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Research Article

Evaluation of The Aegean Region within The Scope of Environmental Indicators of Sustainable Tourism

Sürdürülebilir Turizmin Çevresel Göstergeleri Kapsamında Ege Bölgesi'nin Değerlendirilmesi

Aziz BOSTAN	**Galip Afşin RAVANOĞLU**	**Gizem Evrim BİLGİ**
Assoc. Prof., Aydin Adnan Menderes University	Assoc. Prof., Ankara Yıldırım Beyazit University	Lecturer, Istanbul Esenyurt University
Faculty Of Economics And Administrative Sciences	Faculty of Applied Sciences	Vocational School
abostan@adu.edu.tr	galipafsinravanoglu@aybu.edu.tr	gizemevrimbilgi@esenyurt.edu.tr
https://orcid.org/0000-0001-8187-3871	https://orcid.org/0000-0001-5485-4384	https://orcid.org/0000-0001-8541-0719

Makale Geliş Tarihi	**Makale Kabul Tarihi**
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Abstract

Sustainable tourism is a form of development that prioritizes the protection of the environment and the preservation of cultural heritage and traditional values of local communities. It seeks to promote destinations' progress in economic, social, and environmental terms. The World Tourism Organization has identified 140 indicators, spanning economic, social, and environmental aspects, to gauge sustainable tourism practices.

This study aims to analyze and evaluate the provinces in the Aegean Region concerning these sustainable tourism indicators. Sustainable tourism plays a pivotal role in ensuring the longevity of tourism activities. When sustainable planning is not adopted, the quality of a tourism area will decrease and thus its preference by tourists will decrease. For this reason, the desired benefit from tourism will not be obtained.

By examining sustainable tourism indicators, the goal is to assess the current situation in the Aegean Region, identify areas needing improvement, and facilitate efforts toward enhancement. Within the scope of environmental indicators, solid waste collection, air pollutant sulfur dioxide (SO2) and particulate matter (PM10) values, use of natural resources (organic agriculture production), ecosystem sensitivity, erosion control studies and afforestation areas were determined in the Aegean Region. With the determination of these indicators, the negative effects on the environment will be revealed and the measures to be taken for the realization of environmental sustainability will be determined. Tourism and the environment are in close relationship with each other. Investigating the effects of tourism on the environment is important for achieving success in sustainable tourism.

Keywords: *Tourism, Sustainability, Aegean Region, Sustainable Tourism, Environment*

Öz

Sürdürülebilir turizm, çevrenin korunmasını ve yerel toplulukların kültürel mirasının ve geleneksel değerlerinin korunmasını amaçlayan bir kalkınma biçimidir. Ekonomik, sosyal ve çevresel açılardan destinasyonların ilerlemesini teşvik etmeyi amaçlar. Dünya Turizm Örgütü, sürdürülebilir turizm uygulamalarını ölçmek için ekonomik, sosyal ve çevresel yönleri kapsayan 140 gösterge belirlemiştir. Bu çalışma, Ege Bölgesi'ndeki illeri bu

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sürdürülebilir turizm göstergeleri açısından analiz etmeyi ve değerlendirmeyi amaçlamaktadır. Sürdürülebilir turizm, turizm faaliyetlerinin uzun ömürlü olmasını sağlamada önemli bir rol oynar. Sürdürülebilir planlama benimsenmediğinde, bir turizm alanının kalitesi düşecek ve dolayısıyla turistler tarafından tercih edilmesi azalacaktır. Bu nedenle turizmden istenen fayda elde edilemeyecektir.

Sürdürülebilir turizm göstergelerini inceleyerek, Ege Bölgesi'ndeki mevcut durumu değerlendirmek, iyileştirmeye ihtiyaç duyan alanları belirlemek ve iyileştirmeye yönelik çabaları kolaylaştırmak amaçlanmaktadır. Çevresel göstergeler kapsamında Ege Bölgesi'nde katı atık toplama, hava kirletici kükürt dioksit (SO2) ve partikül madde (PM10) değerleri, doğal kaynak kullanımı (organik tarım üretimi), ekosistem duyarlılığı, erozyon kontrol çalışmaları ve ağaçlandırma alanları belirlenmiştir. Bu göstergelerin belirlenmesiyle çevre üzerindeki olumsuz etkiler ortaya çıkarılacak ve çevresel sürdürülebilirliğin gerçekleştirilmesi için alınması gereken önlemler belirlenecektir. Turizm ve çevre birbirleriyle yakın ilişki içindedir. Sürdürülebilir turizmde başarıya ulaşmak için turizmin çevre üzerindeki etkilerinin araştırılması önemlidir.

Anahtar Kelimeler: *Turizm, Sürdürülebilirlik, Ege Bölgesi, Sürdürülebilir Turizm, Çevre*

1. INTRODUCTION

The term sustainability has become popular in policy-focused research as an expression of what public policies should achieve in recent years, and it is used in almost all fields. Sustainability, originating from the Latin word "Sustinere," means to sustain, maintain, support, uphold, or exist (Kuhlman & Farrington, 2010; Ilal, 2021).

Sustainability and tourism are closely interconnected concepts, as the tourism industry both depends on and impacts natural, social, and economic resources. Sustainable tourism refers to tourism activities that meet the needs of tourists during their visits while preserving future opportunities and adhering to the principles of sustainable development for the continued growth of tourism. Due to the negative impacts of tourism, alternative tourism approaches have emerged. In recent years, the concepts of sustainability and, consequently, sustainable tourism have been emphasized extensively. Along with this concept, practices related to sustainable development, which encompass environmentally friendly principles, have been introduced and implemented globally (Bilgiçli and Ertürk, 2022).

