Geographies, Planning & Tourism StudioS

Year 2026 Vol. 6 Issue: 2 ISNN: 2791-7460

Climate change and seasonal tourism suitability: A TCI-based comparative assessment of destination typologies in Türkiye

İklim değişikliği ve mevsimsel turizm uygunluğu: Türkiye'de destinasyon tipolojilerinin Turizm İklim İndeksi (TCI) temelinde karşılaştırmalı değerlendirmesi

Elçin Durmaz[a], Doğan Dursun[b]

[a] Ministry of Culture and Tourism, General Directorate of Investment and Enterprises, Ankara, Türkiye. ORCID: 0009-0001-2431-0463

[b] Ataturk University, Department of City and Regional Planning, Erzurum, Türkiye. ORCID: 0000-0003-3791-0027

Article Info/Makale Bilgisi

Received/Geliş: 20.05.2026
Accepted/Kabul:06.11.2026

Keywords

Climate change
Tourism Climatic Index-TCI
Tourism Climate Suitability
Seasonal Redistribution
Destination Typology

Anahtar Kelimeler

İklim değişikliği
Turizm İklim İndeksi
Turizm İklim Uygunluğu
Mevsimsel Yeniden Dağılım
Destinasyon Tipolojisi

Type of Article/ Makale Türü

Research /Araştırma

Corresponding Author/ Sorumlu Yazar

D. Dursun
dogan08@gmail.com

www.gpt-studios.org

BY-NC

Abstract / Öz

Climate change is expected to reshape tourism climate suitability, particularly in climate-sensitive regions such as the Mediterranean Basin. While numerous studies have assessed tourism–climate relationships using climate indices, comparative analyses across contrasting destination typologies remain limited. This study evaluates seasonal tourism climate suitability in Türkiye using the Tourism Climatic Index (TCI) across three distinct destination types: coastal (Mersin), transitional coastal–inland (Çanakkale), and mountainous inland (Kayseri). Historical climate conditions (1996–2020) were compared with mid-century (2050–2074) and late-century (2075–2100) climate projections derived from nationally available climate datasets.The results reveal pronounced spatial and seasonal differences in tourism climate suitability. Coastal destinations experience substantial declines in summer suitability due to increasing thermal stress, whereas inland and high-elevation destinations maintain or improve relative summer climatic comfort. Spring and autumn emerge as increasingly favourable periods across all destination types, indicating a progressive redistribution of tourism climate suitability across both space and seasons. These findings suggest that climate change may alter the relative climatic advantages of tourism destinations rather than uniformly reducing tourism potential. The study contributes to the tourism climatology literature by applying a comparative destination typology framework in an under-researched Mediterranean context and by demonstrating how climate change may restructure seasonal tourism suitability patterns.

İklim değişikliğinin, özellikle Akdeniz Havzası gibi iklime duyarlı bölgelerde, turizm açısından iklim uygunluğunu yeniden şekillendirmesi beklenmektedir. Çok sayıda çalışma, iklim indekslerini kullanarak turizm–iklim ilişkilerini değerlendirmiş olsa da birbirinden farklı destinasyon tipolojileri arasındaki karşılaştırmalı analizler sınırlı kalmaktadır. Bu çalışma, Türkiye'de mevsimsel turizm iklim uygunluğunu Turizm İklim İndeksi (TCI) kullanarak üç farklı destinasyon türü üzerinden değerlendirmektedir: kıyı (Mersin), kıyı–iç kesim geçişi (Çanakkale) ve dağlık iç kesim (Kayseri). Geçmiş iklim koşulları (1996–2020), ulusal düzeyde mevcut iklim veri setlerinden elde edilen yüzyıl ortası (2050–2074) ve yüzyıl sonu (2075–2100) iklim projeksiyonlarıyla karşılaştırılmıştır.Sonuçlar, turizm iklim uygunluğunda belirgin mekânsal ve mevsimsel farklılıklar ortaya koymaktadır. Kıyı destinasyonlarında artan termal stres nedeniyle yaz mevsimi uygunluğunda önemli düşüşler yaşanırken, iç kesimlerdeki ve yüksek rakımlı destinasyonlar yaz mevsimindeki göreli iklimsel konforlarını korumakta veya artırmaktadır. İlkbahar ve sonbahar, tüm destinasyon türlerinde giderek daha elverişli dönemler hâline gelmekte, bu durum, turizm iklim uygunluğunun hem mekân hem de mevsimler arasında aşamalı olarak yeniden dağıldığına işaret etmektedir. Bu bulgular, iklim değişikliğinin turizm potansiyelini her yerde aynı biçimde azaltmak yerine, turizm destinasyonlarının göreli iklimsel avantajlarını değiştirebileceğini göstermektedir. Çalışma, yeterince araştırılmamış bir Akdeniz bağlamında karşılaştırmalı bir destinasyon tipolojisi çerçevesi uygulayarak ve iklim değişikliğinin mevsimsel turizm uygunluğu örüntülerini nasıl yeniden yapılandırabileceğini ortaya koyarak turizm klimatolojisi literatürüne katkıda bulunmaktadır.

To cite/Alıntı: Durmaz, E. & Dursun, D. (2026). Climate change and seasonal tourism suitability: A TCI-based comparative assessment of destination typologies in Türkiye. *Geographies, Planning & Tourism*, *6*(2): 1-15. https://doi.org/10.5505/gpts.2026.30502

1. Introduction

Climate constitutes one of the most important environmental resources shaping tourism activities and destination attractiveness. Climatic conditions influence tourist comfort, travel timing, destination choice, seasonality patterns, and the spatial organization of tourism activities (de Freitas, 2003; Scott et al., 2012b). Variables such as temperature, precipitation, humidity, sunshine duration, and wind conditions directly affect the suitability of destinations for outdoor recreation and tourism-related activities. Consequently, climate has long been recognized as a critical factor

in tourism planning and destination management processes (Mieczkowski, 1985).

The relationship between tourism and climate has become increasingly important in the context of climate change. Rising temperatures, increasing frequency of heatwaves, changing precipitation regimes, drought conditions, and other climate-related hazards are expected to alter tourism climate conditions across many destinations worldwide (Scott et al., 2012a; 2016; IPCC, 2023). These changes are particularly significant in climate-sensitive tourism regions such as the Mediterranean Basin, where tourism activities are strongly associated with seasonal climatic comfort conditions (Amelung & Viner, 2006; Moreno & Amelung, 2009). Previous studies indicate that climate change may reduce summer tourism comfort in some coastal destinations while simultaneously improving climatic suitability in cooler inland and high-elevation areas (Hamilton et al., 2005; Perch-Nielsen et al., 2010).

However, the impacts of climate change on tourism climate suitability are not spatially uniform. Different destination types exhibit distinct climatic sensitivities depending on geographical location, elevation, tourism characteristics, and seasonal tourism patterns. Coastal destinations dominated by sea–sand–sun tourism are generally more vulnerable to increasing thermal stress during summer months, whereas mountainous and inland destinations may experience relatively more favorable climatic conditions under warming scenarios (Scott & Lemieux, 2010; Steiger et al., 2019). This spatial differentiation highlights the importance of comparative approaches capable of evaluating climate suitability across different destination typologies.

Within this context, tourism climate indices have become widely used tools for assessing climatic suitability for tourism activities. Among these indices, the Tourism Climatic Index (TCI), developed by Mieczkowski (1985), remains one of the most frequently applied approaches in tourism climatology studies. The TCI integrates thermal, physical, and aesthetic climate variables into a composite index reflecting tourism-related climatic comfort conditions. Due to its methodological simplicity and applicability across different geographical contexts, the index has been extensively used in studies examining tourism–climate relationships, climate change impacts, and destination suitability assessments (Amelung & Viner, 2006; Olya & Alipour, 2015).

Recent studies increasingly emphasize the importance of integrating climate suitability assessments into tourism planning and adaptation processes (European Commission, 2022; WTO, 2019). Nevertheless, many existing studies remain focused on single destinations or descriptive temporal analyses and provide limited comparative evaluation of how different destination typologies respond to climate change. In Türkiye, studies examining tourism climate suitability have generally focused either on national-scale evaluations or on specific tourism destinations, while comparative analyses across contrasting tourism typologies remain limited. Moreover, the planning implications of seasonal changes in tourism climate suitability have not been sufficiently discussed within climate adaptation and tourism development frameworks.

In this context, the present study evaluates seasonal changes in tourism climate suitability across three contrasting destination typologies in Türkiye: coastal tourism destinations (Mersin), transitional coastal–inland destinations (Çanakkale), and mountainous inland destinations (Kayseri). Using the Tourism Climatic Index (TCI), the study compares current climate conditions (1996–2020) with future climate projections for the mid-century (2050–2074) and late-century (2075–2100) periods under the RCP4.5 and RCP8.5 scenarios.

The study aims to contribute to the tourism–climate literature in three main ways. First, it adopts a comparative destination typology framework to evaluate spatial and seasonal differences in tourism climate suitability under climate change scenarios. Second, it examines how seasonal tourism climate conditions vary across coastal, transitional, and inland destinations under future climate conditions. Third, the study discusses the implications of changing tourism climate suitability for climate-sensitive tourism planning, seasonal diversification strategies, and adaptation-oriented tourism development in Türkiye.

