

## EXAMINATION OF CLIMATE CHANGE PRACTICES IN THE ALPS CASE AND SUGGESTIONS FOR ERCIYES SKI RESORT

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### Abstract

Due to the effects of climate change on natural events, the emergence of certain limitations in the activities of ski resorts highlights the importance of practices carried out in the face of climate change based on a sustainability approach. In line with this importance, the aim of the research is to identify the practices carried out in ski resorts in the Alps to mitigate the effects of climate change, to present a comprehensive knowledge base that will have a widespread impact on relevant literature and other practitioners affected by climate change, and to provide guiding findings and recommendations for the Erciyes Ski Resort. In accordance with this purpose, through content analysis, it has been found that a wide variety of activities covering all dimensions of sustainability, from localism to transportation, from certification to environmental integration, are carried out within the framework of the sustainability approach in the Alps. Additionally, it has been determined that practices covering other themes such as energy efficiency, education and voluntary organizations, and afforestation stand out quantitatively.

**Keywords:** Climate Change, Sustainability, Erciyes Ski Resort, Alps.

## İKLİM DEĞİŞİKLİĞİNE YÖNELİK UYGULAMALARIN ALPLER ÖRNEĞİNDE İNCELENMESİ VE ERCİYES KAYAK MERKEZİ'NE YÖNELİK ÖNERİLERİN GELİŞTİRİLMESİ

### Öz

İklim değişikliğinin doğa olayları üzerindeki etkilerine bağlı olarak kayak merkezlerinin faaliyetlerinde birtakım sınırlamaların görülmesi, sürdürülebilirlik yaklaşımı temelinde iklim değişikliğine karşı yürütülen uygulamaların önemini ortaya çıkarmaktadır. Bu önem doğrultusunda, araştırmada Alplerdeki kayak merkezlerinde yürütülen iklim değişikliğinin etkilerinin azaltılmasına yönelik uygulamalarının saptanması, ilgili literatüre ve iklim değişikliğinden etkilenen diğer uygulayıcılara yönelik yaygın etki oluşturacak bilgi birikiminin sunulması ve Erciyes Kayak Merkezi'ne yönelik yol gösterici bulgu ve önerilerin sunulması amaçlanmıştır. Bu amaç doğrultusunda yapılan içerik analizi doğrultusunda, Alplerde sürdürülebilirlik yaklaşımı doğrultusunda yerellikten ulaşım, sertifikasyondan çevresel entegrasyona kadar oldukça çeşitli ve sürdürülebilirliğin bütün boyutlarını kapsayan faaliyetlerin yürütüldüğü saptanmıştır. Ayrıca nicelik bakımından enerji verimliliği, eğitim ve gönüllü oluşumlar, örgütlenmeler, ağaçlandırma gibi uygulamaları kapsayan diğer temalarında yürütülen uygulamaların ön plana çıktığı tespit edilmiştir.

**Anahtar Kelimeler:** İklim Değişikliği, Sürdürülebilirlik, Erciyes Kayak Merkezi, Alpler

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## INTRODUCTION

After the Industrial Revolution, economic developments, along with increases in population and urbanization, have led to environmental degradation and the generation of intense waste. This situation disrupts the balance of the earth's surface with many unnatural human activities and contributes to the occurrence of events referred to as climate change (Akıncı and Kasalak, 2016). Awareness of climate change, particularly its impacts on human life and the observed adversities worldwide, has brought sustainability to the forefront as an approach that needs to be embraced in all aspects of life. The concept of sustainability has emerged with the aim of preserving environmental, social, and economic resources, recognizing and addressing existing problems, and ensuring the transfer of these resources to future generations (Yurdakul, 2023). Therefore, it can be said that sustainability is crucial, especially for the balanced utilization and preservation of all resources, particularly limited natural resources, increasing the quality of life for future generations, and preserving the world in all its aspects.

Climate conditions are a significant factor affecting tourist demand in the tourism sector. In this context, weather and climate changes greatly affect tourism activities worldwide (Aygün Oğur, 2022). Thus, the importance of sustainability for the tourism sector is significant, and this has been reflected in tourism research, especially after the United Nations World Tourism Organization (UNWTO) introduced the 2030 Sustainable Development Goals to tourism. After this introduction, the issue of sustainability has been further investigated (Kusumaningrum, 2022). Another significant aspect that highlights the importance of sustainability for the tourism sector is the trend towards alternative tourism activities due to the impact of globalization. In other words, the inclination towards alternative tourism activities to meet changing holiday preferences and sustain service quality has increased the importance of sustainability in tourism for the conservation of resources and their transfer to future generations.

Reducing the effects of seasonality, one of the most significant problems in tourism, by revitalizing

the winter period traditionally considered as the off-season in tourism and ensuring sustainability can be achieved through ski resorts (Akıncı and Kasalak, 2016). Ski resorts, which are complex systems based on the combination of both natural and artificial resources, encompass environmental, social, and economic activities in resource utilization and management (Akdoğan, 2023). However, one of the most significant threats to ski resorts in recent years has been climate change, the effects of which are increasingly felt. Climate change can have significant impacts on snow quality and quantity (Akıncı and Kasalak, 2016). In this regard, transitioning to renewable energy sources, increasing resource efficiency, and reducing carbon footprint are essential sustainability practices for ski resorts to combat climate change and globalization (Özçoban, 2019).

The Erciyes Ski Resort, the subject of this research, is considered one of Turkey's most important ski resorts, managed by a destination management organization, with its transportation network, mechanical facilities, accommodation options, diversity of slopes, and lengths. However, no practices related to sustainability and climate change were found on the Erciyes Ski Resort's website. On the other hand, the Alps, with their vast geography and ski resorts in different countries offering a wide range of skiing services suitable for every budget and various structures, have been setting guiding examples for other ski destinations for many years due to their experience in skiing activities. Analyses of the websites of ski resorts in the Alps have revealed a wide variety of practices related to sustainability and climate change. Therefore, it is considered important to identify exemplary practices for all ski resorts based on the Erciyes Ski Resort and to develop recommendations accordingly.

