

ARCHITECTURAL SCIENCE AND OUTDOOR RECREATION



Editor: Prof. Dr. Tendü Hilal GÖKTUĞ



October 1, 2024



Copyright © 2024 by İKSAD publishing house All rights reserved.

No part of this publication may be reproduced, distributed or transmitted in any form or by any means,

including photocopying, recording or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other noncommercial uses permitted by copyright law.

Institution of Economic Development and Social Researches

(The Licence Number of Publicator: 2014/31220)

TÜRKİYE TR: +90 342 606 06 75 USA: +1 631 685 0 853

E mail: iksadyayinevi@gmail.com

www.iksadyayinevi.com

It is responsibility of the author to abide by the publishing ethics rules.

Iksad Publications – 2024©

Architectural Sciences and Outdoor Recreation

ISBN: 978-625-367-855-5

Cover Design:

Prof. Dr. Tendü Hilal GÖKTUĞ

October 01, 2024

Ankara / Türkiye

Size = 16x24 cm

PREFACE

As the editor of this volume, I hold the conviction that the intersection of architectural sciences and outdoor recreation plays a pivotal role in fostering environments that are both ecologically sustainable and socially enriching. Through interdisciplinary collaboration in spatial planning, landscape architecture, and recreation studies, this book seeks to offer significant insights that contribute to the advancement of outdoor space design, enhancing the well-being of individuals and communities alike.

This book, titled "Architectural Sciences and Outdoor Recreation," encompasses a broad spectrum of research themes that address the evolving demands and challenges within the realm of outdoor recreation. The chapters explore contemporary methodologies in recreation planning, integrating advanced technologies such as Geographic Information Systems (GIS) and remote sensing to inform spatial decision-making. The volume highlights the use of multi-criteria decision analysis and the Analytical Hierarchy Process (AHP) to assess and define the recreational potential of diverse natural environments. Furthermore, several chapters emphasize the critical importance of accessibility and universal design, with in-depth examinations of inclusive outdoor spaces in urban settings and university campuses. The book also presents innovative contributions in the application of artificial intelligence for the design of micro-recreation areas, alongside sustainable landscape design in healthcare facilities and the role of floristic diversity in enhancing urban green spaces. Additionally, it addresses the utilization of outdoor areas in post-disaster scenarios

and examines the experiential dimensions of extreme sports and their relationship to perceived well-being.

I extend my profound gratitude to all those who contributed to the successful completion of this work: to the authors for their scholarly contributions, the reviewers for their invaluable feedback, and IKSAD Publishing House for their unwavering support in bringing this project to fruition.

I would also like to express my sincere appreciation to Prof. Dr. Atila GÜL, the book coordinator of IKSAD Publishing House, for his guidance and support throughout the publication process.

It is my earnest hope that "Architectural Sciences and Outdoor Recreation" will serve as a valuable reference for scholars, practitioners, and policymakers engaged in the exploration and development of sustainable, inclusive, and thoughtfully designed outdoor recreational spaces.

22.09.2024

EDITOR

Prof. Dr. Tendü Hilal GÖKTUĞ

EDITORS

Prof. Dr. Tendü Hilal GÖKTUĞ

AUTHORS

The authors were listed in alphabetical order

Ali Can KUZULUGİL

Aslıhan TIRNAKÇI

Ayser BAYAR

Bahar TÜRKYILMAZ

Başak AYTATLI

Birsen KESGİN ATAK

Buket ÖZDEMİR IŞIK

Bülent DENİZ

Çiğdem KILIÇASLAN DENİZ

Ebru ERSOY TONYALOĞLU

Elif ÖNAL

Eminsafa DİLMAÇ

Engin EROĞLU

Ezgi KIRMIZIBAYRAK

H. İlkden TAZEBAY ALLIBE

Hasan YILMAZ

Mahshid MIKAEILI

Medine ÇELİK

Mehmet Akif IRMAK

Meliha AKLIBAŞINDA

Meltem GÜNEŞ TİGEN

Müberra PULATKAN

Nagehan SEVEN

Nilgün GÜNEROĞLU

Nurgül TEZCAN KARDAŞ

Orhan BATMAN

Ömer Faruk BAŞGÜN

Sabiha KAYA

Serra ÇAKIR

Tendü Hilal GÖKTUĞ

Tuba Gül DOĞAN

Yahya BULUT

Yaşar Selçuk ERBAŞ

Zeynep R. BOZHÜYÜK ARDAHANLIOĞLU

REVIEWER LIST

The reviewers were listed in alphabetical order

Abdullah KELKİT	Çanakkale 18 Mart University
Aysel USLU	Ankara University
Banu KARAŞAH	Artvin Çoruh University
Cengiz ACAR	Karadeniz Technical University
Cihad BİLGE	Atatürk University
Cihan AYHAN	Sakarya University of Applied Sciences
Doğan DURSUN	Atatürk University
Emine MALKOÇ TRUE	Ege University
Emrah TAŞARER	Batman University
Emral MUTLU	Atatürk University
Ertan DÜZGÜNEŞ	Karadeniz Technical University
Esra ÖZHANCI	Nevşehir Hacı Bektaş Veli University
Fatih TURGUT	İstanbul Aydın University
Gül SAYAN ATANUR	Bursa Technical University
Gülçay ERCAN OĞUZTÜRK	Recep Tayyip Erdoğan University
Hilal KAHVECİ	Bilecik Şeyh Edebali University
İpek ALTUĞ TURAN	Ege University
Kemal ÇELİK	Gümüşhane University
Meliha AKLIBAŞINDA	Nevşehir Hacı Bektaş Veli University
Metin DEMİR	Atatürk University
Nihat KARAKUŞ	Akdeniz University
Nurdan ERDOĞAN	İzmir Demokrasi University
Oksan TANDOĞAN	Tekirdag Namik Kemal University
Ömer ATABEYOĞLU	Ordu University
Ömer Kamil ÖRÜCÜ	Süleyman Demirel University
Ömer Lütfü ÇORBACI	Recep Tayyip Erdoğan University
Özgür KAMER AKSOY	Aydın Adnan Menderes University
Sara DEMİR ALP	Bursa Technical University
Sibel AKTEN	Süleyman Demirel University
Vahit Oğuz KİPER	Sakarya University of Applied Sciences
Volkan MUFTUOĞLU	Bursa Technical University
Yahya BULUT	Atatürk University

CONTENTS

Pages

CHAPTER 1

1-26

Outdoor Recreation from Ontological and Phenomenological Perspectives

Eminsafa DİLMAÇ

Orhan BATMAN

CHAPTER 2

27-49

Current Recreational Activities and New Trends in a Changing World

Bülent DENİZ

Çiğdem KILIÇASLAN DENİZ

CHAPTER 3

50-63

Relationship Between Geographic Information Systems (GIS) Technology and Remote Sensing Methods with Recreation

Yaşar Selçuk ERBAŞ

Buket ÖZDEMİR IŞIK

Sabiha KAYA

CHAPTER 4

64-91

Defining Recreation Potential in Bayraklı-Bornova/Izmir Using Multi-Criteria Decision Analysis

Serra ÇAKIR

Birsen KESGİN ATAĞ

Ebru ERSOY TONYALOĞLU

CHAPTER 5**92-116**

Determination of Suitable Areas for Recreational Activities in Bafa Lake Nature Park Using The AHP Method

Tendü Hilal GÖKTUĞ

Ayser BAYAR

CHAPTER 6**117-136**

Evaluation of Saklıkent National Park in Terms of Recreation Opportunities

Zeynep R. BOZHÜYÜK ARDAHANLIOĞLU

CHAPTER 7**137-157**

The Recreational Importance and Utilization Opportunities of Urban and Rural Waterfront: The Case of Nevşehir

Meliha AKLIBAŞINDA

Aslhan TIRNAKÇI

CHAPTER 8**158-192**

Visual Analysis of Highway and Surrounding Landscapes as Recreational Resource Value

Hasan YILMAZ

Medine ÇELİK

CHAPTER 9**193-219**

Investigation of the Principles of Accessibility and Barrier-Free Landscaping in Urban Recreation Areas in Erzurum Historical Core

Mehmet Akif IRMAK

Ezgi KIRMIZIBAYRAK

CHAPTER 10**220-249**

The Importance of Universal Design Principle in University Campus Area

Mahshid MIKAEILI

CHAPTER 11**250-268**

Outdoor Recreation Analysis on University Campuses, KTU Coastal Facilities Example

Nilgün GÜNEROĞLU

Müberra PULATKAN

CHAPTER 12**269-303**

Artificial Intelligence Supported Micro Recreation Area Designs in Atatürk University; Ata Eco- Parklet

Ali Can KUZULUGİL

Başak AYTATLI

CHAPTER 13**304-341**

Evolution of Recreational Design in Public Swimming Pools: From the Past to Magnificent Futuristic Visions

Başak AYTATLI

Elif ÖNAL

CHAPTER 14**342-367**

Outdoor Recreational Space Design Considerations for Children with Atypical Sensory Processing Features: A Case of Autism Spectrum Disorder

Nagehan SEVEN

H. İlkden TAZEBAY ALLIBE

CHAPTER 15**368-403**

Evaluation of Planning and Design Principles for Hospital Gardens in İzmir and Sustainable Design Recommendations

Meltem GÜNEŞ TİGEN

Bahar TÜRKYILMAZ

CHAPTER 16**404-431**

Recreational Flow Experience and Perceived Wellness in Extreme Sports

Eminsafa DİLMAÇ

Nurgül TEZCAN KARDAŞ

CHAPTER 17**432-462**

Investigation of the Post-Earthquake Use of Open and Green Areas Used for Recreation in the "January 24, 2020, Elazığ Earthquake"

Ömer Faruk BAŞGÜN

Yahya BULUT

CHAPTER 18**463-508**

The Role of Floristic Diversity in Urban Landscapes

Tuba Gül DOĞAN

Engin EROĞLU

Outdoor Recreation from Ontological and Phenomenological Perspectives

Res. Assist. Eminsafa DİLMAÇ¹ 

¹Sakarya University of Applied Sciences, Faculty of Tourism, Department of Recreation Management, Sakarya, Türkiye.

ORCID: 0000-0002-5136-9217

E-mail: eminsafadilmac@subu.edu.tr

Prof. Dr. Orhan BATMAN² 

² Sakarya University of Applied Sciences, Faculty of Tourism, Department of Tourism Management, Sakarya, Türkiye.

ORCID: 0000-0001-7186-7064

E-mail: obatman@subu.edu.tr

Citation: Dilmaç, E. & Batman, O. (2024). Outdoor Recreation from Ontological and Phenomenological Perspectives. Göktuğ, T.H.. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:1, 1-26. ISBN: 978-625-367-855-5. Iksad Publications.

DOI: <https://doi.org/10.5281/zenodo.13871946>

1. Introduction

Islamic scholar Sa'di-i Shirazi once remarked in order to understand human being: "Human is a drop of blood, hundreds of thousands of worries/thoughts." This statement opens the door to profound reflections on human existence. Human being are in a constant pursuit from birth to death, ultimately confronting themselves at the end of this quest. Along the journey of self-discovery, they encounter anxieties, yet amidst these anxieties, emotions like curiosity and wonder also play a significant role in defining human characteristics. Human endeavor to explore their surroundings, seeking a deeper understanding of nature and their own existence by asking questions about their own being. Wonder and curiosity play a crucial role in this process of understanding.

The desire for acquiring knowledge plays a central role in humanity's effort to understand nature and themselves. Epistemologically, nature can be seen as a laboratory of knowledge. Through observation, experience, cultural transmission, and traditional knowledge, human strive to better understand nature and consequently themselves. Contemporary quests for meaning and self-discovery also occur through outdoor recreation. Whereas in the past, human turned to nature for hunting, shelter, and other basic needs, today, they return to nature to escape the density of urban life and the stress of modern living. This need arises for purposes such as efficient time utilization, experiencing different emotions, relaxation, rejuvenation, and personal development.

Ontologically, outdoor recreation highlights humanity's existential relationship with nature and the significance embedded within this relationship. A phenomenological perspective aims to observe the

recreational experience, revealing individuals' interactions with nature and the experiential dimensions of this interaction. Both ontological and phenomenological perspectives are crucial for a deeper understanding of outdoor recreation.

Reviewing the literature on recreation, it's evident that studies predominantly focus on the social-psychological context and the various benefits of recreation on individuals or society. However, there's a noticeable lack of studies examining the etymological, metaphorical, ontological, or phenomenological aspects of recreation. Therefore, conducting a philosophical evaluation of the significance of recreation on human existence, nature, and life is of great importance.

The aim of this section is to evaluate outdoor recreation from ontological and phenomenological perspectives using various philosophical viewpoints. Utilizing philosophical disciplines such as ontology and phenomenology is essential to examine the existential relationship between human and nature and the underlying meaning within this relationship. Despite the commodification and reduction of recreation to consumption in modern life, this study evaluates the ontological and phenomenological dimensions of outdoor recreation activities from an anti-secular perspective. It's believed that this study will serve as an inspiration for future researchers in this field.

2. Literature Review

2.1. Recreation

Recreation refers to voluntary actions and activities in which individuals engage for the purpose of relaxation, enjoyment, or learning, aiming to derive various benefits. These activities take place during leisure time,

outside of work hours, and are typically organized according to individuals' personal needs and preferences. The spectrum of recreational activities encompasses areas such as education, culture, art, or sports. Any activity in which individuals voluntarily participate, have fun, relax, or achieve personal development falls within this scope.

The term "Recreation," used to denote the utilization of leisure time, has its origins in Latin. Derived from the Latin root "Recreatio," the word recreation signifies renewal, reformation, and restoration (Kelly, 1999). Etymologically, the addition of the "-re" prefix to the word "creation" forms "recreation." Recreation is defined as activities or experiences chosen voluntarily by individuals or groups for the purpose of effectively utilizing their leisure time, providing pleasure and enjoyment (Kraus, 1985). In this context, recreation serves as an important tool for supporting both physical and mental health, alleviating stress, acquiring new skills, and continuing self-development. Recreation activities can be classified differently based on their purpose, number of participants, age factor, and location where they are conducted. Spatially, recreation can be categorized into outdoor and indoor recreation. Indoor recreation refers to activities conducted in enclosed spaces, while outdoor recreation pertains to activities conducted in open spaces.

2.2. Outdoor Recreation

Outdoor recreation refers to leisure activities conducted in outdoor environments, encompassing activities individuals engage in nature for relaxation, enjoyment, or various purposes. Such activities typically take place in open spaces, lakeshores, forested areas, or rural settings. Voluntary activities and sports such as hiking, camping, mountaineering,

cycling, nature photography, bird watching, fishing, and hunting fall within the realm of outdoor recreation activities.

These activities aim to allow individuals to spend time in natural settings, distancing themselves from negative influences and deriving positive benefits. Especially with increasing urbanization, people are turning to recreation activities in natural areas. Forests, rural areas, coastal regions, and areas with clean air are preferred locations for outdoor recreation activities. Activities in these areas aim to promote immersion in nature, exploration of natural beauty, stress relief, and the encouragement of a healthy lifestyle. In this context, outdoor recreation activities contribute positively to both physical and mental health and enable individuals to develop a deeper connection with nature. Adventure recreation activities and extreme sports, organized for the pursuit of excitement, are also largely categorized under this group.

Outdoor recreation includes:

- Air Sports (gliding, skydiving, windsurfing, model airplane flying, paragliding, hang gliding, etc.)
- Land Sports (mountaineering, hiking, rock climbing, orienteering, ATV riding, off-road driving, high ropes courses, etc.)
- Water Sports (rafting, canoeing, sailing, scuba diving, catamaran sailing, etc.) as examples.

2.3. Ontology

The term ontology often appears as the philosophy of being or the science of existence. Within this framework, it represents an attempt to look at and make sense of existence by focusing on questions such as "What is existence? Does existence exist? How did existence come into being?"

What does existence mean? What is the purpose of human existence?" Ontology can be thought of as a sub-discipline of metaphysics, one of the fundamental disciplines of philosophy (Cevizci, 2021). Ontology concentrates on the nature of existence, its fundamental characteristics, and the basic principles of existence.

In the context of this research, the aim is to examine outdoor recreation from the perspective of existential ontology concerning the individual's existence and meaning. Existential ontology represents a philosophical approach that investigates the individual's place in the world, their search for meaning, and their existential experiences. Recreation, especially outdoor recreation, gains significance as a domain where individuals engage with nature, renew themselves, and seek existential meaning (Aggerholm, 2015; Booth, 2020).

Within the field of ontology, philosophers such as Heraclitus, Plato, Democritus, Descartes, or Husserl have contemplated existence and interpreted it in various ways. Heraclitus viewed existence as a process of constant change, while Plato sought existence in the world of ideas. Democritus explained existence through atoms and void, Descartes divided existence into the thinking subject and the material world, and Husserl attempted to grasp the essence of existence through a phenomenological approach. These different approaches assist in developing a deeper understanding of the nature of existence.

Heraclitus's concept of constant change and becoming resonates with the dynamic nature of recreation. Plato's world of ideas can be associated with the inner meaning and spiritual tranquility individuals attain during recreational activities. Democritus's atomic view can help us understand

the concrete structure of physical activities and interaction with nature. Descartes's dualism addresses both the mental and physical aspects of recreation, while Husserl's phenomenology allows us to examine individuals' recreational experiences from a subjective perspective.

In light of these perspectives, an analysis can be conducted on the contribution of outdoor recreation to the individual's existential experiences (Vespestad and Lindberg, 2011). Recreation plays a significant role in the individual's process of self-discovery, connection with nature, and search for meaning. Ontologically, recreational activities not only provide physical and mental renewal but also contribute to the individual's existential quest for meaning. Therefore, understanding the philosophical and ontological dimensions of recreation and sports helps us grasp their place and significance in human life (Breivik, 2020; Simpson and Yoshioka, 1992).

In conclusion, examining the effects of outdoor recreation on individuals within the frameworks of ontology and existential perspectives reveals the richness and depth of this domain. Philosophical perspectives demonstrate that recreation is not merely a pastime but also holds a significant place in the individual's existential search for meaning. Such an assessment enables us to better understand the functionality and value of recreation at both individual and societal levels.

2.4. Phenomenology

Phenomenology is a philosophical approach concerned with how individuals perceive and interpret the world and their own realities. It can be defined as the process of perceiving and comprehending situations and events (Mengüşoğlu, 1945). Originated by the German philosopher

Edmund Husserl, phenomenology has been further developed and highlighted by philosophers like Martin Heidegger and Jean-Paul Sartre. Phenomenology focuses on the direct examination of phenomena, i.e., experiences and facts, and represents a philosophical and methodological approach underlying all scientific disciplines (Kleinman, 2019; Öktem, 2005).

Phenomenology sets aside assumptions about the existence or modes of existence of the world and aims to describe the environment through human perception (Cevizci, 2021). This approach seeks to explore the meaning and nature of individuals' subjective experiences. In this context, the phenomenological method aims to reach the essence of experiences and strives to rid itself of prejudices and preconceptions. Phenomenology represents an important philosophical and methodological approach in the field of recreation for understanding individuals' experiences in recreational activities and providing an in-depth framework for these experiences. Recreation encompasses activities where individuals renew themselves, relieve stress, and utilize their leisure time. However, to fully grasp the effects and meanings of these activities on individuals, a phenomenological perspective is necessary (Breivik, 2020). Particularly in the context of outdoor recreation, the phenomenological perspective sheds light on understanding and interpreting personal experiences in individuals' search for meaning and self-realization. Outdoor recreation involves direct interaction with nature, allowing individuals to establish a connection with nature and question their own existence in this process. In this context, phenomenology enables the examination of individuals' interactions with nature and the reflections of these interactions in their

inner worlds. The phenomenological method allows for an in-depth analysis of the experiences individuals undergo during recreational activities. For instance, when the feelings of inner peace, tranquility, or freedom experienced by an individual during a nature walk are approached from a phenomenological perspective, it becomes possible to understand how these feelings contribute to the individual's existential condition and life. Such an analysis not only reveals the physical and psychological benefits of recreation but also highlights its existential and meaning-seeking dimensions.

In conclusion, phenomenology is an important tool for understanding individuals' experiences in the field of recreation and exploring how these experiences contribute to individuals' existential search for meaning (Saruhan and Özdemirci, 2022). The phenomenological approach helps us understand the profound effects of recreational activities on individuals and uncover the meaning these activities add to individuals' lives. Therefore, understanding the philosophical and methodological dimensions of recreation enables us to grasp its place and significance in human life more deeply.

2.5. The Importance of Philosophical Perspectives in the Context of Outdoor Recreation

Different philosophical perspectives on events, situations, concepts, or phenomena can enrich our conceptualizations as much as the strength of our perspective allows. For instance, life can be defined as the period from birth to death. However, there are as many views of life as there are breaths. Individuals perceive, interpret, and evaluate life differently. From this perspective, the importance of the richness of life philosophies and

philosophical perspectives emerges. Life philosophy refers to any general attitude or philosophical view regarding the meaning of life or how life should be lived. Considering this framework, philosophers such as Arthur Schopenhauer, Epictetus, Seneca, Marcus Aurelius, Friedrich Nietzsche, Wilhelm Dilthey, and Henri Bergson stand out when it comes to life philosophy. Various philosophers have developed different perspectives on life and put forth various views on how life should be lived. Schopenhauer's pessimistic philosophy of life, the virtue and rational life philosophies of Epictetus and Stoic philosophers, Nietzsche's will to power and individualistic approach, Dilthey's hermeneutic philosophy for understanding life, and Bergson's emphasis on the creative evolution of life exemplify these different perspectives.

Indeed, life is not merely a biological phenomenon; it is a dynamic process of formation and change. Therefore, philosophical evaluation of this process becomes crucial. Every moment of life gains different meanings through individuals' experiences, and these meanings can be deepened and enriched through philosophical perspectives. When examining the literature, it is observed that although there are various definitions of the concept of recreation and it is evaluated from different perspectives, philosophical evaluations are considered inadequate to meet the needs. However, philosophical criticisms and interpretations can lead to various conceptualizations regarding the concept of recreation.

Recreation is an important area for individuals to renew themselves, relieve stress, and utilize their leisure time. However, this area not only provides physical or psychological benefits but also encompasses ontological and existential dimensions. Especially for demonstrating the

functionality of outdoor recreation, besides scientific evaluations, it is important to examine it from philosophical paradigms. Interaction with nature plays a significant role in individuals' existential experiences, and this interaction can help individuals understand themselves and their environment more deeply. Outdoor recreation is an important area for understanding the ontological relationship between human and nature. In this context, it is necessary to focus on how recreational activities contribute to individuals' existential search for meaning, how these activities shape the relationship between human and nature, and how this relationship is reflected in individuals' experience of existence.

In conclusion, understanding the philosophical dimension of recreation can help us grasp its place and significance in human life more deeply. Philosophical perspectives highlight that recreation is not just a physical or mental activity but also a part of an individual's existential search for meaning. Therefore, considering philosophical perspectives is crucial for fully evaluating the functionality of recreation.

2.6. An Ontological Evaluation of Nature and Humanity

Assessing the relationship between nature and human from an ontological perspective is a profound and expansive topic that encompasses the fundamental questions of existential (ontology) philosophy. Such an assessment involves exploring how human establish an existential connection with nature, how nature is perceived as a part of human existence, and what meaning this relationship holds.

Turkish Divan Literature poet Şeyh Galib, emphasizing the strong bond between humanity and the universe, expresses the necessity for individuals to look closely at themselves, stating that human are the apple of existence

and the essence of the universe (Gökdemir, 1994). This bond can also be evaluated within the framework of existence, nature, and humanity.

Historically, it is known that humankind has engaged in various struggles to sustain life. Actions such as hunting for food, making fires for warmth, or constructing shelter to meet physiological needs can be cited as examples of human struggles in nature. Throughout this struggle, humans have utilized their intellect by constructing traps for hunting, developing cutting or piercing materials for different purposes, and this development is known to have continued over the years.

Considering all these processes, the era where human travel on concrete roads with cars, reside in brick buildings, and begin to consume fast food marks a relatively new period. However, along with technological advancements in this short period, negative impacts such as long working hours, sedentary lifestyles, and imbalanced diets have led modern humans to a position where they are detached both from nature and their essence. Therefore, various distances have emerged between us and nature due to activities we engage in the wilderness, such as touching the soil or benefiting from natural and medicinal plants. Actions like making a fire to warm up in nature, choosing a suitable camping spot, drinking fresh water from streams or lakes, walking in the mountains, or climbing rocks evoke memories that remind us of our affinity with nature.

From an ontological perspective, nature can hold different meanings for humans psychologically, physically, and emotionally. We can evaluate life through a nature-based and nature-friendly perspective. The process of a seed being planted in the soil, growing into a sapling, later sprouting leaves, and eventually bearing fruit resembles the journey of human life.

A bird setting out early in the morning to gather food for its chicks, a lion storing energy to catch its prey, or a deer fleeing for its life represent different perspectives that reflect our existence within life's framework.

Ultimately, the connection human establish with nature reveals the profound meaning of the ontological bond between humanity and nature. Issues such as the positive effects of nature on human, the reflections of nature on consciousness, the negative effects of human on nature, and the ontological and ethical responsibilities of human towards nature provide the basis for a profound philosophical discussion on how the relationship between nature and human can be evaluated ontologically. Each of these aspects provides various perspectives for examining the existential connection between human and nature and its significance.

2.7. Reflections of Existence in Outdoor Recreation

In the postmodern era, it is well known that constantly changing habits, incessant rush, and an increasing need for speed are frequently observed in human life. Modernization is described as society's transition from the old and traditional to the new, marked by economic or technological changes and developments. With the transition to modernity, the human focus shifted away from nature and dispersed. With the industrial revolution and capitalism, human were also turned into consumption objects. The relentless pursuit and search for something characterize human life (Barakazı, 2019). Ultimately, what one is searching for is meaning. Individuals must find the purposes of their lives themselves. Therefore, the meaning of life can vary from person to person or from time to time. It is known that the intention of meaning (logos) often emerges in recreational activities. Individuals engaging in recreational activities are

not only seeking satisfaction but also various meanings. Unless a person experiences neurotic disorders, there is a need for engagement with something. This condition of human is expressed as the "transcendence of human existence." In modern life, everything has become easier and more accessible through technology, leading human to seek artificial tensions through various activities because they cannot find sufficient tension naturally. Otherwise, a sense of meaninglessness and emptiness, known as existential void, arises, with boredom being its main indicator.

In the post-modern society after modernity, while the affluent society has provided the majority with the necessary tools to facilitate their lives, it has failed to offer people a purpose and meaning worth living for. We live in a society with plenty of free time, but we lack ideas on how to spend this time. However, in order for a person to make time valuable, they must spend it on beautiful things.

Nature tourism activities provide individuals with the opportunity to interact directly with the natural environment. Mountains, forests, lakes, and other natural areas can offer individuals tranquility and an inner spiritual connection. By escaping from the hustle and bustle of urban life, pollution from factory chimneys, and factors such as traffic congestion, people engage in nature activities with therapeutic aspects to improve physical and mental health (Breivik, 2010). Outdoor recreation activities reduce the negative emotions perceived by individuals therapeutically, while promoting the emergence of positive emotions, increasing well-being psychologically and physically (Lackey et al., 2021; Wolsko, Lindberg, & Reese, 2019). Recreational activities can help individuals discover themselves, find inner peace, and find the meaning of life.

However, self-realization is not as easy as it is thought to be because no matter how much effort a person puts in, they remain far from realizing themselves. Modern life seems to dictate constantly being happy or chasing happiness, but happiness is not something to be pursued or captured; it should emerge spontaneously (Frankl, 2021a). Frankl suggests that in leisure activities, individuals embark on an inner journey toward themselves, enabling them to confront themselves (Frankl, 2021b). With this perspective, a conscious nature tourist is not escaping from oneself but embarking on a journey towards oneself.

Nature scientist and philosopher Thoreau, expressing that a consumption-based understanding dominates today and that this situation leads to destruction in nature, believes that in modern life, human are more a part of nature than society. Thoreau argues that civilized life alienates the individual from their true nature, leaving the individual virtually imprisoned in this life (Becker, 2008). In return, he presents nature philosophy to reestablish the relationship between human and nature. He states that if we live respectful and friendly with nature, we will feel free and happy, and only through this way can human discover themselves and return to their essence (Stoller, 1956; Thoreau, 2020).

2.8. Evaluation of Outdoor Recreation Experience from Ontological and Phenomenological Perspectives

Human strive to understand the universe they live in through numerous questions they seek to answer. People wonder about the reasons behind phenomena, the meaning of life if there is any, and what that meaning might be. They want to know why they were born, why they live, and why they will die (Saruhan and Özdemirci, 2022). This desire for knowledge is

inherent to human existence. Human approach nature and spend time in it with the aim of learning. The purposes of recreational activities in nature can sometimes be to gain different experiences, while at other times they can serve as a means of learning.

The phenomenological perspective is crucial for deeply examining and understanding individuals' interactions with nature, the experiences they gain through outdoor recreation activities, and the meanings these experiences hold for them (Vespestad and Lindberg, 2011). Therefore, the recreation experience can be evaluated within a phenomenological framework in terms of emotions, experiences, and interactions.

In outdoor recreation activities, individuals have numerous experiences and perceive and interpret these experiences subjectively. For example, rain during a camping event may remind one person of tranquility, while it may remind another of a challenging situation to be overcome. However, when considering positive optimal experiences, the phenomenological approach serves as a tool for better understanding outdoor recreation.

Phenomenology is a philosophical approach that examines the nature and meaning of experience. From this perspective, it is possible to study how nature-based sports and activities shape human experience and what these experiences mean on an individual level. Philosophical perspectives help us understand how sports and activities affect human existential experience and the meaning of life. Challenges faced during activities, tasks overcome, and similar situations contribute to an individual's psychological, physiological, emotional, and spiritual personal development (Godbey, 2009; Dilmaç, 2023).

In outdoor recreation, individuals are in direct interaction with nature. The sounds of animals, the wind blowing, the smell of plants, or the structure and texture of the ground provide various sensory experiences that form the foundation of the recreational experience. This interaction prepares a suitable ground for individuals to know themselves and their surroundings. Unlike urban and crowded environments, individuals participating in nature-based recreational activities are generally on an inner journey and search for meaning. Activities such as walking on a mountain trail, warming by a campfire, or observing nature, though seemingly ordinary, allow individuals to rediscover themselves and their surroundings. Hence, every journey can be seen as a journey towards the self.

Serres (2023), in his work *"Variations Sur Le Corps"* addresses the ontological relationships between the mountain and the philosopher using various metaphors. He compares writing to a nature walk, suggesting that most writers move with a guide and tie themselves to ropes, viewing notes as mountain huts and references as stakes (p.21). He emphasizes that the mountain and the body can have very different meanings in the philosophical sense within the relationship between nature and human. It is thought that various sports activities can maintain the ontological relationship between nature and human for one to return to their essence, whereas modern, competitive, and anger-driven sports distance us from ourselves. To attain virtues and beauty, human need to live a life in harmony with their nature and revisit their ontological relationship with nature through recreation (Serres, 2023).

It is well-known that our thoughts influence our emotions, our emotions influence our behaviors, our behaviors become habits, our habits shape our

values, and our values define our character. At every step of this transformation, the relationship between the individual and nature comes to the forefront. Being familiar with the green and blue of nature, making friends with animals and plants, makes us feel as if we are part of the universe. During this process, time can sometimes feel like it speeds up and other times like it slows down. The individual flows with time in nature. Csikszentmihalyi (1977) defines the flow experience as a holistic feeling and optimal experience that individuals undergo when they concentrate all their interest and focus on the task at hand. In a state of flow, also referred to as the state of optimal performance, individuals are seen to be fully immersed in the experience, ignoring all unrelated perceptions and elements, losing self-awareness, and feeling an optimal state of emotion at the activity's end. The flow experience can be described as a holistic experience where individuals face certain challenges to achieve a specific goal during any activity, their skills are sufficient, the actions are under their control, they fully engage in the activity, and derive immense enjoyment (Csikszentmihalyi, 1990). Chen (2000) describes the flow experience as the state in which individuals, during an activity, are so immersed in full concentration and focus that they do not realize how time passes and derive pleasure and enjoyment from the experience. People develop routines and participate in recreational activities to spend their free time efficiently or to escape moments of anxiety. To improve one's life, one must first improve the quality of the experiences they have (Dilmaç, 2023). For the flow experience to occur during an activity, the individual strives to do their best and continuously improve their skills. Although there is no shortcut to flow, understanding how the flow process

works can show individuals the way to derive pleasure and enjoyment from life, and free up the psychic energy otherwise spent on boredom, anxiety, and stress, thereby positively transforming their lives (Csikszentmihalyi, 1990).

Time and spaces are closely related to our consciousness. Especially in nature, recreational activities can hold special meanings for participants, drawing them into another world. The summit of a mountain, the edge of a lake, or the middle of a forest can positively impact individuals' spiritual well-being, leading them on a spiritual journey. Therefore, places enrich the recreational experience. Through a phenomenological perspective, emotions, experiences, relationships, and meanings within outdoor recreation can be understood more deeply.

3. Conclusion and Suggestions

In this study, we approach outdoor recreation from ontological and phenomenological perspectives, focusing on various aspects of recreation that we believe have been previously overlooked. During this focus process, we aim to provide philosophical interpretations of outdoor recreation within the framework of existence and experiences, while maintaining a critical perspective, and evaluate the subject from an anti-secular viewpoint.

The research results suggest that recreation is not merely a means of entertainment or self-satisfaction. Outdoor activities provide individuals with the opportunity to experience diverse physical, social, and spiritual benefits. Through these activities, people can gain a better understanding of themselves and their surroundings, enhancing their cognitive capacity and finding positive meanings in their life journey. Human are multi-

dimensional beings, and today, we face numerous unknowns regarding both humanity and the universe. In this journey of seeking answers to these unknowns, outdoor recreation is thought to play an important role in self-discovery. In the face of life's adversities, spending time in nature, fishing, camping, traveling, and engaging in similar activities can be seen as an ontological journey to one's essence. During this journey, it is important to consider the needs of individuals and which outdoor recreation activities can fulfill these needs. Additionally, questions such as "Why do I exist?", "What is the nature of my existence?", "What is my purpose in this world?", "What is the meaning of the life I live?", "What is my relationship with time and space?", and "How should I spend my leisure time as a mortal being?" can be answered through the ontological and phenomenological dimensions of outdoor recreation.

This study aims to elevate the philosophy of recreation and leisure time to a different dimension on the world of existence. Therefore, instead of focusing on the cyclic questions related to existence within the section, we have concentrated on topics such as self-realization, feeling, experiencing, and meaning-making. Future research can further enrich the subject scientifically by focusing on the benefits of various recreation activities in the journey to the individual's essence. At the same time, by developing new concepts and metaphors related to recreation science, an intellectual, philosophical, and scientific foundation can be prepared for leisure researchers. In addition to all these, it is suggested that outdoor recreation be examined by utilizing the philosophies of existence, ethics, and religion. Studies on recreation generally focus on situational assessments, quantitative relationships, and practical applications. Most recreation

researchers in Turkey come from sports science or tourism faculties. However, conceptual, theoretical, sociological, and philosophical evaluations by anthropologists, sociologists, psychologists, and philosophers can play a significant role in adapting the practical aspects of recreation to Turkish culture. Therefore, shaping the concept of recreation in the minds of Turkish individuals and developing awareness of leisure time is crucial. When planning, coordinating, and implementing activities, it is essential to consider Turkish-Islamic identity, Anatolian wisdom, and cultural variables. Only in this way can we create a unique leisure time model and ensure that the younger generation is conscious of it. Thus, recreation researchers should focus on the impact of recreation activities on Turkish society, how they should be designed, and the paradigms to be adopted, rather than just the health outcomes, to contribute to the development of recreation philosophy.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Aggerholm, K. (2015). Existential philosophy and sport. In *Routledge handbook of the philosophy of sport* (pp. 142-160). Routledge.
- Barakazı, M. (2019). Turistik tüketim ve turizm faaliyetlerinin turizmi tüketmesi. *Safran Kültür ve Turizm Araştırmaları Dergisi*, 2(2), 138-149.
- Becker, C. (2008). Thoreau's economic philosophy. *The European Journal of the History of Economic Thought*, 15(2), 211-246.
- Booth, D. (2020). Nature sports: Ontology, embodied being, politics. *Annals of Leisure Research*, 23(1), 19-33.
- Breivik, G. (2010). Trends in adventure sports in a post-modern society. *Sport in society*, 13(2), 260-273.
- Breivik, G. (2020). The sporting exploration of the world; toward a fundamental ontology of the sporting human being. *Sport, Ethics and Philosophy*, 14(2), 146-162.
- Cevizci, A. (2021). *Felsefe sözlüğü*. İstanbul: Say Yayınları.
- Chen, H., Wigand, R. T. and Nilan, M. (2000). Exploring web users' optimal flow experiences. *Information Technology & People*, 13(4): 263-281.
- Csikszentmihalyi, M. (1977). *Beyond boredom and anxiety*. (Second Printing). San Francisco: Jossey-Bass.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: HarperCollins.
- Dilmaç, E. (2023). *Ekstrem sporcularda rekreasyonel akış deneyiminin esenlik algısı üzerine etkisi* (Unpublished master's thesis). Sakarya Uygulamalı Bilimler Üniversitesi, Sakarya.
- Frankl, V. E. (2021b). *Anlam istenci logoterapinin temelleri ve logoterapi uygulamaları*. (M. Yalçınkaya, Çev.). İstanbul: Totem Yayınları.
- Frankl, V.E. (2021a). *İnsanın anlam arayışı*. (Ö. Yılmaz, Çev.). İstanbul: Okuyan Us Yayınları.

- Godbey, G. (2009). Outdoor recreation, health, and wellness: Understanding and enhancing the relationship. RFF Discussion Paper No. 09-21.
- Gökdemir, O. (1994). *İnsan ve doğa: Ölen bir ideoloji üzerine incelemeler*. İstanbul: Ataal Yayıncılık.
- Kelly, J.R. (1999). Leisure and society: A dialectical analysis. E. L., Jackson, T. L. Burton (Eds). In *Leisure studies: Prospects fort he twenty first century*. (pp. 53-68) Pennsylvania: Ventura Publishing.
- Kleinman, P. (2019). *Felsefe 101*. (A. Şükrü, Çev.). İstanbul: Say Yayınları.
- Kraus, R. G. (1985). *Recreation program plannig today*. London: Scott, Foresman and Company.
- Lackey, N. Q., Tysor, D. A., McNay, G. D., Joyner, L., Baker, K. H., & Hodge, C. (2021). Mental health benefits of naturebased recreation: A systematic review. *Annals of Leisure Research*, 24(3), 379-393.
- Mengüşoğlu, T. (1945). Fenomenoloji felsefesi. *Felsefe Arkivi*, 1(1). 47-74.
- Öktem, Ü. (2005). Fenomenoloji ve Edmund Husserl'de apaçıklık evidenz problemi. *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi*, 45(1), 27-55.
- Özdemirci, A., & Saruhan, Ş. C. (2022). *Bilim, felsefe ve metodoloji*. (7. Baskı). İstanbul: Beta Yayınları.
- Serres, M. (2023). *Dağ ve filozof: Beden varyasyonları*. (Z.H. Erdoğan, Çev.) Ankara: Fol Kitap.
- Simpson, S., & Yoshioka, C. (1992). Aristotelian view of leisure: an outdoor recreation perspective. *Leisure Studies*, 11(3), 219-231.
- Stoller, L. (1956). Thoreau's doctrine of simplicity. *New England Quarterly*, 443-461.
- Thoreau, H. D. (2020). *Yürümek* (S. Işık, Çev.). İstanbul: Can Yayınları.
- Vespestad, M. K., & Lindberg, F. (2011). Understanding nature-based tourist experiences: An ontological analysis. *Current issues in tourism*, 14(6), 563-580.

Wolsko, C., Lindberg, K., & Reese, R. (2019). Nature-based physical recreation leads to psychological well-being: Evidence from five studies. *Ecopsychology*, *11*(4), 222-235.

Res. Assist. Eminsafa DİLMAÇ

E-mail: eminsafadilmac@subu.edu.tr

Educational Status: Ph.d. Candidate

License: Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation (2016-20)

Degree: Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation (2020-23)

Doctorate: Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation (2023- ongoing)

Professional experiences: Eminsafa Dilmaç is a Research Assistant in the Department of Recreation Management at the Faculty of Tourism at Sakarya University of Applied Sciences. Conducting academic studies in the fields of recreation philosophy and recreation sociology, He works as a recreation specialist in youth camps and is also interested in outdoor recreation and extreme sports.

Prof. Dr. Orhan BATMAN

E-mail: obatman@subu.edu.tr

Educational Status: Professor Dr.

License: Uludağ University, Balıkesir Faculty of Engineering, Balıkesir School of Tourism and Hotel Management, Pr. (1984-88)

Degree: Uludağ University, Institute of Social Sciences, Tourism Management and Hotel Management (1988-90)

Doctorate: Istanbul University, Institute of Social Sciences, Organization and Business Policy (1990-95)

Professional experiences: Orhan Batman is a professor at the department of Tourism and Hotel Management at Sakarya University of Applied Sciences. Some of his selected works include, tourism policy and strategy; philosophy, theory, applications of Halal tourism; hotel management, international hotel management.

Current Recreational Activities and New Trends in a Changing World

Prof. Dr. Bülent DENİZ ¹ 

¹Aydın Adnan Menderes University, Faculty of Agriculture, Department of Landscape Architecture, South Campus, Çakmar, Aydın/Türkiye.

ORCID: 0000-0002-3516-0480

E-mail: bdeniz@adu.edu.tr

Prof. Dr. Çiğdem KILIÇASLAN DENİZ ² 

¹Aydın Adnan Menderes University, Faculty of Agriculture, Department of Landscape Architecture, South Campus, Çakmar, Aydın/Türkiye.

ORCID: 0000-0002-4467-3739

E-mail: ckilicaslan@adu.edu.tr

Citation: Deniz, B. & Kılıçaslan Deniz Ç. (2024). Current Recreational Activities and New Trends in a Changing World. Göktuğ, T.H.. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:2, 27-49. ISBN: 978-625-367-855-5. Iksad Publications.

DOI: <https://doi.org/10.5281/zenodo.13882927>

1. Introduction

We live in a period where technological, economic and social transformations are taking place very dramatically. These transformations are also rapidly changing the recreational attitudes and expectations of individuals.

This article aims to examine the evolution of recreation in the historical process, the dynamic state of recreational tendencies in today's society and the multifaceted factors that direct their transformation.

Activities and events that people do voluntarily for fun and to have a good time in their free time can be defined as recreation (Deniz et al. 2019). It is seen that recreational activities vary greatly from society to society as well as from period to period. The results obtained by examining scientific studies in a broad framework point to some of the main factors that lead to changes in individuals' recreational expectations and attitudes: Technological transformations, increased awareness of health and healthy life priorities, development of environmental awareness, increase in urban areas and urbanization, changes in social dynamics, the effects of the pandemic period and the effects of the search for work-life balance on recreational behaviours.

It would be a great mistake to consider the changes in recreational activities and attitudes as simple changes in the entertainment understanding of individuals and society. We see that the transformations seen in the field of recreation have had very important effects on both individuals and societies from ancient times to the present day. Recreation has had significant effects on the social relations, economic structure and even the political and administrative structure of that society in every

period. It has been a driving force of technological developments, economic activities, and innovation, and one of the most important tools of cultural and social interaction between societies. In fact, recreation has become an increasingly important occupation for urban people living a fast and intense life cycle today. It is one of the most important factors in the reshaping of the social and cultural structures of societies and is also of primary importance in terms of the physical, spiritual and social integrity of individuals (Turan et al, 2024).

1.1. What Do We Understand When We Say Recreation?

First of all, it is necessary to fully answer the questions of what exactly recreation defines, which activities are considered recreation and what are the limits of the definition of recreation. Although the term recreation was first used in English in the late 14th century as a word of Latin origin, meaning "revival or healing of a sick person", the act of recreation itself is probably as old as human history. First of all, the most important feature of recreational activity is that it is done for the purpose of entertainment and relaxation. Recreation is done freely outside of working hours in order to evaluate free time and there is no profit purpose in the action taken. Recreation gets its power from intrinsic motivation. The main purpose is to reveal joy, pleasure, entertainment or personal potential and to push individual limits. There is no external motivation such as compulsion, obligation or reward, or earning. Another general feature of recreation is that it helps with mental and physical recovery (Pegg et al, 2012). Recreational activities are considerably important for individual and community health in terms of psychological, social and physical aspects. For this reason, recreational areas and activities integrated into our daily

life shape the lives of individuals and also support their developments (Türel et al, 2014).

Engaging in recreational activities is like a life support system for all people of various age groups, both working and unemployed, living in cities and rural areas. Also, for people living in the city, doing recreational activities in the countryside is a form of escape from nature (Turan & True, 2023).

The scope of recreational activities is quite wide. It can be carried out individually or collectively. Sports, arts, crafts, cultural activities, passive pursuits, performances and shows, outdoor adventures, exercises and similar activities that individuals and communities can enjoy, have a good time, and satisfy physically and spiritually can be considered recreation. In addition to these, and with the development of technological opportunities today, digital, online and video platforms/games/content, which stand out as the most common recreational activities, have also expanded the boundaries of recreation considerably (Pegg et al, 2012).

As can be understood from these definitions, recreation serves the entertainment purposes of some individuals, while being an important means of social interaction and transformation, and also stands out as a huge commercial market for individuals/groups/companies. This multifaceted complex structure of recreation also makes recreation one of the most important driving forces of societies and the world we live in and one of the leading activities of all kinds of transformation (social, economic, cultural, etc.).

Another feature of recreational activities is their versatility (Jenkins, 2014). A simple individual action such as reading, writing, or painting can

be both a means of having a good time and an important action for personal development. On the other hand, it may require a team game that involves significant infrastructure needs and many participants, or it may require online platforms based on technological infrastructures and software. As can be seen, individuals' recreation preferences require the creation of sometimes huge physical or digital infrastructure opportunities required for recreation to take place, the use of public resources to build sports fields, the creation of spatial arrangements in physical plans, and a huge organization for the production, marketing, advertising, and distribution of all kinds of tools, equipment, and materials required for recreation activities to take place. The point we particularly want to emphasize here is that although recreation is defined as a free time activity performed for individual entertainment and a good time without profit, sometimes huge budgets, lands, infrastructure facilities, and public resources are needed for recreation activities to take place, and a very well-organized economic and commercial structure is needed for these to take place. Understanding the structure, evolution and trends of recreation, which has such an important function in social life and in shaping the world we live in, will have profound effects on our understanding of the future (Griffiths et al., 2014).

1.2. The Place of Recreation in Individual and Social Life

Recreational activities have an important place in individual and social life. Understanding the place of recreation in our lives is of critical importance for analyzing social structure, understanding social, economic and cultural relations and making healthy future plans. First of all, recreational activities serve as one of the most important tools for

individual well-being (Peacock et al., 2018; Demircan, Aytatlı, & Yıldız, 2018).

They allow individuals to get away from their daily responsibilities and work, and provide a break for breathing, renewal and relaxation. The mental and emotional relaxation provided by these activities is invaluable; it helps reduce stress and improve general mental health. Beyond individual benefits, recreation promotes the social harmony of individuals. Most types of recreation create and encourage opportunities for social togetherness and interaction. It prepares the ground for social harmony and solidarity. For example, team sports, community events, festivals, shows, and club activities are places where individuals develop their skills, and they also develop social solidarity, cooperation, and empathy. In addition, some recreational activities play a vital role in keeping local cultures and identities alive, preserving, transmitting, promoting, and developing cultural heritage. Local handicrafts, folklore studies, folk costumes, collecting, and local and ethnic art shows are the most valuable examples (Venter et al., 2020). Such recreational activities contribute to the diversity and richness of local cultures by encouraging cultural richness, creativity, and innovation. As mentioned in the previous section, one of the most important features of recreational activities is their importance and role in the economy. Depending on their nature, recreational activities can have very large economic values. However, the fulfilment of these activities may require the organized work and support of a large population group. If we consider that entertainment, sports, tourism, and art activities are areas of recreational activity, we will better understand how large an industry is in question worldwide. These industries create numerous job

opportunities, create a commercial cycle, direct consumer spending and therefore create a driving force for the country's economy. The increase in the level of welfare, the widespread transportation opportunities and the ease experienced have also increased the diversification of recreational activities and the opportunities for individuals to participate in recreational activities in very different environments (Aytatlı et.al.,2020). Considering the point that technology has reached today, we need to think about how recreation and entertainment terms have been redefined with the opening of the doors of the digital age and how much the boundaries of this area have expanded. Internet platforms, online interactive games and content and digital activities now reach very large audiences and allow individuals to interact and socialize on a global scale. Recreation has now been given much more complex meanings than individuals' leisure time activities with today's experience. The economic developments and the increase in the level of welfare experienced in our world have brought about a considerable diversification of recreational activities and a high level of global access and interaction.

1.3. What Are the Factors Directing Our Recreation Tendencies?

While the world we live in is experiencing major changes in social, cultural, economic and technological areas, these transformations are also reflected in every area of our daily lives, and of course, our recreational tendencies and expectations undergo major transformations over time. In this respect, it is useful to first outline the various factors that affect recreational activities today.

Technology: The most important factor that has fundamentally changed the phenomenon of recreation today is technology. Developments in

technology have had a significant impact on recreational trends. The rise of smartphones, social media and streaming services have changed how people spend their free time. For example, video games, online streaming and virtual reality have become increasingly popular forms of recreation. Innovations such as virtual reality (VR), augmented reality (AR) and digital gaming platforms have fundamentally changed entertainment norms and practices. It would not be wrong to say that the future of recreation will increasingly be shaped by digital, immersive and personalized experiences.

Health and Personal Development: The negative environmental and living conditions of our modern world pose serious threats to the physical and mental health of individuals and societies, and it is observed that these effects are increasing day by day. In recent years, there has been an increasing awareness of health, personal care and development, and a wide variety of demands and activities in this direction. Today, the increase in outdoor activities, especially the interest in yoga, meditation, nature walks, camping and nature sports, points to this fact. People are looking for activities that will improve their general well-being, where they can reach spiritual and physical satisfaction, beyond just spending free time and having fun.

Environmental Awareness: Population growth and industrialization have brought about environmental disasters and led to the emergence of a counter-movement based on environmental awareness, for the protection and improvement of the environment. This awareness has increased the popularity of environmentally friendly recreational activities such as cycling, camping and nature conservation projects. Seeking for more

environmentally friendly activities has gained strength in this period, where activities that may have negative impacts on the environment and local resources, such as mass tourism, are gradually abandoned and more environmentally friendly activities come to the fore.

Effects of Urbanization and Outdoor Recreation: One of the most obvious effects of industrialization is the rapid increase in the urban population and the growth and expansion of urban areas. The growth of cities and the difficulty of working conditions have led to individuals seeking to improve their daily lives and increase their level of welfare; and have necessitated the increase in urban open spaces such as parks, open spaces, playgrounds and sports areas, zoos, and botanical gardens. These areas have created opportunities for society and individuals to come into contact with nature and experience nature by escaping from the negative conditions of cities. **Social Dynamics:** Changes in social dynamics, including demographic changes and cultural influences, also play a role in shaping recreation trends. Significant differences have also occurred in social lifestyles in recent years. Difficulty in living conditions, differences in individual preferences, tendencies towards living alone, decrease in marriage rates, and increase in divorce rates have also caused a significant transformation in the social structure. These changes are also reflected in recreation attitudes. Digital social platforms, the increase in demand for video games, solo travel, an increase in individual entertainment activities, personal development, self-centeredness, self-discovery and independent living trends are clear indicators of this social transformation.

Pandemic Effects: The effects of the COVID-19 pandemic have not been limited to our business life and the way we work. It has also had a deep

and lasting impact on our social life, the way we socialize and our recreational tendencies. The pandemic has radically changed the daily life of the societies. This situation deprived us of many things that were ordinary until recently. The first of these is the freedom to be in contact with other members of the community in common places outside the home (Turan & Malkoç True, 2023). The restrictions imposed on indoor activities during this period have provided a unique opportunity for people to rediscover nature. There has been a phenomenal increase in outdoor activities such as countryside activities, camping, hiking, cycling and outdoor dining. Virtual entertainment such as online events, courses and virtual tours have entered our lives and become popular during this period.

2. Recreation in History

To provide a meaningful background to recreation in today's society, it is useful to look at what recreation was in the past and how it evolved. We can trace the roots of many of our contemporary views of recreation to the traditions and practices of ancient cultures. The history of recreation and leisure is a rich tapestry of people, places, events, and social forces that illustrate the roles of religion, education, and government, and the traditions and values, arts, sports, and entertainment of different cultures. A chronological study of recreation can be traced back to the games of prehistoric peoples in the Paleolithic and Neolithic periods. Although archaeologists have unearthed artifacts that provide first-hand evidence of the creative, athletic, and recreational activities of primitive peoples around the world, little is known about recreation and leisure from such early times.

When it comes to recreation in primitive societies, the first place to look may be games and music. The origin of games can be considered as a re-enactment of wars and conflicts or a sportive preparation activity. Making music and using musical instruments can be completely associated with religious ceremonies and rituals. The use of musical instruments in wars and as elements of rhythm and courage are also frequently encountered. Making clay pots, wall drawings, depictions, paintings, daily use tools, ornamental objects, jewellery and similar early works are examples of cultural activities of daily life. Some of these products also appear as status symbols and indicators of loyalty to a group or community. Competitions and contests where skills, abilities and strength required for activities such as hunting and war were demonstrated were also the forerunners of the first sports activities. Recreational activities in ancient times had much more meaning than just the evaluation of free time. The emergence of these activities was a result of religious, social and cultural influences or a product of war, strength and endurance training stemming from societies' instinct to protect themselves. These activities requiring physical strength, skill and strategy were also a means for individuals to be accepted into the community. These games existed as religious rituals symbolizing the struggle between good and evil, life and death in some communities.

In order to understand recreation, we must first understand the concept of leisure. Because leisure is the basis of recreation. In human history, the transition from hunting and gathering based on nomadism to an agricultural society based on grazing animals and planting crops constitutes an important turning point. As a result of agricultural society, social classes began to form and the ruling classes developed along with

craftsmen, peasants, soldiers and slaves. As villages and cities developed and large areas of land were cultivated and agricultural products increased, upper-class societies gained power, wealth and leisure. Thus, seven thousand years ago, a leisure class emerged for the first time in history in the aristocracy of the first civilizations that developed in the Middle East.

2.1. Recreation in Ancient Egypt

Ancient Egypt established a very advanced and rich civilization in the fields of astronomy, engineering, architecture, construction and agriculture. The ancient Egyptian civilization, dating from 5000 BC to the Roman period, had a strong noble class and a class structure of society with soldiers, priests, artisans, peasants, workers and slaves. The Egyptians, who lived a colorful and enjoyable life, created a rich culture with sports, music, and art. Activities such as bullfighting, music, and drama included both religious themes and served the purpose of entertainment in social life (Hurd et al., 2021).

2.2. Recreation in Ancient Assyria and Babylonia

The Assyrian and Babylonian empires continued their existence as a magnificent civilization on the fertile lands between the Euphrates and Tigris rivers in the Middle East until the invasion of Alexander the Great in 330 BC.

In these civilizations, as in ancient Egypt, art and sports were widely seen as popular entertainment in social life. Reliefs and inscriptions show that hunting was also a very important activity in addition to art and sports. These civilizations were also famous for their feasts, entertainments and events. Hanging gardens, vineyards and fishponds had special importance for the royal circles and nobles during this period.

2.3. Recreation in Ancient Greece

In the ancient Greek civilization, especially between 500 and 400 BC; humanity reached a new peak with the developments in culture, art, philosophy and athletics. The first one was 2800 years ago in BC. The Olympic Games, which began in ancient Greece in 776, are one of the most important events organized on a global scale in today's world. This event included games such as running, wrestling, and javelin throwing, which tested strength and endurance, and brought together athletes from different city-states. The Olympics, which were a central sporting and social event in Greek civilization, were also one of the most important elements of Greek culture and unity. In Greek city-states and Athens, the city dwellers and the noble class, who had full citizenship rights, attached great importance to learning, art, and sports. Music, theatre, poetry, gymnastics, and athletics competitions were organized on special days and festivals with religious themes that coincided with approximately 70 days of the year and were celebrated with wide participation (Hurd et al., 2021).

2.4. Recreation in Ancient Rome

Citizens of the ancient Roman Republic, built on strong and nationalistic foundations, had to fight and defend their country. This tradition led to the widespread practice of sports and gymnastics, which developed as part of the Romans' training for combat readiness. Rituals and games organized to worship Roman gods later became the beginning of festival games. These festivals were held under the supervision of Roman priests and supported by large budgets.

Roman architecture and construction reached the highest levels of that period. They established planned cities, built squares, open-air stages,

amphitheatres, baths, forums and stadiums in these cities. Noble Romans built villas for themselves and included courtyards, gardens and pools in their villas. There was a time in Rome when prosperity was such that 200 days out of 365 were public holidays and 175 of those were days for games and entertainment.

2.5. Recreation in the Middle Ages

With the fall of the Roman Empire, the organized power that maintained authority in Europe came to an end. It was a period of condemnation of the Roman Empire's lifestyle based on pleasure and entertainment, and a period of strengthening of the Catholic Church in society. Early Catholic Christian teaching was based on an asceticism that aimed to reach God through deprivation. This new order completely rejected the lifestyle inherited from Rome and the stadiums, amphitheatres and baths that symbolized that era were destroyed.

2.6. Recreation in the Renaissance

Historians agree that the Renaissance period began around 1350 AD in Italy, 1450 AD in France and around 1500 AD in England. This period is a transition period between the medieval world and the modern age. The word Renaissance means “rebirth”. The characteristic feature of this period is the rediscovery of the knowledge, art, and philosophy of the ancient Greek and Roman civilizations. In clearer terms, the Renaissance defined a new freedom of thought and expression, a more rational and scientific perspective on life, and a social life in European life where science, trade, and travel could be done more freely. As we understand it today, many cultural and artistic activities, recreational approaches, and

hobbies, especially modern sports, theatre, music, and literature, are the products of this period.

During this period, as the great monarchic states of Europe gained stability, the church began to lose its power and the kings and nobles began to gain power. This newly formed noble class became patrons of art, music and literature, especially in Italy and France. During this period, great painters, sculptors, musicians, dancers and playwrights were raised and produced important works.

The development of the printing press during this period created a great development in the world of literature and music. Theatre, music, literature and dance became a very important part of social life, especially in the palaces and the nobility (Hurd et al., 2021). The most important feature that distinguishes the Renaissance from other periods is that recreational activities ceased to be a status symbol of a certain social class. In previous periods, the concept of recreation, which was a class activity, based on religious themes and survival motivation, was opened to the masses and became a tool for personal development, satisfaction of aesthetic feelings and multiculturalism (Huipeng, 2023).

2.7. The Emerging of the First Parks and Recreation Areas

European cities were compact settlements surrounded by castles and walls for defensive purposes in the Middle Ages and before. There were no sports fields or parks in these settlements. With the invention of cannons, it became difficult to defend cities surrounded by walls, and residential areas turned into suburbs outside the walls. Cities were now formed by the construction of wide streets, ornate buildings and monumental structures. Nobles built estates with large and magnificent gardens, and even opened

the gardens to the public. Three types of parks emerged during the Renaissance. The first were royal hunting preserves or parks, some of which have become famous public parks today. The 4,000-acre Prater in Vienna and the Tiergarten in Berlin are good examples. The second were ornamental and formal garden parks designed according to the so-called French garden style. The third were garden parks in the English style, which characterized nature.

2.8. 20th Century: Revolution in Recreation

Throughout history, the greatest changes in recreation occurred during this period. The Renaissance was influential in every area of daily life, as well as in the understanding of recreation and free time, and prepared the ground for the modern age. Recreation was no longer a class activity and encompassed the entire society. Free time activities diversified as much as possible, global organizations emerged, and recreation became a global industry and market. However, there is another reason why the 20th Century is described as a revolution: Technology and media.