1.1. Literature Review

The relationship between climate and tourism has been examined extensively within the fields of tourism climatology, environmental planning, and climate adaptation research. Climate is widely recognized as a fundamental resource influencing tourism activities, tourist comfort, destination attractiveness, and the temporal organization of tourism systems (Butler, 2001; de Freitas, 2003; Scott et al., 2012b). In particular, climatic conditions play a decisive role in determining the suitability of destinations for outdoor recreation and seasonal tourism activities. As a result, changes in temperature, precipitation, humidity, wind conditions, and sunshine duration directly affect tourism demand patterns and destination competitiveness (Denstadli et al., 2011).

The growing impacts of climate change have significantly increased academic interest in tourism–climate interactions. Rising temperatures, increasing thermal stress, changing precipitation regimes, and the growing frequency of climate

extremes are expected to alter tourism climate conditions across many regions worldwide (IPCC, 2023). Previous studies indicate that the Mediterranean Basin is among the regions most vulnerable to climate-induced changes in tourism climate suitability due to its strong dependence on seasonal climatic comfort conditions (Amelung & Viner, 2006; Moreno & Amelung, 2009). Coastal tourism destinations, particularly those dependent on summer-oriented tourism models, are considered especially sensitive to increasing heat stress and prolonged warm periods (Scott et al., 2008). In contrast, inland and mountainous destinations may experience relatively more favorable thermal conditions under warming scenarios, particularly during summer months (Steiger et al., 2019).

The literature further demonstrates that climate change impacts on tourism are spatially differentiated rather than uniform. Differences in elevation, continentality, coastal influence, tourism specialization, and seasonal tourism structure contribute to varying levels of climatic sensitivity across destination types (Scott & Lemieux, 2010). Consequently, tourism climate suitability cannot be evaluated solely through generalized regional averages, and comparative approaches examining different tourism typologies become increasingly important for understanding climate-related spatial variability.

Within this context, tourism climate indices have become one of the primary tools used to evaluate climatic suitability for tourism activities. Climate indices aim to simplify complex meteorological conditions by combining multiple climatic variables into integrated indicators representing tourism-related comfort conditions (Mieczkowski, 1985; de Freitas, 2003). These indices are widely used to support tourism planning, destination management, seasonal analysis, and climate adaptation assessments.

Among the available indices, the Tourism Climatic Index (TCI), developed by Mieczkowski (1985), remains one of the most frequently applied methods in tourism climatology research. The TCI combines thermal comfort, physical conditions, and aesthetic climatic factors through variables including temperature, humidity, precipitation, sunshine duration, and wind speed. Due to its relatively simple structure and broad applicability across geographical contexts, the index has been extensively used in studies evaluating tourism climate suitability under both current and future climate conditions (Amelung & Viner, 2006; Olya & Alipour, 2015).

Numerous studies have applied the TCI to investigate the relationship between climate and tourism across different geographical contexts. Perch-Nielsen et al. (2010) analyzed the effects of climate change on tourism climate suitability in Europe and reported significant seasonal and spatial variations across destinations. Olya and Alipour (2015) examined tourism climate conditions in Northern Cyprus and emphasized the importance of climate-sensitive tourism planning. Recent studies have increasingly incorporated GIS-based spatial analyses into TCI applications to support regional tourism planning and identify climatically suitable tourism zones (Özgenç & Kiper, 2026).

Despite its widespread use, the TCI has several methodological limitations, including expert-based weighting, generalized assumptions about climatic preferences, and limited representation of short-term weather conditions. Alternative approaches address different dimensions of these limitations. The Holiday Climate Index (HCI) incorporates tourists' stated weather preferences and provides formulations tailored to particular tourism settings, improving activity-specific interpretation while requiring the selection of an appropriate formulation (Scott et al., 2016). The Climate Index for Tourism (CIT) combines thermal, aesthetic, and physical weather conditions through a weather typology matrix developed and tested for beach tourism, which limits its direct transfer to other tourism activities (de Freitas et al., 2008). Physiological Equivalent Temperature (PET) evaluates thermal conditions through the human energy balance and offers a physiologically grounded assessment of heat and cold stress, although precipitation and other non-thermal aspects of tourism suitability require separate consideration (Höppe, 1999). The Ski Climate Index (SCI) combines snow reliability with aesthetic and comfort conditions, making it relevant to ski tourism but less applicable to comparisons encompassing coastal and inland tourism settings (Demiroglu et al., 2021).

In this study, the TCI was selected to provide a common analytical framework for comparing broad seasonal and spatial patterns across Mersin, Çanakkale, and Kayseri under the same reference and future climate periods. Because, TCI continues to maintain an important position within tourism climatology research due to several methodological advantages. First, the index enables comparative assessments across different destinations and time periods using widely available climatic variables. Second, its relatively simple structure facilitates the interpretation of seasonal and spatial tourism climate patterns. Third, the TCI remains particularly useful for regional-scale comparative analyses aimed at identifying broad changes in tourism climate suitability under climate change scenarios (Amelung & Nicholls, 2014). In this respect, the TCI should not be interpreted as a direct predictor of tourist behavior, but rather as a planning-oriented indicator reflecting relative climatic suitability for tourism activities.

Recent literature increasingly emphasizes the need to integrate climate suitability assessments into tourism planning and adaptation strategies (European Commission, 2022; WTO, 2019). Climate-sensitive tourism planning requires the

identification of seasonal vulnerabilities, climatically favorable periods, and destination-specific adaptation opportunities. However, many existing studies continue to focus primarily on descriptive temporal analyses or single-destination case studies. Comparative analyses examining how different destination typologies respond to climate change remain relatively limited, particularly in the context of Mediterranean tourism systems.

In Türkiye, studies focusing on tourism climate suitability have generally examined specific tourism destinations or broad national-scale patterns, while comparative analyses across contrasting tourism typologies remain scarce. Furthermore, the spatial planning implications of changing tourism climate suitability have not been sufficiently integrated into climate adaptation-oriented tourism planning discussions. In this context, comparative analyses evaluating coastal, transitional, and mountainous destinations together may provide important insights into the spatial and seasonal differentiation of tourism climate suitability under future climate conditions.

Accordingly, this study adopts a comparative destination typology framework to assess seasonal tourism climate suitability across contrasting tourism geographies in Türkiye. By integrating TCI-based climate suitability analysis with seasonal and spatial comparison, the study aims to contribute to climate-sensitive tourism planning and adaptation-oriented tourism development discussions within the context of Mediterranean tourism regions.

2. Study Area, Data and Methodology

2.1. Research Model and Data

This study focuses on three provinces in Türkiye representing different tourism destination typologies and climatic conditions: Mersin, Çanakkale, and Kayseri. The selection of these provinces is based on their contrasting geographical characteristics, tourism structures, and climate regimes, allowing a comparative assessment of seasonal tourism climate suitability under climate change scenarios.

Mersin represents a coastal Mediterranean tourism destination characterized primarily by sea–sand–sun tourism activities. Located along the Eastern Mediterranean coast of Türkiye, the province experiences typical Mediterranean climatic conditions with hot and dry summers and mild winters. Coastal tourism activities constitute one of the dominant components of the regional tourism economy. Due to increasing thermal stress and prolonged hot periods projected under future climate scenarios, Mediterranean coastal destinations such as Mersin are considered particularly vulnerable to climate-related tourism pressures (Moreno & Amelung, 2009). At the same time, the province contains mountainous hinterland areas with higher elevations, creating significant climatic variability within the destination.

Çanakkale represents a transitional coastal–inland tourism typology influenced by both the Marmara and Aegean climatic systems. The province contains a diversified tourism structure including coastal tourism, cultural tourism, rural tourism, and nature-based tourism activities. Historical and cultural attractions such as Troy and Gallipoli coexist with coastal and island tourism areas. This diversified structure provides an important opportunity for examining seasonal tourism climate suitability across different climatic and geographical contexts within the same destination system. Furthermore, the province exhibits relatively moderate climatic conditions compared to Mediterranean coastal destinations, making it suitable for analyzing transitional climate responses.

Kayseri represents a mountainous inland tourism destination characterized by continental climatic conditions and high-elevation tourism activities. In addition to winter tourism associated with Mount Erciyes, the province also supports cultural and nature-based tourism activities. Compared to coastal destinations, Kayseri experiences colder winters, lower summer temperatures, and stronger seasonal thermal contrasts. These climatic characteristics make the province particularly relevant for evaluating how inland and high-elevation destinations may respond to future warming scenarios. Previous studies indicate that mountainous destinations may experience relatively improved summer tourism climate conditions under climate change due to reduced thermal limitations compared to coastal regions (Steiger et al., 2019).

The combined evaluation of these three provinces enables a comparative assessment of tourism climate suitability across coastal, transitional, and mountainous destination typologies. Rather than representing all tourism systems in Türkiye, these provinces are treated as contrasting climatic and geographical tourism contexts through which different seasonal responses to climate change can be examined.

The study employs both observed climate data and future climate projections. The reference period representing current climatic conditions is defined as 1996–2020. This period provides a sufficiently long temporal baseline for identifying recent climate characteristics while ensuring consistency with contemporary climate assessment practices. The analysis uses the primary climatic variables required for Tourism Climatic Index (TCI) calculations, including mean temperature, maximum temperature, relative humidity, precipitation, sunshine duration, and wind speed.

Observed climate data were obtained from official meteorological datasets and climate databases commonly used in national climate assessments. These datasets provide spatially and temporally consistent climatic information for the selected study areas. Future climate projections were evaluated using Representative Concentration Pathways (RCP4.5 and RCP8.5), representing medium and high greenhouse gas concentration scenarios, respectively. The use of two contrasting climate scenarios allows the evaluation of tourism climate suitability under different future warming trajectories and uncertainty conditions.