Sustainability was first officially published in 1987 by the World Commission on Environment and Development (WCED) under the sponsorship of the UN. The report focuses on environmental problems at national and international levels and their solutions. In addition, this report defines sustainable development. Sustainability is defined in the report as meeting current needs without compromising the needs of future generations (UN, 1987).

The concept of sustainable tourism began to be adapted to the concept of sustainable development with the Agenda 21 Action Report for the Travel and Tourism Industries, which was put forward at the United Nations Conference on Environment and Development in 1992. Later, the concept of sustainable tourism was first recognized with the Green Paper published by the European Union in 1995 and took its place in the literature. The concept of sustainable tourism is related to the implementation of sustainable development within tourism. It includes the long-term use of resources in tourism, reducing the negative effects of tourism, maximizing the positive effects of tourism, and protecting the principles related to this issue (Bozkurt, 2022).

This perspective naturally directs attention to integrative frameworks such as the Triple Bottom Line (TBL), which offers a comprehensive approach to understanding sustainability in the context of tourism. Although the concepts of "sustainability" and "TBL" are frequently used interchangeably in the literature, the TBL framework distinctly conceptualizes sustainability through three interrelated dimensions: economic, environmental, and social. By addressing these dimensions simultaneously, TBL provides a balanced analytical structure for assessing how tourism development can foster economic growth while maintaining environmental integrity and promoting social well-being—key pillars of sustainable development (Alhaddi, 2015).

Within this integrated framework, the environmental dimension has attracted particular attention in tourism research, as the degradation of natural resources directly undermines the long-term viability of destinations. The environmental pillar of TBL emphasizes practices that safeguard natural resources and ensure their continuity for future generations. In line with the Brundtland Report (1987), sustainable development is understood as meeting present needs without constraining the ability of future

generations to meet their own. Accordingly, this dimension focuses on issues such as the efficient use of energy resources, the reduction of greenhouse gas emissions, and the mitigation of ecological impacts arising from human activities.

Building upon the TBL framework, the concept of sustainable tourism seeks to balance economic, environmental, and social demands while accounting for the multifaceted impacts of tourism on destinations and stakeholders. Efforts to operationalize sustainable tourism have resulted in the development of numerous indicator systems designed to measure sustainability performance, with a growing emphasis on destination-level assessments in recent years. Various initiatives aimed at indicator development have significantly expanded the body of research in this field, leading to the proposal of diverse methodological approaches (Rasoolimanesh et al., 2020). As observable and measurable variables, sustainability indicators play a crucial role in rendering sustainable tourism development more tangible and objective, thereby supporting informed decision-making processes (Baidal et al., 2023).

The World Tourism Organization has identified 140 indicators, encompassing economic, social, and environmental dimensions. The identification of environmental indicators, which have significant implications for reducing adverse impacts on the environment and transferring resources to future generations, is particularly important for sustainable development (Vučetić, 2018).

The aim of this study is to examine and evaluate the provinces located in the Aegean Region within the scope of environmental sustainable tourism indicators. Sustainable tourism is important for ensuring continuity in tourism. In this study, the situation of the Aegean Region has been analyzed by revealing sustainable tourism indicators, and suggestions are provided for future development by determining deficiencies in specific areas. Collection of solid waste, levels of sulfur dioxide (SO2) and particulate matter (PM10) polluting the air, use of natural resources (organic agriculture production), sensitivity of ecosystems, erosion control efforts, and afforestation areas have been addressed within the scope of environmental indicators.

While studies on sustainable tourism indicators exist in the literature, determining the provinces in the Aegean Region in terms of these indicators is important for filling the existing gap. This approach is particularly relevant for identifying environmental deficiencies and planning appropriate steps to address these shortcomings.

2. LITERATURE REVİEW

The concept of sustainable tourism began to be adapted to the concept of sustainable development with the Agenda 21 Action Report for the Travel and Tourism Industries, which was put forward at the United Nations Conference on Environment and Development in 1992. Later, the concept of sustainable tourism was first recognized with the Green Paper published by the European Union in 1995 and took its place in the literature. The concept of sustainable tourism is a concept related to the implementation of sustainable development within tourism. It includes the long-term use of resources in tourism, reducing the negative effects of tourism, maximizing the positive effects of tourism and protecting the principles related to this subject (Bozkurt, 2022).

According to Bianchi (2004), sustainable tourism is interpreted as the destination’s ability to compete with different and emerging destinations while considering the destination's future condition, being environmentally compatible, preserving cultural heritage, and satisfying first-time tourists. The competitiveness referred to as sustainable tourism can also be interpreted as providing a competitive advantage to all destinations and stakeholders in the tourism industry within a country. The satisfaction of first-time tourists in a destination is considered crucial for their decision to return to that destination, indicating that satisfaction is the most important factor in deciding to revisit a destination.

In general, the aim of sustainable tourism is to increase the quality of life of the local residents and the experiences of the tourists and to support the environmental resources on which the tourism system is based. Therefore, “achieving sustainable tourism is a continuous process and requires continuous monitoring of the effects and taking the necessary preventive and/or corrective measures when necessary. In this respect, one of the problems that arise when applying the concept of “sustainability” to tourism is the lack of a definitive and accepted methodology to measure it. One of the tools recently proposed to measure sustainability is indicators (Dimoska and Petrevska, 2012).

