35.5164	55	19.6	23.8	68.2	50.0	460.5	3.1	2.9
Guzelyurt	35.1833	35.1834	162	20.2	24.1	69.2	54.3	470.5	8.1	2.5
Çamlibel	35.3001	35.3001	138	18.1	22.8	69.2	48.8	443.4	1.4	2.5
Tatlisu	35.3835	35.3835	164	20.0	24.9	68.8	52.1	456.6	6.3	2.7
Lefke	35.1001	35.1001	347	19.5	23.2	69.4	51.3	466.9	8.4	2.6

Note: *: The unit is decimal degrees. Coordinate system for the data source is WGS 1984. A stand for altitude. AT is average tempreture (°C), MAT is maximum average tempreture (°C), ARH is average relative humidity (%), MARH is minimum average relative humidity (%), P is precipitation (mm), AWS is average wind speed (m/s), and SH is Sunshine hours. These numbers were obtained by calculation of parameters average for a preiod of 33 years (1980-2013).

Such climatic characteristics are conducive to establishment of factors essential for existence of typical 3S tourism that attracts large number of tourists. Sun, Sea and Sand (3S) tourism is associated with mass tourism which is the main product that motivates tourists who are seeking warm climate to indulge in tanning under the sun in the sizzling beaches (Obrador, 2009; Standish, 2005). This form of tourism has been a dominant mode since 1950s and 1960s with seasonal concentration, environmental destruction, and unsustainable development along the coastal areas of the Mediterranean, Caribbean, Adriatic, Aegean, and many islands in the Pacific, to name a few (Koutra & Karyopouli, 2013; Trias et al., 2014).

Nowadays, tourism industry, through its international institutional agencies, has embraced a moral agenda to redirect tourism planners and developers toward so called ‘New tourism’ as an alternative to 3S tourism (mass tourism). “Whereas Mass Tourism might be characterized by sameness, crudeness, destructiveness, and modernity, New Moral Tourism can be viewed as difference and sensitivity as well as constructive and critical of modernity. There are several categories of travel that might be described as New Moral Tourism, including ecotourism, community tourism, agro-tourism, and sustainable tourism” (as cited in Standish, 2005).

3S tourism is also associated with subjecting coastal areas to overdevelopment which is economically lucrative in the short run; however, some of the destinations, especially in the Mediterranean islands, have realized the long-term viability of this form of tourism as a dominant mode engendered a malaise in the tourism system. For instance, in North Cyprus, not only resulted in degradation of coastal environment, it has also submitted the island into seasonality syndrome. “Hence, the image of Cyprus as a sun-lust destination can be deemed a critical cause of seasonality; this is also true about Malta, which is struggling with extreme seasonality” (Koutra & Karyopouli, 2013, p 704-711).

4.3 IDM and its Calculation

The main characteristic of risk is uncertainty. That is because it entails that the unpredicted variables are either to be divided or integrated in diverse cases as the process of granulation is not fixed. One of the main advantages of IDM is the ability it provides for the calculation of risk in uncertain conditions (Huang, 2000). When the risk is subjected to probability and statistical analysis, the uncertainty that is involved is relevant to the similar degree of standard mode, which can be depicted by fuzzy sets membership in mathematics theory. Information diffusion is a fuzzy mathematics logic of set-value method which evaluates optimizing the use of fuzzy information (Huang, 2002).

Conforming to the related literature, IDM is a mathematical approach to calculate the risk of natural phenomena (e.g., flood, drought, soil erosion etc.) (Jiquan et al., 2012). Similarly, the climate attractiveness for tourism activities is also associated with a degree of uncertainty (Gómez Martín, 2005).

Secondly, IDM is a useful model for risk assessment in areas where the database is small. In the case of North Cyprus, and as a result of political uncertainty the weather stations have not been too keen to compile comprehensive data on a regular basis. Nevertheless, data obtained from the Meteorological Organization cover more than 30 years; therefore, IDM is considered a reliable model/ technique to deal with the available sample for an accurate estimation. This is because this mathematics changes observations into normal fuzzy sets (Huang, 2009). Even though the sample size is small, IDM functions properly (Hao et al., 2014).

Furthermore, the proposed approach is useful for risk assessment of precipitation (or other adverse incidents like wind) in relation to the favorability of destination with regard to climate for holiday makers. This is plausible as the extracted data, no matter how small, is sufficient the proposed method to assess and predict the risk.

The purpose of this study is to show that the outcome of this research will provide useful information to decision makers, travel agencies, hoteliers, and insurance firms to organize their plans with low levels of risk. For instance, tour operators can arrange indoor recreation activities during those months that the risk of precipitation is high. Also insurance companies' can benefit from being aware of either favorable or un-favorable conditions of the risk of precipitation as a spoiling parameter (De Freitas, 2003, 2014).

In this study, the normal diffusion model (Huang, 1997) was used for probability estimation. Let $Y = \{y_1, y_2, y_3 \dots y_n\}$ be a set of observations, called a given sample, and $U = \{u_1, u_2, u_3 \dots u_m\}$ be the chosen framework space. If the observations cannot provide sufficient information to identify the precise relationship that is needed, then Y is called an incomplete data set. For any $y \in Y$ and $u \in U$, Eq. (1) is called normal information diffusion:

$$f_j(u_i) = \frac{1}{h\sqrt{2\pi}} e^{-\frac{(y_j-u_i)^2}{2h^2}} \qquad \text{(Equation 1)}$$

Where h is the diffusion coefficient, which can be determined according to the maximum value *b* and minimum value *a* of the samples, and the sample number m in the sample set is as follows (Huang, 1997):

$$h = 1.4208\ (b-a)/(m-1) \qquad m \geq 10 \qquad \text{(Equation 2)}$$

Let

$$Di = \sum_{j=1}^{m} fi(uj) \qquad \text{(Equation 3)}$$

The distribution of sample information by Eq. (4) was then generalized.

$$u_{x_i}(u_j) = \frac{f_i\,(u_j)}{D_i} \qquad \text{(Equation 4)}$$

The function of $u_{x_i}(u_j)$ can be called the normalized information distribution of sample x_i. A good result for risk analysis can be obtained through treatment of the function $u_{x_i}(u_j)$. If we let $x_1, x_{2,} \dots x_m$ be the m specified observation values, then the function can be called the information quantum diffused from the sample of $X = \{x_1, x_{2,} \dots x_m\}$ to the observation point of u_j. This can be represented as follows:

$$q(u_j) = \sum_{i=1}^{m} u_{x_i}(u_j) \qquad \text{(Equation 5)}$$

The physical meaning of the above function is that if the observation value of precipitation can only be chosen as one of the values in the series of $u_1, u_{2,} \dots u_n$, then the sample number with the observation value of u_j can be determined to be $q(u_j)$ through the information diffusion from the observation set of $x_1, x_{2,} \dots x_n$, in regard to all values of x_i as the representatives of the samples. It is obvious that the value of $q(u_j)$ is generally not a positive integer, but it is sure to be a number no less than zero. Then sum $q(u_j)$ values.

$$Q = \sum_{j=1}^{m} q(u_j) \quad \text{(Equation 6)}$$

In fact, Q should be the summation of the sample number on each point of u_j. Therefore, the frequency of a sample falling at u_j can easily be estimated according to Eq. (7).

$$p(u_j) = \frac{q(u_j)}{Q} \quad \text{(Equation 7)}$$

It is also obvious that the probability value transcending of u_j should be as follows:

$$p(u \geq u_j) = \sum_{k=1}^{m} p(u_j) \quad \text{(Equation 8)}$$

Where $p(u \geq u_j)$ is the required risk estimate value.

In the Appendix (IDM), the process of calculation of exceeding probability of precipitation in one station (Kyrenia as a sample) is provided. This procedure redid to estimate risk of precipitation toward tourism climate in the island.

4.4 TCI Calculation

The TCI index is formulated based on the monthly means of seven meteorological factors, namely, maximum daily temperature, minimum daily relative humidity, mean daily temperature, mean daily relative humidity, precipitation, daily duration of sunshine, and wind speed.

To measure thermal comfort, Mieczkowski (1985) developed two sub-indices named CID (Daytime Comfort Index – which combines the variables of maximum daily temperature and minimum daily relative humidity) and CIA (Daily Comfort Index – which combines the variables of mean daily temperature and daily relative humidity).

Daytime Comfort Index (CID) and Daily Comfort Index (CIA) are developed based on ASHRAE thermal sensation scale that was developed by American Society of Heating, Refrigerating, and Air-Conditioning Engineers in 1894 (http://en.wikipedia.org/wiki/ASHRAE). Mieczkowski (1985) used this scale (See Figure 8) to obtain two sub-indices that represent thermal comfort sensation, which elaborated in following sections:

4.4.1 Thermal Comfort Indicators

Measurement of thermal comfort is a complicated approach. Because comfort or discomfort of tourists in terms of temperature and relative humidity depends on numerous factors that formulated and named as "pyschophysiological index" (Terjung, 1966). To simplify the calculation of thermal comfort, Misckoswki (1985) referred to ASHRE scale that covered both psychological and physiological parameters. This scale devised by American Society of Heating, Refrigerating and Air Conditioning Engineers in 1972.

The thermal comfort index for TCI rated from 5 (optimal condition) to 0 and -3 (poor condition). As shown Figure 8, the values of the thermal comfort index depend on two factors, including effective temperatures (℃) and relative humidity (%). It can be clearly seen that importance of relative humidity increase in high level of temperature (See right side of Figure 8).

In the TCI, thermal comfort indicator consists of two sub-indicators, namely, CID (daytime comfort index) and CIA (daily comfort index). To measure CID, maximum daily temperature, minimum daily relative humidity are required. CIA combines two parameters including, mean daily temperature and mean daily relative humidity. For example if the temperature is 25 ℃ and relative humidity is 40%, CID or CIA is 5.

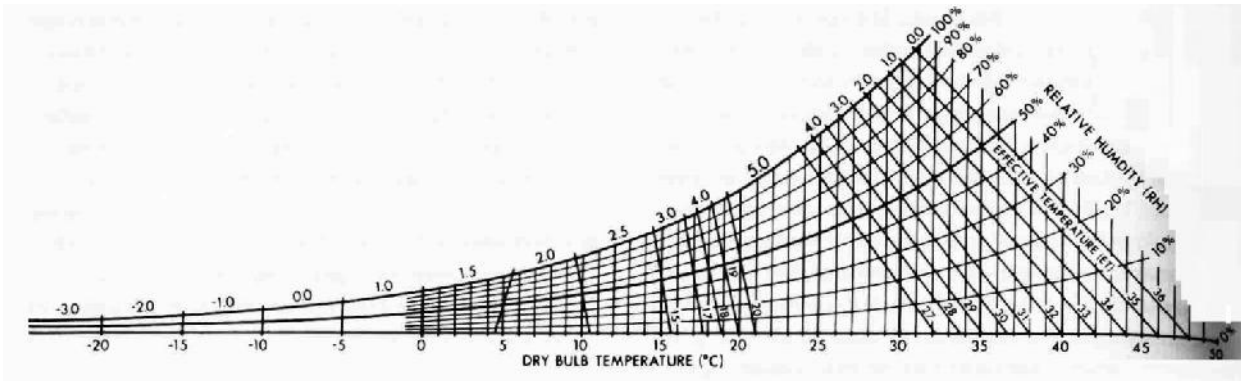


Figure 8. Graph of thermal comfort rating system for TCI based on ASHRE scale

CID has the highest weight (4) among other factors due to its significant impact on satisfying the climate well-being for tourism activities (See Equation 9).

4.3.2 Precipitation

Misckoswki acknowledged the effective contribution of precipitation in satisfaction of tourist pertaining the climate (1985). Apart from amount of precipitation, the average number of rainy days (>1 mm), and precipitation percentage during daytime hours (between 9:00 to 21:00). The last two parameters were dropped because of lack of information on the most of destination, especially in developing countries. The rating scale of precipitation in TCI is presented in Table 2.

Table 2. Rating the precipitation in the TCI

Scale	**Mean Monthly Precipitation (mm)**
5	0.0-14.9
4.5	15.0-29.9
4	30.0-44.9
3.5	45.0-59.9

3	60.0-74.9
2.5	75.0-89.9
2	90.0-104.9
1.5	105.0-119.9
1	120.0-134.9
0.5	135.0-149.9
0	150.0 or more

Source: Misckoswki (1985).

Precipitation is assigned a coefficient of 2 in the TCI formula (Equation 9) and high amount of precipitation adversely affected tourist perception of comfort.

4.4.3 Sunshine

Sunny sky has positively contributed in constructing excellent condition in tourism climate in terms of aesthetic perspective. It improves the image of destination for photography and other purposes (beach activities). De Feteries et al. (2008) recognized a cloudy sky as a negative parameter in attractiveness of climate for tourists. However, insolation in desert area directly associated with sunburn as well as skin cancer. Rates of sunshine have provided in Table 3.

Table 3. Insolation rate for TCI

Scale	**Mean monthly sunshine hours in each day**
5	10 hrs. or more
4.5	9hrs. - 9hrs. 59 min.
4	8hrs. - 8hrs. 59 min.
3.5	7hrs. - 7hrs. 59 min.
3	6hrs. - 6hrs. 59 min.
2.5	5hrs. - 5hrs. 59 min.
2	4hrs. - 4hrs. 59 min.
1.5	3hrs. - 3hrs. 59 min.
1	2hrs. - 2hrs. 59 min.

0.5	1hr. - 1hr. 59 min.
0	Less than 1hr.

Source: Misckoswki (1985).

The weight of sunshine is similar to the precipitation coefficient in the TCI formula, which is 2 (See Equation 9).

4.4.4 Wind

The last meteorological factor of TCI is wind that negatively affected the climate well-being. However, light air /breeze not only does not function as destructive parameters, but also accelerate the transfer of heat through turbulence and evaporating of cooling, which is very pleasant during the hot seasons. The rating system of wind is outlined in Table 4.

Table 4. The classifications of wind speed in TCI

Scale	**Wind speed (km/h)**
5	<2.88
4.5	2.88-5.75
4	5.76-9.03
3.5	9.04-12.23
3	12.24-19.79
2.5	19.80-24.29
2	24.30-28.79
1	28.80-38.52
0	>38.52

Source: Misckoswki (1985).

4.4.5 TCI Formula

Coefficients of each variable were weighted and the following formula was used as an index to estimate the level of climate well-being for tourists:

$$TCI = 2\ (4CID + CIA + 2R + 2S + W)$$ (Equation 9)

Where,

CID: daytime comfort index (Extracted from Figure 8),

CIA: daily comfort index (Extracted from Figure 8),

R: Precipitation (mm) (Extracted from Table 2),

S: Hours of sunshine per day (Extracted from Table 3), and

W: wind speed (km/h) (Extracted from Table 4).

A sample of TCI calculation is provided in Appendix D.

Hence, monthly data of eight meteorological parameters including, maximum daily temperature, minimum daily relative humidity, mean daily temperature, mean daily relative humidity, precipitation, daily duration of sunshine, and wind speed was selected as input for the database to calculate TCI (9).

The details of the variables rating system for the calculation of the TCI was articulated in Mieczkowski's paper (1985). The TCI scores classified in five mapping categories are outlined in Table 5.

Table 5. A classification scheme for mapping the TCI

No.	Numerical value of TCI	Mapping Category
1	80-100	Excellent

2	70-79	Very good
3	60-69	Good
4	40-59	Acceptable
5	-20-39	Unfavorable

Source: Mieczkowski (1985).

Based on the Mieczkowski's classification, excellent climate is formulated when the temperature varies from 22 to 30℃, relative humidity ranges from 10 to 70 %, monthly precipitation is less than 14.9 mm, mean monthly sunshine hours in each day is more than 10 hours or more, and wind speed is less than 2.88 km/h.

4.5 Recreation Management System

In the knowledge-based management system developed by Ackoff (1989), techniques and technology help to transform data into information and knowledge, which is consonant with TEM theory (Figure 7). In this regard, GIS as an integration technology is used to project spatial and temporal variations of TCI (Hall & Page, 2014). Kriging technique is used as a popular geostatistical method in the interpolation of natural elements (Olya & Alipour, 2015; Park & Jang, 2014).

A spatial analysis of TCI is performed for each month to enable temporal analysis of the variations of the TCI in the island. About 12 TCI maps illustrate the attractiveness/appropriateness of climate for tourism purpose temporally and spatially (i.e., by month and location) (Figure 14-25). Based on this rational justification, the proposed RMS calendar can be applied as a scientific guideline in destination planning and management.

Inclusion of all effective factors (e.g. risk of tourism climate, economic, environment, social and cultural issues) in developing RMS, comparison of TCI maps derived from two longitudinal scenarios, application of one geostatistical method (Kriging) for interpolation of TCI value over the island, ignoring the tourist's preferences regarding the climate are four limitations of this study. They will be elaborated later in the thesis.

4.6 Tourism Weather Insurance

The first step in establishment of a business is assessment of demand response. In other words, there is a demand for tourism weather insurance and tourists have tendency to purchase tourism weather insurance to insure the suitability of climate destination during their travel. Then, tourist's intention to purchase tourism weather insurance has been measured. Furthermore, the importance of each meteorological parameters also has been ranked based on tourist's perception, which can be used by insurance institutes to know which item has priority than others. Based on the rank of the factors, insurance institutes can adjust the insurance rating system.

Convenience sampling technique used to collect data from tourists who visited a Mediterranean island (North Cyprus), where the most favorite tourism activities—sun, sand, and sea— are climate dependent. With permission from hotel management, the researcher directly administered the questionnaire to tourists in their accommodations at a time convenient for them.