In the early 1900s, we were introduced to an invention that had never existed in our lives before, namely cinema. This was followed by television broadcasts. These inventions completely changed the form of free time and recreation. These developments offered the masses a home-based entertainment concept with broadcasts such as movies, shows, news, and documentaries. A huge sector and a global platform emerged that reached almost all people in the world and transformed into a cultural transmission tool in the fields of entertainment, art, education, and sports. The most important development following the invention of television was the emergence of video games based on simple pixel games in the 1970s

(McCole et al., 2012). This sector reached enormous dimensions with the invention of the internet towards the end of the 1900s and became one of the most important recreation tools of our age with the internet environment. Digital platforms have not only expanded the boundaries of recreation but have also changed our entire lives and lifestyles.

Digital Entertainment has an important place in our lives today. Online games, broadcast platforms and social media have an important place in this medium. Digital broadcast platforms that offer movies, music and special content have provided unprecedented access to their users and, unlike traditional media tools, have allowed viewers to consume personal content completely according to their own program and preferences. Virtual and augmented reality technologies have begun to blur the line between the digital and physical worlds and create immersive experiences that were previously unimaginable.

On the other hand, in recent years, there has been a remarkable interest in outdoor recreation activities as a reaction to the rise of digital entertainment. This interest, which manifests itself through activities such as nature walks, yoga, meditation, cycling, fitness, camping, rock climbing, rafting and adventure sports, is based on being in touch with nature and being physically active. While the colorful digital world has insidiously entered our lives and changed the way we live, it has also brought many physical and mental problems, and the challenges people have to cope with have changed dramatically. The underlying reason for the turn to outdoor activities is the mental and physical health problems, stress, increasing obesity and cardiovascular fitness problems that people face today. The increase in outdoor recreation activities indicates the sense

of satisfaction, benefit and contentment that people get from these activities and the demand and interest in this direction is increasing significantly.

3. Conclusion

In our article, we tried to draw a general framework on the emergence of recreation in prehistoric times, in Ancient Egypt, in Ancient Assyria and Babylon, in Ancient Greece, in Ancient Rome, in the Middle Ages, in the Renaissance, in the 20th century and in the modern age, the concept of leisure and the dimensions that recreation has evolved to today. The definition of “Man is a social being” is one of the most common and basic definitions. When viewed from this aspect, recreation is an inseparable part of the social side of mankind and it would not be wrong to say that the history of recreation is as old as human history. While the first emergence of recreation developed as an extension of daily survival routines such as hunting and gathering, religion and wars became important motivations in shaping recreation in later periods. The increase in the level of welfare and the widespread concept of leisure transformed recreation into a tool for having a good time, having fun and individual development, moving it beyond religious motivation, meeting basic needs and self-defense instincts. While recreation used to cater to a certain elite group, nobility or royalty, it has become widespread and diversified to a very large segment of society. This diversification covers many areas, from physical and mental health activities to social interactions, outdoor activities, hobby groups, digital and virtual entertainment, economic impacts and environmental concerns. Recreational activities play an important role in improving and developing well-being, creating and strengthening social

ties, providing economic and cultural wealth through global and local tourism and even providing opportunities for environmental sustainability. Today, the level of technology and changes in our social structures have taken recreation to completely different levels, giving it economic, social and cultural importance on a global scale. The future of recreation lies in the intersection of technological developments, demographic shifts and lifestyle changes. Understanding these dynamics is important to better understand and analyse the complex nature of recreation, its future and challenges, and to provide responsive, inclusive and beneficial opportunities for all members of society.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Altuğ Turan, İ., Sönmez Türel, H., Malkoç True, E., Aktaş, E., & Özeren Alkan, M. (2023). A research on daily recreational space usage profile in the context of urban life. *Environment, Development and Sustainability*, 1-21.
- Aytatlı, B., Kuzulugil, A. C., Yıldız, N. D., & İspirli, N. S. (2020). Çocukların aile turizmindeki deneyimleri: Erzurum kenti örneği. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 24(1), 263-278.
- Deniz, B., Kılıçaslan, Ç., & Koşan, F. (2019). Rekreatyoneel Olanaklara Yönelik Beklentilerin Sağlıklı Kentler Yönüyle İrdelenmesi, Aydın Kenti Örneği. *Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, 3(2), 79-89.
- Demircan, N., Aytatlı, B., & Yıldız, N. D. (2018). Erzurum kent insanının rekreatyoneel davranış biçimleri. *Bartın Orman Fakültesi Dergisi*, 20(3), 420-430.
- Griffiths, M. D., Kuss, D. J., & Demetrovics, Z. (2014). Social networking addiction: An overview of preliminary findings. *Behavioral Addictions: Criteria, Evidence, and Treatment*, 119-141.
- Huipeng, Y. (2023). The evolution of recreational activities trends, impacts and future prospects. *Fizičko vaspitanje i sport kroz vekove*, 10(2), 63-77.
- Hurd, A., Anderson, D. M., & Mainieri, T. (2021). *Kraus' recreation and leisure in modern society*. Jones & Bartlett Learning.
- Jenkins, J. (2014). Politics, sport and the media in Britain: The case of the 2012 London Olympic Games. *Media, Culture & Society*, 36(4), 499-515.
- McCole, D., Jacobs, J., Lindley, B., & McAvoy, L. (2012). The relationship between seasonal employee retention and sense of community: The case of summer camp employment. *Journal of Park and Recreation Administration*, 30(2).
- Peacock, A., Leung, D., Larney, S., Colledge, S., Hickman, M., Rehm, J., ... & Degenhardt, L. (2018). Global statistics on alcohol, tobacco and illicit drug use: 2017 status report. *Addiction*, 113(10), 1905-1926.

- Pegg, S., Patterson, I., & Axelsen, M. (2012). The role of community festivals for older adults: a comparative study. *Leisure Studies*, 31(2), 193-211.
- Turan, İ. A., Türel, H. S., True, E. M., Aktaş, E., & Alkan, M. Ö. (2024). Determination of the most preferred daily recreational spaces in a metropolitan city. *Ain Shams Engineering Journal*, 102862.
- Turan, İ. A., & True, E. M. (2023). The perception of public space of the elderly after social isolation and its effect on health. *Ain Shams Engineering Journal*, 14(3), 101884.
- Türel, H. S., Turan, İ. A., True, E. M., & Kalaycı, A. (2014). *Determining the recreational opportunities of Ege University campus with regards to the view of landscape architecture students*, 25th Scientific-Experts Congress on Agriculture and Food Industry. İzmir, 197-200.
- Venter, Z., Barton, D. N., Gundersen, V., Figari, H., & Nowell, M. (2020). Urban nature in a time of crisis: recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. *Environmental Research Letters*, 15(10), 104075.

Prof. Dr. Bülent DENİZ

E-mail: bdeniz@adu.edu.tr

Educational Status: PhD

License: Landscape architecture

Degree: Landscape architect

Doctorate: Landscape ecology and urban planning

Professional experiences: Academic staff in Aydın Adnan Menders University

Prof. Dr. Çiğdem KILIÇASLAN DENİZ

E-mail: ckilicaslan@adu.edu.tr

Educational Status: PhD

License: Landscape architecture

Degree: Landscape architect

Doctorate: Coastal areas, urban areas

Professional experiences: Academic staff in Aydın Adnan Menders University


Relationship Between Geographic Information Systems (GIS) Technology and Remote Sensing Methods with Recreation

Dr. Lecturer Yaşar Selçuk ERBAŞ¹ 

¹Trabzon University Faculty of Sport Sciences, Department of Recreation,
Trabzon / Türkiye
ORCID: 0000-0001-8991-0964
E-mail: ysekcukerbas@trabzon.edu.tr

Assoc. Prof. Buket ÖZDEMİR IŞIK² 

²Trabzon University Faculty of Sport Sciences, Department of Recreation,
Trabzon / Türkiye
ORCID: 0000-0003-1617-8084
E-mail: ozdemirbuket@trabzon.edu.tr

Research Asst. Sabiha KAYA³ 

³Trabzon University Faculty of Sport Sciences, Department of Recreation,
Trabzon / Türkiye
ORCID: 0000-0002-0883-4486
E-mail: sabihakaya@trabzon.edu.tr

Citation: Erbaş Y.S., Özdemir Işık B. & Kaya S. (2024). Relationship Between Geographic Information Systems (GIS) Technology and Remote Sensing Methods with Recreation. Göktuğ, T.H.. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:3, 50-63. ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13872303>

1. Introduction

Urban areas, city centers, rural areas, and suburbs are interconnected; positive or negative situations in one can affect the others. Globally, the Industrial Revolution, and in Turkey since the 1950s, there has been a migration of population from rural to urban areas. This has led to a loss of appeal in rural areas and an increase in population density in cities.

Rural areas, which predate urban areas, have unique landscape values due to agricultural and livestock activities, as well as natural and cultural landscape components (Gül, Cesur & Bostan, 2019). Rural areas differ from urban areas in many aspects, such as population density, economic resources, social and cultural structure, and environmental relationships (Aydemir & Gül, 2023). They are often considered less developed than urban areas due to their low population, lack of infrastructure, and other factors (Erdem, 2012). According to Keleş (1996), rural areas are characterized by their reliance on agriculture, extended family structures, and strong face-to-face neighborhood relationships, distinguishing them from urban settlements.

The encroachment of urban uses into rural areas, due to tourism and second home developments, has led to the erosion of the unique identities of rural areas. To address this, there is a need for recreation planning that strengthens the local fabric and bridges the past and future, preserving the identity by contributing to the goals of protection, development, renewal, and sustainability (Kiper, 2013).

In Turkey, with the acceleration of urbanization since the 1980s, more emphasis has been placed on urban planning, while recreation planning has not been given sufficient importance (Çevik & Eminağaoğlu, 2007).

Since the early years of the Republic, legal frameworks for spatial development have been established. With Turkey's transition to planned development in 1963, national development plans were prepared, which included strategies for recreation areas. However, problems in planning were not fully resolved, and in 2012, with the enactment of the Metropolitan Municipality Law, villages were reclassified as neighborhoods, and urban planning approaches were applied to all areas within metropolitan boundaries (Çakıroğlu & Öztürk, 2020).

The advancements in technology have revealed the potential of using Geographic Information Systems (GIS) and Remote Sensing (RS) methods in planning. Geographic Information Systems (GIS) emerged due to the need to work with multiple maps in planning. GIS is based on mapping and overlaying various data for analysis and decision-making (Orhan, 2007; Yörüklü, 2009; Uzun et al., 2010a; Kurdoğlu et al., 2020). Remote Sensing is defined as obtaining information about physical and spatial characteristics of objects without physical contact, typically using satellite imagery (Lillesand & Kiefer, 1994; Eastman, 2003; Jensen, 2005). Remote Sensing provides data for GIS. The integrated use of GIS and Remote Sensing offers cost-effective and efficient methods for producing and organizing spatial data for land use planning (Şatır, 2013). Generally, maps used in planning display basic data such as road networks, administrative boundaries, geology, and vegetation, but without contextual relationships (Kurum, 2000). GIS and Remote Sensing methods help to establish relationships among these maps. The widespread integration of GIS and Remote Sensing technologies has led

to their extensive use in planning studies (Uzun et al., 2010b; Gözükara et al., 2015).

GIS is an information system that performs data collection, storage, processing, and analysis of geographical information. Remote Sensing involves systems that capture images of the Earth's surface using satellites, drones, airplanes, and other aerial vehicles to obtain information. The aim of this study is to highlight the contributions of integrating GIS technology and Remote Sensing methods in land planning processes and to provide examples of related studies. The study evaluates the advantages and disadvantages of GIS and Remote Sensing methods in the planning of recreational areas and offers recommendations for their sustainable planning.

2. Material and Method

The study is based on various academic works, both domestic and international, that utilize Geographic Information Systems (GIS) and Remote Sensing methods as material. Due to the broad scope of GIS and Remote Sensing methods in both landscape architecture and geomatics, the focus has been specifically on academic studies related to the planning of recreational areas.

3. Findings and Discussion

Cengiz (2003) conducted research on a Rural Development Model for the Protection of Landscape Values in Seben District. By using rapid rural assessment and AHP methods, he digitized natural and cultural landscape elements within a GIS environment. All data were stored within 250*250m grid cells and used to determine the suitability for recreational

purposes in the Alpagut village and its surroundings. The study emphasized the effective use of GIS at all stages.

Topay (2003) identified natural and cultural factors for various activities in Bartın-Uluyayla, such as horseback riding, hunting, mountain biking, mountaineering, free walking, golf, camping, skiing, climatology, bird watching, caving, trekking, and paragliding. Relevant criteria were transferred to a GIS environment, and queries were made to determine which areas were suitable for these activities.

Ergin (2006) used 1/25,000 scale topographic maps and Landsat satellite images from 1987 and 2002 in his study of the Çandarlı Gulf, which includes Çandarlı, Şakran, and Aliğa settlements. The IDRISI GIS Analysis program was used to process the maps and satellite images. CORINE land cover classification was then performed in the GIS environment. The study demonstrated the effective use of GIS and Remote Sensing throughout all stages by comparing controlled and uncontrolled classifications.

In the study conducted by Demirel et al. (2013), various tourism types already in place and potential tourism types in the Meryemana Valley within the Maçka district of Trabzon were identified. Relevant layers were digitized, and continuously updatable databases and maps were created within a GIS environment.

Gözükara et al. (2015) explored the role of Remote Sensing and GIS in organic and traditional farming areas. Remote Sensing technology was used to determine land use, plant types, and crop diversity in organic farming areas and watersheds, monitor plant health and growth, and estimate yields. Additionally, key soil properties, such as soil moisture,

were identified, and GIS was used to analyze relationships between environmental components in organic farming areas to enable sustainable land and soil management decisions and location-based decisions on plant nutrition, disease, and pest management.

Geymen (2017) examined the Elmalı Basin and its land use changes using Landsat satellite images from 1995, 2005, and 2013. The results obtained from the satellite images were transferred to a GIS environment. The study concluded that GIS and Remote Sensing-supported land use change monitoring would enable municipalities to plan water basins more effectively.

Kurdoğlu et al. (2018) investigated ecological sensitivity to reduce the pressure on national parks rich in biological diversity and cultural activities that need protection. GIS was used to analyze data such as slope, vegetation structure, proximity to water sources, elevation, and landform to determine ecological sensitivity. The criteria weights were first calculated using AHP techniques. These weights were then compiled in ArcGIS to conduct an ecological sensitivity analysis. Based on this analysis, recommendations for visitor management were provided to ensure the protection and sustainability of the national park's natural and cultural resource values.

Utuş (2022) performed landscape analyses within the GIS environment for six villages in the Drağna Valley, focusing on natural and cultural values, significant landscape points, ecotourism values, water usage, and agricultural land. Using a 1/25,000 scale topographic map, important landscape points, ecotourism classes, and land use maps were created in

GIS. The study developed recommendations for rural area planning and management.

Kılıç and Arslan (2022) evaluated the topography, land use, and infrastructure approach of the Burdur Basin using Remote Sensing and Geographic Information Systems. Slope, aspect, and elevation maps were created in GIS for the area. The study area was categorized into gray, yellow, green, and blue infrastructure and analyzed in relation to slope, aspect, elevation, and climate characteristics. Controlled classification was performed using Sentinel-2A satellite images, and indices such as NDVI, NDWI, and SAVI were used to analyze the potential of these indices for infrastructure identification.

4. Conclusion and Suggestions

In planning studies, Remote Sensing methods contribute significantly to determining the current land cover, identifying changes in landscape structure over different years, and providing a better understanding of the landscape when assessed alongside ongoing processes within the landscape. Landscape studies play a crucial role in recreational area planning. In this context, selecting appropriate satellite imagery according to the scale of the planning is essential for the success of the planning process. Otherwise, images obtained outside the plan scale will not serve the planning purpose. Since the 1990s, the use of Remote Sensing methods has become more widespread in Turkey. Recent technological advancements have made the processing and interpretation of satellite images easier.

Recently, planning studies or approaches conducted without GIS are almost nonexistent. GIS programs, with their data updating capabilities

and integration with other connected programs, provide significant ease in understanding landscape functions, structures, and changes.

In most examined recreational area planning studies, it is almost impossible to access ready-made databases. In this context, a significant amount of time and effort is spent transferring data into a computer environment. GIS and Remote Sensing methods should be used at all scales in planning studies, and all produced data should be collected at both regional and national levels.

This study highlights both the advantages and disadvantages of integrating GIS technology and Remote Sensing methods in the planning process of recreational areas. The advantages include:

Data Collection and Analysis Capability: GIS provides the ability to collect, store, and analyze geographical data in recreational areas, improving the quality of the planning process.

Decision Support Tool: GIS facilitates decision-making processes for recreational area planning by visualizing geographic data on maps, enabling planners to make better decisions.

Multiple Layers: GIS integrates various data layers, offering a comprehensive view by combining different types of data such as land use, water resources, and population distribution.

Integration with Remote Sensing: When integrated with Remote Sensing technologies, GIS can be used to monitor and manage changes in recreational areas.

The disadvantages of integrating GIS technology and Remote Sensing methods in the planning process of recreational areas are:

High Cost: The development and training costs for GIS applications can be high, which may be a limiting factor for planning small recreational areas.

Infrastructure Issues: Recreational areas are sometimes not central locations. These areas may lack good internet connections and computer infrastructure, making effective use of GIS challenging.

Data Collection Challenges: Collecting up-to-date and accurate geographical data in recreational areas can be difficult, leading to inadequate data for GIS analyses.

Social Acceptance: The societal acceptance of GIS technologies is particularly low in recreational area studies, as GIS is not widely known in these fields.

In conclusion, while the integrated use of GIS and Remote Sensing methods presents some disadvantages in recreational area planning, it offers significant advantages. There are substantial benefits in terms of cost, time, and utility. Considering the use of GIS and Remote Sensing systems is crucial for successful implementation..

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

Authors contributed 1st Author % 50, 2nd Author %30 and 3rd Author %20 contributed.

References

- Aydemir, Ç., & Gül, A. (2023). Köylerin Mekânsal Planlama ve Tasarım Süreçlerinin Mevcut Mevzuata Göre İrdelenmesi. *Planlama Dergisi*.33(2), 1-13.
- Cengiz, T., (2003), *Peyzaj değerlerin Korunmasına Yönelik Kırsal Kalkınma Modeli üzerine yaptığı araştırmada: Seben İlçesi (Bolu) Alpağut Köyü Örneği*. Ankara Üniversitesi Fen Bilimleri Enstitüsü. Doktora Tezi. Ankara.
- Çakıroğlu, B.B., & Öztürk, S. (2020). Kırsal Alan Planlama Stratejileri: Kastamonu Gemiciler Köyü. *Bartın Orman Fakültesi Dergisi*, 22(2), 393-408.
- Çevik, S., Eminağaoğlu, Z. (2007). Kırsal yerleşmelere ilişkin tasarım politikaları ve araçlar. *Gazi Üniversitesi Mühendislik-Mimarlık Fakültesi Dergisi*, 22(1), 157-162.
- Demirel, Ö., Acar, C., Kurdoğlu, O., Karahalil, U., Akbulut, S., Tuluk, Ö. İ., Türk, E., Baykan, C., Işık, U., Bektaş, F., Ayan, V., Bediroğlu, Ş., Günay, T., Bayramoğlu, E., Özdemir Işık, B., Kantarcı, S., Bayramoğlu, M., Pirselimioğlu, Z., Yalçınalp, E., Demirel, S., Yalçın Abanoz, E., Öztürk, S., Düzgüneş, E., Kurt, S. S., Karakuzu, H. A., Var, M., Eroğlu, E., Özçelik, A. E., Karagöz, H., Günaydın, M., Nişancı, R., Erbaş, Y. S., Kurdoğlu, B. Ç., 2013. *Meryemana Vadisi'nde Alternatif Turizm Olanaklarının Araştırılarak Turizm Amaçlı Potansiyel Alan Kullanım Haritasının Oluşturulması*, Turizmde Bölge Potansiyelinin Harekete Geçirilmesine Yönelik Mali Destek Programı, T.C. Doğu Karadeniz Kalkınma Ajansı (DOKA) Ref No: TR90/10/TURİZM001-A/336 DPT.
- Eastman, R. (2003). Idrisi Kilimanjaro Manual and Tutorial. Clark Labs, Clark University, Worcester.
- Erdem, M. (2012). *Kırsal yerleşim peyzaj kimlik özelliklerinin tespiti, korunması ve geliştirilmesine yönelik değerlendirme matrisi önerisi*. Doktora Tezi, Fen Bilimleri Enstitüsü, İstanbul.
- Ergin, E. (2006). *Uzaktan Algılamanın Havza Yönetiminde Kullanımı: Çandarlı Örneği*. Dokuz Eylül Üniversitesi Fen Bilimleri Enstitüsü, İzmir.

- Geymen, A. (2017). Coğrafi Bilgi Sistemi Kullanılarak Su Havzalarındaki Arazi Kullanım Değişikliği ve Çevresel Etkilerin İzlenmesi: Elmalı Havzası Örneği. *Iğdır Üni. Fen Bilimleri Enstitüsü Dergisi*, 7(1), 171-181.
- Gül, A., Cesur, B., & Bostan, Ç. (2019). Kültürel Turizm Kapsamında Yerel Kimlik Oluşturma Yöntem Yaklaşımı. *Eurasian Education Literature Journal*, (3), ISSN: 2149-3510, 461-476, 2019.
- Gözükara, G., Altunbaş, S. & Sarı, M. (2015). *Organik Tarım Alanlarının Uzaktan Algılama ve Coğrafi Bilgi Sistemleri Yardımıyla İzlenmesi*, Doğu Karadeniz II. Organik Tarım Kongresi, 6-9 Ekim 2015, Rize, 156-165.
- Jensen, J. R. (2005). *Digital Image Processing: A remote Sensing Perspective*. Second edition. Prentice-Hall: Upper Saddle River, N.J.
- Keleş, R. (1996). *Kentleşme Politikası*. İmge Kitapevi: Ankara, 734 s.
- Kılıç, E. & Arslan, E. S. (2022). Uzaktan algılama teknikleri ile altyapı sistemlerinin konumsal analizi: Burdur Havzası örneği, *Türkiye Ormancılık Dergisi*, 23(2), 146-155.
- Kiper T (2013) Kentsel ve Kırsal Alanların Planlanmasında Kimliğin Rolü, *Türk Bilimsel Derlemeler Dergisi*, 6 (2), 73-77.
- Kurdoğlu, B. Ç., Yeniçirak, P. Ö. & Bayramoğlu, E. (2018). Ekolojik Duyarlılık Analizi: Kaçkar Dağları Milli Parkı Örneği, *Journal of International Social Research*, 11, 61.
- Kurdoğlu, B.. Ç., Yeniçirak, P. Ö. & Kurt Konakoğlu, S. S., (2020). *Coğrafi Bilgi Sistemlerinin Peyzaj Mimarlığında Kullanımı*, In: Mimarlık, Planlama ve Tasarım Alanında Akademik Çalışmalar, Manzak, B., Gece Akademi, Ankara, ISBN: 78-625-7938-98-3, Bölüm 4, 57-70.
- Kurum, E., (2000), *Peyzaj Planlama ve Tasarımında Coğrafi Bilgi Sistemleri*, Peyzaj Mimarlığı Kongresi, 225-230, Ankara.
- Lillesand, T. M. & Kiefer, R. W. (1994). *Remote Sensing and Image Interpretation*. John Wiley & Sons Inc.: New York.
- Orhan, D.M., (2007), *Türkiye'de CBS Tabanlı Uygulamalar Kapsamında Peyzaj Öğeleri Veritabanı Tasarımı: Ankara Kalesi Çevresi*

- Örneği*, Yüksek Lisans Tezi, A.Ü., Fen Bilimleri Enstitüsü, Peyzaj Mimarlığı Anabilim Dalı, Ankara.
- Şatır, O. (2013). *Aşağı Seyhan Ovası'nda Uzaktan Algılama ve Coğrafi Bilgi Sistemleri Yardımıyla Tarımsal Alan Kullanım Uygunluğunun Belirlenmesi*. Doktora Tezi, Çukurova Üniversitesi Fen Bilimleri Enstitüsü Peyzaj Mimarlığı ABD. Adana.
- Topay, M. (2003). *Bartın Uluyayla Peyzaj Özelliklerinin Rekreasyon–Turizm Kullanımları Açısından Değerlendirilmesi Üzerinde Bir Araştırma*. Fen Bilimleri Enstitüsü Basılmamış Doktora tezi, Ankara Üniversitesi, Ankara.
- Utuş, S. (2022). *Bartın İli Ulus Drahna Vadisi Örneğinde Yeşil Altyapı Yaklaşımı ile Kırsal Alan Planlaması*, Bartın Üniversitesi Lisansüstü Eğitim Enstitüsü Peyzaj Mimarlığı Anabilim Dalı, Yüksek Lisans Tezi, Bartın.
- Uzun, O., Dilek, E.F., Çetinkaya, G., Erduran, F., & Açıksöz, S., (2010a). *Bozkır-Seydişehir-Ahırlı-Yalıhüyük İlçeleri ve Suğla Gölü mevkii peyzaj yönetimi koruma ve planlama projesi sonuç raporu*, Türkiye Cumhuriyeti Orman ve Su İşleri Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü, Ankara.
- Uzun, O., Karadağ, A. & Gültekin, P. (2010b). *Coğrafi Bilgi Sistemlerinin ve Uzaktan Algılama'nın Peyzaj Planlamada Kullanımı*, III. Uzaktan Algılama ve Coğrafi Bilgi Sistemleri Sempozyumu, 11 – 13 Ekim 2010, Gebze, Kocaeli, 97-106.
- Yörüklü, N., (2009). *Peyzaj Mimarlığı Meslek Disiplini İçinde Coğrafi Bilgi Sistemlerinin Yeri ve Önemi*, TMMOB Coğrafi Bilgi Sistemleri Kongresi, İzmir.

Dr. Öğr. Üyesi Yaşar Selçuk ERBAŞ

E-mail:yselcukerbaserbas@hotmail.com

Educational Status:

License: Karadeniz Technical University

Degree: Karadeniz Technical University

Doctorate: Karadeniz Technical University

Professional experiences: Geomatics Engineering, GIS, Land Management

Doç. Dr. Buket ÖZDEMİR IŞIK

E-mail:ozdemirbuket@trabzon.edu.tr

Educational Status:

License: Karadeniz Technical University

Degree: Karadeniz Technical University

Doctorate: Karadeniz Technical University

Professional experiences: Landscape Architect, Recreation Areas Design, Coastal Planning

Arş. Gör. Sabiha KAYA

E-mail: sabihakaya@trabzon.edu.tr

Educational Status:

License: Karadeniz Technical University

Degree: Trabzon University

Doctorate: Trabzon University – continues

Professional experiences: Outdoor Adventure Tourism, Adventure Recreation, Recreation Management

Defining Recreation Potential in Bayraklı-Bornova/Izmir Using Multi-Criteria Decision Analysis

Serra ÇAKIR ¹ 

¹Izmir Democracy University, Faculty of Architecture, Department of Landscape Architecture, Izmir/Türkiye.
ORCID: 0009-0002-0640-3903
E-mail: serra.608@gmail.com

Asst. Prof. Birsen KESGİN ATAK ² 

²Izmir Demokrasi University, Faculty of Architecture, Department of Landscape Architecture, Izmir/Türkiye
ORCID: 0000-0003-4786-0801
E-mail: birsen.kesginatak@idu.edu.tr

Asst. Prof. Ebru ERSOY TONYALOĞLU ³ 

²Aydın Adnan Menderes University, Faculty of Agriculture, Department of Landscape Architecture, Aydın/Türkiye
ORCID: 0000-0002-2945-3885
E-mail: ebru.ersoy@adu.edu.tr

Citation: Çakır S., Kesgin Atak B. & Ersoy Tonyaloğlu E. (2024). Defining Recreation Potential in Bayraklı-Bornova/Izmir Using Multi-Criteria Decision Analysis. Göktuğ, T.H.. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:4, 64-91. ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13882990>

1. Introduction

Recreation encompasses a wide range of activities that individuals voluntarily engage in during their leisure time, away from obligatory tasks such as work or school. It is crucial for both the psychological and physical well-being of individuals. Recreation can be broadly categorized into two main types: passive and active recreation (Tribe, 1995). Passive recreation primarily involves activities where the participant's involvement is minimal, such as observing rather than contributing. Examples include enjoying a landscape, listening to music, appreciating the sound of water, or birdwatching in a park. Conversely, active recreation requires active participation from individuals and includes activities such as sports, travel, and engaging in artistic pursuits (Dalkılıç & Mil, 2017).

As noted by Hacıoğlu et al. (2003) and Sevil et al. (2012), recreation can also be classified based on the setting in which it occurs, giving rise to the concepts of indoor and outdoor recreation. Outdoor recreation refers to activities conducted in open spaces such as national parks, beaches, and forests, whereas indoor recreation encompasses activities that occur in enclosed spaces, such as reading, relaxing, or watching movies.

The rapidly increasing population and ongoing urbanization weaken people's connection to nature, thereby intensifying the need for recreational activities (Deniz et al., 2019). These activities allow individuals from diverse demographic groups—such as different ages, genders, income levels, and education levels—to come together and socialize, contributing to increased social cohesion. Furthermore, outdoor recreational activities have positive effects on environmental awareness and strengthen individuals' connection to nature.

Recreation potential can be defined as the measure of an area's suitability for implementing recreational activities or creating recreational spaces (Ardahanlıoğlu Bozhüyük, & Karakuş,2016). Assessing this potential is particularly important for making informed land-use decisions in newly developing areas, urban renewal projects, and post-disaster reconstruction efforts. These assessments ensure that recreational spaces meet user needs. Additionally, evaluating recreational potential provides valuable insights into whether existing urban structures adequately serve the recreational needs of a growing population, especially in light of migration and increasing urban density.

Rapid urbanization and the expansion of cities, particularly in regions like Bayraklı-Bornova in İzmir, have created a growing demand for well-planned recreational areas that address the diverse needs of urban populations. Urban green spaces are essential for promoting physical and mental well-being, as well as enhancing the overall quality of life in densely populated areas (Chiesura, 2004). However, planning and managing these spaces presents significant challenges due to competing land uses, diverse stakeholder interests, and environmental constraints (Haaland & van den Bosch, 2015).

In this context, evaluating and defining the recreational potential of urban areas through a comprehensive and systematic approach is critical for sustainable urban development. Multi-Criteria Decision Analysis (MCDA) has emerged as a robust tool for integrating various criteria and stakeholder perspectives in the decision-making process, making it particularly suitable for complex urban planning scenarios (Malczewski, 2004). MCDA has been successfully applied in various urban planning

contexts to assess land suitability for different purposes, including recreation.

This study aims to assess the recreational potential of the Bayraklı-Bornova region in İzmir using MCDA. By applying this approach, the research seeks to identify optimal sites for recreational development and provide strategic insights for urban planners and policymakers to enhance livability and quality of life in the region. Previous studies have demonstrated the effectiveness of MCDA in identifying areas with high recreational potential by considering factors such as accessibility, environmental quality, and social benefits (Bryan et al., 2010; Cengiz & Akbulak, 2013; Saaty, 2008).

Furthermore, integrating Geographic Information Systems (GIS) with MCDA has proven to be highly effective for spatial analysis, enabling the visualization and assessment of spatial criteria in urban environments (Malczewski, 2004; Feizizadeh & Blaschke, 2013). This combination allows for a more precise evaluation of urban spaces, ensuring that the identified recreational areas meet the diverse needs of the population while promoting sustainable urban growth.

Through a detailed analysis of geographic, environmental, and social factors, this study not only contributes to the academic discourse on urban recreation planning but also offers practical recommendations for the sustainable development of İzmir's urban spaces. In doing so, it aligns with broader objectives aimed at creating healthy, resilient, and livable cities (Tzoulas et al., 2007; Kabisch et al., 2015).

2. Material and Method

2.1. Study Area

Bayraklı and Bornova are two significant districts located within İzmir, Turkey, each boasting a rich history and cultural heritage (Figure 1). The Bayraklı and Bornova districts of İzmir serve as essential sites for historical research, offering insights into ancient civilizations and the region's continuous development. While Bayraklı emphasizes its archaeological heritage and interactions with influential cultures such as the Trojans and Hittites, Bornova is distinguished by its long-standing agricultural traditions and strategic importance. Together, these districts contribute to the rich tapestry of İzmir's past and present, making them vital for further study in archaeology, history, and cultural studies.

Strategically located at critical transportation intersections and endowed with fertile lands and water resources, Bayraklı and especially Bornova have historically been centers for agriculture and trade. This cosmopolitan area maintained its agricultural prominence during the Ottoman period and continues to thrive today, evolving with enhanced transportation infrastructure through the introduction of metro and garage systems.



Figure 1. Boundaries of the Study Area, Bayraklı and Bornova districts of Izmir (Source: Author)

Bayraklı and Bornova, two vibrant districts in İzmir, not only boast rich historical and cultural heritages but also offer significant recreational potential. The districts provide numerous recreational opportunities, from green parks and sports facilities to cultural venues and natural landscapes. This study area emphasizes the importance of these districts in promoting active lifestyles, community engagement, and leisure activities for a diverse population. Both districts play a crucial role in enhancing the overall recreational landscape of İzmir, making them integral to the city's livability and attractiveness as a destination for both residents and visitors.

2.2. Data Set

In this study, a total of 15 criteria were used in this study, categorized as accessibility, environmental factors and ecological factors (Table 1). Each data used in this study has a unique impact on the recreational potential.

These criteria were further classified according to their importance and degree of influence. The 'degree of importance' in the table refers to the rank of a criterion in terms of its impact on the recreational potential among all criteria. ArcGIS 10.8 software was used for data processing and analysis.

Table 1. Criterias to Assess Recreation Potential (Source: Author)

	Name	Data Source
1	Land Use Types	Urban Atlas 2018
2	Distance to Main Roads	Open Street Maps > Roads
3	Distance to Existing Cultural Areas	Manually created using Google Earth Pro
4	Distance to Waterways	Open Street Maps > Waterways
5	Vegetation Groups	Urban Atlas 2018
6	Forest Type	Copernicus > Dominant Leaf Type
7	Tree Cover	Copernicus > Tree Cover Density
8	Viewpoint Type	Manually created using Google Earth Pro
9	Distance to Erosion Prone Areas	Soil Map
10	Distance to Pastures	Urban Atlas 2018
11	Distance to Settlement	Urban Atlas 2018
12	Temperature	Aster DEM + Radial Basic Functions
13	Slope	Aster DEM
14	Altitude	Aster DEM
15	Aspect	Aster DEM

2.3. Method

2.3.1 Multi-Criteria Decision Making Method

Multi-Criteria Analysis (MCA), also referred to in the literature as Multi-Criteria Decision Making (MCDM), Multi-Criteria Decision Analysis

(MCDA), Multi-Objective Decision Analysis (MODA), Multi-Attribute Decision Making (MADM), or Multi-Dimensional Decision Making (MDDM), is not, contrary to popular belief, a single specific method. Instead, it serves as an umbrella term for various techniques and tools that formally incorporate multiple objectives and decision criteria (or attributes) into the analysis of a problem (Malczewski, 1999).

Multi-criteria methods evaluate a plan by considering its various dimensions and the interplay between often conflicting objectives, decision criteria, and metrics, more explicitly than single-criterion methods (Dean, 2020). Multi-Criteria Decision Making (MCDM) is a valuable tool for analyzing complex options and alternatives that involve diverse environmental and socio-economic impacts (Ünaldık, 2019). This method integrates information by ranking and comparing alternatives based on selected criteria. The process consists of three stages:

1. **Criterion Identification:** Criteria such as slope, elevation, aspect, soil, land use, distance to rivers, and temperature are determined based on the specific requirements of the analysis. Since the potential (or risk) associated with each land use type depends on different variables, a unique set of criteria should be established for each.
2. **Suitability Class Determination:** Suitable and unsuitable areas are defined for each identified criterion. For example, slopes exceeding a certain angle may be classified as unsuitable within the slope criterion.
3. **Weight Analysis:** Different weights are assigned to each criterion to reflect its significance in the decision-making process. These

weights can be obtained through expert opinions, surveys, or calculated using a specific formula.

MCDM is applied in planning and design processes to accurately evaluate situations that depend on multiple variables, such as suitability and risk analysis. In this method, the importance and impact of each criterion are ranked relative to one another, and the "importance degree" of each criterion is determined. Subsequently, the "weight" for each criterion is calculated using the following formula

Weighted Index = (number of criteria - importance degree + 1) / sum of importance degrees

After determining the weights in the application of the method, sub-suitability classes for each criterion are determined. These sub-classes will then be evaluated according to their suitability levels among themselves and included in the analysis in this way. Information on this stage can be found in Table 2.

2.3.1.1. The evaluation of factors

The proportion of vegetation cover is a significant factor in recreational areas due to reasons such as climatic comfort and visual appeal. The higher the proportion of vegetation cover, the greater the suitability for recreation. However, the composition of these plants is also important (Sildoja & Eagles, 2004). Forests, compared to shrublands or other vegetated areas (e.g., agricultural lands, meadows), offer a higher shade ratio, visual appeal, and opportunities for various activities (e.g., camping), making them more suitable. Although broadleaf forests are generally preferred over coniferous forests, mixed forests are considered more suitable for

recreational activities (Hunziker, 1995; Roovers et al., 2002; Ode et al., 2008).

Temperature values significantly influence the types of recreational activities that can be conducted in an area (for example, camping is less preferred in very hot weather) and are also crucial for user comfort (Booth et al., 2011).

Furthermore, accessibility is one of the most critical factors for a recreational area. In this context, areas closer to main roads have higher potential compared to remote regions. Additionally, since accessing areas with high slopes is more challenging, it can be said that recreational suitability decreases as the slope percentage increases. When considering the distance to settlements, areas that people can easily reach from their homes are more valuable in terms of recreational potential.

Areas close to settlements are generally also near other culturally valuable areas. This is important for strengthening the connection between areas serving different recreational purposes and highlights the higher recreational potential of areas closer to existing cultural sites.

Despite the inverse relationship between slope and recreational suitability, recreational suitability increases with elevation. The primary reason for this may be the greater dominance of the landscape and better air quality at higher altitudes. Proximity to water bodies is also a very important factor, similar to elevation, due to the high visual potential, the use of water as a resource, its soothing effect through sound, and the provision of an environment for recreational activities such as fishing and water sports. It can be said that areas closer to water bodies have a higher recreational potential (Oktay et. al., 2016).

As mentioned concerning elevation and water resources, the higher the visual potential of an area, the greater its recreational potential. However, the concept of 'vista type' is also quite important. The type of landscape an area possesses influences user experience and preferences. For instance, an individual living in a city may prefer a sea or mountain view rather than an urban view when seeking a recreational area for relaxation, whereas a tourist visiting a city for the first time may want to observe the city as a whole from a hilltop; in this case, an urban view may be more valuable than a mountain or sea view.

Aspect, on the other hand, affects a variety of factors such as the duration of sunlight an area receives, the amount and type of vegetation it has, the area's temperature, wind exposure, and precipitation. In this context, south- and west-facing slopes, which are generally more temperate, receive longer periods of sunlight and develop denser vegetation, making them more valuable in terms of recreational potential.

However, it is essential to consider the existing land use types in the area where a recreational area is planned. In many cases, a rigid urban fabric will not be demolished to create a natural area, and existing forests or rural areas will be utilized for this purpose.

Table 2. Defined criterion and weights for recreation potential (Source: Author)

Degree of Importance	Weight	Name	Subclasses	Data Source
2	0,12	Land Use Types	forest =4, rural =3, agricultural =2, other =1	Urban Atlas 2018
1	0,13	Distance to Main Roads	closest is most appropriate	Open Street Maps > Roads

4	0,10	Distance to Existing Cultural Areas	closest is most appropriate	Manually created using Google Earth Pro
5	0,09	Distance to Waterways	closest is most appropriate	Open Street Maps > Waterways
8	0,07	Vegetation Groups	forest =5, shrub =4, pasture =3, agricultural =2, other =1	Urban Atlas 2018
7	0,08	Forest Type	broadleaved =3, coniferous =2, non-forest =1	Copernicus > Dominant Leaf Type
6	0,08	Tree Cover	highest is most appropriate	Copernicus > Tree Cover Density
10	0,05	Viewpoint Type	forest =3, sea =3, mountain =2, city =1	Manually created using Google Earth Pro
15	0,01	Distance to Erosion Prone Areas	the farthest is the most suitable	Soil Map
14	0,02	Distance to Pastures	the farthest is the most suitable	Urban Atlas 2018
3	0,11	Distance to Settlement	closest is most appropriate	Urban Atlas 2018
11	0,04	Temperature	medium temperature is most suitable	Aster DEM + Radial Basic Functions
9	0,06	Slope	least is most appropriate	Aster DEM
12	0,03	Altitude	least is most appropriate	Aster DEM
13	0,03	Aspect	South and west sides are most suitable	Aster DEM
SUM OF DEGREES OF IMPORTANCE:		120		**Distance classes start with 0-250 and continue with 500 and 1000 m.
SUM OF WEIGHTS:		1,00		

In determining the sub-suitability classes of the criteria and the suitability status of these classes, expert opinions and other academic studies were

utilized. The data on the criteria were obtained from the sources shown in Table 1 and were subsequently subjected to the following processes.

Extracting the parts of the data to be used: From the road data obtained from OpenStreetMap, primary and secondary roads to be used in the analysis; from the soil map-derived erosion risk data, areas with erosion risk levels 3 and 4.

Reclassification: At this stage, both vector and raster data are reclassified according to their attributes to make them suitable for analysis. All classified vector data should be rasterized in order to run the analysis. Finally, a result map was generated using the Raster Calculator tool. The resulting map was reclassified according to a suitability scale ranging from 1 to 5. Hot Spot and High/Low Clustering analyses were employed to evaluate the results.

2.3.2. Hot spot and cluster analysis

To enhance the interpretation of the resulting map, hot spot and clustering analyses were conducted. These analyses help identify where high-potential recreational areas are concentrated and reveal the spatial patterns of this concentration. The Optimized Hot Spot Analysis identifies statistically significant spatial clusters of high values (hot spots) and low values (cold spots), generating a new output dataset that includes a z-score, p-value, and G_i Bin for each feature in the input data. Additionally, the High/Low Clustering tool supports this analysis by producing outputs with four key values: Observed General G, Expected General G, z-score, and p-value. This tool can also optionally generate an HTML file that provides a graphical summary of the results (see Figure 5).

In hot spot and clustering analyses, the z-score indicates how many standard deviations a point within the analyzed area deviates from the average recreational potential. The higher the z-score, the greater the recreational potential of the specified area relative to other points in its vicinity. The p-value represents the probability that the observed result occurred by chance. Typically, p-values below 0.05 are considered statistically significant. A smaller p-value indicates a more significant z-score, suggesting a higher likelihood that the identified patterns are meaningful rather than random.

3. Findings and Discussion

The assessment of the recreational potential in the Bayraklı-Bornova region using a Multi-Criteria Decision-Making (MCDM) approach has yielded insightful results that can significantly contribute to the urban planning and management of these districts. The analysis, incorporating 15 different criteria related to accessibility, environmental, and ecological factors, has identified key areas within the region that hold the highest potential for recreational development (Figure 2).

The study area, covering 224.37 km², has been analyzed to determine zones that are highly suitable for recreational use. Approximately 37.6% of this area has been classified as either highly suitable (rating 4) or very suitable (rating 5) for recreational purposes. Specifically, 20 km² of the area received the highest suitability rating of 5, indicating regions that are particularly favorable for a variety of recreational activities. Another 63 km² were classified as suitable, making these areas ideal for enhancing current recreational offerings or introducing new facilities. (Table 3) (Figure 3).

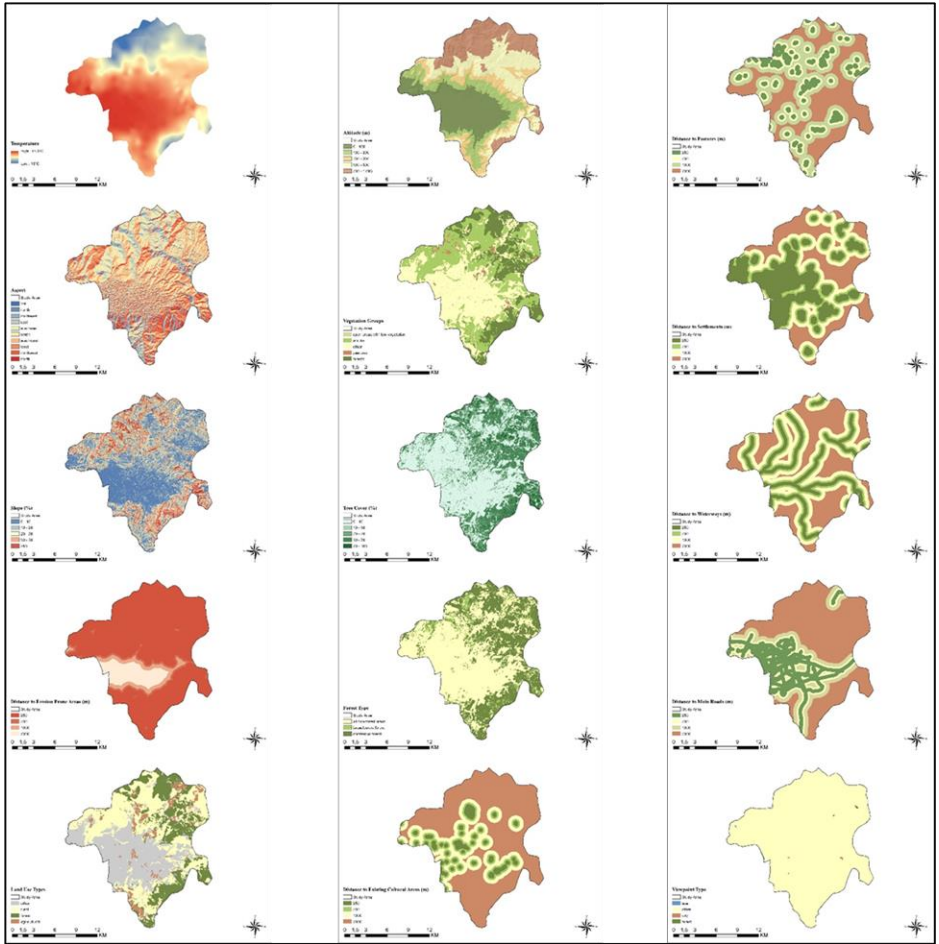


Figure 2. Degree of suitability criteria maps (Source: Author)

(1) temperature, (2) aspect, (3) slope, (4) distance to erosion prone areas, (5) land use types, (6) altitude, (7) vegetation groups, (8) tree cover, (9) forest type, (10) distance to existing cultural areas, (11) distance to pastures, (12) distance to settlements, (13) distance to waterways, (14) distance to main roads, (15) viewpoint types

Several factors were identified as critical in determining the high recreational potential of specific areas. Accessibility, for example, played a pivotal role; areas closer to main roads and public transportation hubs were more likely to be deemed suitable for recreational use. This finding underscores the importance of integrating recreational planning with

transportation infrastructure to maximize accessibility and user convenience.

Natural beauty, as indicated by the presence of features such as forests, water bodies, and varied topography, was another significant factor. The study found that areas with diverse landscapes not only offer aesthetic value but also provide opportunities for various recreational activities, such as hiking, birdwatching, and picnicking. Proximity to existing recreational facilities, such as parks and cultural sites, further enhanced the suitability of certain areas, suggesting that these locations could serve as hubs for expanded recreational networks.

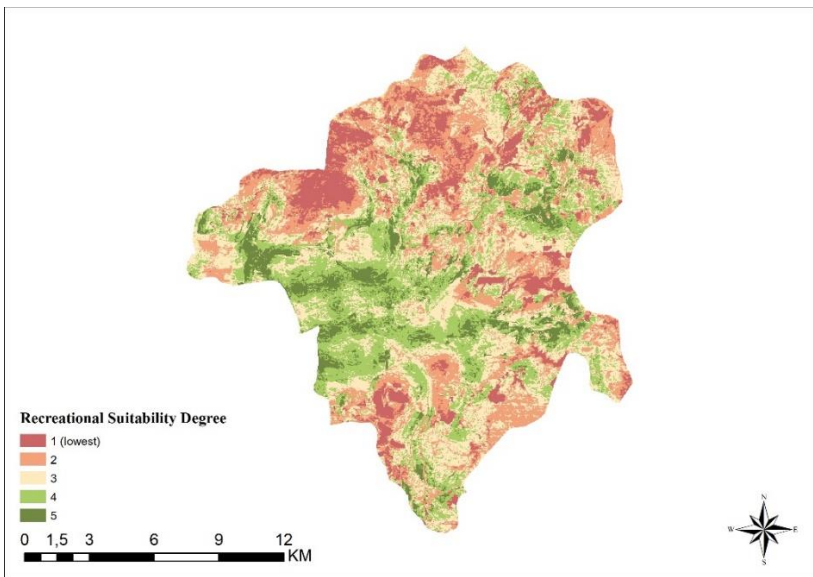


Figure 3. Recreation Potential Map for the Bayraklı-Bornova Area (Source: Author)

Table 3. Percentages of the Most Suitable Areas (Source: Author)

Suitability Class	Area (km ²)	Area Ratio (%)
4 (suitable)	63	8,91
5 (very suitable)	20	28,07

3.1. Hot Spot and Clustering Analysis

The clustering analysis conducted as part of this study revealed a z-score of 12.02 and a p-value of 0.000009, indicating highly significant spatial clustering of areas with high recreational potential. This statistical confirmation supports the hypothesis that specific regions within the Bayraklı-Bornova area are exceptionally well-suited for recreational development. The identified "hot spots" are characterized by a combination of natural features, accessibility, and existing recreational infrastructure, making them prime candidates for further investment and development. (Figure 4)

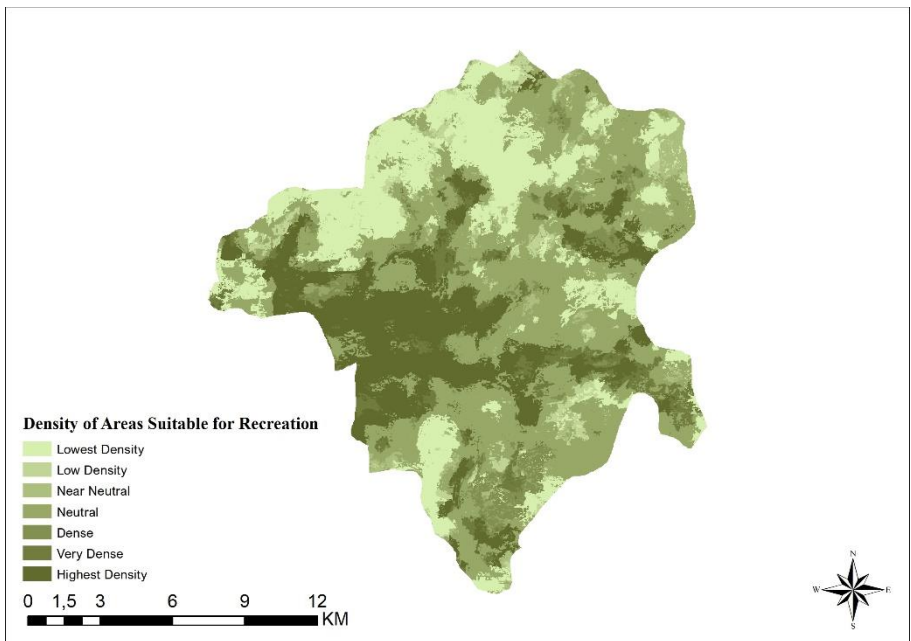


Figure 4. Hotspots (Source: Author)

The extremely low p-value of 0.000009 confirms that the obtained z-score is highly statistically significant. In other words, the point identified on the map truly possesses very high recreational potential, and this is not by

chance (Figure 5). Based on these results, it can be hypothesized that the areas identified as hot spots are characterized by:

Natural beauty: Features such as forests, lakes, and waterfalls.

Accessibility: Proximity to roads and public transportation.

Existing recreational facilities: Availability of parks, picnic areas, and other amenities.

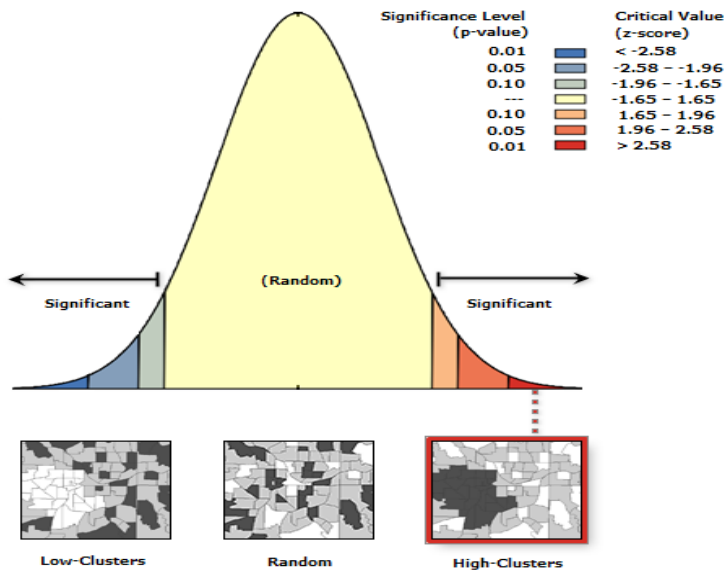


Figure 5. Cluster Analysis Report (Source: Author)

This study has highlighted the importance of preserving open green spaces that maintain their natural characteristics for recreational purposes within urban areas. In particular, areas near major roads with high levels of green cover have been identified as highly suitable for recreation. This finding underscores the potential to transform underutilized urban green spaces into valuable recreational areas through effective planning. The primary reason for the high recreational potential of these areas is their ability to retain their natural character despite increasing urbanization. This

preservation allows for a variety of recreational activities that are not feasible in heavily urbanized or significantly altered spaces. Therefore, maintaining and protecting these natural characteristics is essential for the successful development of these areas for recreational use.

The identification of recreation suitability zones is crucial for sustainable recreation management. As noted by Gül et al. (2006), the carrying capacity and activity levels of these zones should be continuously monitored to minimize environmental impacts and meet user needs.

The future of natural and protected areas depends on preserving both their intrinsic characteristics and their relationships with the surrounding landscape. As emphasized by Schonewald-Cox et al. (1992) and Steiner et al. (2000), decision-making processes grounded in scientific data are vital for the long-term health of these areas.

In planning and managing existing or potential protected areas, striking a balance between use and conservation is fundamental. Researchers such as Gül (2002), O.B. (1996) and Sakarya (2000) have highlighted the importance of achieving this balance, indicating that protected areas should be managed not only to safeguard biodiversity but also to provide social and economic benefits.

4. Conclusion and Suggestions

This study has successfully identified areas within the Bornova and Bayraklı districts with significant recreational potential by evaluating both natural and human environmental factors. Through the application of advanced spatial analysis techniques, including Hot Spot and Clustering analyses, it was determined that approximately 37.6% of the study area is highly or very suitable for recreational use. These areas, distinguished by

their natural beauty, accessibility, and existing recreational facilities, offer unique opportunities for activities such as camping and birdwatching, setting them apart from other urban recreational spaces.

The findings emphasize the importance of preserving the natural characteristics of these high-potential areas, particularly as urbanization continues to expand. By maintaining their natural landscapes and implementing effective planning strategies, these areas can meet the growing recreational needs of the Bayraklı-Bornova region, which is on the verge of becoming a major urban center.

Moreover, the study highlights the critical role of sustainable recreation management. Continuous monitoring of these identified zones is essential to balance recreational demand with environmental preservation. As indicated by previous research, decision-making based on scientific data is crucial for the long-term sustainability of natural and protected areas.

In conclusion, this study underscores the necessity of proactive planning and management of urban green spaces to maximize their recreational potential while safeguarding their ecological integrity. This approach will enable the Bayraklı-Bornova region to address the recreational demands of its growing population and enhance the overall quality of life in the area. The results of this study have significant implications for urban planning in the Bayraklı-Bornova region. High-potential areas identified in this study should be prioritized in future urban development plans, with an emphasis on preserving their natural characteristics while improving accessibility and recreational offerings. A balanced approach that integrates recreational planning with broader urban development goals is

crucial to ensuring that the growing population has access to high-quality recreational spaces.

Additionally, the findings suggest that underutilized urban green spaces, particularly those near major roads and public transportation, hold significant potential for transformation into valuable recreational areas. This potential can be realized through strategic planning that preserves the natural landscape while introducing new recreational amenities to meet the diverse needs of the community.

Ultimately, the MCDM approach used in this study has effectively identified key areas within the Bayraklı-Bornova region that are highly suitable for recreational development. The integration of spatial analysis techniques such as hot spot and clustering analysis has provided a robust framework for understanding the distribution of recreational potential across the region. These insights should inform future urban planning and development efforts, ensuring that the Bayraklı-Bornova area continues to offer high-quality recreational opportunities for its residents and visitors.

This study underscores the importance of preserving natural landscapes within urban areas and highlights the need for sustainable recreational management practices that balance environmental preservation with recreational use. By adopting these practices, the Bayraklı-Bornova region can enhance its livability and attractiveness as a destination for both residents and tourists.

Acknowledgements and Information Note

The author received no financial support for the research, authorship, and/or publication of this paper.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. Authors approve that to the best of their knowledge, there is not any conflict of interest or common interest with an institution/organization or a person that may affect the review process of the paper.

References

- Ardahanlıođlu Bozhüyük, Z. R., & Karakuş, N. (2016). Determining the Recreational Potentials of Some of the Bays in Fethiye. Environmental Sustainability and Landscape Management. ST. Kliment Ohridski University Press, Sofia.
- Booth, K. L., Cessford, G. R., McCool, S. F., & Espiner, S. R. (2011). Exploring visitor experiences, crowding perceptions and coping strategies on the Milford Track, New Zealand. *Science for Conservation*, 1–94. Online ISSN: 1173-2946. Access Address (19.07.2024):
<https://www.doc.govt.nz/globalassets/documents/scienceandtechnical/sfc313entire.pdf>
- Bryan, B. A., Raymond, C. M., Crossman, N. D., & King, D. (2010). Comparing spatially explicit ecological and social values for natural areas to identify effective conservation strategies. *Conservation Biology*, 25(1), 172-181. doi: 10.1111/j.1523-1739.2010.01560.x. Access Address (21.07.2024):
<https://conbio.onlinelibrary.wiley.com/doi/epdf/10.1111/j.1523-1739.2010.01560.x>
- Cengiz, T. & Akbulak, C. (2013). Application of analytic hierarchy process and geographic information systems in land-use suitability evaluation: A case study of Dümrek village (Çanakkale, Turkey). *International Journal of Sustainable Development & World Ecology*, 20(4), 332-335. doi: 10.1080/13504500903106634. Access Address (20.07.2024):
<https://www.tandfonline.com/doi/full/10.1080/13504500903106634?scroll=top&needAccess=true>
- Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, 68(1), 129-138. doi: 10.1016/j.landurbplan.2003.08.003. Access Address (21.07.2024):
<https://www.sciencedirect.com/science/article/abs/pii/S0169204603001865>
- Dalkılıç, G., & Mil, B. (2017). Rekreasyon-animasyon hizmetlerinin sınıflandırılması ve otel işletmelerindeki öneminin değerlendirilmesi. *Beykoz Akademi Dergisi*, 5(2), 40-72. doi: 10.14514/BYK.m.21478082.2017.5/2.40-72. Access Address

(02.08.2024):

<https://dergipark.org.tr/en/pub/beykozad/issue/52133/681537>

Dean, M. (2020). Multi-criteria analysis. *Advances in Transport Policy and Planning*, No: 6. Chapter 6. (p.165–224). ISBN: 978-0-12-820821-2. doi:10.1016/bs.atpp.2020.07.0. Access Address (25.07.2024):

<https://www.sciencedirect.com/science/article/abs/pii/S2543000920300147>

Deniz, B., Kılıçaslan, Ç., & Koşan, F. (2019). Rekreatyonel olanaklara yönelik beklentilerin sağlıklı kentler yönüyle irdelenmesi, Aydın kenti örneği. *Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, 3(2), 79-89. Access Address (03.08.2024):

<https://dergipark.org.tr/tr/download/article-file/724858>

Feizizadeh, B., & Blaschke, T. (2013). Land suitability analysis for Tabriz city, Iran: A multi-criteria evaluation approach using GIS. *Journal of Environmental Planning and Management*, 56(1), 1-23. doi: 10.1080/09640568.2011.646964. Access Address (29.07.2024):

https://www.researchgate.net/publication/232985063_Land_suitability_analysis_for_Tabriz_County_Iran_A_multi-criteria_evaluation_approach_using_GIS

Gül, A. (2002). Orman peyzajı ve rekreasyon ders notları. S.D.Ü. Or. Fak. Or. Muh. Bölümü. (Unpublished lecture notes).