The development of tourism can lead to various negative impacts such as environmental, economic, and seasonal income/employment effects. Particularly, the adverse environmental impacts of greenhouse gas emissions related to travel, accommodation, and recreational activities are widely debated. In this regard, sustainable tourism indicators are expected to facilitate the assessment of the sustainability of tourism development. Indicators should generate information that is methodologically consistent, scientifically valid, and easy to apply and communicate (Lee and Hsieh, 2016).

Sustainable tourism indicators will determine the status of tourism-related destruction in the country and will provide benefits for what kind of precautions can be taken against these problems in the future. With the emergence of indicators, the status of the existing destruction will be measured and will guide future practices (Calik and Zurnacı, 2019).

Environmental resources are used as an indispensable part of tourism products such as landscape, a famous landscape of the region, climate and biological life etc. If these resources are not used carefully, all businesses that depend on them are also affected. The environment also has an indirect effect on tourism-related activities. Any damage to resources such as drinking water and air quality is reflected back to the business by decreasing the number of visitors to the region. Another disadvantage of such negative impact is that there may be health problems for local people and personnel related to these environmental issues. The damage to the environment is either irreparable or very costly to reverse. In the last case, it is quite obvious that these costs should be reflected back to the local or national economies. Therefore, planning, creating and sustaining environmentally friendly activities is very important for the environmental economy. Any activity related to tourism damages the environment or endangers the transfer of its natural resources to future generations. In order to control and correct this damage, the current status of the environment must be determined with environmental indicators (Bozkurt, 2015).

Calik et al. (2021) conducted a study on plateau tourism in Gümüşhane in terms of sustainable tourism indicators. In their research, the effects of plateau tourism on wildlife and natural life in the region, the reuse and recycling levels of solid and liquid waste in the region, environmental pollution occurring during the plateau festival period, architectural pollution and illegal construction were examined within the scope of environmental indicators in terms of the harmony of tourism activities. Especially during the highland festival period, garbage and similar solid and liquid wastes left by the participants of the festivals are an important pollution element. In addition, it is emphasized by the businesses that local governments do not collect this solid waste periodically. Businesses try to destroy their solid wastes mostly by burying them in the ground or burning them, which causes environmental pollution.

In their research, Tamer and Yangil (2021) aimed to determine the perception of sustainability in hotel businesses by revealing the perspectives of hotel managers on sustainable tourism. Environmental sustainability, which includes “air quality, amount of erosion in natural areas” and “environmental accidents related to tourism”, is perceived as the most important dimension by managers as it constitutes the basic building block of sustainable tourism.

Calik (2014) examined the Eastern Black Sea Region within the scope of sustainable tourism indicators. According to the research results, the sewer infrastructure, the solid waste problem that occurs especially during festivals and festivities in the plateaus, and the low use rates of recycling and reuse systems are the problem areas that should be emphasized regarding solid waste in the region. In addition, the study emphasized that tourism investment decisions should be made by considering the protection/use balance in sensitive areas in the sustainable tourism development strategy and sustainable measures should be taken in areas where erosion is intense.

Gurer and Eke (2012) investigated the provinces of Erzurum, Erzincan and Bayburt by considering sustainable tourism indicators. They concluded that the priority issues for these provinces are to prevent identity loss and protect cultural diversity and cultural heritage, to take measures to minimize external pressures (population growth, migration, poverty, etc.), to protect mountain ecosystems and to develop local government systems with a sustainable resource management approach.

Choi and Sirakaya (2006) found that sustainable tourism at the local community level requires at least a development control policy, a policy on the natural environment, a security and visitor safety policy. Legal compliance regulations (e.g. enforced by fines), land development regulations, and development

regulations are also required. The study panels also found that tourism requires more investment to build and improve infrastructure, preserve natural and cultural resources, and support local industry.

In the study conducted by Roberts and Tribe (2008), a list of indicators covering economic, socio-cultural and institutional sustainability dimensions was developed to assess a destination's progress towards long-term sustainability.

3. METHODOLOGY

In this study, environmental indicators from the 140 indicators identified by the World Tourism Organization were addressed. Data were collected through literature review, utilizing the document analysis technique, which is a qualitative research method. Document analysis involves recorded texts and images without any intervention by the researcher. Documents such as advertisements, magazines, journals, artworks, survey data, and reports are among the types of documents analyzed (Kiral, 2020). The selection of documents was based on their relevance to sustainable tourism and environmental indicators, reliability, and recency. Searches were conducted in national and international databases as well as the archives of official institutions using these keywords. The retrieved sources were subjected to a preliminary evaluation; documents deemed not directly relevant to the study's objectives, outdated, or methodologically limited in reliability were excluded from the scope of the analysis. The analysis was conducted thematically, focusing on environmental sustainability aspects such as waste management, air pollution, natural resource use, ecosystem sensitivity, erosion control, and afforestation.

In the selection of documents, priority was given to sources that directly address indicators related to environmental sustainability and tourism. In line with the criterion of timeliness, data and publications from the period 2018–2024 were emphasized in order to reflect current conditions. Reliability was ensured by drawing on sources produced by official institutions, peer-reviewed academic studies, and nationally recognized statistical agencies.

Data were obtained from the Turkish Statistical Institute (TURKSTAT), the Ministry of Environment, Urbanization and Climate Change, the Ministry of Agriculture and Forestry, and the General Directorate of Nature Conservation and National Parks. The study population comprises Turkey's seven geographical regions, while the Aegean Region was selected as the sample. Data covering the period from 2018 to 2024 were analyzed using a purposive sampling method to ensure that the selected documents and data sources were directly relevant to the research objectives and sufficiently informative. This approach enabled the collection of comprehensive and appropriate data for evaluating environmental sustainability indicators in tourism destinations.