In conclusion, this research, conducted based on secondary data, aims to identify the effects of climate change on ski resorts in the Alps and practices to mitigate these effects through content analysis of the websites of these ski resorts. Additionally, the aim is to provide guiding findings and recommendations for the Erciyes Ski Resort, to present a comprehensive knowledge base that will have a widespread impact on relevant literature

and other practitioners affected by climate change. The conceptual framework to be developed within the scope of this research is crucial because it will be comprehensive, covering all ski resorts in the Alps included in the research universe, and because no research on the subject has been found in the relevant literature.

## 1. CONCEPTUAL FRAMEWORK

### Sustainability

Industrialization, technological advancement, population growth, and globalization have increased the demand for natural resources and energy, leading to a decrease in non-renewable energy sources. This situation has directed society towards the use of renewable energy sources and has led to the importance of the concept of sustainability in order to leave a healthy world for future generations (Ceylan, 2019). Sustainability is an integrative concept that transcends traditional boundaries of life, typically encompassing economic, social, and environmental issues that need to be addressed at multiple levels (Paris, 2016). At the core of the concept of sustainability lies the idea of meeting the needs of present generations without jeopardizing the needs of future generations (Uğurlar, A., 2017). It ensures the functionality of a system, whether it be society, an ecosystem, or any system with continuity, by preserving vital resources without depletion or degradation (Pelit et al., 2015).

Sustainability is depicted as a triad consisting of social, economic, and environmental dimensions (Paris, 2016). If we evaluate the dimensions of sustainability separately, the social dimension focuses on the ability of society to meet the needs of both current and future generations while preserving their well-being (Akdoğan, 2023). The economic dimension aims to support economic growth by promoting the efficient consumption of resources and conducting economic activities in line with long-term sustainability principles to ensure the well-being of future generations (Gedik, 2020). The environmental dimension aims to preserve the ecological balance and diversity of our planet

through the conservation of natural resources, the reduction of environmental pollution, and ensuring the healthy functioning of ecosystems (Janker and Mann, 2020).

### Sustainable Tourism

The tourism sector has long been described with terms like 'clean industry' or 'smokeless industry', considering its lesser negative impact on the environment compared to other industries and business activities (Sungur, 2012). However, given that tourism is one of the sectors with the most intensive use of environmental, economic, and social resources, and its continuity depends on these resources, sustainability is recognized as an approach that aims to maintain the long-term balance of environmental, economic, and social impacts, making it a consideration that should always be taken into account (Garrigos-Simon et al., 2015; Gudrun et al., 2019; Magnusson et al., 2023). In conceptualized tourism as sustainable tourism, sustainability aims to consciously use environmental resources and preserve the socio-cultural characteristics of local communities, while also aiming to provide long-term benefits to both local communities and tourists, ensuring economic development (Gedik, 2020).

Sustainable tourism encompasses principles such as conservation of natural resources, minimizing environmental impacts, supporting local communities, respecting cultural values, and ensuring the distribution of economic benefits (Yurtsal, 2019). The goal of sustainable tourism is to provide a positive experience for local communities in terms of development (Paris, 2016) and to preserve the unique appeal of tourist destinations for future generations (Garda and Temizel, 2016). Especially in areas where natural resources are heavily used and the conservation of these resources is necessary for the continuity of tourist mobility, one of the most important areas requiring such conservation is ski resorts, where winter tourism activities take place. In other words, ski resorts are areas where tourism activities are

concentrated and where the natural environment plays a significant role (Tsiaras, 2017).

Key elements in ski resorts include factors such as climate, natural resources, snow reliability, precipitation, and temperature conditions, which are considered prerequisites for snow-based activities (Demiroğlu et al., 2019; Kapatzenakis et al., 2022). Therefore, it is evident that existing and potential ski resorts are vulnerable to climate change (Demiroğlu et al., 2019). Consequently, it is crucial for ski resorts to be managed and operated in accordance with the principles of sustainable tourism, as they play a critical role in the future sustainability of ski resorts within the scope of sustainable tourism.

Climate change, accepted as the main reason for the emergence of sustainable tourism, refers to significant changes observed worldwide and expected in future climate conditions associated with the increasing concentrations of greenhouse gases in the atmosphere due to human activities (Pang et al., 2013). The impact of human activities on climate change is particularly associated with factors such as burning fossil fuels, industrial processes, deforestation, and agricultural activities (Steiger et al., 2023). These factors lead to a series of effects, such as rising temperatures, sea-level rise, extreme weather events, decreasing water resources, loss of biodiversity, and economic impacts (Njoroge et al., 2015). Thus, these factors, referred to as climate change, create various and serious implications for winter tourism (Steiger et al., 2022). Factors such as insufficient snow cover, decreased snow quality, temperature increases, and unexpected weather events negatively affect the activities of ski resorts (Ogrin M., 2011). In this context, due to the effects of climate change on winter conditions, ski seasons are shortened in ski resorts, and the quantity and quality of snow show significant declines. As a result, implementing sustainable tourism practices and combating climate change have become crucial to making ski resorts more resilient to the effects of climate

change and minimizing their potential impacts (Ahmed and Helhel, 2022).