Gül, A., Örucü, M. K., & Karaca, Ö. (2006). An approach for recreation suitability analysis to recreation planning in Gölcük Nature Park. *Environmental Management*, 37(5), 606–625. doi: 10.1007/s00267-004-0322-4. Access Address (18.07.2024):

<https://link.springer.com/article/10.1007/s00267-004-0322-4>

Hacıoğlu, N., Gökdeniz, A., & Dinç, Y. (2009). *Boş zaman & rekreasyon yönetimi: (örnek animasyon uygulamaları)*. Detay Yayıncılık. Access Address (22.07.2024):

<https://www.detayyayin.com.tr/urun/bos-zaman-ve-rekreasyon-yonetimi-ornek-animasyon-uygulamaları>

Haaland, C., & van den Bosch, C. K. (2015). Challenges and strategies for urban green-space planning in cities undergoing densification: A review. *Urban Forestry & Urban Greening*, 14(4), 760-771. doi:

- 10.1016/j.ufug.2015.07.009. Access Address (28.07.2024): <https://www.sciencedirect.com/science/article/abs/pii/S161886671500103X>
- Hunziker, M. (1995). The spontaneous reforestation in abandoned agricultural lands: Perception and aesthetic assessment by locals and tourists. *Landscape and Urban Planning*, 31, 399–410. doi: 10.1016/0169-2046(95)93251-J. Access Address (03.08.2024): <https://www.sciencedirect.com/science/article/abs/pii/S0195925514000754>
- Kabisch, N., Qureshi, S., & Haase, D. (2015). Human-environment interactions in urban green spaces—A systematic review of contemporary issues and prospects for future research. *Environmental Impact Assessment Review*, 50, 25-34. doi: 10.1016/j.eiar.2014.08.007. Access Address (22.07.2024): <https://www.sciencedirect.com/science/article/abs/pii/S0195925514000754>
- Malczewski, J. (2004). GIS-based land-use suitability analysis: A critical overview. *Progress in Planning*, 62(1), 3-65. doi: 10.1016/j.progress.2003.09.002. Access Address (26.07.2024): https://www.researchgate.net/publication/222678711_GIS-based_Land-use_Suitability_Analysis_A_Critical_Overview
- Malczewski, J. (1999). *GIS and multicriteria decision analysis*. John Wiley & Sons. ISBN: 978-0-471-32944-2. Access Address (04.08.2024): <https://www.wiley.com/en-us/GIS+and+Multicriteria+Decision+Analysis-p-9780471329442>
- O. B. (Orman Bakanlığı) (1996). Milli Parklar Kanunu (National Parks Law: #2873). T.C. Orman Bakanlığı M.P.Y.H.G.M., Tertip: 5, Cilt: 22, Ankara, Turkey.
- Ode, A., Tveit, M. S., & Fry, G. (2008). Capturing landscape visual character using indicators: Touching base with landscape aesthetic theory. *Landscape Research*, 33, 89–117. doi: 10.1080/01426390701773854. Access Address (01.08.2024): https://www.researchgate.net/publication/248993826_Capturing_Landscape_Visual_Character_Using_Indicators_Touching_Base_wit_h_Landscape_Aesthetic_Theory#fullTextFileContent

- Okday, H. E., Erdoğan, R., & Oktay, F. B. (2016). Akarsular ve akarsularda rekreasyon olanakları. *İnönü Üniversitesi Sanat ve Tasarım Dergisi*, 6(13). Online ISSN: 1309-9884. Access Address (21.07.2024): <https://dergipark.org.tr/en/download/article-file/716823>
- Roovers, P., Hermy, M., & Hubert, G. (2002). Visitor profile, perceptions and expectations in forests from a gradient of increasing urbanisation in central Belgium. *Landscape and Urban Planning*, 59, 129–145. doi: 10.1016/S0169-2046(02)00011-7. Access Address (21.07.2024): <https://www.sciencedirect.com/science/article/abs/pii/S0169204602000117>
- Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International journal of services sciences*, 1(1), 83-98. doi: 10.1504/IJSSCI.2008.017590. Access Address (22.07.2024): https://www.researchgate.net/publication/228628807_Decision_making_with_the_Analytic_Hierarchy_Process
- Sakarya, Y. (2000). *Ormaniçi dinlenme yeri planlaması*. Ankara, Turkey: Milli Parklar ve Yaban Hayatı Genel Müdürlüğü, Personeli Güçlendirme Vakfı, Publication No: 002.
- Schonewald-Cox, C., Buechner, M., Sauvajot, R., & Wilcox, B. A. (1992). Cross-boundary management between national parks and surrounding lands: A review and discussion. *Environmental Management*, 16, 273–282. doi: 10.1007/BF02393833. Access Address (19.07.2024): <https://link.springer.com/article/10.1007/BF02393833>
- Sevil, T., Şimşek, K. Y., Katırcı, H., Çelik, O., Çeliksoy, M. A., & Kocaekşi, S. (2012). Boş zaman ve rekreasyon yönetimi. *Anadolu Üniversitesi Yayını*. Access Address (28.07.2024): <https://anabilgi.anadolu.edu.tr/?contentId=80806>
- Sildoja, J., & Eagles, P. F. J. (2004). Campsite use levels compared to campsite attributes in Emily Provincial Park, Ontario. Access Address (04.08.2024): https://www.academia.edu/18697755/CAMPSITE_USE_LEVELS_COMPARED_TO_CAMPSITE_ATTRIBUTES_IN_EMILY_PROVINCIAL_PARK_ONTARIO

- Steiner, F., McSherry, L., & Cohen, J. (2000). Land suitability analysis for the upper Gila river watershed. *Landscape and Urban Planning*, 50, 199–214. doi: 10.1016/S0169-2046(00)00093-1. Access Address (05.08.2024):
https://www.researchgate.net/publication/222663787_Land_suitability_analysis_for_the_upper_Gila_River_watershed
- Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kazmierczak, A., Niemela, J., & James, P. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. *Landscape and Urban Planning*, 81(3), 167-178. doi: 10.1016/j.landurbplan.2007.02.001. Access Address (02.08.2024):
<https://www.sciencedirect.com/science/article/abs/pii/S0169204607000503>
- Tribe, J. (1995). The economics of leisure and tourism: Environments, markets and impacts. Butterworth-Heinemann. Online ISBN: 9780080505039. Access Address (18.07.2024):
https://www.academia.edu/30752599/The_economics_of_leisure_and_tourism_environments_markets_and_impacts
- Ünaldık, S. B. (2019). Mekansal yer seçimi kararlarının hazırlanmasında CBS kullanımı ve çok kriterli karar verme yöntemi. *Yapı Bilgi Modelleme*, 1(2), 46-52. ISSN 2687-4660. Access Address (19.07.2024):
<https://dergipark.org.tr/tr/download/article-file/964555>

Doç. Dr. Birsen KESGİN ATAK

E-mail: birsen.kesginatak @idu.edu.tr

Educational Status: Associate professor

License: Landscape Architecture

Degree: Landscape Architecture

Doctorate: Landscape Architecture

Professional experiences: Landscape Architecture

Doç.Dr. Ebru ERSOY TONYALOĞLU

E-mail:ebru.ersoy @adu.edu.tr

Educational Status: Associate professor

License: Landscape Architecture

Degree: Landscape Architecture

Doctorate: Landscape Architecture

Professional experiences: Landscape Architecture

Serra ÇAKIR

E-mail:serra.608@gmail.com

Educational Status: Master Student

License: Landscape Architecture

Determination of Suitable Areas for Recreational Activities in Bafa Lake Nature Park Using the AHP Method

Prof. Dr. Tendü Hilal GÖKTUĞ ¹ 

¹Aydın Adnan Menderes University, Faculty of Agriculture, Department
of Landscape Architecture, Aydın /Türkiye.

ORCID: 0000-0001-7544-9943

E-mail: tgoktug@adu.edu.tr

Ayser BAYAR ² 

²Yıldız Technical University, Faculty of Architecture, Department of
Urban and Regional Planning, İstanbul/Türkiye

ORCID: 0000-0002-0063-6776

E-mail: ilhanaysr@gmail.com

Citation: Göktuğ T.H. & Bayar A. (2024). Determination of Suitable Areas for
Recreational Activities in Bafa Lake Nature Park Using the AHP Method. Göktuğ T.H.
(Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:5, 92-116.
ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13873752>

1. Introduction

Protected areas encompass various objectives, including the conservation and utilization of natural and cultural resources, ensuring species continuity, providing environmental education, offering recreational opportunities, and contributing to socio-economic development at local and regional levels (Borrie et al., 1999). In this context, protected areas, which play a crucial role in ecosystem preservation and sustainability, have also increasingly functioned as recreational spaces over the past thirty years. (De Aranzabal et al., 2008; Cocklin, 2019).

The growing demand for recreational activities within protected areas, particularly for entertainment and relaxation, has led to increasing pressure on natural ecosystems, resulting in the gradual degradation and depletion of natural resources (Gül et al., 2006). Consequently, it is crucial to implement proper planning that safeguards the resource values of protected areas, identifies appropriate recreation zones, and ensures sustainability by maintaining the balance between conservation and use. In this context, the identification of suitable areas for recreation planning in protected regions is conducted through suitability analysis (FAO, 1985; Kliskey, 2000).

Suitability analysis was first introduced by McHarg (1969) in his study, where he identified appropriate land uses (such as conservation and recreation areas) by overlaying transparent maps with varying light and dark values (Collins et al., 2001). The spatial assessment of recreation suitability was first applied in a study by Duffield and Coppock (1975), in which multiple criteria related to physical, social, and cultural values were analyzed using a computer-based system to determine suitable areas for

outdoor recreation. Another method employed in the literature for assessing recreation suitability is the recreation suitability index model, developed with the assistance of Geographic Information Systems (GIS). Levinsohn et al., (1987) presented a model that included spatial mapping of data associated with selected variables, calculation of weighted suitability indices for these variables, and ultimately the determination of a composite suitability index (De Aranzabal et al., 2008)

In determining the suitability of recreational areas within protected zones, a multi-criteria approach is employed, incorporating factors such as natural resource values, cultural significance, transportation links, and topographic features. In addressing such spatial decision-making problems, Geographic Information Systems (GIS) and multi-criteria decision-making analyses are utilized to assign relative weights to the criteria (Aklıbaşında, 2019).

A review of the current literature reveals that the Analytical Hierarchy Process (AHP) is one of the most widely used methods. AHP is popular due to its ability to organize data hierarchically, making the relationships between indicators clear and comprehensible. Additionally, it allows for the mathematical calculation of criteria weighting scores using a relative importance scale and is fully compatible with GIS systems.

Bunruamkaew and Murayam (2011) identified nine criteria (slope, elevation, land use, species diversity, protection status, visibility, proximity to cultural values, road access, and settlement size) for selecting suitable locations for ecotourism areas using AHP and GIS, and conducted a suitability analysis. Similarly, Çağlayan et al. (2020) developed a recreation suitability map for Istanbul's Belgrade Forest using GIS-AHP,

where criteria such as natural beauty, high-activity areas, accessibility, proximity to recreational sites, slope, elevation, aspect, and canopy closure were evaluated to create a suitability map. Gül et al. (2006) applied the recreation suitability index method to identify suitable areas for recreation, evaluating criteria related to slope, elevation, vegetation, soil, climate, cultural facilities, accessibility, proximity to water resources, and visual appeal. As evidenced, the criteria for suitability analyses vary based on the specific characteristics and structure of the area under consideration.

In this context, conducting suitability analyses in sustainable recreation area planning within protected areas will enhance visitor demand and recognition, while ensuring the conservation and appropriate use of resources.

In this study, Bafa Lake Nature Park—under pressure due to its cultural resource values, lake ecosystem, endemic species, accessibility, and rising demand—was selected as the study area. Using the Analytical Hierarchy Process (AHP) and Geographic Information Systems (GIS), the multi-layered structure of the park, which incorporates various indicators, was analyzed to identify suitable areas for recreation. This study is expected to contribute to park management and the academic literature, addressing the current absence of recreation planning for the area, and supporting its sustainability as one of Turkey's key conservation sites.

2. Material and Method

2.1. Research Area

Bafa Lake Nature Park, selected as the study area, is situated within the borders of Aydın and Muğla provinces in the Aegean Region of Turkey.

This study focuses on the natural and cultural resource values of Bafa Lake.

In terms of natural resources, the area is of particular significance, hosting endemic species, important bird habitats, and wetlands, and is designated as a first-degree natural protected area. The park encompasses a diverse range of terrestrial and aquatic ecosystems, including the lake ecosystem itself (Eşbah et.al.,2010; Tonyaloğlu, and Atak, 2019).

Culturally, Bafa Lake also has a multi-layered structure, with first-degree archaeological protected areas. Additionally, the unique traditional structure of the settlement within the park, as well as the surrounding rural communities, has been preserved to the present day (Figure 1)

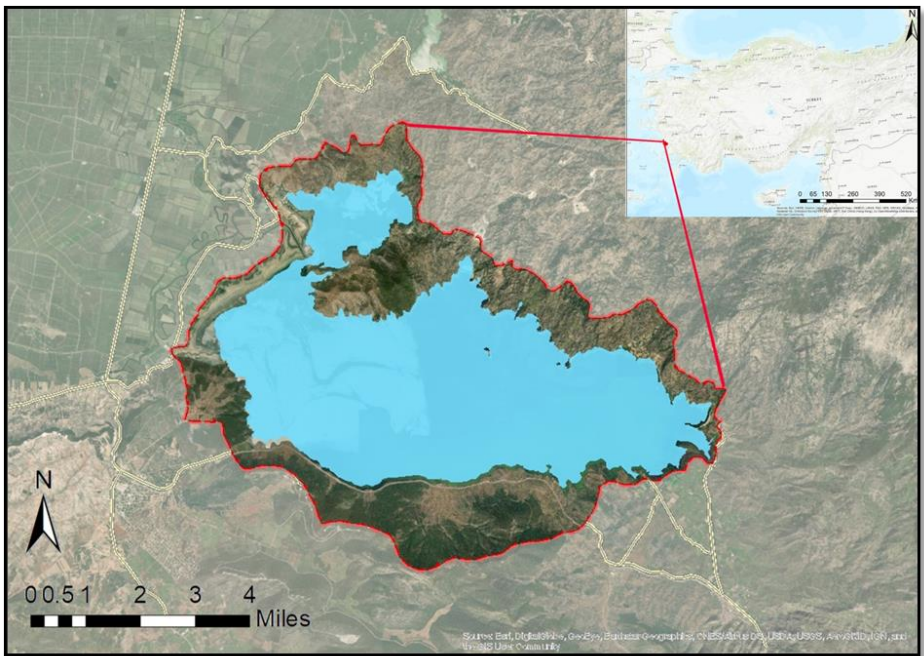


Figure 1. Bafa Lake Nature Park Location Map (Source: Authors)

2.1. Material

The workflow diagram of the study is presented in Figure 2.

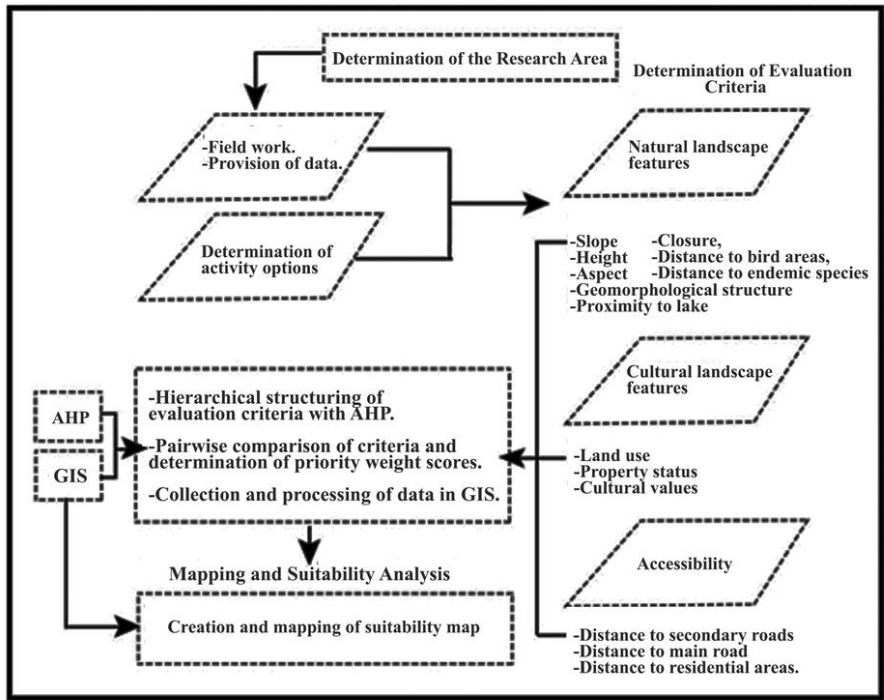


Figure 2. Bafa Lake Nature Park suitable recreation site selection model schematic diagram (Source:Authors)

2.1.1. Fieldwork and data collection

In this study, preliminary fieldwork was conducted in collaboration with the Aydın Nature Conservation and National Parks Branch Directorate and non-governmental organizations, which provided guidance on the area. General information about the site was gathered during the fieldwork, and data on current recreational use patterns and visitor demands were collected through interviews. Additionally, existing recreational areas were identified using GPS, and the collected data were transferred to a GIS

platform. Problems related to the recreational areas were also identified, with interviews conducted with local residents and administrators to address these issues. Other data sets utilized in the study are presented in Table 1

Table 1. Data Sets (Anonymous, 2019a and Anonymous, 2019b).

Data	Scale	Source
<i>DEM</i>	1/25.000	Aydın Metropolitan Municipality
Land Use Map	1/25.000	Aydın Nature Conservation and National Parks Branch Directorate
Cultural Heritage Map	1/25.000	Aydın Nature Conservation and National Parks Branch Directorate
Important Bird Areas Map	1/25.000	Aydın Nature Conservation and National Parks Branch Directorate
Endemic Species Map	1/25.000	Aydın Nature Conservation and National Parks Branch Directorate
Ownership Status Map	1/25.000	Aydın Nature Conservation and National Parks Branch Directorate
Boundary Maps	1/25.000	Aydın Metropolitan Municipality
Transportation Map	1/25.000	Aydın Metropolitan Municipality
Geomorphological Map	1/25.000	Aydın Metropolitan Municipality
Canopy Density Map	1/25.000	Aydın Metropolitan Municipality
Master Plan	1/25.000	Aydın Nature Conservation and National Parks Branch Directorate

2.1.2. Determining activity options

When planning outdoor recreation activities, it is essential to consider the physical conditions of the area, as well as its natural and cultural resource values, to determine appropriate activities. In this context, Van Der Zee (1990) categorized the assessment of recreational activities into three main criteria:

1. ***Physical suitability:*** This refers to the appropriateness of the physical environment for the proposed activities. For instance, in activities such as boat tours, the water level must be at an appropriate depth to ensure

safety and functionality. The existing land structure should be evaluated to ensure it supports the intended recreational activities.

2. Visual landscape quality: The attractiveness of natural areas contributes significantly to their appeal as recreational destinations. For example, visitors may find swimming in pristine lakes or seas amidst forested areas more appealing than swimming in urban pools. The visual landscape quality of the area plays a crucial role in enhancing its attractiveness.

3. Accessibility: Even if a rural area is suitable for various recreational activities in terms of physical and visual qualities, it must also be accessible. Visitors tend to prefer areas that are easier to reach.

Based on the data obtained from interviews with local residents, non-governmental organizations, and relevant authorities, as well as literature reviews, experts determined the recreational activity options for Bafa Lake Nature Park (see Table 2).

Table 2. Recreational Activity Options Identified for Bafa Lake Nature Park

Nature Walk	Fishing
Visiting Historical Sites	Camping
Picnic	Birdwatching
Landscape Viewing	Photography

2.1.3. AHP Method

AHP (Analytic Hierarchy Process) was developed by Saaty in the early 1970s to address the resource allocation and planning needs of the U.S. military. Today, it is one of the most widely used methods in multi-criteria decision-making analyses (Saaty, 1980). In site selection studies, AHP facilitates the hierarchical structuring of relationships between the

identified factors. Through this hierarchical system, the method calculates the weight scores of criteria from the lowest level, ultimately deriving a composite weight score. Furthermore, AHP enables collaboration across different disciplines and supports the generation of alternative scenarios in suitability analyses (Saaty, 1994).

In this study, weight scores were calculated using AHP with the aid of Microsoft Excel and ArcGIS/ArcMap software, and a suitability map was produced. The AHP method for determining appropriate recreation sites consists of four key stages: (1) identifying the evaluation factors and criteria for the suitability analysis, (2) establishing the hierarchical model, (3) conducting pairwise comparisons and calculating weight scores, and (4) producing the suitability map

2.1.4. Determination of evaluation factors and criteria:

In the context of recreation planning for Bafa Lake Nature Park, identifying suitable areas involves a multi-criteria decision-making process. To this end, the site suitability analyses were based on an assessment of the current conditions, expert opinions, practical experiences, and literature reviews. Three main factors were identified in this study: natural landscape features, cultural landscape features, and accessibility. The natural landscape features include slope, elevation, aspect, geomorphological structure, proximity to the lake, canopy cover, distance to bird habitats, and proximity to endemic species. The cultural landscape features include land ownership, land use, and proximity to cultural assets. Finally, accessibility factors include distance to secondary roads, main roads, and residential areas (see Figure 2).

Natural landscape features: Lake Bafa is classified as an alluvial dam lake, with its deepest point reaching approximately 25 meters. Generally, the slope decreases from the northeast to the west of the area. While the western section has a slope ranging from 0-10%, steeper areas with slopes exceeding 30% are identified, particularly in the southern and northeastern regions. The elevation of the nature park ranges from 0 to 682 meters. The Beşparmak Mountains in the northeast and the Ilbıra Mountains in the south serve as natural barriers enclosing the lake (Anonymous, 2019b). The annual average rainfall in Lake Bafa Nature Park is 576.3 mm, with the highest precipitation occurring between November and January. The average annual temperature is 17.94 °C, with January and July temperatures averaging 8.7 °C and 27.7 °C, respectively (Anonymous, 2019b).

In terms of flora, 237 genera, 325 species, 22 subspecies, and 7 varieties belonging to 80 families have been identified within the park, 16 of which are endemic plant species. The fauna includes 261 bird species, 22 reptile species, and 19 mammal species (Anonymous, 2019b). Furthermore, the park is recognized as an Important Bird Area and is classified as a 1st-class Wetland, capable of supporting at least 20,000 water birds. Lake Bafa plays a crucial role in maintaining biodiversity and supporting various ecosystems, contributing to the continuity of species (Çoban and Göktuğ, 2023).

Cultural landscape features: The ancient cities of Latmos and Herakleia, located in parts of Lake Bafa, are classified as first-degree archaeological sites. The ancient city of Herakleia, one of the most well-preserved cities of Western Anatolia, is situated in what is now the village of Kapıkırı, on

the shores of Lake Bafa. The study area is characterized by a multi-layered structure in terms of its cultural values, featuring numerous significant resources. These include prehistoric rock paintings, the ruins of Latmos and Herakleia on the southern slopes of Beşparmak Mountain (northeast of the lake), and remnants of monasteries and towers from the Byzantine period. Additionally, the traditional products and social values of the settlements in and around Kapıkırı village, located within the Nature Park, have been preserved and continue to survive today (Anonymous, 2019b).

Accessibility: Convenient access to the area is one of the key criteria that enhances its attractiveness for recreational activities. The study area benefits from its advantageous location along the Söke-Milas (D-525) highway. Additionally, access to settlements within and around the Nature Park is provided by a network of asphalt and stabilized roads branching off from the D-525 highway.

Relevant layers for each criterion were generated using ArcMap software. Slope, elevation, and aspect data were derived from the Digital Elevation Model (DEM) and reclassified into slope categories (4 classes), elevation ranges (5 classes), and aspect (4 categories). Distances to the lake, cultural landmarks, endemic species habitats, bird areas, settlements, secondary roads, and main roads were determined through distance analysis."

2.1.5. Establishing the hierarchical model

At this stage, a decision hierarchy is constructed by defining criteria at various levels to support suitability analysis and site selection decisions for the study area. The key consideration in building the hierarchical model is ensuring that the higher-level and lower-level criteria are interconnected within the established hierarchical system (Cheng and Li, 2001). For

example, including a criterion such as landslide risk in the analysis of recreational areas, even when no landslide risk exists in the area, could distort the results of the suitability analysis. Ensuring that the relationships between criteria are accurately represented at this stage is critical for the integrity and effectiveness of subsequent processes (Figure 3).

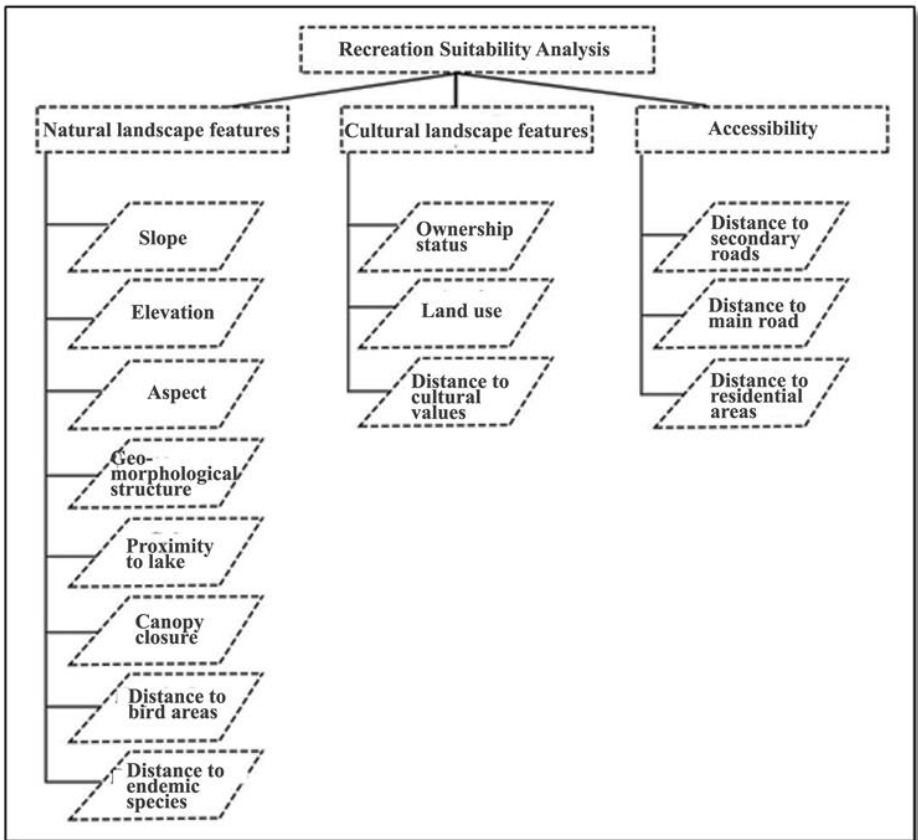


Figure 3. Hierarchical Order of Criteria

2.1.6. Making pairwise comparisons and obtaining weight scores

Following the hierarchical model established for the suitability analysis, a pairwise comparison matrix is constructed for each criterion based on the relative importance scale. The scoring scale (1-9), which allows for the

relative evaluation of two criteria, assumes that the row criterion is equal to or more important than the column criterion. When the row criterion is less important than the column criterion, reciprocal values (1/3, 1/5, 1/7, or 1/9) are applied (Sadasivuni et al., 2009) (See Table 3).

Table 3. Relative Importance Scale

Severity	Definition	Explanation
1	Equal importance	Based on experience and evaluation, both activities contribute equally to the objective.
3	Moderate importance	Based on experience and evaluation, one activity is slightly preferred over the other.
5	Strong importance	Based on experience and evaluation, one activity is significantly preferred over the other.
7	Very strong importance	Based on experience and evaluation, one activity is strongly preferred over the other, with its superiority demonstrated in practice
9	Extreme importance	At the highest possible level, one activity is overwhelmingly preferred over the other.
2,4,6,8	Intermediate values	When a precise evaluation cannot be made, an intermediate value between the numerical scores is assigned."

A pairwise decision matrix was created for each criterion within the established hierarchical system using Microsoft Excel, and comparisons were made. Once the matrix was constructed, the weight scores for each criterion were calculated by dividing each criterion by the sum of the values in its respective column, thus normalizing the data (Formula 1) (Forman & Gass, 2001).

$$\text{Formula 1: } X_i' = x_i / \sum_1^n x$$

Next, the weight scores for the criteria were obtained by averaging the values in each row of the normalized data (Formula 2).

$$\text{Formula 2: } W_i = \sum_1^n x_i / n$$

Accordingly, among the factors and sub-criteria, priority was given to natural landscape features, which received the highest scores due to their importance in ensuring the sustainability of the area's unique terrestrial and

aquatic ecosystems and protecting species under threat of extinction. Cultural landscape values followed in priority, with accessibility factors evaluated last in terms of importance (see Table 4).

Table 4. Weight scores of criteria

Primary Criteria	Weight Point
Natural Landscape Features	0,6
Cultural Landscape Features	0,23
Accessibility	0,17
Secondary Criteria	
Natural Landscape Features	
Slope	0,3886
Altitude	0,0550
Aspect	0,0222
Proximity to Lake	0,1042
Closedness	0,1036
Distance to Bird Areas	0,1546
Geomorphic Structure	0,0202
Endemic Species	0,1699
Distance	
Cultural Values	0,2106
Ownership	0,5485
Land Use	0,2409
Cultural Values	
Accessibility	0,5813
Proximity to Secondary Roads	0,1096
Proximity to Main Road	0,3092

Finally, the consistency ratio is calculated to assess the accuracy of the scores assigned in the pairwise comparisons. The consistency ratio is determined using the following formula (Vargas, 1990):

$$CR = CI / RI$$

where:

$$CI = (\lambda_{max} - n) / (n - 1)$$

- *CI: Consistency Index*
- *RI: Random Index*
- *CR: Consistency Ratio"*

Table 5. Random Index

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

If the consistency ratios calculated using the AHP method exceed $CR \leq 0.10$, the matrix is considered faulty, and the hierarchical system established by the decision-makers, along with the assigned scores, must be re-evaluated. Otherwise, the method is deemed invalid (Donegan and Dodd, 1991; Saat, 2000). In this study, the relative importance scores for each criterion in selecting suitable recreation sites were determined based on expert opinions, and weight scores were calculated. The CR values for the criteria are provided in Table 6.

Table 6. CR Values of Criteria

Natural Landscape Features	CR
Slope	0,031
Altitude	0,039
Aspect	0,086
Proximity to Lake	0,027
Closedness	0,033
Bird Areas Distance	0,035
Geomorphic Structure	0,029
Endemic Species Distance	0,087
Cultural Values	CR
Ownership	0,025
Land Use	0,050
Cultural Values	0,087
Accessibility	CR
Proximity to Secondary Roads	0,038
Proximity to Main Road	0,019
Proximity to Settlement	0,089

3. Findings

In this phase, known as the synthesis phase, the mathematical relationships between the hierarchical levels are established. The weight scores assigned to each criterion in the hierarchical model reflect their relative importance for the area's suitability. Each criterion's score is multiplied by the scores

of its related sub-criteria and upper criteria to obtain its relative score. The weight scores determined for each criterion at the three hierarchical levels are multiplied by the scores of the criteria at the upper level to derive the final result. This process is illustrated by the following example (Şener et al., 2010)

$$\text{Slope Relative Score} = (\text{Natural Landscape Features Weight Score}) \times (\text{Slope Weight Score}) + (\text{Slope Groups Weight Score}).$$

After calculating these scores for each criterion in the hierarchical order, they are reclassified in ArcMap software into raster format according to their relative scores (see Figure 4).

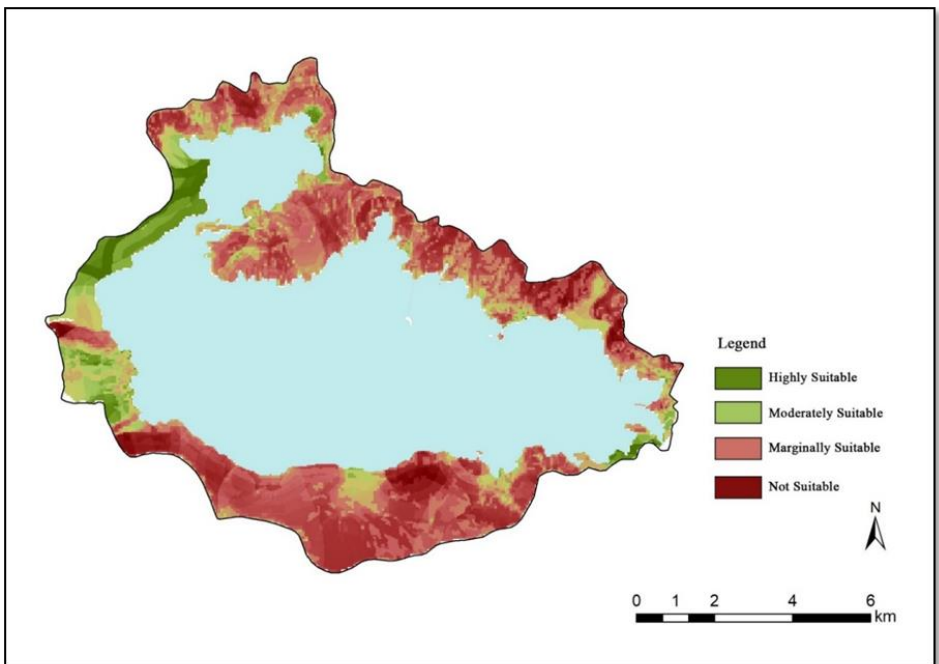


Figure 4 Bafa Lake Nature Park Recreation Suitability Map (Source: Authors)

The suitability map was categorized into four classes based on the FAO suitability classification: very suitable (1), moderately suitable (2), slightly

suitable (3), and not suitable (4). It was determined that 11% of the area was very suitable for recreational activities, 20.45% was moderately suitable, 33.74% was slightly suitable, and 34.81% was not suitable (see Map 2).

In planning recreational areas around Lake Bafa, priority was given to natural landscape features, cultural landscape features, and accessibility. Within the natural landscape features, the sub-criteria were ranked as follows: slope, distance to endemic species, distance to bird areas, proximity to the lake, and canopy cover. For cultural landscape features, the sub-criteria were land use, distance to cultural values, and ownership. In terms of accessibility, the sub-criteria included distance to secondary roads, proximity to settlements, and proximity to main roads. Due to the generally sloping topography of the area, lower slopes (0-10%) were preferred for recreational activities. Emphasis was placed on maintaining a distance of at least 500-750 meters from endemic species and important bird areas due to their significant natural resource value. Accordingly, as shown in Map 2, the optimal recreational areas were concentrated in the western part of the area. Medium and low suitability areas were distributed throughout the region, while unsuitable areas were identified in the hilly regions with slopes exceeding 40% in the north and south.

Three potential recreation areas were selected based on their suitability ratings. Area (1) was identified as having the highest recreational potential, supporting activities such as bird watching, hiking, bicycle tours, picnicking, short-term camping, scenic viewing, historical site visits, boat tours, fishing, and amenities like park entrance facilities, local food outlets, a cafeteria, and parking. Area (2) contains sensitive ecosystems due to its

natural resource values and proximity to important plant and bird species, making it a medium-potential recreation area where activities like bird watching, walking, landscape viewing, botanical observation, and controlled camping (with limits) can occur. Area (3) has lower recreational potential due to its topographic features, but can still support activities such as walking, dining, and photography

4. Discussion and Conclusion

This study evaluates the Analytic Hierarchy Process (AHP) method for spatial land suitability assessment in recreational area planning, presenting a structured approach to identifying potential recreation areas while balancing resource protection and use in protected environments.

The methodological framework developed for Bafa Lake Nature Park integrates three primary factors—natural landscape features, cultural landscape features, and accessibility—along with fourteen sub-criteria, based on literature review, expert field studies, and interviews. The area's notable attributes, including its natural site, wetland status, significant bird areas, endemic species, and lake ecosystem, highlight the importance of incorporating both protection and sustainable use in planning.

Monz (2006) underscored the pressure recreational activities can place on protected areas and the resulting ecological damage, emphasizing the need for careful management. Sayan and Ortaççeşme (2006) further confirmed that physical criteria like slope, elevation, and aspect are crucial in determining the suitability of recreational areas. These factors align with the findings of Kliskey (2000), Gül et al. (2006), and Çağlayan et al. (2020), who emphasized the importance of distance factors, such as proximity to roads and residential areas. Specifically, the optimal distances

for proximity to main roads and lakes were set at 0-250 meters, reflecting best practices in minimizing ecological impact while maximizing accessibility.

Piran et al. (2013) highlighted cultural values as significant factors in recreational attractiveness, recommending distances of at least 3 kilometers from culturally sensitive areas. This study aligns with these recommendations, incorporating cultural values into the suitability analysis to enhance the area's recreational potential while preserving its historical and cultural integrity.

One of the strengths of the AHP method is its ability to integrate multiple criteria into a cohesive decision-making framework. By allowing for systematic analysis and facilitating expert evaluations through a relative importance scale, AHP supports more objective and rational decision-making. This is particularly valuable in complex scenarios where multiple factors must be balanced.

Despite its advantages, the AHP method is not without limitations. The accuracy of the results is heavily dependent on the quality of input data and expert judgments. Additionally, while AHP provides a structured approach to evaluating suitability, it requires careful consideration of the weightings assigned to each criterion. Misestimation or bias in these weightings can affect the final suitability assessment.

In Turkey, protected areas such as National Parks and Nature Parks are essential for conserving natural and cultural resources while providing recreational opportunities. However, planning and management often face challenges due to a focus on broader-scale considerations, which can lead to inadequate attention to detailed, lower-scale studies necessary for

effective recreation area design. This can result in unplanned and uncontrolled visitor activities that may negatively impact the area's ecological and cultural values.

This study's suitability assessment of Bafa Lake Nature Park offers a valuable framework for addressing these challenges. By applying the AHP method, the research provides a detailed analysis of recreational suitability that considers natural, cultural, and accessibility factors. This approach not only aids in identifying high-potential recreational areas but also supports the development of strategies for sustainable use and protection of resource values.

The results indicate that the western part of Bafa Lake Nature Park is the most suitable for recreational activities, with medium and low suitability areas distributed throughout the park. The study identifies three potential recreational areas with varying degrees of potential, offering specific recommendations for activities in each area. This targeted approach can help park managers balance visitor needs with conservation goals, ensuring that recreational activities are conducted in ways that preserve the park's natural and cultural heritage.

In conclusion, this study highlights the effectiveness of the AHP method in recreational area planning and provides a comprehensive assessment framework that can be applied to other protected areas. Future research could explore the integration of additional criteria, such as socio-economic factors and climate change impacts, to further refine suitability assessments and enhance the sustainability of recreational planning.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Aklıbaşında, M. (2019). Determining the active green areas and their adequacy by using satellite images and GIS: The case of Nevşehir City (Turkey). *Fresenius Environmental Bulletin*, 28(10), 7274-7281
- Anonim (2019a). Aydın Büyükşehir Belediyesi Bafa Gölü Dem verileri.
- Anonim (2019b). Aydın Doğa Koruma ve Milli Parklar Şube Müdürlüğü, Bafa Gölü Tabiat Parkı verileri
- Bunruamkaew, K., & Murayam, Y. (2011). Site suitability evaluation for ecotourism using GIS ve AHP: A case study of Surat Thani province, Thailand. *Procedia-Social and Behavioral Sciences*, 21, 269-278.
- Borrie, W. T., McCool, S., & Stankey, G. H. (1999). Protected area planning principles and strategies
- Cheng, E. W. & Li, H. (2001), Analytic Hierarchy Process, Measuring Business Excellence, 5(3).
- Cocklin, C. (2019). *Demands On Rural Lands: Planning For Resource Use*. Routledge.
- Collins, M. G., Steiner, F. R., & Rushman, M. J. (2001). Land-use suitability analysis in the United States: historical development and promising technological achievements. *Environmental Management*, 28(5), 611-621.
- Çaglayan, İ., Yeşil, A., Cieszewski, C., Gül, F. K., & Kabak, Ö. (2020). Mapping of recreation suitability in the Belgrad Forest Stands. *Applied Geography*, 116, 102153.
- Çoban, G., & Göktuğ, T. H. (2023). Bafa Gölü Tabiat Parkı'nın ekoturizm potansiyeli açısından değerlendirilmesi. *Artgrid-Journal of Architecture Engineering and Fine Arts*, 5(2), 194-215.
- De Aranzabal, I., Schmitz, M. F., Aguilera, P., & Pineda, F. D. (2008). Recreation suitability analysis: Application in protected and non-protected areas
- Donegan, H. A. & Dodd, F. J. (1991), A Note On Saaty's Random Indexes. *Mathematical and Computer Modelling*, 15(10), 135-137.

- Duffield, B. S., & Coppock, J. T. (1975). The delineation of recreational landscapes: the role of a computer-based information system. *Transactions of the Institute of British Geographers*, 141-148.
- Esbah, H., Deniz, B., Kara, B., & Kesgin, B. (2010). Analyzing landscape changes in the Bafa Lake Nature Park of Turkey using remote sensing and landscape structure metrics. *Environmental Monitoring and Assessment*, 165, 617-632.
- FAO. (1985). *Guidelines: Land Evaluation For Irrigated Agriculture*, FAO Soils Bulletin.
- Forman, E. H. & Gass, S. I. (2001), The Analytic Hierarchy Process—An Exposition, *Operations Research*, 49(4), 469-486.
- Gül, A., Örucü, M. K. & Karaca, Ö. (2006), An approach for recreation suitability analysis to recreation planning in Gölcük Nature Park, *Environmental Management*, 37(5), 606-625.
- Kliskey, A. D. (2000). Recreation terrain suitability mapping: a spatially explicit methodology for determining recreation potential for resource use assessment. *Landscape and Urban planning*, 52(1), 33-43.
- Levinsohn, A., Langford, G., Rayner, M., Rintoul, J. & Eccles, R.,(1987), *A Microcomputer based GIS for assessing recreation suitability. In: proceedings of GIS*, American Society For Photogrammetry And Remote Sensing, Falls Church.
- Monz, C. (2006). Recreation ecology and visitor impact research: Past, present and future. *Exploring the Nature of Management*, 70, 98.
- Öztürk, S. (2005), Kastamonu–Bartın Küre Dağları Milli Parkı'nın rekreasyonel kaynak değerlerinin irdelenmesi, *Türkiye Ormancılık Dergisi*, 6(2), 138-148
- Piran, H., Maleknia, R., Akbari, H., Soosani, J., & Karami, O. (2013). Site selection for local forest park using analytic hierarchy process and geographic information system (case study: Badreh County). *International Research Journal of Applied and Basic Sciences*, 6(7), 930-935.
- Sadasıvunu, R., O'hara, C. G., Nobrega, R. & Dumas, J. (2009), *A transportation corridor case study for multi-criteria decision*

- analysis*, In American Society of Photogrammetry and Remote Sensing Annual Conference.
- Saat M., (2000), Çok amaçlı karar vermede bir yaklaşım: analitik hiyerarşi yöntemi. *Gazi Üniversitesi İktisadi Ve İdari Bilimler Fakültesi Dergisi*, 2(2), 149-162
- Saaty, T. L. (1980), *The Analytic Hierarchy Process*, Mcgraw-Hill, New York.
- Saaty, T. L. (1994), How to make a decision: The analytic hierarchy process, *Interfaces*, 24(6).
- Sayan, S., & Ortaçşeme, V. (2006). Recreational carrying capacity assessment in a Turkish National Park. *Exploring the Nature of Management*, 211.
- Şener, Ş., Şener, E., Nas, B. & Karagüzel, R. (2010), Combining AHP with GIS for landfill site selection: A case study in the Lake Beyşehir catchment area (Konya, Turkey), *Waste Management*, 30(11), 2037-2046.
- Tonyaloğlu, E. E., & Atak, B. K. (2019). Delta sistemlerinde peyzaj deseni ve mekansal bağlantılılığın analizi, Büyük Menderes Deltası örneği. *Adnan Menderes Üniversitesi Ziraat Fakültesi Dergisi*, 16(2), 209-215.
- Vargas, L. G. (1990), An overview of the Analytic Hierarchy Process and its applications, *European Journal of Operational Research*, 48(1), 2-8.
- Van Der Zee, D. (1990). The complex relationship between landscape and recreation. *landscape ecology*, 4, 225-236.

Prof. Dr. Tendü Hilal GÖKTUĞ

E-mail:tgoktug@adu.edu.tr

Educational Status: Proffesor

License: Landscape Architecture

Degree: Landscape Architecture

Doctorate: Landscape Architecture

Professional experiences: Recreation Planning, Recreation Satisfaction, Recreational Carrying Capacity

Ayser BAYAR

E-mail:ilhanaysr@gmail.com

Educational Status: Master Student

License: Urban and Regional Planning

Evaluation of Saklıkent National Park in Terms of Recreation Opportunities

Doç. Dr. Zeynep R. BOZHÜYÜK ARDAHANLIOĞLU ¹ 

¹Muğla Sıtkı Kocman University, Fethiye A.S.M.K Vocational School,
Landscape and Ornamental Plants Breeding Program,
48300, Muğla (Fethiye), Türkiye.
ORCID: 0000-0002-5571-1008
E-mail: zeyneprb@mu.edu.tr

Citation: Bozhüyük Ardahanlıoğlu Z.R. (2024). Evaluation of Saklıkent National Park in Terms of Recreation Opportunities. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:6, 117-136. ISBN: 978-625-367-855-5. Iksad Publications.

DOI: <https://doi.org/10.5281/zenodo.13874175>

1. Introduction

Unplanned and unhealthy urbanization, which emerged as a result of developments in industry and technology after the 19th century, has caused people to be negatively affected physically, spiritually and socioculturally (Yılmaz, 2006). Today, with the rapid development of urbanization, open and green areas are being replaced by different constructions (Şimşek & Korkut, 2009; Aklıbaşında, 2019). In this case, the areas where people can do their recreational activities are also shrinking. Recreation is defined as renewing oneself with the activities one wishes to feel healthier and work more efficiently (Kılıçaslan, 2008; Özer et al, 2014). In other words, recreation; These are activities generally done in spare time in order to rest and regain vitality (Güleç, 1990; Özer & Karakuş, 2012; Aklıbaşında et al.,2019). Recreation areas are areas where recreational activities are carried out (Uzun, 2005). Recreation areas have become smaller due to unplanned construction that has increased in recent years, causing people to turn to natural areas. For this reason, natural areas are priority areas where people will meet their recreational needs (Kaptanoğlu, 2010; Akten & Akten, 2011; Karakuş et al., 2014). National parks, which have important resource values within their protected area status, are accepted as important recreation and tourism resources around the world (Kim, et al., 2003; Göktuğ 2021; Çoban & Göktuğ 2019). These areas are also considered important tourism destinations (Timothy, 2000; Özer et al., 2016). The concept of national parks in Turkey gained legal status with the "Forest Law" that came into force in 1956, and the "National Parks Law" came into force in 1983. (Sayan & Karagüzel, 2010). The concept of national park refers to

"Natural pieces with rare national and international natural and cultural resource values and conservation, recreation and tourism areas in terms of scientific and aesthetics" in Turkey for the first time in 1958. It has been declared a National Park. Today, the number of national parks in Turkey is 49 (927,137ha). (Anonymous, 2024).

"Saklık National Park, with the Principle Decision No. 99 on Conditions of Protection and Use of Natural Protected Areas published in the Official Gazette No. 29959 dated 25.01.2017, was declared a sensitive area to be strictly protected." Sensitive Area to be Strictly Protected; "It includes species, habitats and ecosystems of national and international importance, contributes to ecosystem services in terms of biological, geological and geomorphological features, has a high risk of deterioration or destruction as a result of human activities, and whose vegetation, topography and silhouette must be protected and transferred to future generations, and It is defined as "water and sea areas declared by the Presidential Decree".

Saklık National Park, located within the borders of Seydikemer district of Muğla, was declared by the decision of the Council of Ministers on 06.06.1996. The main resource value of Saklık National Park is Saklık Canyon, which is the longest and deepest canyon in Turkey. 1,556 hectares of the national park are within the provincial borders of Antalya; 87 hectares of this are within the borders of Muğla province. The region was also registered as a sensitive area that must be strictly protected in 2019. Saklık Canyon, a valley consisting of very narrow and steep rocks, is an impressive natural wonder with its rocks that are 18 kilometers long and sometimes extend up to 300 meters deep.

In this study, which was conducted to evaluate Saklıkent National Park in terms of recreational opportunities, it was determined that many recreational activities can be carried out in the national park area.

2. Natural and Cultural Features of Saklıkent National Park

2.1. Saklıkent National Park Geographical Location

Saklıkent National Park is located in Seydikemer district of Muğla province. The main resource value and feature of the national park is the Saklıkent Canyon, which has very steep valleys and slopes with an altitude of 1,000-1,100 meters on the Karaçay Stream, a branch of the Eşen Stream. Karaçay is a branch separated from Eşen Stream and the general structural features of the canyon have a calcareous texture. This feature has brought about the striking natural formations formed by water over a long period of time. The flow rate of water at the entrance of the canyon is 14-17 m³ / sec. The canyon and its surroundings were declared as Saklıkent National Park on June 6, 1996 (Anonymous, 2022). It is stated that there are 16 caves in the canyon, which is said to have been used by people to hide about 3000 years ago and called it Saklıkent. Saklıkent Canyon is located on the Karaçay Stream, which is a branch of the Eşen Stream located in the east of the canyon. It is surrounded by Akdağ in the north and Beydağları in the south and east. The western skirts of Akdağ (3,024 meters), which extends in the same direction as Eşen Stream, are cut by fracture faults. These large fractures broke apart the Akdağ limestone and formed the Saklıkent Canyon. Saklıkent Canyon, which is the seventh largest canyon in Europe, is also protected as a first degree natural protected area (Gülbay, 2007). The area of the National Park, which had an area of 12,390 hectares when it was

declared, is 1643 hectares today. (Uzal, 2006). The canyon has also been used for tourism purposes since the 1990s (Anonymous, 2009). (Figure 1).

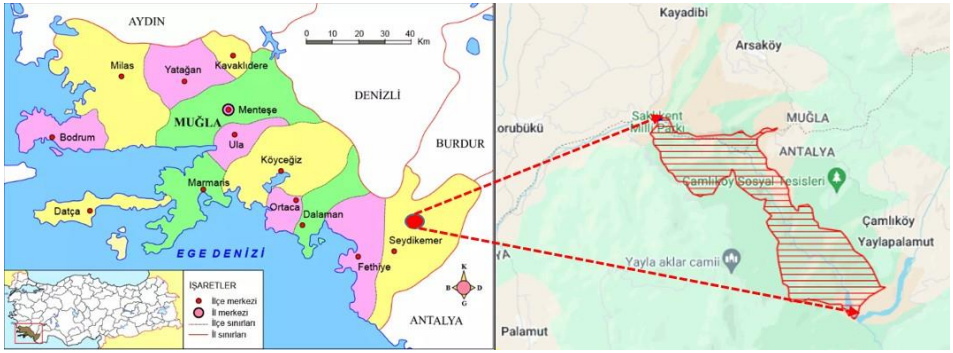


Figure 1. Geographical location of Saklıkent National Park (Source: Author; url1)

2.2. Geological Structure of Saklıkent National Park

The formations in Saklıkent National Park consist of Mesozoic, Tertiary and Quaternary aged limestones and alluviums. The area was exposed to the Alpine orogeny and later gained its current appearance through faulting. The Mesozoic period is observed especially in the place where Saklıkent Canyon was formed. The field extends in the North East-South West direction, corresponding to the area elevated as a result of faulting. In the area extending in the northeast-southwest direction in the Eşen Stream valley, Tertiary areas are seen as Pliocene formations. There are claystone, sandstone and limestone in these areas (Bozyiğit, 1997).

2.3. Geomorphology of Saklıkent National Park

The geomorphological units in Saklıkent National Park consist of mountainous areas, plateaus with various elevations, valleys and terraces. The most important mountainous areas here are Akdağ and Dumanlıdağ.

Akdağ extends in the N-S direction, to the east and northeast of Saklıkent Canyon. Karaçay (Kocaçay), which was also effective in the formation of Saklıkent Canyon, was formed by the merger of waters coming from low-flow sources leaking from the southeastern foot of Akdağ. Erosion surfaces of various ages and levels are observed in the region, and elevations varying between 1000-1300 m. There are plains between 800-1000 m altitude. Especially the part corresponding to the land in the north of the canyon collapsed as a result of faulting. Travertine formations and small stalactites at the entrance of the canyon attract attention. There is a 70-80 m long karst tunnel in the canyon, which is approximately 2 km away from the entrance (Şengün, 2011).

2.4. Saklıkent National Park Flora and Climate

Saklıkent and its surrounding ecosystems reflect the diversity of vegetation and biological richness in the region. The entrance part of Saklıkent Canyon and its surroundings are mostly home to red pine trees. In the southeastern part of Saklıkent National Park, larch trees can be found in zones above 1000 m. Additionally, cedar trees can be found in Dumanlıdağ and its surroundings (Uçar, 2010). Coastal vegetation is found on both sides Nerium oleander, Pistacia terebinthus, Platanus orientalis, Ceratonia siliqua, Ulmus sp., Tamarix sp., perennial plants such as Plantago major, Plantago lanceolata, Rubus sp., Sium sisarum L.var. lancifolium ve Asparagus acutifolius It consists of shrub-shaped plants such as (Yorulmaz, 2006). According to a research conducted on Saklıkent flora, the presence of 92 species of endemic plants in the region was determined (Dinç, 1997). There are cedars that are monumental trees around Dumanlıdağ. There are endemic geophytes and cyclamens in

Aktar Plateau (Ekotaban, 2022). This area stands out as an important habitat where endemic plant species survive in a special ecosystem (Demirdöven, 2024). Seydikemer district, which hosts Saklıkent National Park, is located in the Mediterranean Region and has a typical Mediterranean climate with hot and dry summers and warm and rainy winters. The average annual temperature in Seydikemer varies between 18.3 and 17.4°C. Additionally, the average annual rainfall is around 812.5 mm (Anonymous, 2018).

2.5. Saklıkent National Park Hydrology

Karaçay, which originates within the borders of Antalya province and passes through the canyon, is approximately 18 km within the borders of Muğla province. After forming the long Saklıkent canyon, it merges with Kemer Stream and takes the name Eşen Stream. Eşen Stream sometimes crosses the provincial borders of Muğla and Antalya and reaches the Mediterranean from Patara. The color of the water passing through the canyon is blurry, especially in winter and spring. According to the water quality study of Eşen Stream sampling points, it was determined that Saklıkent sampling point had the best water quality. Karaçay Stream, which originates from Saklıkent and joins Eşen Stream, has an improvement effect on the water quality of Eşen Stream and causes it to be included in a better water quality class (Yorulmaz, 2006). Additionally, there are many large and small spring waters within the canyon. Karaçay (Kocaçay) is a branch of Eşen Stream, which was effective in the formation of the canyon. It takes its source from various low-flow streams located at the southwestern base line of Akdağ.

Karaçay was formed in the Pliocene and buried in the basement in the Quaternary (Şengün, 2005).

2.6. Current Situation of Saklıkent National Park

Saklıkent Canyon has been used for tourism purposes since 1988. It was known and visited by village residents before this date. Entrance to the canyon is made by walking over the 100 m long bridge. There are 5 strong spring water outlets on the northern slope of the canyon, 100 m after the entrance. These hot springs and their surroundings have a rich tourist potential. Saklıkent National Park has been operated by Seydikemer Municipality since 2014 (Özcan, 2020). In Saklıkent Canyon, visitors can reach the place where the stream comes to the surface by proceeding in a single file on the wooden piers attached to the canyon wall. At this point, it is possible to enter the water and proceed towards the depths of the canyon. It is necessary to use sea shoes as the bottom of the water is gravel. Entrance to the canyon is paid (Anonymous, 2022; Ok, 2023). Outside the canyon, there are restaurants scattered along Kocaçay and located near the entrance of the canyon. These are mainly located on the south side, while on the north side there are parking lots, paid toilets and shops allocated to the villagers. The shops, which were designed more simply until 2004, now look more modern. These businesses include shops selling local products and souvenirs, renting sea shoes and helmets, restaurants and cafeterias, and a rafting business. Some of the restaurants have created platforms built on water and furnished them with cushions and pillows. Thus, it is possible to eat and drink while sitting on the water. The area also includes toilets, a prayer room, changing cabins, showers and children's playgrounds. It is

possible to see various businesses at the entrance of Saklıkent Canyon. It is possible to find local product sales in the region. These products are mostly olives, figs, honey, carob and molasses, and apples (Figure 2).

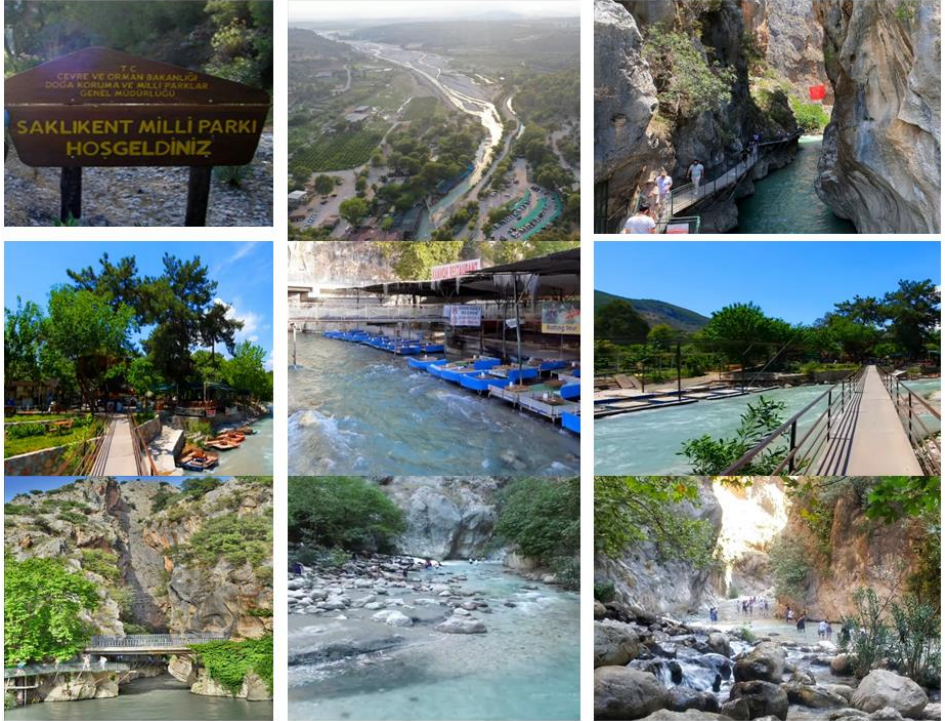


Figure 2. Views from Saklıkent National Park (Source: Author)

The canyon has an average of 1000-1500 visitors per day during the summer season. The number of tourists visiting the region throughout the year is between 400-500 thousand. Area management in the canyon is carried out by Seydikemer Municipality. Seydikemer Municipality operates Saklıkent Canyon by renting it from the Directorate of Nature Conservation and National Parks (Çetinkaya, 2018). There is a small stream waterfall formed as a result of a slope crack, approximately 3 km away from the entrance of the canyon. Additionally, potholes have

formed in the section due to water fall. This section should be passed with the help of a support.