4. FINDINGS OF THE RESEARCH

Developments regarding the sustainability of tourism have gained significance in recent years. This is due to the increasing awareness of public administrations about the limits of natural and cultural resource utilization and the potential negative impacts of tourism on the environment if appropriate measures are not taken (Fernández et al., 2019). In this regard, the identification of environmental indicators is crucial for ensuring sustainability in tourism and addressing deficiencies. The environmental indicators of sustainable tourism are addressed under six main headings.

Indicator Topic 1: Collection of Solid Waste

Industry has become a significant part of modern society, and waste generation is an inevitable consequence of development activities. When waste is not properly processed, stored, transported, or disposed of, it can pose a potential threat to human health and the environment (soil, air, water) (Misra and Pandey, 2005). Therefore, the collection of waste is important for environmental protection and is among the environmental indicators of sustainable tourism.

The three largest producers of municipal solid waste are the United States, China, and India. The composition of solid waste varies with income: low- and middle-income populations produce more organic waste. The United States produces 258 million metric tons of solid waste, China 220 million metric tons, and India 169 million metric tons. Five developing countries, China, India, Brazil, Indonesia, and Mexico, are among the top ten producers of municipal solid waste due to their rapidly

prospering populations and their large urban populations, similar to developed countries.Higher-income populations produce more waste paper, metal, and glass. An average of 0.74 kg of waste is produced per person per day. Urban solid waste production is expected to increase to 3.4 billion tons by 2050 (Nanda and Berruti, 2021).In the context of environmental indicators, the waste collection data for the Aegean Region is provided in Table 1 (TUIK, 2022).

Table 1. Amount of Waste Collected by Municipalities

Province	***Number of Municipalities Providing Waste Services (2022)***	***Amount of Waste Collected (2022)***	***Municipality's Dumping Sites Amount of Waste (Tonnes) (2022)***	***Waste Treatment Facilities Amount of Waste (Tonnes) (2022)***	***Other Disposal Methods* Amount of Waste (Tonnes) (2022)***
Izmir	31	1 983 465	0	1 972 425	11 040
Manisa	18	634 997	1 200	633 197	600
Kutahya	28	146 765	11 049	132 882	2 834
Mugla	14	582 240	178 988	403 202	50
Usak	11	123 553	17 717	105 836	0
Denizli	20	342 621	69 880	271 791	950
Aydin	18	456 122	0	446 226	9 895
Afyonkarahisar	60	198 273	20 090	175 952	2 231

Source: Turkish Statistical Institute (TUIK), 2022

*Data refers to disposals by burning in an open area dumping into river/onto land and burying.

When the amount of municipal solid waste collected is evaluated on a provincial basis, İzmir appears as the province with the highest waste volume. This situation can be associated with İzmir's large population, high level of urbanization, and its role as a major tourism destination, all of which contribute to increased waste generation. In contrast, although Afyonkarahisar ranks first in terms of the number of municipalities providing waste services, the relatively low volume of collected waste indicates that waste quantities are influenced not only by the number of service-providing municipalities but also by factors such as population density, the level of economic activity, and tourism intensity.

Indicator Topic 2 : Air Pollutant Sulfur Dioxide (SO2) and Particulate Matter (PM10) Values

With rapid urbanization and industrialization over the past twenty years, air pollution has become a significant environmental issue. Sulfur dioxide (SO2) and particulate matter, evaluated within the scope of the indicator topic, also contribute to environmental problems. Sulfur dioxide is one of the substances that significantly pollute the atmosphere, causing not only acid precipitation but also impairing visibility and forming haze. Therefore, it is crucial to develop accurate and reliable models to determine the spatial and temporal characteristics of SO2 in the atmosphere (Wu et al., 2020). Particulate matter resulting from factories, construction-related pollution, fires, and energy facilities is a mixture of suspended particles in the air. These particles can be deposited in the respiratory system. These substances, which significantly affect the environment, have been measured at air quality monitoring stations. The daily limit value for PM10 parameter was determined as 40 µg/m3 and for SO2 parameter as 125 µg/m3 in 2022. The total number of exceedances in 2022 is 36334 for PM10 parameter and 322 for SO2 parameter. (Ministry of Environment, Urbanization and Climate Change, General Directorate of Permits and Inspections, Department of Laboratory Measurement and Monitoring, 2023). According to the World Health Organization (WHO), the 24-hour limit has been increased to 40 µg/m3 corresponding to the distribution of daily SO2 concentrations and their annual averages (World Health Organization. (2021). Table 2 presents the values of sulfur dioxide (SO2) and particulate matter polluting the air.