The study considers two future projection periods: the mid-century period (2050–2074) and the late-century period (2075–2100). This temporal framework is widely used in climate change impact assessments and enables the comparison of medium-term and long-term climate suitability changes. Seasonal analyses were conducted separately for spring, summer, autumn, and winter in order to capture the temporal variability of tourism climate conditions across destination typologies.

In addition to climatic data, tourism-related spatial information regarding tourism areas, tourism development patterns, and destination characteristics was considered during the interpretation of tourism climate suitability patterns. This approach allows climate suitability results to be discussed within a broader tourism planning and destination management context. The study does not aim to directly predict tourist demand or behavioural responses. Instead, the Tourism Climatic Index is used as a comparative planning-oriented indicator to evaluate relative changes in tourism climate suitability across different destination typologies and seasonal conditions under future climate scenarios.

2.2. Methodology

Tourism climate suitability was assessed using the Tourism Climate Index (TCI) developed by Mieczkowski (1985), one of the most widely applied indicators in tourism climatology research. The TCI integrates thermal, physical, and aesthetic climatic conditions into a composite indicator reflecting the suitability of climate for general outdoor tourism activities. The index is calculated as:

$$TCI = 2(4CID + CIA + 2P + 2S + W)$$

where CID represents the daytime comfort index derived from maximum temperature and minimum relative humidity, CIA represents the daily comfort index derived from mean temperature and mean relative humidity, P denotes precipitation, S denotes sunshine duration, and W denotes wind speed. Following the original weighting scheme proposed by Mieczkowski (1985), daytime thermal comfort contributes 40% of the final score, daily thermal comfort 10%, precipitation 20%, sunshine duration 20%, and wind conditions 10%. TCI values theoretically range from −20 to 100, with higher scores indicating more favourable climatic conditions for tourism activities. The resulting values were interpreted according to the original TCI classification system ranging from “Impossible” to “Ideal” climatic suitability conditions.

The analysis was conducted using both historical climate observations and future climate projections. Historical climate conditions were represented using the ERA5-Land reanalysis dataset produced by the European Centre for Medium-Range Weather Forecasts (ECMWF), which provides climate data at an approximate spatial resolution of 9 km. Future climate projections were obtained from the İklimSu Project dataset, based on MPI-ESM-MR global climate model outputs under two Representative Concentration Pathways, RCP4.5 and RCP8.5, representing intermediate and high radiative forcing trajectories, respectively[1]. Climate suitability was evaluated for a reference period (1996–2020), a mid-century period (2050–2074), and a late-century period (2075–2100).

Future climatic conditions were assessed under the Representative Concentration Pathways (RCP) 4.5 and 8.5 scenarios, representing moderate and high greenhouse gas concentration trajectories, respectively. Although Shared Socioeconomic Pathways (SSPs) have increasingly become the standard framework in recent climate research, nationally consistent climate projection datasets and climate hazard assessments currently available for Türkiye remain predominantly based on the CMIP5–RCP framework. Therefore, RCP-based projections were employed to ensure methodological consistency between tourism climate suitability analyses and the climate risk

[1] Representative Concentration Pathways describe alternative trajectories of atmospheric greenhouse gas concentrations and associated radiative forcing used to drive climate models. RCP4.5 follows a stabilization pathway approaching approximately 4.5 W m^{-2} after 2100, whereas RCP8.5 follows a rising pathway reaching approximately 8.5 W m^{-2} in 2100, relative to pre-industrial conditions. For context, the IPCC Fifth Assessment Report projects global mean surface warming in 2081–2100, relative to 1986–2005, of 1.8°C under RCP4.5, with a likely range of 1.1–2.6°C, and 3.7°C under RCP8.5, with a likely range of 2.6–4.8°C. Precipitation responses vary geographically and seasonally, with decreases projected in many subtropical dry regions and increasing heavy-precipitation intensity over most mid-latitude land areas, particularly under RCP8.5 (IPCC, 2014). These global assessments provide scenario context rather than numerical estimates for the three study provinces, whose climatic conditions were evaluated using the study’s projection dataset and reference period.

assessments used in the study.

Temperature, relative humidity, precipitation, sunshine duration, and wind speed variables were extracted for each study area and projection period. Monthly climate data were aggregated into seasonal averages for spring (March–May), summer (June–August), autumn (September–November), and winter (December–February), and TCI values were calculated separately for each season. Spatial distributions of TCI scores were subsequently mapped and compared across periods, scenarios, and destination types in order to identify potential shifts in tourism climate suitability under future climate conditions.

To examine whether climatically suitable tourism areas are simultaneously exposed to climate-related risks, TCI results were evaluated together with climate risk assessments developed through the impact chain approach. Climate risk was conceptualized as a function of climate hazards, exposure, sensitivity, and adaptive capacity. Risk components were weighted using Principal Component Analysis (PCA), and composite risk maps were generated through the integration of heatwave, extreme precipitation, and wildfire hazards with tourism-related exposure, sensitivity, and adaptive capacity indicators. Finally, tourism climate suitability maps and climate risk maps were overlaid to identify areas where high climatic suitability and high climate risk coexist, thereby providing a spatially explicit framework for climate adaptation-oriented tourism planning.

3. Findings

3.1. Seasonal Shifts in Tourism Climate Suitability

This section evaluates seasonal changes in tourism climate suitability based on TCI results for Çanakkale, Mersin, and Kayseri. The analysis identifies how climatically favourable conditions for tourism shift across seasons, which periods gain relative advantages, and where comfort losses become more pronounced. Overall, the results indicate that climate change does not produce uniform changes but instead leads to a systematic redistribution of tourism climate suitability across seasons.

Spring emerges as one of the most stable and consistently favourable seasons across all three provinces (Figure 1). In Çanakkale, minimum suitability conditions during the reference period are largely within the “Good” class, particularly in coastal and island districts such as Ayvacık, Bozcaada, and Gökçeada. Future projections indicate a gradual decline toward the end of the century, especially in northern districts, where suitability levels shift toward the “Acceptable” class. In Mersin, spring conditions remain strong and are projected to be largely maintained or slightly improved, with many districts continuing to fall within the “Good” to “Very Good” classes even in late-century scenarios. In Kayseri, spring suitability is already high and remains largely stable across future periods, with only limited spatial fluctuations.

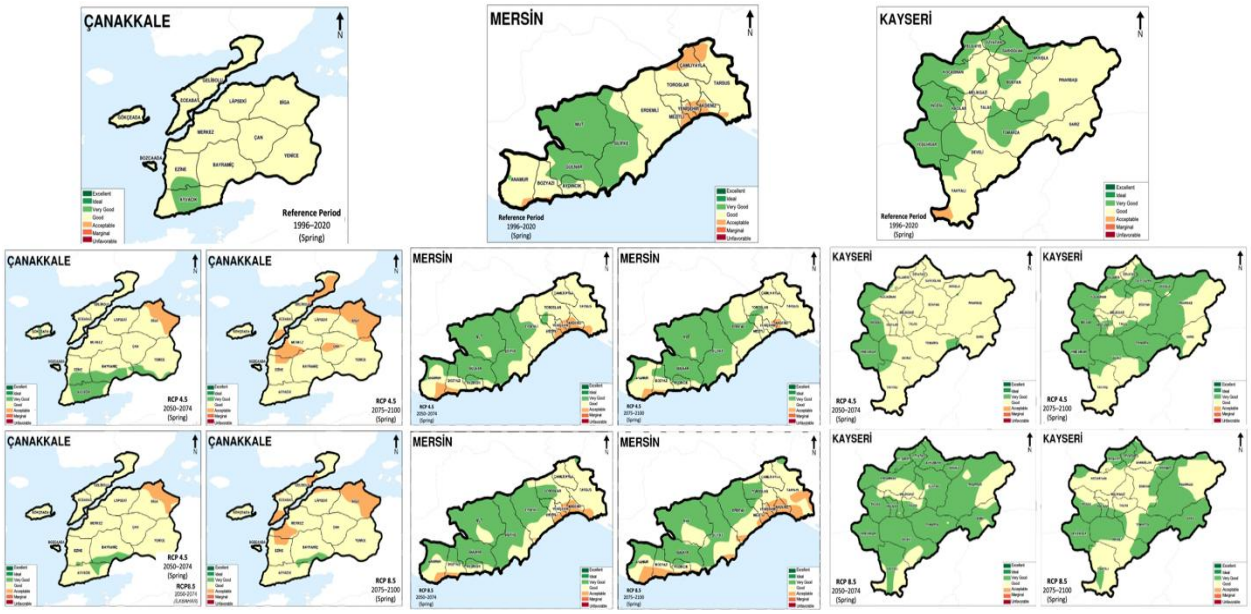

Figure 1. *Tourism Climatic Index (TCI) values for the spring season in Çanakkale, Mersin, and Kayseri, showing spatial distributions for (a) the reference period (1996–2020) and (b) the mid-century (2050–2074) and late-century (2075–2100) periods under the RCP4.5 and RCP8.5 scenarios*
Source: Dursun et al., 2024, p.126, 135, 145

Taken together, these findings indicate that spring increasingly functions as a climatic stability window, where moderate thermal conditions remain within optimal comfort thresholds despite broader warming trends. This suggests a structural shift in tourism seasonality, in which spring evolves from a transitional period into a more central tourism

season.