3. Findings and Discussion

3.1. Recreation Opportunities of Saklıkent National Park

Saklıkent National Park allows many different recreational activities thanks to its geography. The road used to come to Saklıkent National Park provides a natural driving pleasure with slightly inclined bends. When you reach the area, there is a toll booth where you can enter the canyon. The primary recreational activity that can be done in the area is walking through the canyon. The first part of this walk is provided by a wooden walking bridge. After the cafeteria at the end of the wooden bridge, the second part of the canyon begins and this part constitutes the walking stage inside the canyon. In this part, recreational activities based on rivers such as river adventure walking, geological observation, photography, mud bathing can be done. Safety precautions should be taken in the interior of the canyon and swampy areas formed by dense clay should be avoided. Since the flow of the stream flows quickly when passing to this section, the passage rope within the canyon must be held securely. Some visitors do not prefer to enter this section. It is not allowed to go further into the canyon where the caves are located. Many different recreational activities can be done in Saklıkent National Park, although most of them are river-based activities. These activities are seen in Table 1.

Table 1. Recreational Activities that can be done in Saklıkent National Park

Nature photography: Saklıkent National Park; It hosts many different geographical formations with its canyons and streams. These areas also offer breathtaking views and attract the intense attention of photographers. The national park area provides the opportunity to take photographs of many different landscapes with its flora, fauna, geological formations, mountainous areas, local rest areas and water arrangements.



Trekking: There is an unofficial mountain route in the national park, which is generally known by guides and local people. This route is a route that is formed spontaneously by following the paths used by climbers who come to the region over time. The route, which is 18 km long, starts from Yayla Palamut District and ends in Kaya Dibi District. It offers very different experiences to visitors who come to the region for nature walks.

Camping: Saklıkent National Park is also an attractive spot for campers and caravanners due to its natural habitats and being in touch with nature. There are also tree houses within the area that allow for daily accommodation.



Mountain bike: To Saklıkent National Park The main road used for transportation offers a different experience for cyclists with its winding feature.



Rock climbing: There are areas suitable for rock climbing with special equipment in the rocky areas of Saklıkent National Park, whose heights reach 1000-1300 m.



Jeep safari: Many people engage in jeep safety activities in Saklikent National Park's regions with different elevations and unpaved roads (url2).



Mud bath: Karaçay, which passes through the canyon in Saklikent National Park, has a dense clay soil on its bottom. Mud baths can also be taken for personal care purposes, especially in and around the canyon (url3).



Geological observation: Saklikent canyon is of karstic origin in terms of its geological structure and has become magnificent today as a result of the eroding of rocks by streams coming from Karaçay and Bey Mountains for thousands of years. It is possible to observe these different geological formations as you move through the canyon.



Canyon crossing: After entering Saklikent Canyon, walking through the canyon begins by crossing the wooden bridge. This point takes users to a small waterfall. Before starting to pass through the canyon, the high-speed section of the Karaçay River is crossed with a strong rope, and then the walk continues along the slower-flowing stream. At more inland locations, a different experience can be had by taking mud baths with clayey soil.



Picnic: After the activities in the canyon section of Saklikent National Park, it is possible to spend a quiet and peaceful hour by sitting in the small restaurants built around the Karaçay stream and eating while enjoying the refreshing effect of the water.



Nature watching: Saklıkent National Park offers a different experience at every point with its geology and geography formed by the influence of rivers. Observing this geography and taking photographs has a beautiful effect on people.



Zipline: Ziplining, also known as rope gliding, is done by gliding along a specific route using strong ropes. The route created usually moves from a high point to a lower point. Users who move with sliding ropes can engage in an exciting activity. There is a zipline activity in Saklıkent National Park, which is located outside the canyon and starts from the point where the tree houses are located, and many users also perform this activity (url4).



Bungee jumping: Bungee jumping, It is an outdoor activity that allows users to be pulled back up after being dropped from a high point with a rope tied to their feet. bungee jumping, It is a preferred recreation activity that can be done in Saklıkent National Park.



Karaçay River boat trip: Proceeding with boats to a certain point at the variable speed of the stream passing through Saklıkent Canyon is a very preferred activity in Saklıkent National Park. Users steer the boats with their oars, move at variable speeds depending on the flow rate, and have an exciting journey.



Flora observation: Saklıkent flora includes many different plant species. Observing the species and taking photographs in this area, where 92 endemic species have been identified, is a quieter recreational activity and can be done within the borders of the national park.



4. Conclusion and Suggestions

Turkey has a uniquely beautiful geography with its altitude above the world average, different geological formations, mountains, being surrounded by seas on three sides, lakes and rivers. For this reason, the number of protected areas such as national parks in Turkey is increasing day by day. As a result of rapidly increasing urbanization and technological developments in recent years, the use of natural resources for recreational purposes is also becoming widespread (Ardahanlıoğlu & Karakuş, 2016). In the use of natural resources for outdoor sports recreation activities, especially in mountainous, forested, rocky, etc. The areas allow many outdoor recreation activities, from climbing to walking, from skiing to paragliding (Aslan et al., 2002). Saklıkent National Park also provides opportunities for many different recreational activities with its canyon, the stream passing through the canyon, mountainous areas, different geology and untouched natural areas. Saklıkent National Park encounters an increasing visitor potential every day due to its many features. This situation not only provides economic tourism input, but also puts pressure on the National Park.

As a result, some suggestions for Saklıkent National Park, both for recreational activities and in general, have been made below.

- Security measures should be increased for users inside the canyon, especially during the canyon walking section.
- Information activities should be carried out for visitors to the area. It should be noted that non-slip, sturdy shoes should be worn, especially for users who want to reach the waterfall by passing through the stream.

- There are areas within the canyon where walking becomes difficult and the dense clay soil turns into mud and forms a swamp. Passage to these areas should be prohibited and inspected.
- This passage should be made more secure with an iron chain instead of rope in the inner part of the stream that provides passage to the canyon walking.
- Direction signs should be made while walking inside the canyon.
- Considering that Saklikent National Park has an important tourism potential for the local people, the region should be better promoted.
- Rafting, nature walking paths, climbing areas, camping and travel areas that can be done in the national park area should be designed and implemented within a project.
- The number of equipment should be increased in the area outside the canyon, where small businesses and restaurants are generally run by local people.

Saklikent National Park, which is used extensively by local and foreign visitors every year, has the potential to meet the recreational demands of the local people. For this reason, sustainable recreation activities should be made possible in the region by making plans that take into account the conservation-use balance, are supported by visitor management plans, and do not exceed the carrying capacity of the national park.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

References

- Akten, M., & Akten, S. (2011). *Rekreasyon Potansiyellerinin Belirlenmesine Yönelik Bir Model Yaklaşımı: Gülez Yöntemi*, I. Ulusal Sarıgöl İlçesi ve Değerlendirme Sempozyumu, Sarıgöl.
- Aklıbaşında, M. (2019). Determining the active green areas and their adequacy by using satellite images and GIS: The case of Nevsehir City (Turkey). *Fresenius Environmental Bulletin*, 28(10), 7274-7281.
- Aklıbaşında, M., & Özdarıcı, Ok, A. (2019). Determination of the urbanization and changes in open-green spaces in Nevsehir city through remote sensing. *Environmental Monitoring and Assessment*, 191(12), 756.
- Anonymous, (2009). T.C. Çevre ve Şehircilik Bakanlığı.
- Anonymous, (2018). T.C. Tarım ve Orman Bakanlığı VI. Bölge Müdürlüğü.
- Anonymous, (2022). Seydikemer Belediyesi.
- Anonymous, (2024). Doğa Koruma ve Milli Parklar Genel Müdürlüğü.
- Ardahanlıoğlu Z.R. & Karakuş N. (2016). Determining the Recreational Potentials of Some of the Bays in Fethiye. *Environmental Sustainability and Lanscape Management*, 573-584pp.
- Aslan, M., Göyün, D., Yiğit, B., & Zehir, S. (2002). Dağ Milli Parklarından Rekreasyon ve Turizm Olanaklarının Değerlendirilmesi. *Türkiye Dağları*, 1.
- Bozyiğit R. (1997). *Eşen Çayı Havzası Jeomorfolojisi*, Marmara Üniversitesi, Sosyal Bilimler Enstitüsü, Doktora Tezi) İstanbul.
- Çetinkaya, G., Yıldız, M., & Özçelik, M. A. (2018). Yerel halkın milli park ziyaret nedenlerinin belirlenmesi: Antalya ili örneği. *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (32), 135-143.
- Çoban, G., & Göktuğ, T. H. (2019). Küre Dağları ve Ilgaz Dağı Milli Parklarında ziyaretçi yönetim araçlarının değerlendirilmesi. *Bartın Orman Fakültesi Dergisi*, 21(3), 700-712.

- Demirdöven, A. (2024). *Saklıkent Milli Parkı'nda Zerconid akarlar (Acari, Zerconidae) üzerine sistematik arařtırmalar*. Pamukkale Üniversitesi, Yüksek Lisans Tezi.
- Göktuğ, T. H. (2021). Visitor-Sourced Pollution and Esthetic Quality in the Coastal National Parks: Sample of Dilek Peninsula Büyük Menderes Delta National Park/Turkey. *Coastal Management*, 49(2), 183-200.
- Güleç, S. (1990). Orman içi rekreasyon potansiyelinin saptanması için geliştirilen bir değerlendirme yöntemi. *Journal of the Faculty of Forestry Istanbul University*, 40(2).
- Karakuş, N., Selim S., Ardahanlıođlu Z. R., Çınar İ., & Özer Ö. 2014. *Aktif Rekreasyon Alanları Dağılımının Cbs Teknikleri ile Analizi Üzerine Fethiye Kent Merkezi Örneğinde Bir Arařtırma*. Türkiye Coğrafyacılar Derneđi Uluslararası Kongresi, 4 - 06 Haziran 2014, ss.570-576.
- Kılıçaslan, Ç., (2008), „Ortaca Kenti Rekreasyon Alanlarının Mevcut Durumu Ve Muđla Üniversitesi Ortaca Meslek Yüksekokulu Öğrencilerinin Rekreasyon Alanlarına Yönelik Beklentileri, *Düzce Üniversitesi Ormancılık Dergisi*, Cilt: 4, Sayı: 1-2, Sayfa: 3-16.
- Kim, S. S., Lee, C., & Klenosky, D. B. (2003). The influence of push and pull factors at Korean national parks. *Tourism Management*, 24, 169-180.
- Ok, M. (2023). *Ege Bölgesi'ndeki Millî Parkların Ekoturizm Potansiyelinin Arařtırılması* (Master's thesis, Necmettin Erbakan University (Turkey)).
- Özer, Ö., & Karakuş N. (2012). *Dalyan Destinasyonundaki Rekreasyonel Olanakların Deđerlendirilmesi ve Rekreasyonel Potansiyelin Arařtırılması*. I. Rekreasyon Arařtırmaları Kongresi, Türkiye, 12 - 15 Nisan 2012, ss.574-586.
- Özer, S., Kulözü, N., & Aklıbaşında, M. (2014). *Kent Ormanı Kullanıcılarının Memnuniyet Düzeylerinin ve Beklentilerinin Saptanması Erzurum Kent Ormanı Örneđi*. III. Uluslararası Odun Dışı Orman Ürünleri Sempozyumu, 756-766.

- Özer, Ö., Avcı, M. & Karakuş, N. (2016). A study for the evaluation of alternative tourism opportunities in Fethiye destination. *Journal of Tourism & Gastronomy Studies*, 4(1), 21-26.
- Sayan, S., & Karagüzel, O. (2010). Problems of Outdoor Recreation: The Effect of Visitors' Demographics on the Perceptions of Termessos National Park, Turkey". *Environmental Management*, 45, 1257-1270.
- Şengün, M.T., & Tonbul, S. (2005). Olbe Kanyonu ve Deve Mağarasının (Harput - Elazığ) Jeomorfolojik Özellikleri, Gelişimi ve Turizm Potansiyeli, *Doğu Anadolu Araştırmaları Dergisi*, Cilt:4, Sayı:2, s.10-16.
- Şengün, M. T. (2011). *Saklık Canyon (Fethiye-Turkey)*. *Procedia-Social and Behavioral Sciences*, 19, 571-579.
- Şimşek D. S., & Korkut A. B. (2009). Kıyı Şeridi Rekreasyon Potansiyelinin Belirlenmesinde Bir Yöntem: *Tekirdağ Merkez İlçe Örneği*, *Tekirdağ Ziraat Fakültesi Dergisi*, Cilt: 6, Sayı: 6, Sayfa: 316-327.
- Timothy, D. J. (2000). *Tourism and international parks* (Ed: R.W. Butler, ve S.W. Boyd), John Wiley ve Sons, West Sussex.
- Uzun, S. (2005). *Kırsal ve Kentsel Alanlardaki Parklarda Kullanıcı Memnuniyeti: Gölcük Ormanı Dinlenme Alanı ve İnönü Parkı Örneği*, Abant İzzet Baysal Üniversitesi, Fen Bilimleri Enstitüsü, Peyzaj Mimarlığı ABD, Yüksek Lisans tezi, Sayfa: 104.
- Yılmaz, R. (2006). *Saroz Körfezi'nin Turizm ve Rekreasyonel Kullanım Potansiyeli Üzerine Bir Araştırma*. Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi, Seri: A Sayı: 1, Sayfa: 124-135.
- url1: <https://s.milimaj.com/others/image/harita/mugla-ili-haritasi.png>
- url2: <https://cloudbasetravel.com/hizmet/jeep-safari-turu-saklikent/>
- url3: https://www.gorgeclub.com.tr/wp-content/uploads/KOL_1555-480x400.jpg
- url4: https://www.gorgeclub.com.tr/wp-content/uploads/DSC_0157-480x400.jpg

Zeynep R. BOZHÜYÜK ARDAHANLIOĞLU

E-mail:zeyneprb@mu.edu.tr

Educational Status: Associate Professor

License: Landscape Architecture

Degree: Dr

Doctorate: Landscape Architecture

Professional experiences: Landscape Planning

The Recreational Importance and Utilization Opportunities of Urban and Rural Waterfront: The Case of Nevşehir

Assoc. Prof. Meliha AKLIBAŞINDA¹ 

¹ Nevşehir Hacı Bektaş Veli University, Faculty of Engineering and Architecture, Department of Landscape Architecture, Nevşehir/Türkiye

ORCID: 0000-0003-3250-6375

E-mail: melihaaklibasinda@nevsehir.edu.tr

Assoc. Prof. Aslıhan TIRNAKÇI² 

² Nevşehir Hacı Bektaş Veli University, Faculty of Engineering and Architecture, Department of Landscape Architecture, Nevşehir/Türkiye

ORCID: 0000-0002-0122-5637

E-mail: aslihanerdogan@nevsehir.edu.tr

Citation: Aklıbaşında M. & Tırnakçı A. (2024). The Recreational Importance and Utilization Opportunities of Urban and Rural Waterfront: The Case of Nevşehir. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:7, 137-157 ISBN: 978-625-367-855-5. Iksad Publications.

DOI: <https://doi.org/10.5281/zenodo.13874667>

1. Introduction

Recreation, which signifies renewal, is defined as relaxing and entertaining activities that individuals voluntarily engage in during their leisure time (Karaküçük, 2008). Recreation encompasses all forms of pleasurable and enjoyable activities that participants voluntarily choose to engage in during their leisure time, whether alone or in groups, with or without the use of vehicles, in open or enclosed spaces, within the city or outside of it, affiliated with an organization or independently (Yazici & Pirli, 2022).

In contemporary urban environments, where stress and hectic lifestyles are prevalent, the importance of recreation and the need for recreational areas are increasing. Recreational activities, which encompass a variety of purposes such as relaxation, artistic expression, cultural engagement, and sports, can take place in both indoor and outdoor settings (Ardahanlıoğlu Bozhüyük & Karakuş, 2016). With rapid urbanization, individuals who spend the most of their time among dense building structures and have limited interaction with nature tends to outdoor recreational activities and open-green spaces. Forested areas, urban and peri-urban picnic sites, parks, surroundings of water bodies such as sea, lake, dam, river, highlands that provide individuals with the opportunity to connect with nature are the most preferred areas for recreational activities.

Green spaces play crucial roles in the lives of humans and other living beings. In addition to their ecological functions such as purifying the air, filtering wind and noise, regulating the climate, and preserving biodiversity, they are also important for human physical and mental health by promoting physical activities, providing social opportunities, and offering psychological benefits (Aklıbaşında, 2019). Open-green areas

facilitate interaction between individuals and nature, as well as among people, while offering various outdoor recreation opportunities (Karaşah, 2017). In addition, green spaces provide urban people with opportunities to be alone or recover, as well as the opportunity to be together with plants and animals (Fuller et al., 2007; Wolch et al., 2014; Karaşah, 2016).

There are many factors that determine the recreational value of an area, and natural factors such as topographic structure, climate, floristic diversity, fauna richness, and the presence or proximity of water resources are the main ones (Surat, 2018). Semi-terrestrial ecosystems like lake and river shores, and wetlands, not only provide ecological benefits to urban areas but also play a significant role in enhancing quality of life by offering green space potential and opportunities for socialization (Tülek & Barış, 2014).

Water, which has very strong and significant characteristics and effects for living life, has a wide range of literature that has been scientifically addressed in different aspects. Many studies show that water is an element that increases visual quality and that such landscapes are more appreciated and preferred by people (Bulut & Yılmaz, 2009; Aklıbaşında & Bulut, 2018; Hu et al., 2023). In addition to influencing perception and visual preference, water has positive effects on human psychology and mental health (Atabeyoğlu & Aklıbaşında, 2017; Vert et al., 2020; McDougall et al., 2021). Areas with water sources also possess unique microclimatic conditions that enhance thermal comfort (Xu, 2019; Jacobs et al., 2020; Yücekaya et al., 2022). When all these studies are considered holistically, it becomes evident how and why water is an essential natural resource for recreational activities.

The relationship between cities and their shorelines has changed and diversified over time due to various dynamics. In recent years, the visual, functional, perceptual, and ecological qualities of shorelines have increasingly been utilized for tourism purposes (Koçan, 2021). Rivers flowing through cities are unique landscape elements that provide identity to urban areas, on the other hand, when integrated into urban design, contribute positively to the socio-cultural life of the city residents (Duman & Turgut, 2020). Additionally, the banks of rivers, natural lakes and dams are the most popular rural recreational areas, especially on weekends during the summer. These areas are highly desired for recreational activities such as picnic, camping, sports, sitting, resting, swimming, trekking, sightseeing and fishing (Bulut, 2003).

Especially in regions such as Nevşehir, where continental climate and steppe vegetation are dominant, waterfronts gain more importance in recreational activities with their green texture and become a center of attraction. In this study, urban and rural waterfront recreation areas used intensively for recreational purposes were examined. As a result of the research, the qualities of these areas, their importance for the city of Nevşehir, their natural and cultural characteristics, existing and potential recreational opportunities were revealed, and suggestions for improving their recreational use were presented.

2. Material and Method

The study was conducted in three main recreational areas in Nevşehir province: Damsa Dam recreation area in Ürgüp district, riverside recreation areas in Avanos and Gülşehir districts where the Kızılırmak River flows (Figure 1). These areas are recreation areas of regional

importance due to their proximity to Nevşehir city center and their different landscape characteristics from the region's continental climate and steppe vegetation. These recreational areas used by many visitors from the surrounding provinces as well as Nevşehir city residents, especially during the spring and summer periods.

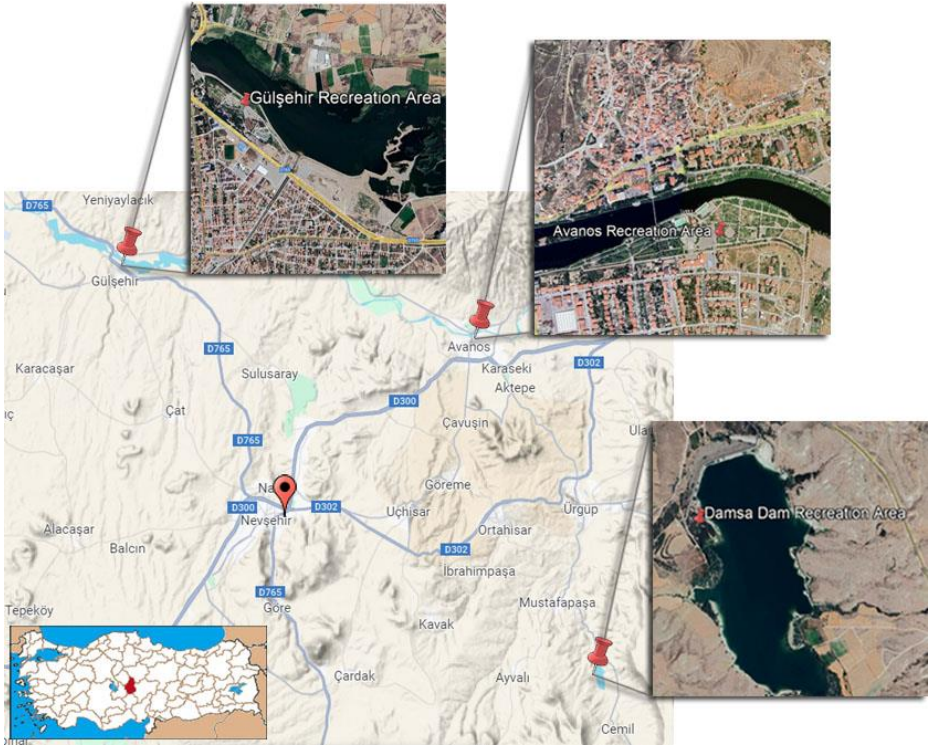


Figure 1. Location map of the research areas, Source: Authors

Nevşehir province is located in the Central Anatolia Region of Türkiye, with a population of 315,994 according to TUIK 2023 data (Anonymous, 2024a). Nevşehir province consists of 8 districts: Center, Acıgöl, Avanos, Derinkuyu, Gülşehir, Hacібektaş, Kozaklı and Ürgüp. The Avanos riverside recreation area is 16 km from Nevşehir city center, the Gülşehir

riverside recreation area is 20 km away, and the Ürgüp Damsa Dam recreation area is 30 km away.

Within the scope of the research, the natural, cultural and visual landscape characteristics of the recreation areas, the recreational opportunities provided to visitors and the visitor profile were determined through on-site observations and photography studies. In this direction, the recreational importance of the research areas for the city of Nevşehir was revealed; positive and negative aspects were evaluated and suggestions were presented to improve the recreational aspects.

3. Results

3.1. Avanos Kızılırmak Riverside Recreation Area

It is the closest waterfront recreation area to Nevşehir city center among the research areas. The Kızılırmak River passes through the city center of Avanos and while the old settlement develops towards the slopes to the north of the river, the new settlements develop towards the plains to the south of the river. The river, which is physically effective in the development of the city, is also of great importance in socio-cultural and economic terms. A recreational area approximately 1,5 km in length has been established in the city center along the northern and southern banks of the river which is surrounded by agricultural fields.

The Historical Stone Bridge, built in 1898 over the Kızılırmak River (Anonymous, 2024b), connects both sides of Avanos. This bridge mainly provides transportation by vehicle and connects the recreation area on both sides of the river (Figure 2).



Figure 2. Avanos Historical Stone Bridge, Source: Authors

Another bridge connecting both banks of the river is the Asma Bridge (suspension bridge). It was built in 1973, 180 m. long, 2,30 m. wide and suitable for pedestrian walking only (Anonymous, 2024b) (Figure 3). The bridge connects the recreation area on both sides of the river and is important for visitors to actively use both sides. The bridge, which visually enriches the space, is found exciting by the users with its slight swaying at the crossing. The bridge attracts great interest by visitors who want to experience this and take photos.



Figure 3. Avanos Asma Bridge, Source: Authors

In the recreation area, where uses have changed from past to present, today there are promenades, cafes, restaurants, local product sales units, kiosks, amphitheater, countryside wedding area, playground equipments units, basketball court and seating units. In addition to these, a caravan area has recently been established but has not yet been operational. Only picnics without fire are allowed in the recreation area and the large grass areas are used intensively by users for this purpose, especially on hot summer days (Figure 4).



Figure 4. Views from the Avanos Kızılırmak Riverside Recreation Area, Source: Authors

Various events such as concerts are held in the amphitheater in the recreation area and fairs are organized around it. There are gondola and jet boat tours on the river and it is seen that water-based recreational activities are also included in the recreation area (Figure 5).



Figure 5. Water-based recreational activities in Avanos Kızılırmak Riverside Recreation Area, Source: Authors

The area forms a very dense green texture within the city with tall willow trees (*Salix* sp.) on the riverbank, large grass areas and ornamental plants used in landscaping. Ducks and geese were brought to this part of the river and a habitat was created for them on the islet in the river (Figure 6). The increasing population of ducks and geese over time has added visual value

to the recreation area. At the same time, people were allowed to observe and feed them. All these features and the fact that it is one of the tourism attraction points in the Cappadocia Region have made this area a popular destination for local and foreign tourists.



Figure 6. Views of Kızılırmak and its banks, Source: Authors

3.2. Gülşehir Kızılırmak Riverside Recreation Area

Gülşehir is another district in Nevşehir where the Kızılırmak River passes through. The district was established on the plains south of the river. The area between the Kırşehir-Nevşehir highway, which runs in the east-north direction of the settlement texture, and the Kızılırmak River has been designed as a waterfront recreation area. The recreation area, which is approximately 1,5 km long, consists of two parts: Sadabad Park and Gülşehir National Garden.

Sadabad Park includes a picnic area with barbecue, children's playground, fitness area, restaurant, cafe, poolside wedding area, walking paths, seating units, amusement park and go-kart area (Figure 7). The park has a dense green texture with tall trees and many plants. There are willow trees (*Salix* sp.) close to the river and a wide variety of landscape ornamental plants inland. There are no water-based recreation opportunities on the banks of

Kızılırmak due to the high embankments built for flood prevention. However, the recreation area is in high demand due to the microclimatic effect created by the river, the dense green texture of the area and its proximity to Nevşehir city center. It is especially preferred by the people of the region during the hot summer months.



Figure 7. Views from the first part of Gülşehir Kızılırmak Riverside Recreation Area (Sadabad Park), Source: Authors

The Gülşehir National Garden is started in 2023 and currently has walking paths, numerous playgrounds, seating units and a waterfront walkway (Figure 8). Various plant designs have been made in the area, but since the plants have not yet reached their general habitus, no mass green texture has been formed. When the landscape design application of the area is completed and the green texture is formed, it will become a shoreline with a high recreational value that serves users with different functions together with Sadabad Park. At the same time, the area located at the entrance of

Gülşehir and on the intercity transportation network will contribute to the city identity visually.



Figure 8. Views from the second part of Gülşehir Kızılırmak Riverside Recreation Area (Gülşehir National Garden), Source: Authors

3.3. Damsa Dam Recreation Area

Damsa Dam in Ürgüp district of Nevşehir was constructed between 1965 and 1971 for irrigation and flood prevention (Anonymous, 2024c). The dam is located 12 km from Ürgüp district center. Afforestation works were carried out around the dam in the past. The entrance part, where tall pine trees (*Pinus* sp.) are dense, has been used as a recreation area from the past to the present (Figure 9). The area is intensively used by the residents of Nevşehir and from time to time by visitors from neighboring provinces for picnics, especially in the summer months. Unlike the other areas examined in the research, it stands out with its natural rural landscape features. In recent years, it has been made more functional by making landscape arrangements. Picnic units, barbecues, fountains, walking paths, playground, basketball court, volleyball court and country cafe are used in the recreation area. In 2022 and 2023, Damsa Dam Festivals were organized by Ürgüp Municipality and various recreational activities were carried out. The area, which offers a wide view of the lake under densely

planted tall trees, is very attractive to people. Although it is farther away from other waterfront recreation areas in the city of Nevşehir, it is in high demand with its natural landscape features.

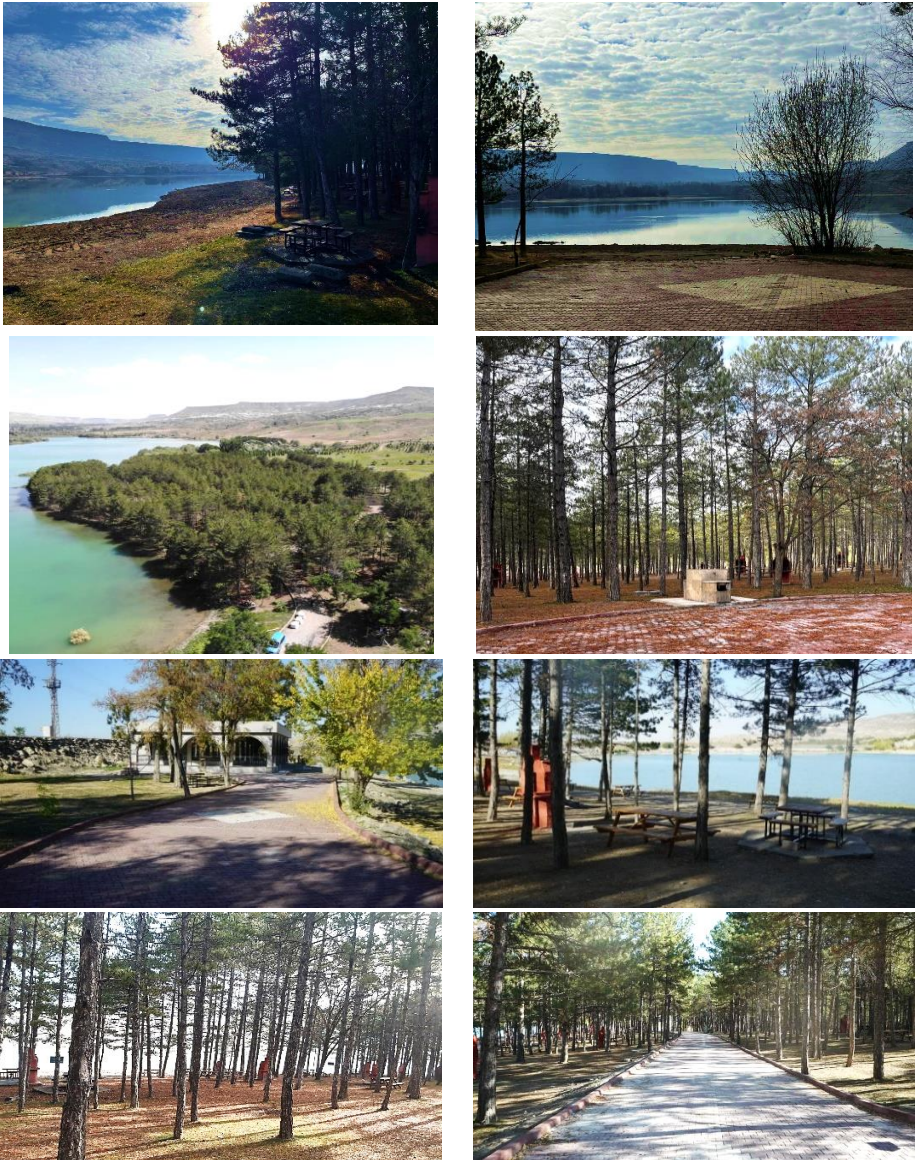


Figure 9. Views from Damsa Dam Recreation Area, Source: Authors

4. Conclusion and Suggestions

Water resources, which have been an important factor in the shaping of cities from past to present, offer various recreational opportunities to people both with waterfront landscaping arrangements in urban areas and with their natural features in rural areas. Especially in regions such as Nevşehir, where continental climate and steppe vegetation is dominant, water shores gain more importance with their green texture and become a center of attraction in recreational activities. As Burmil et al. (1999) point out, water plays a very important role in shaping the earth and affects the amount and distribution of vegetation, aquatic organisms and wildlife species. In arid regions, people's perceptions of water vary. In addition to its necessity for vital activities, it serves as one of the most visually attractive and important elements of the landscape.

In Nevşehir, where summers are hot and dry, people primarily prefer waterfront recreation areas due to their cooling effect. These areas, which provide bioclimatic comfort, have positive psychological effects and high visual quality, offer various recreational opportunities. In this study, the most important recreation areas in the city were examined. These waterfront recreation areas have different qualities and are intensively used.

Avanos Waterfront Recreation Area is located in the city center and unlike the others, it has a direct impact on the city image. It is seen that the area, which has been developed with continuous landscaping arrangements, has a high importance not only for local residents but also for regional tourism with its natural and cultural landscape features. The area, which is used throughout the year, offers a wide range of recreation opportunities. Unlike

others, recreational activities based directly on water (such as gondola, jet boat, goose-duck watching) are also included in this area. Again, unlike other areas, there are no barbecue picnics in Avanos waterfront recreation area.

The first section of the Gülşehir Coastal Recreation Area, which consists of two sections, is actively used and people do not have visual or physical interaction with water. However, the area is preferred for its dense green texture, microclimatic features created by the river and with its recreational opportunities. It is intensively used in the spring and summer months by the people of Nevşehir city, who mostly prefer recreational activities and picnics with barbecues. A walking path was created on the shore in the second part of the recreation area and the visual features of the river were also utilized. Since Gülşehir coastal recreation area is located at the entrance of the district and on the intercity transportation artery, it also contributes to the city visually.

Damsa Dam Recreation Area, unlike other recreation areas, stands out with its natural features and wide water views. The landscape where the water is visually more dominant, together with the grove created, is found interesting by the city residents. It is important for people to integrate with nature in the trees and allows them to have direct contact with water. Although it is the furthest waterfront recreation area from the city center, it is intensively used by the residents of the city and visitors from neighboring provinces, especially in the summer months. It is mostly used for picnics with barbecues and for longer periods of time during the day. As a result, the surroundings of water resources such as seas, rivers and lakes are highly preferred by people due to the recreational opportunities

they offer as well as their aesthetic, ecological and microclimatic features. In Nevşehir province, which has a continental climate, it is seen that especially water resources and their surroundings have a special recreational importance. The vegetation different from its surroundings makes these areas different in terms of satisfying the urban residents' longing for green. At the same time, the fact that water is one of the main landscape components that increase the scenic beauty of the landscape, and its cooling and relaxing properties increase the attractiveness of these areas. Depending on their location (urban-rural) and the characteristics of the water, they provide opportunities for many direct and indirect water-based recreational activities. It is seen that the studied areas are intensively used by the city residents and visitors from neighboring settlements for different purposes according to their different environmental characteristics, locations and land uses. In this context, it is important to ensure the sustainability of water resources within the balance of protection-utilization and to carry out landscape design studies in line with the needs of people on the water shores.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Ardahanlıođlu Bozhüyük, Z. R., & Karakuş, N. (2016). Determining the Recreational Potentials of Some of the Bays in Fethiye. *Environmental Sustainability and Landscape Management*. ST. Kliment Ohridski University Press, Sofia.
- Aklıbaşında, M. (2019). Determining the active green areas and their adequacy by using satellite images and GIS: The case of Nevsehir City (Turkey). *Fresenius Environmental Bulletin*, 28(10), 7274-7281.
- Aklıbaşında, M., & Bulut, Y. (2018). Kırsal turizm planlamasında farklı peyzaj tiplerinin görsel kalite yönünden deđerlendirilmesi. *Akademik Ziraat Dergisi*, 7(1), 93-100.
- Anonymous. (2024a). *Türkiye İstatistik Kurumu (TÜİK) Web Sitesi*. <https://biruni.tuik.gov.tr/medas/?locale=tr> (10.07.2024)
- Anonymous. (2024b). *T.C. Avanos Kaymakamlığı Web Sitesi*. <http://www.avanos.gov.tr/avanosun-tarihi-kopruleri> (11.07.2024)
- Anonymous. (2024c). *T.C. Tarım ve Orman Bakanlığı, Devlet Su işleri Genel Müdürlüğü Web Sitesi*. <https://bolge12.dsi.gov.tr/Sayfa/Detay/1141> (13.07.2024)
- Atabeyođlu, Ö., & Aklıbaşında, M. (2017). Psychology of the water in the design. *International Conference; the West of the East, the East of the West. Abstract Proceeding Book* (p. 452), Prague, Czechia, July 4-6.
- Burmil, S., Daniel, T. C., & Hetherington, J. D. (1999). Human values and perceptions of water in arid landscapes. *Landscape and Urban Planning*, 44(2-3), 99-109.
- Bulut, Y. (2003). Palandöken (Tekederesi) Baraj Göleti'nin Rekreasyonel Kullanımlar Yönünden Deđerlendirilmesi. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi*, 1, 89-96.
- Bulut, Z., & Yılmaz, H. (2009). Determination of waterscape beauties through visual quality assessment method. *Environmental Monitoring and Assessment*, 154, 459-468.

- Duman, G., & Turgut, H. (2020). Akarsu kıyılarının kent kimliğine katkısı: Çoruh Nehri örneği. *Bartın Orman Fakültesi Dergisi*, 22(2), 354-366.
- Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007). Psychological benefits of green space increase with biodiversity. *Biology Letters*, 3, 390-394.
- Hu, X., Zou, X., & Fan, H. (2023). Analysis of landscape influencing factors of urban waterfront greenways based on the scenic beauty estimation method, taking Tongjian Lake in Hangzhou as an example. *Frontiers in Earth Science*, 11, 1211775.
- Jacobs, C., Klok, L., Bruse, M., Cortesão, J., Lenzholzer, S. & Kluck, J. (2020). Are urban water bodies really cooling? *Urban Climate*, 32, 100607.
- Karaküçük, S. (2008). *Rekreasyon: Boş zamanları değerlendirme* (6. baskı). Gazi Kitabevi.
- Karaşah, B., & Var, M. (2016). Botanik bahçelerinde ziyaretçi tercihlerinin belirlenmesi: Nezahat Gökyiğit Botanik Bahçesi örneği. *Kastamonu Üniversitesi Orman Fakültesi Dergisi*, 16(1), 120-130.
- Karaşah, B. (2017). Kentsel ve kırsal rekreasyon alanlarına yönelik kullanıcı tercihlerinin belirlenmesi: Artvin kenti örneği. *Bartın Orman Fakültesi Dergisi*, 19(1), 58-69.
- Koçan, N. (2021). Importance of coastal landscape designs and suggestions for Kurucasile (Bartın) port. *GÜFBED/GUSTIJ*, 11(2), 305-314.
- McDougall, C. W., Hanley, N., Quilliam, R. S., Bartie, P. J., Robertson, T., Griffiths, M., & Oliver, D. M. (2021). Neighbourhood blue space and mental health: A nationwide ecological study of antidepressant medication prescribed to older adults. *Landscape and Urban Planning*, 214, 104132.
- Surat, H. (2018). Baraj gölü ve çevrelerinin rekreasyonel kullanımına yönelik potansiyellerinin belirlenmesi ve değerlendirilmesi üzerine bir araştırma: Deriner Barajı örneğinde. *Uluslararası Sosyal Araştırmalar Dergisi*, 11(61), 996-1010.

- Tülek, B., & Barış, M. E. (2014). Kent içi ve yakın çevresindeki su kıyısı rekreasyon alanlarının ekolojik kriterler açısından değerlendirilmesi: Mavi Göl örneği. *Uludağ Üniversitesi Ziraat Fakültesi Dergisi*, 28(2), 13-26.
- Vert, C., Gascon, M., Ranzani, O., Márquez, S., Triguero-Mas, M., Carrasco-Turigas, G., Arjona, L., Koch, S., Llopis, M., Donaire-Gonzalez, D., Elliott, L. R., & Nieuwenhuijsen, M. (2020). Physical and mental health effects of repeated short walks in a blue space environment: A randomised crossover study. *Environmental Research*, 188, 109812.
- Wolch, J. R., Byrne, J., & Newell, J. P. (2014). Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'. *Landscape and Urban Planning*, 125, 234–244.
- Xu, X., Liu, S., Sun, S., Zhang, W., Liu, Y., Lao, Z., Guo, G., Smith, K., Cui, Y., Liu, W., Higuera García, E. & Zhu, J. (2019). Evaluation of energy saving potential of an urban green space and its water bodies. *Energy and Buildings*, 188-189, 58–70.
- Yazici, K. & Pirli, A. (2022). A Research on Determination of Recreational Potential of Yozgat Çamlığı National Park. *Bozok Journal of Agriculture and Natural Sciences*, 1(1), 11-23
- Yücekaya, M., Aklıbaşında, M., & Günaydın, A. S. (2022). Suyun iklimsel etkisinin ENVI-Met simülasyonu ile analizi. *Online Journal of Art and Design*, 10(4), 301-313.

Assoc. Prof. Meliha AKLIBAŞINDA

E-mail: melihaaklibasinda@nevsehir.edu.tr

Educational Status: PhD

License: Landscape Architecture

Degree:

Doctorate: Landscape Architecture

Professional experiences: Atatürk University, Nevşehir Hacı Bektaş Veli University

Assoc. Prof. Aslıhan TIRNAKÇI

E-mail: aslihanerdogan@nevsehir.edu.tr

Educational Status: PhD

License: Landscape Architecture

Degree:

Doctorate: Landscape Architecture

Professional experiences: Artvin Çoruh University, , Nevşehir Hacı Bektaş Veli University

Visual Analysis of Highway and Surrounding Landscapes as Recreational Resource Value

Prof. Dr. Hasan YILMAZ ¹ 

¹ Atatürk University, Faculty of Architecture and Design, Department of Landscape Architecture, Erzurum/Türkiye.

ORCID: 0000-0003-3768-4760

E-mail: hyilmaz@atauni.edu.tr

Master's Degree Landscape Architect Medine ÇELİK ² 

² Atatürk University, Institute of Science. Faculty of Architecture, Department of Landscape Architecture, Erzurum/Türkiye

ORCID: 0000-0002-3734-0979

E-mail: clkmedine21@gmail.com

Citation: Yılmaz, H. & Çelik, M. (2024). Visual Analysis of Highway and Surrounding Landscapes as Recreational Resource Value, Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:8, 158-192. ISBN: 978-625-367-855-5. Iksad Publications.

DOI: <https://doi.org/10.5281/zenodo.13883033>

1. Introduction

People prefer to be in places and locations that are visually appealing, regardless of the type of tourism. While perceptions of visual beauty and attractiveness vary from person to person, certain elements such as water features, forests, botanical diversity, vibrant colors, historical elements, intriguing geological formations, authentic structures, untouched natural landscapes, and similar factors make locations interesting (Irmak & Yılmaz, 2010).

Recreation refers to activities undertaken by individuals during their leisure time, either actively (expending energy) or passively (expending little energy), in open or indoor spaces, aimed at maintaining or enhancing physical and mental health. According to Karaküçük (2008), recreation involves voluntary and enjoyable activities, whether solitary or in groups, pursued during leisure time to restore health, which may be adversely affected by hectic work schedules and lifestyles.

Recreation activities are activities carried out individually or with many people in urban or rural areas. Activities in urban areas are called urban recreation and activities in rural areas are called rural recreation.

Humanity has been intertwined with recreational activities in its daily life since its existence. For example, although hunting is related to nutrition or compulsory, it has survived to the present day as an action that gives people pleasure. In the selection of settlements for shelter purposes, places that are safe, close to water, with enough space for agricultural occupation are preferred, while at the same time places with beautiful views (such as water shore, forest area, vista area, mountainous area) are preferred. On

the basis of this, people have evaluated the places and occupations that will give them pleasure while continuing their daily lives.

Today, people's demand for recreational activities is increasing. There are many different reasons for this situation. Especially when it is considered that more people live in cities than in rural areas and this rate will increase to 70% in the world in 2050, many environmental problems that threaten human and environmental health have started to emerge in urban areas. In the periods when the urban population was small, there were many alternative places in the urban space in the neighborhood and urban dimension where the city dwellers could relax and spend a pleasant time actively or passively outside of their daily pursuits, but this situation has changed over time.

The fact that people participate in various recreational activities or tourism for similar purposes in order to have a pleasant and fun time has led to the existence of a strong relationship between recreation and tourism. For this reason, it is also seen that there are problems in the positioning of recreation and tourism. Although definitions of recreation are based on 3 basic elements 1. leisure time, 2. distraction, having fun, getting away from stress, being happy, 3. volunteering), what recreation actually is and its conceptual content are not clear (Koçak & Eryılmaz, 2018).

The basic features of recreation are summarized below according to (Karaküçük 2008).

- Activities should be self-selected and give freedom to the individual.
- Recreational activities bring joy and happiness

- In recreation activities, gender and age do not matter, there can be planned or unplanned participation.
- Recreation activities include more than one activity and provide opportunities for all ages and genders to participate
- Recreation activities can be carried out indoors or outdoors and all year round.
- It reveals the abilities of the person participating in recreational activities in that field
- It is the activity of receiving pleasure and joy, and brings personal and social qualities to the individual
- People who participate in recreation have the chance to choose the recreation action/type.

These characteristics highlight the diverse and inclusive nature of recreation, emphasizing its role in personal enjoyment, skill development, and social interaction across different settings and demographics.

2. Increase in Demand for Recreational Activities

2.1. Changes in Urban Physical Structure Due to Urbanization and Resulting Environmental Issues / Urbanization as a Driving Force

- Decrease in open-green areas / Although zoning plans require 10 square meters of green space per person, this ratio is insufficient in many cities. Open green areas are gradually decreasing.
- Density of physical structure/concrete construction pressure
- Decline of urban agricultural land
- Urban water resources, change of natural morphological structure
- Environmental pollution (air, water, noise, soil, etc.)

- Stress caused by the increasing number of vehicles, transportation problems-traffic congestion, lack of parking, impatience of people in traffic
- Dense neighborhood and residential population
- The intensity and stress of urban busy work and life

2.2. Desire to Experience Rural or Natural Settings / Attractive Qualities of Rural Areas

- Desire to see rural or natural places / Attractive forces of rural places
- Desire to get to know wildlife or ecosystems
- Willingness to observe agricultural activities on site and to buy agricultural natural products
- Desire to observe seasonal color changes in the countryside (forest, agricultural areas)
- Desire to be in the fresh air
- The desire to be in a quiet place away from the pressure of vehicles and traffic
- Desire to see rural and local architecture on site
- Desire to see folkloric life, recognize and participate in living cultures

2.3. Other Reasons for the Increase in Recreation Demand / Socio-economic and Cultural Factors

- Increase in people's economic income
- Increase in private car owners
- Increased transportation opportunities/increase in air, road, sea and train transportation/accessibility

- Increase in short and long term, near and far, domestic and international travel tour organizations
- Increase in free time
- Willingness to renew oneself/willingness to give rewards
- Developments in the field of gastronomy
- Increase in opportunities/organizations/accommodation opportunities in the fields of faith tourism, cultural tourism, congress tourism, health tourism, trade tourism, eco-tourism
- Willingness to leave the place of residence and go to a certain area or see new places - curiosity / habits
- Willingness to spend time with family or friends / strengthening family ties / socialization / unity
- Developments in the field of communication and informatics /Social media and advertising.

3. Natural and Cultural Landscape Elements Along the Highway Route

Natural landscapes are defined as areas that have been exposed to little or no anthropogenic impact (Gül, 2000). The prominent impressive elements of natural landscapes can be listed as water assets, vegetation and topography. One of the most important factors of change in rural areas is the desire of people to perceive and evaluate the natural environment (Courtney, 2006).

The natural landscape is a combination of landforms such as mountains, hills, plains and plateaus. Lakes, rivers, soils (such as sand or clay) and natural vegetation are other features of the natural landscape. For example,

a desert landscape usually shows sandy soil and few deciduous trees. Even desert landscapes can vary (URL 1).

Cultural landscapes are areas that reflect the interaction over time between people and their environment. In a sense, it is the process by which people adapt their environment to suit their needs (Gül, 2000).

The cultural landscape is the successive change over time of the material living environment of a settled human society, responding with increasing strength and diversity to the dynamic challenges of nature, the needs and desires of the society itself, and the historical conditions of different regions at different times (Conzen, 2001)

Cultural landscape is defined as the trace of human activity on the earth's surface, cultural landscape is a specific area where cultures have left identifiable artifacts, and cultural landscape is the general term that recognizes the human contribution to most natural landscapes in the world (URL 2).

The combined works of nature and humanity are the result of a long and intimate relationship between people and their natural environment. The term cultural landscape encompasses various manifestations of the interaction between humankind and its natural environment. Cultural landscapes often reflect specific techniques of sustainable land use, taking into account the characteristics and limits of the natural environment in which they are established and a certain spiritual relationship with nature. Conservation of cultural landscapes can contribute to modern techniques for sustainable land use and preserve or enhance natural values in the landscape. The continued existence of traditional land use patterns supports biodiversity in many regions of the world. Conservation of

traditional cultural landscapes therefore helps to preserve biodiversity. Today, 66 cultural landscapes are inscribed on the World Heritage List (UNESCO, 2024a).

As of now, there are 1,199 designated heritage sites worldwide. Among these, 933 are cultural, 227 are natural, and 39 are mixed (both natural and cultural) heritage sites. Turkey has a total of 21 heritage sites listed on the UNESCO World Heritage List, comprising 19 cultural sites and 2 mixed sites. Additionally, Turkey has 79 heritage sites on the UNESCO Tentative List, which includes 72 cultural, 4 mixed, and 3 natural sites (UNESCO, 2024b).

Cultural landscape consists of 3 groups (UNESCO 2024a; URL 2).

Designed landscapes (parks, gardens, other designs). Diyarbakır Castle and Hevsel Gardens Cultural Landscape (Diyarbakır- 2015), Bergama Multilayered Cultural Landscape Area (İzmir- 2014), The Taj Mahal (Agra, India), The Great Mosque Of Djenne (Mali), The Lake District (England), The Lavaux Vineyards (Switzerland)

Organically developed landscape (a landscape in which the spiritual, economic and cultural significance of an area develops along with its physical characteristics). Göbekli Tepe (Şanlıurfa-2018), Divriği Great Mosque and Darüşşifa (Sivas-1985), The Lavaux Vineyards (Switzerland), The Great Wall Of China (China), Machu Picchu (Peru)

Social cultural landscapes (associated with important historical events or people). Bursa and Cumalıkızık: The Birth of the Ottoman Empire (Bursa-2014), Goreme National Park and Cappadocia (Nevşehir-1985 /Karma Heritage Site), Uluru (Australia)

The Council of Europe's Cultural Routes program was launched in 1987 to show how the heritage of different European countries contributes to a common cultural heritage through a journey through time and space (URL 3). The process of creating cultural routes as touristic products is recognized as a new principle in the protection, revitalization, use and promotion of cultural heritage. The combination of cultural exchange and social values creates a recognizable identity for each cultural route. Although their main concept is not primarily focused on touristic use, they represent a touristic product as well as a cultural dimension (Terzic & Bjeljic, 2016).

Important cultural routes in our country are Lycian Way, Evliya Çelebi Road, Hz. İbrahim Road, Ephesus-Mimas Road, Kaçkars, Hittite Road, Küre Mountains, Ağrı Mountain, Independence Road, Sarıkamış trails, Fethiye hiking trails, Yenice forest roads, Sultans Road, Idyma Road, Phrygian Road, Caria Road (Culture Routes Association, 2017).

The concept of cultural routes has prioritized the promotion and protection of cultural sites with the joint efforts of ICOMOS, UNESCO and the Council of Europe, and different definitions of cultural routes have been developed. Cultural routes are defined as routes that gather around a specific theme and support the protection of cultural heritage and sustainable development and local economic development by expressing a common value (Gengörü & Öcalır, 2024).

3.1. Visual landscape characters presented by highway routes

Along the highway routes, changes in morphological structure determine the landscape characters. Recreation types may also change according to the landscape characters revealed by the morphological structure. The

natural structure of the area (such as topography, geology, hydrology, hydrology, soil structure, vegetation, climate) and cultural structure (such as architectural texture, settlement types, agricultural landscapes, folkloric life) directly affect the uniqueness of highway routes and their preferability as scenic routes.

Along the highway routes, 4 basic landscape characters shaped by natural and cultural landscapes, consisting of high mountain ecosystems, plain landscapes, valley landscapes and settlement patterns, are intensively observed.

3.1.1. High mountain ecosystems/forests/alpine areas/vistas

Slope differences in an area reveal the relief energy and as this energy increases, the landscape character value of the area increases. In our country, changes in the topographical structure in the north-south direction increase the diversity of land use, and this change is reflected in the socio-cultural structure and architectural structure.

The landscape characters of high mountain ecosystems are generally composed of mountain landscapes, plateau settlements, forested areas, alpine plants, touristic facilities, food and beverage break areas, and viewpoints/vistas (Figure 1). The presence of forest in high mountain ecosystems directly affects the quality of visual recreation. As a matter of fact, in a study, it was revealed that images dominated by bare landscapes are not preferred, and landscape characters covered with dense vegetation are preferred. It was determined that vegetation and snow cover have a positive effect on the visual quality of the landscape (Özhancı & Yılmaz, 2014). After water-based recreation, woodland shores are the second most

preferred recreation areas for picnic purposes in terms of safety. Forested areas offer opportunities for many recreation activities.

- Botany /flora tourism/fotosafari /endemic plant monitoring/alpine vegetation, vistas,
- Recreational activities in protected areas/national parks,
- Monumental trees/ethnobotany (development of nature conservation awareness),
- Observing forest formations/moorland, oak forest, beech forest, chestnut forest, alpine plants etc,
- Utilization of forest products (collecting wild fruits and medicinal plants found in the forest),
- Watching natural and rural life, camping, nature walks, getting to know nature,
- To see the natural forest ecosystem on site, to observe seasonal landscape changes,
- Observing flora and fauna (wildlife) life on site, taking pictures,
- Daily picnics in forest recreation facilities,
- Safari, trekking, horseback riding or camping,
- Observing and benefiting from transhumance activities for recreation and/or economic purposes,
- Fresh air, foggy mountain ecosystems and the desire to be in a quiet environment,
- Traditional habits, attractive landscape views of high mountain ecosystems.



Figure 1. Various landscapes in high mountain ecosystems (Source: Author)

3.1.2. Plain landscape/agricultural landscape/prairie-pasture areas

One of the landscape character types along the highway routes is flat and lowland settlements with a predominance of agricultural landscapes (Figure 2). Agricultural landscape characters include vineyards and orchards (vineyards of grapevines-Salihli, Hazelnut and tea gardens-Eastern Black Sea Region, Apricot orchards-Malatya, Olive orchards-Aegean and Marmara Region, Citrus orchards-Mediterranean Region), cultivated agricultural areas (wheat fields-Central Anatolia) and meadow pasture areas (Eastern Anatolia Region) and agricultural farms. Agricultural landscapes have brought the concept of agrotourism to the agenda, and there is an increasing desire to get away from the intense workload and gloomy environment of urban areas, even for a short time,

and to be in rural areas. Agricultural landscapes along the highway route offer the chance to perform different recreational activities.

- Eating and drinking local products at rest and rest stops along the highway,
- Buying organic agricultural products along the highway,
- Getting to know the rural landscape closely, getting to know, seeing and analyzing the agricultural landscape closely,
- Seeing agricultural activities in situ,
- Monitoring seasonal color changes of agricultural landscape,
- Escape from the city, desire to be in natural or near-natural places, socializing/making new friends.

In a study conducted in Lithuania (Vugule & Turlaja, 2016), participants along highway routes were found to most appreciate agricultural areas, meadow-pasture landscapes, and open spaces (54.4%), followed by forests (45.6%), and roadside tree and shrub communities (39.5%) in terms of visual quality.

3.1.3. Valley landscape/stream landscape/water + highway landscape

Valley landscapes are characterized by narrow and steep cliffs and valleys, surprising road silhouettes, interesting topography, settlement patterns, vineyards and gardens, and landscapes dominated by water and riparian vegetation (Figure 3). In cold climates such as the Eastern Anatolia Region (Çoruh Valley, Tortum Valley, etc.), transition regions (Harşit Stream and its surroundings) and some parts of the Central Anatolia Region, the microclimate characteristics of the valleys offer opportunities for settlement patterns and agricultural landscapes.



Figure 2. Different agricultural landscape characters, Source: Author

Due to the basin characteristic of valley landscapes, water-based landscape characters constitute the indispensable visual landscape quality. The water element in valley areas can be in the form of streams, rivers, lakes, dams, wetlands, waterfalls. In a research, it was determined that water-based visual natural landscapes constitute the most preferred visual landscape character among other natural landscape visuals (Özhancı & Yılmaz, 2011). The highway-water relationship is especially evident along the seashores (all coastal highways) and around large lakes (such as Lake Van, Lake Eğirdir, Keban Dam Lake, Lake Tortum). Coastal settlements, steep slopes, local folkloric life, agricultural pursuits, resting and rest stop places, touristic facilities determine the visual landscape quality and offer different recreational tourism opportunities.

- They provide cooling with their thermal comfort effect, have a positive effect on people's mental health with their visual effects, and increase the sense of security,
- They offer the opportunity for water-based recreation (yachting, boating, surfing, canoeing, rafting, diving, angling, etc.),
- Sea coasts contribute to tourism development,
- Seeing, watching, photographing and sharing the natural and socio-cultural structure,
- They offer picnics and outings,
- They offer forest recreation facilities, hiking and cycling paths, camping and sightseeing opportunities around dams and ponds,
- Using eating and drinking places on highway routes, buying local products,
- In addition to their economic contribution, dam structures are also prestige sites that are visited and toured for curiosity purposes.

3.1.4. Topographical structure/architectural texture harmony or contrast/Settlement silhouettes

Along the highway routes, it is possible to see and observe urban settlements, historical areas and texture, local architecture and unique rural settlements (Figure 4). It contributes to the socio-cultural development of the individual by providing the opportunity to understand and evaluate the settlement texture that varies from region to region. During this travel, one has the chance to get to know folkloric life, local culture, local architecture, gastronomy, music, accommodation, ruins and festivals, and authentic life. As cultural tourism, it is the travel or trips made for watching-examining the historical and cultural texture, getting to know the socio-cultural and

economic structure, being informed in natural or near-natural areas, and curiosity.



Figure 3. Valley landscape characters offer diverse visual panoramas, (Source: Author)

In addition to the specialization and diversification of tourist products, the development of cultural routes has shaped tourist behaviors, giving rise to concepts such as "active tourism," "slow tourism," and/or "solo tourism." Cultural routes typically aim to provide tourists with personalized products, various information, and digital support to offer high-quality knowledge and experiences (Terziç, 2023).

3.2.The Relationship Between Highway Routes and Scenery

The total number of road motor vehicles registered in Turkey was 29 million 367 thousand 254 as of the end of March. Of the registered vehicles, 52.8% were automobiles, 18.1% were motorcycles, 15.5% were vans, 7.5% were tractors, 3.3% were trucks, 1.7% were minibuses, 0.7% were buses and 0.4% were special purpose vehicles (Turkish Statistical Institute (TUIK, 2024). The most preferred transportation network in Turkey is road transportation.



Figure 4. Rural landscape settlements and folkloric structures, Source: Author

Road transportation accounts for 70% of freight and 90% of passenger transportation. Highways are a method that can provide transportation almost everywhere in Turkey.

It is frequently preferred for both urban and rural transportation (URL 4). With the increasing use of highways for transportation in recent years, people have started to prefer scenic highways (Vugule et al. 2014).

The natural landscapes along train routes attract significant attention from travelers and photography enthusiasts. The peak season for such journeys is during the summer. The Eastern Express route, which is among the top 10 most beautiful railway travel routes in the world, captivates travelers with its stunning natural scenery (Turkish State Railways (TCDD, 2024). Between the 2019-2024 seasons, a total of 66,258 passengers traveled on the Touristic Eastern Express. Covering a distance of 1,300 km, the Eastern Express completes its route in 31 hours and 40 minutes, offering travelers an enjoyable journey through the natural landscapes between Ankara and Kars that they will not forget (Source 5).

The Mesopotamia Express provides passengers with the opportunity to see historical and cultural landmarks and natural beauties along its route. Travelers enjoy the scenic views of nature throughout the Southeastern, Eastern, and Central Anatolian regions, while also getting to know the cities where breaks are taken. Participants visiting historical sites in the region also have the chance to taste local delicacies and purchase local products (Source 6).