Tourists from different origin climate have different preferences regarding favorability of the climate, which is called "cross-cultural characteristic of tourism climate" (De feteries et al., 2008). To cover preferences of all culture, quota sampling technique must be used and it is suggested as research direction for further studies. Hence, a predefined quota must be allocated to each group of tourists with different origin climate. Since, purpose of the present survey is to find whether there is a demand from tourist perspective for tourism weather insurance, convenience sampling technique can be considered as appropriate method.

To minimize common method variance, the researcher followed the procedures recommended by Podsakoff et al. (2003). For example, information about the study purpose and data confidentiality was provided on the first page of the questionnaire. To identify unnecessary, difficult, or ambiguous items, 20 questionnaires were administered in a pilot study. The questionnaire consisted of two sections. The first explored Intention to Purchase Tourism Weather Insurance (IPTWI) and importance of climate factors in creating favorable climate for tourism activities and second captured respondents' profile.

Survey was conducted for the duration of three weeks in July, 2014. 300 tourists requested to participate in the survey that 227 persons agreed to respond to the questionnaires. However, 15 questionnaires were disregarded due to incomplete data. The remaining effective sample size was 212, which yielded a response rate of 70 %. Demographic information of the respondents is shown in Table 6.

Table 6. Respondents' profile (N=212)

Item	N	%	Item	N	%
Age			*Educational level*		
18-27 years old	61	28.8	High School or less	71	33.5

28-37 years old	80	37.7	Bachelor degree	89	42.0
38-47 years old	36	17.0	Master degree	42	19.8
48-57 years old	16	7.5	PhD degree	10	4.7
>57 years old	19	9.0	Total	212	100.0
Total	212	100.0	*Gender*		
Annual income			Male	97	45.8
Less than $30,000	125	59.0	Female	115	54.2
$30,000-$59,999	39	18.4	Total	212	100.0
$60,000-$89,999	22	10.4	*Visit time*		
$90,000-$119,999	15	7.0	First time visit to the Island	159	75.0
$120,000 or more	11	5.2	Repeat visitation to the Island	53	25.0
Total	212	100.0	Total	212	100.0

About 29% of the respondents ranged in age from 18 to 27 years. Thirty seven percent of the respondents were aged between 28-37 years and 17% were between 38-47 years. Approximately 8% of the respondent ranged in age from 48-57 years and 9% were older than 57. The sample consisted of 97 (46%) female and 115 (54%) male. 33 % of the respondents were completed high school, 42% had bachelor degree. About 20% of the respondents had master degree and the rest had doctoral degree. The annual income of majority of the respondents (59%) was less than $30,000 and 18 % was between $30,000 and $59,999. Ten percent of the respondents earned between $60,000 and $89,999 per year. The annual income of the rest was more than $90,000.75% percent of the respondents reported that it is the first time they visit the island, and 25% were repeat visitors.

The six items were derived from Ajzen and Fishbein (1980) and Taylor and Baker (1994) (e.g., “I intend to purchase tourism weather insurance on my next trip”). A sample of questionnaire is provided at the end of dissertation as Appendix E. Means, standard deviations, correlation, and reliability tests were performed using SPSS 20.0.

Chapter 5

RESULTS

5.1 TCI Risk Map

5.1.1 Tourism Climate Risk at Different Precipitation Exceeding Probabilities

Mean monthly precipitation does not exceed 150 mm in North Cyprus. Hence, a set of [0, 150] on the space of a one-dimensional real number can be regarded as the universe of x_i, according to the variation range of the precipitation. The continuous universe of [0, 150] can be transformed into a discrete universe through equidistantly selecting the points. Considering the requirement for calculating accuracy, 11 points were selected to form the discreet universe, which can be represented as following:

$$U = \{u_1, u_2, u_3 \ldots u_m\} = \{0, 14.9, 29.9 \ldots, 150\}$$

Risk assessment value p for the precipitation ($m = 11$) from January to December ($n = 12$) for all meteorological stations in North Cyprus can be obtained using the equation 1 to 8.

Precipitation was associated with the probability of 0.5 to 0.8 extracted from Figure 9 and outlined in Table 7. According to Mieczkowski (1985), rainfall of more than 60 mm per month adversely affects the well-being of tourists. Rainfall decreases at a high level of probability.

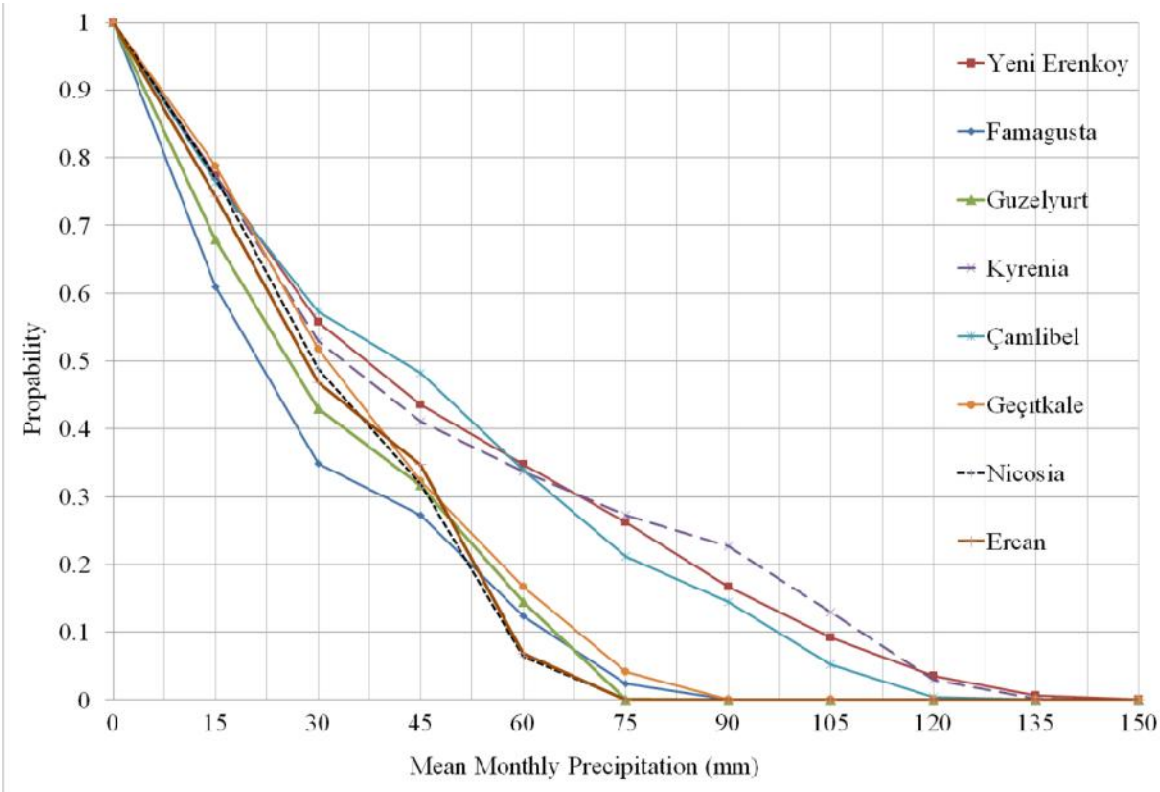


Figure 9. Probability curves of precipitation from meteorological stations

As shown in Table 7, precipitation corresponding to a probability of 0.05, 0.1, 0.2, and 0.3 were considered a risk for tourism. From this, precipitation at *p*=0. 05, *p*=0. 1, *p*=0. 2, and *p*=0. 3 were inserted into the TCI formula to calculate favorability of tourism climate in the amount of various precipitation risk value at all stations.

Table 7. Risk assessment value p for the precipitation at meteorological stations

No	Precipitation at each station	*Probability*								
		0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
1	Yeni Erenkoy	123	104	84	67	49	38	27	17	10
2	Famagusta	70	63	51	39	25	21	16	11	8
3	Guzelyurt	68	64	56	43	33	28	19	15	10

4	Kirynia	117	108	93	68	46	34	19	18	13
5	Çamlibel	105	97	77	63	54	41	26	19	12
6	Geçıtkale	74	68	58	46	39	31	19	19	15
7	Nicosia	73	58	52	47	38	29	23	18	13
8	Ercan	63	59	53	47	38	28	23	17	11

It was assumed that other factors would be similar to the current situation in the future, in view of clearly examining tourism climate risk caused by precipitation and the great uncertainty of the prediction of other factors.

5.1.2 Spatial Pattern of Tourism Climate Risk

The TCI scores by embedding rainfall, obtained from the IDM with exceeding probability, ranged from 75 (very good) to 83 (excellent). Since, mapping spatial distribution of the TCI for each station was required for tourism planning and management, spatial analysis of the TCI at different exceeding probability was performed using geostatistical techniques and GIS, which is depicted in Figure 10 to Figure 13.

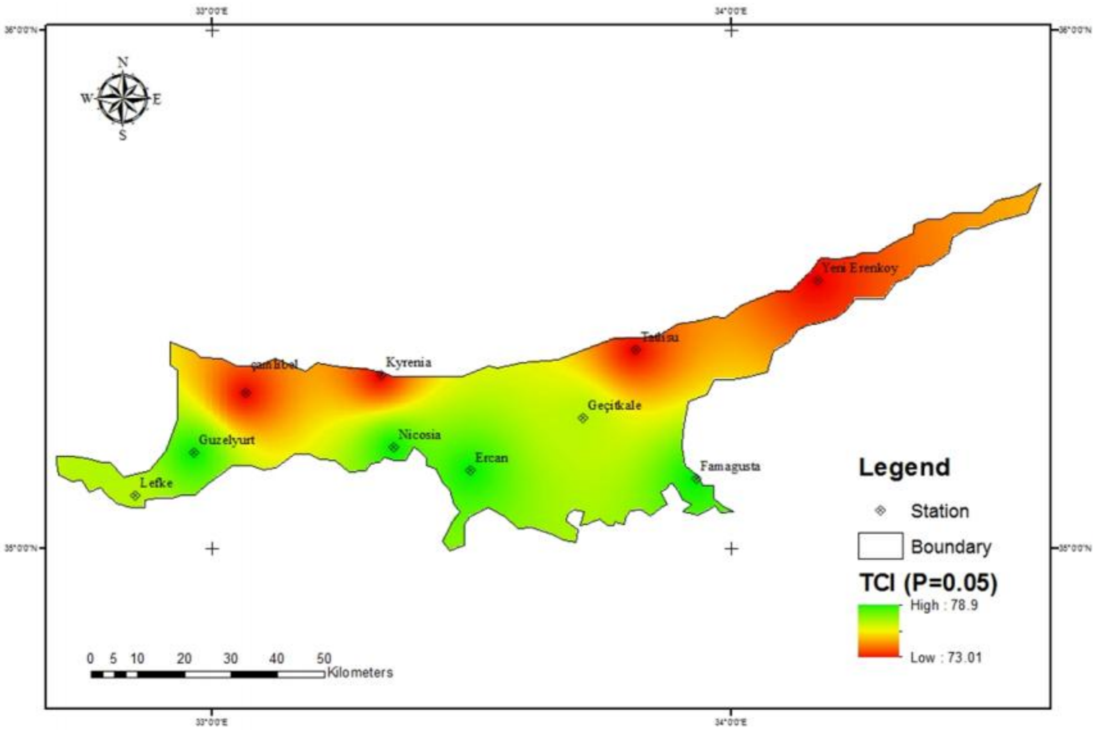


Figure 10. Risk map of precipitation toward tourism climate at level of .05 (*p*=.05)

Risk analysis of tourism climate at *p*=0. 05 revealed that the TCI varies from 73 to 79, which means most regions of the island have a "very good" climate. Nevertheless, northern boundaries are exposed to higher levels of rainfall risk than other areas (Figure 10).

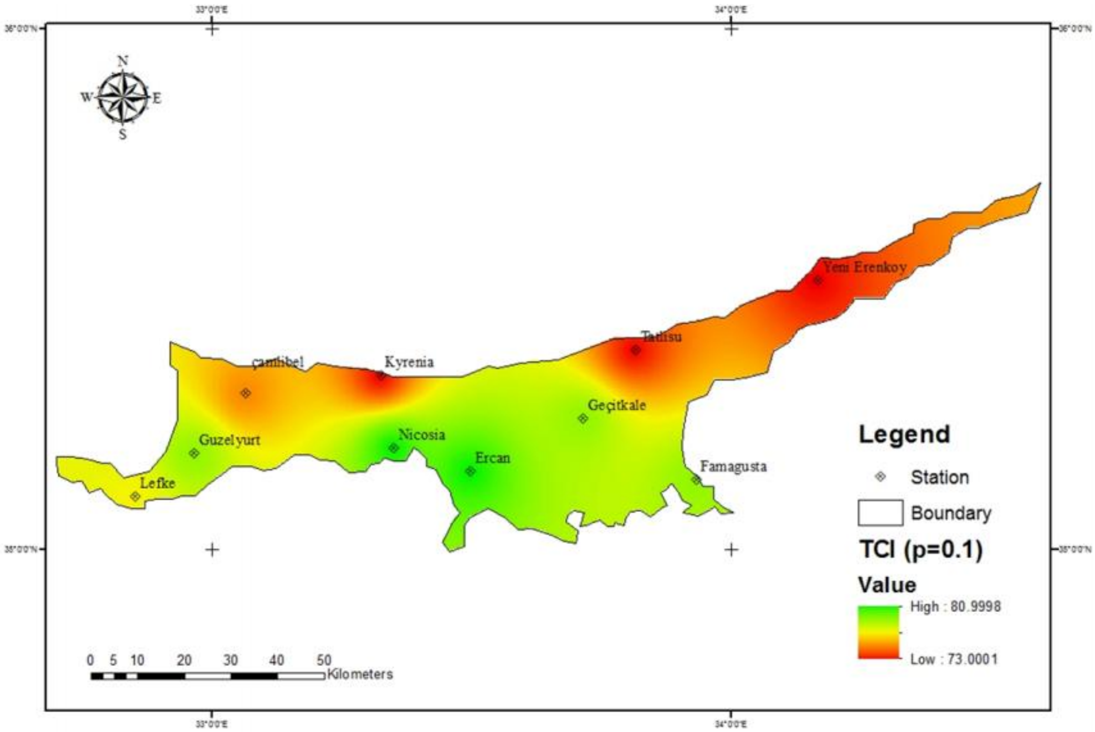


Figure 11. Risk map of precipitation toward tourism climate at level of .1 (*p*=.1)

Since, rainfall decreases at higher levels of probability, risk of tourism climate would also fall. Therefore, the TCI class at higher levels of P elevated from "very good" to "good". Risk of tourism at level *p*=0.1 slightly decreased in the northwestern area (Figure 11).

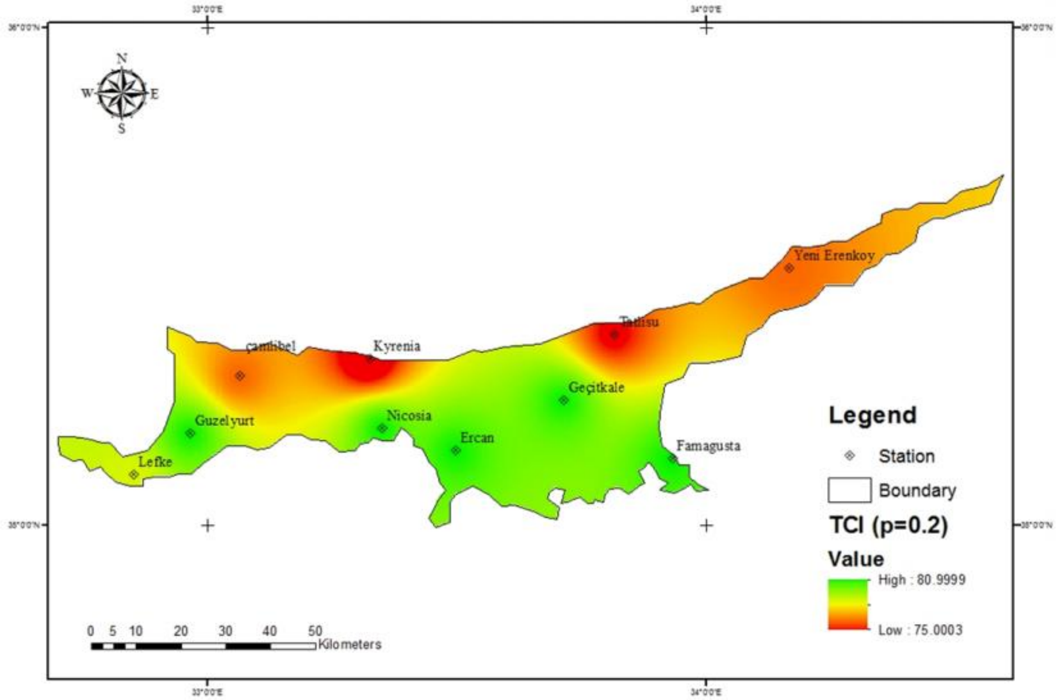


Figure 12. Risk map of precipitation toward tourism climate at level of .2 (*p*=.2)

When the exceeding probability of rainfall was 0.2, tourism climate risk reduced in the central and southern regions. Even in the northern areas, the TCI scores increased from 73 to 75 (Figure 12).