Table 2. Aegean Clean Air Center Sulfur Dioxide (SO2) Values

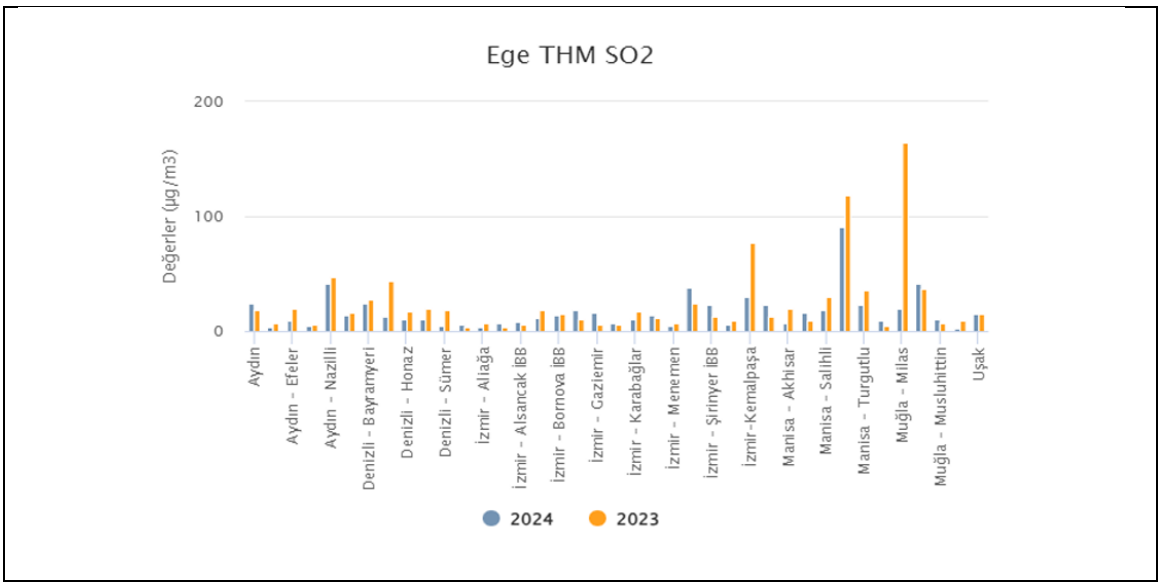
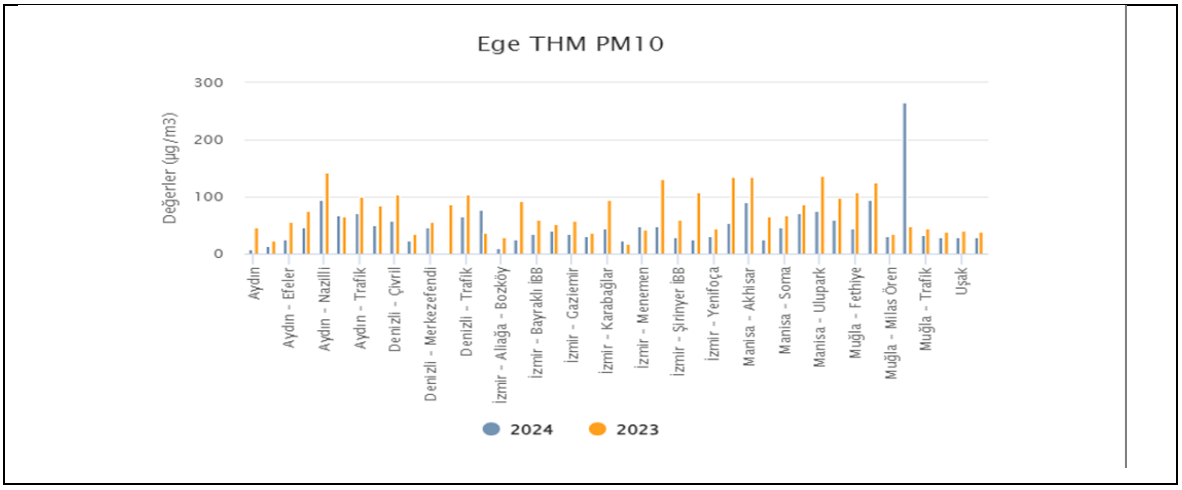


Table 3. Aegean Clean Air Center Particulate Matter (PM10) Values



Source: Ministry of Environment and Urbanization, Air Quality Bulletin, 2024.

When Table 2 is examined, the highest sulfur dioxide level in 2023 is observed in the Milas district of Muğla. This situation may be associated with regional energy production activities and emission sources. The significant decrease recorded in 2024 can be explained by the implementation of emission control measures or changes in environmental conditions. In contrast, the highest value in 2024 is identified in Manisa, indicating that air pollution levels may vary depending on regional dynamics. According to the particulate matter levels presented in Table 3, the highest rate in 2024 is recorded in Muğla. This finding may be linked to regional economic activities and seasonal population mobility. The decrease observed across all provinces compared to 2023 points to the positive effects of environmental regulations and improvement efforts. Aydın, which ranks among the provinces with the lowest values in 2024, can be evaluated within the framework of industrial intensity and environmental factors. These results suggest that air quality indicators are closely related to regional activities and tourism mobility.

Indicator Topic 3: Use of Natural Resources (Organic Farming Production)

Organic farming is defined as a valid, environmentally and socially sustainable agricultural production method that does not use any synthetic chemical fertilizers or pesticides. It plays an important role in ensuring the continuity of environmentally sustainable agricultural production. States increasingly recognize the value of organic farming, which is effective in solving sensitive issues such as environmental protection, and support the use of organic farming production (Pugliese, 2001). For the Aegean Region, data on organic farming production is presented in Table 4.

Table 4. Organic Production Data

Provinces	Production Amount (Ton) (2020)	Production Amount (2022)	Production Amount (2023)
Afyonkarahisar	21 411 77	15 077 33	36 227 51
Aydin	31 263 24	77 273 36	142 701 53
Denizli	1 407 54	3 730 64	799 38
Izmir	19 618 92	11 940 10	27 687 31
Kutahya	308 82	689 90	478 95
Manisa	58 510 24	64 260 35	128 035 09
Mugla	11 908 43	8 831 16	6 793 44
Usak	29 69	201 82	5,99

Source: Ministry of Agriculture and Forestry, Official Statistics, 2020-2023

While Manisa recorded the highest level of organic farming production in 2020, leadership shifted to Aydın in 2022 and 2023. This change indicates that organic farming activities may vary in response to regional dynamics, policy incentives, and market conditions. In contrast, the consistently lowest production levels observed in Uşak across all examined years suggest that organic farming performance is influenced by regional production capacity and economic structure. These findings demonstrate that organic farming constitutes an important indicator not only for sustainability and rural development but also for the environmental and economic performance of tourism destinations.