Tourism or recreational contexts often emphasize the visual or scenic quality as a primary component of the natural environment. Significant landscapes aren't just beneficial to those experiencing them firsthand; they also contribute significantly to the attractiveness of the area, thus correlating with economic benefits for the region. The visual character

profoundly influences the overall quality of a tourist or recreational experience (Clay & Daniel, 2000).

Scenic road, scenic route, tourist path, tourist route, tourist drive, vacation route, themed route, or scenic byway is a specially designated road or waterway passing through an area with natural or cultural beauty. A landscape is a part of the Earth's surface that can be seen from a single location at one time, consisting of geographical features that mark or characterize a specific area (Source 7).

In recreation and tourism activities, sensitivity/empathy of the areas, environmental quality, appropriateness of services offered, and management capacity are important considerations for the sustainability of resource values. In this context, when planning recreation and tourism sectors, not only natural landscapes but also cultural landscapes should be taken into account. In recent years, one of the holistic approaches that integrates natural and cultural landscape areas/values is route planning (Görmüş et al., 2017).

The structure of a landscape is closely related to the perceived visual landscape quality. The visual landscape character plays a significant role in the preference of recreational areas. The more natural, diverse, harmonious, open, mysterious, perspective-giving, reassuring, and orderly a landscape's visual structure is, the higher its landscape beauty. Furthermore, there is a relationship between landscape visual quality and landscape features such as water source type, water ratio, and degree of naturalness (Özhancı & Yılmaz, 2011). Ecotourism is defined as activities that minimize damage to the physical, socio-cultural, and various other characteristics of a region (Demir & Çevirgen, 2006).

The term recreation, although often interpreted in terms of activities, actually refers to the concept of improving health (Torkildsen, 2012). Tourism, on the other hand, involves traveling to other countries, cities, or regions for purposes such as relaxation, entertainment, learning, and meeting needs beyond one's place of residence (Uçkun, 2004). Tourism also plays a significant role in reducing unemployment rates in countries (Yıldız, 2011).

Recreation and tourism are two interrelated concepts where recreational diversity contributes to tourism. While tourism involves traveling to different places, recreational activities can take place in the environments where people reside (İskender, 2019). In a study focusing on scenic roads, along the 214 km corridor of the Erzurum-Rize highway, corridor management plans and environmental analyses were conducted. Visual quality analysis was also performed, proposing recreational tourism planning for scenic road planning (Karahan & Yılmaz, 2004). Similarly, Sezen (2018) conducted a study analyzing scenic road planning, evaluating significant scenic roads both domestically and internationally. Naturalness is a direct determinant factor in revealing visual quality (Kaplan & Kaplan, 1989). Landscape can be defined as the structure of thoughts and emotions of an individual, while another definition describes it as the cognitive structure created in individuals by what is observed (Beza, 2010). Landscape quality is a concept that can be established through perceptible processes based on human comprehension characteristics, expert opinions, and directly sensed perceptions (Daniel, 2001).

In the 1970s in the USA, recreational areas were classified as high intensity areas (such as beaches), general outdoor areas (picnic areas), natural areas (forests), unique natural areas (waterfalls), simple areas (wilderness areas), historical and cultural areas (such as castles) (URL, 8).

Purpose of the study; In the sustainable use of natural and cultural resources, it is necessary to define and classify resource values correctly and to make planning decisions for use. Landscape characters and the determination of the rates of change of these characters have been discussed within the scope of the European Landscape Convention, and countries have responsibilities for the protection of natural and cultural landscapes. In this study, it is aimed to make an analysis of the landscape characters on the highway routes that have increased in recent years in our country due to various reasons (such as the increase in the number of vehicles, the suitability of road conditions, the increase in rest and stopover places on the road route, the desire to see new places, the attractive / attractive resource values of rural areas).

3.2.1.Important scenic routes in our country

Important scenic routes in our country were identified by utilizing different sources (URL 9, URL 10; URL 11, URL 12), reclassified with new additions and the results are given in Table 1 and Figure 5.

Table 1. Important scenic routes and recreational tourism values in Türkiye, (URL 9, URL 10; URL 11, URL 12)

Road name	Types of Landscape	Visual landscape resource value
Bayburt-Trabzon soğanlı road	Natural Landscape	One of the most dangerous roads in the world - winding road, interesting topography, vista, alpine vegetation
İnebolu Road /Kastamonu	Natural Landscape	Küre Mountains forest ecosystem

Finike yolu/Antalya	Cuultural Landscape	Agricultural landscape, citrus groves, sea view
Foça Road	Natural and Cultural Landscape	Historical texture, seascape-coves, agricultural landscape, vistas,
Kemaliye Road /Erzincan	Natural Landscape	Unique topography/ steep cliffs, dam lake, narrow valley landscapes
Safranbolu_Bartın Road	Natural Landscape	Natural tunnel road with plane trees, seasonal color changes, forest ecosystem
Van Gölü çevresi Road	Natural and Cultural Landscape	Historical texture, Nemrut Crater Lake, Lake view, agricultural areas, coastal settlements, bird watching areas, waterfall
Amasra-Sinop Road	Natural Landscape	Forest ecosystem, vistas, sea views, winding roads
Finike-Kaş Road	Natural Landscape	Bay views, winding roads, unique topography
Gökova -Marmaris Road	Cultural Landscape	Alle way with eucalyptus trees, memorial value
İğneada Road /Kırklareli	Natural Landscape	Forest ecosystem, waterfront cruise
Şile –Ağva Road	Natural Landscape	Natural scenery
Bolu-Abant Road	Natural Landscape	Natural vegetation, color change, winter landscape, presence of water
Çanakkale-Gelibolu Road	Cuultural Landscape	Monitoring historical texture, Monumental structure/new Çanakkale Bridge
Kapıkırı-Gölyaka-Bafa gölü	Cuultural Landscape	Historical road, rural settlements
Likya Road	Natural and Cultural Landscape	It is one of the world's best long historic hiking trails. Gelidonya Lighthouse, ancient trail, rural settlements
Hadım-Mut Road	Natural and Cultural Landscape	High mountain ecosystem, winding roads, rural settlements
Nevşehir-Ürgüp Road	Natural and Cultural Landscape	Interesting geological formations/Fairy chimneys, settlement pattern, vineyards
Erzincan-Tunceli-Ovacık Road	Natural and Cultural Landscape	Valley landscape, river and reservoir monitoring, national park, wildlife monitoring, endemic plants, rural settlements
Erzurum surrounding Roads	Natural and Cultural Landscape	Tortum Lake, valley landscapes, Ağrı and Ardahan road/ova landscape/grassland pasture areas, İspir road/valley landscape, dam and water shores, Bingöl road-floating islands/dam, valley landscapes/rural

		settlement, Kop Mountain, Çoruh Valley/rafting/interesting geological formations/dam lakes/local architecture
Eskişehir –Han Road	Natural Landscape	Unique morphological structure
Ordu surrounding Road	Natural and Cultural Landscape	Coastal roads/coves/historical texture, local architecture, agricultural landscape, roads connecting Ordu and its districts to Central Anatolia/high mountain ecosystems/ forested areas/color changes/ monitoring changes in natural and cultural structure
Eastern Black Sea Route	Natural and Cultural Landscape	Coastal roads, Kaçkar Mountains, plateau roads, rural settlements, unique agricultural products (tea, corn, hazelnut), high mountain ecosystems (Zigana Mountain, Kaçkar Mountains), autumn color changes, unique lakes (Uzungöl, Borçka Lake, Karagöl), biosphere reserve areas, historical texture (Sümela Monastery), mysterious foggy plateau and village, valley settlements, architectural texture monitoring



Abant road (URL 9)



İğneada road (URL 10)



Finike-Kaş road (URL 11)



Marmaris road (URL 12)

Figure 5. Some of the important scenic routes in Türkiye

3.2.2. Important scenic routes abroad

The most well-known major scenic routes abroad (URL 13; URL 14) are classified and presented in Table 2 and Figure 6.

Table 2. Important scenic routes and recreational tourism values abroad (URL 13; URL 14)

Road name	Types of Landscape	Visual landscape resource value
Amalfi Coastal Road//Italy	Natural and Cultural Landscape	Seaside view, rural settlement
Atlantic Ocean Road /Norvey	Natural Landscape	Ocean views, small islands, interesting bridge architecture
Great Ocean Road/ Avustralia	Natural Landscape	Ocean views, natural vegetation
Chapman’s Peak Road/ South Africa	Natural Landscape	Mountain ecosystem, exciting dangerous route, road through rocks, vistas
Col de Turini / French Alps	Natural Landscape	Mountain landscape, dangerous curves
Furka Pass /Switzerland	Natural Landscape	Unique mountain scenery of the Alps, high altitude passes, alpine vegetation
Guiliang Tunnel Road/China	Natural Landscape	Mountain landscape, dangerous road carved in stone
Khardung Pass/India	Natural Landscape	High mountain ecosystem, one of the highest and most dangerous highway passes in the world, sharp curves and cliffs
Stelvio Pass /Italy	Natural Landscape	High mountain ecosystem, one of the highest passes in the Alps, preferred area for adrenaline-loving bikers, nearly 50 dangerous and sharp bends
Tianmen Mountain Road/China	Natural Landscape	High mountain ecosystem, Vista, winding road
Transfagarasan Highway/Romania	Natural and Cultural Landscape	High mountain ecosystem, tunnels and viaducts
Trollstigen Road “Troll Staircase” /Norway	Natural Landscape	High mountain ecosystem, winding roads, vistas
Seven Mile Bridge/Florida, USA	Natural Landscape	Ocean views

Ruta 40 /Argentina	Natural and Cultural Landscape	High mountain ecosystem, valley landscape, protected areas, one of the longest roads with 5000km
Queen Charlotte Road/New Zealand	Natural Landscape	Waterfront landscape, natural vegetation, vistas
Karakorum Highway/China - Pakistan	Natural and Cultural Landscape	This road connecting China to Pakistan is a long and difficult route. It forms part of the historic Silk Road. It represents mountain ecosystems.
Guiliang Tunnel Road/China	Natural Landscape	Interesting mountain ecosystem, tunnel and challenging stage
Highway 1 /California, ABD	Natural Landscape	Road through the ocean, waterscape
Denali Highway/Alaska, ABD	Natural Landscape	Natural vegetation, wildlife watching



Stelvio crossing (URL14)



Zoji road in India (URL14)



Guiliang road (URL 14)



Atlantic Ocean Road (URL 13)



Amalfi coast road (URL 13)



The Great Ocean Road (URL 13)

Figure 6. Some of the most important scenic routes in the World

4. Conclusion and Suggestions

The protection of natural resources is only possible by determining the resource values. In order to prevent the destruction of areas that have been identified to be rich in terms of both vegetation and other natural resource values with tourism, good planning is required (Irmak & Yılmaz, 2010).

Introducing these resources to the world through promotion and advertising, offering ideal photographic resources by creating different tour routes depending on seasonal changes, ensuring the participation of the local people in order to create conditions that will enable the cultural structure to be introduced more closely, and increasing the level of awareness will be important steps to be taken in this sense (Özhancı & Yılmaz, 2014).

The transformation of highway landscapes into an enjoyable journey for people depends entirely on the vehicle and road conditions as well as the unique natural and cultural elements of the route. The frequency of changes in landscape character along the highway and the presence of eating, drinking, stopping and accommodation areas along the route directly affect recreational trends and road preferences. In our country, the high number of natural and cultural similarities in the landscape character in the east-west direction may create monotony along the long route, while the variable and unique landscape characters in the north-south direction increase the landscape quality of the road. As a matter of fact, according to Sezen (2018), unique characters and surprising places in the natural structure along the highway route directly increase the scenic road value of the highway.

Scenic routes are an important factor in revitalizing tourism and protecting natural areas (Vugule & Turlaja, 2016). They also contribute to the economy and sustainable tourism of the region.

For highway transportation, an inventory of basic information about the route system and the surrounding landscape, including all environmental and social issues, is required, as well as the protection and use planning of

sensitive areas (Switalski, 2018). In recreational tourism planning, it is necessary to sustain the living cultures that have been formed over long periods of time in rural areas on highway routes and to preserve the authentic texture. In other words, the continuity of the original structure should be essential. In a study (Yılmaz, Mutlu & Özhancı, 2018), it is emphasized that the natural and traditional land uses on the Erzurum-Trabzon Highway route, especially in the valley areas, are gradually transformed and the original structure is faced with the danger of deterioration.

In a study conducted in a visual assessment study in the mountain ecosystem; water, road, settlement and vegetation-active mountain landscapes were evaluated in terms of photographic value, and the photographs selected to be used in visual quality analysis were scored. General silhouette, natural landscape / vegetation, road landscape, agricultural landscape, cultural landscape images were evaluated. Suggestions were made to ensure the continuity of the existing natural structure and to support and strengthen local, unique and identity architecture and to create an effective character (Özhancı & Yılmaz, 2017). It was concluded that natural landscapes along the highway increase visual quality, while the road landscape active mountain character type has low visual quality because it reduces naturalness (Özhancı & Yılmaz, 2014). Highway landscaping is a discipline that organizes the environment of roads and makes the road more pleasant and functional in terms of aesthetic, ecological and user experience, and it is recommended to include natural vegetation to save water and support biodiversity in terms of sustainability (Ertekin & Çorbacı, 2010).

A major component of the natural environment in a tourism or recreational context is visual or landscape quality. Landscapes of scenic importance are not only beneficial to the individual who inhabits them. They make an important contribution to the attractiveness of the area, so they can be associated with the economic benefits of the region. This is because visual character affects the overall quality of a tourist/recreational experience (Clay & Daniel, 2000).

Cultural routes, defined as paths or itineraries linking cultural heritage and historical sites, are often organized around a historical, cultural or thematic focal point. They offer visitors the opportunity to discover important cultural and historical sites in a particular geographical region or country. In addition to preserving cultural heritage, these routes contribute to the local economy and can reach different regions and countries (Gengörü & Öcalır, 2024).

Our country has unique natural and cultural resource values with its different geographical features. High mountain ecosystems, forested areas, waterfront landscapes, agricultural areas, valleys and plains, aquatic ecosystems, richness in flora and fauna along the highway routes constitute important landscape characters and types. In addition to the natural landscape in each region, the unique historical and architectural texture, folkloric life attracts great interest of local and foreign tourists. In this context, recreational tourism trends towards natural and cultural areas with concepts such as nature tours, cultural routes and scenic routes using highways are gradually increasing.

The increasing interest in natural and rural areas makes it necessary to take into account the balance of conservation and utilization for the sustainable

use of resource values with ecology-based planning (Aksoy & Acar, 2021). In terms of sustainable use of these areas; it is imperative to define resource values, determine ecological and physical carrying capacities, monitor changes due to use and make plans for protection.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

1st Author % 65, 2nd Author % 35 contributed. I would like to thank **Cihad Bilge**, Research Assistant of our department, who contributed to the pre-publication formal editing of this study.

References

- Aksoy, Ö.K. & Cengiz, A. (2021). Ekolojik temelli turizm olanakları: Perşembe-Fatsa kıyı kesimi örneğinde bir inceleme. *Ecological Perspective*, 1(1), 2-14.
- Beza, B.B., (2010).The aesthetic value of a mountain landscape: a study of the mt. everest trek. *Landscape and Urban Planning*, 97, 306–317.
- Clay, G.R. & Daniel, T.C. (2000). Scenic landscape assessment: the effects of land management jurisdiction on public perception of scenic beauty. *Landscape and Urban Planning*, 49, 1–13.
- Conzen, M.P. (2001). Cultural Landscape in Geography. *International Encyclopedia of the Social & Behavioral Sciences*,3086-3092.
- Courtney, P., Hill, G. & Roberts, D. (2006). The role of natural heritage in rural development: An analysis of economic linkages in Scotland. *Journal of Rural Studies*, 22(4),469-484.
- Daniel TC. (2001). Whither scenic beauty? Visual landscape quality assessment in the 21 st century. *Landscape and Urban Planning*, 54 (1-4), 267- 281.
- Ertekin, M. & Çorbacı, Ö.L. (2010). Karayollarında peyzaj planlama ve bitkilendirme çalışmaları. *Ecological Life Sciences*, 5(2),105-125.
- Görmüş, S. (2017). Kültürel peyzaj değerlerini korumak için yeni bir yaklaşım: Kültürel rotalar. *Plant Peyzaj ve Süs Bitkiciliği Dergisi*, 7(25), 122-130.
- Görmüş, S., Atmış, E. Günşen, H.B. Özkazanç, N.K. & Artar, M. (2017). The Importance of Mapping Natural and Cultural Routes in Rural Tourism: Bartın Case. *Research Journal of Agricultural Sciences Tarım Bilimleri Araştırma Dergisi*, 10 (1), 32-38, E-ISSN: 1308-027X.
- Gül, A. (2000). Peyzaj-İnsan İlişkisi ve Peyzaj Mimarlığı. *Turkish Journal of Forestry*, 1;97-114.
- Irmak, M.A. & Yılmaz, H. (2010). Farklı peyzaj karakter alanlarına göre doğal ve kültürel kaynak değerlerinin görsel analizi: Erzurum Örneği *GOÜ, Ziraat Fakültesi Dergisi*, 27(2),45-55.

- İskender, A. (2019). Boş zaman ve rekreasyon ile turizm arasındaki ilişki üzerine akademik bir araştırma, *Ankara Hacı Bayram Veli Üniversitesi Turizm Fakültesi Dergisi*, 22(1),50-59.
- Kaplan R. & Kaplan S., (1989). *The experience of nature: A psychological perspective*. Cambridge university press.
- Karahan, F. & Yılmaz, H. (2004). *Erzurum-Rize Karayolu Koridorunun Görsel Kalite Analizi*. TMMOB Peyzaj Mimarları Odası Peyzaj mimarlığı II. Kongresi, 2004, Ankara.
- Karaküçük, S. (2008). *Rekreasyon: Boş Zamanları Değerlendirme*, Gazi Kitapevi, 328s. Ankara.
- Koçak, G.N. & Eryılmaz, G. (2018). Rekreasyon Araştırmaları İçin Temel Bir Araştırma Yapısı ve Ölçek Önerisi. *Gaziantep Üniversitesi Spor Bilimleri Dergisi*, 3(2),61-84.
- Kültür Rotaları Derneği, (2017). Türkiye Kültür rotaları. Access Address; (14.07.2024): <https://cultureroutesinturkey.com/tr/tum-rotalar>
- Özhancı, Ö. & Yılmaz, H. (2011). Rekreasyon alanlarının görsel peyzaj kalitesi yönünden değerlendirilmesi; Erzurum Örneği. *Iğdır Üni. Fen Bilimleri Enst. Der. / Iğdır Univ. J. Inst. Sci. & Tech.*, 1(2), 67-76.
- Özhancı, E. & Yılmaz, H. (2014). Değişik peyzaj karakterleri barındıran dağların, foto safari amaçlı görsel peyzaj analizi. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi*, 44(1),83-89.
- Özhancı, E. & Yılmaz, H. (2017). Görsel peyzaj kalite değerlendirmelerinde kalite göstergelerinin mekansal yansımaları. *Erciyes Üniversitesi Sosyal Bilimler Enstitüsü Dergisi XLIII*, 2,157-173.
- Sezen, I. (2018). Karayolu peyzajı ve manzara yolları. *Mimarlık Bilimleri ve Uygulamaları Dergisi*, 3(1),54-65.
- Switalski, A. (2018). Off-highway vehicle recreation in drylands: A literature review and recommendations for best management practices. *Journal of Outdoor Recreation and Tourism*, 21,87-96.
- Türkiye Cumhuriyeti Devlet Demiryolları (TCDD), (2024). Devlet Demiryolları Taşımacılık, Access Address (03.07.2024):

- (14.07.2024)https://www.tcddtasimacilik.gov.tr/tr/ana_hat_tren/detay/3.
- Terzic, A. & Bjeljic, Z. (2016). Cultural Routes – Cross-border Tourist Destinations within Southeastern Europe. *Forum Geografic*, 15(2),180-188.
- Terzici A. (2023). *Cultural Routes' Interactions and Synergies: a case of the „Sultan's Trail*. ATLAS Annual Conference 2023: "Quality of Life: Health, Tourism and Climate" - Abstract Book, 2023, 93-94.
- Torkildsen, G. (2012). *Leisure and Recreation Management* eBook ISBN9780203477571 USA: Routledge
- Türkiye İstatistik Kurumu (TUIK), (2024). Motorlu Kara Taşıt Sayıları. Access Address (03.07.2024): <https://data.tuik.gov.tr/Bulten/Index?p=Motorlu-Kara-Tasitlari-Mart-2024-53455&dil=1>
- UNESCO, (2024a). Kültürel Peyzajlar. Access Address (12.07.2014); <https://whc.unesco.org/en/culturallandscape/>
- UNESCO, (2024b). Kültürel Peyzajlar. Access Address (13.07.2024); <https://www.unesco.org.tr/Pages/125/122/UNESCO>).
- Vugule, K., Bell, S. & Stokmane, I. (2014). Road landscape development in Latvia up to the 21st century. *Landscape Architecture and Art*, 4(4),10-16.
- Vugule, K. & Turlaja, R. (2016). Scenic roads in Latvia. *Research for Rural Development*, 1,182-188.
- Yıldız, Z. (2011). Turizmin Sektörünün Gelişimi Ve İstihdam Üzerindeki Etkisi, SDÜ, *Vizyoner Dergisi*, 3(5),54-71.
- Yılmaz, H., Mutlu, E. & Özhanç, E. (2018). *Natural and Cultural Landscape Characters Along With the Erzurum- Trabzon Highway*.4th International Symposium on Environment And Morals 27-29 June 2018 (ISEM2018 Sarajevo / Bosnia and Herzegovina)
- Gengörü, E. & Öcalır, E. (2024). A Literature Review on Cultural Routes: Bibliometric Analysis with Vosviewer, *Kent Akademisi Dergisi*, 17(4),1464-1485.
- URL 1. National Geographic , (2024). Access Address (18.07.2024); <https://education.nationalgeographic.org/resource/landscape/>

- URL 2. Cultural Landscapes. Access Address (18.07.2024);
<https://www.vaia.com/en-us/explanations/human-geography/cultural-geography/cultural-landscapes>
- URL 3. Cultural Routes. Access Address (18.07.2024);
<https://www.coe.int/tr/web/cultural-routes>
- URL 4. Ulaşım Access Address (02.07.2024): <https://124.im/cPYVRt>
- URL 5. Doğu Ekspresi, Access Address (02.07.2024);
<https://124.im/OVg7nT>
- URL 6. Mezopotamya Ekspresi Tanıtım Turu. Access Address (02.07.2024); <https://124.im/q2xYg>
- URL 7. Resource of landscape. Access Address (15.07.2024);
<https://education.nationalgeographic.org/resource/landscape/>
- URL 8. Highways and Outdoor Recreation, Access Address (25.06.2024);
[https://onlinepubs.trb.org/esirable recreational land can be acquired cheaply](https://onlinepubs.trb.org/esirable%20recreational%20land%20can%20be%20acquired%20cheaply). Highways and Outdoor Recreation Harold Brodsky, The Washington Center for Metropolitan Studies
- URL 9. Türkiye'nin En Güzel Manzara yolları. Access Address (20.07.2024); <https://www.otokar.com.tr/haberler/blog/turkiyenin-en-guzel-manzarali-yollari>
- URL 10. Türkiye'nin En Güzel Manzara Yolları. Access Address (20.07.2024); <https://www.budget.com.tr/e-bulten/turkiyenin-en-guzel-manzarali-yollari>
- URL 11. Türkiye'nin En Güzel Manzara Yolları. Access Address (20.07.2024); <https://blog.obilet.com/turkiyenin-en-guzel-manzarali-yollari/unutmayiniz>.
- URL 12. Türkiye'nin En Güzel Manzara Rotaları. Access Address (20.07.2024); <https://www.turna.com/blog/turkiyenin-en-guzel-manzarali-surus-rotalari>
- URL 13. Dünyanın En Güzel Yolları. Access Address (21.07.2024);
<https://otoplus.com/otomag/dunyanin-en-guzel-yollari-6966>
- URL14.Dünyanın En Tehlikeli Yolları. Access Address (21.07.2024);
<https://www.generali.com.tr/blog/dunyanin-en-tehlikeli-yollari>

Prof. Dr. Hasan YILMAZ

E-mail: hyilmaz@atauni.edu.tr

Educational Status: Prof. Dr

License: Ataturk University

Degree: Atatürk University

Doctorate: Ege University

Professional experiences: Since 1987

Yüksek Peyzaj Mimarı Medine ÇELİK

E-mail: clkmedine21@gmail.com

Educational Status: PhD Candidate

License: Ataturk University

Degree: Atatürk University

Doctorate: PhD Candidate

Professional experiences: Since 2018

Investigation of the Principles of Accessibility and Barrier-Free Landscaping in Urban Recreation Areas in Erzurum Historical Core

Prof. Dr. Mehmet Akif IRMAK¹ 

¹Atatürk University, Faculty of Architecture and Design, Department of
Landscape Architecture, Erzurum/Türkiye.

ORCID: 0000-0001-8285-5341

E-mail: mairmak@atauni.edu.tr

Ezgi KIRMIZIBAYRAK² 

¹Atatürk University, Faculty of Architecture and Design, Department of
Landscape Architecture, Erzurum/Türkiye

ORCID: 0000-0001-7645-7670

E-mail: ekbayrak06@gmail.com

Citation: Irmak, M.A. & Kırmızıbayrak, E. (2024). Investigation of Principles of Accessibility and Barrier-Free Landscaping in Urban Recreation Areas in Erzurum Historical Core. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:9, 193-219. ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13882787>

1. Introduction

Individuals with different characteristics come together to form a community. These communities include individuals with many different characteristics such as women, men, children, patients, people with permanent or temporary disabilities, people with physical or mental disabilities, and pregnant women (Jové Sandoval, 2018).

Disability is defined as the loss of physical, mental or social abilities at different rates due to various reasons at birth or later; as a result of these losses, it is defined as the situation of having difficulty in adapting to life in society and meeting their daily needs (Tuğluer & Ekren, 2022).

According to the report published by the World Health Organization (WHO) in 2023, it was stated that more than 1.3 billion people with disabilities live in the world. It indicates that this number corresponds to approximately 16% of the world population and one out of every 6 people in the world has a disability (WHO, 2024).

According to the data published by the Turkish Statistical Institute (TÜİK) in 2002, disabled people constitute 12.29% of Türkiye's population. Of this rate, 9.7% are disabled due to chronic diseases and 2.58% are orthopedically, speech, language, hearing and visually impaired (TÜİK, 2002).

In the today's era, the majority of people live in cities. Cities consist of public, semi-public, private and semi-private areas according to the usage characteristics of the individuals living in them. Public areas are places that have a great importance in the fulfillment of social, economic and cultural functions of individuals (Kaplan & Öztürk, 2004; Demircan, Aytatlı & Yıldız 2018).

It is very important that all designs made in public areas are suitable for the use of all members of the society in terms of accessibility and quality of life.

In this study, several important principles that need to be considered in terms of accessibility in urban landscape areas are emphasized. The landscape areas located within the historical city core of Erzurum are examined in terms of accessibility principles. Incorrect and correct practices are analyzed with examples.

1.1. Definition of Accessibility

Accessibility is the ability of every living individual to safely and independently access and use any place and any service they want. All individuals should be able to access all areas, spaces and services, from residential buildings to workplaces, from educational areas to open spaces and public transportation. The arrangements that have been made and will be made and the services provided should be used by all individuals without anyone's help and without any risk (Erişilebilirlik Kılavuzu, 2020).

1.2. Importance of Chain of Accessibility

In addition to public buildings where various services are provided in cities, educational areas, structures where health services are provided, workplaces and residential buildings; open spaces such as sidewalks, green areas, pedestrian crossings, overpasses and underpasses, and transportation systems connecting these areas should be used smoothly by all individuals at any time of the day. For this reason, all built and designed areas should be planned as accessible as a whole. All of the arrangements made to ensure accessibility represent the chain of accessibility, and each

of the arrangements made constitutes a link in this chain. If one of these links' breaks, the whole chain breaks and the entire accessibility status deteriorates (Erişilebilirlik Kılavuzu, 2020). For example, if a visually impaired individual wants to leave his house to receive services in a public institution providing health services; there should be barrier-free passages on the sidewalks he uses along the road between his home and the building where he will receive services, stops and buses where he will get on and off at public transportation stops, internal voice announcements, audible signals at pedestrian crossings with traffic lights, appropriate directional signs on the road route leading to the building where he will receive services, and tactile walking surface application. If any of these arrangements are missing, a link in the accessibility chain may be broken, resulting in a significant decrease in the quality of life.

1.3. United Nations Convention on the Rights of Persons with Disabilities and Türkiye's Accession

The "Convention on the Rights of Persons with Disabilities" was adopted by the United Nations in 2006 in order to ensure that all individuals, especially persons with disabilities, can exercise their rights and freedoms independently and safely (Tuğluer & Ekren, 2022). Türkiye signed this convention on March 30, 2007 and the notification of becoming a party to the convention, which was approved by the Turkish Parliament on December 3, 2008, was notified to the United Nations on September 28, 2009.

In our country, there are various legislative arrangements to ensure accessibility and to build and organize suitable living spaces. Zoning Law No. 3194, Zoning Regulation on Planned Areas, Parking Regulation,

Additional Regulations on Shelters, Implementation Regulation on Slums Law, Building Inspection Implementation Regulation, and on the other hand, in accordance with the provisions of the Law on Disabled Persons No. 5378 and the UN Convention on the Rights of Persons with Disabilities, it is obligatory to make fully accessible designs at the planning, project and implementation stages (Eriřilebilirlik Kılavuzu, 2020).

Law No. 5378 on Persons with Disabilities protects the right of persons with disabilities to live equally and freely in accordance with various international conventions, laws and regulations, especially the 1982 Constitution (Kuter & akmak,2017).

1.4. Measures to Be Followed in Landscape Areas Related to Disabled People (TS, ISO)

In the Building Inspection and Implementation Regulation, which is included in the Zoning Legislation and which greatly concerns the design of places, regulations that entered into force on May 30, 2019 have been made in order to check compliance with accessibility standards in the controls made during the project design and implementation processes in order to accept the buildings as accessible. In these regulations, the Accessibility Control Form has been added as a new section in Appendix-3 Form-1: Architectural Project Control Form. According to this form, the standards that the building must meet for each part of the building separately are specified, and building inspection companies can check whether all arrangements such as sidewalks, building entrances, ramps, direction signs and building installations in the site and floor plans are in compliance with the dimensions in the accessibility standards while they

are still in the project phase. This form consists of 12 sections and 128 questions and thus the entire designed space is recognized as accessible (Eriřilebilirlik Kılavuzu, 2020).

Law No. 5378 on Disabled Persons and Amendments to Certain Laws and Decree Laws has made accessibility standards mandatory in the licensing and inspection processes of the designed and implemented area, and public institutions and organizations are required to make all existing roads, sidewalks, ramps, open-green areas, recreation areas, etc. fully accessible within seven years from the date of entry into force of this law (Kuter & akmak,2017). With this obligation, commissions established in each province monitor and inspect the accessibility of existing built areas and examine the necessary arrangements. Within the scope of these examinations and regulations, Accessibility Monitoring and Inspection Regulation and Accessibility Monitoring and Inspection Circulars have been published. In Appendix I of the Monitoring and Inspection Regulation, it is checked whether the buildings are suitable for accessibility, and in Appendix II, the accessibility of pedestrian sidewalks, pedestrian crossings, bus stops, parking lots, public telephone booths, public toilets and city parks are checked (Özkaraca & İnceođlu, 2021).

One of the most important issues in accessibility legislation is standards. These standards have taken their place in the legislation in our country as "standards on accessibility published by the Turkish Standards Institute (TSE)" (Kuter & akmak, 2017). In the standards guide published by TSE, there are necessary explanations regarding the accessibility regulations and standards that should be related to pedestrian sidewalks and pedestrian crossings, outdoor-green areas, recreation areas, official

buildings belonging to public institutions and organizations, as well as private buildings and environmental regulations (Arslan & Acar, 2020).

The standards prepared by TSE are as follows:

- TS 9111 "Accessibility Requirements in Buildings for Persons with Disabilities and Mobility Impairments"
- TS 12576 "Design Rules for Structural Precautions and Signs for Accessibility on Sidewalks and Pedestrian Crossings"
- TS 12460 "Rail Transportation Systems Section 5: Design Rules for Facilities for the Disabled and Older Persons"
- TS ISO 23599 "Auxiliary Products for the Visually Impaired or People with Low Vision - Tactile Walking Surface Signs"
- TS 13536 "Supplementary standards for the implementation of TS ISO 23599"
- ISO 23600 "Auxiliary products for the visually and hearing impaired - Pedestrian traffic lights - Audible warnings and tactile surfaces"
- TS 13622 "Accessibility Requirements in Public Transportation Systems for Persons with Disabilities and Mobility Restrictions"
- TS 13882 "Rules for Classification of Pedestrian Walking Surfaces - Basic Requirements and Evaluation Methods" (Erişilebilirlik Kılavuzu, 2020).

1.5. The Accessibility Guidelines and Details

In the accessibility guide, certain standards and measurements are given, such as the location of urban reinforcement elements, what to pay attention to in outdoor-green areas, what to comply with in parking lots, as well as physical environmental arrangements such as pedestrian paths, pedestrian

crossings, ramps, stairs. When these measurements and standards are examined, some of the issues that come to the fore and should be considered in terms of landscape architecture are as follows;

1.5.1. Sidewalks (according to TS 12576 standards):

- Sidewalks should be at least 150 cm wide. The ideal width is 200 cm.
- On sidewalks, there should be a safety strip of at least 25 cm next to properties and 50 cm on the side of the curbstone, including the curbstone.
- Sidewalks should have non-slip and walkable pavements.
- Sidewalk heights should be maximum 15 cm and minimum 3 cm.
- Sidewalk widths should be a minimum of 3.0 m at bus stops and 3.5 m in front of shops.
- Depending on the width of the sidewalk, ornamental plants and reinforcement elements to be planted on the edge of the carriageway and sidewalk should be placed in a strip of at least 75 cm and at most 1.2 m wide along the sidewalk in a proper alignment.
- Urban furniture, equipment and trees on the sidewalks should be positioned on a platform 10 cm above the sidewalk to be noticed especially by the visually impaired.

1.5.2. Ramps (according to TS 12576 standards):

- Ramps should have a minimum width of 1.8m to ensure easy use in cases where two wheelchairs need to pass side by side or opposite each other.

- For ramps longer than 10 m, a level rest area of at least 2.5 m should be provided.
- If the ramp changes direction at the landing, a 1.5m x 1.5m landing should be planned for wheelchair maneuvering.
- If there is an elevation difference of more than 2 cm on existing roads, a ramp should be constructed.
- When there is an elevation difference of more than 1.3 cm on the walking route, a ramp should be built to overcome these elevation differences.
- When the elevation difference is 15 cm or less, the slope should be 8%, when between 16-50 cm, the slope should be 7%, when between 51-100 cm, the slope should be 6%, and when the elevation difference is over 101 cm, the slope should be set to a maximum of 5%.
- The surface of the ramps should be covered with a non-reflective, hard, non-slip material with very little roughness.
- For safety reasons, handrails in outdoor areas should continue 45 cm before the start of the ramp and 45 cm after the end of the ramp.

1.5.3. Stairs (according to TS 12576 standards):

- Since stairs prevent the mobility of disabled individuals, the use of ramps in connecting different elevations is important for easy access. In cases where the ramp cannot be used and the staircase is designed, handrails should be built on both sides of the staircase.
- Stairs should have a maximum riser height of 15 cm.
- Stair surfaces should be covered with non-reflective, anti-slip materials.

- There should be a protective non-slip strip at least 2.5 cm wide at the ends of the stairs.
- In cases where the staircase continues in the same direction and the elevation difference is 1.8m, the designed staircase should have a 2m landing.
- At the beginning and end of the stairs, a 1.2m long landing with a flat and different textured surface should be planned for visually impaired individuals.
- Tactile surfaces should be used so that stairs can be found and felt. Tactile surfaces should be positioned just before the first step of the staircase and just after the last step of the staircase, parallel to the width of the staircase. Tactile surfaces should be at least 60 cm wide and designed in different colors and textures.

1.5.4. Parking spaces for the persons with disabilities (according to TS 12576 standards):

- According to the Parking Regulation, in public buildings and regional parking lots, not less than one parking space should be reserved for the disabled at the rate of 5% of the number of parking spaces in the entire area.
- There should be a maximum distance difference of 25 m, preferably 10 m, between the parking lot and the destination after parking.
- In parking lots designed as open and closed, disabled parking spaces should be located closest to the elevator, entrance and exit.

- In the parking lots of public or private areas, sidewalks should be lowered between 0 cm and 3 cm according to the level of the carriageway in order to avoid any obstacles in the case of getting on and off.
- The width of a parking space designed for people with disabilities should be at least 3.6m and ideally 3.9m.
- A 1.2m access aisle should be designed between two parking spaces for the movement of wheelchairs. Parking lot widths should be 2.5m (BM, 2004).
- There should be easily visible and readable disabled signs and directional signs for the parking lot of disabled people in publicly used car parking areas.
- Sidewalk ramps should be built in roadside parking areas and curbstone heights should be 3cm.
- Ticket machines and parking meters in the parking lot should be between 90 cm and 120 cm, which is the height that disabled people can use.

1.5.5. Outdoor-Green areas

- For lighting main roads, lighting profiles should be at least 1.5 m wide and 2.3 m high.
- Road widths should be limited to a minimum of 1.2 m and a maximum of 2 m.
- The longitudinal slope of main roads in open areas should be 4% and the transverse slope should be 2%.
- Tactile surfaces should be positioned at the entrances to open spaces or parking areas.

- Rest areas should be located along the walking paths at maximum 18 m intervals, within sight distance.
- Roads in open and green areas should be covered with non-slip coatings.
- Side roads should have a longitudinal slope of 4% and a transverse slope of 2%. In exceptional cases, the longitudinal slope can be planned between 4% and 6%. In such cases, rest areas should be located at 10 m intervals.
- Lighting profiles on side roads should be at least 90 cm wide and 2.3m high.

1.5.6. Urban furniture (according to TS 12576 standards):

- In urban furniture; telephone booths, sales kiosks, ice cream shops, fire hydrants, garbage and mailboxes, sitting benches, etc. should be positioned in such a way that they do not constitute an obstacle in the direction of movement on the pedestrian path.
- If it is necessary to place tactile and contrasting colored signs for the visually impaired around the obstacles, they should be placed at a height of not less than 70 cm.
- The head rescue distance should be accepted as 2.2 m and any stairways lower than this distance should be closed.
- The edges of the urban furniture should be rolled to prevent any accidents.
- By using texture differentiation in surface coverings, the locations of the reinforcement elements should be made easy for visually impaired individuals to find.

- Sitting benches in recreation areas should be placed at regular intervals such as 100 m - 200 m (BM, 2004).
- In rest areas, 1.2 m of space must be left for wheelchairs to be positioned next to the bench.
- In order for the benches to be ergonomically useful, the seating area should be 45 cm above the ground and the backrest should be 70 cm above the ground.
- Garbage bins should be located at least 45 cm away from the curbstone at a minimum distance of 45 cm and at a minimum height of 90 cm and a maximum height of 120 cm so as not to interfere with pedestrian movements.

1.5.7. Controlling Accessibility

Within the scope of the accessibility monitoring and supervision regulation, the duties and responsibilities of the commission are specified in detail. In the second part of this regulation, under the heading "Organization, Duties and Authorities, Working Procedures and Principles of Commissions"; it is stated as follows: "The commission consists of the provincial director under the chairmanship of the governor or the deputy governor to be appointed by the governor, one full and one substitute member preferably from architects, engineers, city planners, landscape architects or construction technicians working in the provincial organization of the Ministries specified in the provisional article 3 of the Law, and two full and two substitute members representing different disability groups of the confederations related to the disabled, preferably from disabled individuals residing in that province, not exceeding five people in total".

These commissions carry out the following activities:

- Preparing the monitoring and supervision program,
- To monitor, inspect and prepare reports on existing public buildings, roads, sidewalks, pedestrian crossings, outdoor and green areas, sports fields and similar social and cultural infrastructure areas belonging to public institutions and organizations, all kinds of structures built by real and legal persons and providing public services, and metropolitan municipalities and other municipalities, public transportation services provided by them or under their control within the city according to monitoring and inspection forms.
- Establishing a technical evaluation team and assigning it to conduct a preliminary evaluation when deemed necessary
- To issue an accessibility certificate if there is no deficiency as a result of monitoring and inspection.
- To repeat the monitoring and inspection of the places where administrative fines are imposed as a result of monitoring and inspection.

2. Investigation of the Historical Core of Erzurum City

Erzurum province is the largest province in the Eastern Anatolia region and the fourth largest province in Türkiye in terms of area. Since 63% of Erzurum province is covered with mountains, it has a topographically high and rugged structure (KUDAKA, 2024).

According to 2023 data, Erzurum province, with a total population of 749,993, has a very important place in terms of winter tourism with Palandöken mountain, while it also has very old settlements with historical sites such as Erzurum Castle and Yakutiye Madrasah. Erzurum city center consists of Yakutiye, Palandöken and Aziziye districts and the population

of these 3 central districts is 431,426 people (TÜİK, 2024; Ministry of Culture and Tourism, 2024).

Within the scope of this study, the surroundings of Erzurum Castle and Yakutiye Madrasah (Figure 1) were examined in accordance with the Accessibility Legislation and as a result, areas that comply with the legislation and areas that do not comply with the legislation were identified. On the side of the photographs taken from the field, the content of the Erişilebilirlik Kılavuzu (2020) prepared by the Republic of Türkiye Ministry of Family, Labor and Social Services is described with examples.

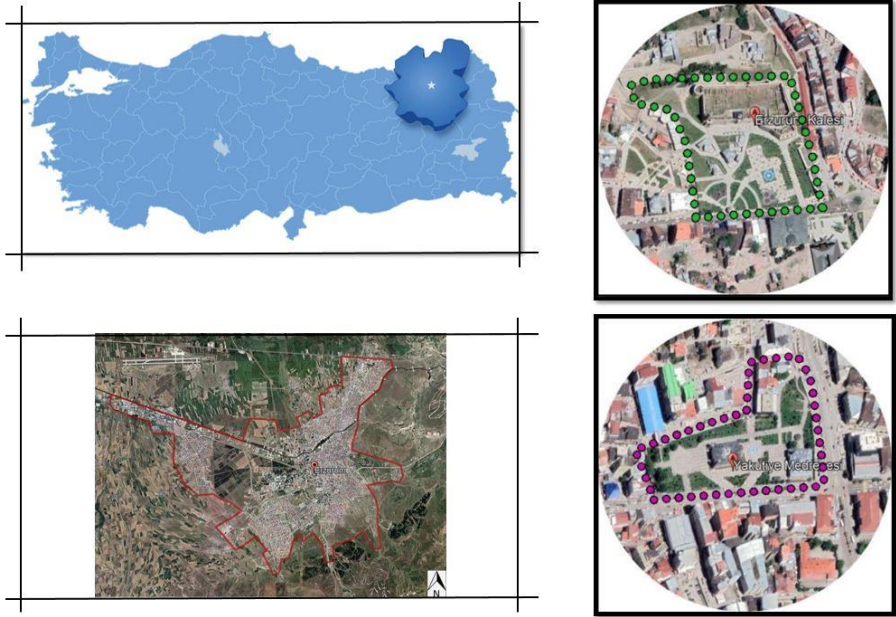


Figure 1. Erzurum Castle and Yakutiye Madrasah surroundings that have been investigated (Maps were made using Google Earth).

When the surroundings of Yakutiye are evaluated in terms of accessibility;



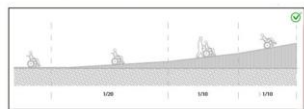
a



b

Figure 2. A view around the Yakutiye Madrasah (a:Source;Authors, b:Erişilebilirlik Kılavuzu, (2020)).

According to accessibility legislation, all stairs in open areas should have sensible warning surfaces at the beginning and end of the stairs. Warning surfaces should be positioned across the width of the staircase at the end and at the beginning. These warning surfaces should be 60 cm deep 30 cm before the start and 30 cm after the end of the staircase.



a

Figure 3. View from a ramp around the Yakutiye Madrasah (Photos: Source; Authors, a:Erişilebilirlik Kılavuzu, (2020))

As can be seen in Figure 3, the ramp surfaces should be covered with hard, stable, non-slip and slightly rough material. Roughnesses on the surface should not have a height of more than 2 cm. 8% slope should be used on

ramps less than 10 m long. The slope of the ramp in Figure 3 is designed in accordance with this rule. At the same time, the handrails placed around the ramp were preferred in accordance with the height of 70 cm and 90 cm as stated in the legislation.



Figure 4. A view of the stairs and ramp around the Yakutiye Madrasah, (a: Source; Authors, b:Erişilebilirlik Kılavuzu, (2020)).

Although the slope of the ramp in Figure 4 and the handrails on the sides are appropriate according to the accessibility guidelines, the lack of tactile surfaces in front of and at the end of the stairs and the lack of handrails on the sides of the stairs pose a problem for disabled people.

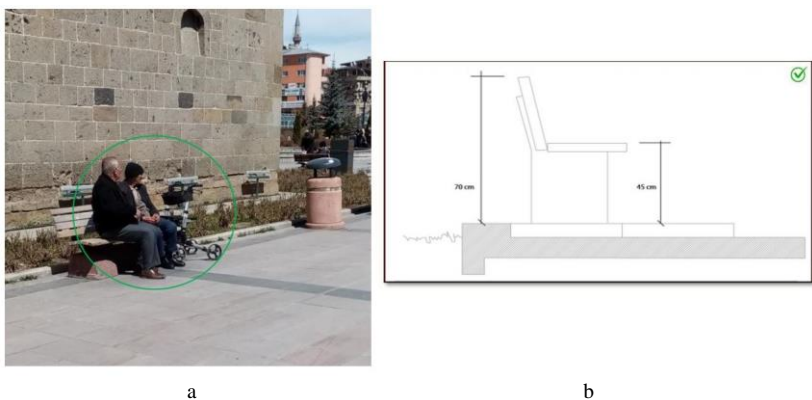


Figure 5. A view of the urban furniture around Yakutiye Madrasah, (a: Source;Authors, b:Erişilebilirlik Kılavuzu, (2020)).

The seating heights of the urban furniture used in the photo above should be 45 cm and the height of the backrest surface should be 75 cm. Garbage bins should be positioned at least 45 cm away from the curbstone at a minimum distance of 45 cm and at a minimum height of 90 cm and a maximum height of 120 cm so as not to interfere with pedestrian movements.

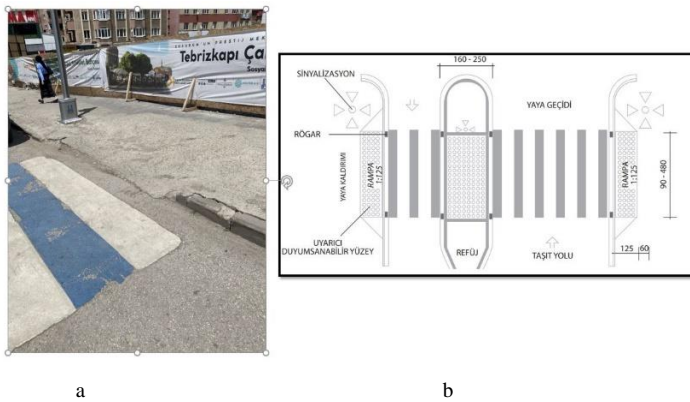


Figure 6. A view of the pedestrian crossing around the Yakutiye Madrasah (a: Source; Authors, b:Erişilebilirlik Kılavuzu, (2020)).

Although the ramps in areas with sidewalks and pedestrian crossings have an appropriate slope, the ramp surface should be smooth and slightly rough. The indentations and protrusions on the surface coating of the existing ramp are not suitable for disabled individuals, and the lack of a tactile surface on the ramp causes visually impaired individuals to experience difficulties in use.

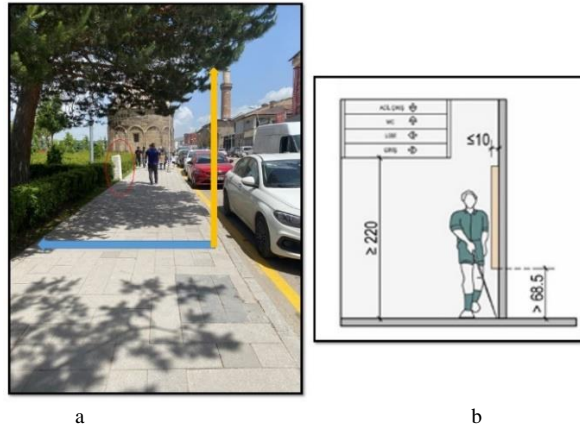


Figure 7. A view of the pedestrian road around Erzurum Castle (a:Source; Authors, b:Erişilebilirlik Kılavuzu, (2020)).

The minimum width of the sidewalk should be 150 cm to allow all pedestrians to move freely. In all open and closed circulation areas, the vertical net (clear) height of the space to be provided unobstructed should be at least 220 cm.

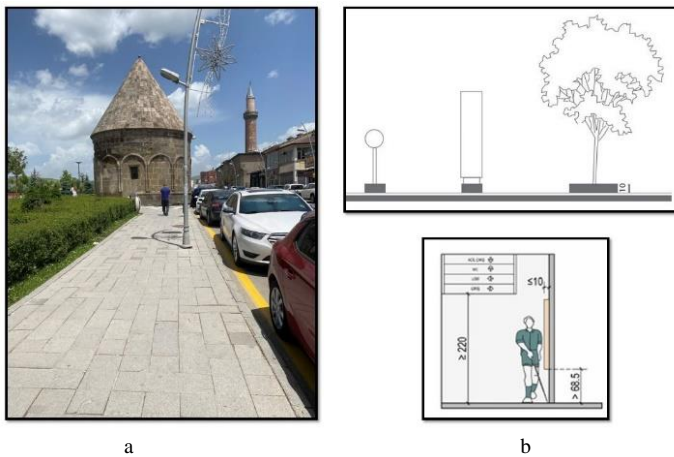


Figure 8. A view around Erzurum Castle, (a: Source; Authors, b:Erişilebilirlik Kılavuzu, (2020)).

According to the accessibility legislation, the width of the pedestrian path should be at least 150 cm (ideally 200 cm) and the reinforcement elements,

lighting elements and trees should be separated from this pedestrian path and placed in a proper alignment in a strip of at least 75 cm and at most 1.2 m wide along the sidewalk. As can be seen in Figure 8, in this area, the lighting element is positioned on the sidewalk and no warning and sensible surface is placed around it, especially for visually impaired individuals.



Figure 9.A view of the park around Erzurum Castle (Source; Authors)

In Figure 9, stairs and ramps are used together in this recreation area around Erzurum castle. While the slope of the ramp is designed correctly, no railing is positioned next to the ramp. In the staircase in use, the differences in the height of the rails create difficulties especially for visually impaired individuals. In addition, handrails were not positioned on both sides of the stairs and no tactile stimulating surfaces were added in front of and at the end of the stairs.



Figure 10. View from two different areas around Erzurum Castle (Source;Authors)

The surface of accessible routes should be safe and usable for people who use wheelchairs or who have difficulties in walking. Floor and paving surfaces along accessible routes should be hard, stable, solid, durable and non-slip. Placing the urban furniture in the environment in a way that does not interfere with the walking route is a correct practice according to the accessibility legislation. Tactile surfaces should be used correctly for comfortable use by the visually impaired.

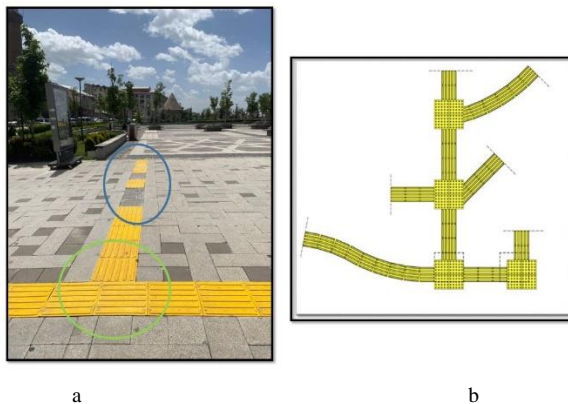


Figure 11. Tactile surfaces around Erzurum Castle (a: Source;Authors, b:Erişilebilirlik Kılavuzu, (2020)).

There are deficiencies in the continuity of the tactile surfaces on the walking path route around Erzurum Castle (Figure 11). In addition to these deficiencies, a 60 cm warning surface should be applied at the intersection points on the tactile surfaces.

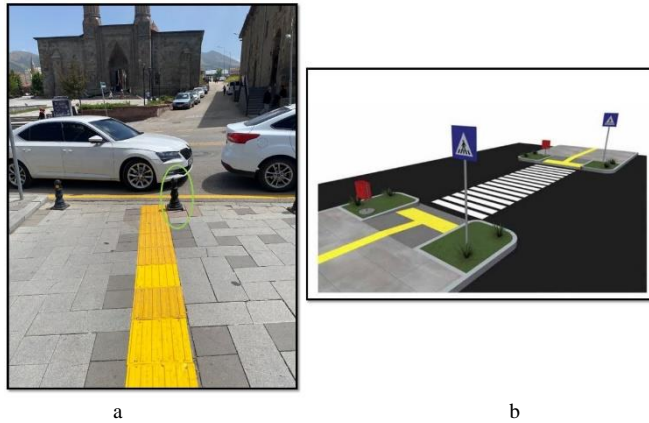


Figure 12. A view of the tactile surface application around the castle (a:Soure; Authors, b:Erişilebilirlik Kılavuzu, (2020)).

It is necessary to ensure the integrity of the tactile surfaces positioned on the pedestrian path, and in case the direction is changed and the path is interrupted, the warning tactile surface applications should be done correctly. In Figure 12, the tactile surfaces are not properly connected to the warning surfaces and are cut suddenly, causing problems in the use of visually impaired individuals. At the same time, while no obstacle should be placed at least 60 cm away from the tactile surfaces, the obstacle left here poses a big problem for visually impaired individuals.

3. Conclusion and Suggestions

Although the areas around Erzurum Castle and Yakutiye Madrasah contain some applications suitable for the use of disabled people, it has been determined that there are many deficiencies. As a result of the applications,

it was determined that the use of tactile surfaces is poor and inappropriate, suitable ramp slope and railing applications are not made especially on the stairs in public areas, and there are deficiencies in the tactile-stimulating surface applications that should be made in front of and behind the stairs. While there were errors in the positioning of equipment and lighting elements around Erzurum Castle, it was determined that the use of garbage bins and urban furniture in the parks around the Castle was in accordance with the legislation. It is very important that the design and implementation works performed in recreation areas are carried out carefully in terms of ensuring the accessibility chain, that the relevant regulations and standards are taken into consideration during the design and implementation stages, and that joint studies are carried out with the right professional disciplines.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Arslan, H. D. & Acar, S. (2020). Konya Mevlana Kültür Merkezinin Erişilebilirlik Açısından Değerlendirilmesi. *Sosyal Politika Çalışmaları Dergisi*, 285-326.
- BM. 2004, Accessibility for the Disabled a Design Manual for a Barrier Free Environment, United Nations, Department of Economic and Social Affairs, Division for Social Policy and Development.
- Demircan, N., Aytatlı, B., & Yıldız, N. D. (2018). Erzurum kent insanının rekreasyonel davranış biçimleri. *Bartın Orman Fakültesi Dergisi*, 20(3), 420-430.
- Erişilebilirlik Kılavuzu. (2020), T.C. Ministry of Family, Labor and Social Services, Ankara.
- Jové Sandoval, J. M. (2018). Accessibility, Heritage, and Project. Re-Architectures for Everyone. *Millenium*, (7), 103-111.
- Kaplan, H. & Öztürk, M. (2004). Engelliler, Kamu Mekânı ve Engelsiz Tasarım: Kamusal İç Mekânlarda İrdelenmesi İçin Bir Çerçeve. *Planlama Dergisi*, 2(4), 67-74.
- KUDAKA. 2024 <https://kudaka.ka.gov.tr/bolgemiz/erzurum> Erişim tarihi: 02/07/2024
- Kuter, N. & Çakmak, M. (2017). Kamusal Dış Mekânlarda Engelliler İçin Tasarım: Ankara, Seğmenler Parkı Örneği. *Anadolu Orman Araştırmaları Dergisi*, 3(2), 93-110.
- Ministry of Culture and Tourism. 2024 <https://erzurum.ktb.gov.tr/TR-56044/genel-bilgiler.html> Erişim tarihi: 02/07/2024
- Özkaraca, N. & İnceoglu, M. (2021). Üniversite Yerleşkelerinde Erişilebilirlik Değerlendirmesi: Düzce Üniversitesi Kampüsü Örneği. *Düzce Üniversitesi Bilim ve Teknoloji Dergisi*, 9(5), 1891-1908.
- TS 12576: Şehir İçi Yollar- Özürlü ve Yaşlılar İçin Sokak, Cadde, Meydan ve Yollarda Yapısal Önlemlerin Tasarım Kuralları.
- Tuğluer, M. & Ekren, E. (2022). Kentsel Açık Yeşil Alanların Engelliler İçin Evrensel Standartlar Kılavuzu Kapsamında Değerlendirilmesi:

Kahramanmaraş Engelliler Sevgi Parkı Örneđi. *Turkish Journal of Forest Science*, 6(2), 588-603.

TÜİK. (2002). <https://data.tuik.gov.tr/Kategori/GetKategori?p=Saglik-ve-Sosyal-Koruma-101>, Erişim tarihi: 05.07.2024

TÜİK. (2024). <https://data.tuik.gov.tr/Kategori/GetKategori?p=Nufus-ve-Demografi-109>, Erişim tarihi: 05.07.2024

WHO. (2024). World Health Organizations. <https://www.who.int/news-room/fact-sheets/detail/disability-and-health>. Erişim Tarihi: 05.07.2024.

Prof. Dr. M. Akif IRMAK

E-mail: akfpeyzaj@gmail.com; mairmak@atauni.edu.tr

Educational Status: University

License: Landscape Architecture

Degree: PhD

Doctorate: Atatürk University

Professional experiences: Landscape design, Landscape planning, Urban climate, Thermal comfort, Urban furniture, Ornamental plants design. Since 1999.

Ezgi KIRMIZIBAYRAK

E-mail: ekbayrak06@gmail.com

Educational Status: University

License: Interior Architecture (Akdeniz University)

Degree: Master's degree (Landscape Architecture)

Doctorate: Continues (Landscape Architecture)

Professional experiences: Interior design, landscape planning, urban climate, thermal comfort.

The Importance of Universal Design Principle in University Campus Area

Assist. Prof. Dr. Mahshid MIKAEILI¹ 

¹ Bursa Technical University, Faculty of Forestry, Landscape Architecture
Department, Mimar Sinan Campus, Bursa/Türkiye.

ORCID: 0000-0002-8126-3069

E-mail: mahshid.mikaeili@btu.edu.tr

Citation: Mikaeili M. (2024). The Importance of Universal Design Principle in University Campus Area. Göktuğ, T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:10, 220-249. ISBN: 978-625-367-855-5. Iksad Publications. DOI: <https://doi.org/10.5281/zenodo.13883076>

1. Introduction

Universal Design is one of the new terms in the design field in recent years. The concept of Universal Design (UD) aims to make all products and the built environment as accessible, aesthetically pleasing, and usable as possible for everyone, regardless of gender, age, status, ability, or disability (CEUD, 2024).

Persons in diverse types of societies include children, the elderly and young, expectant mothers and fathers, patients, overweight individuals, persons with temporary or permanent disabilities, and those with mental or physical problems. Therefore, people require access to a livable city and all of society's amenities.

The goal of universal design is to let everyone reach their full potential. The art and practice of creating for a varied range of people at all stages of life is known as universal design.

Universal Design is described as offering design solutions that accommodate a diverse array of people and skills without categorizing them as impaired (Story, 1998, 6). The Universal Design principle makes accessibility for all people possible in all domains of society.