#### **Erciyes Ski Resort**

Winter tourism is a type of tourism conducted in mountainous regions with heavy snowfall, and skiing is one of the most important activities of winter tourism (Çakmak and Yılmaz, 2015). The increase in the number of ski resorts compared to the past, the appeal of winter sports to people from all walks of life, and awareness-raising efforts made for this purpose have created a wide range of employment opportunities in snowy areas (Hendrikx, 2013). One of the successful examples of winter tourism in Turkey in recent years is the Erciyes Ski Resort (Özçoban, 2019). Declared a tourism resort in 1989, the Erciyes Ski Resort is an important destination with ski slopes ranging from 1800 to 3000 meters in altitude, offering different gradients (10% to 30%) and the opportunity to ski in powder snow with Alpine and Nordic skiing disciplines (Ayaz and Apak, 2017). It is known that global climate change has had certain effects on Erciyes, as in all ski resorts, resulting in a shortened ski season (Yenice and Ercoşkun, 2019).

#### **Alps**

Mountains, due to their geographical features as well as climate and terrain, are one of the most important natural attractions for modern tourism (Paunović and Jovanović, 2017). Among these natural attractions, the Alps stand out as an important mountain range in Europe, spanning many countries including France, Switzerland, Slovenia, Italy, Austria, and Germany, known for their high peaks, glaciers, lakes, and impressive landscapes (Salim et al., 2021). With a total length of approximately 1,200 kilometers, the Alps (Schmid et al., 2010) are renowned for their high peaks, vast glaciers, deep valleys, and lakes (Baud, 2019). The Alps are one of the most important destinations with ideal conditions for activities such as mountaineering, skiing, snowboarding, hiking, biking, and paragliding (Körner, 1999). They offer services in various locations as significant ski resorts that support winter tourism activities with

characteristic mountain fauna (Bausch and Pechlaner, 2019), historical and cultural riches such as mountain villages, castles, monasteries, and ancient passes (Veblen, 2008), as well as rivers and lakes (Stoelzle et al., 2008). It is known that climate change has a negative impact on all resources in the Alps (Elsasser and Bürki, 2002). Therefore, in

## 2. METHODOLOGY

In this research, content analysis was conducted with the aim of examining practices related to climate change in the Alps, providing guiding findings and recommendations for Erciyes Ski Resort, and presenting the expected knowledge accumulation that will have a widespread impact on the subject. The web pages of the ski resorts included in the scope of the research were subjected to content analysis, which involves categorizing all recorded content and systematically summarizing and transforming it into comparable data (Berg, 2009), with the results generally indicating the frequency of repetition (Snelson, 2016). All ski resorts in the Alps were included in the research scope; therefore, no sampling was conducted. Accordingly, 51 ski resorts were identified in the Alps, access was obtained to the websites of 40 of them, and appropriate content for the purpose of the research was identified on the websites of 31 ski resorts. The themes examined in

addition to flora, fauna, water resources, historical, and cultural structures, sustainable tourism practices and combating climate change are crucial for the Alps in terms of preserving snow quality and quantity as a ski resort.

the research were determined by the researchers based on the practices found in ski resorts, as no similar research had been conducted before. In this context, the examinations were conducted based on 10 themes, including education, certification, carbon footprint, energy efficiency, resource efficiency, locality, waste management, transportation, environmental integration, and others.

## 3. FINDINGS

In this section of the research, the frequency distributions of the relevant ski resorts regarding the identified themes are presented. In this context, Table 1 provides the frequency distributions of practices related to sustainability and climate change, which are primarily addressed in ski resorts, for all themes considered.

**Table 1.** Frequency distributions related to themes

	<b>Theme</b>	<b>Content</b>	<b>n</b>	<b>%</b>
<b>1</b>	Education	Ecological activities, awareness-raising, informative and scientific education	8	25,8
<b>2</b>	Certification	Certification on sustainability, green buildings, snowflakes, and similar issues	3	9,6
<b>3</b>	Carbon footprint	E-vehicles, central systems, synthetic fuels, and digital applications	5	16,1
<b>4</b>	Energy efficiency	Utilization of solar energy, consumption limits, incentive for saving, and use of thermal resources	11	35,5
<b>5</b>	Resource efficiency	Prevention of mixing dirty waters, water-saving systems	4	12,9
<b>6</b>	Locality	Support for local products and producers, and employment of local people	3	9,6
<b>7</b>	Waste management	Waste segregation, recycling, composting	3	9,6
<b>8</b>	Transport	Transport capacity, vehicles harmless to the air	3	9,6
<b>9</b>	Environmental integration	Preservation of habitats and nature, biological diversity, wetlands	6	19,3
<b>10</b>	Other	Afforestation, communities, management organizations	7	22,5
n: Number of ski resorts				

According to Table 1, energy efficiency practices related to sustainability and climate change are more frequently implemented in ski resorts in the Alps, followed by education and other practices. However, it is noteworthy that the implemented practices exhibit a significant diversity, ranging from locality to transportation, certification to environmental integration. Another important point is that this diversity encompasses practices targeting all dimensions of sustainability.

Providing detailed data on the practices contained within the identified themes and the ski resorts where they are implemented is crucial for the purpose of the research. In this regard, Table 2 presents the practices carried out under the education theme in ski resorts in the Alps and the relevant ski resorts.

**Table 2.** Practices and ski resorts related to the education theme

Education Practices	Ski Resorts
Integrating sustainability with tourism.	Zermatt (Switzerland), Salzburg (Austria), Arlberg (Austria), Rogla (Slovenia), Val D'Isère (France), Val Thorens (France), Serre Chevalier (France), Alpe d'Huez (France)
Eco-driving training for employees.	Arosa (Switzerland), Salzburg (Austria), La Plagne (France), Les Deux Alpes (France), Serre Chevalier (France), Alpe d'Huez (France), Flaine (France)
Sustainability days to raise awareness about sustainability.	Zermatt (Switzerland), Serre Chevalier (France)
Educational sustainability websites.	Val D'Isère (France), Val Thorens (France)
Scientific projects related to sustainability.	La Plagne (France), Serre Chevalier (France)
Informing about eco-local community practices.	Val Thorens (France), Alpe d'Huez (France)
Informative programs on local radios about waste separation at home and during holidays.	Val Thorens (France)
Promoting and instilling sustainability approach and responsible purchasing approach in all stakeholders through sustainable sustainability programs.	Verbier (Switzerland), Zermatt (Switzerland), Grindelwald (Switzerland), Gstaad (Switzerland), Arosa (Switzerland), Davos-Klosters (Switzerland), St. Anton am Arlberg (Austria), Kitzbühel (Austria), Engelberg (Switzerland), Ischgl (Austria), Obergurgl-Hochgurgl (Austria), Bad Gastein (Austria), Mayrhofen (Austria), Salzburg (Austria), Crans-Montana (Switzerland), Val D'Isère (France), La Plagne (France), Serre Chevalier (France)