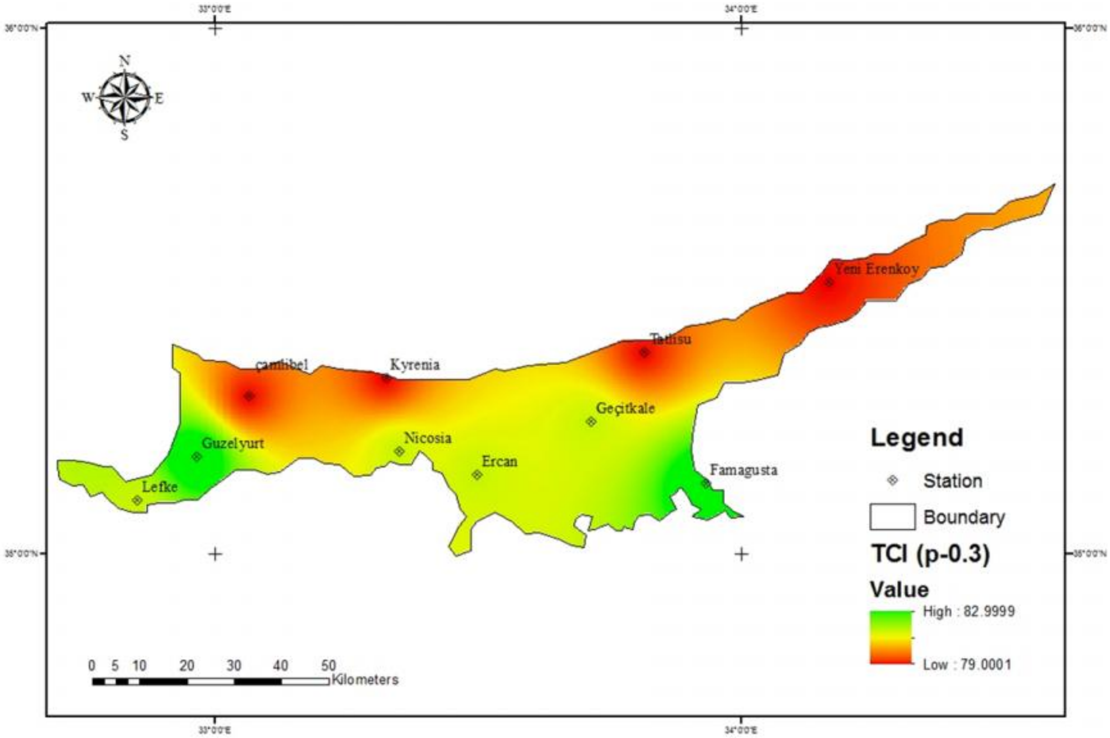


Figure 13. Risk map of precipitation toward tourism climate at level of .3 (*p*=.3)

The pattern of the risk map of tourism climate at *p*=0. 3, showed improvement of climate for the well-being of tourists to the extent of the TCI score throughout the whole island, which ranged from about 80 to 82. However, the class of the TCI was excellent at level *p*=0.3, tourism climate risk still presented a characteristic of high in the northern areas (Figure 13).

Overall, spatial distribution of tourism climate risk showed that the northern parts were exposed to a high level of risk due to rainfall.

5.2 TCI Values

TCI values varied ranging from 41 (acceptable) in Yeni Erenkoy to 98 (excellent) in Çamlibel and Kyrenia. Yeni Erenkoy is a flat shoreline characterized as dense to separate forest. Brush is the main staple land use of this area which is also the habitat of famous Cyprus donkey. Çamlibel has a special geomorphology that varies from coast (altitude=0 m) to mountain (altitude >1000 m).

Similar to Yeni Erenkoy and Karpaz region, this area is also covered with dense to separate forest and brush. This area is also possesses cultivated fields and garden crops as part of its land use pattern. Kyrenia and Çamlibel have similar topographical and geomorphological conditions. Apart from forest and cultivated fields and garden crops, irrigated farms are also dominant land use.

The average TCI values for 12-month ranged from 70 (very good) in Nicosia to 85 (excellent) in Kyrenia, except for Yeni Erenkoy which is 56. Other districts have "very good" (70-80) climate conditions for tourism activities.

During spring and fall, higher TCI scores are found throughout the island. Similar findings are reported in Amelung and Viner's (2006), Deniz's (2011), and Perch-Nielsen et al.'s (2010) studies, which revealed that variations in average TCI scores present a bimodal distribution in the Mediterranean regions. Meaning that climate in the spring and fall are more suitable for the well-being of tourists than those in the winter and summer.

Researchers recognized climate change caused by increasing temperature will result in decreasing quality of climate in the Mediterranean during the summer. Perch-Nielsen et al. (2010) in their comparison of climate change for a period of 110 years found that the number of acceptable (TCI>40), good (TCI>60), and excellent (TCI>80) days in summer for Mediterranean region will decrease from 7, 10, and 8 days, respectively. The results of TCI values for all meteorological stations presented in Table 8.

Table 8. Monthly and seasonal TCI values calculated for all meteorological stations

TCI	*Inland areas*			*Coastal areas*						
	Ercan	Nicosia	Geçıtkale	Çamlibel	Guzelyurt	Tatlisu	Famagusta	Yeni Erenkoy	Lefke	Kyrenia
Jan.	66.2	68.0	64.8	63.8	63.8	60.7	62.7	60.0	65.2	59.6
Feb.	64.2	72.0	66.4	59.0	63.1	61.9	62.0	63.0	66.1	62.0
Mar.	69.2	76.6	79.6	71.0	74.0	74.2	76.0	76.6	75.2	71.6
Win.	*66.3*	*72.2*	*70.3*	*63.6*	*66.6*	*65.9*	*66.7*	*66.2*	*65.7*	*64.1*
Apr.	85.2	86.2	85.2	73.2	87.0	85.2	86.2	85.3	85.4	86.6
May	80.8	87.4	83.0	92.0	86.0	87.1	86.0	90.0	89.3	86.0
Jun.	72.0	70.4	79.0	84.0	70.0	75.2	70.0	78.0	73.5	74.0
Spr.	*78.7*	*81.3*	*82.5*	*83.1*	*80.9*	*80.6*	*79.7*	*84.3*	*82.5*	*81.0*
Jul.	59.0	53.0	66.0	80.0	56.6	66.1	56.6	72.0	59.9	67.0
Aug.	53.2	51.0	61.0	70.0	53.8	60.6	54.2	70.0	57.4	54.0
Sep.	69.6	67.0	75.4	80.0	62.8	65.7	61.2	71.0	67.3	68.0
Sum.	*59.9*	*57.7*	*67.5*	*76.7*	*56.7*	*60.1*	*57.0*	*71.0*	*77.0*	*63.0*
Oct.	81.4	81.0	87.1	90.0	85.8	86.3	65.4	88.0	85.9	84.4
Nov.	81.6	87.2	86.0	79.2	72.8	74.8	84.0	69.6	75.8	78.0
Dec.	67.8	80.6	68.0	61.4	74.0	65.9	81.4	64.0	78.7	69.0
Aut.	*76.9*	*82.9*	*80.3*	*76.9*	*77.2*	*81.3*	*76.9*	*73.9*	*77.3*	*77.1*

Note:-20-39: Unfavorable; 40-59: Acceptable; 60-69: Good; 70-79: Very good; 80-100: Excellent

5.3 TCI Map

According to the calculated TCI score for January (Figure 14), the climate is good (60-70) for tourism. The climates of Nicosia, Lefke and Guzelyurt are more favorable (68, 65, and 64, respectively) for tourists during this month (see Table 2 for score classification).

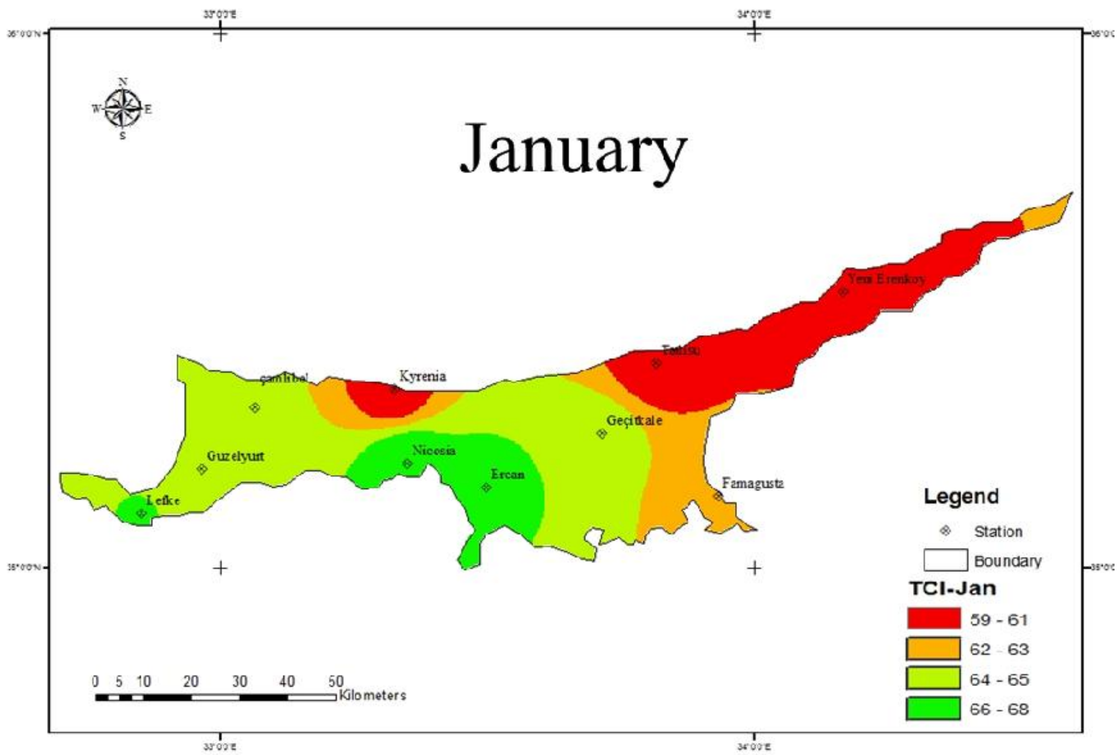


Figure 14. Spatial pattern of TCI in January

The TCI scores range from acceptable (59) in Çamlibel to very good (72) in February (Figure 15) has been shown for Nicosia. Eastern and south-western areas have good climates for tourists' well-being.

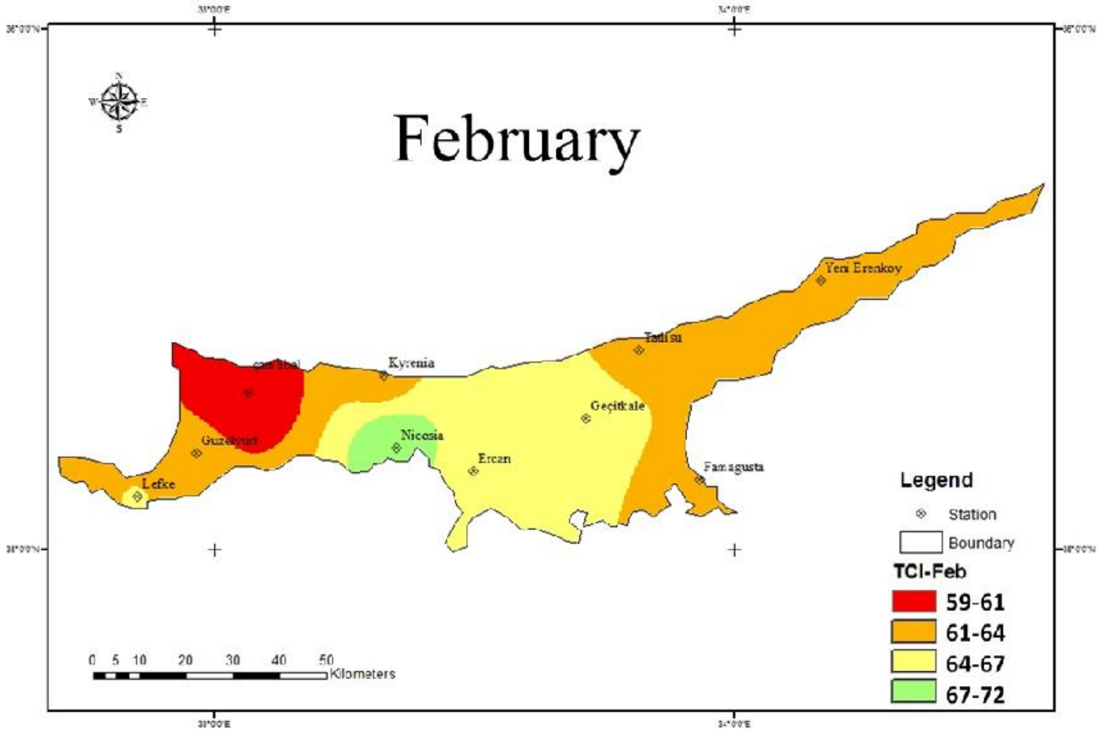


Figure 15. Spatial pattern of TCI in February

During the month of March, a “very good” climate (70-80) prevails over the whole island (Figure 16). However, the climate is more suitable in the eastern parts of the island.

During the spring, except for Geçitkale in March, there are no excellent climates (80-100) in the island. Geçitkale is an inland area with flat land (altitude= 100-300 m) that mainly covered by irrigated and dryland farms.

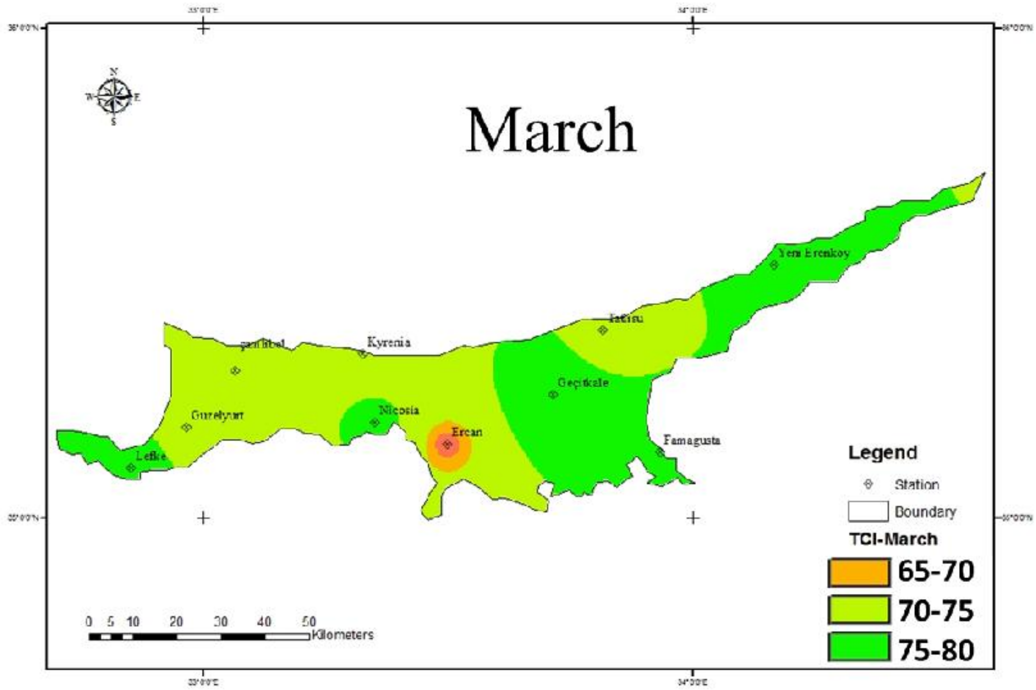


Figure 16. Spatial pattern of TCI in March

The TCI values improve to the excellent category in April and May (Figure 17 and 18), not counting Çamlibel in April (73).

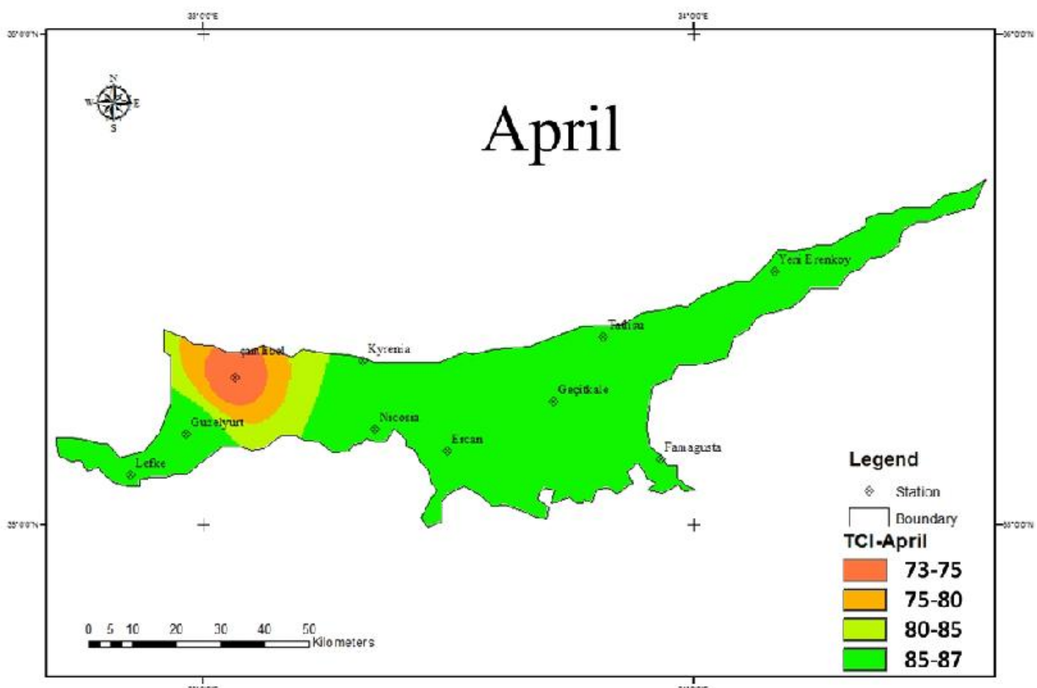


Figure 17. Spatial pattern of TCI in April

The TCI reaches the highest score (≥90) in Yeni Erenkoy and Çamlibel in May (Figure 18).