A set of guidelines for creating places and products that are equally accessible to a diverse variety of people is known as universal design. One example of an inclusive approach to accessible design is Universal Design (Beck, et al. 2014, 209).

Accessible design concept is achieved through compliance with state, local, and national building codes and standards that establish a minimum level of design necessary to accommodate people with disabilities. Achieving the Universal Design concept demands understanding the

relationship between accessibility, usability, and inclusion (DOIT, 2024). University campuses are part of the urban public areas. Campus areas are small cities that present various functions for their dwellers. They include a variety of users, flexible usage times, and accessibility to the spaces at every point. Only in this case could be ensured about the rights, freedom, and comfort of all users.

The Accessibility Report On University Campuses (2020) defines accessibility as the ability for all individuals to independently and safely enter and use any place or service. Furthermore, Universal Design principles apply to lectures, classroom discussions, group projects, handouts, web-based instruction, fieldwork, and other academic activities. Campuses of universities share requirements with public urban areas. Campus design requires the creation of educational facilities as well as solutions to transport, housing, cultural, and social issues. Campuses serve as public spaces for the university and as platforms for social expression. The primary purposes of a modern campus in modern times can be categorized as follows: housing, sports, culture, education, leisure, and circulation. The campus combines the natural environment with the constructed environment for education.

Education is a constitutional right and should be available to all. The educational environment should be responsible for supporting equality and being inclusive. The main aim of this study is to explore the relationship between the Universal Design approach and the design of university campuses to create a coherent landscape design for campuses that aims to promote unity in design over time.

2. Material and Method

The study's conceptual framework is drawn through the descriptive method by presenting the importance of using Universal Design (UD) principles on university campuses. The study aims to determine how Universal Design principles contribute to creating a coherent campus design with a clear identity that will enhance the connection, inclusive design, and the experience of nature.

Within this scope, the study follows a descriptive method for understanding the importance of Universal Design principles based on the various academic research and studies conducted by world organizations. To achieve this, the first stage of the study needs to investigate the meaning of the Universal Design principle and its origin. The second stage looks at how Universal Design concepts are applied on campus. The final step includes recommendations for incorporating Universal Design concepts into campus spaces to promote accessibility in all sectors.

3. Findings and Discussion

3.1. Universal Design Concept

The Universal Design concept (UD) aims to design all products and the built environment as accessible, aesthetically pleasing, and usable as possible for everyone, regardless of gender, age, status, ability, or disability. A place should be designed to meet the needs of all people, not just one group of people (CEUD, 2024). Universal Design is expressed in various terms "Design for All", "Inclusive Design", "Lifespan Design", and "Barrier-Free Design".

Societies are made up of a diverse range of individuals, including patients, young people, the elderly, and those with temporary or permanent physical or mental problems (Sandoval, 2018, 105).

The origins of the Universal Design concept can be traced back to the 1950s after the Second World War. After the Second World War, accessibility became a significant term in designing urban public open spaces, design for people with disabilities, or Barrier-Free Design. The Barrier-Free Design aims to improve urban areas by making urban public open spaces accessible to the growing number of disabled people after the war (Barnes, 2011, 57, Evcil, 2014, 16). During these years, the concept of Barrier-Free Design developed under the design heading for disabled people to create individual lives, participate in social life, and use urban areas without problems. However, over time, it was thought that these solutions discriminated or stigmatized against individuals with disabilities (Soyupak, 2021, 88).

The phrase Universal Design was first used by Ronald Mace, an American architect who intended to concentrate on Universal Design-compliant accessible housing. He contracted polio at the age of nine and used a wheelchair ever since. During his training period as an architecture student at North Carolina State, he had to be carried up and down stairs to attend classes, and his wheelchair did not fit into the men's toilets. His life with mobility problems inside a society with insufficient spatial public areas for disabled people was a catalyst for the creation of facilities and comfort in the lives of people with disabilities.

Mace championed accessible building codes and standards in the United States that North Carolina adopted in 1973. Mace wrote in 1988 "The Fair

Housing Amendments Act”. Then, in 1990, he wrote “The Architectural Guidelines of the Americans with Disabilities Act” and “Accessible Environments Toward Universal Design”. Mace presented the origin of the Universal Design principles in “Accessible Environments Toward Universal Design”. He believed both groups with and without impairments may live more comfortably thanks to accessibility features.

The inclusive design philosophy is best shown by Mace’s term, Universal Design. Since then, several nations have utilized the law as a model for legislation of a similar nature. A set of guidelines known as Universal Design is used to create settings and goods that are usable by a variety of consumers (Beck, et al. 2014, 209).

Universal Design is defined as designing for all so that everyone may access and use products, services, and settings without requiring additional changes. Universal Design is described as proposing design solutions that satisfy the demands of a wide range of people of different ages and abilities without designating them as disabled (Story, 1998, 6). According to Mace et al. (1991, 3), removing environmental barriers makes it possible for individuals with disabilities to engage more completely in everyday activities.

However, there is a difference between designing for disability and Universal Design. According to Goldsmith (2000, 5), the concept of design for disability is about making buildings and the built environment accessible for use by people with disabilities. The Universal Design concept is about making buildings safe and comfortable for all users, including people with disabilities.

According to Hanson (2004), the “Barrier-Free Design” method has evolved from developing buildings and goods for small groups of individuals with specific needs to designing for everyone, regardless of age, gender, or ability, to underline its relevance. In other words, Universal Design seeks to produce uniform designs for all groups of individuals with diverse features in society, regardless of their talents, physiological attributes, age, gender, social, economic, or educational status. Universal Design seeks to reach as many people as possible while also taking into account social values.

Universal Design entails producing places and products that can be used by anybody without the requirement for specific adaptation or design. Table 1 depicts the distinctions between the requirements for designing for people with special needs and Universal Design.

Table 1. Differences between Special Needs and Universal Design principles (Adapted from Hanson, 2004)

Special Needs	Universal Design
Designer client. Persona of a young, fit, active, male, white adult the yardstick for good design.	People are individuals, who have different needs and requirements during their life course.
Others - older people and people with disabilities - are not ‘normal’ clients. They have ‘special needs’.	Us - we all have goals / aspirations as well as problems / impairments. We share ‘generic needs’.
Micro-environmental approach	Macro-environmental approach
Ethos of specialisation and pragmatism.	Ethos of normalisation and enablement.
Tailors the environment so that it is ‘just right’ for each client group.	Extends parameters of design until no one is excluded
Telling people what they need	Asking people what they want.
Does your disability prevent you from using the city centre?	What is it about the design of the city centre that prevents you from using it?

According to Hanson (2004), an inclusive environment is one in which all users, regardless of ability, can carry out their daily activities comfortably,

effectively, and safely, unrestricted by poor design, maintenance, or management of the built environment.

Between 1994 and 1997, the Centre for Universal Design undertook a research project called “Studies to Further the Development”. Creating a set of Universal Design Guidelines was one of the project's tasks (Story, 2011, 44). These criteria served as the foundation for the development of the following universal design principles:

- 1- Equitable use,
- 2- Flexibility in use,
- 3- Simple and intuitive,
- 4- Perceptible information,
- 5- Tolerance for error,
- 6- Low physical effort,
- 7- Size and space for approach and use.

In 2000, Manley introduced three additional concepts to foster greater cohesion, satisfaction, and interaction between people and their surroundings in urban areas. These guidelines were as follows:

- 1- Adding to human delight
- 2- Functional and aesthetic integration
- 3- Social cohesion and participation.

According to Hanson (2004, 13), the principles of Universal Design aim to accommodate a wide range of body shapes, sizes, and movements, and believe that designers and manufacturers should ensure that buildings, products, and services meet the needs of many people. A key outcome of Universal Design should be alleviating environmental pressures and solving architectural shortcomings, as well as creating a greater degree of

social equity and justice. Table 2 describes the Universal Design principle's aim and scope.

Table 2. Description of the Universal Design Principles (Hanson, 2004, Story, 2011)

Principle	Description
Equitable Use	The product is marketable and beneficial to individuals with a variety of skill levels.
Flexible in Use	It can meet a great variety of personal requirements and preferences.
Simple and Intuitive Use	Regardless of the user's background, level of expertise, language proficiency, or level of focus at the moment, the design is simple to use.
Perceptible Information	Whatever the user's sensory ability or the environment, the design efficiently conveys the necessary information to them.
Tolerance for Error	The design reduces dangers and the negative repercussions of accidental or unintentional behaviors.
Low Physical Effort	The design allows for efficient and comfortable use with minimal fatigue.
Size and Space for Approach and Use	The ergonomic design makes it suitable for most users.

Universal Design principles can have applications to design and build environments, products, and services, including learning environments, resources, and instruction methods (DOIT, 2024). Furthermore, access to the concept of Universal Design requires establishing the relationship between the three factors of accessibility, usability, and inclusion. Figure 1 illustrates the relationship between these factors and the characteristics of a built environment or product based on Universal Design principles.

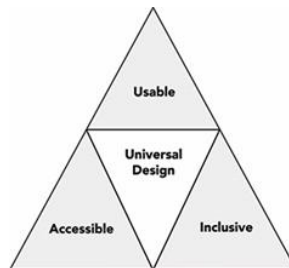


Figure 1. Characteristics of any Universal Design (DOIT, 2024)

Urban and landscape designing, public open spaces, parks and recreational areas, homes, public, commercial, and educational buildings, tourism, hospitals, health and wellness buildings, senior housing, and industrial design are all areas where Universal Design principles can be applied in the urban public areas and architectural design (Lid, 2014, 1345).

Adopting Universal Design successfully requires a broad framework of community-based organizations, including local residents, interest groups, and public and private organizations, to apply the concept in urban public open spaces (Njungea & Asilsoyb, 2020, 38).

Urban public open spaces play a vital role in people's lives, where they regularly meet people and carry out their daily activities. Urban public open spaces, as part of the urban environment, need to meet the necessary and significant needs of disadvantaged people.

According to the Chester County Planning Commission (2024), Universal Design for urban public open spaces is a technique that makes public and private spaces equally accessible to people of all ages and abilities. By standardizing elements in public open spaces, including broader, unobstructed sidewalks, benches, no-step entries, ramps, wider doorways, and halls, universal design benefits people of all ages and abilities.

Based on the Center for Universal Design concept, the Chester County Planning Commission (2024) proposed a few methods for implementing universal design principles in metropolitan public open spaces. These are listed in the following order:

1- Equitable use: Public open spaces planned for equitable use enable a diverse variety of users to enjoy the same building. For example, a

universally designed sports ground should give possibilities for multi-generational play and users with all physical and mental capacities.

2- Flexible use: Accommodate a wide range of individual abilities and preferences, such as a height-adjustable desk in the university library that can be used sitting or standing.

3. Intuitive use: Easy to understand with minimal user experience, knowledge, or language skills. For example, by using simple signage that can be easily understood by all.

4. Perceptible information: Using a thermostat with increased visual information, a tactile design, and contrasted colors are examples of how this Universal Design principle communicates necessary information independently of the user's sensory abilities (sight or sound) and environmental conditions (such as background noise or dim lighting).

5. Error tolerance: This principle limits the adverse consequences and hazards of unintentional actions or accidents, such as a boundary along a trail separating the surface trail from steep slopes. This boundary can provide a margin of error for those who are physically unable to see or react to potentially dangerous features while using the trail.

6. Low physical effort: It allows for equitable use by all people, for instance, seamless surfacing for playgrounds or flooring in a public space.

7. Size and space for access and use: It is preferable to provide suitably sized rooms for all users, regardless of size, posture, or mobility. For example, an extra-wide paved pathway would allow for a wide range of recreational applications for individuals of all abilities, as would open floor patterns that allow for a variety of turning maneuvers for wheelchair users.

Furthermore, according to Burgstahler (2021, 2), Universal Design principles can be applied to lectures, classroom discussions, group work, handouts, web-based instruction, fieldwork, and other academic activities. As previously said, the principles of universal design demonstrate a significant capacity to use many subjects. Universal construct principles can be used to construct educational facilities, including computer laboratories, UDL guidelines, and curriculum and pedagogy.

According to Izzo et al. (2011, 392), Universal Design for Learning (UDL) is an approach to teaching that ensures that students with a wide range of abilities can access course content and materials and ultimately succeed at training. Universal Design for Learning is a scientifically valid framework for guiding educational practice that obtains flexibility in training, reduces instructional challenges, and provides appropriate accommodations.

In Universal Design for Learning, there are three basic principles for inclusive course design: (1) multiple ways to arouse interest: the why of learning; (2) multiple ways to learn: the what of learning; and (3) multiple ways to act and express: the how of learning (Wall, 2023, 3).

Universal Design for Learning recommends offering course information in a wide range of formats to allow for varied levels of participation and to aid in the exhibition of acquired knowledge and abilities.

3.2. University Campus Area

According to the Cambridge Dictionary (2024), the meaning of a university campus is “the buildings of a college or university and the land surrounding them”. The term campus is a Latin word meaning “large field” or “open space”. Originally in Latin, campus meant garrison, a military.

Although the word “campus” is a Latin term, the origin of the new campus concept can be traced back to the Americas. The campus reflects a unique new educational concept. The campus was first built outside the city in a large park in 1746 for Princeton University (Kuyrukçu & Alkan, 2021, 652, Turner, 1984). However, the roots of the modern university are traced back to the 12th and 15th centuries in medieval Western Europe, especially in Italy, France, and England.

The political, religious, social, and economic aspects that influenced the university's institutional growth might be identified. Universities' organizational structures started to take shape when student or faculty guilds emerged. However, the origins of higher education are considerably older (Tekeli, 2003, 125).

Before the establishment of universities in the Middle Ages, there was evidence of formal and higher education institutions in ancient China, Japan, Persia, Egypt, India, and Semitic peoples (McCormick & Cassidy, 1953, 315-326).

Most European universities took their names from the cities in which they were located, and their buildings were scattered throughout the streets (Hebbert, 2018, 883). According to Coulson et al. (2015, 3-10), initially, European universities were places where teachers and students gathered in lecture halls, and university activities usually took place in buildings rented by the masters. Examinations and meetings were held in churches and monasteries. It was not until the 15th century that the University of Paris began to acquire land and build a series of lecture halls, libraries, colleges, dormitories, and churches.

Later, European universities adopted more formal landscaping by incorporating elements of European garden architecture, namely the Palace Gardens of Versailles and the geometric areas planted with trees and flowers, created by French landscape architect Andre Le Notre (Hebbert, 2018, 885; Gumprecht, 2014, 84). When it came to American universities, the settlers of the New World had a great opportunity: they had the knowledge and experience of a thousand years of civilization and a suitable land on which to build their ideal world. However, the pivotal moment in the history of American campus design came in 1779 when Thomas Jefferson proposed a reform of public education to the state legislature (Turner, 1984, 76).

According to Coulson et al. (2011, 10-11), the campus's straightforward design incorporates a broad and rectangular central space surrounded by a series of pavilions that serve as classrooms and professors' apartments along the long sides. One of the rectangle's short sides showcased Virginia plantations, while the other highlighted the beautiful and iconic library structure. Virginia University's spatial design was renowned for providing an axial open area with symbolic structures at each end. Later, this layout became widely used in American campus planning practice.

In the 19th century, approaches to campus design in America underwent a succession of transformational periods, including picturesque nature, the Beaux Arts movement, and the Gothic Revival. Noticing the natural terrain in designing was a significant difference between American and European universities (Coulson et al. 2011,13, Turner, 1984, 101).

There are two main design concepts that have been applied to landscaping on American university campuses. The naturalistic and casual park designs

of Frederick Law Olmsted, the landscape architect of New York Central Park, had been a model for many institutions to follow. Some campuses were more structured and took their cues from European colleges, which focused on creating geometric spaces (Gumprecht, 2014, 82).

In Turkey, after the traditional Seljuk and Ottoman schools, first modern university, Darülfünun (Fen Evi), was founded in 1845 with the proclamation of the Imperial Edict of Reorganisation and later moved to the site of today's Istanbul University (Yaylalı, Çil, & Can, 2015, 371).

After the Republic of Turkey was established, the initial universities were founded Istanbul University (1933), Istanbul Technical University (1944), and Ankara University (1946) are the first three oldest universities of Turkey that have roots in the Ottoman Era. In the second part, were established Karadeniz Technical University (1955), Ege University (1955), Atatürk University (1957), and Middle East Technical University (1959) (Kömürlü, 2019, 35).

Universities around the world saw substantial changes in the 20th century, especially following World War II, when a large increase in the number of persons pursuing higher education occurred (Günay, 1988, 32-33). Furthermore, American universities experienced rapid expansion in the years following World War II as a result of the influx of veterans and the subsequent entrance of baby boomers, which led to an exponential increase in enrollment (Thelin, 2004, 210). By the 1950s, after the Second World War, the campuses of many American universities had become mini-cities in size and complexity. Le Corbusier defined the American university as “a world in itself or a temporary paradise” (Coulson et al. 2011, 25).

According to Kortan (1981, 39), Le Corbusier also stressed that the university campus should be composed of functions based on the definition of the urban area in CIAM in the Athens Charter. It follows:

1. Educational activities, consisting mainly of faculty buildings, correspond to “work”,
2. Student residences and professors’ residences correspond to “habitation”,
3. Sports facilities, canteens, and cultural activities correspond to “leisure”,
4. Circulation system, consisting of pedestrian paths, squares, and roads, corresponds to “traffic”.

The university campus functions as a small-scale city with all the requirements of a city because of this definition and categories. In addition, Team 10 introduced innovative concepts in urban planning and design around the close of the 1950s. These concepts included identification, association, consideration of the particular environment, and promoting communication amongst people from other disciplines. Campus design was therefore approached with these concepts in mind. These innovative concepts, however, were at odds with the CIAM's purely functional methodology (Günay, 1988, 30). For instance, based on Team 10 ideas, they introduced a public open space such as a Street is “... An arena for social expression”.

According to this argument, a specialized environment and communication among people from many professions serve as a modern foundation for the development of a campus that is accessible to all.

Today, the approaches towards campus design have displayed a few varieties. The location and general tendencies of the society shaped these

approaches. They have found an opportunity to design an urban settlement with all the main functions of a modern city. On the other hand, the campuses also serve as social and cultural centers for the cities in which are located (Gumprecht, 2014, 86). A campus is like a small city and needs the same spatial arrangements as a city (Sıramkaya, & Çınar, 2012, 62, Gumprecht, 2014, 86).

Integration of contemporary societies' demands and modern ideas of campus design provides landscape architects with the keywords for campus design. The main functions of a contemporary campus can be grouped as follows: education, accommodation, sport, culture, leisure, and circulation.

Currently, the campus serves as a verdant island with imposing buildings that serve as the backdrop for a wide variety of social and cultural events. Concert halls, museums, sports arenas, a lush natural setting, and an active event schedule are all features of the campuses.

Campuses serve as a center of activity for the town's greater populace in addition to students and personnel. As a result, the campus serves as both a public learning area and an educational setting (Gumprecht, 2007, 72). In the last century, universities migrated out of the city in search of a better future in the natural landscape of the campus (Hebbert, 2018, 894).

University campuses are urban spaces with many functions beyond education and training. While campuses are accepted as public open spaces due to the diversity of users and different usage times and purposes, campuses require specific spatial designs to meet the diverse needs of their occupants.

To accommodate different functions with different space designs, campus areas include open, semi-open, and closed areas. These spaces are divided into two groups as follows: spaces used for education, administration, and basic needs, and recreational spaces (Sıramkaya, & Çınar, 2012, 65).

In addition to education and training, university campuses include social activities, cultural activities, sports activities, recreational areas, catering areas, and accommodation areas. On the other hand, like an urban area various subjects such as climate change, carbon reduction, sustainability, energy efficiency, accessibility, and walkability are other significant factors in campus design (Hebbert, 2018, 892).

Therefore, one of the most important criteria for the design of the campus, which is classified as a small urban area, is accessibility based on Universal Design principles.

The concept of Universal Design in universities is a campus-wide process involving all stakeholders and encompassing teaching, assessment, services, the digital environment, and physical spaces that are accessible to all, so implementing Universal Design requires rethinking and influencing all aspects of the system (Evans et al. 2017; Soyupak, 2021, 87; Zorec, et al. 2022, 1149).

Education is a constitutional right and should be available to all at the same distance, and educational environments as a second lecturer should be responsible for supporting equality and present inclusive characteristics (Soyupak, 2021, 87).

According to John & Robie (2011, 181), there are many issues to address while meeting the requirements of Universal Design principles in

educational institutions and campuses. Some of these problems are as follows:

- Status of the existing facility: architectural barriers that people disabilities face in the institution area,
- Balancing capital needs: the ways to meet the accessibility intent of the law without making physical changes to facilities, programs, or staff
- Transition planning: Applying the best developed implementation strategy that balances the capital funding needs of accessibility compliance and general facility improvement.

4. Conclusion and Suggestions

Campus areas of universities that have been spatially organized function as urban areas that provide people with a variety of opportunities. Campuses mandate that all functional areas be urban places on the one hand. They also require a built environment, identification, association, and communication among individuals with diverse backgrounds and viewpoints. Education, housing, transportation, athletics, culture, social events, and leisure are all examples of contemporary campus functions that should be available to all university students.

Campus areas, like public urban spaces, are places for different groups of people, their purposes, and their temporary or permanent needs. Campuses, to meet the diverse needs of their occupants, require specific spatial designs. Designing campus areas for people of all abilities creates open spaces for those who may have previously been restricted in their interaction with the community due to disability or other physical hardship.

The Universal Design approach is an extended field that meets these needs. Applying Universal Design principles to the design of public open spaces, such as university campuses, has several advantages. Universal Design and its inclusive principles offer some benefits:

- 1- Multi-generational benefits that can maximize the use of campus facilities and encourage positive social interaction between generations.
- 2- The campus with a distinctive character that assistance in promoting positive interaction with the community.

The campus is perceived as a public open space with spatial characteristics. However, the campus requires a unique new approach to education. The benefits of applying Universal Design principles are not limited to the design of public open spaces such as campuses. Universal Design principles convey great potential for utilization in academic activities, lectures, classroom discussions, group work, handouts, web-based instruction, and fieldwork.

The principles of Universal Design in academic activities have changed to inform the design of educational facilities such as computer labs, Universal Design for Learning Guidelines, and curriculum and pedagogy development.

Combining the different methods of Universal Design principles to access highly effective solutions can cost-effectively serve a wide variety of people, for instance, by using new designing methods in architectural and urban open spaces, personal assistance, procedures, equipment, and medical interventions.

Public education and involvement are needed to raise public awareness of Universal Design. Preparing a Universal Design action plan will raise user

awareness and promote the rapid adoption of ideas and principles. The education of design professionals and academics is a priority. Successful solutions require compatibility with many good practices and preparing a comprehensive action plan. Applying the principles of Universal Design on campus at the level of design concepts can include and respond to the specific needs of groups of individuals and create harmonious solutions that are equally beneficial and appropriate for all. To create a liveable campus area based on the Universal Design principles that can serve the university population regardless of their abilities, it is first necessary to identify the open space problems and then prepare the solution to be offered.

The campus problems could be divided into spatial, circulating, training, and gathering areas. Some solutions are presented based on the Universal Design principles here as follows:

1- Spatial

- Establish design principles for guide path on university campuses,
- Preparing an accessible campus map based on the Universal Design principles,
- Develop accessibility guides with detailed information,
- Preparation of campus accessibility map in various forms online, signs, or print for new students.
- Provide accessible sidewalks, paths, public transport, and connections to create a continuous active transport network based on the principle of Universal Design.

- The campus map should be prepared as simple and informative, clearly showing main roads and buildings, accessible entry points, entrances, car parks, lifts, ramps, handrails, and toilets.
- Creating various choices in the public open areas,
- Direction changes in the campus path should follow the general flow of campus main traffic but keep minimum counts.
- Consider the width of the path and the possible need for a hierarchy of paths,
- Avoid obstructions,
- Creation free spaces on either side of the way,
- Provide contrast, preferably both tactile and color for information,
- Tactile indicators must be positioned at a suitable height,
- Choosing a suitable location for hazard and warning signs,
- Provide information based on a variety of modes of information delivery, for example, alarms and warnings should be both visual and audible,
- Preparation of accessibility guides containing detailed information,
- Utilizing accessibility principles in designing sidewalks, trails, public transit, and connections to create a continuous active transportation network based on the Universal Design principles in campuses.

2- Education

- All aspects of university life should be fully accessible and inclusive for all, both technologically and physically.

- To develop the staff's responsibility for technologies that include students with disabilities.

3- Classrooms and assembly

- Designing classrooms with accessible seating for all groups regardless of their abilities,
- Installation of sensor-activated automatic doors in student residences to assist disabled students,
- Ensure aisles are wide enough for wheelchairs by providing benchmarks,
- Encourage the vertical display of products in cafeteria units rather than the typical horizontal display.
- Multi-height counters at food outlets,
- Accessible seating distributed,
- Use of audio and visual scoreboards for information,
- Tables and seating with accessible for knee and toe gap,
- Family toilets for those requiring assistance,
- Private and accessible public showers and lockers.

4- Circulation:

- Provision of convenient, accessible, safe, and sustainable mixed transport options for the whole campus,
- Active transport includes walking, cycling, and transport by other human-powered vehicles such as wheelchairs and scooters,
- Provision of technical assistance for facilities such as flexible parking, structures, and active transport facilities such as sidewalks, byways, trails, and connections,

- Interconnected roads, sidewalks, and trails,
- Street has wide sidewalks, street trees, and decorative street lighting,
- Sidewalks along streets,
- Buffered sidewalks and clear crosswalks along streets, in car parks, and between buildings,
- Bicycle facilities, such as cycle racks and lockers,
- Improving safety and mobility for pedestrians and cyclists through traffic calming, footpaths, cycle lanes, and improved road connections.
- Extensive sidewalk and trail network,
- Bus shelters with sidewalk access.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

The 1st author Mahshid MIKAEILI contributed to the article. There is no conflict of interest.

References

- Accessibility Report On University Campuses in Ankara (2020). Association For Persons With Disabilities and Youth, Access Address (2.06.2024): <https://etkiniz.eu/wp-content/uploads/2020/07/Accessibility-report-of-university-campuses-in-Ankara-disabled-rights.pdf>
- Barnes, C. (2011). Understanding disability and the importance of design for all. *Journal of Accessibility and Design for All: JACCES*, 1(1), 55–80
- Beck, T., Diaz del Castillo, P., Fovet, F., Heather Mole, H., & Noga, B., (2014). Practice Brief Applying Universal Design to Disability Service Provision: Outcome Analysis of a Universal Design (UD) Audit, *Journal of Postsecondary Education and Disability*, 27(2), 209-222.
- Burgstahler, Sh., (2021). How to Apply Universal Design to Any Product or Environment, *Universal Design: Process, Principles, and Applications*. 1-6, Access Address (2.06.2024): https://www.washington.edu/doit/sites/default/files/atoms/files/Universal_Design_04_12_21.pdf
- Cambridge Dictionary (2024), Access Address (2.06.2024): <https://dictionary.cambridge.org/dictionary/english/campus>
- CEUD, (The Centre for Excellence in Universal Design), (2024), Access Address (2.06.2024): <https://universaldesign.ie/about-universal-design/history-of-universal-design>
- Coulson, J., Roberts, P., & Taylor, I. (2015). *University Planning and Architecture*. The Search for Perfection. Routledge, New York.
- Chester County Planning Commission (2024). Access Address (2.06.2024): <https://www.chescoplanning.org/MuniCorner/eTools/18-UniversalPublic.cfm>
- DOIT, (Disabilities, Opportunities, Internetworking, and Technology), (2024). Access Address (2.06.2024): <https://www.washington.edu/doit/universal-design-process-principles-and->

[applications#:~:text=Universal%20design%20principles%20can%20be,resources%2C%20and%20methods%20of%20instruction.](#)

- Erişilebilirlik Kılavuzu, (2020). *Aile, Çalışma ve Sosyal Hizmetler Bakanlığı*. Ankara: Uzman Matbaacılık.
- Evans, N. J., Broido, E. M., Brown, K. R., & Wilke, A. K., (2017). *Disability in Higher Education: A Social Justice Approach*. San Francisco: Jossey-Bass, An Imprint of Wiley.
- Evcil, A.N., (2014). *Herkes İçin Tasarım: Evrensel Tasarım*. Boğaziçi Yayınları. İstanbul.
- Goldsmith, S., (2000). *Universal Design a Manual of Practical Guidance for Architects*. Reed Educational and Professional Publishing.
- Gumprecht, B., (2007). The Campus As A Public Space in The American College Town. *Elsevier, Journal of Historical Geography*, 33, 72-103.
- Günay, B., (1988) History of CIAM and Team 10. *METU Journal of Faculty of Architecture*, 8 (1), 23-44.
- Hanson, J., (2004). The Inclusive City: Delivering a More Accessible Urban Environment Through Inclusive Design. *Conference Paper, International Construction Conference Responding to Change: York, 7-8 September*.
- Hebbert, M., (2018). The Campus And The City: A Design Revolution Explained. *Routledg, Journal of Urban Design*, 23(6), 883-897.
- Petronis J.P. & Robie, R.W. (2011). A Capital Planning Approach to Ada Implementation in Public Educational Institutions. Preiser, W. F. E. (Ed.). *Universal Design Handbook*. Chapter 18, (s.181-190). ISBN: 978-0-07-162922-5.
- Kömürlü, E., (2019). Establishment of Initial Universities in Turkey until 1960's, *Journal of University Research*, 2(1), 35-42.
- Kortan, Enis (1981) *Çağdaş Üniversite Kampusları Tasarımı*. Orta Doğu Teknik Üniversitesi, Ankara.
- Kuyrukçu, Z. & Berber, A., (2023). Ulaşımında Erişilebilirlik: KTO Karatay Üniversitesi Merkez Kampüsü Örneği, *European Journal of Science and Technology*, 52,1-18.

- Kuyrukçu, Z., & Alkan, A., (2021). A Methodological Approach to Inner-city Location Selection of Universities, *Journal of Higher Education*, 11(3), 649-670.
- Lid, I. M. (2014). Universal Design and disability: An interdisciplinary perspective. *Disability and Rehabilitation*, 36(16), 1344-1349.
- Mace, R. L., Hardie, G. J., & Place, J. P. (1991). *Accessible Environments Toward Universal Design*. The Center for Universal Design, North Carolina State University.
- Manley, S., (2000). Creating An Accessible Public Realm. Preiser, W. F. E. (Ed.). *Universal Design Handbook*. Chapter 58, (s. 175-180), MacGraw Hill, New York, USA.
- McCormick, P., J. & Cassidy, F. P. (1953). *History of Education, A Survey of the Development of Educational Theory and Practice in Ancient, Medieval, and Modern Times*. The Catholic Education Press, Washington D.C.
- Njungea, E. K., & Asilsoyb, B., (2020). A Study about Public Participation in the Universal Design of Public Spaces. *Journal of Faculty of Architecture*, 2 (2), 37-47.
- Izzo, M.V., Rissing, Andersen, S.W.C, Nasar, J.L. & Lissner, S.L., (2011). Universal Design for Learning in The College Classroom. Preiser, W. F. E. (Ed.). *Universal Design Handbook*. Chapter 39, (s.391-400). ISBN: 978-0-07-162922-5.
- Sandoval, J. M. J. (2018). Accessibility, Heritage, and Project. Re-Architectures For Everyone. *Millenium*, 2 (7), 103-111.
- Sıramkaya, S.,B., & Çınar, K. (2012). Üniversite Kampüs Yerleşkelerinde Ortak Kullanım Mekânlarının İncelenmesi: Selçuk Üniversitesi Aleaddin Keykubat Kampüsü Örneği. *Selçuk Üniversitesi Mühendislik ve Mimarlık Fakültesi dergisi*, 27(3), 61-72.
- Story, M. F. (2011). The Principles of Universal Design. Preiser, W. F. E. (Ed.). *Universal Design Handbook*. Chapter 4, (s. 400-412).
- Story, M. F. (1998). Maximizing Usability: The Principles of Universal Design, *Assistive Technology*, 10 (1), 4-12.
- Soyupak, İ., (2021). Analysis of the Educational Spaces and Universal Design: The Case Study of Duzce University Faculty of Art, Design

- and Architecture Campus, *Journal of Accessibility and Design for All*, 11, (1), 86-115.
- Tekeli, İ., (2003). Dünyada ve Türkiye’de Üniversite Üzerinde Konuşmanın Değişik Yolları. *Toplum ve Bilim Dergisi*, 97, 123-143.
- Thelin, J. R., (2004). *A History Of American Higher Education*. Baltimore: Johns Hopkins University Press
- Turner, P. V. (1984). *Campus: An American Planning Tradition*. The MIT Press, Cambridge, Massachusetts.
- Wall, J., (2023). Creating Interaction Effects Between Parallel Campus and Online Courses: Course Design Proposal For Diversified Student Group. *9th Swedish Engineering Education Development Conference*, Mälardalen University, Västerås, Sweden, November 22-23.
- Yaylalı Yıldız, Çil, E. & Can, I., (2015). Kampüs Morfolojisi: Bir Yaşam Alanı Olarak Üniversite Yerleşkelerinin Analizi. *Türkiye Kentsel Morfoloji Araştırma Ağı 1. Sempozyumu*, Ekim 2015 Mersin, Türkiye. 368-386. Access Address (2.06.2024): <https://tnum.org.tr/index.php/tnum/issue/view/1>
- Zorec, K., Desmond, D., Boland, T., McNicholl, O’Connor, A., Gillian, S., & Gallagher, P., (2022). A Whole-campus Approach to Technology and Inclusion of Students with Disabilities in Higher Education in Ireland. *Disability & Society*, 39(5), 1147-1172.

Assist. Prof. Dr. Mahshid MİKAEİLİ

E-mail: mahshid.mikaeili@btu.edu.tr

Educational Status: PhD. in Landscape Architecture

License: Architecture

Degree: Asst. Prof. Dr.

Doctorate: Ankara University Landscape Architecture

Professional experiences:

2018-2022, Asst. Prof. Dr. in Atatürk University Faculty of Architecture and Design, Department of Architecture, Erzurum, Türkiye

From 2022 Asst. Prof. Dr. in Bursa Technical University, Faculty of Forestry, Landscape Architecture Department, Bursa, Türkiye

Outdoor Recreation Analysis on University Campuses; KTU Coastal Facilities Example

Prof. Dr. Nilgün GÜNEROĞLU ¹ 

¹Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, Kanuni Campus, Trabzon/Türkiye.

ORCID: 0000-0002-0825-0405

E-mail: nayhan@ktu.edu.tr

Assoc. Prof. Müberra PULATKAN ² 

²Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, Kanuni Campus, Trabzon/Türkiye

ORCID: 0000-0002-6619-9804

E-mail: muberra@ktu.edu.tr

Citation: Güneroğlu N. & Pulatkan M. (2024). Outdoor Recreation Analysis on University Campuses; KTU Coastal Facilities Example. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:11, 250-268. ISBN: 978-625-367-855-5. Iksad Publications.

DOI: <https://doi.org/10.5281/zenodo.13874970>

1. Introduction

Cities are settlements that play an important role in the development process of humanity, where population density is high and economic, social, cultural and administrative activities are intensively carried out. Throughout history, cities have been the cradle of civilisations and have assumed important duties as the centre of trade, science, art and administration (Yüksel, & Yeşil, 2017; Kahveci, & Güneroğlu, 2022). In the modern world, cities reflect the dynamic structure and diversity of societies. Roads, bridges, public transport systems, health services, educational institutions and other public services are more widespread and developed in cities (Aytaç, 2013). These infrastructure and services improve the quality of life of people living in cities and facilitate their daily lives. Various social and cultural activities such as theatres, cinemas, museums, concert halls and sports events are an indispensable part of urban life. These activities increase the cultural richness of cities and revitalise social life. Education and research is another important characteristic of cities (Eminağaoğlu, & Muhacir, 2018). Educational institutions, research centres and universities are generally located in cities.

Universities are not only centres of education and research, but also important institutions that make great contributions to their cities in various aspects such as economic, social, cultural and intellectual structure (Wang, et al., 2021). Students and academic staff stimulate commercial activities in the city with their accommodation, food and beverage, clothing, entertainment and other needs. Universities enrich the social fabric of cities by hosting many activities such as conferences,

seminars, exhibitions, theatre plays, concerts and sports events. From an intellectual point of view, universities help cities to become centres of knowledge and innovation. In addition, universities improve the quality of urban life. Especially the large green areas in the campuses of universities make significant contributions to making cities more sustainable, livable and healthy places (Bekar & Güneroğlu, 2018; Ercan Oğuztürk, & Pulatkan, 2022). Campus green areas meet the needs of not only students, academic and administrative staff, but also the public living in urban areas for recreational activities such as rest and sports (Erduran et al., 2010; Suárez, et al., 2020).

Recreation is the whole of activities that enable individuals to be physically and mentally renewed through activities such as resting, having fun, doing sports, participating in social and cultural activities in their free time. In addition, recreation helps people to get rid of their daily stresses, lead a healthy life and strengthen their social ties. Recreation types are very diverse depending on people's interests, needs and environmental conditions (Table 1). These types of recreation offer different experiences according to the interests and needs of individuals and improve the quality of life.

Recreational activities may vary according to geography and culture, time and space, urban perception, urban life and architectural structure, technology, economy and social approaches. In general, outdoor recreational activities can be natural-based outdoor recreation such as hiking, camping, fishing, climbing, as well as water and land sports such as diving, surfing, tennis, football. It can also include cultural and artistic activities such as listening to music, painting, visiting museums. There

are also types of recreation that include educational, social, digital and electronic activities (Metin et al., 2017). Coasts, which are suitable areas for nature-based outdoor recreation, provide opportunities for many activities since they are the junction of water and land (Table 2).

Table 1. Types of recreation (Giritlioğlu et al., 2017)

Recreation Types	Classification of Recreation Types
Types of Recreation According to the Way of Participation in Activities	Active Recreation
	Passive Recreation
Recreation Types from Spatial Perspective	Open Space Recreation
	Indoor Recreation
Recreation Types by Number of Participants	Individual Recreation
	Group Recreation
Recreation types in functional terms	Commercial recreation
	Aesthetic Recreation
	Social Recreation
	Health Recreation
	Physical Recreation
	Artistic Recreation
	Cultural Recreation
Recreation Types According to Local Classification	Touristic Recreation
	Urban Recreation
	Rural Recreation

Considering the outdoor recreational diversity provided by the coasts, it is seen that the open green areas of university campuses that interact with the coast will provide various advantages for students, academic staff and the university community (Lazarow, 2007). Students' physical and mental health is positively affected by taking sea air and spending time on the beach by walking between classes or in their free time. Opportunities for research and education in the department of marine sciences increase. Field studies on coastal ecosystems and marine life provide students with practical experience. For both students and academics, the natural environment and the seascape are a source of inspiration for creative work and projects. Campus green spaces with

coastal features often encourage interaction with tourists, locals, students and academic staff, which enhances cultural diversity. The university's social events and festivals become more attractive in a seaside environment, increasing participation in events. In summary, it offers a unique educational and living experience for students and staff by combining natural beauty, sports and recreational facilities, academic and research opportunities.

Table 2. Coastal recreational activities

ACTIVITIES			
WATER		COAST	
Swimming		Sunbathing	Children's games
Diving	Free diving	Beach volleyball	Cruising
	Scuba diving	Beach soccer	Cycling
	Boat diving	Beach tennis	Badminton
Surfing	Classic surfing	Throwing stones into the sea	Wrestling
	Windsurfing	Walking	Sand castle making
	Kite surfing	Skateboard	Fitness
Skiing	Wakeboard	Rollerblading	Sitting-Rest
	Kneeboarding	Running	Reading a book
	Water skiing	Horse riding	Listening to music
Fishing	Sea fishing	Coastal fishing	Dancing
Rafting		Yoga and Pilates	Food and drink
Jet Ski		Sea shell collection	Scooter
Sail		Picnic	
Canoe		Camp	
Jumping		Wildlife observation	
Water cannon		Taking a photo	
Shovel		Kite flying	
Stand up paddle		Jumping from rock to rock	
Sup yoga-pilates		Frisbee	
Dragon Bot			
Sea bicycle			

For these reasons, in this study, it is aimed to analyse the recreational activities carried out by both children, students, staff and citizens depending on the opportunities offered by open green areas other than the existing activity areas such as swimming pool, basketball and tennis

courts in Karadeniz Technical University Coastal Facilities. The possibilities of the area and the diversity of space utilisation were determined and design proposals were presented.

2. Material and Method

Karadeniz Technical University is located in Trabzon province in the Black Sea region of Turkey. Kanuni campus, the main campus of KTU, is located in Ortahisar district of Trabzon (Figure 1). Founded in 1955, Karadeniz Technical University is one of the first universities established in Turkey other than Istanbul and Ankara provinces (Güneroğlu, et al., 2018). The campus, which has an important green area size for the city of Trabzon, contributes aesthetically, functionally and ecologically to both students and citizens (Güneroğlu & Pektaş, 2022; Ercan Oğuztürk, & Pulatkan, 2023). The university also has campuses in the districts of Trabzon province such as Maçka, Sürmene and Arsin. KTU Coastal Facilities are also located outside the main campus on the Black Sea coast. Since the Coastal Facilities are located on the Black Sea coast, it has a very rich environment in terms of natural beauties such as sea view, open green areas and wooded areas. When the immediate surroundings of the area, which has a coast to the Black Sea in the north, are examined, there are Mehmet Akif Ersoy indoor swimming pool and Mehmet Ali Yılmaz Sports Facilities in the east, 100th Yıl park and 100th Yıl fishing shelters in the west. In the south, Trabzon Airport is located and Ahmet Suat Özyazıcı Stadium is located at the entrance of the area (Güneroğlu et al., 2024).



Figure 1. Study area (URL-1, URL-2, Google Earth)

The study consists of research, review, evaluation and recommendations sections (Figure 2). In addition to the literature information obtained, observations were made in field studies. As a result of the observations carried out in different time periods during the four seasons, weekdays and weekends, the zones used by both students and staff in the area and the activities they perform in these zones were determined. By evaluating these activities, design examples suitable for the regions were created using Autocad, Archicad and Lumion programs.

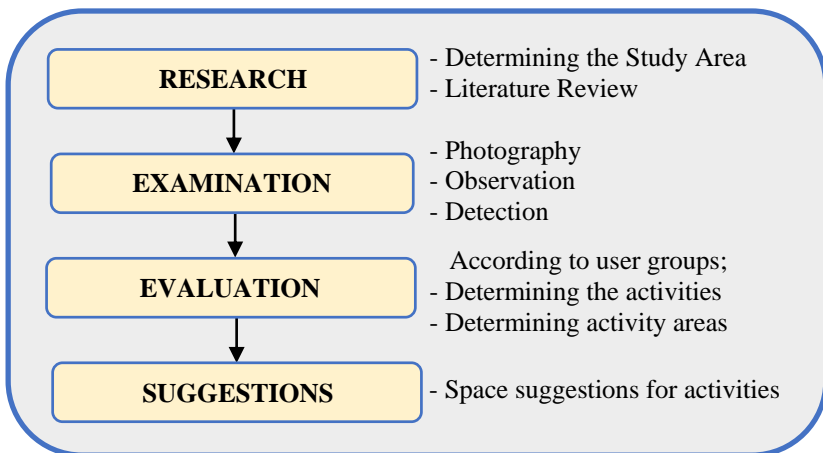


Figure 2. Study flow diagram

3. Findings

As a result of the examinations and observations made during the field studies, the information about the area was analysed under three headings and the findings were evaluated.

3.1. Built environment analysis

KTU Coastal Facilities are located 7 km from the city centre. Access to the facility is provided by minibuses, private vehicles and on foot. Within the area, there is a restaurant that allows various events such as food and beverage, symposiums, congresses, weddings and engagements to be organised. There are two different car parks next to the restaurant entrance and sports fields and a pier extending from the restaurant exit to the beach (Figure 3).



Figure 3. Area circulation and photographs (Source: Author)

The olympic pool in the Coastal Facilities is not in use. In addition to these, there are 3 outdoor and 1 indoor tennis courts, 1 basketball and 1 volleyball court. There is also a children's playground for children aged 3-6 years. Three buildings in the Facilities serve as guesthouses and one building is used as a masjid. Although the area is a social facility, education and training is carried out in the Faculty of Marine Sciences

and Institute of Marine Sciences and Technology buildings (Figure 4). For these reasons, academic staff and students constitute the majority of the users of the area. It has been observed that local people are included in the users of the area during weekends and holidays. Especially in the summer months, both day and night use of the area is quite high.



Figure 4. Built environment in the area (Source: Author)

3.2. Green area analysis

In the study area, the green texture is used quite intensively compared to the structural elements. In addition to the grass areas, a mass effect was created in the planting design created with the combination of shrubs and trees (Figure 5). Species diversity is remarkable in the plants used in terms of size, form, leaf and flower aesthetics (Table 3). In the study area, 50 plant taxa including 24 trees, 15 shrubs, 10 ground cover and 1 climber were identified.



Figure 5. Green area and photographs (Source: Author)

Table 3. Plant taxa by form

Tree	Shrub
<i>Platanus orientalis</i> L.	<i>Juniperus horizontalis</i> Moench.
<i>Aesculus hippocastanum</i> L.	<i>Juniperus chinensis</i> L.
<i>Picea orientalis</i> L.	<i>Hydrangea macrophylla</i> L.
<i>Pinus pinea</i> L.	<i>Euonymus japonica</i> Thunb. "Aurea"
<i>Magnolia grandiflora</i> L.	<i>Spirea x vanhouttei</i> Briot
<i>Magnolia</i> × <i>soulangeana</i> Soul.	<i>Yucca filamentosa</i> L.
<i>Populus nigra</i> L.	<i>Thuja occidentalis</i> L.
<i>Ficus carica</i> L.	<i>Pittosporum tobira</i> Thunb.
<i>Cedrus libani</i> A. Rich.	<i>Abelia grandifolia</i> (Rovelli ex André) Rehder
<i>Robinia pseudoacacia</i> L.	<i>Cotoneaster frigidus</i> Wall. ex Lindl.
<i>Acer negundo</i> L.	<i>Cotoneaster microphyllus</i> Wall. ex Lindl.
<i>Hibiscus syriacus</i> L.	<i>Laurus nobilis</i> L.
<i>Prunus avium</i> L.	<i>Rosa</i> sp.
<i>Tamarix tetrandra</i> Pall.	<i>Agave americana</i> L.
<i>Morus alba</i> L.	<i>Spartium junceum</i> L.
<i>Eucalyptus globulus</i> Labill.	<i>Camellia japonica</i> L.
<i>Phyllostachys</i> sp.	Ground cover
<i>Betula pendula</i> Roth	<i>Trifolium repens</i> L.
<i>Nerium oleander</i> L.	<i>Trifolium pratense</i> L.
<i>Prunus domestica</i> L.	<i>Carpobrotus edulis</i> L.
<i>Trachycarpus fortunei</i> H. Wendl	<i>Drosanthemum floribundum</i> Haw.
<i>Phoenix canariensis</i> Hort.	<i>Bellis perennis</i> L.
<i>Washingtonia robusta</i> H. Wendl	<i>Ranunculus</i> sp.
Climber	<i>Ornithogalum</i> sp.
<i>Hedera helix</i> L.	<i>Muscari</i> sp.
	<i>Gazania</i> sp.
	<i>Petunia</i> sp.

3.3. Activity-space analysis

When the study area was analysed in terms of event venues, it was evaluated in three sections (Figure 6). The first section is the restaurant and its immediate surroundings. In this area, in addition to eating and drinking activities, it was determined that children ride roller skates, skateboards and bicycles. The second area is the green area close to the guesthouses behind the restaurant. In this area, picnic tables are used for sitting and resting. You can also walk in the circulation in this area. Fruit trees are dense in this area.

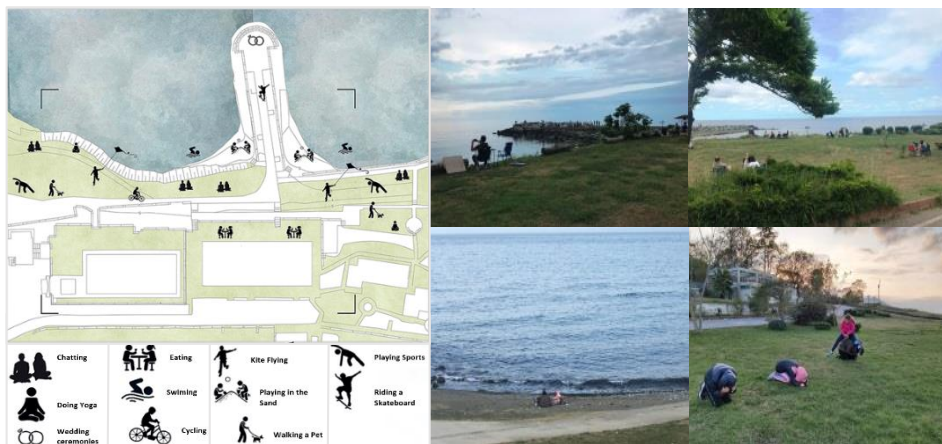


Figure 6. Activities and spaces (Source: Author)

It was determined that the users took fruit from the fruit trees. The third and last area is the coast. This area has both sand and gravel coast. There is also a large grass area in the area behind the coast. Tree groups in certain parts of the area are the areas preferred by users for sitting and picnicking. However, there is no suitable equipment for sitting and sunbathing on the coast. For this reason, users bring their chairs and tables to the area and watch the view. Throwing stones into the sea on the pebble beach, walking on the large rocks on the pier and playing in the sand are the most preferred activities of the children. In addition to these, activities such as collecting seashells on the coast and observing different animals such as crabs and birds are rarely done. Since the sea water is dirty, swimming and sunbathing activities are not carried out in the area. It was determined that children usually put their feet in the water and a few elderly people swim in the sea from time to time. It was observed that fishing is done on the pier as well as diving and spearfishing. The pier and the paths along the coast are used for walking by all users. Since the facility is very close to the airport, aircraft landings can be easily

monitored from the pier. The variety of activities in the area according to user groups is given in Table 4.

Table 4. Activity diversity by user groups

Children	Students	Staff-Citizens
Running	Hiking	Sitting-rest
Cycling	Taking a photo	Hiking
Skateboard	Scenic viewing cruising	Taking a photo
Scooter	Food and drink	Food and drink
Rollerblading	Reading a book	Cruising
Throwing stones into the sea	Sitting-rest	Dancing (wedding-engagement)
Jumping from rock to rock	Listening to music	Swimming
Kite flying		Using a model ship
Children's games		Fishing
Seashell collection		Football, Volleyball
Sea creature watching		Picnic
Flower picking		Listening to music
Playing with water		
Playing with sand		

4. Conclusion and Suggestions

In the study conducted on the example of Karadeniz Technical University Coastal Facilities, the use of open spaces for outdoor recreation was examined. It was determined that the outdoor spaces in the area provide opportunities for different activities. Children are the ones who benefit the most from these opportunities. Students and academic staff mostly use outdoor spaces for relaxing and socialising during breaks. Urbanites, on the other hand, mostly use the area on holiday days to participate in different activities with their children. According to the findings obtained as a result of the examination, alternative design proposals suitable for the users were produced. In these proposals, solutions to space problems are produced and spaces suitable for favourable possibilities are designed.

There are no swimming and water contact activities in the coastal area. For these reasons, the safety of children should be ensured by building artificial pools on the coast. It was observed that children use natural elements as play elements in the facility. For this reason, a children's playground where natural materials and water are effective was considered. Dry pools were also designed in this playground (Figure 7). Seating units and swings were designed at certain intervals along the walkway. In the vicinity of the children's playground, seating units have been created for families to watch and relax while their children play.



Figure 7. Playgrounds and seating units (Source: Author)

Sunbathing and reading areas for students and other users were created on the grass in green areas. At the entrance, which is the intensive use area of the students, ornamental pools were designed for both aesthetic and cooling purposes (Figure 8). The identified plant species are suitable for the area. For this reason, a new planting plan has not been made. In the existing planting plan, only all plants were considered along the walkways. *Betula pendula* species, which is one of the existing species in

the area, was preferred. The grass ground effect was emphasised with white trunked birch trees. Because the existing grass texture in the area is quite healthy. For this reason, grass areas have been preserved. Priority has been given to places where contact with grass can be achieved.



Figure 8. Entrance and grass areas (Source: Author)

Along the coast in front of the restaurant, fixed as well as movable fixtures were designed. Since the area is used intensively in summer, shade elements and trees are used in the seating areas. Seating units provide socialising as well as watching the sea view. In addition, rocks were used for seating and play (Figure 9).



Figure 9. Seating and shade elements (Source: Author)

In conclusion; various strategies and measures should be implemented to prevent marine pollution, which is an important problem of the area and restricts the effective use of the sea by people. Efforts such as waste management, water treatment, voluntary clean-up campaigns and

ecosystem restoration help prevent marine pollution. These approaches contribute to both environmental protection and the long-term well-being of society.

User satisfaction is directly related to the quality and facilities of the area. Creating aesthetic, functional, healthy, social, sustainable and economically valuable areas in accordance with the needs and wishes of the users increases the satisfaction of the users and the preferability of the area. For these reasons, the use of the area will increase with the increase in the quality of green areas and the variety of equipment offered in the proposals. For future application projects in the area, surveys should be conducted with the users to determine their opinions about the area. Especially the expectations of the students should be determined in order to ensure their participation in the activities that can be carried out in the area.

Acknowledgements and Information Note

The authors thank Dilara Dinç for her contribution.

The book section complies with national and international research and publication ethics.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the book section. There is no conflict of interest.

References

- Aytaç, Ö. (2013). Kent mekânları ve kimlik/farklılık sorunu. *İdealkent*, 4(9), 138-169.
- Bekar, M., & Güneroğlu, M. (2018). Açık Yeşil Alanların Bitkilendirme Tasarım Kriterleri Açısından Değerlendirilmesi, KTÜ Kanuni Kampüsü Örneği. *Social Sciences Studies Journal*, 4(16), 1113-1123.
- Eminağaoğlu, Z., & Muhacir, E. S. A. (2018). Artvin Çoruh Üniversitesi kampüs alanlarının planlama ve tasarım ilkeleri kapsamında değerlendirilmesi. *Artium*, 6(1), 38-43.
- Ercan Oğuztürk, G., & Pulatkan, M. (2022). Üniversite Yerleşkelerinin Bütüncül Planlama Yaklaşımıyla Değerlendirilmesinin Bibliyometrik Analiz ile irdelenmesi. *Düzce Üniversitesi Orman Fakültesi Ormancılık Dergisi*, 18(2), 1-13.
- Ercan Oğuztürk, G., & Pulatkan, M. (2023). Interaction of urban and university campuses; KTU Kanuni campus example. *Architectural Sciences and Urban/Environmental Studies-I*, 22-43.
- Erduran, F., Özel Cengiz, A. E. & Kabaş, S. (2010). Determination of recreational demands of the staff and students on central campuses of Çanakkale Onsekiz Mart University. *Scientific Research and Essays*, 5(17), 2424-2431
- Giritlioğlu, İ., Olcay, A., Gündoğan, H. R., & Alkan, B. N. (2017). Belek, Side Ve Alanya Bölgelerinde Faaliyet Gösteren Otel İşletmelerinin Müşterilerine Sunduğu Rekreasyon Etkinliklerinin İçerik Analizine Yönelik Bir Araştırma. *Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 9(22), 235-250.
- Güneroğlu, N., Bekar, M., Aktürk, E., & Dihkan, A. (2018). Kentsel yeşil alan sistemlerinde hobi bahçeleri; Karadeniz Teknik Üniversitesi Kanuni kampüs örneği. *International Journal Of Social And Humanities Sciences Research*, 5(25), 2253-2263.
- Güneroğlu, N., & Pektaş, S. (2022). Yenilebilir meyve özelliği olan odunsu bitki taksonlarının peyzaj mimarlığındaki önemi: KTÜ Kanuni Kampüsü örneği. *Turkish Journal of Forestry*, 23(1), 79-89.

- Güneroğlu, N., Gülpınar Sekban, D. Ü., & Genç, S., (2024). Coastal Recreation; The Case of Karadeniz Technical University Social Facilities, 10th International Black Sea Coastline Countries Scientific Research Conference, 7-9 April 2024, Samsun, Türkiye, 538-545.
- Kahveci, H., & Güneroğlu, N. (2022). Plants As Item of Identity in Cities, Çetinkale Demirkan, G., & Güngör, S. (Ed.). *Research & Reviews in Architecture, Planning and Design*, Gece Kitaplığı, Bölüm: 3. (s. 33-50). ISBN: 978-625-430-561-0. Ankara.
- Lazarow, N. (2007). The value of coastal recreational resources: A case study approach to examine the value of recreational surfing to specific locales, *Journal of Coastal Research*, 50, 50(50):12-20
- Metin, T. C., Sariçam, Katırcı, H., Yüce, A., Sariçam, S., & Çabuk, A. (2017). Rekreasyon Aktivite Türleri ve Rekreasyon Aktivitelerinin Kategorileştirilmesine İlişkin Bir Envanter Çalışması. *The Journal of Academic Social Science Studies*, 6(59), 547-561.
- Suárez, M., Barton, D. N., Cimburova, Z., Rusch, G. M., Gómez-Baggethun, E., & Onaindia, M. (2020). Environmental justice and outdoor recreation opportunities: A spatially explicit assessment in Oslo metropolitan area, Norway. *Environmental Science & Policy*, 108, 133-143.
- URL-1: <https://cografya.sitesi.web.tr/haritalar/bos-haritalar/bos-turkiye-haritasi-5/> (Access date: 17/05/2024)
- URL-2: https://tr.m.wikipedia.org/wiki/Dosya:Trabzon_%28tr%29.svg (Access date: 17/05/2024)
- Wang, R., Jiang, W., & Lu, T. (2021). Landscape characteristics of university campus in relation to aesthetic quality and recreational preference. *Urban Forestry & Urban Greening*, 66, 127389.
- Yüksel, M., & Yeşil, M. (2017). Kent ve yaşam (Ordu kenti örneği). *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 21(2), 679-693.

Prof. Dr. Nilgün GÜNEROĞLU

E-mail:nayhan@ktu.edu.tr

Educational Status

License: Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, 2002.

Degree: Karadeniz Technical University, Graduate School of Natural and Applied Sciences, Department of Landscape Architecture, 2007.

Doctorate: Karadeniz Technical University, Graduate School of Natural and Applied Sciences, Department of Landscape Architecture, 2013.

Professional experiences:

Res. Assist., Karadeniz Technical University, (2005-2012).

Lecturer, Karadeniz Technical University, (2012-2016).

Assist. Prof. Dr., Karadeniz Technical University, (2016-2018).

Assoc. Prof. Dr., Karadeniz Technical University University, (2018-2023).

Prof. Dr., Karadeniz Technical University University, (2023-....).

Assoc. Prof. Dr. Müberra PULATKAN

E-mail:muberra@ktu.edu.tr

Educational Status

License: Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, 1996.

Degree: Karadeniz Technical University, Graduate School of Natural and Applied Sciences, Department of Landscape Architecture, 2001.

Doctorate: Karadeniz Technical University, Graduate School of Natural and Applied Sciences, Department of Landscape Architecture, 2010.

Professional experiences:

Res. Assist., Karadeniz Technical University, (1998-2011).

Assist. Prof. Dr., Karadeniz Technical University, (2011-2019).

Assoc. Prof. Dr., Karadeniz Technical University, (2019-...).