Summer represents the season during which climate-induced constraints become most pronounced, particularly for coastal destinations (Figure 2). In Çanakkale, summer conditions during the reference period range from “Very Good” in southern parts of the province to “Acceptable” and locally “Marginal” conditions in northern areas such as Biga. Under both scenarios—especially under the late-century RCP8.5 scenario—summer suitability declines significantly, with northern districts shifting toward “Marginal” and “Unfavourable” categories.

In Mersin, summer suitability is already constrained along much of the coastal zone during the reference period, where “Acceptable” and “Marginal” conditions dominate. Future projections indicate a pronounced deterioration, with parts of the coastal strip expected to reach “Unfavourable” conditions by the late-century period under RCP8.5. In contrast, higher-elevation districts such as Çamlıyayla, Toroslar, and Gülnar retain relatively more favourable conditions, highlighting their potential as climatic refuge areas.

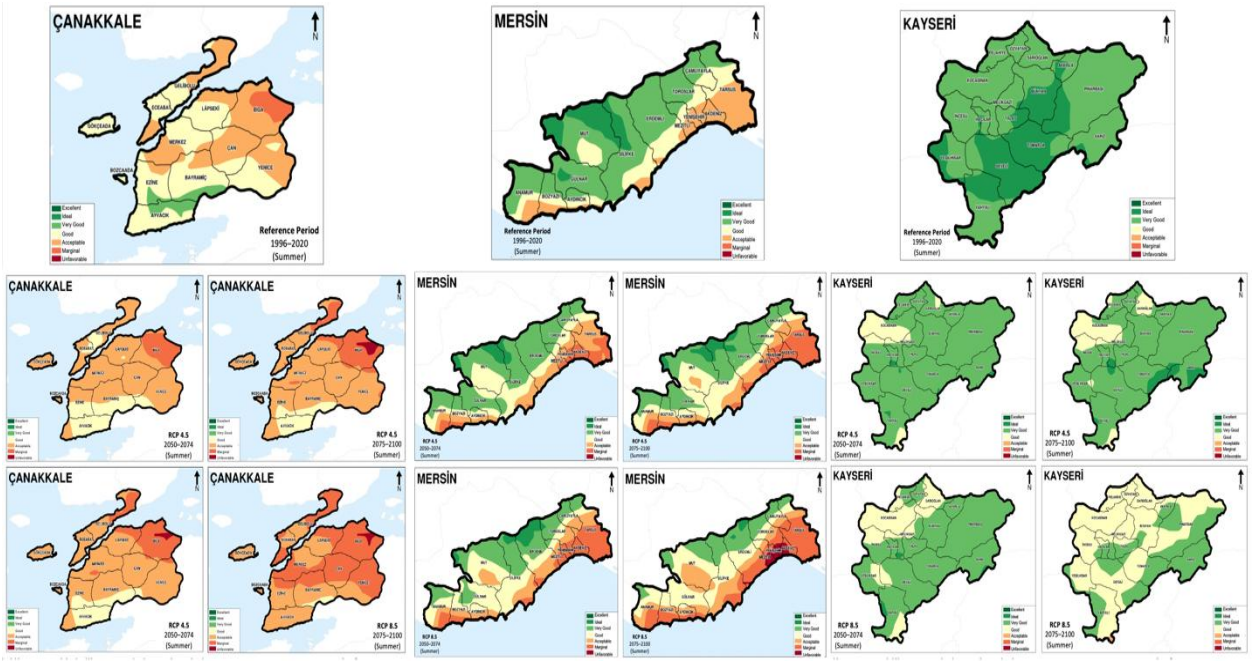

Figure 2. *Tourism Climatic Index (TCI) values for the summer season in Çanakkale, Mersin, and Kayseri, showing spatial distributions for (a) the reference period (1996–2020) and (b) the mid-century (2050–2074) and late-century (2075–2100) periods under the RCP4.5 and RCP8.5 scenarios*
Source: Dursun et al., 2024, p.127, 138, 147

Kayseri exhibits a contrasting pattern. Summer remains the most favourable season, with conditions largely classified as “Very Good” and locally “Ideal,” although some districts shift toward slightly lower classes in future periods.

This divergence between coastal and inland regions reflects a threshold-based response to thermal stress, where increasing temperatures exceed optimal comfort ranges in coastal environments while enhancing thermal comfort in cooler inland and high-elevation areas. As a result, summer tourism suitability is redistributed geographically, indicating a shift in climatic advantage from coastal to inland destinations.

Autumn plays an important balancing role, although projections suggest a gradual weakening in coastal areas (Figure 3). In Çanakkale, autumn conditions during the reference period predominantly fall within the “Good” to “Acceptable” classes, with future projections indicating a shift toward more widespread “Acceptable” conditions and localized transitions into the “Marginal” class under the RCP8.5 scenario. In Mersin, autumn is highly favourable during the reference period, with extensive areas classified as “Very Good” to “Good,” but projections indicate a gradual decline toward “Acceptable” conditions. In Kayseri, autumn suitability remains strong across all periods, largely confined to “Very Good” and “Good” classes.

These changes indicate that thermal stress effects increasingly extend beyond peak summer months into shoulder seasons. While autumn remains a relatively favourable period, its role shifts toward compensating for declining summer suitability, suggesting a transformation in the temporal distribution of tourism demand.

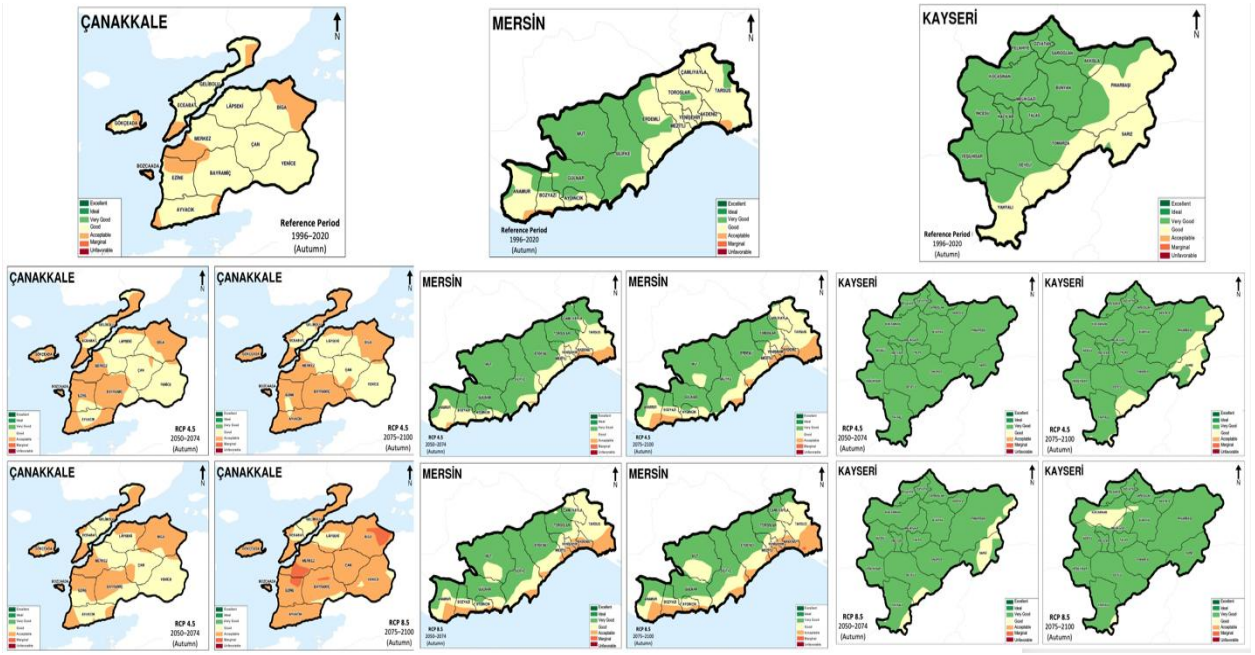

Figure 3. *Tourism Climatic Index (TCI) values for the autumn season in Çanakkale, Mersin, and Kayseri, showing spatial distributions for (a) the reference period (1996–2020) and (b) the mid-century (2050–2074) and late-century (2075–2100) periods under the RCP4.5 and RCP8.5 scenarios*
Source: Dursun et al., 2024, p.129, 139, 149).

Winter results reveal a dual response (Figure 4). In Çanakkale, winter conditions during the reference period are largely classified as “Acceptable,” with limited changes in future projections and some localized improvements. In Mersin, winter suitability improves under future scenarios, with a greater proportion of areas shifting into “Acceptable,” “Good,” and occasionally “Very Good” classes. In Kayseri, winter suitability also shows limited improvement, with minimum suitability classes shifting toward “Acceptable” levels.