Table 2 presents the practices related to the education theme and the matching of these practices with the ski resorts. In this context, promoting a sustainability approach and a responsible purchasing approach to all stakeholders are seen as the fundamental educational practices in ski resorts' sustainability programs. Additionally, integrating sustainability with tourism and providing eco-driving training for employees are among the highly valued findings. Sustainability days emphasizing sustainability and climate change, educational sustainability websites, scientific

projects related to sustainability, informing about eco-local community practices, promoting waste separation at home and during holidays, and informing programs on local radios are education practices that ski resorts actively implement. The practices listed in Table 2 indicate significant steps towards implementing educational practices and undertaking necessary efforts to raise awareness about the seriousness of sustainability issues.

Table 3 provides information about the relevant ski resorts regarding certification and the practices carried out in these ski resorts.

**Table 3.** Practices related to certification theme and ski resorts

Certification Practices	Ski Resorts
Certification related to sustainability program.	Zermatt (Switzerland), Val Thorens (France)
Certification of buildings carrying out sustainability practices.	Maribor (Slovenia)
Certification of mountain destinations complying with sustainable development criteria with the green snowflake label.	Les Deux Alpes (France), Val Thorens (France), Flaine (France), Serre Chevalier (France)

In Table 3, certification practices related to sustainability are listed, indicating that ski resorts in France take this issue seriously, while there are also initiatives in Switzerland and Slovenia. Certifications such as general sustainability program certification,

certification of buildings carrying out sustainability practices, and certification of mountain destinations meeting the criteria for sustainable development with a green snowflake label demonstrate the importance placed on sustainability.

**Table 4.** Practices and ski resorts regarding carbon footprint theme

Carbon footprint practices	Ski Resorts
Implementation of electric bike, e-scooter, and	Lech-Zürs (Austria), Salzburg (Austria), Maribor
Installation of central heating systems.	Engelberg (Switzerland)
Implementation of practices such as e-complaints to reduce digital carbon footprint, deletion of old data, and mobile practices.	Val D'Isère (France), Val Thorens (France), Alpe d'Huez (France)
Use of synthetic fuel in all snow clearing vehicles.	Flaine (France)

Table 4 shows carbon footprint practices related to sustainability and climate change, indicating that many ski resorts are actively engaged in these practices. Implementation of initiatives such as e-bike, e-scooter programs for transportation, electric "Green Garage" application for electric vehicles, digital carbon footprint reduction initiatives, data purging, mobile practices, central heating systems, and synthetic fuel usage in snow clearing vehicles demonstrate the commitment of numerous ski resorts to sustainability and addressing climate change.

Data regarding the implementation of energy efficiency practices in ski resorts, encompassing a wide range of initiatives, are presented in Table 5.

According to the Table 5, it is observed that the application of electricity generation from hydroelectric power plants and solar energy, related to energy efficiency, is being implemented

by many ski resorts included in the research. Therefore, it can be said that this application is highly valued in terms of energy efficiency. The practice of limiting electricity consumption is observed to be carried out by the Maribor ski resort in Slovenia. In addition to this information, the practices of limiting lighting on slopes and special event decorations, installing geothermal systems to heat swimming pools, promoting energy-saving practices, halting artificial snow production during non-peak times while chairlifts are operational, prioritizing natural lighting and limiting heating to 19°C, shortening the season by one week to achieve 10% energy savings, closing chairlifts to the slopes when traffic is reduced, and utilizing thermal cameras are being implemented by ski resorts in France. These practices indicate that there is a significant emphasis on energy efficiency and sustainability at the national level in France.



**Table 5.** Practices regarding energy efficiency theme and ski resorts

Energy Efficiency Practices	Ski Resorts
Production of electricity from hydroelectric power plants and solar energy.	Saas-Fee (Switzerland), Grindelwald (Switzerland), Arosa (Switzerland), Davos-Klosters (Switzerland), Lech-Zürs (Austria), St. Anton Am Arlberg (Austria), Kitzbühel (Austria), Engelberg (Switzerland), Ischgl (Austria), Obergurgl-Hochgurgl (Austria), Bad Gastein (Austria), Salzburg (Austria), Crans-Montana (Switzerland), Arlberg (Austria), Val D'Isère (France), Serre Chevalier (France)
Limitation of electricity consumption.	Maribor (Slovenia)
Limitation of lighting on slopes and special day decorations.	La Plagne (France)
Installation of a geothermal system to heat swimming pools.	La Plagne (France)
Implementation of practices that encourage energy consumption savings.	Les Deux Alpes (France), Serre Chevalier (France)
Halting artificial snow production during off-peak times when ski lifts are operational.	Les Deux Alpes (France)
Prioritizing natural lighting and limiting heating to 19°C.	Les Deux Alpes (France), Serre Chevalier (France), Alpe D'Huez (France)
Shortening the season by one week to achieve a 10% energy saving and shutting down ski lifts to slopes when density decreases.	Les Deux Alpes (France)
Utilization of thermal cameras to monitor energy efficiency.	Les Deux Alpes (France)

In addition to energy, practices related to conserving other resources are covered in the resource efficiency theme. The practices

implemented at ski resorts related to this theme are provided in Table 6.