Artificial Intelligence Supported Micro Recreation Area Designs in Atatürk University; Ata Eco- Parklet

Dr. Ali Can KUZULUGİL¹ 

¹Atatürk University, Faculty of Architectural and Design, Department of
Landscape Architecture, Ataturk University Campus, Erzurum/Turkey
ORCID:0000-0003-2288-6749
E-mail: alikuzulugil@atauni.edu.tr

Dr. Başak AYTATLI^{2*} 

²Atatürk University, Faculty of Architectural and Design, Department of
Landscape Architecture, Ataturk University Campus, Erzurum/Turkey
ORCID: 0000-0002-4039-293X
E-mail: bashakayt@gmail.com

Citation: Kuzulugil A & Aytatlı B. (2024). Artificial Intelligence Supported Micro Recreation Area Designs in Atatürk University; Ata Eco- Parklet. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:12, 269-303. ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13883107>

1. Introduction

Cities are of great importance today as complex and dynamic structures where people meet their needs and expectations, socialise and express themselves within a certain order (Vlahov & Galea, 2002; Jiang et al., 2008; Lee-Smith, 2010; Gehl, 2013; Chen et al., 2019; Wei et al., 2022). One of the biggest challenges of modern urbanisation is the lack of public spaces where people can relax and socialise. This situation leads to the lack of areas where city dwellers can be in touch with nature and breathe. The city should include a number of components in order for urban individuals to sustain their daily lives, develop themselves and contribute to society. These components come together to form the physical, social, economic and cultural structure of cities (Berry, 2008; Carmona, 2021). Effective planning and management of each component ensures the sustainability of cities by improving the quality of life for the residents of the city (Pickett et al., 2001; Nordh et al., 2011; Belmeziti et al., 2018; Deng et al., 2020; Irmak & Avcı 2019). Streets and pavements, which constitute the main open spaces and infrastructure elements in the physical environment of the city and connect the spaces to each other, are hard surfaces that cover most of the land area of the city (Costanza, 2001; Marshall, 2004; Jones et al., 2008; Bhuyan & Nayak, 2013), and are spatial components with road networks that are generally open to vehicle and pedestrian traffic, which are determined by their width and structural features, which are an integral part of our daily experiences in urban life, where people can walk around comfortably, shop, participate in activities.

Cities therefore have the opportunity and responsibility to make the most efficient use of valuable street space (Simpson, 2011; Southworth & Ben-

Joseph, 2013; Garau & Pavan, 2018; Middleton, 2018). Sidewalks are indispensable complementary components of streets, regulating pedestrian traffic, enabling people to walk safely and providing ease of access for the disabled groups, as well as increasing the aesthetic value of the city together with street furniture and landscaping, and providing rest and meeting points for residents (Nilufar, 2002; Mascaró, 2012; Cuculić et al., 2012; Karndacharuk et al., 2014; Bertolini, 2020; VanHoose & Bertolini, 2023). Effective and equitable planning and management of urban components is vital for the welfare of urban dwellers and the sustainability of cities. The fact that public spaces, which are the common property of urban individuals, are under pressure from global or individual rents such as heavy traffic, concretisation, ground and building surfaces, and the occupation of public space restricts the use of these streets and pavements (Ehrenfeucht & Loukaitou-Sideris, 2010; Latham & Layton, 2019; Morelli, 2019; Bertolini, 2020). The concept of new urbanism, which rethinks the way urban streets are designed, improves the quality of streetscapes, and rethinks the priorities of public space use in favour of people rather than cars and structural elements, leads the new generation of landscape planners to seek different design approaches (Provenzale, 2017; Zwangsleitner, 2020). For this purpose, the trend of creating spaces that symbolise the desire of individuals to create a healthier, pleasant and lively public space in the city is increasing day by day.

One of these innovative and creative urban interventions with the potential to make city life more livable is parklet design applications, which are created to provide buffer areas between traffic lanes and pavements to improve the pedestrian environment that can help people feel safer and

more comfortable (Waugh, 1947; King, 2012; Lee, 2015; Sickmann, 2016; Mata et al., 2019; Ghandi, 2019; Stevens & Morley, 2024). Parklets are small, temporary spaces created by the reorganisation of parking spaces or pavements in urban areas to expand public use and provide more green space for communities (Littke, 2016; Young, 2018; Herman & Rodgers, 2020) (Figure 1, Figure 2).



Figure 1. “Brackenbury’s Parklet” (Anaoymus 2017).



Figure 2. “South Melbourne Market Parklet” (Anonymus 2021).

Parklets are spaces that have emerged as solutions that enable the transformation of narrow unused spaces into public and recreational spaces within the city and are a way to make large cities more livable for all residents (Koue, 2013; Shokry, 2019; Herman & Rodgers, 2020; Jáuregui, 2023). These micro recreation areas, parklets, which are usually created by converting one or a few car parking spaces, are miniature parks that not only transform car parking areas into public spaces, but also improve urban aesthetics and environmental quality in terms of urban landscape design, act as a buffer on streets with heavy traffic, and make important contributions to cities (Birdsall, 2013; Jarman & Stratford, 2023; Stevens & Morley, 2024).

Furthermore, parklets are public seating platforms for social interaction and strengthening community ties, where people can gather, relax, chat and organise various activities. The symbolic change from parkland to public space and the tactical urbanity inspiration of the concept are two important components of the symbolic value of parklets (Littke, 2016; Stevens et al., 2024)

Parklets, also known as street seats or curbside seating, are the product of partnerships between the city and local businesses, residents or neighbourhood associations, stimulating the local economy by increasing customer traffic to surrounding businesses and increasing interest in cafes, restaurants and shops (Sohrabi & Sajadzadeh, 2023; Jarman & Stratford, 2024) (Figure 3).

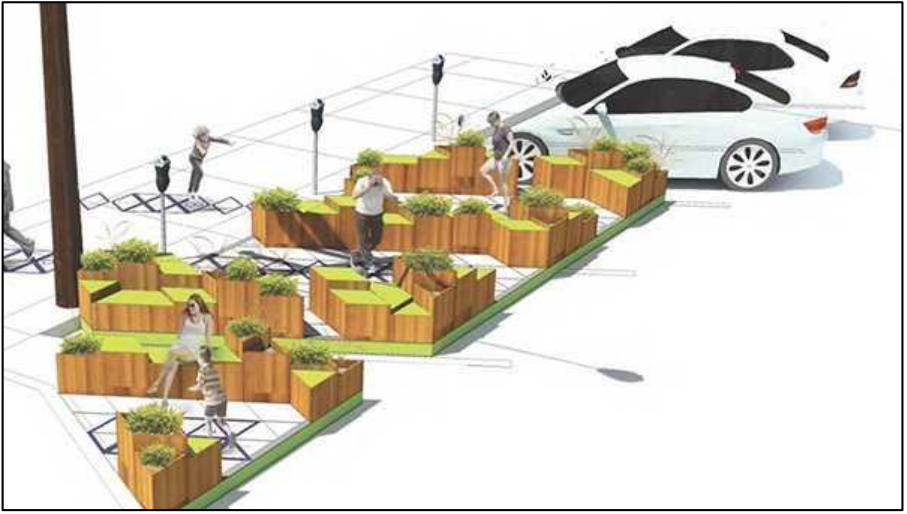


Figure 3. “The Hopscotch parklet in Covington” (Anonymus 2016).

The first example of a parklet emerged in downtown San Francisco in 2005 with the Park(ing) action, when the art-design-activist organization Rebar put a bench, a tree, and some grass on the street as a protest against paying a parking meter for two hours (Ignatieva et al., 2011; Lavine, 2012; O'Brien, 2018). This action has since led to a formal planning programme in San Francisco and an annual global Park(ing) Day event aimed at generating a critical debate about the quality and need for public space (Rodrigues, 2017; Kenny et al., 2020). This design action, which started to improve street and pavement views and thus provide new green public spaces in narrow spaces, has been formalised as a positive intervention in urban areas and has been the first application that has set an example for planning in cities all over the world (Kaufman, 2015; Owens, 2018) (Figure 4).



Figure 4. Parking-day installation first parklet design (Anonymus 2013).

A good parklet design improves urban aesthetics and functionality while enhancing the user experience. To be recognized by landscape architects and urban planners as a crucial tool in the management and development of urban areas, the design of these spaces adheres to several core principles. These principles include functionality, user profile, safety, accessibility, scale and proportion of the space, economic benefits, environmental sensitivity, and community participation. The specific approach is shaped by the intended use of the area, prevailing environmental conditions, and the needs of its users. (Le Pira et al., 2024; Gawryluk et al., 2024). In line with these basic principles, the basic elements that must be present to ensure that a parklet design is functionally and aesthetically successful are as follows:

- Seating Areas
- Vegetation and Green Areas

- Shading
- Standing and Circulation Areas
- Bicycle Parking
- Lighting
- Accessibility
- Security
- Environmental Regulation

Parklets, which are one of the important design applications that save ground and space, while at the same time increasing environmental development in cities and providing social benefits, if applied based on ecological design principles, it protects natural resources and supports ecosystem services by expanding green areas. Thus, it can be effective in creating environmentally friendly and functional urban environments (Steiner, 2011; Kay, 2019; Muller, 2021; Takata, 2024). Cities have a number of physical and biological complexes that make them ecosystems. However, the nature of new structures that contribute to these biotic structures are seen as extensions of the basic ecosystem concept. Especially university campuses designed according to ecological principles, which have the ability to meet the green space needs of cities to a large extent, provide comprehensive benefits to urban ecosystems and users. These designs support environmental sustainability, improve air quality, as well as increase water and energy efficiency. In this way, they can maintain their ecological campus identity with more permanent, sustainable, innovative and practical design solutions (Bela, 2014; Genta et al., 2019). Especially in campuses, ecological design applications should be put forward in campuses to control pedestrian and vehicle traffic and

make more efficient use of car parks and sidewalks."Eco-campuses" are educational institutions with sustainability and environmental stewardship at their core. These campuses aim to minimise environmental impacts, promote ecological awareness and generally serve as living laboratories for sustainable practices (Buch, et al., 2011;Smead, 2013; Bell & Gallagher, 2023). Eco-campuses are spaces that aim not only to reduce their environmental footprint but also to serve as models for sustainable living and education.

They often inspire students and staff to adopt environmentally friendly practices both on and off campus (Collins, 2013; Suki et al., 2015; Gage & Graefe, 2019; Al-Dmour, 2023). In this context, it will be possible to evaluate parklets with ecological design approaches that can be included in the planning and design of campuses both functionally and aesthetically. In addition to the general parklet design principles, these more modern and green mini parklets can be designed with different equipment elements, especially within the scope of user-oriented studies. In university campus areas, which students and local people frequently visit, the most economical solution that can meet the parking needs in narrow spaces are parklets (Hussin & Kunjuraman, 2015; Ikegami & Neuts, 2020; Zucchelli et al., 2022).

This study aims to create eco-parklet design proposals based on ecological principles. These designs aim to provide comfortable and relaxing spaces for passive recreation. The study also seeks to develop effective and creative design materials that are low-cost, recyclable, and sustainable. Additionally, it focuses on energy and water-saving features in the design idea. By using artificial intelligence-supported design tools, the study aims

to raise awareness of nature and healthy living. Ultimately, it contributes to the development of a more livable, green campus at Atatürk University.

2. Material and Method

The region determined as the research area is the Atatürk University campus located in the city of Erzurum. Located in the west of the city, this campus covers an area of 8 km².

The layout of Atatürk University was created and implemented by a team led by Hayati Tabanlı in 1958. The campus can be accessed from three different points: The main entrance is the gate with the eagle statue located in the east of the campus, about 500 metres from Erzurum city centre. The second entrance is located on the Erzurum-Erzincan highway, on the Erzurum-Erzincan highway, connecting to the Faculty of Agriculture from the University groves area and is located in the south of the campus. The third entrance can be accessed from the north of the campus, at the intersection of Erzurum-Bingöl highway and the Credit and Dormitories Institution. Campus entrances are provided by controlled and card automatic barrier systems. There are 22 faculties and 8 institutes within the campus, as well as administrative buildings, lodgings, dormitories and student centre buildings. The campus, which is designed to be student-oriented, also has indoor and outdoor sports fields. The campus has become an important area for the city, where the green area of the city is met to a great extent. The speed limit on campus is limited to 30 km. Transport within the campus is provided by ring shuttles, public transport, individual vehicles and pedestrian routes (Anonymus, 2016). Atatürk University has become an educational institution with the title of a research university that has adopted the UN sustainable development goals within

the scope of the sustainable campus master plan prepared in 2017 and the new generation university. In this context, all structural and environmental elements on the campus are transformed in support of efforts to develop these goals. Atatürk University campus consists of two regions: the east and west campus. Especially with the development of the western campus within the campus, the number of buildings of faculties has increased. In addition, the fact that hospitals, post offices, religious buildings, water-based sports activity areas, kindergartens, secondary schools, primary schools, lodgings, dormitories are located on the campus creates a very irregular and intense traffic problem (Demircioğlu Yıldız et al., 2017; Aytatlı et al., 2019). Accordingly, it is known that the pavements and streets on the campus are inadequate. Sustainable design approaches to solve these and similar infrastructure and environmental problems are being developed on campus everyday (Figure 5).

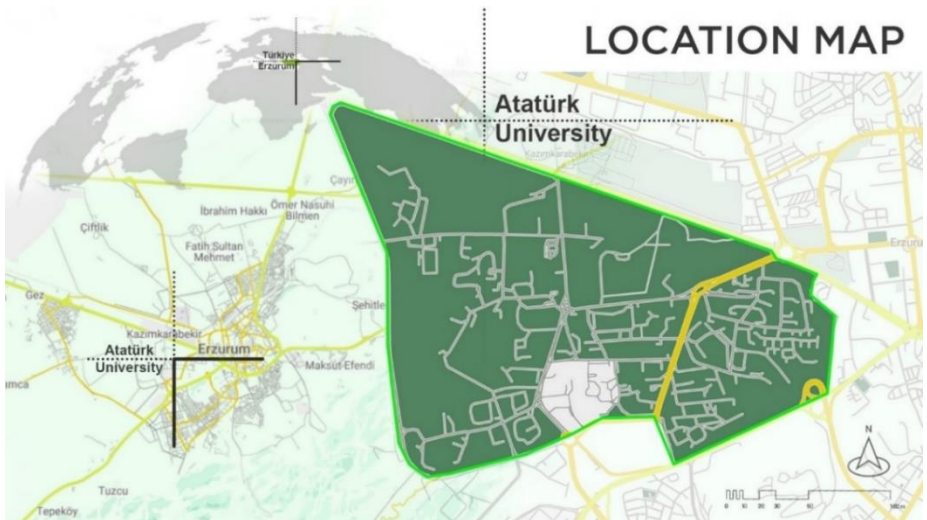


Figure 5. Atatürk University campus study area location map (Source:Author)

In this context, ecologically based parklet designs suitable for Atatürk University Campus, which was determined as the study area, were made. In this study, Adobe Photoshop, Adobe Illustrator and Adobe Firefly software were used to develop an artificial intelligence supported eco-parklet design idea. The method followed in the design process consists of 4 basic stages: Data Collection and Preprocessing, Determination of design idea Parameters, text to Image Generation Method and Prototype Generation.

2.1.Data Collection and Preprocessing:

In the first stage, data sets and visual materials to be used in the design of ecological parklets were collected. These materials include the examination of various environmental factors and sustainable design principles. In this direction, factors such as vegetation cover, local climatic conditions, user needs and existing urban design examples were taken into consideration. The collected data was analysed using Adobe Firefly artificial intelligence algorithms. This analysis was carried out to determine the basic parameters that will guide the design process.

2.2.Determination of Design Idea Parameters:

Following the data analysis, the ecological parklet design was developed using Adobe Photoshop and Adobe Illustrator programs. At this stage, the artificial intelligence-supported design idea suggestions and algorithmic visualisation capabilities of Adobe Firefly were utilised.

Photoshop was used to create and edit the visual components of the design, while Illustrator was preferred to create vector drawings and scalable graphics. Throughout the design process, sustainability and ecological

balance were prioritised and materials were selected in accordance with these criteria.

2.3. Text to Image Production Method:

The term "Text to Image Generation" refers to computer-based methods that can transform textual descriptions into visually represented concepts. In this field, supervised methods and text-to-image correlation analyses are often used to find the best match between text and images. Captioning for images requires the production of semantically intelligible and syntactically fluent text. The system should be able to identify important semantic elements in an image, understand the relationships between these elements, and produce a coherent description of the overall content of the image. In this context, in order to obtain the desired image, a series of terms and requests describing the image were written in Open AI, and it was asked to write effective prompts to obtain the image (Figure 6).

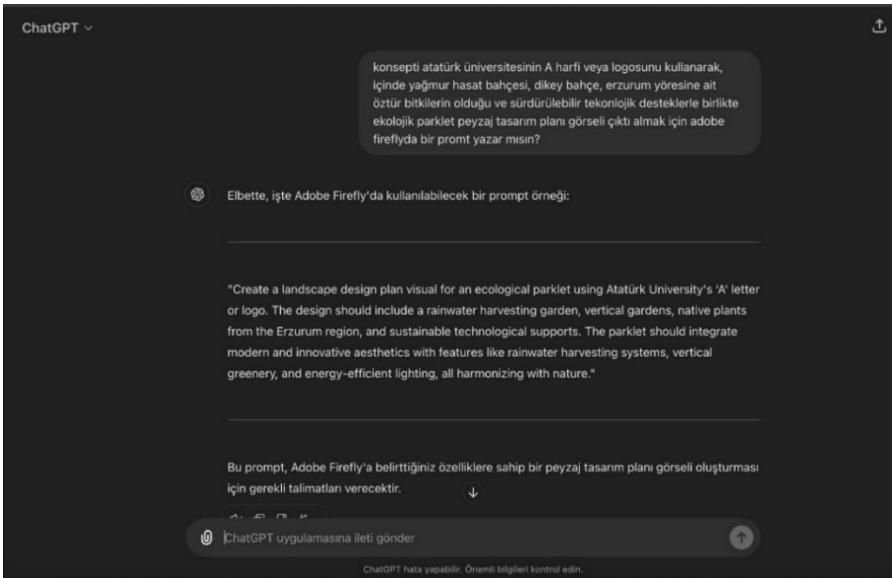


Figure 6. An example of prompt development with Open AI

2.4. Prototype Production:

Following the design development process, the resulting parklet design idea was turned into a prototype using Adobe Firefly. At this stage, the real-world performance of the design idea was evaluated using the rapid prototyping and simulation tools provided by Firefly. Criteria such as environmental impacts, user interactions and structural durability were taken into consideration during prototype production. As a result of the analyses and improvements made on the prototype, the final design was shaped and presented as the final product of the study. The basic concept of these ecological minimal structures to be designed for Atatürk University campus in the study consists of Atatürk University Logo, the first letter (A) of the word 'ATATÜRK' and original design applications with artificial intelligence supported design tools with ecological principles (Figure 7). During the design process, powerful software such as Adobe Photoshop, Adobe Illustrator and Adobe Firefly were used to create a parklet rich in both aesthetics and functionality. As a result of the analyses and evaluations, the following findings were obtained (Figure 8).

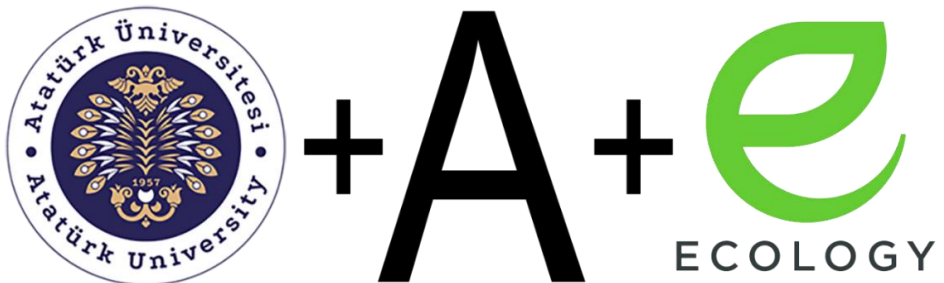


Figure 7. Design concept components (Source:Author)

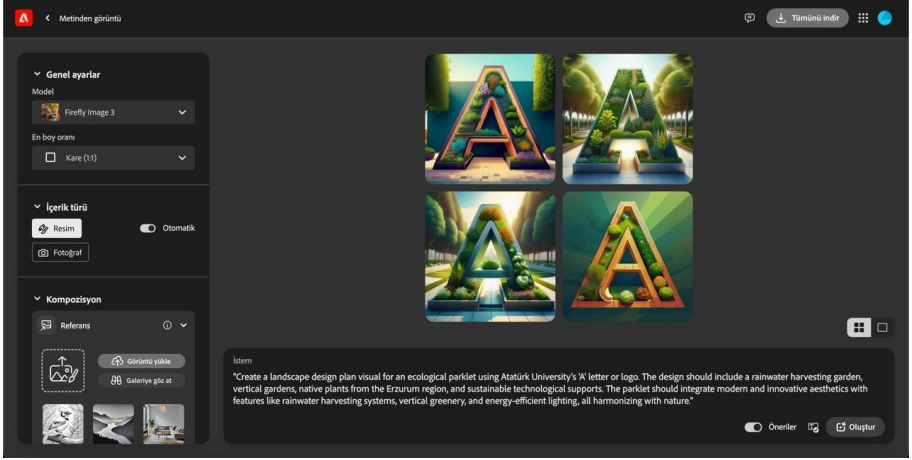

















Figure 8. Adobe Firefly program user interface

3. Findings and Discussion

In the study, design ideas produced with artificial intelligence were created with 3 different concepts according to ecological principles and classified according to design components. Accordingly, eco-parklets were designed with aesthetic, functional and low-cost applications by using recyclable materials. This application meets basic ecological principles such as energy efficiency and management, water management and conservation, material and waste management, carbon footprint and sustainability, biodiversity and ecosystem health, and social and user-oriented design. This methodological approach demonstrates the potential of AI-assisted design processes to create ecological and sustainable urban furniture and serves as a model for future studies (Table 1).

Table 1. Sustainable Ecological Principles for Eco-Parklet

Icons	Sustainable Ecological Design	Icons	Sustainable Ecological Design
	Sustainable resource management		Mobility management
	Biodiversity/Use of natural plants		Reduce waste
	Solar energy		Reduce urban heat island
	Recreation		Animal friendly
	Rainwater management		Cool paving
	Vertical garden		Renewable energy/Charging units
	Disabled access		Recycle
	Tiny landscape		

“A” concept: In the ecological parklet design idea developed based on the concept of artificial intelligence supported "A" letter symbol, the letter "A" symbol was transformed in accordance with ecological design principles, while offering a strong aesthetic form. In the design process, a sustainable structure was created by blending the geometric structure of the letter with vegetal elements and natural materials (Figure 9). This approach both preserved the meaning of the symbol and made it compatible with the

ecological environment. This finding shows that symbolic forms can be used effectively in ecological design (Brown et al., 2022).



Figure 9. Design ideas based on the letter ‘A’ (Source:Author)

The letter “A” provides functions such as rainwater harvesting, solar energy panels, natural plants of the region and their contribution to biodiversity, vertical gardens provided by the form of the building, mobility management, disabled access, reduction of the urban heat island effect, recreation opportunity, tiny landscapes, energy-saving natural lighting and devices, cool paving, which are the basic components of sustainability in the concept eco-parklet design (Figure 10).



Figure 10. Designs obtained using the letter “A” (Source:Author)

Logo concept: In this design idea, the Atatürk University logo is stylised in a modern way and integrated into various components of the parklet. In this way, it is applied in a wide range from the floor patterns or seating areas of the parklet to the lighting elements. It includes seating areas, tables and other furniture made of recycled or environmentally friendly plastics or organic composite materials, garbage bins, artificial intelligence-based systems to monitor the lighting, ventilation, irrigation and air quality of the parklet, small herb gardens that will provide a visual and emotional experience, flowers and aromatic plants placed between seating areas, seating areas and passageways suitable for disabled access, tiny landscape applications, biodiversity and natural plant use, cool paving, mobility management, recreation, animal freriendly, reducing waste (Figure 11).



Figure 11. Design ideas obtained by using the logo of Atatürk University
(Source:Author)

“A”+Logo concept: The parklets, created from the integrated design idea of Atatürk University logo and the letter A symbol, are designed to be used at intersections, refuges and focal points of the campus with the abstraction of its form and logo. Like other designs, besides its aesthetic appearance, it has functions such as renewable energy, recycled floor and seating materials, natural lighting, recreation, animal friendly, natural plant use and biodiversity, mobility management, disabled access, cool paving (Figure 12).



Figure 12. Design ideas obtained using the letter A with the Atatürk University logo (Source:Author)

General Concept (A+Ecology): Parklets designed on sidewalks where there is heavy vehicle traffic and pedestrians have difficulty using throughout the campus, environmentally friendly materials such as vertical gardens, green walls and furniture made of recycled materials, rainwater collection and filtration systems, solar-powered lighting and shading systems, natural plant use and biodiversity, composting areas, education panels and art works, areas to inform the campus community about sustainability by increasing environmental awareness, parklets designed with design tools such as disabled access contribute to the ecological and social goals of the campus in terms of both aesthetics and functionality. Design examples were created by abstracting the letter A. (Figure 13, Figure 14).



Figure 13. Design ideas obtained using the General Concept (A+Ecology) (Source:Author)



Figure 14. Design ideas obtained using the General Concept (A+Ecology) (Source:Author)

4. Conclusion and Suggestions

This study aims to implement the use of ecologically based parklets on university campuses by considering both environmental and social benefits. Such parklets contribute to the protection of natural resources and the reduction of carbon footprint by supporting sustainability principles. While using the parklet materials designed in the study, the environmental impact was minimized and long-term durability was increased. Therefore, the material selection was taken into consideration in the eco-parklet design. With this finding, the study is consistent with the study of Levinson and Carroll (2019), emphasizing that material selection is of critical importance

in ecological design. In addition, the use of local vegetation supported biodiversity and preserved the ecological balance. This artificial intelligence-supported design is structured to improve the user experience and increase the sustainability awareness of the society. Thompson (2020), also emphasized in his study that the functionality and aesthetic appeal of the parklet encourages users to actively interact. The study concluded that it is consistent with the literature that argues that urban furniture should be designed not only as functional but also as structures that contribute to society. In addition, increasing green areas for students and staff, ecological parks that encourage social interactions and improve the quality of campus life, increase environmental awareness and enable campuses to adopt an ecosystem-friendly approach. Therefore, the dissemination of this practice is considered an important step towards both preserving the ecological balance of campuses and improving public health. In particular, using more up-to-date technological tools makes campus usage more

modern and sustainable. Parklet designs made with artificial intelligence technology offer an innovative approach that transforms student and staff experiences and increases environmental sustainability. Adobe Firefly's artificial intelligence capabilities played an important role in the creative process by offering various suggestions and optimizations during the design process. In this way, designers were able to develop more innovative and sustainable solutions by exceeding traditional boundaries. In line with the findings in the literature on how the integration of artificial intelligence into design processes transforms creative processes (Jones & Wang, 2020), this study also concluded that artificial intelligence technologies increase design efficiency. Also dynamic spaces are created that can be customized according to user needs and increase energy efficiency. In addition, artificial intelligence-based systems optimize environmental conditions and reduce the ecological footprint of campuses by minimizing resource consumption. With these designed eco-parklets, more livable and healthy public spaces will be created by providing renewable energy use, minimum input (resource) and output (waste), urban environmental system, locally obtained resources, zero waste system, carbon neutrality and sustainable resource management. As a result, a modern and efficient campus life will be provided to students and users, and an important step will be taken in achieving sustainability goals. Such smart parklet designs will become one of the cornerstones of campus, crowded cities planning and green space management in the future, providing examples that increase the quality of life of students and staff. Parklets provide various advantages in the urban landscape, making city life more attractive, sustainable and human-oriented. Such innovative

applications will reinforce the ecosystem-friendly approach of the campus and improve the user experience.

Erzurum Atatürk University's adoption of these technologies will create a model that both supports environmental sustainability and enriches modern campus life, and thus the university will take a leading role in sustainability and technology integration at both local and national levels. The integration of ecologically based parklets and artificial intelligence-based designs on the Erzurum Atatürk University campus will be one of the innovative design approaches that can make significant contributions to the university's sustainability goals. Parklets, which will be designed especially for the harsh climate conditions of Erzurum, will be effective in creating solutions that increase energy efficiency and protect natural resources. The movement to design entire streets that encourage more pedestrians and cyclists on campus will set an example for the entire city, as large metropolitan cities reclaim their street-side parking spaces and transform them into miniature public parks. Future studies are suggested to integrate such designs into larger-scale urban projects and explore how different symbolic forms can be aligned with ecological design principles.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Al-Dmour, H. (2023). Green-Smart University Campuses: The Mediating Role of Student Engagement in Enhancing Corporate Image. *SAGE Open*, 13(4), 21582440231219591.
- Angeles, L. N. (2015). Claim Campus: A Survey of Outdoor Public Spaces on the UBC Vancouver Campus.
- Anonymus 2013, The Planner's Guide to Tactical Urbanism, <https://reginaurbanecology.wordpress.com/wp-content/uploads/2013/10/tuguide1.pdf>
- Anonymus 2016, Ataturk University new generation structural transformation applications, <https://atauni.edu.tr/yuklemeler/34d75585cfb0fb5df597b501e7b2dd2b.pdf>, access date: 10.06.2024
- Anonymus 2016, <https://www.bloomberg.com/news/articles/2016-07-04/curb-d-pairs-local-businesses-and-design-teams-on-interactive-parklet-installations-in-covington-kentucky> access date:21.07.2024
- Anonymus 2017, Brackenbury's Parklet, <https://awalkinaparklet.wordpress.com/2019/05/01/brackenburys-parklet/>, access date: 12.07.2024
- Anonymus2021, SouthMelbourneMarketParklet, <https://www.rightside.net.au/parklets?pgid=kjtibg2o-2aad2128-b1b2-4bcd-bcec-b0b027d691c4>, access date:21.07.2024
- Aytatlı, B., Yildiz, N. D., & Kuzulugil, A. (2019, August). *Fakülte Çevresi Rekreatyon Alanlarının Mekânsal Konfigürasyonu ve Sosyal Etkileşim İlişkisinin Kullanım Açısından İrdelenmesi: Atatürk Üniversitesi Kampüsü Örneği*. In SETSCI-Conference Proceedings (Vol. 7, pp. 21-29). SETSCI-Conference Proceedings.
- Bela, J. (2014). *11 User Generated Urbanism and the Right to the City. Now Urbanism: The Future City Is Here*.
- Bell, S., & Gallagher, A. (2023). Building community evidence for urban parklets in Edinburgh.
- Belmeziti, A., Cherqui, F., & Kaufmann, B. (2018). Improving the multi-functionality of urban green spaces: Relations between components

- of green spaces and urban services. *Sustainable Cities and Society*, 43, 1-10.
- Berry, B. J. (2008). Urban Ecology An International Perspective on the Interaction Between Humans and Nature. *Urbanization* Online ISBN, 978-970
- Bertolini, L. (2020). From “streets for traffic” to “streets for people”: can street experiments transform urban mobility?. *Transport Reviews*, 40(6), 734-753.
- Bhuyan, P. K., & Nayak, M. S. (2013). A review on level of service analysis of urban streets. *Transport Reviews*, 33(2), 219-238.
- Birdsall, M. (2013). Parklets: Providing space for people to park... themselves. Institute of Transportation Engineers. *ITE Journal*, 83(5), 36.
- Buch, M., Divringi, E., McCann, M., Millard, M., Patten, J., Berki, A., & Cachot, A. (2011). *Greening Campus Landscapes. Technical Report* The University of Michigan, USA.
- Cachot, A. (2011). *Greening Campus Landscapes. (Technical Report)* The University of Michigan, USA.
- Carmona, M. (2021). *Public places urban spaces: The dimensions of urban design*. Routledge.
- Chen, M., Gong, Y., Lu, D., & Ye, C. (2019). Build a people-oriented urbanization: China’s new-type urbanization dream and Anhui model. *Land Use Policy*, 80, 1-9.
- Collins, T. (2013). *Campus buildings & student engagement in institutional sustainability efforts*. In ARCC Conference Repository.
- Cuculić, M., Babić, S., Deluka-Tibljaš, A., & Šurdonja, S. (2012, January). *Pavement surfaces in urban areas*. In Proceedings of the 2nd International Conference on Road and Rail Infrastructure.
- Demircioğlu Yıldız, N., Kuzulugil, A. C., & Aytatlı, B. (2017). Student Centered Landscape Scenarios in Winter City University Campuses: Erzurum Atatürk University Case. *Gstf Journal Of Engineering Technology*, 4(3).

- Deng, L., Li, X., Luo, H., Fu, E. K., Ma, J., Sun, L. X., ... & Jia, Y. (2020). Empirical study of landscape types, landscape elements and landscape components of the urban park promoting physiological and psychological restoration. *Urban Forestry & Urban Greening*, 48, 126488.
- Ehrenfeucht, R., & Loukaitou-Sideris, A. (2010). Planning urban sidewalks: Infrastructure, daily life and destinations. *Journal of Urban Design*, 15(4), 459-471.
- Gage, R., & Graefe, D. (2019). Campus conservation initiatives: factors influencing student engagement, attitudes and behaviours. *International Journal of Higher Education and Sustainability*, 2(3), 197-215.
- Garau, C., & Pavan, V. M. (2018). Evaluating urban quality: Indicators and assessment tools for smart sustainable cities. *Sustainability*, 10(3), 575.
- Gawryluk, D., Biała, I., & Gawrychowska, M. (2024). Concept of pocket gardens on the campus of Białystok University of Technology as a result of a survey of the academic community. *Economics and Environment*, 88(1), 740-740.
- Gehl, J. (2013). *Cities for people*. Island press.
- Genta, C., Favaro, S., Sonetti, G., Barioglio, C., & Lombardi, P. (2019). Envisioning green solutions for reducing the ecological footprint of a university campus. *International Journal of Sustainability in Higher Education*, 20(3), 423-440.
- Ghandi, M. (2019). *Parklet: A new urban platform for emergent forms of communication and social interaction in the cities*. Modular and Offsite Construction (MOC) Summit Proceedings, 571-578.
- Gu, R. (2021). *Streetscapes on the Campus Edge* (Master's thesis, University of Georgia).
- Herman, K., & Rodgers, M. (2020). From tactical urbanism action to institutionalised urban planning and educational tool: The evolution of park (ing) day. *Land*, 9(7), 217.

- Herman, K., & Rodgers, M. (2020). From tactical urbanism action to institutionalised urban planning and educational tool: The evolution of park (ing) day. *Land*, 9(7), 217.
- Hussin, R., & Kunjuraman, V. (2015). *Exploring strategies for sustainable 'ecocampus': The experience of Universiti Malaysia Sabah*. *Geografia*, 11(3).
- Ignatieva, M., Stewart, G. H., & Meurk, C. (2011). Planning and design of ecological networks in urban areas. *Landscape and Ecological Engineering*, 7, 17-25.
- Ikegami, M., & Neuts, B. (2020). Strategic options for campus sustainability: cluster analysis on higher education institutions in Japan. *Sustainability*, 12(6), 2527.
- Irmak, M. A., & Avcı, B. (2019). Avrupa Yeşil Başkentlerin yeşil alan politikalarının incelenmesi. *Nevşehir Bilim ve Teknoloji Dergisi*, 8, 1-19.
- Jarman, N., & Stratford, E. (2023). Whose rights to the city? Parklets, parking, and university engagement in urban placemaking. *Australian Geographer*, 55(1), 115–136. <https://doi.org/10.1080/00049182.2023.2256590>
- Jarman, N., & Stratford, E. (2024). Whose rights to the city? Parklets, parking, and university engagement in urban placemaking. *Australian Geographer*, 55(1), 115-136.
- Jáuregui, A. (2023). *Impacts Of Covid-19 On Commercial Streetscape Design And Urban Street Evolution In Southern California: A Comparative Case Study Analysis Of Parklets And Streetscapes In Pasadena, Long Beach And Glendale* (Doctoral Dissertation, California State Polytechnic University, Pomona).
- Jiang, L., Young, M. H., & Hardee, K. (2008). Population, urbanization and the environment. *World Watch*, (5), 34-39.
- Jones, M., & Wang, Z. (2020). The Role of Artificial Intelligence in Modern Design Practices. *Design Studies*, 65, 45-60
- Jones, P., Marshall, S., & Boujenko, N. (2008). Creating more people-friendly urban streets through 'link and place' street planning and design. *IATSS Research*, 32(1), 14-25.

- Karndacharuk, A., Wilson, D. J., & Dunn, R. (2014). A review of the evolution of shared (street) space concepts in urban environments. *Transport Reviews*, 34(2), 190-220.
- Kaufman, B. (2015). Design Guidelines and Analysis for Transit-Friendly Parklets in Alameda County. *Re-Inventing the Bus Stop*.
- Kay, A. D., Scherber, E., Gaitan, H., & Lovelee, A. (2019). Transitional ecology: Embedding ecological experiments into temporary urban public art. *Journal of Urban Ecology*, 5(1), juz020.
- Kenny, O., Stebel, P. J., Goodman, L., & Braun, L. (2020). *Parklets San Luis*. (Doctoral dissertation, California Polytechnic State University, San Luis Obispo).
- King, J. (2012). Parklets, Everywhere. *Landscape Architecture*, 102(11), 78–87. [Http://Www.Jstor.Org/Stable/44795121](http://www.jstor.org/stable/44795121)
- Koue, C. (2013). *Sustainable implementation of emerging infrastructure in cities: A case study of parklets*. Georgetown University.
- Latham, A., & Layton, J. (2019). Social infrastructure and the public life of cities: Studying urban sociality and public spaces. *Geography Compass*, 13(7), e12444.
- Lavine, M. (2012). Exploring the relationship between corporate social performance and work meaningfulness. *Journal of Corporate Citizenship*, (46), 53-70.
- Le Pira, M., Distefano, N., Cocuzza, E., Leonardi, S., Inturri, G., & Ignaccolo, M.(2024),Pedestrian mobility and University campus accessibility: an analysis of student preferences. *European Transport*. (97), 1-10.
- Lee, L. (2015). The Thin Green Lines. *Landscape Architecture Magazine*, 105(5), 80–84. <http://www.jstor.org/stable/44796653>
- Lee-Smith, D. (2010). Cities feeding people: an update on urban agriculture in equatorial Africa. *Environment and Urbanization*, 22(2), 483-499.
- Levinson, J., & Carroll, P. (2019). Sustainable Material Choices in Urban Design: Impacts and Benefits. *Environmental Design Journal*, 23(2), 215-230.

- Littke, H. (2016). Revisiting the San Francisco parklets problematizing publicness, parks, and transferability. *Urban forestry & Urban Greening*, 15, 165-173.
- Marshall, S. (2004). *Streets and patterns*. Routledge.
- Mascaró, J. J. (2012). Shaded pavements in the urban environment—a case study. *Road Materials and Pavement Design*, 13(3), 556-565.
- Mata, L., Garrard, G. E., Fidler, F., Ives, C. D., Maller, C., Wilson, J., Thomas, F., & Bekessy, S. A. (2019). Punching above their weight: the ecological and social benefits of pop-up parks. *Frontiers in Ecology and the Environment*, 17(6), 341–347. <https://www.jstor.org/stable/26757601>
- Middleton, J. (2018). The socialities of everyday urban walking and the ‘right to the city’. *Urban Studies*, 55(2), 296-315.
- Morelli, N. (2019). Creating Urban Sociality in Middle-Class Neighborhoods in Milan and Bologna: A Study on the Social Streets Phenomenon. *City & Community*, 18(3), 834-852.
- Muller, J. L. (2021). Examining the Ecological and Social Implications of Parklets and Plazas Across Multiple Urban Scales. (Master's thesis, California Polytechnic State University, San Luis Obispo).
- Nilufar, F. (2002). Regeneration of pavements as an effective urban space. *CUS Bulletin on Urbanization and Development*, (43).
- Nordh, H., Alalouch, C., & Hartig, T. (2011). Assessing restorative components of small urban parks using conjoint methodology. *Urban Forestry & Urban Greening*, 10(2), 95-103.
- Obrien, M. (2018, September). *Parklets, Social Media and Public Health*. In ARCC Conference Repository.
- Owens, L. B. (2018). A Tale of Two Cities: The Parklet Implementation Processes in Los Angeles and San Francisco. (Master's thesis, Occidental College, Los Angeles).
- Pickett, S. T., Cadenasso, M. L., Grove, J. M., Nilon, C. H., Pouyat, R. V., Zipperer, W. C., & Costanza, R. (2001). Urban ecological systems: linking terrestrial ecological, physical, and socioeconomic components of metropolitan areas. *Annual Review of Ecology and Systematics*, 32(1), 127-157.

- Provenzale, J. (2017). The matador mile: parks and open space. (Master's thesis, California State University, Northridge).
- Rodrigues, N. C. (2017). Estudo Para Implantação De Parklets No Recife. *Portal De Trabalhos Acadêmicos*, 9(2).
- Ryan, R. L. (2018). Green infrastructure planning on campus: case studies from university of Massachusetts–Amherst. *Journal of Green Building*, 13(3), 145-157.
- Shokry, H. (2019). *Are Street Urban Spaces Can Invite City Life? Parklets; Small Places with Big Impacts*. In 4th Int. Conf. Eng. Innov. Technol..
- Sickmann, J. (2016). Portable landscapes: flexibility and customization associated with temporary landscapes. (Master's thesis, Kansas State University, Manhattan).
- Simpson, P. (2011). Street performance and the city: Public space, sociality, and intervening in the everyday. *Space and Culture*, 14(4), 415-430.
- Sinou, M., Timotheou, K., Chantiona, C., & Koutsanitis, S. (2022, June). *Small urban space network: the perspective of a green network including small and very small urban spaces as an answer to the scarcity of available public space in city centers*. In Proceedings of the International Conference on Changing Cities V: Spatial, Design, Landscape, Heritage & Socio-Economic Dimensions, Corfu Island, Greece (pp. 20-25).
- Smead, L. (2013). *Parklets in somerville: A resource for implementation* (Master's thesis, Tufts University).
- Sohrabi, N., & Sajadzadeh, H. (2023). Assessing and Evaluating the Role of Parklets in Increasing the Vitality of Urban Boulevards (Case Example: Hamadan Eram Boulevard). *Geography and Planning*, 27(83), 85-101.
- Southworth, M., & Ben-Joseph, E. (2013). *Streets and the Shaping of Towns and Cities*. Island Press.
- Steiner, F. (2011). Landscape ecological urbanism: Origins and trajectories. *Landscape and Urban Planning*, 100(4), 333-337.

- Stevens, Q., & Morley, M. (2024). The contested value of parklets. *Journal of Urban Affairs*, 1–19. <https://doi.org/10.1080/07352166.2024.2334290>
- Stevens, Q., & Morley, M. (2024). The contested value of parklets. *Journal of Urban Affairs*, 1-19.
- Stevens, Q., Leorke, D., Thai, H. M. H., Innocent, T., & Tolentino, C. (2024). Playful, portable, pliable interventions into street spaces: deploying a ‘playful parklet’ across Melbourne’s suburbs. *Journal of Urban Design*, 29(2), 231-251.
- Suki, N. M., Suki, N. M., Chowdhury, I. A., & Othman, I. W. (2015). Campus Sustainability: Does Student Engagement with Eco-Campus Environmental Activities and Green Initiatives Really Matter?. *Journal of BIMP-EAGA Regional Development*, 1(1), 42-56.
- Sund, N. (2019). Streets to Social Space: A Tactical Approach to Suburban Placemaking. (Master's thesis, University of Oregon, Oregon).
- Takata, M. (2024). Developing and operating unit-type green parklets for parking lots in urban area—Part 1: Development and experimental study of unit-type green parklets. *Japan Architectural Review*, 7(1), e12449.
- Thompson, D. (2020). Community-Centered Urban Design: Enhancing User Engagement Through Public Spaces. *Urban Studies*, 58(3), 520-536.
- VanHoose, K., & Bertolini, L. (2023). The role of municipalities and their impact on the transitional capacity of city street experiments: Lessons from Ghent. *Cities*, 140, 104402.
- Vlahov, D., & Galea, S. (2002). Urbanization, urbanicity, and health. *Journal of Urban Health*, 79, S1-S12.
- Waugh, D. (1947). Parklets: Gardens Of Eden For Those Who Cannot Go To A Real Park. *Landscape Architecture*, 37(2), 56–56. [Http://Www.Jstor.Org/Stable/44660160](http://www.jstor.org/stable/44660160)
- Wei, H., Hauer, R. J., Sun, Y., Meng, L., & Guo, P. (2022). Emotional perceptions of people exposed to green and blue spaces in forest

parks of cities at rapid urbanization regions of East China. *Urban Forestry & Urban Greening*, 78, 127772.

Young, L. F. (2018). *Creating a Sense of Place on the Street: Parklets in San Francisco Neighborhoods* (Doctoral dissertation, University of Oregon).

Zucchelli, D., Rovere, A., Monaco, S. L., Giombini, V., Simion, H., Marsoner, T., ... & Hladnik, J. (2022). *Shaping a sustainable future with Green Infrastructure*. Sprint24.

Zwangsleitner, F. (2020). Form follows comfort: An evidence-based approach to enhancing streetscapes. *J. Digit. Landsc. Archit*, 5, 94-102.

Dr. Ali Can KUZULUGİL

E-mail: ali.kuzulugil@atauni.edu.tr

Educational Status: Doctorate

Professional experiences: Research assistant

Dr. Başak AYTATLI

E-mail: bashakayt@gmail.com

Educational Status: Doctorate

Professional experiences: Research assistant

Evolution of Recreational Design in Public Swimming Pools: From the Past to Magnificent Futuristic Visions

Dr. Başak AYTATLI ¹ 

¹Atatürk University, Faculty of Architectural and Design, Department of Landscape Architecture, Ataturk University Campus, Erzurum/Turkey
ORCID:0000-0002-4039-293X
E-mail: bashakayt@gmail.com

Dr. Elif ÖNAL ^{2*} 

²Atatürk University, Faculty of Architectural and Design, Department of Landscape Architecture, Ataturk University Campus, Erzurum/Turkey
ORCID:0000-0002-8458-2305
E-mail: elif.onal@atauni.edu.tr

Citation: Aytatlı B. & Önal E. (2024). Evolution of Recreational Design in Public Swimming Pools: From the Past to Magnificent Futuristic Visions. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:13, 304-341. ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13886780>

1. Introduction

Cities are settlements that provide infrastructure and services that improve people's quality of life, provide both economic and social opportunities for the people of the city, and meet the needs of people to sustain their lives (Crompton, 2001; Foley et al., 2005; Cohen, 2017; Garau & Pavan, 2018; MacKenzie et al., 2019; Irmak, & Avcı 2019). By creating a dynamic atmosphere for urban life, land uses in cities offer various opportunities to communities, which are the heart of cities, and encourage social interaction. These spaces include parks, gardens, sports fields and artworks, creating environments where residents can rest, have fun, play sports and participate in cultural activities (Blackman et al., 2003; Hastings et al., 2006; Dahmann et al., 2010; Gehl, 2013). The phenomenon of 'beautification' and 'improvement' of public spaces in cities has become increasingly common in recent years (Woolley, 2003; Talen, 2010; Chen et al., 2018; Sørensen & Torfing, 2018). The direct contact of individuals with each other and the formation of social networks require public recreation areas to be open and accessible to everyone (Wridt, 2004; Dufour, 2017; Jansson et al., 2018). In this way, individuals feel more valuable in crowded cities. Urban public spaces are the centre of civic life and are known as places where most interactions, activities and behaviours are restricted and determined by certain rules, where individuals comply with strict social and cultural norms to ensure the safety and comfort of all users (Batty et al., 2012; Hassinger et al., 2018; Sim, 2019; Carmona, 2021). Considering that individuals spend their daily lives in urban spaces, the pools offer individuals a wide range of recreational opportunities.

These possibilities are increased by integrating many different facilities as well as active or passive recreational entertainment areas (Madanipour, 2003; Cervero et al., 2017; Hollands, 2020). The use of water structures such as fountains, waterfalls, ponds, which are among the most important elements of parks and gardens in cities and urban recreation designs, are the elements that increase the attractiveness of the places they are located in (Colsaet et al.,2018; Latham & Layton, 2019; Liu et al., 2019; Von Schnurbein et al., 2023; Malkoç et.al.,2021). Public swimming pools are one of the places where urban individuals take part more actively and provide water-based active recreation opportunities together. Swimming pools which rarely come to mind when it comes to public space in cities, are places that help to increase the general welfare of the society by providing both relaxation and free physical activity opportunities to the city people (Culver, 2010; Schets et al., 2011; Littlewood, 2016; O'Neill & Wagner, 2022). Pools symbolise a form of sovereignty, artificially providing certain conditions for individuals to use water.The act of swimming and bathing represents a more intimate and primitive phenomenon, a sensory experience different from other forms of recreation (Lake, 2012; Smith, 2012; Greenwood & Fletcher, 2021). In addition to the benefits of contact with water for human health, it provides the opportunity to get away from the stress and pressures of daily life (Beard & Paley, 2013). With the use of pools in urban environments, they not only provide social living spaces but also create an environment for active entertainment and recreation in the city center (Figure 1).



Figure 1. Image of “Blackpool Lido” (Anonymous 2022)

While pools provide relief from the constraints of city life in densely populated areas, they are known as places that allow non-professional neighborhood children and other swimmers to have a different city experience (Colwin, 2002; Kirk, 2014; Clemente, 2017; Fuentes, 2023). They provide a common meeting point where people of all ages and origins can come together, improving social harmony and a sense of community, and serving a balancing function in terms of social harmony in cities (Anonymous, 2022; Anonymous, 2023a). Also as a public space they support social equality by offering the opportunity to swim at affordable prices and ensure that everyone, regardless of their economic situation, can benefit from this important activity. Public pools, usually located in city centers or near residential areas, play an important role in the social life of the city. Public swimming pools are versatile facilities that improve the quality of urban life, strengthen social ties and promote health. Use of pools in urban landscape design increases the recreational value of them in the city. In summary, the benefits of public swimming pools for urban individuals and the entire city can be listed as follows:

- Fun and Enjoyment
- Physical Activity and Health
- Mental and Emotional Relaxation
- Social Interaction
- Personal Development
- Recreational Activities
- Accessibility and Low Cost (Zambon et al., 2015; Langie et al., 2022).

Swimming pools, which are common property of the public, show that swimming, which was a public recreational activity in prehistoric times, has become increasingly individualized and is an action that represents a fascinating and magnificent history hidden within the walls, like bathrooms in private properties (Gutman, 2008; Love, 2013; Miniotaite, 2016; Aronson et al., 2016; James, 2000). Therefore, aquatic spaces have been valued as prestigious spaces since ancient times and have always been in a close relationship with architecture by affecting structures (Lees, 2004; Beach 2007; Vidal et al., 2011; Langie et al., 2022). The first known public bathhouse, the 5,000-year-old ruins of the Great Bath at Mohenjo-daro, Pakistan, are similar in many ways to today's pools. The Great Bath dates back to before the 3rd millennium BC and is believed to have been used for ritual bathing (Anonymous, 2023b) (Figure 2).

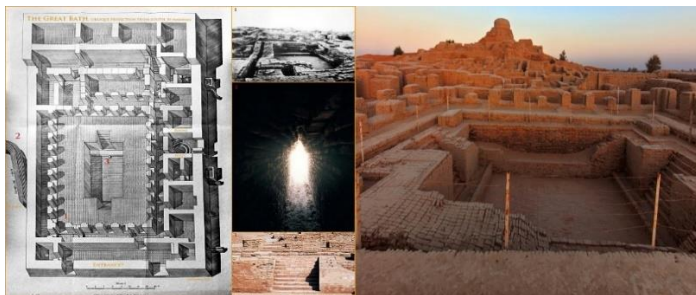


Figure 2. Image of “Mohenjo-daro Great Bath” (Anonymous 2015)

Water bathhouses, the pioneer of swimming pools, were initially used for cleansing and therapeutic purposes, but over the years they have increasingly been used for recreational purposes. In the 1800s, New York City became a mobile recreational space in the form of "floating baths" along both the East and Hudson Rivers (Mjagkij, 2007; Lewi & Phillips, 2013; Adiv, 2015; Romisher, 2019; Caudwell, 2020). They were used as public pools with wooden floors, filled with river water, and changing rooms for men and women (Figure 3).



Figure 3. Image of New York city “Swimmobile” (Anonymous 2021)

In the 15th century, Ottoman baths offered relaxation and entertainment opportunities to the public in separate areas for men and women and were important centers for social and cultural activities and included elaborate mosaics, marbles and pools of water of various temperatures (Sibley, 2007; Ergin, 2011). In 18th century English baths, mineral springs were used primarily for the purpose of treating illnesses. In Greek civilization, swimming is seen as a part of sports complexes and is usually located in

open areas (Manderscheid, 2000; Puech et al., 2001; Wiltse, 2003; Beanland, 2020). In Egyptian and Japanese civilizations, public pools used for bathing purposes were widely used and their designs combine aesthetics and functionality (Figure 4).



Figure 4. Image of “Cağaloğlu Turkish Bath” (Anonymous 2016)

In the Ancient Roman Period, public baths (thermae) that were swimming pools were an important social and cultural center. Swimming is known as an important element for both sports and social interaction in Roman society (Yegül, 2013; Boraik et al., 2017; Tchikine , 2018). Pools were used as a social recreation center where people met to discuss politics, gossip or people watch, learn important news of the day, make business deals or just chat with friends and colleagues and play water-based games, etc. The design features of large public baths were generally huge structures, containing pools of water of various temperatures and pools of

cold water. In the Byzantine period, the structures became more sophisticated and were decorated with mosaics and marbles.

The first public swimming pools were built during this period. In medieval Europe, the tradition of public swimming decreased to a large extent with the increase in individual baths (Figure 5).



Figure 5. Image of Ancient Roman “The Great Bath” (Anonymous 2023c.)

Cold water bathing pavilions or diving pools were introduced to the landscape primarily from the mid-18th century to facilitate a healthy lifestyle (Salvati & Zambon, 2018). During the Renaissance, pools became more aesthetic and ornate. Art and architecture were prominent; elegant mosaics, sculptures and natural water features were included in the design of pools (Kosso & Scott, 2009; Tannenbaum, 2017). The concept of using public swimming pools for recreation in the United States began in the late 1800s, and the way people swam was shaped by social class; wealthy elites often visited beaches and pools to relax and socialize, while the middle

class used pools to swim and the lower class used pools to “bath” (Pick 2010; Wiltse, 2014; Kentner, 2022).

In many rural towns, public pools became the epicenter of their neighborhoods and the site of many social gatherings. However, the term “public” began to change in the postwar period, when pools were segregated by race due to laws or social pressures of the time (Bellis, 2020) (Figure 6).



Figure 6. Image of “Sunnyside Pool” (Anonymous 2014)

In the modern period, especially in the late 19th and early 20th centuries, new and different versions of public swimming pools became popular again. With the industrial revolution, the demand for public facilities to meet the recreational needs of people increased due to the population growth in cities. During this period, many large public swimming pools were built, especially in the United States and Europe (Wade, 1998; Gordon & Inglis, 2009).

Especially the infrastructure development of cities and changes in people's lifestyles made public swimming pools more widespread (Figure 7).



Figure 7. Image of “Floating Pools and Beach” (Anonymous 2024)

However, some European cities still have public swimming pools as common areas. Modern and imaginative swimming pools are equipped with ergonomic designs, energy-efficient systems and environmentally friendly materials. There are types that include complexes designed with various entertainment and sports features. In the modern era, public pools are planned to be aesthetically appealing and to be in harmony with the natural and artificial environment. Pools that stand out with elements such as glass edges, use of natural light and sustainable materials have begun to be used. In addition to the functionality of public swimming pools, design elements reflecting their aesthetic and cultural values have played an important role throughout history.

In every civilization and society, recreation has diversified and shaped not as a luxury but as a need and an indispensable element of life. Swimming pools are becoming an important recreational element for individuals who have to live in communities in cities every passing day. The design of these facilities plays a critical role in terms of safety, comfort and accessibility of users (Figure 8).



Figure 8. Image of Nine Elms “Sky Pool (Anonymous 2020)

A good design should provide hygiene standards by regulating the quality and temperature of the water, minimizing health risks for users. Accessibility for users with special needs such as disabled individuals and the elderly should be considered as a part of the design. While the design creates areas that encourage social interaction, it should consider the privacy and safety of individuals (Tunnard, 2014; Sandeva & Despot 2015; Pearson, 2020).

Designs to be made in order to adapt to innovations and to meet the recreational expectations of individuals at the maximum level are developed in order to foresee possible future developments, innovative concepts and design trends. Especially in terms of architecture, the implementation or foreseeing of different concepts, combining technology with unlimited imagination, supports the development and sustainability in urban areas. Thus, futuristic designs, which are a familiar concept of the modern century, aim to lay the foundations for future developments and offer creative solutions. The swimming pools of the future are positioned not only as sports and entertainment areas, but also as integrated spaces that encourage social interaction and support public health. These designs include structural innovations aimed at increasing the use of environmentally friendly materials and energy efficiency. Materials and energy-saving heat pump systems, intelligent water management systems, integrated intelligent lighting and air control systems are used. Biomimicry and natural forms used in the design combine aesthetics and functionality; features such as wave-making systems and underwater lighting offer visitors a visual and sensory experience (Ruban, 2018; Murphy, 2022). This study aims to develop futuristic proposals for the future by taking inspiration from the past in the design of public swimming pools, and to present aesthetically impressive design approaches integrated with modern technologies, inspired by historical and cultural elements of the past, and to reveal futuristic design principles and application proposals on how public swimming pools of the future can be shaped based on past experiences.

For this purpose, innovative design strategies that bring together sustainability, aesthetics, technology and functionality were proposed and their potential effects on public recreational areas were evaluated.

2. Material and Method

The study used literature on the compliance of pools with environmentally friendly design criteria and their role in urban planning. Swimming pools are artificial water bodies that are generally used for sports, recreation and health purposes and contain various materials and components. In order to ensure the effective use of recreational areas, the materials preferred for swimming pools include durable and water-resistant materials such as concrete, glass fiber reinforced plastic (CFRP), polypropylene and stainless steel. Pools vary according to their size and purpose of use; while Olympic pools comply with competition standards, public pools are generally designed for entertainment and learning to swim. In the study, innovative strategies that can be used in the design of futuristic public swimming pools were determined through a comprehensive analysis process. First, a literature review was conducted to create a broad knowledge base on past and current swimming pool designs. Then it was evaluated how flexible design approaches such as modular design and dynamic space use could be integrated (Pearson, 2020; Langie et al., 2022). In this process, innovative strategies and design principles were created to ensure the balance between the aesthetic, functional and environmental elements of the design, and the proposed solutions were shaped to adapt to the requirements of future public swimming pools (Table 1).

Table 1. Futuristic design approach strategies and principle (Ajima, 2000; Burchard, 2005; Tungate, 2009; Mc Lachlan, 2012; Trümper, 2018 ;Tóth-Pál, 2024).

Principles	Materials	Contents
Color and Lighting	Dynamic LED Lighting	LED systems that can change color underwater and in the surrounding areas.
	Visual Effects	Moving light patterns and projections on and around the water surface.
Materials and Structure	Smart Materials	Water-friendly and energy-saving surface coatings
	Sustainable Materials	Recycled and environmentally friendly building materials
Form and Shape	Organic Shapes	Design concepts that mimic natural fluid forms.
	Modular Elements	Pool parts that can be added, removed and rearranged.
Technology and Interactive Features	Underwater Displays	Underwater digital displays used for information and entertainment.
	Interactive Touch Surfaces	Touch panels and screens that interact with users.
Sustainability	Solar Energy	Providing energy with solar panels
	Water Recycling	Systems for purifying and reusing existing water
Accessibility and Comfort	Disabled Access	Ramps, lifts and accessible pool edges
	Child and Elderly Features	Low depths and supporting structures for safe and comfortable use
Safety	Automatic Cleaning	Robots that clean dirt from the water surface
	Emergency Alert Systems	Security cameras and emergency buttons
Social and Cultural Elements	Community Spaces	Large seating and relaxation areas designed for social events.
	Art Installations	Artworks and sculptures that interact with water.
Architectural Styles	Historical Inspirations	Integrating design motifs and forms
	Mixing Periods	Combining façades with modern materials and design techniques.
Spatial Organization	Historical Arrangements with Modern Functionality	Interpreting historical spatial organization principles such as symmetry and balance in classical gardens and the layout of modern pools
	Period-Inspired Design Districts	Enriching the pool area with modern amenities inspired by Renaissance courtyards or Victorian gardens
Cultural and Social Integration	Historical Contextualization	Integrating spaces reflecting the heritage and social practices of different periods
	Community Spaces with Historical Influence	Designing social and entertainment areas inspired by historical gathering places but adapted with modern comfort and accessibility features

The futuristic public swimming pool designs created for the study, design proposals to be implemented in accordance with contemporary architecture and design principles were modeled in Sketch up and Dream AI create drawing programs. Thus, the futuristic examination of the design, analysis and advanced solutions and technologies for aesthetic possibilities were supported. In designs, the use of modern materials, environmental sustainability, ergonomic design and aesthetic elements were prioritized. Thanks to the 3D modeling opportunities offered by the “SketchUp Programme”, both spatial and functional features of the designs could be examined in detail and optimized. The visual drafts, created in the first phase of the design process, were enriched with collage techniques using the Picassa 3 program. At this stage, the aesthetic integrity of the designs was preserved by bringing together images taken from different angles, while at the same time emphasizing the futuristic elements of the design.