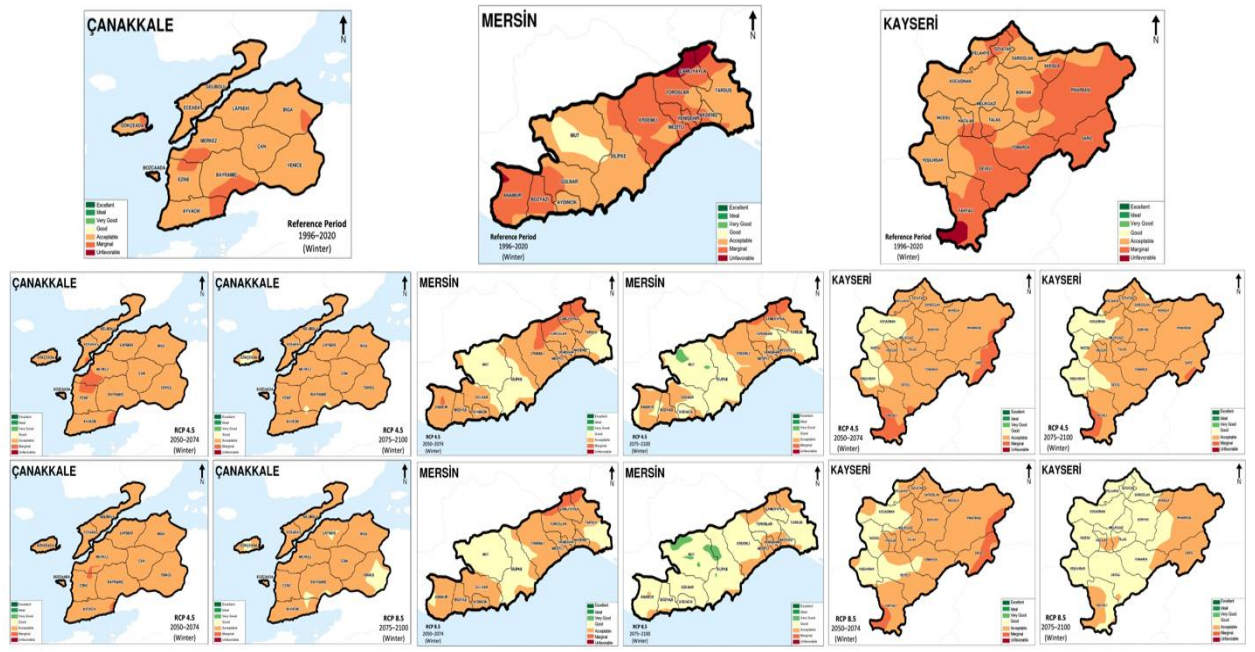

Figure 4. *Tourism Climatic Index (TCI) values for the winter season in Çanakkale, Mersin, and Kayseri, showing spatial distributions for (a) the reference period (1996–2020) and (b) the mid-century (2050–2074) and late-century (2075–2100) periods under the RCP4.5 and RCP8.5 scenarios*
Source: Dursun et al., 2024, p.131, 141, 151

However, these improvements should be interpreted cautiously. Increases in general climatic comfort do not necessarily translate into improved conditions for snow-dependent tourism (Abegg et al., 2007). Instead, they reveal a functional mismatch between general thermal comfort and the specific climatic requirements of winter tourism activities, particularly those dependent on snow reliability.

Taken together, the findings for the three provinces reveal a pronounced seasonal redistribution of tourism climate

suitability, indicating a structural reconfiguration of tourism seasonality under climate change. Summer suitability becomes increasingly constrained in coastal regions, while spring and autumn gain strategic importance. Inland and high-elevation areas, in contrast, gain relative advantages during summer, suggesting a broader reorganization of tourism flows across both space and time.

3.2. Climate-Informed Tourism Corridors Across Coastal, Inland, and Mountain Destinations

The comparative analysis of coastal, inland, and mountainous destinations demonstrates that climate change does not produce uniform impacts but instead drives a spatial differentiation of tourism climate suitability. In addition to illustrating the spatial differentiation of climatic suitability, Figures 5–7 identify potential tourism corridors by considering existing tourism resources together with the projected climatic conditions. These proposed connections indicate where coastal, nature-based, and cultural tourism routes could support seasonal diversification and adaptation. Existing national parks, cultural heritage sites, settlements, and other attractions serve as reference points, while the corridors represent the authors' suggestions for linking these resources. Their implementation would require more detailed assessment of accessibility, ecological sensitivity, conservation requirements, and infrastructure capacity.

Coastal destinations—particularly in Mersin and parts of Çanakkale—exhibit a clear shift toward "borderline" or "marginal" thermal comfort conditions under future scenarios. In Çanakkale, this spatial pattern is clearly illustrated in Figure 5, where a pronounced north–south differentiation emerges. Northern districts such as Biga, Lapseki, and Gelibolu approach "borderline" comfort conditions, while southwestern coastal areas retain relatively more favourable conditions. This spatial contrast indicates that climate impacts are locally mediated and not uniformly distributed across coastal systems. For Çanakkale, investment priorities could strengthen coastal-cultural tourism connections along the Geyikli–Ezine–Ayvacık–Behramkale–Küçükkuyu corridor and nature-based routes around Bayramiç, Kalkım, and Pazarköy, where summer climatic suitability remains comparatively favourable. Along the northern coastal corridor, particularly around Biga and Karabiga, greater emphasis should be placed on adapting existing facilities and developing spring and autumn itineraries. These priorities support a more diversified tourism portfolio linking coastal attractions, cultural heritage, and inland natural resources. Overall, future investment should give greater relative emphasis to cultural and nature-based tourism, while coastal investment should focus on adaptation and selective improvements along climatically favourable corridors.

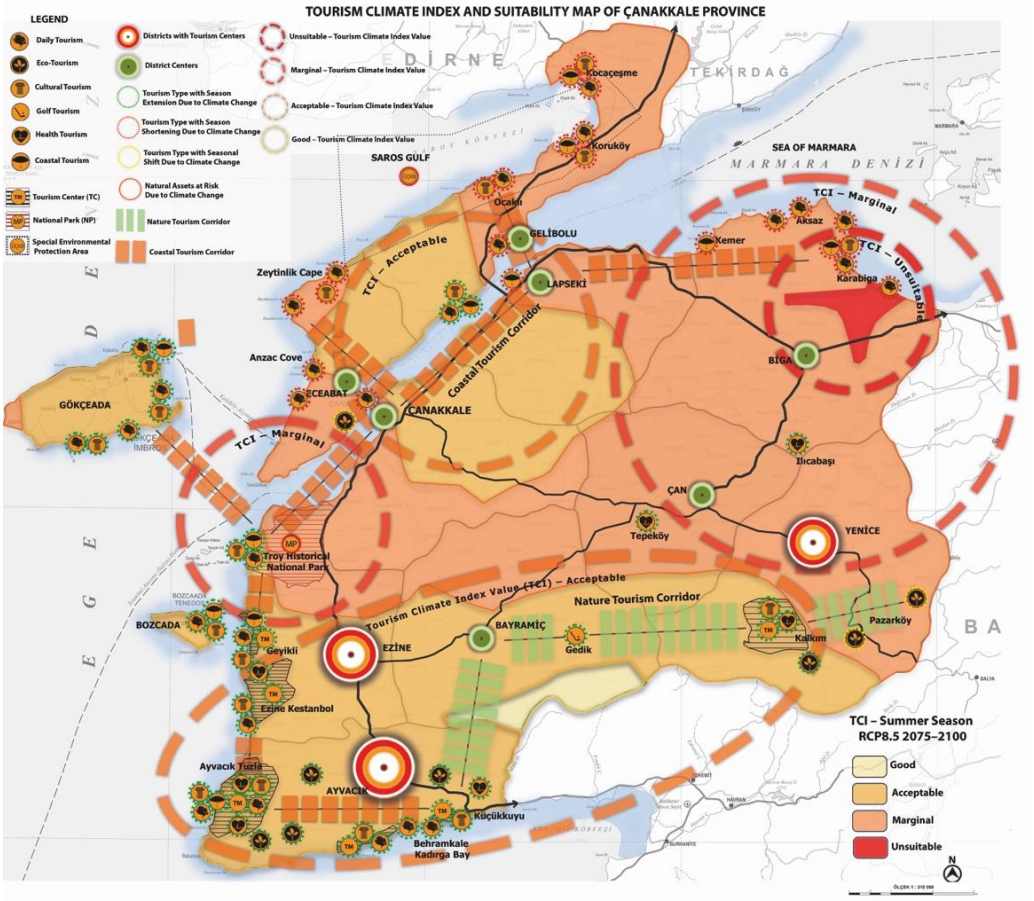

Figure 5. *Tourism Climatic Index and climate suitability map for Çanakkale*
Source: Dursun et al., 2024, p.158

In Mersin, the transformation of coastal tourism climate suitability is more systematic. As shown in Figure 6, the coastal strip extending from Tarsus to Anamur experiences a substantial decline in summer suitability, with large areas projected to reach “borderline” or “unfavourable” conditions under late-century scenarios. This pattern suggests that coastal tourism systems are approaching critical thermal thresholds, beyond which climatic conditions no longer support high levels of outdoor comfort. Moreover, the spatial continuity of these changes along the coastline highlights the scale at which climate-induced constraints operate in Mediterranean coastal systems. For Mersin, investment priorities could give greater weight to nature-based and highland tourism along the proposed inland corridor linking the Mut uplands, Kozlar and Kırobası plateaus, and the Güzel yayla–Çamlıyayla area, where summer climatic suitability remains comparatively favourable. Connections with the Anamur–Silifke–Erdemli coastal corridor could support complementary itineraries across different elevations. Along the coast, particularly around Mersin and Tarsus, investment should prioritize adaptation of existing facilities and seasonal diversification, while inland development should safeguard ecosystems and water resources.