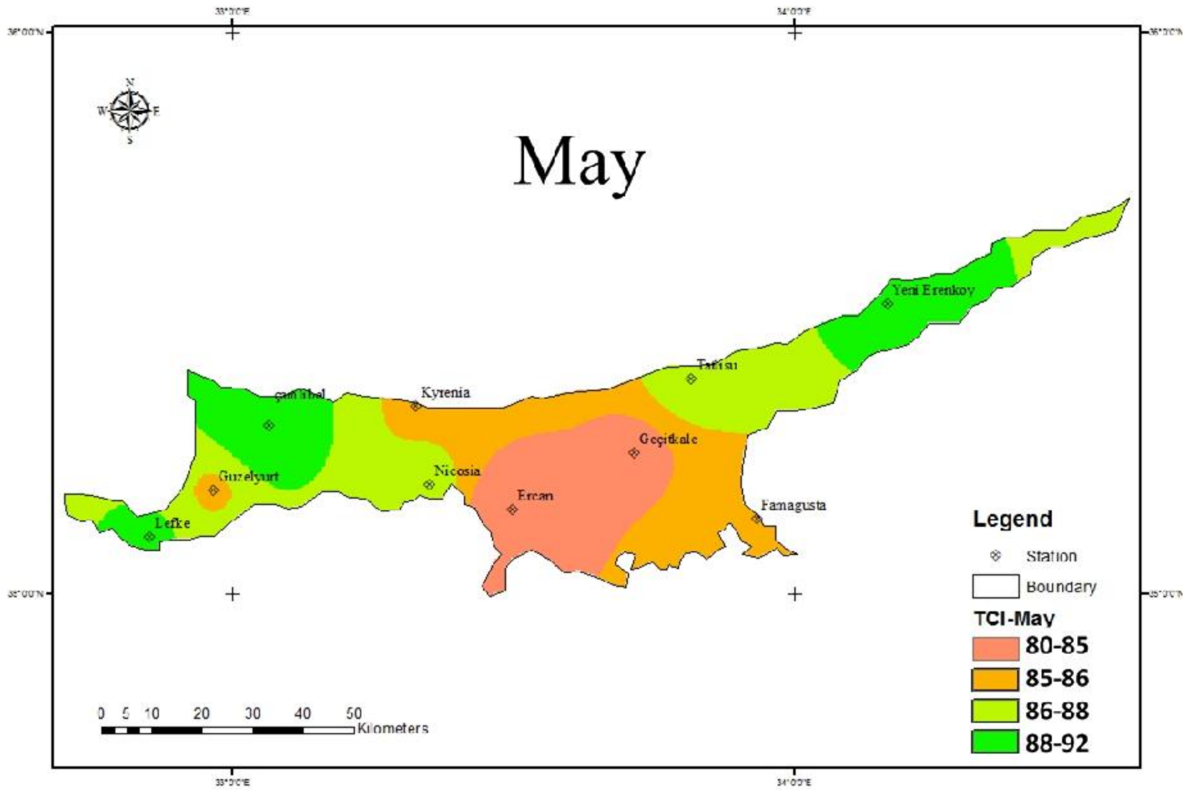


Figure 18. Spatial pattern of TCI in May

The TCI scores drop from the "excellent" category in the first two months of spring to the "very good" category due to increasing temperature; whereas, Çamlibel has an excellent (84) climate for recreation purposes in June (Figure 19).

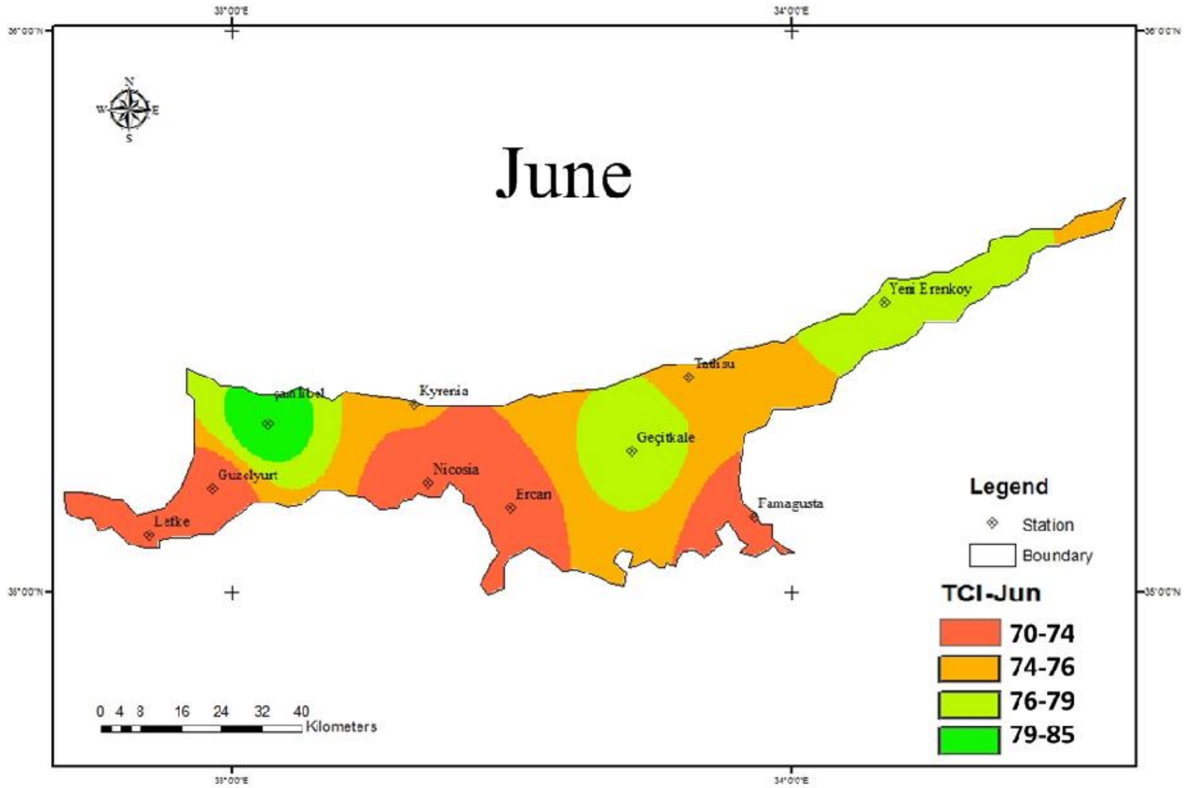


Figure 19. Spatial pattern of TCI in June

The diversity of climate well-being for leisure increases in July, and the TCI score fluctuates between 53 (acceptable) in Nicosia to 80 (excellent) in Çamlibel (Figure 20).

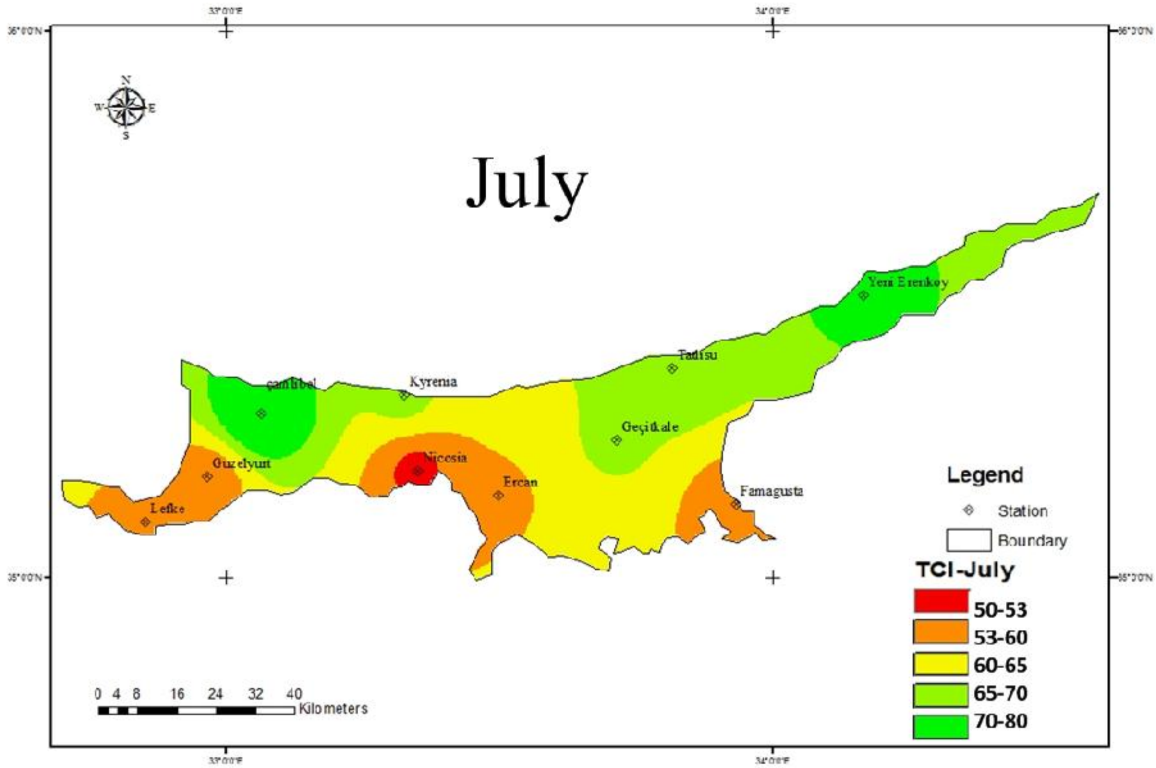


Figure 20. Spatial pattern of TCI in July

Famagusta (70), Guzelyurt (69), have "good" climates in June, while Lefke (77), Yeni Erenkoy (78) and Kyrenia (74) have "very good" climates. Variations of TCI scores in August are similar to July, demonstrating "acceptable" and "good" conditions in the central and south eastern and south-western areas; meanwhile, Çamlibel (80) and Yeni Erenkoy (68) are climatically "very good" for tourists (Figure 21).

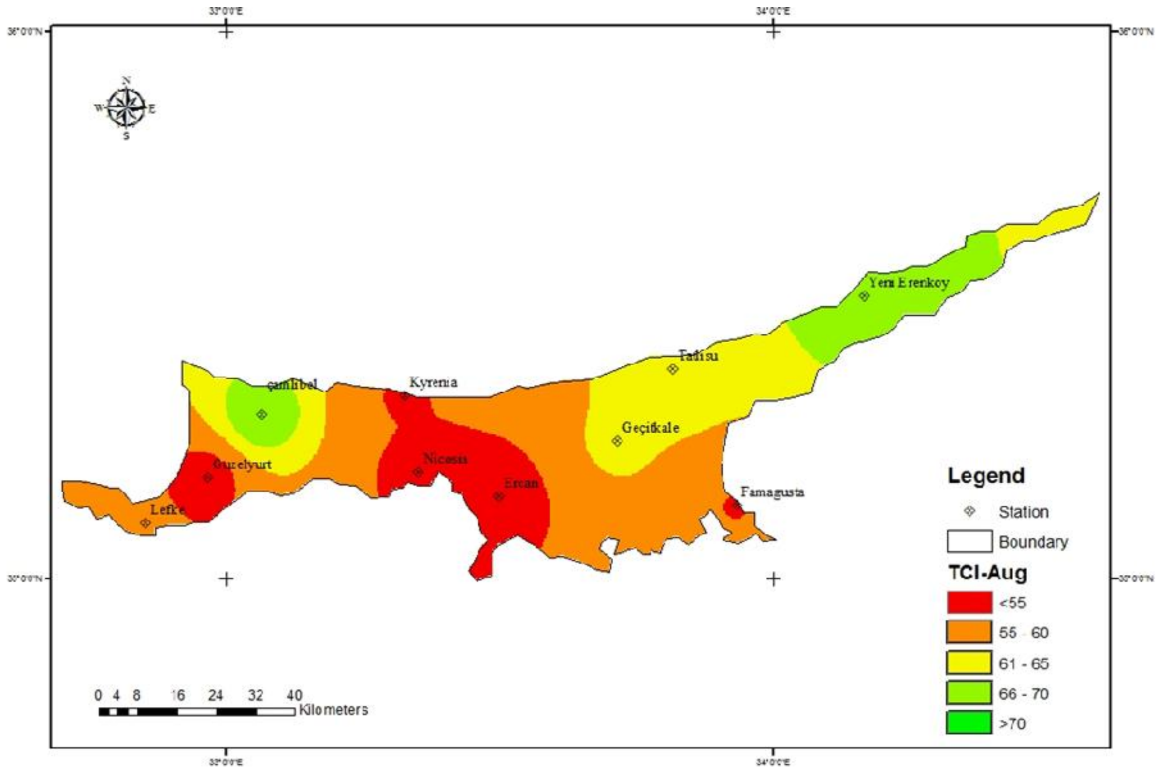


Figure 21. Spatial pattern of TCI in August

In the last month of summer, except in Çamlibel (80) and Geçitkale (75), other areas are below a TCI rating of 75. In September, Çamlibel and Geçitkale have “excellent” and “very good” climates, respectively (Figure 22).

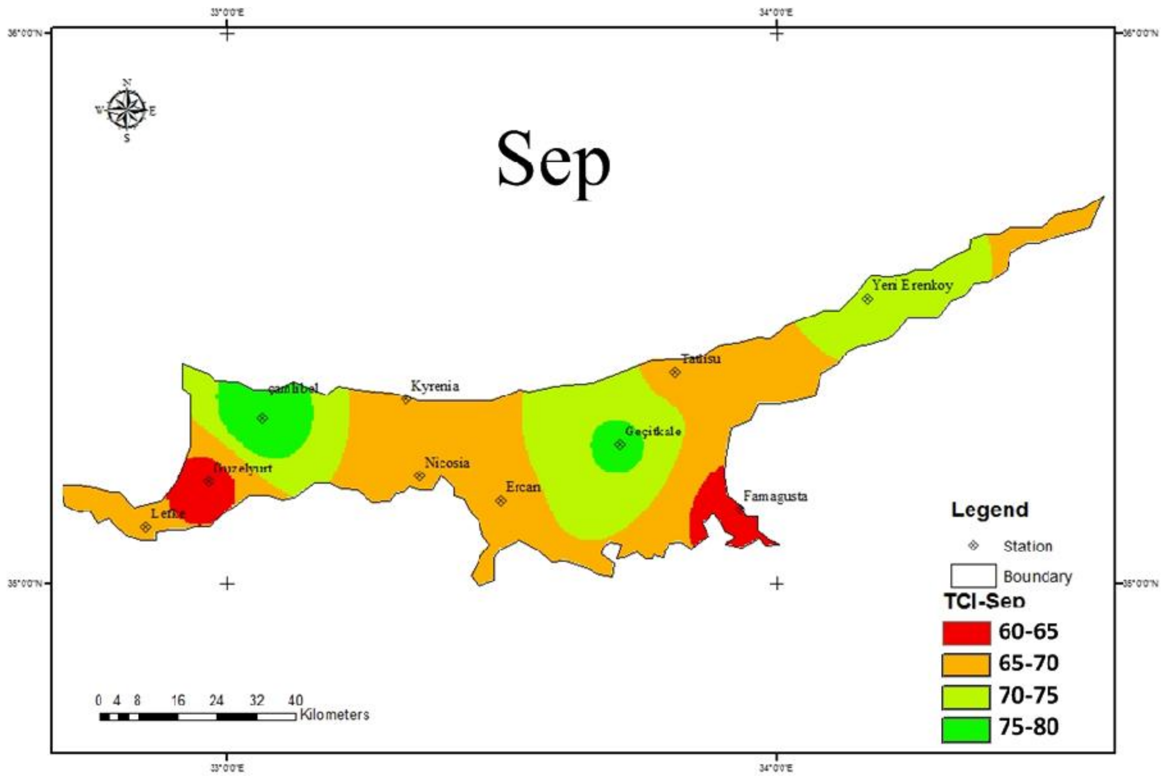


Figure 22. Spatial pattern of TCI in September

Compared to the summer, TCI values are high across most of the island in the fall. The TCI values for Çamlibel, Lefke, Yeni Erenkoy, and Geçitkale are greater than 85, which represent an "excellent" climate in October (Figure 23).