**Table 6.** Practices and ski resorts related to the resource efficiency theme

Resource Efficiency Practices	Ski Resorts
Practices that prevent dirty water from mixing with clean water and ensure the preservation of water sources, providing clean drinking water to everyone.	Grindelwald (Switzerland), St. Anton Am Arlberg (Austria), Engelberg (Switzerland), Obergurgl-Hochgurgl (Austria), Bad Gastein (Austria), Crans-Montana (Switzerland), Maribor (Slovenia)
The use of fixtures that save water.	Arosa (Switzerland), Bad Gastein (Austria)
The use of software that saves water in processes such as measurement, control, and consumption.	La Plagne (France)
Resource efficiency practice with measures aimed at the consumption of resources, especially food and water.	Les Deux Alpes (France), Serre Chevalier (France)

The information in Table 6 indicates that many ski resorts are engaged in activities related to preventing the mixing of dirty water with clean water, preserving water resources, and providing clean drinking water to everyone. It is observed that ski resorts are implementing initiatives and

practices related to the use of water-saving fixtures, the use of software for water conservation in processes such as measurement, monitoring, and consumption, and measures to reduce the consumption of resources such as food and water, thereby promoting resource efficiency.

**Table 7.** Practices regarding energy efficiency theme and ski resorts

Locality Practices	Ski Resorts
Prioritizing the purchase of regional agricultural products.	Ischgl (Austria), Obergurgl-Hochgurgl (Austria), Mayrhofen (Austria), Salzburg (Austria), Crans-Montana (Switzerland)
Supporting local producers for the production of many products by local producers.	Maribor (Slovenia), Val D'Isère (France), Garmisch-Partenkirchen (Germany)
Adopting policies that create employment and highlight local culture and products.	Val D'Isère (France), Val Thorens (France), Cortina D'Ampezzo (Italy)

Table 7 indicates that many ski resorts have implemented practices prioritizing the purchase of regional agricultural products, supporting local producers for the production of many items, and adopting policies that highlight local culture and products, which create employment. In this context, it can be said that local practices not only improve the operational efficiency and long-term

sustainability of ski resorts but also increase their potential for winter tourism.

Waste management is among the most important practices related to sustainability and climate change. It is observed that various waste management practices are also implemented in ski resorts.

**Table 8.** Practices and ski resorts related to the waste management theme

Waste Management Practices	Ski Resorts
Implementing source separation of waste.	Zermatt (Switzerland), Davos-Klosters (Switzerland), Engelberg (Switzerland), Obergurgl-Hochgurgl (Austria), Salzburg (Austria)
Establishing recycling centers.	Les Deux Alpes (France), Val Thorens (France), Serre Chevalier (France), Alpe d'Huez (France)
Recycling of chairlift tires and composting of organic waste.	Flaine (France)

It is observed that the practice of waste separation at the source is implemented by ski resorts based in Switzerland and Austria. On the other hand, ski resorts based in France are pioneers in establishing recycling centers, recycling ski lift tires, and composting organic waste.

Although there are practices aimed at reducing the carbon footprint, particularly transportation-based initiatives, the theme of transportation has been specifically identified, and it is presented in Table 9.

**Table 9.** Practices and ski resorts related to transportation theme

Transportation Practices	Ski Resorts
The implementation of practices such as routes with the lowest CO2 emissions, allocation of public transportation vehicles, and prioritizing the use of electric vehicles.	Zermatt (Switzerland), Verbier (Switzerland), Grindelwald (Switzerland), Gstaad (Switzerland), Arosa (Switzerland), Davos-Klosters (Switzerland), St. Anton Am Arlberg (Austria), Kitzbühel (Austria), Flaine (France), Engelberg (Switzerland), Ischgl (Austria), Obergurgl-Hochgurgl (Austria), La Plagne (France), Bad Gastein (Austria), Val D'Isère (France), Mayrhofen (Austria), Salzburg (Austria), Crans-Montana (Switzerland), Kranjska Gora (Slovenia), Rateče (Slovenia), Mojstrana (Slovenia), Maribor (Slovenia), Serre Chevalier (France)
Restricting vehicle access to the destination to reduce air pollution.	Zermatt (Switzerland), Val Thorens (France), Serre Chevalier (France), Flaine (France)
Implementation of elevator and escalator usage in some transportation processes.	La Plagne (France)

The most popular practices among the ski resorts listed in Table 9 under the transportation theme include implementing routes with the lowest carbon dioxide (CO2) emissions, allocating public transportation vehicles, and prioritizing the use of electric vehicles. This highlights the significance of CO2 emissions in terms of sustainability and climate change. Additionally, practices such as limiting vehicle access to the destination to reduce air

pollution and incorporating features like elevators and escalators in certain transportation processes are also among the implemented measures.

It can be observed that considerable efforts have been made in these relevant ski resorts to implement environmentally friendly practices. Therefore, the environmental integration theme has been established in the table below.

**Table 10.** Practices and ski resorts related to the theme of environmental integration

Environmental Integration Practices	Ski Resorts
Preservation and enhancement of habitat through an approach of pristine environment, smart home practices, and cooling systems using primitive methods.	Grindelwald (Switzerland), Verbier (Switzerland), Engelberg (Switzerland), Ischgl (Austria), Salzburg (Austria), Chamonix Mont-Blanc (France), La Plagne (France), Serre Chevalier (France), Flaine (France)
Creation of tree canopy walkways, botanical gardens, green buildings, and parks to protect the environment.	Rogla (Slovenia), Maribor (Slovenia), Serre Chevalier (France), Alpe D'Huez (France)
Restoration and preservation of cultural heritage elements.	Maribor (Slovenia), Val D'Isère (France)
Conservation of national parks and gardens along with biological diversity.	Serre Chevalier (France), Alpe D'Huez (France), Flaine (France)
Underground burial of electrical systems to mitigate visual pollution.	Alpe D'Huez (France), Flaine (France)
Preservation of wetlands through drainage management.	Flaine (France)

Environmental integration practices enable ski resorts to be managed in harmony with the natural environment they are located in and to achieve sustainable tourism goals. In this context, according to the information in Table 10, practices such as preserving and enhancing habitats with an intact environment approach, smart home practices, and cooling with primitive methods are supported by many ski resorts to promote environmental integration. Additionally, practices aimed at protecting the environment, such as tree canopy

trails, botanical gardens, green buildings and parks, restoration and preservation of cultural heritage elements, conservation of national parks and gardens, buried electrical systems to reduce visual pollution, and preservation of wetlands through drainage, demonstrate a diversified approach to sustainability and climate change mitigation.