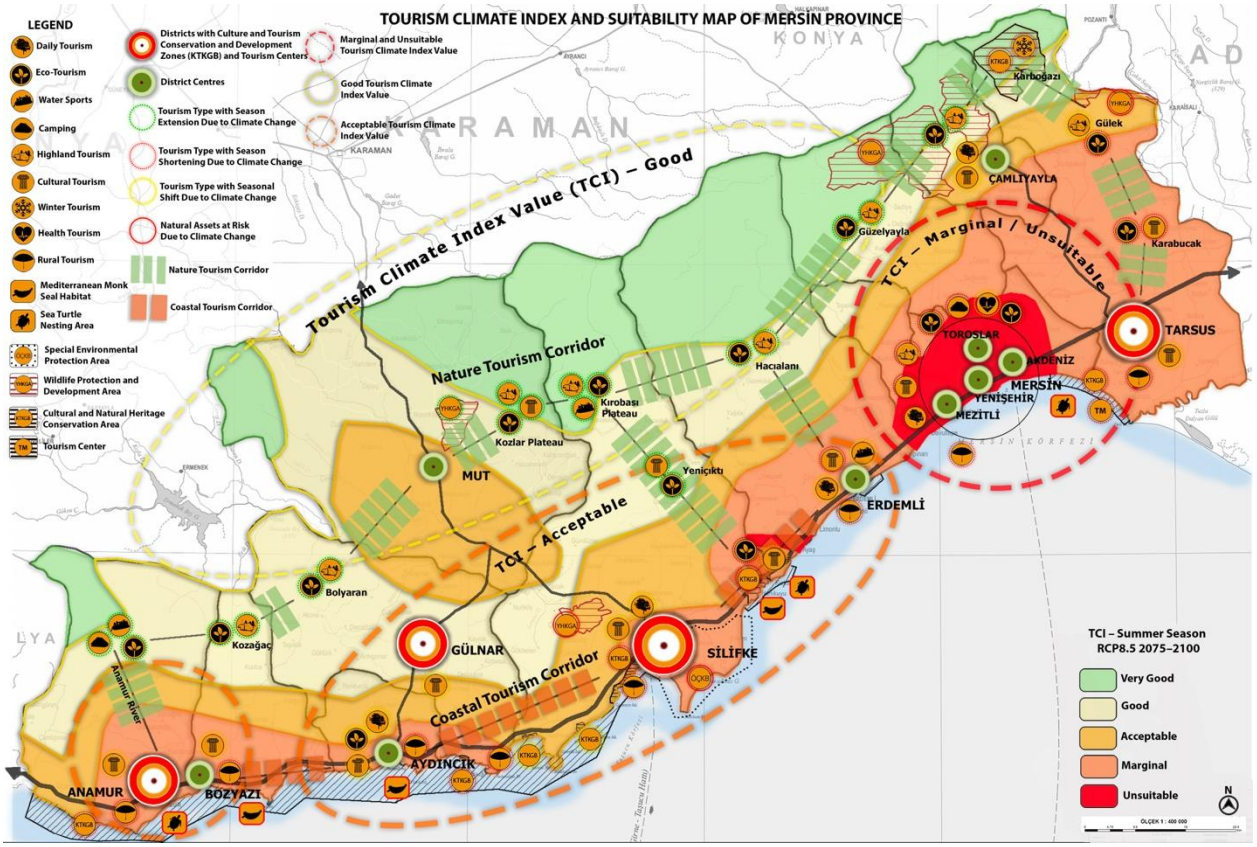

Figure 6. *Tourism Climatic Index and climate suitability map for Mersin*
Source: Dursun et al., 2024, p.162

In contrast, inland and mountainous destinations display a markedly different trajectory. The spatial distribution of tourism climate suitability in Kayseri, presented in Figure 7, demonstrates that many inland areas maintain or improve their summer suitability under future climate conditions. Large portions of the province remain within the “Good” to “Very Good” classes, reflecting relatively stable or enhanced thermal comfort conditions.

This pattern reflects a climate-induced elevation advantage, where areas with cooler baseline climatic conditions shift toward optimal thermal comfort ranges under warming scenarios. As a result, inland and high-elevation destinations gain relative competitiveness, particularly during summer months, indicating a potential redistribution of tourism demand from coastal to inland regions.

However, winter tourism systems exhibit a different dynamic. While Figure 7 indicates improvements in general climatic comfort across parts of Kayseri, these changes do not necessarily correspond to improved conditions for snow-dependent tourism. Instead, they reveal a functional mismatch between general thermal comfort and the specific climatic requirements of winter tourism activities, particularly in high-elevation areas such as Erciyes (Elsasser & Bürki, 2002).

Across all destination types, the figures collectively demonstrate that summer TCI values decline more sharply in coastal areas compared to inland and mountainous regions. While sunshine duration remains favourable, increasing thermal stress reduces overall climatic suitability during peak tourism periods.

For Kayseri, investment priorities could give greater weight to nature-based tourism along the proposed İncesu–Yeşilhisar–Yahyalı and Yahyalı–Tomarza–Sarız–Pınarbaşı corridors, linking existing attractions around Sultan Marshes, Kapuzbaşı Waterfalls, and the Zamantı River. Cultural routes connecting Kültepe, central Kayseri, and surrounding heritage sites could complement this diversification. Around Erciyes, investment in snow-independent activities could support year-round use of existing infrastructure, while further ski-related investment should be informed by snow-specific assessments. The favourable summer TCI conditions shown on the map support these diversification opportunities without establishing winter skiing suitability.

Although Kayseri is an important winter tourism destination, summer TCI is used in Figure 7 to maintain comparability with Çanakkale and Mersin and to assess opportunities for nature-based and cultural tourism diversification. Kayseri's winter TCI results are presented separately in Figure 4. As winter TCI represents general outdoor climatic comfort, assessing skiing suitability would additionally require snow-specific indicators, including snow depth, snow-cover duration, and snowmaking conditions.

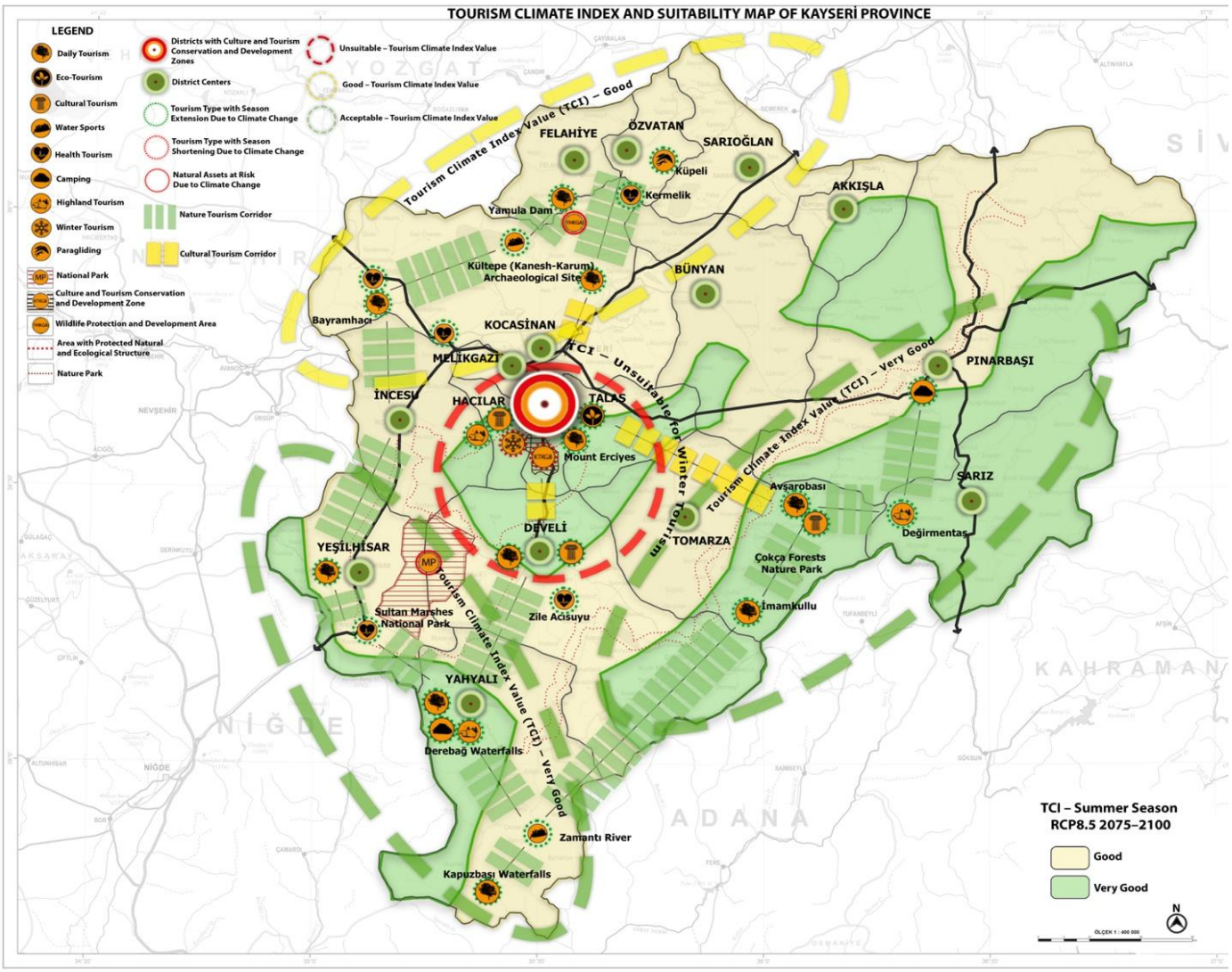

Figure 7. *Tourism Climatic Index and climate suitability map for Kayseri*
Source: Dursun et al., 2024, p.166

Overall, the coastal–inland–mountain comparison, as illustrated in Figures 5–7, indicates a structural redistribution of tourism climate suitability, confirming that climate change acts as a spatial reallocation mechanism rather than a uniform degradation process

4. Conclusion and Discussion

The findings suggest that climate change may progressively reshape the seasonal climatic attractiveness of tourism destinations in Türkiye by intensifying thermal stress in coastal environments while relatively preserving climatic comfort conditions in inland and high-elevation destinations. However, these changes are not spatially uniform and vary considerably according to climatic characteristics, elevation, and destination structure. The comparative assessment reveals that coastal, transitional, and mountainous tourism destinations respond differently to future

climate conditions, particularly during summer and transition seasons.