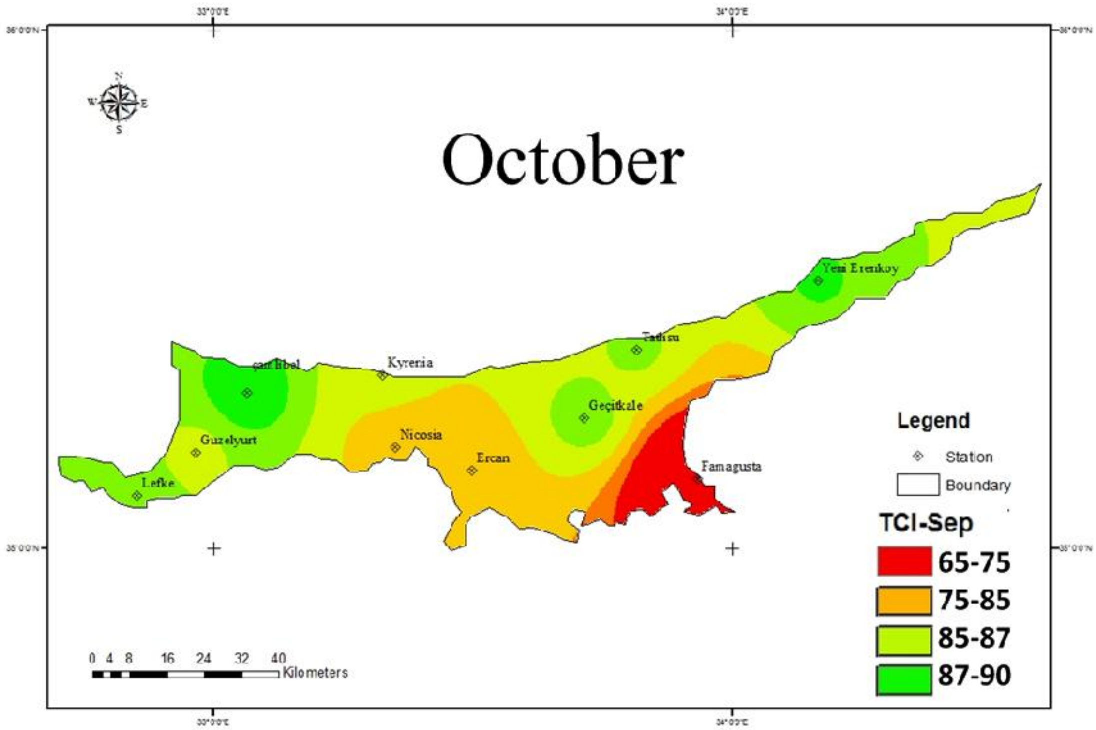


Figure 23. Spatial pattern of TCI in October

Lefke is a coastal area with irrigated and cultivated fields and garden crops including wheat, vegetables, potatoes, and citrus fruits. In November, the central regions present excellent (>80) climates for tourism activities. Nevertheless, other regions have "very good" climates during this month (Figure 24).

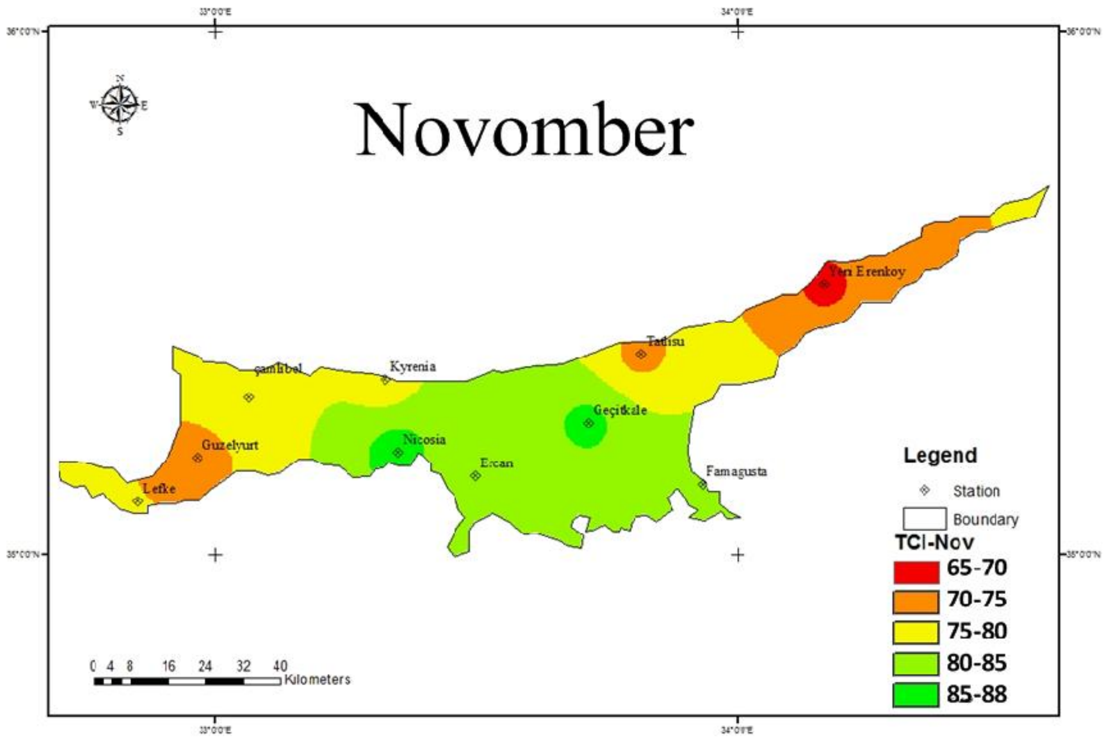


Figure 24. Spatial pattern of TCI in November

It can be clearly seen that the tourism climates in Famagusta (81) and Nicosia (80) are excellent in December (Figure 25). Famagusta is a coastal area with low altitude (<200 m) possesses irrigated farms and garden crops. Nicosia is an inland area that altitude varies between 100 to 300 m and its land use for cultivation of agriculture and garden products.

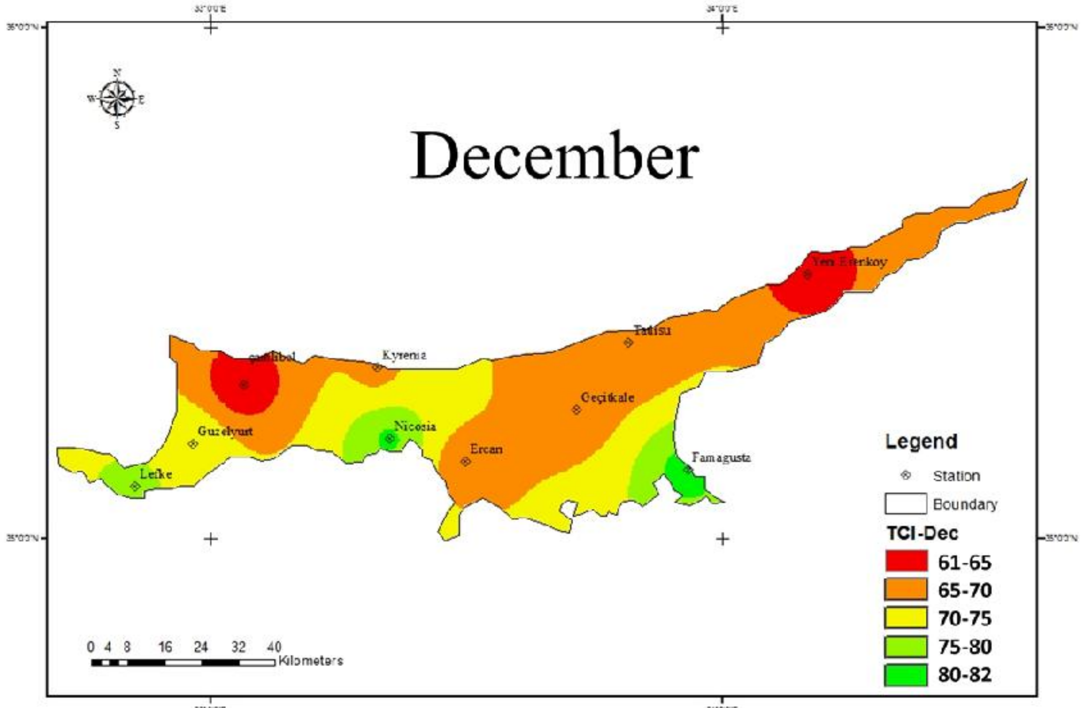


Figure 25. Spatial pattern of TCI in December

5.4 RMS Calendar

Results of the spatio-temporal pattern of TCI reveal that there are viable opportunities to reorganize tourism activities in the northwest part of the island, where two-thirds of the hotels are located (Figure 2). A Pearson correlation test (an inferential statistical analysis) was performed to investigate the correlation between number of the hotels and favorability level of the climate for tourism activities. Because the aforementioned variables are quantitative data, not nominal, Pearson correlation test was performed. According to the statistical result, number of the hotels do not have a significant correlation with level of TCI (r=-.262, p>.05). Such results confirm that climate is ignored in recreation management where it is the most important tourism resource.

Hamilton et al. (2005), Amelung and Viner (2006), and Saarinen (2014), observed that climate as a key determinant of tourist demand, especially in the Mediterranean islands, can be considered just as important a factor in spatial and temporal tourism planning. Besides the importance of the climate factor for tourists, the need to propose adaptive strategies against climate change and seasonality issues provides rational incentive to redistribute tourism activities (through RMS) based on the favorability of climate in terms of spatial and temporal changes. This logic supported by Ma et al. (2008) and Li et al. (2009), who draw attention to the inevitable role of climate in RMS. Hence, based on spatio-temporal changes in the TCI, the RMS calendar is developed to determine the locations and durations of tourism activities in the island (Figure 26).

Risk of tourism climate; environmental, and social concerns/potentials must be considered within the developing procedure of the RMS calendar with respect to the principles of TEM. For example, based on the spatio-temporal patterns of TCI, January and December are suitable period in Guzelyurt and Lefke which is also coinciding with citrus fruit harvesting season. According to risk map of TCI, risk of precipitation in Guzelyurt and Lefke is more than southern part of the island. Then, an alternative destination (e.g. Famagusta) has been selected within the RMS calendar. Such coincidence enhances and influences visitors' perceptions and experiences. In addition, the flower festival is held in Guzelyurt and Lefke every February (named Orkide festivali) is another attractive function in this region. Surfing is also a popular activity in Guzelyurt and Lefke coastal area in October.

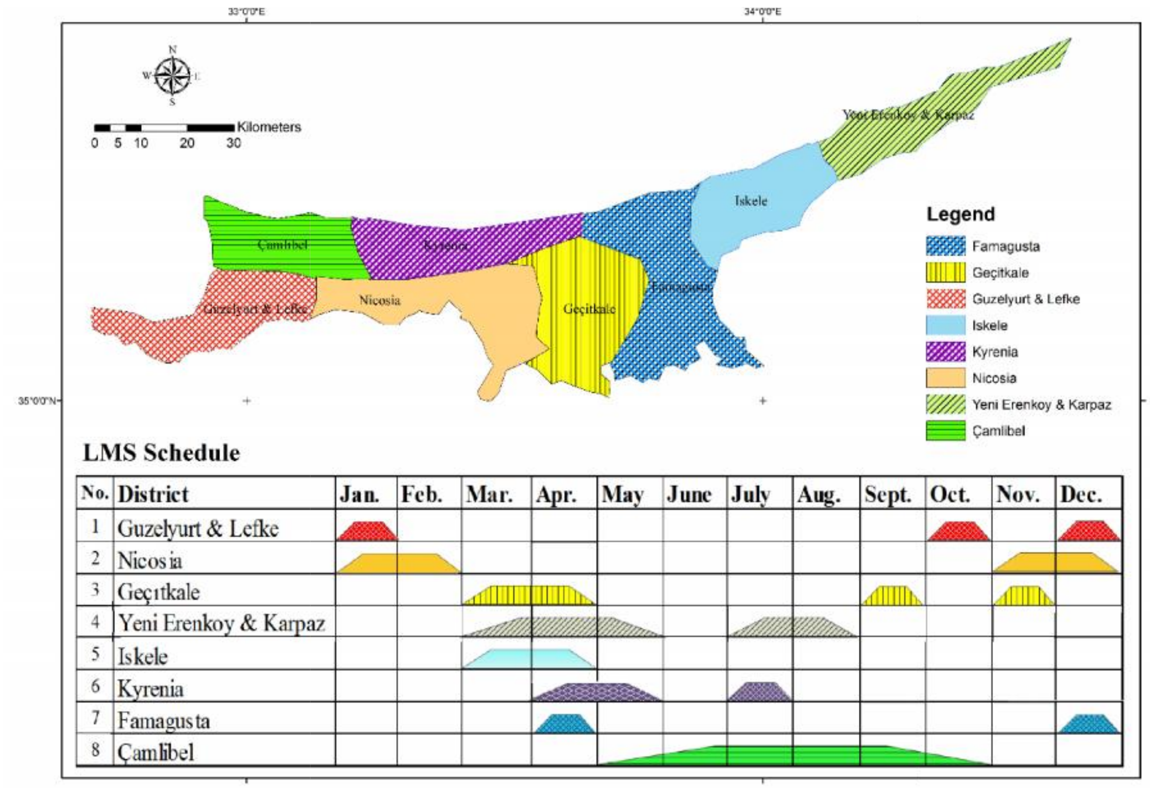


Figure 26. Tourism activities calendar based on recreation management system (RMS)

Nicosia, capital of the island, is mainly attracting tourists in January, February, November, and December (Figure 26). Tourism businesses can arrange exhibitions, festivals and events to accompany the other functions of the capital city (e.g., trade, politics). Bear in mind that Nicosia has a “very good” to “excellent” climate for tourism during this period (Figure 26). An International theatre festival and similar social events are also held in Nicosia in September. These events can be shifted to October when the climate is “excellent” (81).

Geçitkale is a destination with an excellent climate in February, March, April, September, and November; it has remarkable potential for the development of rural tourism, agro-tourism, ecotourism, and other types of alternative tourism. For instance, Hellim festival is a well-known food festival that is organized in Geçitkale during April.

Tourists' flow to Yeni Erenkoy and Karpaz can be encouraged during the months of March, May, July and August, where the sandy beaches and panoramic views are abundant. The Karpaz region is also home to Medoş and Lale Festivals and presentation of local handicrafts during March that adds to the attraction of the location.

Iskle can be visited by tourists in August and September when regional and national food festivals (e.g. Yeni Boğaziçi Pulya Festivali) are held to revive the food culture of the local people. Birdwatching is also popular in Iskele during the months of March and April.

Kyrenia attracts tourists who enjoy the pleasant weather, social events, historical attractions, and trekking during the months of March, April, June, and July. Kyrenia is also home to Alagadi Beach where the unique kinds of turtles (green and the loggerhead turtles) have the nesting ground. This is an attraction for nature lovers during the months of June and July. Kyrenia is also venue for a social event called Lepta Orchid, which takes place during the month of March, and home to several museums as well as an ancient shipwreck.

This arrangement is matched with results of precipitation risk. Kyrenia is a destination that the probability of exceeding rainfall is high during the winter. Then, summer and spring are two offered seasons in the RMS calendar, which are more suitable for recreation activities and precipitation does not disturb the enjoyment of tourists.

Famagusta is home to a major university as well as a coastal city. It has already suffered anthropogenic pressure due to overdevelopment and poor infrastructural amenities. It has access to several beaches which are crowded by domestic and international tourists beginning from April to October. It is also a venue for numerous social events e.g. Children's festival, Sand sculpting, musicals and spring fest organized by municipality and university.

Çamlibel is a mountainous landscape that provides favorable climates during the hot season (May to October) as shown in Figure 26. Apart from well-being of the climate for tourism, an exhibition is held in June, which provides an opportunity for local people to sell their organic products as well as handicrafts. It is also venue for strawberry festival during the harvest.

According to the TCI results, high temperature and relative humidity negatively affects the suitability of the climate for tourism activities. Based on climate change scenario estimated temperature will rise in the Mediterranean region, and this will have ramification in terms of tourist comfort. Currently, spring and autumn are the most favorite seasons for travel to the island. Nevertheless, the favorability of the climate will decline in early fall and late spring due to climate change. In contrast, winter would be a suitable season for tourists who select the island for holiday in the future. Furthermore, the period of the 3S tourism will expand due to temperature rise in the study area. Thus, climate change might generate new opportunities in the island by attracting tourists in spring instead of summer. This is accordance with findings of Scott et al.'s (2006) reassessment study that found climate change not only does not consider as a risky factor toward Ski-based tourism industry in Canada, but also positively enhance the industry though providing more regional consolidation and contraction in the business marketing.

According to the proposed model, stakeholders have various options in terms of time and space to develop and rearrange their business. This will also allow decision-makers to apply knowledge-based approaches to their planning processes. Therefore, this model meets the criteria of TEM (Castles & Stratford, 2014; Huber, 2000; Mol, 2002). Moreover, this model follows the funneling process from "data to wisdom" that was suggested by Ackoff (1989).

5.5 Demand for TWI

According to correlation results, level of the education positively related to IPTWI (r=.15, P<.05). That is educated tourists have more tendency to purchase tourism weather insurance. Level of income has a significant correlation with IPTWI (r=.17, P<.05). Tourist with high level of income exposes high intention to purchase tourism weather insurance (9). Visit time negatively related to IPTWI (r=-.14, P<.05). It means tourist who visited the island more than two times, has not willingness to purchase tourism weather insurance. One of the reason is that North Cyprus has excellent weather for 3S tourism activities, especially in the summer time. Repeat visitors are aware about this condition. Hence, they recognized that there is no need to purchase tourism weather insurance for travel to the island. In contrast, first-time visitors intended to purchase this service. Because the composite score of items relating to IPTWI is more than average (*Mean*=4.36).

Table 9. Mean, standard deviations and correlation matrix of the study variables

Variable	**1**	**2**	**3**	**4**	**5**	**6**
1. Age	1	.115	.097	.272**	.211**	.019
2. Gender		1	.032	-.104	.008	.054
3.Education			1	.257**	.042	.155*
4. Income level				1	.082	.170*
5. Visit time					1	-.140*
6. IPTWI						(.945)
Mean	2.293	.536	1.948	1.825	.250	4.361
Std. Deviation	1.216	.500	.853	1.193	.434	1.605

Note: IPTWI stand for Intention to Purchase Tourism Weather Insurance. **: Correlation is significant at the 0.01 level (2-tailed) and *: Correlation is significant at the 0.05 level (2-tailed). Cronbach alpha for reliability check is presented in the parenthesis.