Indicator Topic 4: Sensitivity of Ecosystems

National parks, nature parks, natural monuments, and protected areas are all within the scope of conservation areas, and their conservation in the country is crucial for the continuity of a sustainable environment. These areas should be planned with a balance between protection and use. If these areas are preserved properly, it is expected that environmental damage will be minimized (Calik, 2014).

Table 5. Protected Areas (National Parks, Nature Parks, Natural Monuments, Nature Reserves)

Provinces	National Parks	Natural Parks	Nature Monument	Nature Reserve
Afyonkarahisar	1	6	3	1
Aydin	1	4	0	0
Denizli	1	1	0	1
Izmir	0	8	10	0
Kutahya	0	4	1	2
Manisa	1	3	2	0
Mugla	2	9	5	2
Usak	0	3	0	1
Total	6	38	21	7

Source: General Directorate of Nature Conservation and National Parks, Official Statistics,2023

When Table 5 is examined, Muğla is observed to have the highest number of national parks, nature parks, and natural monuments, while İzmir has the highest number of nature reserves. Additionally, it is evident that nature protection areas are located in the provinces of Kütahya and Muğla. The presence of a total of 72 protected areas in the Aegean Region indicates that the region possesses significant potential in terms of biodiversity and ecosystem conservation.

This situation highlights an important advantage for the Aegean Region in the context of sustainable tourism practices. The existence of protected areas can support ecotourism and nature-based tourism

activities, thereby contributing to the environmental sustainability of destinations. Nevertheless, the balance between conservation and tourism use must be managed with careful consideration.

Indicator Topic 5: Erosion Control Efforts

One of the environmental indicators of sustainable tourism is erosion control efforts. Soil erosion is the main cause of land degradation in different parts of the world. Erosion, which disrupts the ecosystem and leads to desertification, is a concern for developing countries. Erosion destroys the fertile topsoil, which contains organic matter and nutrients (Ebabu et al., 2022).

The implementation of effective control measures and the enhancement of afforestation rates are of great importance for preventing erosion. Table 5 reveals that the intensity of soil loss exhibits spatial variation at the provincial level. The fact that Aydın has the highest severe erosion intensity may be associated with factors such as land use patterns, agricultural activities, and topographical characteristics. In contrast, the lower soil loss intensity observed in Kütahya can be evaluated in relation to the province's natural vegetation cover and land structure, which may limit erosion risk.

These findings indicate that erosion is influenced not only by natural processes but also by human activities, thereby emphasizing the necessity of sustainable land management and environmental planning.

Table 6. Distribution of Soil Loss Severity at Provincial Level

Provinces	**Land Loss (2023)**
Izmir	9,76
Aydin	15,33
Denizli	3,39
Mugla	8,49
Manisa	6,12
Afyonkarahisar	4,68
Kutahya	1,88
Usak	2,53

Source: Ministry of Environment, Urbanization, and Climate Change, Official Statistics, 2023

Indicator Topic 6: Afforestation Areas

Afforestation efforts, evaluated within the environmental indicators of sustainable tourism, are an effective practice for reducing global warming by sequestering large amounts of carbon in the soil (Chen et al., 2020). Afforestation activities should be among the public policies to ensure environmental sustainability. Failure to do so increases the risk of desertification in the region. While our country ranked 46th in the world in terms of forest area in 2015, it ranked 27th in 2020. When the Forest Area Ranking by Country is examined, the Russian Federation ranks first with 815,311.60, Brazil ranks second with 496,619.60, Canada ranks third with 346,928.10. The USA ranks fourth with 309,795.00, and China ranks fifth with 219,978.18. (Ministry of Agriculture and Forestry, Forest Assets of Turkey, 2020). Table 6 presents the comparative distribution of afforestation areas and forest presence across the provinces of the Aegean Region. Muğla's position as the province with the highest forest presence can be associated with its natural ecosystem structure, extensive forested areas, and the existence of protected zones. In contrast, the relatively low level observed in Uşak may be explained by factors such as land use patterns, climatic conditions, and the limited vegetation cover. These findings emphasize the importance of afforestation policies for regional environmental sustainability and point to differences in ecological capacity among provinces.

Table 7. Comparison of Forest Presence by Provinces

Provinces	2015	2018	2020
Izmir	470 910	475 779	478 547
Aydin	326 605	326 605	326 605
Denizli	588 672	588 672	588 672
Mugla	830 378	829 309	829 309
Manisa	539 648	542 480	542 480
Afyonkarahisar	278 836	278 836	278 836
Kutahya	646 552	646 552	646 552
Usak	223 496	223 496	223 496

Source: Ministry of Agriculture and Forestry, Forest Assets of Turkey, 2020.

5. CONCLUSIONS AND RECOMMENDATIONS

In today's world, where environmental degradation is increasing, the concepts of sustainability and sustainable development have become some of the most debated topics in recent years. Sustainability is defined as a state of balance between human activities and the social, natural, and cultural environment. To meet the development needs of future generations, this balance must be established in a healthy manner. In this context, sustainability is considered an approach aimed at mitigating the economic, social, and environmental drawbacks created by the impacts of human activities. Sustainability concepts have also been applied within the tourism sector. Sustainable tourism is approached as a tourism concept that emphasizes the importance of the local community and aims to increase the economic benefits of tourism (Güzel et al., 2020).