One of the most important findings of the study is the growing thermal vulnerability of Mediterranean coastal tourism destinations during summer months. Increasing temperatures and prolonged heat conditions substantially reduce climatic comfort in low-elevation coastal environments, particularly under the RCP8.5 scenario. These findings are consistent with previous studies emphasizing the increasing exposure of Mediterranean tourism systems to heat-related climatic stress (Amelung & Viner, 2006; Moreno & Amelung, 2009). The results further indicate that future climatic suitability losses are not distributed evenly across tourism geographies but are strongly shaped by elevation, continentality, and regional climatic characteristics.

At the same time, the findings indicate that inland and mountainous destinations may maintain relatively more favourable tourism climate conditions during summer months. Kayseri, characterized by continental climatic conditions and higher elevation, preserves comparatively high summer tourism climate suitability under both RCP4.5 and RCP8.5 scenarios. Similar patterns have been identified in previous studies examining the effects of climate change on mountainous tourism destinations (Steiger et al., 2019; Scott & Lemieux, 2010). Lower baseline temperatures and reduced thermal stress enable inland and high-elevation destinations to maintain climatic comfort conditions despite regional warming trends.

These findings highlight the importance of spatial differentiation in tourism climate responses. Rather than producing uniform climatic impacts across all tourism systems, climate change generates varying levels of vulnerability and relative climatic advantage depending on destination typology. In particular, elevation and continentality emerge as important factors shaping future tourism climate suitability patterns. High-elevation districts within coastal provinces, such as the mountainous hinterland areas of Mersin, demonstrate relatively more favourable climatic conditions compared to low-elevation coastal tourism zones. This spatial differentiation suggests that topographic diversity may play an increasingly important role in climate-sensitive tourism planning processes.

Another important finding concerns the growing importance of transition seasons. Spring and autumn maintain relatively favourable tourism climate suitability across most destination typologies under future scenarios. Particularly in coastal destinations experiencing declining summer thermal comfort, shoulder seasons emerge as climatically suitable periods for tourism activities. Similar seasonal shifts have been identified in previous tourism climatology studies focusing on Mediterranean tourism systems (Perch-Nielsen et al., 2010; Scott et al., 2004). These findings suggest that tourism seasonality patterns may gradually shift toward spring and autumn periods under future climate conditions (Amelung et al., 2007).

The growing climatic importance of transition seasons has important implications for tourism planning and destination management. Seasonal diversification strategies may become increasingly necessary in destinations vulnerable to summer thermal stress. Extending tourism activities toward spring and autumn periods may support the adaptation capacity of climate-sensitive tourism systems while reducing pressure associated with highly concentrated summer tourism demand. In this respect, climate-sensitive tourism planning should consider not only annual tourism potential but also changing seasonal climatic suitability patterns.

The comparative destination typology framework adopted in this study provides a more differentiated interpretation of tourism climate suitability compared to single-destination assessments frequently found in the literature. Rather than treating tourism destinations as climatically homogeneous systems, the findings demonstrate that coastal, transitional, and mountainous destinations exhibit distinct seasonal sensitivity patterns under future climate scenarios. In particular, mountainous and inland destinations preserve relatively favourable summer climatic conditions despite regional warming trends, whereas coastal Mediterranean destinations become increasingly constrained by thermal stress. These differences highlight the importance of spatially differentiated adaptation strategies in tourism planning processes.

From a spatial planning perspective, the findings indicate that climate-sensitive tourism development strategies will increasingly require season-oriented and destination-specific adaptation approaches. In Mediterranean coastal destinations, the gradual decline in summer climatic comfort may increase the strategic importance of spring and autumn tourism periods, potentially contributing to the temporal diversification of tourism demand. Similarly, inland and high-elevation destinations may gain relative climatic advantages during summer months under future warming conditions. These trends suggest that future tourism planning frameworks should integrate climatic suitability assessments into destination management, tourism investment decisions, and long-term regional adaptation strategies.

From a methodological perspective, the study confirms the continued usefulness of the Tourism Climatic Index (TCI) as a comparative planning-oriented tool for assessing broad seasonal and spatial tourism climate patterns. Despite

criticisms concerning generalized weighting structures and limited physiological sensitivity (de Freitas et al., 2008; Moreno & Amelung, 2009), the TCI remains useful for identifying relative changes in climatic suitability across destinations and time periods. In particular, the index provides a practical framework for comparing tourism climate conditions across contrasting geographical contexts using accessible climatic variables.

Several limitations of the study should nevertheless be acknowledged. First, the Tourism Climatic Index represents a generalized indicator of climatic suitability and does not directly capture tourist perceptions, behavioural responses, or tourism demand dynamics. Consequently, the results should be interpreted as indicative assessments of relative climatic suitability rather than deterministic projections of tourism flows. Second, the study focuses primarily on climatic variables and does not incorporate socio-economic conditions, tourism infrastructure capacity, destination image, or adaptive management practices that may influence tourism resilience under climate change. Third, although the selected provinces represent contrasting destination typologies, they do not encompass the full diversity of tourism systems in Türkiye. Future research may therefore benefit from integrating tourism demand analyses, visitor preference studies, and multi-dimensional vulnerability indicators into tourism climate assessments.

Despite these limitations, the findings provide important insights for climate-sensitive tourism planning and adaptation-oriented tourism development. The results indicate that future tourism planning processes should increasingly consider seasonal climatic suitability, spatial differentiation, and destination-specific climate sensitivities. In particular, climate adaptation strategies may require:

- diversification of tourism seasons
- increased consideration of high-elevation tourism areas
- climate-sensitive destination management approaches
- planning frameworks integrating future thermal comfort conditions into tourism development decisions

Within the context of Mediterranean tourism systems, these findings reinforce the importance of integrating climate suitability assessments into long-term tourism planning and climate adaptation policies.

This study evaluated seasonal tourism climate suitability across three contrasting destination typologies in Türkiye under current and future climate scenarios using the Tourism Climatic Index (TCI). By comparatively examining coastal Mediterranean, transitional coastal–inland, and mountainous inland destinations, the study aimed to identify how tourism climate conditions may vary spatially and seasonally under climate change scenarios.

The findings demonstrate that tourism climate suitability responses differ substantially according to destination typology and seasonal conditions. Coastal Mediterranean destinations experience decreasing summer climatic suitability due to increasing thermal stress, particularly under the RCP8.5 scenario. In contrast, inland and mountainous destinations maintain relatively more favorable summer thermal comfort conditions under future warming scenarios. Transition seasons, especially spring and autumn, continue to provide comparatively suitable climatic conditions for tourism activities across most destination types.

The results indicate that climate change may alter the seasonal distribution of tourism climate suitability by changing the relative climatic advantages of different tourism geographies. In particular, the growing thermal limitations observed in coastal summer tourism conditions highlight the increasing importance of transition seasons and high-elevation tourism areas within climate-sensitive tourism systems.

From a planning perspective, the findings emphasize the need for climate-sensitive tourism development strategies that consider seasonal climatic suitability and destination-specific vulnerabilities. Future tourism planning processes may increasingly require:

- seasonal diversification approaches
- adaptation-oriented destination management strategies
- consideration of high-elevation tourism potentials
- integration of climate suitability assessments into tourism planning frameworks

The study further demonstrates the importance of comparative destination typology approaches in tourism climatology research. Evaluating contrasting tourism geographies together provides a more detailed understanding of spatial variability in climate suitability responses under future climate conditions.

Methodologically, the study confirms the usefulness of the Tourism Climatic Index as a comparative planning-oriented tool for evaluating broad tourism climate suitability patterns across different geographical contexts. Although the index does not directly predict tourist behaviour or tourism demand, it provides valuable insights into relative climatic

suitability conditions relevant to tourism planning and climate adaptation discussions.

Several limitations should nevertheless be acknowledged. The study focuses primarily on climatic suitability conditions and does not incorporate socio-economic variables, tourism demand dynamics, or adaptation capacity indicators. In addition, the selected destination typologies represent contrasting tourism geographies rather than the full diversity of tourism systems in Türkiye. Future studies may benefit from integrating tourism demand data, visitor behaviour analyses, socio-economic indicators, and broader destination networks into climate-sensitive tourism assessments.

Despite these limitations, the findings contribute to tourism–climate literature by providing a comparative assessment of seasonal tourism climate suitability across contrasting destination typologies in Türkiye. In addition, the study offers planning-oriented insights for climate-sensitive tourism development and adaptation-focused tourism planning within Mediterranean tourism regions.

Ethics Committee Permission/Etik Kurul İzni

Ethics committee approval was not required for this study, as it was based exclusively on secondary climate datasets, spatial analyses, and publicly available information and did not involve human participants, animals, or personal data.

Bu çalışma yalnızca ikincil iklim verilerine, mekânsal analizlere ve kamuya açık bilgilere dayandığından; insan katılımcıları, hayvanları veya kişisel verileri içermediğinden etik kurul izni gerektirmemektedir.