Friedman test was performed to explore which meteorological parameter has more priority in shaping ideal climate for tourism activities (Conover & Iman, 1981). As presented in Table 10, there was a significant difference among mean rank of each factor (χ^2= 45.6, P<.001).

Table 10. Result of Friedman test

Parameter	**Mean**	**Std. Deviation**	**Mean Rank**	**Priority**	**Chi-Square**
Rainfall	4.60	1.86	3.61	1	
Temperature	5.25	1.83	3.41	2	
Wind	4.60	1.83	3.41	3	45.59**
Relative humidity	4.72	1.82	3.28	4	
Cloudiness	4.82	2.02	3.23	5	

Note: **: P<.01. The tourist were asked to rate importance of meteorological parameter in shaping excellent climate from 1(not at all important) to 7 (extremely important).

According the results, rainfall is the most important factor from demand perspective, that followed by rainfall, temperature, wind, relative humidity, and cloudiness. This result is accordance with work of Olya and Alipour (2015) that rainfall considered as a destructive factor in attractiveness of the tourism climate in a Mediterranean island.

5.6 Process of Tourism Weather Insurance Operationalization

The proposed model has international functionality that its implementation entails local actions. Climate of each destination varies based on the geographical location. Hence, measurements of meteorological data, contribution of local people and business sector, basic research about the study area, some local regulations, and some sorts of marketing and monitoring practices are steps that required local and regional actions.

A national and international coordination and cooperation is needed to operationalize the service of tourism weather insurance. For example, support of third parties, such as international digital wallet based e-commerce companies, is useful to accelerate transfers of payment through internet. Furthermore, global unified legislation, rating system, fulfillment and order system ensure the functionality of the model. This framework spot dynamic capability by considering an internal process for policy making system (Figure 27).

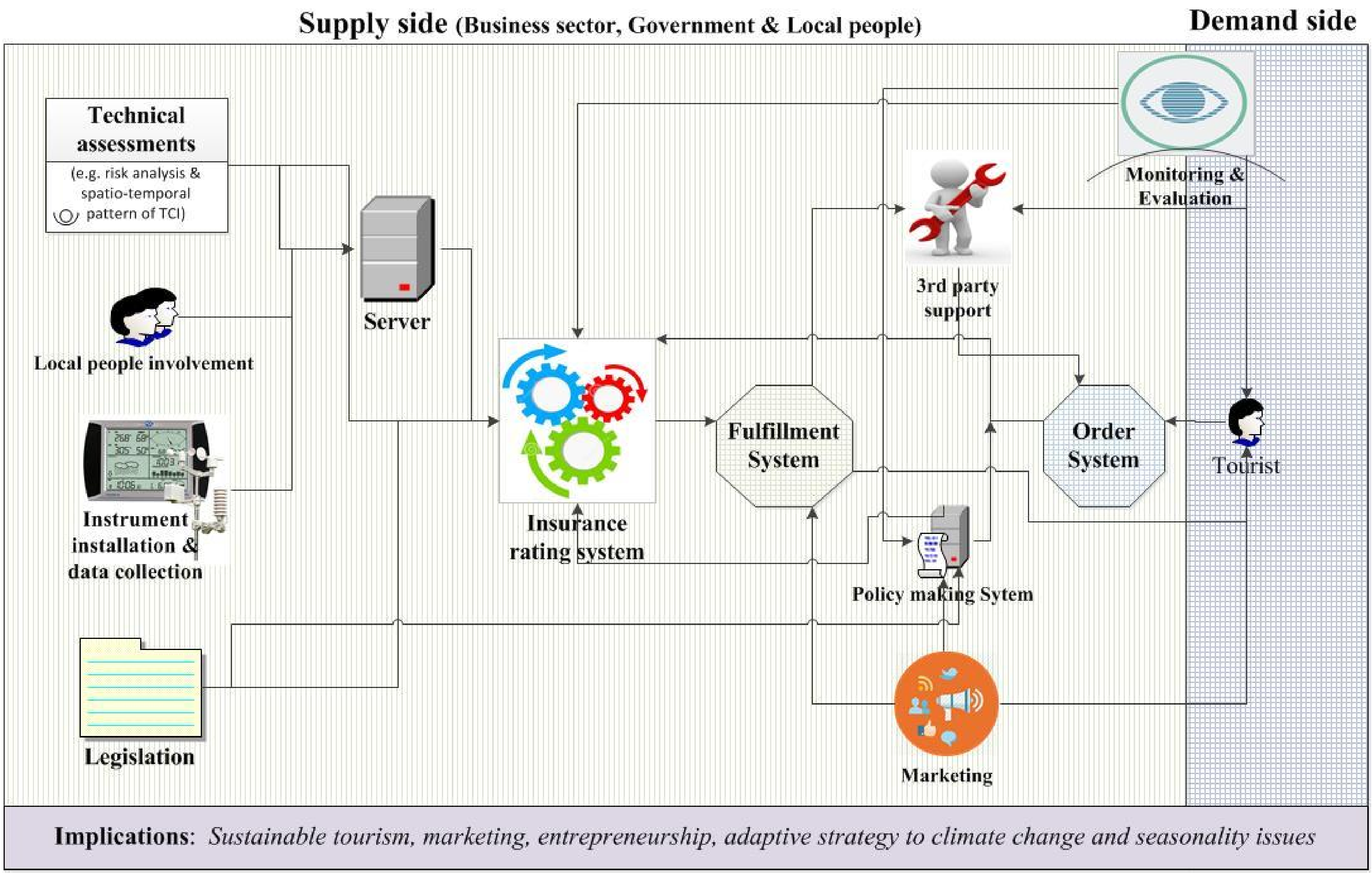


Figure 27. A framework for operationalize tourism weather insurance

The following are steps in process of tourism weather insurance:

5.6.1 Technical Assessments

After scoping, data collection and analysis of information is one the main process of strategic planning (Dwyer and Edwards, 2010). Since proposed idea is an innovative approach, comprehensive studies should be conducted to assess the various facets of the system. Obtaining the information about tourists' profile and preferences, investors and local people, major tourism activities, and basic information of the study area can be considered as inputs for interpretation and analyses of such information. For example, meteorological data used for spatiotemporal analysis of TCI and also risk assessment of tourism climate. Both demand and supply side can be benefited from results of technical assessments. In other words, findings of risk assessment of tourism climate is useful for business sector to minimize risk of investment as well as insurance rating system.

5.6.2 Local Community Involvement

Involvement of local people and communities is one of the main indicators of sustainable tourism development (Lee, 2013). Local people can contribute in establishment and maintenance of the meteorological instruments. In addition, comminutes indigenous knowledge can be used as a useful source for technical assessment.

5.6.3 Instrument Installation and Data Collection

The nest stage is installation of the devices for measurement of meteorological parameters. There is new weather station provides accurate weather factors (e.g. temperature, humidity, rainfall, wind speed, barometric pressure, radiation shield, and sunshine hours) in a self-contained, easy-to-install system. This instrument is not very expensive and occupies little space. Then, initiation of this business does not need high capital and place.

5.6.4 Legislation

A governmental regulation plays a key role in success of the tourism weather insurance system. As Beerepoot and Beerepoot stated (2007, p 4815):

> The role of the government in an innovation system is to facilitate innovation through either support measures (e.g. funding public research institutes, R&D subsidies) or government regulation (i.e. norms and standards). The first role is directly interventionist or facilitating, whereas the second is to stimulate innovation indirectly, as it should encourage or force companies (e.g. by means of product bans) to make transformations.

As aforementioned unified regulation framework should be legislated that consider benefits of all stakeholders.

5.6.5 Insurance Rating System

The extracted information form server will imported to insurance rating engine, which is heart of the tourism weather insurance system. Architecture of this rating system must be designed by experts from different sectors (e.g. finance, meteorology, and tourism). Generally, two common rating system are expert-based and index-based system. Šubelj et al. (2011) suggested an expert system for car insurance industry. In other hand, a weather index used for measurement of purchase intention of the people in insurance of climatic hazards (Park et al., 2013). Speed, accuracy, and flexibility are three important characteristics of insurance rating system. Since, the orders sent to this system need a quick and precise reply is required. Feedbacks from monitoring and policy making system will used in restructuration of the insurance rating system. Then a flexible system should be designed to assure dynamic capability of the model. Especially, for international enterprise, dynamic capability is one of the important indicators of competitive advantage (Aharoni, 2015, p 27).

5.6.6 Order and Fulfillment System

There are several sophisticated systems for operationalization of order-fulfillment system in insurance industry. Napier et al. (2004, p1) developed an application that "includes methods and systems for negotiating insurance conditions, for advising or determining that the insurance conditions have been met and for electronically initiated release of goods or filing a claim".

A recent study investigated technical approaches that applied innovation in order-fulfillment system of insurance industry. The main advantages of such system are quickness, efficiency, simplicity and flexibility, productivity, support differentiated product/service through integration of information, functions, and rules (Jeon et al., 2015). A schematic plan of process innovation system is demonstrated in Figure 28 (see detailed information about this system in original paper of Jeon et al., 2015, p 25).

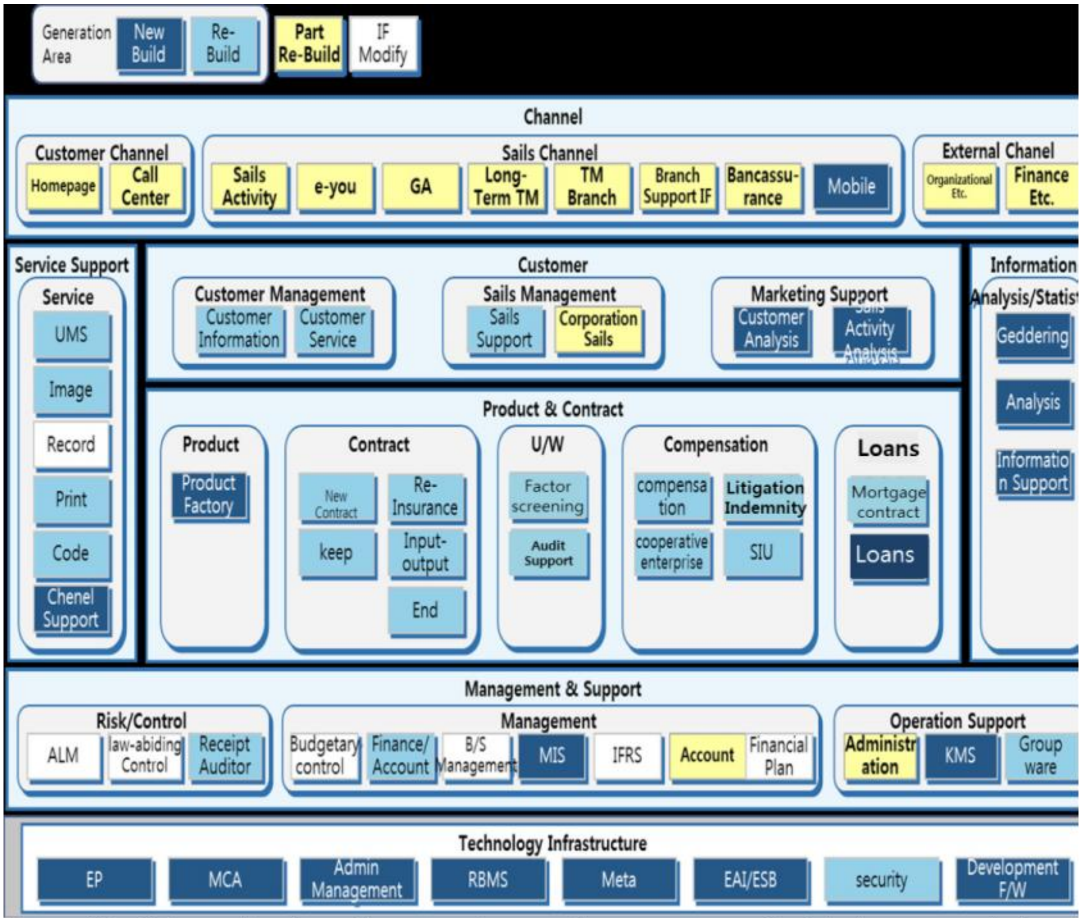


Figure 28. Schematic plan of process innovation system applied in insurance industry (Source: Jeon et al., 2015)

This innovative system can be used for accomplishment of order-fulfillment system of tourism weather insurance and useful lessons from insurance system in others sectors can be applied in the proposed model.

-3d Party Support

Third parties provide viable contributions in implementation of tourism weather insurance. Travel agencies, banks, and international digital wallet based e-commerce companies are some examples that can accelerate process of information sharing and marketing as well as transformation of the payment through internet. Akdeniz et al. (2013) examined moderating effect of third party information on the relationship between price and perceived quality. They emphasized on key role of third parties in performance of the insurance firms. In fact, reputation of third parties significantly associated with customer trust in purchasing decision (Akdeniz et al., 2013; Shaffer & Zettelmeyer, 2002).

-Policy Making System

A policy making system is embedded that functions based on external and internal changes and feedbacks. As aforementioned, this system assure dynamic capability of the model, which is a practical tool in turbulent and competitive business environment (Aharoni, 2015). Information extracted from monitoring and evaluation process, marketing practices and updated legislation can be considered as inputs of the system.

-Monitoring and Evaluation

Monitoring and evaluation of the process help to identify whether the system functions in line with predefined principles. As Guerra-López and Hicks (2015, p21) noted "monitoring and evaluation systems can help organizations align, communicate, and execute their strategies and plans to a vision that clearly identifies the measurable value they commit to add to their stakeholders". The results of this step can be useful in reengineering of insurance rating system as well as policy making system. Since climate change influences the climate pattern of the touristic destination, regular monitoring and evaluation needed as adaptive strategy in insurance of tourism climate (Klein & Maciver, 1999). A comprehensive monitoring and evaluation structure in the context of human and institutional capacity development was elaborated by Guerra-López and Hicks (2015) that can be applied in the tourism weather insurance system to enhance the insurance firms.

Conducting a survey, as a bridge between demand and supply sides, can provides customers perspectives concerning satisfaction, trust, loyalty, service quality, etc. Importance of this step in health insurance system is highlighted by Bias et al. (2015).

Chapter 6

DISCUSSION AND CONCLUSION

6.1 Remark Findings

The weather and climate are crucial resources for tourism activities. As a result, tourism is vulnerable to the effects of climate change. One important category of such effects is changes in tourism destinations' climatic suitability. Actual and potential suitability changes have been subjected to considerable scientific research, resulting in more refined and sophisticated representation of climatic conditions. This research applied a mathematical approach concerning tourism climate risk at different levels of precipitation exceeding probabilities. The IDM was used to calculate exceeding probability of precipitation (as a damaging parameter that is a risk to tourism climate) embedded in the TCI. Application of the IDM coupled with the TCI was also illustrated, taking the North Cyprus climate stations as an example. The findings indicated that the IDM held the appropriate capability in the extraction of sufficient useful information, improving the accuracy of recognition in an uncertain, random, and complex system. The practicality of the model in similar systems (e.g. drought, flood, water crisis, grassland fires, and soil erosion) has been declared by other scholars (Feng and Luo, 2008; Hao et al., 2014; Kocheva et al., 2014; Liu et al., 2010; Liu et al., 2013; Zhang et al., 2008). Similarly, the TCI is a valid approach in measuring the climatic attractiveness of the Mediterranean area (Amelung & Viner, 2006).

The results indicate that increasing precipitation (p=0. 05) will generate a higher risk for tourism climate on the island. Furthermore, the difference of the TCI between p=0. 3 and p=0.05 will increase as average rainfall increases. Similarly, the areas with a high level of precipitation (the northern areas) are exposed to a high level of risk that is accompanied by a low degree of TCI score. Thus, in accordance with Day et al. (2013), De Freitas et al. (2008), Jeuring and Becken (2013), and Scott et al. (2004), precipitation has a negative impact on the well-being of climate for tourists.

Consonant with Becken et al. (2014) and Liu et al. (2010), spatial distribution of tourism climate risk using GIS, provided an analytical end result that is easy to understand. It may be a practical implication for tourism management, planning, and also insurance of the climate (Becken & Hay, 2007; De Freitas, 2003; Heltberg et al., 2009; Lou & Sun, 2013). Moreover, intention of both demand (tourists) and supply sides (travel agency, hotels, and insurance firms) in regard to insurance of tourism climate is an under-researched topic. Weather insurance, based on the results of the risk assessment, is also a useful mechanism in tourist loyalty through a reduction in the gap between perception and experience of tourist in regard to destination climate. In this respect, Gómez Martín (2005) revealed that climate disconfirmation negatively affected retention and loyalty of tourists.

Proposed scientific approaches to tourism risk assessment based on the IDM not only have significant theoretical meaning, but also can guide the effective management of tourism. As Rutty et al. (2014) properly reported, weather risk assessment is directly associated with successful implementation and organization of touristic events and programs through providing financial contribution as well as more accurate scheduling.

This study developed a RMS model based on climatic attractiveness for tourism on the Mediterranean island of North Cyprus. The districts that do not have favorable climate are not considered as destinations in RMS calendar. In contrast, the tourism activities distributed to the districts where more favorable climate exists during specific time. Another functionality of RMS calendar is its consideration for physical and human pressures in the context of recreational management. Furthermore, tourism specific resources (i.e., climate and environment) have been considered for developing RMS calendar. This approach not only reduces negative environmental and social impacts that are caused by concentration of tourism activities in one location, it also addresses the suitability of numerous locations with favorable climate to distribute tourists in time and space (i.e., spatially and temporally) for the purpose of marketing as well as solution to seasonality problem.