Indicators play a crucial role in the context of sustainable development for tourism, as they are essential for assessing the sustainability, existence, and ultimately the future of the tourism sector in a destination. In any destination, indicators provide information that responds to the fundamental risks and concerns regarding the sustainability of tourism, while also helping to clarify issues and measure responses. Indicators typically provide insights into a destination's natural resources and environment, economic sustainability concerns, cultural assets, social values, and broader outcomes related to both the tourism sector and organizational and management issues within the destination (UNWTO, 2004). Therefore, the identification of indicators in destinations is crucial for the future of sustainable tourism. Identifying indicators in destinations will provide insights into the deficiencies in those regions and guide future corrective measures.

Environmental sustainability aims to improve human welfare without causing harm by conserving the resources used for human needs (Moldan et al., 2012). In this context, this study evaluates the provinces in the Aegean Region in terms of environmental indicators of sustainable tourism.

Within the scope of environmental indicators, the study examines solid waste. Waste collection is crucial for ensuring environmental sustainability. Looking at the Aegean Region, it is observed that Izmir has the highest waste collection rate, however, a higher waste collection rate is expected. More attention should be paid to the collection of waste, which has a significant environmental impact. Izmir province also has the highest number of disposals through open burning, dumping into rivers/soil and burying. As stated in the research of Calik et al (2021), the fact that businesses try to dispose of their solid waste by burying it in the ground or burning it causes environmental pollution. When examining Afyonkarahisar, it is observed that although this city has the highest number of municipalities providing waste services, the amount of waste collected is low. The primary objectives of solid waste management are to protect human health and the environment and to conserve resources. Waste is a material that is considered to have little or no value by either the producers or consumers of society. Therefore, political, economic, legal and engineering aspects must be taken into account in the planning and operation of a solid waste management program (Kanat, 2010).

Imam et al (2008) conducted a study on solid waste management in Abuja. As a result of the study, they stated that Abuja residents should be aware of waste management. They stated that waste should be separated more, recyclable materials should be separated and the amount of waste that requires collection and disposal should be reduced.

Another indicator topic is the examination of sulfur dioxide and particulate matter that pollute the air. These two substances are harmful to nature and contribute to the deterioration of air quality. When considering the years 2023 and 2024, the most significant decrease in Mugla. Regarding particulate matter, while the province with the highest particulate matter rate in 2024 was Mugla, one of the provinces with the lowest rate was Aydin. In general, there was a decrease in the provinces in 2024 compared to 2023. To reduce air pollution, further efforts are warranted to enhance the number of air pollution measurement stations, develop a comprehensive air pollution map of the city, and ensure that new zoning plans are aligned with this map.In order to develop control methods related to air quality; especially in new settlement areas, housing should be planned considering the dominant air circulation direction. In order to distribute the pollution caused by vehicles and heating in the atmosphere, attention should be paid to a structure that provides air circulation between the buildings and measures should be taken to direct and make central heating mandatory in new settlements. It is necessary to pay special attention to the construction of the structures to be built around the city in a way that will create an air circulation corridor and remove pollutants from the city (Kok, 2018).

Cukurluoglu and Bacanli (2018) also investigated the Aegean Region in terms of Sulfur Dioxide and Particulate Matter. According to the results of the research, it was determined that annual SO2 concentrations decreased in Izmir and Kutahya. Winter season SO2 concentrations in Izmir, Kutahya and Afyon showed a downward trend. PM10 concentrations decreased in Izmir during the winter season.

Another environmental indicator is the use of natural resources. Using organic farming is crucial for protecting future generations. Aydin is the province with the highest organic farming production. It is essential to increase organic production further. Organic farming is effective in preventing soil erosion and ensuring biological diversity. More attention should be paid to organic farming to eliminate chemical residue and ensure environmental sustainability.

One of the other environmental indicators within erosion control activities should be carefully considered. Soil erosion is one of the factors that harm nature and contribute to desertification. Therefore, it is evaluated within environmental indicators. In this context, another indicator is the increase in afforestation areas. Mugla has the highest forest presence within the Aegean Region. In regions where arid climate prevails, natural vegetation is weak due to insufficient available moisture, and therefore the organic matter content of the soil is quite low. The low amount of soil organic matter reduces aggregation, making these areas potential erosion areas. Afforestation stands out as one of the important applications that can be done in these areas (Simsek et al 2013).

The findings of this study clearly demonstrate the need for policy development grounded in environmental indicators to strengthen sustainable tourism in the Aegean Region. The high levels of improper waste disposal in provinces such as Izmir indicate that local administrations should enhance monitoring capacity and implement stricter sanctions against environmentally harmful practices. Similarly, fluctuations in SO_2 and particulate matter levels show that air quality monitoring stations should be expanded and urban planning should prioritize air circulation. The strong organic farming potential observed especially in Aydin suggests the necessity of promoting organic agriculture and reducing chemical inputs as part of regional sustainability strategies. Additionally, erosion-prone areas would benefit from intensified afforestation programs to increase ecological resilience. Overall, the findings highlight the importance of developing integrated, long-term, and locally inclusive environmental policies to support sustainable tourism in the region.

It is important that the recommendations developed in line with the findings obtained within the scope of this study be addressed specifically in relation to the tourism sector. Strengthening waste management systems at destinations, enhancing energy and water efficiency in accommodation establishments, promoting sustainable transportation practices, and expanding environmental awareness programs will contribute to reducing tourism-induced environmental pressures. In particular, it is recommended that

facilities holding sustainability certifications be supported and that environmental performance be incorporated into destination marketing strategies.