Finally, various sustainability and climate change practices carried out in ski resorts, which are not included in the above themes, are presented in Table 11.

**Table 11.** Practices and ski resorts related to the other theme

Other Practices	Ski Resorts
Raising awareness with sustainability logos	Saas-Fee (Switzerland)
Afforestation for climate balance	Ischgl (Austria), Chamonix Mont Blanc (France), Flaine (France), Alpe D'huez (France)
Formation of voluntary communities against climate change	Cortina D'amezzo (Italy), Serre Chevalier (France), Courchevel (France), Alpe D'huez (France)
Establishment of management organizations for sustainability	Garmisch-Partenkirchen (Germany), Courchevel (France)

In addition to the mentioned themes, it is possible to mention the presence of other practices carried out within the scope of sustainability

activities in ski resorts. According to Table 11, practices such as raising awareness with sustainability logos, afforestation for climate

balance, the establishment of voluntary communities against climate change, and the establishment of management organizations to sustain sustainability in every aspect are implemented.

#### 4. CONCLUSIONS AND SUGGESTIONS

The purpose of this research is to determine the effects of climate change and the sustainability practices aimed at mitigating these effects through content analysis of the websites of ski resorts in the Alps, to provide guiding findings and recommendations for Erciyes Ski Resort, and to present a comprehensive knowledge base that will have a widespread impact on relevant literature and other practitioners affected by climate change. Accordingly, it has been observed that many practices are being carried out in the context of achieving sustainability against climate change in ski resorts.

In ski resorts in the Alps, practices related to sustainability and climate change, particularly those concerning energy efficiency, are more frequently implemented, followed by education and other practices. However, a noteworthy point is the considerable diversity in the implemented practices, ranging from local issues to transportation to certification to environmental integration. Another important aspect is that this diversity encompasses practices addressing all dimensions of sustainability. By evaluating the practices carried out in the context of sustainability and climate change under 11 different themes, it is possible to draw numerous conclusions based on the findings obtained.

Education practices play a fundamental role in achieving sustainable development goals for ski resorts through quality education. In this context, education practices can be considered a secondary and important activity in supporting the sustainability of ski resorts. These education practices contribute to raising awareness among tourism sector employees, managers, community leaders, and local residents in a correct manner. By

enhancing both individual and societal well-being, they play a significant role in ensuring the future success of ski resorts. Thus, not only individual development is facilitated but also sustainable tourism practices are adopted, and long-term environmental awareness is increased, leading to the conservation of natural resources. For these reasons, education practices can be seen as a tool that supports and promotes the sustainability of ski resorts.

Certification practices are considered an important tool for the sustainability activities of ski resorts. These practices determine the quality and standards of the resorts, officially promote the suitability of their conditions, and thereby ensure reliability. Moreover, by demonstrating their environmental responsibilities to consumers, they increase their attractiveness among conscious consumers and provide a competitive advantage among other ski resorts. Additionally, by encouraging continuous improvement and development, they play a significant role in achieving set goals. The efforts in this field are considered a key aspect of ski resorts' sustainability strategies and receive support.

The carbon footprint represents the amount of carbon dioxide (CO<sub>2</sub>) and greenhouse gases emitted into the atmosphere by an individual, business, or ski resort. These gases accumulate in the atmosphere, raising the planet's temperature and causing climate change. Therefore, carbon footprint practices are considered a helpful tool for ski resorts to reduce their environmental impacts and achieve sustainable tourism goals.

Energy efficiency practices are crucial within the scope of sustainability activities, as they provide economic savings, environmental protection with less energy consumption, contribute to combating climate change, and help ensure that the energy used is more reliable and clean. Therefore, energy efficiency is said to be of critical importance for the long-term sustainability and environmental obligations of ski resorts. Within this scope, energy efficiency practices gain top priority among

sustainability efforts at ski resorts, and activities carried out in this area involve intensive efforts.

Resource efficiency refers to the effective use of limited and rapidly depleting resources. This necessity is seen in terms of increasing production capacity, keeping operational costs lower, and reducing waste. Resource efficiency practices increase the sustainability of ski resorts and ensure their continuity in the market. By being perceived as environmentally friendly and responsible businesses, these practices make ski resorts attractive to environmentally conscious tourists.

Localization allows the natural and cultural riches of a destination to be preserved and allows these riches to develop within tourism activities. Offering products obtained from the region's resources to consumers supports both regional economies and local employment. Practices focusing on local values are considered important for supporting sustainable tourism and contributing to the local economy at ski resorts. In this context, localization practices improve the operational efficiency and long-term sustainability of ski resorts while also increasing the potential for winter tourism.

Waste management in ski resorts is crucial for environmental sustainability and brand perception in the tourism sector. Waste management practices ensure the separation and recycling of waste, as well as the processing of organic waste through various methods for use in other resources. Effective waste management contributes to environmental protection by reducing energy and water consumption and lowering carbon footprints.