The proposed approach is supported by TEM theory through generating and sharing knowledge, using technology, as well as, considering the cooperation of policy makers, stakeholders and other contributors. In other words, this model integrates environmental concerns with economic benefits by utilizing GIS as an interface between environmental and social issues. Spatio-temporal patterns of TCI are considered the basis for proposing the RMS calendar that follows both environmental (i.e., reducing human pressure on the environment, reducing excessive exploitation of natural resources and managing the biodiversity) and socio-economic concerns. These concerns and objectives can be achieved by utilizing different locations (spatial distribution), adapting resources to the demand, innovative marketing strategies based on favorability of the climate, raising tourist awareness, developing alternative forms of tourism, and tracking the pro-poor role of tourism in its enhancement of the livelihood of local communities.

The process of the transformation of data to knowledge and wisdom is performed based on a knowledge-based management system that recommends decision making based on knowledge instead of raw data. In fact, the RMS calendar provides a practical knowledge for managers how to manage the recreation activities in time and space. This not only minimizes the adverse environmental effect, but also enhances social and economic benefits of tourism. The illustrative result of this study helps managers to address the seasonality-related challenges.

This model is conducive to climate change –characterized by climate scientists–as it is capable to monitor and evaluate processes by empowering the system to accommodate changes in climatic data. Results of this empirical study contributed to the awareness of both demand (tourists) and supply (policy makers, managers, travel agencies, tour operators, hoteliers, and local communities) to translate the spatio-temporal patterns of TCI into practical strategy. Ultimately, this study attempts to strengthen the link between theory and practice by developing the RMS calendar, which is clearer and more understandable for non-experts in this field.

6.2 Implications

6.2.1 Reducing Environmental Degradation

The proposed model provides a strategy for tourism decision makers to adapt tourism activities to the capacity and tolerance of the resources that are available in North Cyprus. Distribution of tourism activities based on RMS colander not only decreases human pressure (social carrying capacity), but also reduces the negative impact of tourism on the environment. Based on RMS calendar, each area is matched to demand of the tourists in terms of climatic attractions/ favorability. In line with Perkins et al. (2013) and consonant with Cantasano and Pellicone's (2014) statements, planners should be sensitive to proper recreation management systems to prevent irreparable effects, as well as, applying spatio-temporal analysis to reduce environmental degradations (See Figure 1). In this regard, the practicality of RMS based on spatial analysis in a GIS setting was ascertained by Turner (1989) and Wan et al. (2014). One should keep in mind that the successful implementation of such a project relies on the participation of researchers, decision-makers, stakeholders, and local communities. In the meantime, contributions and achievements of the project must meet their satisfaction (Imran et al., 2014; Li et al., 2009, p. 27; Wolfsegger et al., 2008).

In other words, package and advertisements calendar as a part of Master Plan requires the participation of all contributors. For instance, change of date and place of social events/festival that are not matched with the results of RMS in terms of climate suitability, require cooperation of the local communities and business sectors toward adjusting the situations accordingly. Similarly, de-concentration diffusion of tourism activities from one location to another needs some types of rules to accelerate the process.

6.2.2 Seasonality and Tourism Marketing

The results of seasonal variation of TCI in the island are depicted in Figure 29. As illustrated, the island has “very good” (70-79) to “excellent” (80-100) climate in all seasons. Nevertheless, spring is the best season in terms of favorability of the climate except for Ercan (79); all the other stations reported “excellent” climate (>80). In autumn, Nicosia (83), Lefke (80), and Geçıtkale (80) have “excellent” climate and other area have “very good” climate (>70).

During the winter, tourism climate in Niocsia (72) and Geçıtkale (70) is “very good”. Other areas presents “good” climate for tourism activities (>70). Nicosia (57), Guzelyurt (58), and Famagusta (57) have “acceptable” climate for well-being of tourist during the summer. However, other destinations presents “good” climate for tourist (>60).

According to the results, there is no unfavorable climate (<40) in North Cyprus and tourists can chose locations with “excellent” and “very good” climate during all seasons. Consonant with findings of Amelung and Viner (2006), TCI values find possible shifts in the climatic favorability of various areas in different seasons. The issue is distribution of the tourism activities throughout the island and respective districts spatially and temporally; the RMS calendar address this issues.

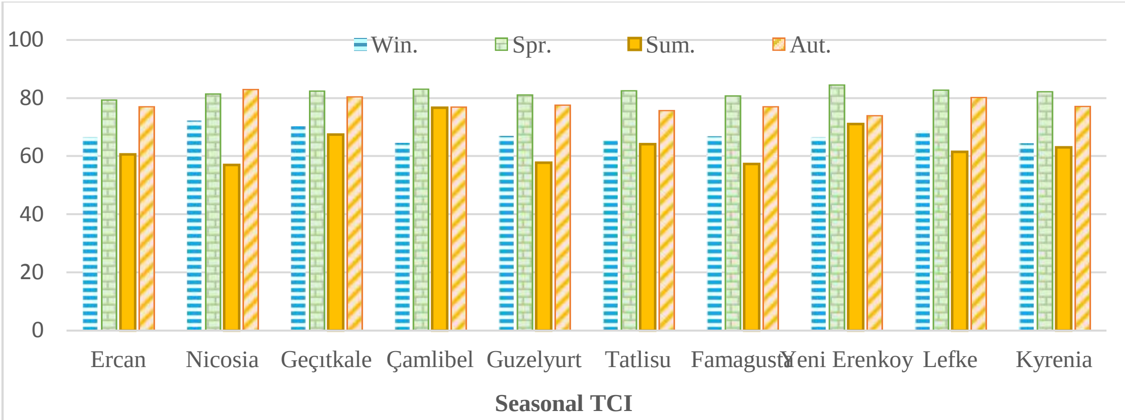


Figure 29. Seasonal variation of TCI in the study area

More importantly, advertising/marketing the climatic attractiveness of all the districts during different seasons is a significant attribute to boost destination's image (Oppermann, 2000; Truong et al., 2014). Furthermore, this will enable tourism decision makers to minimize the gap between the expectations and experiences of tourists through implementation of the RMS calendar, which is positively linked to tourist loyalty (Denstadli et al., 2011; Gómez Martín, 2005).

The proposed model, which functions based on variations in the suitability of the climate for tourists, addresses seasonality issues. This claim matches Ridderstaat et al. (2014) who reiterated that seasonality is highly associated with climate attractiveness. Therefore, the current study tackles this problem by proposing the RMS calendar that identifies which district renders the most favorable climate.

The result of this study is a practical example of the application of TEM in tourism climate literature, which is consonant with Belle and Bramwell's study (2005).

6.2.3 Distribution of Tourism Benefits (Social Achievement)

The concentration of tourism enterprises in Kyrenia region has not necessarily benefited the rest of the island. As Eagles (2014) and Truong et al. (2014) reported that this type of development tends to ignore the pro-poor role of tourism in poverty alleviation.

This research, by proposing a knowledge-based management system (Ackoff, 1989), provides a guideline to diffuse the tourism activities and their benefits temporally and spatially throughout the island. One should bear in mind that concentration of tourism in Kyrenia accompanied with luxury hotels and casinos which are prone to foreign investment and high import content as well as leakage (Gunn & Var, 2002). In the context of TEM (Giddens, 1998), the proposed model paves the way for innovative ideas that not only will contribute to environmental quality, but also will benefit remote areas. As described earlier, most of the remote areas have potentials for alternative forms of tourism without requiring high capital or foreign investment.

6.2.4 Adaptive Strategy to Climate Change

In the proposed model, evaluating and monitoring are embedded as the key processes that enable the RMS calendar to adapt to climate change. Charging the model with new meteorological datasets will produce updated information that can be translated into knowledge for policy-makers to apply a new strategy to climate change; it will also allow monitoring the activities that measure the effectiveness of actions (Ahn & Shafer, 2002; Reed et al., 2013).

As most of the climate change patterns estimated temperature rise (Meehl et al., 2007), especially in the Mediterranean region, TCI will vary in the near future. Hot summer weather in North Cyprus will adversely affect favorability of the climate for tourists. Rising temperature will be exacerbated by high relative humidity in the island, which decreases tourist’s comfort. The situation will escalate in inland areas (e.g. Nicosia) where there are no resources for 3S tourism.

This model considers Jacobson et al. (2014) and Reed et al.’s (2013) advice that it is not adequate to apply only adaptive management; information, monitoring, evaluation and knowledge must also inform future actions in coastal areas. Similarly, Wong et al. (2014) emphasized the importance of monitoring and evaluating steps in adjusting environmental policies to climate change adaptation. There are tourists with cultural differences in relation to tourism climate, which is an overlooked issue (De Freitas et al., 2008), present approach enhances the practicality of the RMS calendar for an efficient destination management, especially in island states with limited resources. In other words, tourists who come from various places express different perceptions/sensations about the climate; hence, the proposed model helps managers to match those sensations with the RMS calendar, which is extracted from the spatio-temporal patterns of the TCI.

6.3 Limitations and Future Research Directions

There are several limitations that can be considered for future research. First, this research proposed a model that is triggered by meteorological data. It would be enriching if the data for whole island of Cyprus were available. This study focused on North Cyprus. As Turner (1989) indicated, the RMS process needs to examine the system as a whole through scrutinizing the effective dimensions of sustainable tourism development pertinent to political, socio-cultural, environmental, technological, and economic dimensions. It is recommended to apply the proposed model in more sophisticated approaches within tourism recreation management, such as the Recreational Opportunity Spectrum (Clark & Stankey, 1979) and the Limits of Acceptable Change (Ahn et al., 2002), in future studies. Furthermore, the extent to which these sophisticated approaches in tourism recreation management are compatible with TEM should be examined.

Second, the RMS calendar was developed based on a lengthy data set (1980-2013); however, the comparison of TCI maps derived from two longitudinal scenarios would provide more accurate information in developing the RMS calendar (Deniz, 2011). Third, from a technical perspective, consonant with other studies (e.g. Park and Jang, 2014), the Kriging method was used for the spatial analysis of TCI values. Future studies can identify appropriate geostatistical approaches for the interpolation of TCI values among the meteorological stations. Fourth, regarding the popularity and capability of TCI in the projection of tourism climate variations, it is used to perform spatio-temporal analysis in the study area. It is suggested to devise a mechanism that is able to obtain and apply tourists' attitudes about climate conditions. In other words, instead of expert-based indices (e.g., CIT, developed by De Freitas et al. (2008)), perhaps it would be beneficial to cover the demand spectrum's considerations.

Assessments of the multicultural characteristics of tourism climate and risk assessments of the destructive factors of climate on tourism activities are two areas for future researches that could improve the functionality of the current model. The reason that just one factor (rainfall) out of two destructive parameters in relation to tourism climate used is that wind speed in the study area does not exceed at the optimal level (w> 19.80 km/h) and it is not a risky factor in management of tourism (See monthly pattern of wind speed in Appendix- Figure 31).

In other areas, such as the east and south east of the United States where both wind and rainfall acts as disturbing elements, risk assessment of tourism climate can be calculated through estimation of synthetic Relative Membership Degree (RMD) of each indictor using fuzzy recognition model developed by Li et al. (2006).

Synthetic RMD ($u'_h(x_j)$ and normalized synthetic RMD (H) can be calculated using Equation 10 and 11, respectively.

$$u'_h(x_j) = \left\{1 + \left[\frac{\sum_{i=1}^{m}[w_i(1-\mu(x_{ij})_h)]^p}{\sum_{i=1}^{m}[w_i\mu(x_{ij})_h]^p}\right]^{\frac{x}{p}}\right\}^{-1} \quad \text{(Equation 10)}$$

$$H = (1,2) * u'_h(x_j) \quad \text{(Equation 11)}$$

Where h is degree value for tourism climate index is 5 (See Table 2). j is number of risky factors [j=2 (wind and rainfall)]. W is weight of each factor, which can be extracted from Equation 9 (Mieczkowski, 1985). For those indices that the weight of factors are not predefined, AHP (analytic hierarchy process) method can be applied to estimate impact factor of each indicator (Li et al., 2012). It would be helpful if we need to insert a new factor (e.g. air pollution or temperature of see water and so on) in the TCI. i is sample number. Rule parameter of model optimization represented by α and p is distance parameters.

Although, the IDM was frequently used for the calculation of occurrence probability of natural hazards; future studies should compare current methods with one or more models (e.g. Bootstrap, Bayes, Bayes Bootstrap, and Monte Carlo Simulation) for risk assessment of tourism climate.

This study has focused on spatial analysis of tourism climate risk that provides sufficient evidence for the practicality of the IDM and the TCI in the calculation of climate favorability for tourism activities. It is offered to perform analysis of tourism climate risk for special events in future research. It might be useful to further conduct risk analysis of the tourism climate during holiday periods, as well as, assessment of risk and TCI for various kinds of recreation activities (e.g. surfing, tackling, birdwatching, etc.). However, the spatial-temporal pattern of TCI has also revealed where tourists can experience an ideal weather conditions at certain periods of the year. But TCI is a general index for recreation and tourism activities. Nevertheless, the result has a marketing implications for travel agencies for ensuring when a suitable climate in the Mediterranean Islands is most likely respectively for outdoor and indoor activities. This will consequently have a positive effect on coordination of facilities in the supply side.

This study has also potential implications for insurance firms to add weather insurance to their services. This is highly likely as tourism sector begins to take notice of and preparations for uncertain climatic conditions at the time climate change. As Njoroge (2014, p. 23) stated, ‘tourism is not only contributing to climate change but also vulnerable to risks induced by changing climate regime’. Based on the results of the risk assessment of the tourism climate, it is recommended to measure the willingness of both tourists and insurance institutes to allocate expenses/program for weather insurance. As for the limitations, the assumption that rainfall is the only climatic parameter that affects tourism is only half of the truth. There are other factors that need to be incorporated for further research. This limitation can be addressed through a composite method based on variable fuzzy sets and the information diffusion model (Li et al., 2012), which is suggested as a direction for future studies. Tourism weather insurance provides several implications, namely, marketing and entrepreneurial business, sustainable tourism development, and adaptive strategy against climate change and seasonality issues.

Tourism weather insurance, as an innovative idea, is an entrepreneurial action. Marketing practices and insurance sales create numerous job opportunities. Furthermore, some of travel agencies are encountering with problem due to computerization of reservation system. Especially, young generation are more willing to online reservation (Hsu et al. 2013). Then, tourism weather insurance can be considered as a business opportunities for travel agencies to adapt theirs service accordance with new technology.

Apart from financial advantages, announcement of tourism weather insurance enhance the awareness of the tourists regarding variability of the climate condition and escalate their sensitivity to negative consequences of climate change. Since, cognitive knowledge leads to pro-environmental attitude and behavior, advertising the tourism weather insurance boost intention of tourist to support green activities in tourism industry (Mohd et al., 2015).

Another implication of tourism weather insurance is that it provides a peace of mind for tourists about favorability of destination weather (Mills, 2005). It means that occurrence of disastrous climate incidents cannot be an effective element in selection of another destination where has more attractive weather. In other word, tourism weather insurance mitigates the adverse effects of perceived risk of undesirable climatic condition on destination choice and destination loyalty.

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APPENDICES

Appendix A: A Sample of IDM Calculation

In this section, table of parameter and spreadsheet pertaining calculation of IDM for one station (Kyrenia) is provided (Table 7). This process repeated to calculate exceeding probability of precipitation according Equation 1 to 8.