This study, which is about environmental tourism indicators, has some limitations. In the study, only the Aegean Region was examined in terms of environmental indicators. In addition, only environmental indicators were considered among sustainable tourism indicators. It is suggested that other regions should also be examined and the situation of different cities in terms of sustainable tourism should be revealed.

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Araştırma Makalesi

Evaluation of The Aegean Region within The Scope of Environmental Indicators of Sustainable Tourism

Sürdürülebilir Turizmin Çevresel Göstergeleri Kapsamında Ege Bölgesi'nin Değerlendirilmesi

Aziz BOSTAN	Galip Afşin RAVANOĞLU	Gizem Evrim BİLGİ
Assoc. Prof., Aydin Adnan Menderes University	Assoc. Prof., Ankara Yıldırım Beyazit University	Lecturer, Istanbul Esenyurt University
Faculty Of Economics And Administrative Sciences	Faculty of Applied Sciences	Vocational School
abostan@adu.edu.tr	galipafsinravanoglu@aybu.edu.tr	gizemevrimbilgi@esenyurt.edu.tr
https://orcid.org/0000-0001-8187-3871	https://orcid.org/0000-0001-5485-4384	https://orcid.org/0000-0001-8541-0719

Genişletilmiş Özet

Sürdürülebilirlik terimi, son yıllarda gündeme gelen, kamu politikalarının neyi başarması gerektiğinin bir ifadesi olarak politika odaklı araştırmalarda popüler hale gelmiştir ve bu terim neredeyse tüm alanlarda kullanılmaktadır. Sürdürülebilirlik, köken olarak Latince bir kelimedir ve Latince "Sustinere" kelimesinden gelmektedir, anlamı ise sürdürmek, devam ettirmek, sağlamak, desteklemek, var olmak anlamlarında kullanılmaktadır (Kuhlman ve Farrington, 2010; İlal, 2021).

Sürdürülebilirlik çalışmaları, mevcut ihtiyaçlara hitap ederek, kimlere ve nelere layık bir alan bırakılması gerektiğini gözönüne almaktadır. Sürdürülebilirlik ile birlikte mevcut ihtiyaçların karşılanması gerektiği ancak bu ihtiyaçları karşılarken yapılacak tüm faaliyetlerin doğaya dayalı olduğu savunulmaktadır. Doğadaki kıt kaynakların minimum girdi ile işlenmesi ve maksimum fayda sağlaması beklenir. Bu sayede ekosistem içerisinde doğayı dengeleyen çarklar, fonksiyonlarını kaybetmeden yaşam döngüsünü tamamlayabileceklerdir (Ece, 2019).

Sürdürülebilirlik ilk kez resmi olarak 1987 yılında BM sponsorluğunda Dünya Çevre ve Kalkınma Komisyonu (WCED) tarafından yayınlanmıştır. Rapor, ulusal ve uluslararası düzeyde çevre sorunlarına ve bu sorunların çözümüne odaklanmaktadır. Ayrıca bu raporda sürdürülebilir kalkınmanın tanımı yapılmıştır. Sürdürülebilirlik, raporda mevcut gereksinimlerin gelecek nesillerin ihtiyaçlarını ödün vermeden karşılanması olarak tanımlanmaktadır (UN,1987).

Kuhn'a (2007) göre, sürdürülebilir turizm, gelecek nesillerin ihtiyaçlarını karşılayabilme durumlarını ön planda tutarak turistlerin, turizm sektörünün ve yerel toplumların ihtiyaçlarını karşılamayı amaç edinmiş bir anlayıştır.

Bianchi (2004) göre, sürdürülebilir turizm, destinasyonun gelecekteki durumunu düşünerek destinasyonun farklı ve yeni çıkan destinasyonlarla rekabet gücüne sahip olması, çevreyle uyumlu olmasıyla birlikte, ayrıca kültürel mirası koruması ve destinasyona ilk kez gelen turistleri memnun etmesi şeklinde yorumlanmıştır. Rekabet gücü olarak ifade edilen, sürdürülebilir turizmin, ülkede bulunan tüm destinasyonlara ve turizmde yer alan paydaşlarına rekabet avantajı sağlayacağı şeklinde de yorumlanabilmektedir. Destinasyonda ilk defa bulunan turistlerin memnuniyetinin, ikinci defa gelenler kadar yüksek olması da, turistin gitmiş olduğu o destinasyona tekrar gelme kararı almasında en önemli etkinin memnuniyeti olduğundan yola çıkılarak algılanabilmektedir.

Dünya Turizm Örgütü, ekonomik, sosyal ve çevresel olmak üzere 140 gösterge belirlemiştir. Çevre üzerindeki kötü etkilerin azaltılması ve kaynakların gelecek kuşaklara da aktarılması konusunda hükümetlere önemli sonuçlar veren çevresel göstergelerin belirlenmesi, sürdürülebilir kalkınma için de son derece faydalıdır (Vučetić, 2018).

Çalışmada çevresel göstergeler ele alınmıştır ve bu göstergeler aşağıdaki şekilde gösterilmiştir:

- Katı atıkların toplanması,
- Havayı kirleten kükürt dioksit (SO2) ve partikuler madde (PM10) değerleri,
- Doğal kaynakların kullanımı (organik tarım üretimi),
- Ekosistem hassaslığı,
- Erozyon kontrolü çalışmaları,
- Ağaçlandırma alanları.