One of the most significant factors contributing to environmental impacts is transportation, especially in terms of CO<sub>2</sub> emissions. Practices in transportation vehicles such as electric vehicles, public transportation, and low CO<sub>2</sub> emission routes are important for reducing adverse environmental effects in ski resorts. Moreover, the classification of vehicle entries demonstrates the necessary sensitivity shown in terms of transportation

capacities and resource conservation in relevant ski resorts.

Environmental integration practices enable ski resorts to be managed in harmony with the natural environment and achieve sustainable tourism goals. These practices, aimed at preserving the environment, are determined to be of tertiary importance within sustainability activities in ski resorts. Smart home practices within these practices have features such as energy efficiency, remote control, and programmable temperature settings. Primitive cooling systems, natural ventilation, and shading techniques reduce the need for mechanical cooling. Restoration and preservation of cultural heritage elements are crucial for maintaining the region's cultural identity and passing it on to future generations. Moreover, preserving wetlands through drainage contributes to the management of water resources in the region and increases the sustainability of ecosystems in dry parts of the region.

In addition to the mentioned themes, other practices carried out within the scope of sustainability activities in ski resorts can also be mentioned. Awareness-raising activities through sustainability logo studies, environmental awareness creation, recognition of social responsibilities, brand value creation, and thus meeting international standards are important practices for ski resorts. Reforestation efforts aimed at maintaining the climate balance in the region help reduce harmful environmental effects. Furthermore, the establishment of management organizations for conducting sustainability studies in the region is considered important for achieving sustainability goals, ensuring the correct use of the region's natural resources, and providing education and awareness-raising activities. In conclusion, many sustainability activities are being carried out by ski resorts in the Alps, highlighting the increasing importance of sustainability activities with each passing day.

Based on the findings presented above, several recommendations have been developed for the Erciyes Ski Resort:

- Focusing on integrating tourism activities as a lifestyle of sustainability at its core,
- Providing education, activities, and incentives to increase awareness and consciousness about sustainability,
- Implementing eco-driving training and awareness programs for all employees to adopt both in the workplace and in their personal lives,
- Activating certification and reward systems to support practices such as green snowflakes and green buildings,
- Establishing central systems and cloud computing to reduce carbon footprints, as well as adapting fuel types used in vehicles,
- Encouraging investments in renewable energy,
- Implementing energy-saving measures such as reducing decorative lights, opting for energy-efficient devices, and shutting off electronic devices when not in use under the leadership of the destination management organization,
- Protecting the future and ensuring the continuity of ski resorts by shortening the season by one week, as done in Les Deux Alpes,
- Promoting practices that conserve water and reduce pollution,
- Supporting the local community and businesses in terms of both employment and consumption of products,
- Creating waste management guidelines for the destination and making it mandatory for all facilities to comply,
- Collaborating with local authorities to recycle recyclable waste,
- Closing vehicle or guest access when necessary to preserve carrying capacity;
- Preferring eco-friendly vehicles in all processes where vehicles are used;
- Encouraging scientific research and protective activities for the preservation of existing habitats and further afforestation,
- Eliminating elements causing visual and noise pollution;
- Promoting the formation of voluntary communities and organizations to actively carry out practices related to climate change in line with the sustainability approach.

### Ethical Approval

This article does not involve a study group that requires ethical approval.

### REFERENCES

- Ahmed, Y., & Helhel, Y. (2022). İklim değişikliği ve turizm ilişkisi: Olası uyum ve çözüm önerileri. *Journal of Tourism Research Institute*, 3(2), 101-122.
- Akdoğan, L. (2023). Sürdürülebilir tüketim: Kavramsal bir çalışma. *Oğuzhan Sosyal Bilimler Dergisi*, 5(1), 43-53.
- Akıncı, Z., & Kasalak, M. A. (2016). Sürdürülebilir turizm yönetimi açısından özel ilgi turizminin yeri ve önemi. *Çatalhöyük Uluslararası Turizm ve Sosyal Araştırmalar Dergisi*, (1), 161-182.
- Ayaz, N., & Apak, Ö. C. (2017). Kış turizmine katılan yerli turistlerin seyahat motivasyonları ve seyahat memnuniyetleri. *Erzincan Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 79-94.
- Aygün Oğur, A., & Baycan, T. (2023). How to manage tourism development based on impacts of climate change in Türkiye. *Asia-Pacific Journal of Regional Science*, 1-24.
- Baud, A. (2019). Mont Blanc and the Aiguilles Rouges: A guide for skiers. *The Alpine Journal*, 123.