Table 11. Table of Parameter for calculation of climate risk using IDM

min	max	x1-u1	2h2	1/hr2phi	m	Rate	Mean Monthly Precipitation	U	n	m	h
0.6	102.9		298.3362	2.506631	1	5	0-14.9	0	12	11	12.21344
				30.61459	2	4.5	15-29.9	15			
				0.032664	3	4	30-44.9	30			
					4	3.5	45-59.9	45			
					5	3	60-74.9	60			
					6	2.5	75-89.9	75			
					7	2	90-104.9	90			
					8	1.5	105-119.9	105			
					9	1	120-134.9	120			
					10	0.5	135-149.9	135			
					11	0	150 or more	150			

Kyrenia	u	0	15	30	45	60	75	90	105	120	135	150
Jan.	99.4	-33.1182032	-23.8769523	-16.1441	-9.919546	-5.20339	-1.9956	-0.29618	-0.10512	-1.42242	-4.24809	-8.58212887
Feb.	91.8	-28.2474573	-19.7704447	-12.8018	-7.3415152	-3.3896	-0.94605	-0.01086	-0.58404	-2.66558	-6.25549	-11.3537667
Mar.	46.1	-7.12353969	-3.24201318	-0.86885	-0.0040558	-0.64762	-2.79956	-6.45986	-11.6285	-18.3056	-26.4909	-36.1847097
Apr.	19.2	-1.23565279	-0.05912792	-0.39097	-2.2311738	-5.57974	-10.4367	-16.802	-24.6756	-34.0577	-44.9481	-57.3468392
May	12.2	-0.49890018	-0.02627907	-1.06202	-3.6061325	-7.65861	-13.2194	-20.2887	-28.8662	-38.9522	-50.5465	-63.6491243
Jun.	10.4	-0.36254396	-0.07092668	-1.28767	-4.0127878	-8.24627	-13.9881	-21.2383	-29.9969	-40.2638	-52.0391	-65.3228064
July	2.4	-0.01930707	-0.53215125	-2.55336	-6.0829353	-11.1209	-17.6672	-25.7219	-35.2849	-46.3563	-58.9361	-73.024184
Aug.	0.6	-0.00120669	-0.6950547	-2.89727	-6.6078464	-11.8268	-18.5541	-26.7898	-36.5338	-47.7862	-60.547	-74.8161219
Sep.	2.6	-0.022659	-0.51539164	-2.51649	-6.0259526	-11.0438	-17.57	-25.6045	-35.1475	-46.1987	-58.7584	-72.8264206
Oct.	22.5	-1.69691088	-0.18854565	-0.18855	-1.6969109	-4.71364	-9.23874	-15.2722	-22.814	-31.8642	-42.4228	-54.4896938
Nov.	60.4	-12.2283504	-6.90884904	-3.09771	-0.794942	-0.00054	-0.7145	-2.93682	-6.66751	-11.9066	-18.654	-26.9097719
Dec	102.9	-35.4915321	-25.8983293	-17.8135	-11.237019	-6.16891	-2.60917	-0.55779	-0.01478	-0.98014	-3.45385	-7.43593889

Fi (uj)													Di
Jan.	99.4	1.35213E-16	1.39458E-12	3.18E-09	1.6072E-06	0.00018	0.00444	0.024291	0.029405	0.007876	0.000467	6.1221E-06	0.066666
Feb.	91.8	1.76342E-14	8.46987E-11	9E-08	2.1169E-05	0.001102	0.012683	0.032311	0.018215	0.002272	6.27E-05	3.82995E-07	0.066667
Mar.	46.1	2.63243E-05	0.001276683	0.0137	0.03253195	0.017093	0.001987	5.11E-05	2.91E-07	3.66E-10	1.02E-13	6.29871E-18	0.066667
Apr.	19.2	0.009493675	0.03078879	0.022094	0.00350821	0.000123	9.58E-07	1.65E-09	6.27E-13	5.28E-17	9.85E-22	4.06121E-27	0.066009
May	12.2	0.019833619	0.031816961	0.011294	0.00088705	1.54E-05	5.93E-08	5.04E-11	9.5E-15	3.96E-19	3.65E-24	7.4406E-30	0.063847
Jun.	10.4	0.022731114	0.030427655	0.009012	0.00059066	8.57E-06	2.75E-08	1.95E-11	3.07E-15	1.07E-19	8.2E-25	1.39552E-30	0.06277
July	2.4	0.032039564	0.019184973	0.002542	7.4522E-05	4.83E-07	6.94E-10	2.2E-13	1.55E-17	2.41E-22	8.29E-28	6.31061E-34	0.053841
Aug.	0.6	0.032624773	0.016300958	0.001802	4.4088E-05	2.39E-07	2.86E-10	7.58E-14	4.44E-18	5.76E-23	1.66E-28	1.05158E-34	0.050772
Sep.	2.6	0.03193235	0.019509216	0.002637	7.8892E-05	5.22E-07	7.65E-10	2.48E-13	1.78E-17	2.82E-22	9.9E-28	7.69058E-34	0.054158
Oct.	22.5	0.005985667	0.027051243	0.027051	0.00598567	0.000293	3.17E-06	7.61E-09	4.04E-12	4.74E-16	1.23E-20	7.07128E-26	0.06637
Nov.	60.4	1.59723E-07	3.26285E-05	0.001475	0.01475138	0.032647	0.015987	0.001732	4.15E-05	2.2E-07	2.59E-10	6.71902E-14	0.066667

Dec	102.9	1.25978E-17	1.84744E-13	5.99E-10	4.3042E-07	6.84E-05	0.002404	0.018699	0.032185	0.012258	0.001033	1.92612E-05	0.066667
uxi(uj)	u												
Jan.	99.4	2.0282E-15	2.09188E-11	4.77E-08	2.4108E-05	0.002694	0.066602	0.364365	0.441076	0.118145	0.007002	9.18319E-05	
Feb.	91.8	2.64513E-13	1.27048E-09	1.35E-06	0.00031753	0.016523	0.190239	0.484669	0.273223	0.034081	0.000941	5.74492E-06	
Mar.	46.1	0.000394865	0.019150233	0.205506	0.48797893	0.256391	0.029808	0.000767	4.36E-06	5.5E-09	1.53E-12	9.44806E-17	
Apr.	19.2	0.143823984	0.466433331	0.334713	0.0531474	0.001867	1.45E-05	2.5E-08	9.51E-12	8.01E-16	1.49E-20	6.15252E-26	
May	12.2	0.310643301	0.498331947	0.176889	0.01389339	0.000241	9.29E-07	7.9E-10	1.49E-13	6.2E-18	5.71E-23	1.16538E-28	
Jun.	10.4	0.362130815	0.484744909	0.143577	0.00940989	0.000136	4.38E-07	3.11E-10	4.88E-14	1.7E-18	1.31E-23	2.22322E-29	
July	2.4	0.595072355	0.356323429	0.047211	0.00138411	8.98E-06	1.29E-08	4.09E-12	2.88E-16	4.47E-21	1.54E-26	1.17207E-32	
Aug.	0.6	0.642570788	0.321060309	0.035496	0.00086835	4.7E-06	5.63E-09	1.49E-12	8.75E-17	1.14E-21	3.26E-27	2.07117E-33	
Sep.	2.6	0.589610628	0.36022532	0.048698	0.00145669	9.64E-06	1.41E-08	4.58E-12	3.28E-16	5.21E-21	1.83E-26	1.42002E-32	
Oct.	22.5	0.09018624	0.407581979	0.407582	0.09018624	0.004416	4.78E-05	1.15E-07	6.08E-11	7.14E-15	1.85E-19	1.06543E-24	
Nov.	60.4	2.39583E-06	0.000489425	0.022123	0.22127005	0.489698	0.239806	0.025985	0.000623	3.31E-06	3.88E-09	1.00785E-12	
Dec	102.9	1.88967E-16	2.77116E-12	8.99E-09	6.4564E-06	0.001026	0.036059	0.280489	0.482773	0.183863	0.015494	0.000288919	
													Q
q(uj)		2.734435372	2.914340883	1.421797	0.87994313	0.773015	0.562577	1.156275	1.197699	0.336093	0.023437	0.000386495	12
P (uj)		0.227869614	0.24286174	0.118483	0.07332859	0.064418	0.046881	0.096356	0.099808	0.028008	0.001953	3.22079E-05	0.337457
Pu>uj													

Appendix B: Average Monthly Precipitation

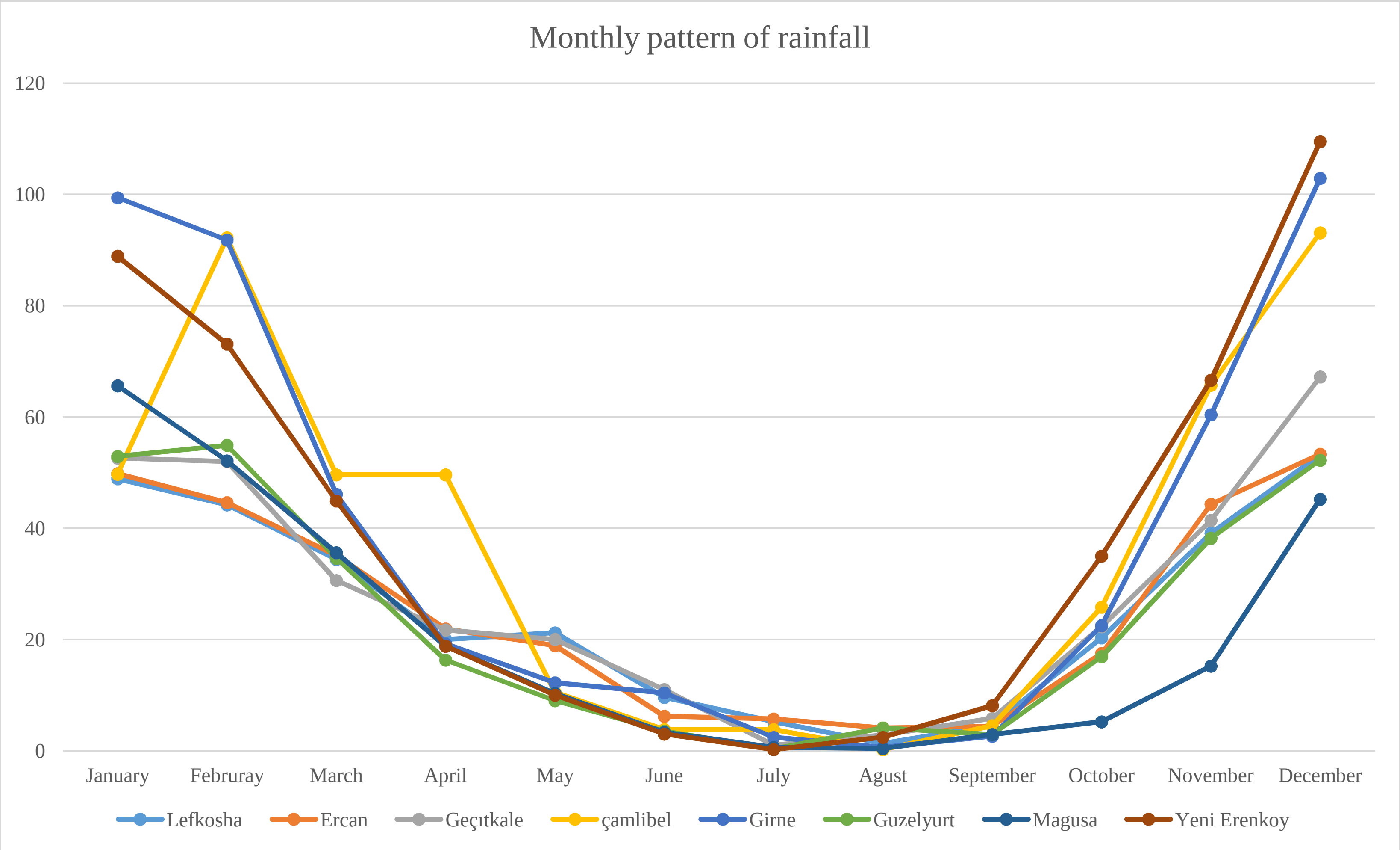

Figure 30. Average monthly precipitation (mm) over the island

Appendix C: Monthly Pattern of Wind Speed

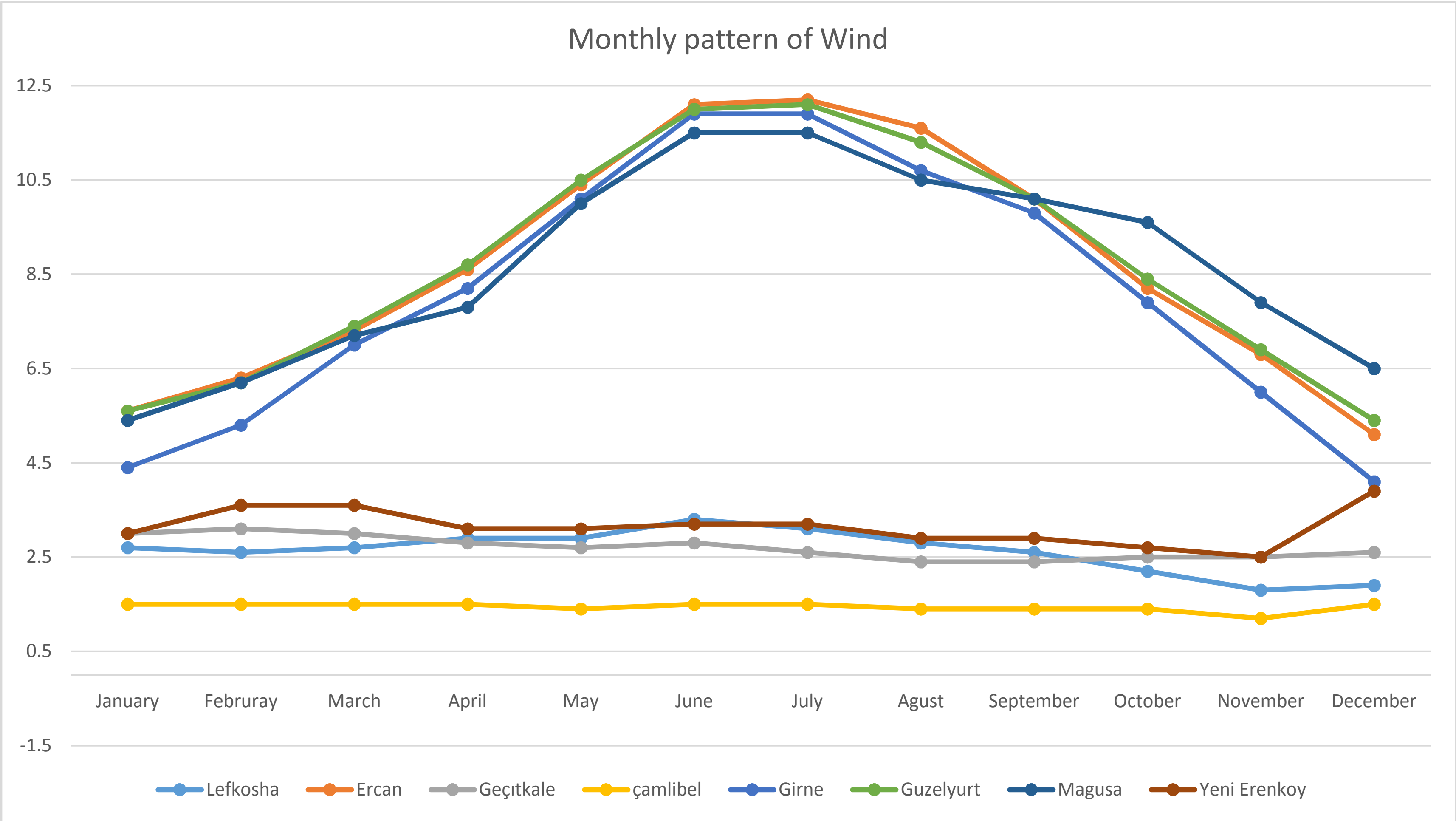

Figure 31. Monthly pattern of wind speed (km/h)

Appendix D: A Sample of TCI Calculation

Nicosia	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Ave. Temp	10.3	10.7	13.1	17.3	21.9	26.3	29	28.9	25.7	21.3	15.6	11.8
Max Ave. Temp	15.9	16.3	19.5	24.5	29.6	34	36.9	36.9	33.7	28.7	22.3	17.7
Ave. Relative Humidity (%)	74.3	72.5	68.6	62.5	58.2	55	55.4	58.9	59.8	63.1	69.1	74.3
Min Ave. Relative Humidity (%)	52.2	48.8	41.7	34.1	28.7	25.7	25	26	27.8	33.9	42.6	51.1
Precipitation (mm)	48.9	44.2	34.4	20	21.2	9.6	5.2	1.3	4.6	20.3	39.1	53.2
Ave. Wind speed (m/s)	2.7	2.6	2.7	2.9	2.9	3.3	3.1	2.8	2.6	2.2	1.8	1.9
Sunshine hours	3	3.2	3.3	3.5	3.6	3.8	3.6	3.5	3.5	3.3	3	2.9
CID	3	3.5	4.1	5	4.7	2.8	1	1	2.5	4	4.8	4.7
CIA	2.5	2.5	2.4	3.6	4.9	3	1.5	1	2	4	4.9	3.5
Precipitation	4	4	4	4.5	4.5	5	5	5	5	4.5	4	3.5
wind	5	5	5	4.5	4.5	4.5	4.5	5	5	5	5	5
S	1.5	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	1
CID	24	28	32.8	40	37.6	22.4	8	8	20	32	38.4	37.6
CIA	5	5	4.8	7.2	9.8	6	3	2	4	8	9.8	7
Precipitation	16	16	16	18	18	20	20	20	20	18	16	14
wind	20	20	20	18	18	18	18	20	20	20	20	20
S	3	3	3	3	4	4	4	3	3	3	3	2
TCI	68.0	72.0	76.6	86.2	87.4	70.4	53.0	53.0	67.0	81.0	87.2	80.6

Appendix E: A Sample of Questionnaire

Dear Respondent;

You are kindly asked to participate in a study to examine intention purchase of tourist in insuring the destination weather during the visitation of the island. All information that you provide will remain confidential and in no way you will be identified when the results of this study are reported.

Thank you for taking the time to complete this survey and being a part of this study.

Section 1

For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate box. The response scale is as follows:

1. **Strongly disagree**
2. **Disagree**
3. **Undecided or Neutral**
4. **Agree**
5. **Strongly agree**

Intention to purchase tourism weather insurance		**1**	**2**	**3**	**4**	**5**
1	I intend to purchase tourism weather insurance on my next trip.					
2	I plan to include tourism weather insurance in my future travel packages.					
3	If tourism weather insurance had been offered during this trip, I would have purchased it.					
4	I need to purchase tourism weather insurance when I travel.					
5	I intend to purchase tourism weather insurance on my next trip.					
6	I plan to include tourism weather insurance in my future travel packages.					

Importance of climate parameter	**1. Not at all important**	**2**	**3.Neutral**	**4**	**5.Extremely important**

1	Thermal sensation (Temperature)					
2	Relative humidity					
3	Sunshine					
4	Sky cloudiness					
5	Wind					
6	Rain					

Section 2

Age:

18-27 ( )
28-37 ( )
38-47 ( )
48-57 ( )
>57 ( )

First time visit to the Island ( )
Repeat visitation to the Island ( )

Gender:

Male ( )
Female ( )

Education:

High School ( )
Bachelor degree ( )
Master degree ( )
PhD degree ( )

Activities undertaken during the visit *(multiple answers possible):*

Sightseeing ( )
Beach activities ( )
Outdoor recreation ( )
Other, please specify:…………

Nationality:………………......

Annual income in US dollars*:*
Less than $30,000 ( )
$30,000-$59,999 ( )
$60,000-$89,999 ( )
$90,000-$119,999 ( )
$120,000 or more ( )

THANK YOU VERY MUCH FOR YOUR COOPERATION.