GenAI and AI Usage / Üretken Yapay Zeka ve Yapay Zeka Kullanımı

During the preparation of this manuscript, ChatGPT (OpenAI) was used for language and style improvement and translation support. The AI-generated outputs were checked and verified by the authors. The authors bear full scientific, ethical, and legal responsibility for the final content of the manuscript.

Bu makalenin hazırlanma sürecinde ChatGPT (OpenAI), dil ve üslup iyileştirme ve çeviri desteği amacıyla kullanılmıştır. Yapay zekâ çıktıları yazarlar tarafından kontrol edilmiş ve doğrulanmıştır. Çalışmanın nihai içeriğine ilişkin tüm bilimsel, etik ve hukuki sorumluluk yazarlara aittir.

Data Availability Statement / Veri Erişilebilirliği Beyanı

The datasets used and/or analysed during this study are available from the corresponding author upon reasonable request, subject to the data providers' access and sharing conditions. Climate data were obtained from ERA5-Land and nationally available climate projection datasets produced within the İklimSu Project framework.

Bu çalışmada kullanılan ve/veya analiz edilen veri setleri, veri sağlayıcılarının erişim ve paylaşım koşulları çerçevesinde, makul talep üzerine sorumlu yazardan temin edilebilir. İklim verileri, ERA5-Land veri setlerinden ve İklimSu Projesi kapsamında üretilen ulusal iklim projeksiyonu veri setlerinden elde edilmiştir.

Conflict of Interest/ Çıkar Çatışması

The authors declare that they have no conflicts of interest.

Yazarlar, kendileri ve/veya üçüncü kişi ve kurumlarla herhangi bir çıkar çatışmalarının bulunmadığını beyan eder.

Authors' contribution/ Yazar katkısı

Idea/Concept – E.B.D., D.D.; Design – E.B.D., D.D.; Supervision – D.D.; Data Collection and/or Processing – E.B.D.; Analysis and/or Interpretation – E.B.D., D.D.; Writing—Original Draft – D.D.; Critical Review and Editing – E.B.D., D.D.; Visualization – D.D.; Project Administration – D.D. All authors read and approved the final manuscript.

Fikir/Kavram – E.B.D., D.D.; Tasarım – E.B.D., D.D.; Denetleme – D.D.; Veri Toplama ve/veya İşleme – E.B.D.; Analiz ve/veya Yorum – E.B.D., D.D.; İlk Taslağın Yazımı – D.D.; Eleştirel İnceleme ve Düzenleme – E.B.D., D.D.; Görselleştirme – D.D.; Proje Yönetimi – D.D. Tüm yazarlar makalenin son hâlini okumuş ve onaylamıştır.

Financial Support/ Proje Desteği

This work was supported by the Republic of Türkiye Ministry of Culture and Tourism, General Directorate of Investment and Enterprises. The study is based on research conducted within the project entitled "Climate Change and Tourism: Tourism Climate Index Analysis and Climate Suitability Assessment in the Provinces of Çanakkale, Mersin, and Kayseri."

Bu çalışma, Türkiye Cumhuriyeti Kültür ve Turizm Bakanlığı Yatırım ve İşletmeler Genel Müdürlüğü tarafından desteklenmiştir. Çalışma, "İklim Değişikliği ve Turizm: Çanakkale, Mersin ve Kayseri İllerinde Turizm İklim İndeksi Analizi ve İklim Uygunluğunun Değerlendirilmesi" başlıklı proje kapsamında yürütülen araştırmaya dayanmaktadır.

References

Abegg, B., Agrawala, S., Crick, F., & de Montfalcon, A. (2007). Climate change impacts and adaptation in winter tourism. In S. Agrawala (Ed.), *Climate change in the European Alps: Adapting winter tourism and natural hazards management* (pp. 25–60). OECD Publishing. https://doi.org/10.1787/9789264031692-en

Amelung, B., & Nicholls, S. (2014). Implications of climate change for tourism in Australia. *Tourism Management, 41*, 228–244. https://doi.org/10.1016/j.tourman.2013.10.002

Amelung, B., & Viner, D. (2006). Mediterranean tourism: Exploring the future with the tourism climatic index. *Journal of Sustainable Tourism, 14*(4), 349–366. https://doi.org/10.2167/jost549.0

Amelung, B., Nicholls, S., & Viner, D. (2007). Implications of global climate change for tourism flows and seasonality. *Journal of Travel Research, 45*(3), 285–296. https://doi.org/10.1177/0047287506295937

Butler, R. W. (2001). Seasonality in tourism: Issues and implications. In T. Baum & S. Lundtorp (Eds.), *Seasonality in tourism* (pp. 5–21). Pergamon. https://doi.org/10.1108/eb058278

de Freitas, C. R. (2003). Tourism climatology: Evaluating environmental information for decision making and business planning in the recreation and tourism sector. *International Journal of Biometeorology, 48*(1), 45–54. https://doi.org/10.1007/s00484-003-0177-z

de Freitas, C. R., Scott, D., & McBoyle, G. (2008). A second generation climate index for tourism (CIT): Specification and verification. *International Journal of Biometeorology, 52*(5), 399–407. https://doi.org/10.1007/s00484-007-0134-3

Demiroglu, O. C., Turp, M. T., Kurnaz, M. L., & Abegg, B. (2021). The Ski Climate Index (SCI): Fuzzification and a regional climate modelling application for Turkey. *International Journal of Biometeorology, 65*, 763–777. https://doi.org/10.1007/s00484-020-01991-0

Denstadli, J. M., Jacobsen, J. K. S., & Lohmann, M. (2011). Tourist perceptions of summer weather in Scandinavia. *Annals of Tourism Research, 38*(3), 920–940. https://doi.org/10.1016/j.annals.2011.01.005

Elsasser, H., & Bürki, R. (2002). Climate change as a threat to tourism in the Alps. *Climate Research, 20*(3), 253–257. https://doi.org/10.3354/cr020253

European Commission (2022). Transition pathway for tourism. *Publications Office of the European Union* https://doi.org/10.2873/344425

Hamilton, J. M., Maddison, D. J., & Tol, R. S. J. (2005). Climate change and international tourism: A simulation study. *Global Environmental Change, 15*(3), 253–266. https://doi.org/10.1016/j.gloenvcha.2004.12.009

Höppe, P. (1999). The physiological equivalent temperature—A universal index for the biometeorological assessment of the thermal environment. *International Journal of Biometeorology, 43*, 71–75. https://doi.org/10.1007/s004840050118

Intergovernmental Panel on Climate Change (2014). Climate change 2014: Synthesis report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Core Writing Team, R. K. Pachauri, & L. A. Meyer, Eds.). *Intergovernmental Panel on Climate Change* https://www.ipcc.ch/report/ar5/syr/

Intergovernmental Panel on Climate Change (2023). Climate change 2023: Synthesis report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Core Writing Team, H. Lee, & J. Romero, Eds.). *Intergovernmental Panel on Climate Change* https://doi.org/10.59327/IPCC/AR6-9789291691647

Mieczkowski, Z. (1985). The tourism climatic index: A method for evaluating world climates for tourism. *The Canadian Geographer, 29*(3), 220–233. https://doi.org/10.1111/j.1541-0064.1985.tb00365.x

Moreno, A., & Amelung, B. (2009). Climate change and tourist comfort on Europe's beaches in summer. *Weather, Climate, and Society, 1*(1), 55–66. https://doi.org/10.1080/08920750903054997

Olya, H. G. T., & Alipour, H. (2015). Risk assessment of precipitation and the tourism climate index. *Tourism Management, 50*, 73–80. https://doi.org/10.1016/j.tourman.2015.01.010

Özgenç, E. K., & Kiper, T. (2026). Spatiotemporal analysis of climatic suitability using the tourism climate index: A case study of Tekirdağ/Türkiye. *European Planning Studies, 34*(3), 624–651. https://doi.org/10.1080/09654313.2025.2609898

Perch-Nielsen, S., Amelung, B., & Knutti, R. (2010). Future climate resources for tourism in Europe based on the daily tourism climatic index. *Climatic Change, 103*(3–4), 363–381. https://doi.org/10.1007/s10584-009-9772-2

Scott, D., & Lemieux, C. (2010). Weather and climate information for tourism. *Procedia Environmental Sciences, 1*, 146–183. https://doi.org/10.1016/j.proenv.2010.09.011

Scott, D., Gössling, S., & Hall, C. M. (2012). International tourism and climate change. *Wiley Interdisciplinary Reviews: Climate Change, 3*(3), 213–232. https://doi.org/10.1002/wcc.165

Scott, D., Hall, C. M., & Gössling, S. (2012). Tourism and climate change: Impacts, adaptation and mitigation. *Routledge* https://doi.org/10.4324/9780203127490

Scott, D., McBoyle, G., & Schwartzentruber, M. (2004). Climate change and the distribution of climatic resources for tourism in North America. *Climate Research, 27*(2), 105–117. https://doi.org/10.3354/cr027105

Scott, D., Rutty, M., Amelung, B., & Tang, M. (2016). An inter-comparison of the Holiday Climate Index (HCI) and the Tourism Climate Index (TCI) in Europe. *Atmosphere, 7*(6), Article 80. https://doi.org/10.3390/atmos7060080

Steiger, R., Scott, D., Abegg, B., Pons, M., & Aall, C. (2019). A critical review of climate change risks for ski tourism. *Current Issues in Tourism, 22*(11), 1343–1379. https://doi.org/10.1080/13683500.2017.1410110

World Tourism Organization (2019). Baseline report on the integration of sustainable consumption and production patterns into tourism policies. *World Tourism Organization* https://doi.org/10.18111/9789284420605