- Bausch, T., & Pechlaner, H. (2019). Outdoor recreation and sustainable tourism in the Alps: A review of research. *Journal of Alpine Research Revue de Géographie Alpine*, 107(4).
- Berg, B. L. (2009). An introduction to content analysis. *Qualitative Research Methods for the Social Sciences* (pp. 338–377) (7th ed.). Boston: Allyn & Bacon.
- Ceylan, Y. (2019). Sürdürülebilir turizm kapsamında turizmde eko etiketler. *Turizm Ekonomi ve İşletme Araştırmaları Dergisi*, 1(1), 65-80.
- Çakmak, F., & Yılmaz, Ö. (2018). Turizmin iktisadi sürdürülebilirliği açısından kış turizmi. *Hitit Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 11(1), 267-286.
- Demiroğlu, O. C., Lundmark, L., Saarinen, J., & Müller, D. K. (2019). The last resort? Ski tourism and climate change in Arctic Sweden. *Journal of Tourism Futures*, 6(1), 91-101.
- Elsasser, H., & Bürki, R. (2002). Climate change as a threat to tourism in the Alps. *Climate Research*, 20(3), 253-257.
- Garda, B., & Temizel, M. (2016). Sürdürülebilir turizm çeşitleri. *Selçuk Üniversitesi Sosyal ve Teknik Araştırmalar Dergisi*, (12), 83-103.
- Garrigós-Simón, F. J., Galdón-Salvador, J. L., & Gil-Pechuán, I. (2015). The economic sustainability of tourism growth through leakage calculation. *Tourism Economics*, 21(4), 721-739.
- Gedik, Y. (2020). Sosyal, ekonomik ve çevresel boyutlarla sürdürülebilirlik ve sürdürülebilir kalkınma. *Uluslararası Ekonomi Siyaset İnsan ve Toplum Bilimleri Dergisi*, 3(3), 196-215.
- Hendriks, J., Zammit, C., Hreinsson, E. Ö., & Becken, S. (2013). A comparative assessment of the potential impact of climate change on the ski industry in New Zealand and Australia. *Climatic Change*, 119, 965-978.
- J. M. Njoroge., (2015). Climate change and tourism adaptation: Literature review. *Tourism and Hospitality Management*, 21 (1), 95-108.
- Janker, J., & Mann, S. (2020). Understanding the social dimension of sustainability in agriculture: a critical review of sustainability assessment tools. *Environment, Development and Sustainability*, 22(3), 1671-1691.
- Kapetanakis, D., Georgopoulou, E., Mirasgedis, S., & Sarafidis, Y. (2022). Weather preferences for ski tourism: an empirical study on the largest ski resort in Greece. *Atmosphere*, 13(10), 1569.
- Körner, C. (1999). Biodiversity of the Alps: Assessment, spatial patterns and threats. *Biodiversity and Conservation*, 8(9), 1313-1329.
- Kusumaningrum, S. D. (2022). Sustainability and destination branding: A review of research Trends. *Tourism & Rural Development Studies*, 7(4).
- Magnusson, T., Karabag, S. F., Wigger, K., & Andersson, G. (2023). Sustainability transitions in tourism: on the transformation of a fragmented sector. *Tourism Geographies*, 1-16.
- Nurettin, A. Y. A. Z., & Apak, Ö. C. (2017). Kış turizmine katılan yerli ziyaretçilerin seyahat davranışları: Erciyes Kayak Merkezi örneği. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, (49), 27-43.
- Ogrin M., Ogrin D., Rodman N., Močnik M., Vengar R., Smolej A. & Bunčič G. (2011). Climate change and the future of winter tourism in slovenia. *Hrvatski Geografski Glasnik*, 73(1), 215- 228.
- Özçoban, E. (2019). Türkiye’de kış turizmi ve erciyes kayak merkezi üzerine bir değerlendirme. *Journal of Tourism & Gastronomy Studies*, 7(3), 1606-1625.
- Paris, C. M. (2016). Sustainability: A threshold concept for tourism education. *Tourism: An International Interdisciplinary Journal*, 64(3), 329-337.
- Paunović, I., & Jovanović, V. (2017). Implementation of sustainable tourism in the German Alps: A case study. *Sustainability*, 9(2), 226.
- Pelit, E., Baytok, A., & Oybalı, H. H. (2015). Sürdürülebilir turizm mi? Turizmde sürdürülebilirlik mi? Kavramsal bir tartışma.



- Gümüşhane Üniversitesi Sosyal Bilimler Enstitüsü Elektronik Dergisi*, 6(14).
- Salim, E., Ravanel, L., Bourdeau, P., & Deline, P. (2021). Glacier tourism and climate change: effects, adaptations, and perspectives in the Alps. *Regional Environmental Change*, 21(4), 120.
- Schmid, S. M., Kissling, E., & Roberts, D. G. (2010). Geology and tectonics of the Alpine mountain belt. *Earth-Science Reviews*, 102(3-4), 121-158.
- Snelson, C. L. (2016). Qualitative and mixed methods social media research: A review of the literature. *International Journal of Qualitative Methods*, 15(1), 1-15.
- Steiger, R., Knowles, N., Pöll, K., & Rutty, M. (2022). Impacts of climate change on mountain tourism: A review. *Journal of Sustainable Tourism*, 1-34.
- Steiger, R., Posch, E., Tappeiner, G., & Walde, J. (2023). Seasonality matters: simulating the impacts of climate change on winter tourism demand. *Current Issues in Tourism*, 26(17), 2777-2793.
- Stoelzle, M., Seibert, J., & Stahl, K. (2008). Assessing the hydrological significance of Alpine areas for lowland water resources. *Hydrological Processes*, 22(13), 2235-2246.
- Sungur, Z. (2012). Sürdürülebilir ekoturizmin toplumsal etkileri: Türkiye'den örnekler. *In International Conference On Eurasian Economies*, 1 (1), 338-344).
- Tsiaras, S. (2017). Exploring the impact of tourism to the sustainable development of mountain regions: Implications of the climatic conditions. *International Journal of Agricultural and Environmental Information Systems (IAEIS)*, 8(1), 14-28.
- Uğurlar, A. (2017). Turizmde sürdürülebilirlik: Bir ölçülebilirlik aracı olarak göstergelerin önemi. *İdealkent*, 8(21), 118-140.
- Veblen, T. L. (2008). The cultural landscape of the Alps: Past, present and future. *Mountain Research and Development*, 28(3/4), 298-309.
- Yenice, Z., & Ercoşkun, Ö. Y. (2019). Türkiye'de kış turizmi merkezlerinin iklim değişikliğine dirençliliğinin değerlendirilmesi, Bolu Köroğlu Dağı ve Erzurum Palandöken örnekleri. *Resilience*, 3(2), 269-285.
- Yurdakul, M. (2020). İşletmelerde sürdürülebilirliğin sağlanmasında eko inovasyon uygulamaları: Bir model önerisi. *İşletme Ekonomi ve Yönetim Araştırmaları Dergisi*, 3(1), 15-33.
- Yurtsal, K. (2019). Türkiye'de sürdürülebilir turizm. *Sivas İnterdisipliner Turizm Araştırmaları Dergisi*, 61-69.