3. Findings and Discussion

The study has set forth general strategies and principles in the design of public swimming pools and all of the designs created accordingly include basic strategies such as “Material and Structure, Accessibility and Comfort, Technology and Interactive Features, Sustainability and Security”. However, 5 different classifications have been made according to aesthetics, functionality and cultural and social integration features.

3.1. According to Design Approaches:

In urban pool design, the aesthetics and functionality of the space are improved by using different design approaches. These approaches stand

out as organic forms, geometric forms, modular and flexible designs, and dynamic and interactive designs.

Organic Forms: Organic forms are inspired by nature and provide soft and fluid lines to the design.

Curved surfaces, natural slopes and wavy shapes used in the pool area offer both an aesthetic appeal and a relaxing atmosphere to the space.

Geometric Forms: Geometric forms give the space a modern and clear appearance with their regular and symmetrical structures. Designing the pool with distinct shapes such as rectangles or squares emphasizes the regularity of the space and creates a minimalist aesthetic. Geometric forms offer users a comfortable and focused environment by emphasizing simplicity and functionality in the design.

Modular and Flexible Designs: Modular and flexible designs allow the space to be easily adapted to different needs. This approach allows the pool area to be composed of reconfigurable sections and to be structured in different ways according to the purpose of use. This flexibility makes the pool ideal for different activities and user groups during use.

Dynamic and Interactive Designs: Dynamic and interactive designs encourage users to interact with the space. This approach is achieved by incorporating elements such as moving water games, lighting effects and sensor-operated water fountains into the design. With this approach, the organic and geometric forms, modular and flexible structures and dynamic and interactive elements used in urban pool design ensure that the space is enriched both aesthetically and functionally and contribute to the creation of a versatile and attractive pool area that appeals to different expectations of users (Figure 9).



Figure 9. Proposed drawings made according to the design approach
(Source: Author)

3.2. According to Materials and Surfaces:

The selection of materials and surfaces used in the urban pool design is based on a balanced blend of sustainability, smart technologies, modern aesthetics, natural materials and traditional elements. This design approach aims to create a high-quality space in terms of both environmental and user experience. Recommended design findings reveal how sustainability, technological innovations and aesthetic values can be combined in a balanced way in urban pool projects.

Sustainable Material: Sustainability has been accepted as the cornerstone of this design. In particular, waterproof concrete and high-performance composite materials have increased the durability of the structure while minimizing environmental impacts and with the energy-efficient lighting

systems and solar-powered ventilation systems have been integrated as smart solutions to reduce energy consumption.

Smart Technologies and Materials: Smart pool technologies have been included in the design to maximize user comfort and energy efficiency. With the smart sensors that automatically adjust the temperature and pH levels continuously monitor and optimize the pool water quality. Specially coated glass that reflects sunlight and optimizes interior lighting contributes to energy savings.

Modern Aesthetics and Material Selection: The modern design concept is distinguished by minimalist lines and innovative material usage. Modern materials such as stainless steel and tempered glass offer both aesthetic elegance and functional durability. Non-slip surface coverings and modular seating areas used around the pool increase user safety and comfort while providing a modern visual.

Natural Materials and Sustainability: Natural materials have been meticulously selected to emphasize environmental harmony. Natural stones and wooden surfaces obtained from local sources have been used around the pool to create an atmosphere in harmony with nature. The materials both add aesthetic richness with their natural textures and colors and support biophilic design principles.

Use of Traditional Elements: Traditional materials and architectural elements have not been overlooked in the design. Ceramic mosaics and hand-made tile details reflecting local cultural heritage increase the aesthetic appeal of the pool while providing cultural continuity. The elements work in harmony with modern design elements, contributing to

the creation of a space that both respects the past and is oriented towards the future (Figure 10).



Figure 10. Designs according to material diversity and surface differences (Source: Author)

3.3. According to Functional Features:

In the urban pool design, various findings have been obtained by considering functional features such as energy efficiency, automatic systems, accessibility and social area usage.

Energy Efficiency: Renewable energy sources have been used to ensure energy efficiency. While solar panels meet the water heating and lighting needs of the pool, energy-saving LED lighting has been used.

Automatic Systems: Various automatic systems have been integrated to increase user comfort in the management of the pool. While sensors that constantly monitor water temperature and quality ensure that the pool

remains in ideal conditions, smart lighting systems provide energy savings and optimize the atmosphere of the environment.

Accessibility: This principle has been prioritized in the design to create an area that everyone can use comfortably. Ramps and elevators provide easy access to the pool for disabled users, while non-slip surfaces and wide corridors provide a safe environment.

Social Areas and Entertainment: The pool has been designed to be suitable for social and entertainment activities other than swimming. Water play areas, slides and large recreational areas offer entertainment and social interaction areas that appeal to different age groups. The findings show how features such as energy efficiency and accessibility can be balanced in a modern urban pool design. The design aims to provide a sustainable and functional pool area while prioritizing user comfort (Figure 11).



Figure 11. Designs according to functional features (Source: Author)

3.4. According to Aesthetics and Concepts

Aesthetics and concepts in urban pool design are enriched with futuristic approaches, cultural and historical touches, artistic decorations and elements reflecting the period style.

Futuristic Aesthetics: Futuristic design aims to create a modern and innovative look. Fluid forms, minimalist lines and high-tech materials add a contemporary air to the pool. Light effects and reflective surfaces strengthen this futuristic aesthetic.

Cultural and Historical References: Local culture and history are emphasized in the design with motifs and ornaments.

These elements reflect the identity of the region where the pool is located and give the space a unique character (Figure 12).



Figure 12. Designs according to aesthetics and concepts-1 (Source: Author)

Artistic and Decorative Features: Sculptures, mosaics and specially designed coatings used around the pool increase the aesthetic appeal of the space. The decorative elements not only add visual richness, but also offer an artistic experience.

Design Reflecting Period Style: The design is inspired by ancient architectural styles that combine the elegance of the past with modern architecture. This style allows the pool to be perceived as a timeless space. As a result, the findings have made the urban pool an aesthetically rich and user-friendly space (Figure 13).



Figure 13. Designs according to aesthetics and concepts-2 (Source: Author)

3.5. Scope and Scale

The concepts of scope and scale determine the details at different levels in design projects and the effects of the details on the space. Large-scale,

medium-scale and small-scale designs add various layers to the project and ensure that the space is addressed with a holistic approach.

Large-scale Designs: Large-scale designs cover the general layout plan and the general organization of the space. At this stage, the location of the pool in the city, its relationship with its surroundings and the main lines that direct the user flow are determined. Some elements such as large green areas and transportation routes are included in this scope.

Medium-scale Designs: Medium-scale designs include the structural details of the pool and its immediate surroundings. The interior arrangements of the pool, surrounding walkways, rest areas and landscape elements are designed at this stage. Recommended designs cover the elements that directly affect the user experience.

Small-scale Designs: Small-scale designs focus on the fine details of the space. The furniture, planting, flooring materials and decorative objects around the pool are considered within this scope. Designs shape the character of the space and the individual experiences of the users. As a result, designs from large scale to small scale provide a comprehensive and detailed treatment of the project. Each scale contributes to the project and provides a rich experience for the user (Figure 14).



Figure 14. Designs according to scope and scale (Source: Author)

4. Conclusion and Suggestions

In this study, the contributions of public swimming pools on the urban community and individuals are discussed. Public swimming pools are recognised as important places for people to engage in physical activity, relaxation and socialisation. The reinvention of pools requires a balanced combination of landscape aesthetics and recreational opportunities. In this way, public swimming pools can become sustainable and enjoyable places that support people's physical and mental health. Studies by Putnam (2000), and also Cattell (2001), have shown that social participation has positive effects on the mental health of individuals and acts as a buffer against the problems of modern life such as loneliness. Barton & Pretty (2010), stated that the impact of public speed pools on social health, especially the mental health of the elderly, is positive. Bowling & Stafford

(2007), identified the potential of social spaces such as public swimming pools to reduce social isolation and increase social inhibition in elderly individuals. This has demonstrated the appeal of public swimming pools to a wide range of people and their contribution to sociality. City public swimming pools not only support individual health but also enrich the social fabric of a community. Furthermore, aesthetically appealing and modern designs can attract more users to the pools, contributing to making these facilities more economically sustainable. High visitor numbers can both generate direct income and encourage the development of surrounding commercial areas. This will have a positive impact on the local economy around the pools, contributing to regional development. Futuristic designs will increase the attractiveness of cities in terms of aesthetics, while economically offering a sustainable and profitable model in the long term. Considering all, it is understood that public swimming pools should be considered as an important social resource not only as sports and recreation areas, but also as an important social resource due to their contribution to the general health and social integrity of a society. As a result, futuristic design approaches can increase the aesthetic, economic, social and recreational value of public swimming pools, making them indispensable elements of modern urban life. While contributing to the architectural identity of cities in terms of aesthetics, it will create more modern and pleasant cities with sustainable and innovative technologies. Therefore, the recreational value of public swimming pools is not limited to physical activities only, but also provides significant contributions to social interaction, mental relaxation and overall quality of life. Therefore, managing such facilities with a more inclusive, accessible and user-

centered approach will support community health and well-being. These structures need to include many dynamics for more effective and active use. Public swimming pools need to be transformed into multifunctional areas that support not only swimming activities but also different recreational activities. Creating areas suitable for group activities such as yoga and water aerobics will encourage users to participate in more diverse recreational activities. In order to increase the value of these pools as social interaction areas, the design of the seating, resting and socializing areas should be reviewed.

Social areas supported by larger and more comfortable seating areas, cafeterias and green areas will make the time spent by the users in the pool more enjoyable. In order to prevent overcrowding of the pools, capacity limitations and usage arrangements should be made according to time zones. Applications such as reservation systems or special sessions for different age groups on certain days can manage the density of users more effectively. In addition to increase the recreational value of the pools, arrangements should be made according to the needs of disabled individuals and different age groups. In this context, facilitating pool access and creating special swimming hours and programs for children, the elderly and disabled individuals will allow a wider segment to benefit from these facilities. While it is not yet known what the public pools of the future will look like and how they will be used, it is agreed that there is a need for more public spaces, including swimming pools, especially in neighbourhoods without access to public transport and remote pools. Expectations and requirements such as pleasure, status, leisure, recreation, leisure time and health, which transform these artefacts into objects of

desire and cultural icons of the western world, will have to be met in the future as in the past. Jencks (2005), while discussing the aesthetic values that futuristic architecture adds to the public, states that especially public buildings and popular futuristic designs have the power to transform the architectural image of cities.

It has been important to show how public outdoor swimming pools can be designed with a futuristic style and such an aesthetic structure. Papadopoulos (2013), in his study of Zaha Hadid's fluid architecture, emphasizes that the Aquatic Center in London Olympic Park was designed with a futuristic architectural understanding and is in harmony with the modern personality of the city. Therefore, futuristic approaches should be adopted in future public swimming pool designs and should be planned in a way to provide maximum benefit both individually and socially.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

The 1st Author % 60 2nd Author % .40 contributed. There is no conflict of interest between authors.

References

- Adiv, N. (2015). Paidia meets ludus: New York City municipal pools and the infrastructure of play. *Social Science History*, 39(3), 431-452.
- Ajima, T. (2000). Patents Assigned to Rika Kogyo, Inc., U.S. Patent and Trademark Office. Access Address (12.08.2024) : <https://patents.justia.com/assignee/rika-kogyo-inc> Anonymous 2020, Nine Elms, "Sky Pool" <https://www.embassygardens.com/sky-pool/>.
- Anonymous 2024, Zakrzówek Swimming Area - Floating Pools and Beach, <https://krakow.wyborcza.pl/krakow/51,44425,31126104.htm#S.galeria-k.c-b.1-l.1.duzy>, Access Date: 21.07.2024
- Anonymous 2014, "Sunnyside Pool" <https://www.gettyimages.no/photos/sunnyside-pool>, Access Date: 15.06.2024
- Anonymous 2015, Mohenjo-daro Great Bath Diagram, <https://www.harappa.com/blog/mohenjo-daro-great-bath-diagram>, Access Date: 22.07.2024
- Anonymous 2016 Cagaloglu Turkish Bath, https://www.researchgate.net/figure/Outer-Cooling-Room-of-the-Bath-near-Psamatra-Kapousi-Thomas-Allom-1838-c-Source-IBB_fig4_310389260, Access Date: 15.06.2024.
- Anonymous 2021, New York City's "Swimmobile", 1970s, Historic Photographs, <https://www.facebook.com/HistoricPhotographs/posts/new-york-citys-swimmobile-1970s/1887272624779812/> Access Date: 21.07.2024
- Anonymous 2022, A Brief History of Swimming Pools, <https://www.worlledgeassociates.com/post/a-brief-history-of-swimming-pools> Access Date: 13.06.2024
- Anonymous 2023b , Britannica, The Editors of Encyclopaedia. "Great Bath". Encyclopedia Britannica, 2023, <https://www.britannica.com/place/Great-Bath-Mohenjo-daro> Access Date: 17.06.2024
- Anonymous 2023c, Ancient Roman Public Swimming Baths "The Great Bath" <https://www.througheternity.com/en/blog/history/bath-guide->

to-roman-baths.html,Access Date:15.06.2024

Anonymus2023,

WaterinArchitecture,https://www.archdaily.com/tag/archdailytopic2023waterinarchitecture?ad_source=monthly_article&ad_medium=bottom_link,Access Date:13.06.2024

- Aronson, M. F., Nilon, C. H., Lepczyk, C. A., Parker, T. S., Warren, P. S., Cilliers, S. S., & Zipperer, W. (2016). Hierarchical filters determine community assembly of urban species pools. *Ecology*, 97(11), 2952-2963.
- Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science & Technology*, 44(10), 3947-3955.
- Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., & Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics*, 214, 481-518.
- Beach, M. J. (2007). *Waterborne: recreational water*. In *Cryptosporidium and cryptosporidiosis* (pp. 335-370). CRC Press.
- Beanland, C. (2020). *Lido: A dip into outdoor swimming pools: the history, design and people behind them*. Batsford Books.
- Beard, A., & Paley, R. (2013). *In the water they can't see you cry: A memoir*. Simon and Schuster.
- Bellis, M., (2024). The History of Swimming Pools. Retrieved from <https://www.thoughtco.com/history-of-swimming-pools-1991658>.
- Blackman, T. I. M., Mitchell, L., Burton, E., Jenks, M., Parsons, M., Raman, S., & Williams, K. (2003). The accessibility of public spaces for people with dementia: A new priority for the 'open city'. *Disability & Society*, 18(3), 357-371.
- Boraik, M., Al-Masekh, S., Fournet, T., & Piraud-Fournet, P. (2017). *The Roman baths at Karnak, between river and temple. Architectural study and urban context*. Collective Baths in Egypt 2. New Discoveries and perspectives, B. Redon (éd.), Le Caire, 2017, p. 215-261.

- Bowling, A., & Stafford, M. (2007). How do objective and subjective assessments of neighbourhood influence social and physical functioning in older age? Findings from a British survey of ageing. *Social Science & Medicine*, 64(12), 2533-2549.
- Burchard, C. (2005). *Water House*. Prestel Publishing.
- Carmona, M. (2021). *Public places urban spaces: The Dimensions of Urban Design*. Routledge.
- Cattell, V. (2001). Poor people, poor places, and poor health: the mediating role of social networks and social capital. *Social Science & Medicine*, 52(10), 1501-1516.
- Caudwell, J. (2020). Transgender and non-binary swimming in the UK: Indoor public pool spaces and un/safety. *Frontiers in Sociology*, 5, 64.
- Cervero, R., Guerra, E., & Al, S. (2017). *Beyond mobility: Planning cities for people and places*. Island Press.
- Chen, Y., Liu, X., Gao, W., Wang, R. Y., Li, Y., & Tu, W. (2018). Emerging social media data on measuring urban park use. *Urban Forestry & Urban Greening*, 31, 130-141.
- Clemente, M. (2017). *Urban Natures for Public Spaces*. In Proceedings of the International Conference on Changing Cities III Spatial, Design, Landscape & Socio-economic Dimensions (pp. 103-113). Grafima Publishings.
- Cohen, S. (2017). *The sustainable city*. Columbia University Press.
- Colsaet, A., Laurans, Y., & Levrel, H. (2018). What drives land take and urban land expansion? A systematic review. *Land Use Policy*, 79, 339-349.
- Colwin, C. M. (2002). *Breakthrough swimming*. Human Kinetics.
- Crompton, J. L. (2001). The impact of parks on property values: A review of the empirical evidence. *Journal of Leisure Research*, 33(1), 1-31.
- Culver, L. (2010). *The Frontier of Leisure: Southern California and the shaping of modern America*. Oxford University Press.

- Dahmann, N., Wolch, J., Joassart-Marcelli, P., Reynolds, K., & Jerrett, M. (2010). The active city? Disparities in provision of urban public recreation resources. *Health & Place*, 16(3), 431-445.
- Dufour, A. P., Behymer, T. D., Cantú, R., Magnuson, M., & Wymer, L. J. (2017). Ingestion of swimming pool water by recreational swimmers. *Journal of Water and Health*, 15(3), 429-437.
- Ergin, N. (Ed.). (2011). *Bathing culture of Anatolian civilizations: architecture, history, and imagination*. Peeters.
- Foley, J. A., DeFries, R., Asner, G. P., Barford, C., Bonan, G., Carpenter, S. R., & Snyder, P. K. (2005). Global consequences of land use. *Science*, 309(5734), 570-574.
- Fuentes, J. A. (2023). *Addressing Obsolescence in Fort Worth Public pools: Enhancing Forest Park Public City Pool* (Doctoral dissertation).
- Garau, C., & Pavan, V. M. (2018). Evaluating urban quality: Indicators and assessment tools for smart sustainable cities. *Sustainability*, 10(3), 575.
- Gehl, J. (2013). *Cities for people*. Island Press.
- Gordon, I. I. D., & Inglis, S. (2009). Great lengths: the historic indoor swimming pools of Britain. (No Title).
- Greenwood, S., & Fletcher, T. (2021). Open water swimming events, social capital, and sociality. *Event Management*, 25(6), 665.
- Gutman, M. (2008). Race, place, and play: Robert Moses and the WPA swimming pools in New York City. *Journal of the Society of Architectural Historians*, 67(4), 532-561.
- Hassinger-Das, B., Bustamante, A. S., Hirsh-Pasek, K., & Golinkoff, R. M. (2018). Learning landscapes: Playing the way to learning and engagement in public spaces. *Education Sciences*, 8(2), 74.
- Hastings, D. W., Zahran, S., & Cable, S. (2006). Drowning in inequalities: Swimming and social justice. *Journal of Black Studies*, 36(6), 894-917.

- Hollands, R. G. (2020). *Will the real smart city please stand up?: Intelligent, progressive or entrepreneurial?. In The Routledge companion to smart cities.* pp. 179-199. Routledge.
- Irmak, M. A., & Avcı, B. (2019). Avrupa Yeşil Başkentlerin yeşil alan politikalarının incelenmesi. *Nevşehir Bilim ve Teknoloji Dergisi*, 8, 1-19.
- James, K. (2000). "You can feel them looking at you": The experiences of adolescent girls at swimming pools. *Journal of Leisure Research*, 32(2), 262-280.
- Jansson, M., Vogel, N., Fors, H., & Randrup, T. B. (2018). The governance of landscape management: new approaches to urban open space development. *Landscape Research*.
- Jencks, C. (2005). *The Iconic Building: The Power of Enigma*.
- Kentner, K. D. (2022). *Healthy Diversions: Swimming Venues as Working-Class Institutions of Health and Entertainment, 1890–1925* (Master's thesis, Southern New Hampshire University).
- Kirk, J. A. (2014). Going Off the Deep End: The Civil Rights Act of 1964 and the Desegregation of Little Rock's Public Swimming Pools. *The Arkansas Historical Quarterly*, 73(2), 138-163.
- Kosso, C., & Scott, A. (Eds.). (2009). *The nature and function of water, baths, bathing, and hygiene from antiquity through the Renaissance* (Vol. 11). Brill.
- Lake, J. (2012). The Aquatic Ape and the Rectangular Pit: Perceiving the Archaeology and Value of a Recreational Landscape. CHAT Organization Conference Book .University College. London, pg 41-52.https://www.academia.edu/1780921/The_Good_the_Bad_and_the_Unbuilt_Handling_the_Heritage_of_the_Recent_Past#:~:text=Heritage%20CHAT%20conference,The%202008%20Heritage%20CHAT%20conference,-was%20the%20sixth.
- Langie, K., Rybak-Niedziółka, K., & Hubačíková, V. (2022). Principles of Designing Water Elements in Urban Public Spaces. *Sustainability*, 14(11), 6877.

- Latham, A., & Layton, J. (2019). Social infrastructure and the public life of cities: Studying urban sociality and public spaces. *Geography Compass*, 13(7), e12444.
- Lees, L. (2004). The emancipatory city?: Paradoxes and possibilities.
- Lewi, H., & Phillips, C. (2013). Immersed at the water's edge: modern British and Australian seaside pools as sites of 'Good living'. *Architectural Research Quarterly*, 17(3-4), 281-291.
- Littlewood, M. (2016). A guide to building natural swimming pools. *Schiffer Publishing*.
- Liu, N., Wang, J., & Song, Y. (2019). Organization mechanisms and spatial characteristics of urban collaborative innovation networks: A case study in Hangzhou, China. *Sustainability*, 11(21), 5988.
- Love, C. (2013). *A social history of swimming in England, 1800–1918: Splashing in the Serpentine*. Routledge.
- MacKenzie, A., Pearson, L. J., & Pearson, C. J. (2019). A framework for governance of public green spaces in cities. *Landscape Research*.
- Madanipour, A. (2003). *Public and private spaces of the city*. Routledge.
- Malkoç True, E., Kılıçaslan, D. Ç., Deniz, B., Kenanoğlu, Z., & Özeren Alkan, M. (2021). Kent içi su sistemleri ve restorasyon örnekleri. In Ö. Demirel & E. Düzgüneş (Eds.), *Peyzaj Araştırmaları-I* (pp. xx-xx). Livre de Lyon.
- Manderscheid, H. (2000). *The water management of Greek and Roman baths*. In *Handbook of ancient water technology* (pp. 467-535). Brill.
- Mc Lachlan, F. H. (2012). *Poolspace: A deconstruction and reconfiguration of public swimming pools* (Doctoral dissertation, University of Otago).
- Miniotaite, R. (2016). Evaluation of The Optimal Engineering Solution for Swimming Pool Construction. Access Adress (15.09.2024) : https://scholar.googleusercontent.com/scholar?q=cache:qUtMqcZUvqUJ:scholar.google.com/+Swimming+Pools:+Structural+Design+and+Rehabilitation&hl=tr&as_sdt=0,5.

- Mjagkij, N. (2007). *Contested Waters: A Social History of Swimming Pools in America*.
- Murphy, D. (2022). *Last futures: nature, technology and the end of architecture*. Verso Books.
- O'Neill, J., & Wagner, N. (2022). *Leisure for the Modern Citizen: Swimming in Singapore*.
- Papadopoulos, A. (2013). Zaha Hadid's fluid architecture: A study of dynamic form. *Architectural Review*, 142(5), 12-17.
- Pearson, C. (2020). *The Architecture of Bathing: Body, Landscape, Art*. MIT Press.
- Perkins, P.H. (2000). *Swimming Pools: Design and Construction*, Fourth Edition (4th ed.). CRC Press. <https://doi.org/10.4324/9780203477885>
- Pick, R. (2010). *The Development Of Baths And Pools In America, 1800-1940, With Emphasis On Standards And Practices For Indoor Pools, 1910-1940*.
- Puech, M. C., McAnulty, J. M., Lesjak, M., Shaw, N., Heron, L., & Watson, J. M. (2001). A statewide outbreak of cryptosporidiosis in New South Wales associated with swimming at public pools. *Epidemiology & Infection*, 126(3), 389-396.
- Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Touchstone.
- Romisher, J. (2019). *The Jim Crow North: Segregation and Agency in New Jersey Beaches and Swimming Pools*. Past Tense.
- Ruban, L. (2018). Principles of architectural and landscape design of water areas. *Technical Transactions*, 115(6), 29-40.
- Salvati, L., & Zambon, I. (2018). *Swimming pools: A landmark of sprawl. Mediterranean urbanity, landscape architecture and social issues* (pp. 1-195). Nova Science Publishers, Inc..
- Sandeva, V., & Despot, K. (2015). *Composition of futurism in landscape architecture*. In 15th International Scientific Conference Vsu 2015 (Vol. 3, No. 3, pp. 23-28).

- Schets, F. M., Schijven, J. F., & de Roda Husman, A. M. (2011). Exposure assessment for swimmers in bathing waters and swimming pools. *Water Research*, 45(7), 2392-2400.
- Sibley, M. (2007). The Pre-Ottoman Public Baths of Damascus and Their Survival Into the 21 St Century: An Analytical Survey. *Journal of Architectural and Planning Research*, 271-288.
- Sim, D. (2019). *Soft city: building density for everyday life*. Island Press.
- Smith, P. C. (2012). Reflections in the water: Society and recreational facilities, a case study of public swimming pools in Mississippi. *Southeastern Geographer*, 52(1), 39-54.
- Sørensen, E., & Torfing, J. (2018). Co-initiation of collaborative innovation in urban spaces. *Urban Affairs Review*, 54(2), 388-418.
- Talen, E. (2010). The spatial logic of parks. *Journal of Urban Design*, 15(4), 473-491.
- Tannenbaum, L. (2017). 7 Soaking in architecture. *Architecture and the Body, Science and Culture*. Access Address (12.08.2024):[https://books.google.com.tr/books?hl=tr&lr=&id=59YrDwAAQBAJ&oi=fnd&pg=PT223&dq=Tannenbaum,+L.+\(2017\).+7+Soaking+in+architecture.+Architecture+and+the+Body,+Science+and+Culture.&ots=Cp1UrCZ0V6&sig=3YaTCQ4siTGPITjb0L00XCknHi0&redir_esc=y#v=onepage&q&f=false](https://books.google.com.tr/books?hl=tr&lr=&id=59YrDwAAQBAJ&oi=fnd&pg=PT223&dq=Tannenbaum,+L.+(2017).+7+Soaking+in+architecture.+Architecture+and+the+Body,+Science+and+Culture.&ots=Cp1UrCZ0V6&sig=3YaTCQ4siTGPITjb0L00XCknHi0&redir_esc=y#v=onepage&q&f=false).
- Tchikine, A. (2018). "When in Rome," *Places Journal*,. Access Adress (10.09.2024) : <https://doi.org/10.22269/180710>.
- Tóth-Pál, E. (2024). Water is life : A Comparative Sustainability Analyses of Natural and Conventional Chlorinated Swimming Pools in Hungary and Sweden, Epsilon Archive for Student Projects, <https://stud.epsilon.slu.se/20305/>.
- Trümper, M. (2018). *Swimming Pools and Water Management in the Eastern Mediterranean World of the 4th to 1st Century BC., Water Management in Ancient Civilizations*, ISBN (print): 978-3-981836967, <https://refubium.fuberlin.de/handle/fub188/23838>.
- Tungate, M. (2009). *Luxury world: the past, present and future of luxury brands*. Kogan Page Publishers.

- Tunnard, C. (2014). *Gardens in the modern landscape: a facsimile of the revised 1948 edition*. University of Pennsylvania Press.
- Vidal, M., Domene, E., & Saurí, D. (2011). Changing geographies of water-related consumption: residential swimming pools in suburban Barcelona. *Area*, 43(1), 67-75.
- Von Schnurbein, G., Potluka, O., & Mayer, A. (2023). Creating social innovation in urban development through collaborative processes. *Innovation: The European Journal of Social Science Research*, 36(2), 316-332.
- Wade, B. (1998). Making a splash in local recreation. *American City & County*, 113(10), 20-29.
- Wiltse, J. (2003). *Contested waters: A history of swimming pools in America*. Brandeis University.
- Wiltse, J. (2014). The Black–White swimming disparity in America: A deadly legacy of swimming pool discrimination. *Journal of Sport and Social Issues*, 38(4), 366-389.
- Woolley, H. (2003). *Urban open spaces*. Taylor & Francis., Leminen, S., Rajahonka, M., Westerlund, M., & Hossain, M. (2021). Collaborative innovation for sustainability in Nordic cities. *Journal of Cleaner Production*, 328, 129549.
- Wridt, P. J. (2004). An historical analysis of young people's use of public space, parks and playgrounds in New York City. *Children Youth and Environments*, 14(1), 86-106.
- Yegül, F. K. (2013). *Development of baths and public bathing during the Roman republic*. A Companion to the Archaeology of the Roman Republic, 13-32.
- Zambon, I., Sabbi, A., Schuetze, T., & Salvati, L. (2015). Exploring forest ‘fringescape’: Urban growth, society and swimming pools as a sprawl landmark in coastal Rome. *Rendiconti Lincei*, 26, 159-168.

Dr. Başak AYTATLI

E-mail: bashakayt@gmail.com

Educational Status: Doctorate

Professional experiences: Research Assistant

Dr. Elif ÖNAL

E-mail: elif.onal@atauni.edu.tr

Educational Status: Doctorate

Professional experiences: Doctor Lecturer

Outdoor Recreational Space Design Considerations for Children with Atypical Sensory Processing Features: A Case of Autism Spectrum Disorder

Nagehan SEVEN ¹ 

¹Ankara University, Graduate School of Natural and Applied Sciences,
Faculty of Agriculture, Department of Landscape Architecture,
Ankara/Türkiye
ORCID: 0000-0002-6239-9382
e-mail: sevens@ankara.edu.tr

Prof. Dr. H. İlkden TAZEBAY ALLIBE ² 

²Ankara University, Faculty of Agriculture, Department of Landscape
Architecture Ankara/Türkiye.
ORCID: 0000-0002-8286-6574
e-mail: tazebay@ankara.edu.tr

Citation : Seven N. & Tazebay Allibe İ. (2024). Outdoor Recreational Space Design Considerations for Children with Atypical Sensory Processing Features: A Case of Autism Spectrum Disorder. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter :14, 342-367. ISBN : 978-625-367-855-5. Iksad Publications. DOI : <https://doi.org/10.5281/zenodo.13886974>

1. Introduction

Humans interact with their environment through sensory processing. Sensory processing describes how sensory stimuli are received and interpreted. In sensory-based processes, environmental information is perceived and processed by the system. Processing refers to organizing and appropriately sensory stimuli from the environment and one's body to develop adaptive responses to the environment. Nevertheless, there may be differences in the processing of sensory information between individuals. These sensory differences can affect an individual's perception of the environment, emotions, or behaviours. This leads to atypical perceptual experiences, which usually refer to the impairment of senses such as sight, hearing, taste, touch, smell, and/or spatial awareness, and can lead to high anxiety.

Atypical sensory processing is one of the main topics of Autism Spectrum Disorder (ASD) research. In the field of psychiatry, publication by the American Psychiatric Association (APA) for the classification of mental disorders, “The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)” recognizes sensory features as a diagnostic criterion for ASD. DSM-5 considers atypical sensory features of ASD patients as hypersensitivity, hyporeactivity, or hyposensitivity to sensory input.

In the field of architectural design and ASD, an increasing number of theories have focused on the sensory perceptions of children. In this context, a widely accepted “Sensory Design Theory” is developed by Magda Mostafa in 2008 for indoor spaces. The theory is based on the concept of the sensory environment as a major player in perception and

behavioural development. This theory argues that spaces should be designed to help children with ASD. The goal is to provide users with ASD with tools to manage their senses to alleviate sensory overload and create opportunities for learning, social interaction, and general skill development.

In addition to indoor spaces, outdoor recreation spaces offer various opportunities, alternatives, and benefits to children with ASD. Sensory sensitive and stimulative outdoor space design can effectively establish the connection between the child's inner world and the environment. This can be mentally and physically restorative and create opportunities for cognitive and sensory development, communication, and social and motor skills.

In this chapter, the sensory systems involved in sensory processing in ASD, which are auditory, visual, olfactory, tactile, proprioception, and vestibular, will be examined separately for children with ASD diagnosed in two diverse groups hypersensitive and hyposensitive. The senses and their role in outdoor recreation space design will be examined in the context of atypical sensory processing outdoor recreation space design considerations for hypersensitive and hyposensitive children with ASD will be presented. In outdoor recreation space design for ASD both hard and soft landscapes play crucial roles in creating accessible and engaging environments. The interplay between hard and soft landscapes is vital in creating an inclusive environment that caters to the diverse needs of individuals with ASD. By incorporating design considerations, from the perspective of landscape design, children with ASD can fully participate and benefit from outdoor activities and play. In essence, by fostering a

culture of sensory awareness and inclusivity, outdoor recreation spaces can become enriching and empowering environments where children with ASD and other sensory differences can thrive, play, and connect with the surrounding environment.

2. Atypical Sensory Processing in Children with ASD

To perceive, interact, and engage with the environment, the sensory system must perceive and process sensory information. This process is known as “sensory processing”. Nevertheless, some individuals’ brains process sensory stimuli differently. This is called “atypical sensory processing”.

Atypical sensory processing was first described by Dr. A. Jean Ayres in 1972. Following the work, she conducted with children who have learning disabilities. According to Ayres, the main characteristic of atypical sensory processing is difficulty in managing and controlling sensory stimuli. The lack of proper processing of multisensory input leads to significant performance issues that hinder optimal functioning and cause environmental conflicts (Mueller & Tronick, 2020).

“Ayres proposed that sensory systems do not develop independently of one another; rather, visual, and auditory processing depends on foundational body-centred senses (Ayres, 1972a, 1972b, 1972c, 1972d). According to Ayres, sensory information is not processed in isolation and given this essential feature of the central nervous system, the therapeutic intervention that incorporates sensation to affect multisensory perception will influence learning and behaviour” (Roley et. all, 2007).

Sensory difficulties are a typical occurrence in ASD and have been well documented in the literature, particularly in children with ASD (McCormick et al., 2016; Ohannesson et al., 2021; Gentil-Gutiérrez et al.,

2021; Randell et al., 2022). “In 1948, Leo Kanner definitively described ASD as a syndrome of social communication deficits combined with repetitive and stereotyped behaviours, with an onset in early childhood. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) considers ASD as a neurodevelopmental disorder. For DSM-5, the essential features of autism spectrum disorder are, social-communication and social-interactive deficits and restricted, repetitive behaviours, interests, and activities” (Anonymus, 2014).

Unlike its earlier editions, DSM-5 recognizes sensory features as a diagnostic criterion for ASD. The DSM-5 evaluates the atypical sensory features of individuals with ASD as hypersensitivity, hyporeactivity, or hyposensitivity to sensory input. These atypical sensory features are defined as "showing unusually high or low levels of response to sensory inputs or exhibiting an unusual interest in aspects of the environment (e.g. indifference to pain/temperature, adverse reactions to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movements)" (Anonymous, 2014, Morimoto et al., 2021). These individuals have difficulty processing and responding to sensory information in their daily lives.

Although there are significant differences between children with ASD, what seems common to all children on the spectrum is their atypical behavioural responses to sensory information. Recent studies have mentioned that people exhibit atypical perceptual and information processing in auditory, visual, and tactile areas (Morimoto et al., 2021). More than 96% of children with ASD report hypersensitivities in multiple domains. Like communication and social deficits, the severity of the

spectrum ranges from mild to severe for sensory behavioural differences, which may persist into adulthood (Marco et al., 2011).

As stated by Bal (2023) different stimuli are received from various sources and these stimuli are converted into electrochemical signals of the nervous system (Cushwa, 2015). Although the sensory systems associated with these senses are quite different, they all share a standard function. This function responds to a stimulus (such as light, sound, or the body's position) and converts it into an electrical signal in the system.

Most atypical sensory experiences in children with ASD are believed to be caused by an inability to properly filter or process simultaneous visual, auditory, and tactile input channels. A child with ASD may have difficulty interpreting and organizing the input of objects they see, taste, touch, hear, and smell. Sensory perception can become frightening and even painful, leading to severe anxiety. They can be oversensitive or undersensitive to sensory stimuli (Bal, 2023). It has been seen that recently more studies in the field of ASD have focused on the sensory perceptions of children with ASD.

According to Devein and Terzi (2023), the correct processing of sensory stimuli in the central nervous system shapes perception, behaviour, and learning. Otherwise, inappropriate reactions will occur (Emmons & Anderson, 2005; Zimmer & Resch, 2012). Because sensory information is a part of social and cognitive functions at elevated levels, atypical sensory processes in children with ASD are important for characterizing and understanding autism (Morimoto et al., 2021).

Designing spaces where children feel comfortable is an important part of this process, while educational and psychological support is provided to

overcome sensory difficulties. Outdoor recreational spaces designed with sensory stimuli can increase focus and attention, reduce anxiety, and improve quality of life.

The seven sensory systems associated with sensory processing in ASD are, auditory (hearing), visual (vision), olfactory (smell), tactile (touch), proprioception (spatial), vestibular (balance), and gustatory (taste). In this regard, the sensory systems, functions related to outdoor recreational space design (ORSD), and sensory features of hyposensitive and hypersensitive children with ASD are summarized in Table 1.

Table1. Sensory System Functions and Features Related to Autism Spectrum Disorder prepared with reference to Gaines et al., (2016), Mueller&Tronick (2020), Kyriacou, Jones et al., (2021), Deveci M.& Terzi D. (2023), Finnigan (2023).

SENSORY SYSTEMS AND FUNCTIONS RELATED TO ORSD	SENSORY FEATURE	
	Hyposensitive Child	Hypersensitive Child
AUDITORY Interpretation and interaction with the environment	Sign: Lack of sound stimulation by sounds Impact: Individuals seek to obtain more sensory input from the environment	Sign: Overly sensitive to sound Impact: Dislikes noisy environments
VISUAL Defining distance size, shape& colour	Sign: Struggles to recognize subtle differences in visual elements and seeks out more visual stimuli. Impact: Observing only the outlines of certain objects, Enjoy bright, reflective, or rotating objects or lights, Inability to distinguish shape-ground relationship	Sign: Hypersensitivity to visual input Impact: Avoid bright lights and visually overwhelming environments. Problem with perceiving distance and depth. Reacting to the appearance of certain objects or colours
OLFACTORY Arousal of positive or negative emotions, memories Detection of potential hazards	Sign: Smells everything Impact: Dangerous and unhygienic practices	Sign: Negative reactions to smell Impact: Avoiding certain places

<p>TACTILE Establish social connections, Correct response to stimuli, Interacting with the environment, Developing trust and sense of attachment</p>	<p>Sign: Disliking crowds. Difficulty standing in line or sitting in a group. Impact: Avoiding crowds and public places Lack of concept of personal space</p>	<p>Sign: Lack of response to pain, the tendency to avoid being touched and to display a preference for certain textures in objects. Impact: Delayed development of fine motor skills, self-care skills, and play. Difficulties in social communication Avoid tasks that involve a certain degree of tactile engagement, such as working with clay, playing with water, or painting.</p>
<p>PROPRIOCEPTION Perceive the location, movement, and action of body parts, Control of the movement, Internal sense of body awareness</p>	<p>Sign: Poor spatial awareness, unaware of obstacles along the pathway, difficulty moving. Struggles with activities that require spatial awareness for example puzzles, copying models, and building blocks. Impact: Avoidance of physical activity: may be seen mostly when sitting. Appear floppy, leaning against people, furniture, and walls. Bumping into objects and people, often stumble, and tend to fall, have poor grip.</p>	<p>Sign: It may appear clumsy when moving. May have difficulty with fine motor skills. Impact: Enjoys rough play yet may engage in excessive roughness with others. Maintains the body in odd positions and may have difficulty handling small objects.</p>
<p>VESTIBULAR Transmission of balance-related information from the joint, eye, and body to the central nervous system, Perception of body parts position in space</p>	<p>Sign: Seeking intense experiences of movement; whirling, jumping, spinning, crashing, being upside down, and running. Struggles to sit still. Impact: Difficulty concentrating due to constant seeking of vestibular input Difficulty in planning and processing motor tasks (dyspraxia), sequencing and balance problems.</p>	<p>Sign: Fearful reactions to ordinary movements. Difficulty climbing or descending stairs or hills. Apprehensive about walking on uneven surfaces. Impact: Avoiding physical activity Difficulty walking on different surfaces, Walking close to a wall or holding on to supports such as railings.</p>

3. Outdoor Recreation and Children with ASD

ASD is characterized by atypical cognitive, social, emotional, and perceptual functioning. Recent studies have reported that children with ASD exhibit atypical perceptual and information processing in auditory, visual, and tactile domains (Morimoto et al., 2021). Sensory processing describes how sensory stimuli are received and interpreted. In a sensory-based process, sensory system perceives and processed environmental information information.

Studies on children with ASD have shown that outdoor recreational activities may increase mental and physical health in addition to the social and emotional benefits of connecting with nature. many benefits. Chang and Chang (2010) conducted a study by interviewing teachers, parents, and volunteers, and the basic benefits mentioned included physical activity, social interactions, and communication. In another study, Gaines et al., (2016) identified the positive effects of outdoor recreational activities as; social engagement, cultural and collective meaning, relaxation and psychological restoration, visual and auditory privacy when needed; movement between interaction and solitude, learning and knowledge sharing, connection with nature and natural processes, sensory variability, nature-like sound levels, interesting visual environment with aesthetic integrity, wayfinding and making sense, exercise, sense of equality. In this context, the positive effects of outdoor recreational activities on children with ASD were identified (Table 2).

Table 2. Positive effects of outdoor recreational activities in children with ASD

POSITIVE EFFECTS OF OUTDOOR RECREATIONAL ACTIVITIES IN CHILDREN WITH ASD	
Development of Physical and Motor Skills	Improved physical and mental health. Improved body coordination (Chung & Chung 2010). Encouraged activities such as walking, cycling, etc. (Gaines et al., 2016). Improved motor skills, coordination, balance, muscle strength, and sense of well-being and self-confidence.
Applied Learning	Opportunities for hands-on learning in nature. Experiential learning by observing natural features. Learning the sounds, colours, textures, visuals, and tastes (Gaines et al., 2016). Experiencing shape, form, texture, and pattern in nature (Gaines et al., 2016).
Reducing Autistic Behaviour, Emotional Regulation	Reduced stress and anxiety levels. (Calming effect for children with ASD who may have difficulty with social interaction and communication or sensory sensitivities). Regulation of emotions and behaviours. (The calming effect of nature, combined with physical activity and sensory stimulation, can support emotional resilience and behavioural challenges. This helps to reduce autistic behaviours). Reduction of repetitive behaviors. (Chung & Chung 2010).
Social Skills and Social Interactions Development	Opportunities for social interaction and skill development. A supportive environment for learning and developing social skills. Increased language and communication skills (Chung & Chung 2010).
Sensory Stimulation	The reduced reaction to certain sensitive situations through learned sensory stimulation (Chung & Chung 2010). Rich sensory experiences that can have both calming and stimulating effects. (The natural sights, sounds, textures, and smells in outdoor environments offer a variety of sensory landscapes that can help regulate sensory processing and help relaxation).

Designing outdoor recreational areas as sensory sensitive allows individuals with atypical functions to fully benefit from the outdoor recreational area. For this reason, recreational areas should be evaluated by sensory systems to design these areas as sensory sensitive. As reported

by Türer&Köse (2023), sensory systems consist of many subunits such as auditory, visual, gustatory (taste), olfactory (smell), somatosensory (touch, proprioceptive), vestibular, interoceptive (senses involved in the regulation of internal functions such as hunger, digestion, heart rate, respiration) systems (Camarata et al.,2020). Jovellar-Isiegas et al., (2020) stated that for the individual to develop proper and harmonious responses to the environment, he/she should be able to organize and integrate sensory stimuli from the environment and his/her body appropriately (Türer & Köse, 2023). Karakaş (2017) defines the sensory system in the Psychology Dictionary as a sensation-specific system that starts from sensory organs and their receptors and ends by passing through various centres and pathways. He explained that each type of sensation is processed by its distinct system, and it is through the functioning of these systems that we experience specific sensory information from our sensory organs.

4. Sensory Considerations in Outdoor Recreational Space Design

Children with ASD can benefit greatly from sensory experiences that connect them to the environment around them, thereby establishing a connection between the child's inner world and the environment.

Outdoor recreational spaces designed with natural elements provide sensory stimulation. Designs that consider sensory sensitivities can create a restorative and stimulating environment for children with ASD so they can explore and develop various skills and be mentally and physically restorative. Exploring sensory stimuli in outdoor spaces and recreational activities may help develop cognitive, sensory, social, motor, and communication skills.

Mostafa M. (2021), in her “University Design Guide for Individuals with ASD”, recommends that the spatial hierarchy of architectural spaces should be integrated with nature. The design of architectural spaces integrated with nature has led to the opinion that learning is positively affected when exposed to natural environments. It was also suggested to use natural features with multi-sensory qualities such as water, aromatic gardens, and textural natural materials as landscape elements. These elements will not only help with environmental control but also provide important therapeutic multisensory input opportunities for users with ASD.

By enhancing sensory experiences in outdoor recreational space design, such as the acoustics of the natural space, the sounds of nature, visual perception, the sense of smell through associative connection with space, memory, and experience, the sense of touch through the experience of touching and feeling the elements in space, the sense of proprioception and spatial awareness through activities such as climbing, running, and the vestibular sense through games related to movement and balance in a natural environment in outdoor spaces is an important aspect of creating engaging and fulfilling recreational spaces.

Designing outdoor spaces for children with sensory sensitivities involves addressing both hyposensitivity and hypersensitivity to various sensory stimuli. Children with hyposensitivity may seek out intense sensory experiences while children with hypersensitivity may become overwhelmed by intense or unexpected sensory stimuli. The sensory design considerations for children with ASD involve calming strategies for the hypersensitive group and stimulating strategies for the hyposensitive

group, addressing their auditory, visual, olfactory, tactile proprioceptive and vestibular systems. Nevertheless, certain design considerations can apply to both groups. The following are some recommendations:

4.1. Auditory System

Many children diagnosed with ASD have auditory sensitivities. Children hypersensitive to sensory input often do not notice auditory stimuli while hypersensitive children notice auditory stimuli at intensity levels which may cause sensory overload. As stated by Wilson et al., (2017), for individuals experiencing sensory overload, everyday sounds can become unpleasant and overwhelming, potentially resulting in poor emotional and social regulation (Goncalves & Monteiro, 2023).

Kaymaz et al. (2013), World Health Organization has defined 50 dB and below as the right sound level in outdoor living spaces (Kang 2007). For children with ASD, it has been reported that sound levels below 55 dB are associated with a decrease in negative behaviours, whereas between 55 and 70 dB, negative behaviours increase (Mostafa M, 2021; Decroches 2014). For children with ASD, nature sounds can have calming and therapeutic effects. Birdsong, flowing water, rain, wind, and rustling leaves can provide a pleasant auditory experience. Sensory overload in outdoor environments is, often caused by background noises traffic sounds, construction noise, and crowds maybe significant sources of sensory overload. Recommendations for the design of outdoor recreational areas for auditory features are given in Table 3.

Table 3. Outdoor Recreational Space Design Considerations for ASD-
Auditory Features

ORSD CONSIDERATIONS FOR AUDITORY FEATURES	
To Stimulate Hyposensitive Child	To Calm Hypersensitive Child
<p>Involve the sounds of waterfalls, birds etc. in your design concept. Avoid the potential dangers by implementing clear and informative warning signs, symbols, or colour codes.</p>	<p>Use noise barriers such as natural or structural sound barriers to reduce noise. Allow distraction in enclosed escape areas. Create a safe and supportive environment for children who may exhibit anxiety and fluttering for immediate safety concerns and to contribute to a calming atmosphere (soft ground coverings, rounded surfaces etc.)</p>
<p>Common Considerations: Use colours and signage at the transition to places to ease sensory regulation. Segment high and low auditory stimulus zones with transition areas for sensory regulation. Use colours and signage at the transition to places to ease sensory regulation.</p>	

4.2. Visual System

Outdoor spaces are rich with elements that stimulate the visual sense, enriched by a diverse array of colours, textures, patterns, and shapes. Although outdoor spaces contribute positively to neurotypical individuals with this visual diversity, according to Gaines et al., (2016), they can create challenges for atypical individuals particularly those with visual sensitivity. The complexity of visual stimuli in outdoor settings can overwhelm these individuals, potentially leading to discomfort or adverse reactions. Gaines et al., (2016) researched the influence of various visual factors on children with ASD. Their evaluation explores a range of elements that cover visual stimuli. Including not only colour, lighting, the effects of bright light and reflection as well as spatial organization. Additionally, the study explores fundamental design principles that play a significant role in shaping the space.

Below there are some recommendations for the design of outdoor recreational areas regarding visual features (Table 4).

Table 4. Outdoor Recreational Space Design Considerations for ASD-Visual Features

ORSD CONSIDERATIONS FOR VISUAL FEATURES	
To Stimulate Hyposensitive Child	To Calm Hypersensitive Child
<p>Use vivid colours to draw attention and encourage interaction. Create spaces with visual stimuli. (varied textures and colours, contrast etc.) Use colours or textures for orientation and to support navigation and identify key areas or functions (create colour zones, visual cues, floor markings, contrasts etc.) Use bright materials or toys and play equipment to increase interest in activity areas. However, spatial organization should be carefully planned. Use imaginative-themed outdoor furniture, lighting elements or play equipment for creative play.</p>	<p>Use pastel colours for a calming environment and in escape areas to ensure comfort. Create a serene and peaceful environment by balancing vibrant colours with calming, soft features. Avoid overwhelming colour changes. Avoid using reflective materials. Consider sunlight reflection and shading solutions. Create clear, understandable, non-distracting activity areas. Avoid sharp, or abrasive materials and surfaces. Ensure the safe use of hard or coarse-textured materials. Ensure that potential dangers are recognized effectively, using warning colours and clear signage. Use LED lighting, and avoid fluorescent lamps (Tola et al., 2021).</p>

Common Considerations:

Create organized and clutter-free spaces for visual clarity, and ease of access.
 Design multi-use spaces with minimal colour and texture (Kavaz,2022), and create distinct functional zones (using subtle changes in floor levels, colour, textural changes, outdoor furniture arrangement, screening etc.).
 Create transition areas between high-stimulus and low-stimulus spaces to guide users smoothly from one environment to another.
 Divide transition areas using colours to create a visual and sensory transition to navigate between high-stimulus and low-stimulus spaces.
 Avoid complex patterns and colours.
 Create shaded areas to avoid direct to sunlight exposure.

4.3. Olfactory System

When the sense of olfaction is activated, it reaches the olfactory center of the brain and is shaped by past experiences to define olfaction. The brain

synthesizes emotions and senses and interprets the olfactory experience through memory. Just as scent evokes people, it also evokes places. Each place has a specific smell and gives information to users about the place (Gezer, 2012). In their study, Çelik & Çalışkan (2021) listed the most popular scents of users in the olfactory of the landscape as the olfactory of grass, flowers, trees, bushes, soil, and aromatic plants.

Children with ASD are either hyposensitive or hypersensitive to odours. Hypersensitive individuals may be disturbed by olfactory stimulation in which no neurotypical individual would react. Hyposensitive individuals may not react even to the strongest odours. In addition, spatial memory is also linked to olfactory sense. An activity or a place can be associated with a smell. This close neurological relationship means that smells can often trigger vivid memories of places and help in orienting and navigating environments.

According to Hussein H., (2009) remembering places through the senses, involves interpreting the environment by recognizing different sounds, smells, and textures encountered along the way. This process creates a "sensory trail," a new phenomenon like sensory gardens, designed to help individuals learn orientation and wayfinding skills. The design considerations for the olfactory elements in outdoor recreational areas for individuals with ASD are outlined in Table 5.

Table 5. Outdoor Recreational Space Design Considerations for ASD-Olfactory Features

ORSD CONSIDERATIONS FOR OLFACTORY FEATURES	
To Stimulate Hyposensitive Child	To Calm Hypersensitive Child
Use plants with strong, pleasant scents. Create sensory-rich accessible areas for olfactory stimulation. Place aromatic plants around seating or play areas for continuous stimulation.	Use plants with mild, pleasant scents. Place strong scented plants away from seating or playing areas and create buffer zones. Avoid using scented plants close to escape areas. Create scent-neutral zones. Mask the unpleasant smell (if there is one) with buffer zones.
<p>Common Considerations: Consider the wind direction when placing the fragrant plants. Promote natural airflow.</p>	

4.4. Tactile System

Research conducted by Bal (2023), highlights that the most common sensitivity in ASD is tactile sensitivity (Wiggins et al., 2009). According to Bal (2023), hypersensitive children with ASD dislike wearing certain clothes, washing their hair, and avoiding being touched and touching different surfaces (Chamak et al., 2008). In addition, these individuals often tend to avoid activities that involve significant tactile engagement, such as playing with clay, water play, hand painting, or cooking. Such activities can overwhelm their sensory systems (Gaines et al., 2016). On the contrary, hyposensitive children seek out sensory input. Outdoor recreational spaces serve as an ideal setting for both groups of children presenting a multitude of sensory opportunities. The varied texture of natural elements, including plants, stones, leaves, and flowers, create rich environments that not only foster exploration but also stimulate curiosity and facilitate learning through hands-on interaction. To enhance outdoor

recreational areas for individuals with ASD, with a focus on incorporating tactile elements, design considerations have been outlined (Table 6).

Table 6. Outdoor Recreational Space Design Considerations for ASD-Tactile Features

ORSD CONSIDERATIONS FOR TACTILE FEATURES	
To Stimulate Hyposensitive Child	To Calm Hypersensitive Child
<p>Incorporate various textures and materials into the design (natural or artificial; soft, rough, smooth, etc.).</p> <p>Design paths with different textures (gravel, sand, stone, rubber, etc.)</p> <p>Create areas to encourage tactile stimuli. Use plants, sand, and water features.</p>	<p>Use smooth, round surfaces, and avoid rough, gritty, or abrasive textures.</p> <p>Create smooth surfaces and choose materials like soft rubber or smooth wood.</p> <p>Create sensory interaction areas for a calming tactile experience. Use plants, sand, and water features.</p> <p>Create escape places using soft, comfortable materials.</p>

Common Considerations:

Avoid abrupt changes in tactile stimuli that may cause discomfort or confusion.
 Clear the boundaries of each zone. Avoid mixing textures.

4.5. Proprioception and Vestibular Systems

When perceiving space, individuals can assess the arrangement of objects and structures in their surroundings and interpret information from the entire environment. However, children with ASD, may struggle with spatial perception, experiencing difficulties with understanding their position in time and space and maintaining balance (Gaines et al. 2016).

The proprioception system provides the body the information about the location of objects. It involves the length of muscles and receptors that monitor muscle tension and pressure (Bal, 2023). Children with ASD who are hypersensitive tend to avoid activities involving jumping and rhythmic movement. On the other hand, hyposensitive children may not enjoy moving or playing. Those who are keen in this sense might seek sensory

input by engaging in activities such as kicking and touching others (Anonymous, 2024). According to Bal (2023), children with ASD who have a weak sense of proprioception struggle with understanding sensations related to body position and movement. They may have difficulty applying the right amount of pressure when using objects and encounter challenges with tasks such as turning door handles or holding objects of varying weights. Due to a lack of body awareness, they may seek visual confirmation of what their body is doing (Kranowitz, 2014).

The vestibular sense is responsible for maintaining body balance. Children with ASD who are less sensitive to this sense may not be interested in experiencing different types of movement or might not develop a self-protection reflex. They might not feel pain when they fall and may have an excessive desire for circular movements, engaging in rocking for prolonged periods (Bal, 2023). On the other hand, hypersensitive children may avoid activities that require balance, such as walking on a balance board, or cycling.

Outdoor recreational areas play a crucial role in developing proprioception and vestibular sensations in children with ASD. Outdoor activities can also significantly enhance balance and movement skills. Table 7 presents suggestions for designing outdoor recreational areas.

Table 7. Outdoor Recreational Space Design Considerations for ASD-Proprioception and Vestibular Features

ORSD CONSIDERATIONS FOR PROPRIOCEPTION AND VESTIBULAR FEATURES	
To Stimulate Hyposensitive Child	To Calm Hypersensitive Child
<p>Create active zones to challenge and stimulate movement.</p> <p>Use diverse and stimulating ground surface materials.</p> <p>Create inclined surfaces.</p> <p>Provide additional sensory stimulation.</p>	<p>Create zones that provide predictable and controlled sensory inputs.</p> <p>Use consistent and soft ground surface materials.</p> <p>Create areas to calm and minimize movement.</p> <p>Reduce additional sensory stimulation.</p>

Common Considerations:

Design for proprioception needs: provide opportunities for physical activity and motor development.

Design for vestibular needs: provide opportunities for balance, coordination, and spatial orientation.

5. Conclusion

This study examined sensory systems related to outdoor recreational area design for children with ASD. It assessed the auditory, visual, olfactory, tactile, proprioception, and vestibular sensory systems considering both hypersensitivity and hyposensitivity. The study highlighted the importance of designing spaces that are responsive to atypical sensory needs.

Designing outdoor recreational spaces by addressing atypical sensory processing and diverse needs of children with ASD, enhances the well-being of the children. By integrating natural elements into sensory design, these spaces can significantly improve the quality of interaction children have with their environment. These areas serve multiple purposes: development of physical and motor skills, facilitating hands-on learning experiences, reducing autistic behaviors, supporting emotional regulation, and providing sensory stimulation. Furthermore, promotes social skills and

interactions by creating opportunities to engage with peers in a designed setting.

When designing outdoor recreational areas for children with ASD, it is imperative to consider their sensory sensitivities. The primary objective is to create environments that stimulate hyposensitive children while providing a calming influence for those who are hypersensitive.

The recommendations presented in this chapter are designed to create inclusive environments that accommodate a wide spectrum of users. Besides, spaces that are not only physically accessible but also sensory welcoming. Ultimately, the goal is to ensure secure, enjoyable, and fulfilling experiences that support sensory and developmental needs and enhance well-being.

Acknowledgements And Information Note

This article follows national and international research and publication ethics. There was no situation requiring ethics committee approval in this study. This study was conducted at Ankara University, Graduate School of Natural and Applied Sciences, Department of Landscape Architecture, PhD degree, “Autisim Friendly Desing Deteremination of Criteria: Special Education and Rahabilitation Centres Example” from his doctoral dissertation.

Author Contribution And Conflict Of Interest Disclosure Information

All authors contributed equally to the article. The named authors have no conflict of interest.

References

- Anonymus. (2014). DSM-5 Guidebook: The Essential Companion to the Diagnostic and Statistical Manual of Mental Disorders. (E.b.Grant, Ed.) Virginia: American Psychiatric Association Publishing: Arlington, Acces Adress <https://repository.poltekkes-kaltim.ac.id/> (14.05.2024)
- Anonymus. (2024). 6. His Özel Eğitim. 6.His: Acces Adress <https://tls.tc/0vDP5> (10.05.2024)
- Bal, F. (2023). Duyu Reseptörleri ve Otizmle İlişkisi Sensory Receptors and Their Relationship with Autism. Journal of of International Psychological Counseling and Guidance Researches *Uluslararası Psikolojik Danışma ve Rehberlik Araştırmaları Dergisi*, 5(2). doi:10.47793/hp.1207870
- Chang , Y.Y. & Chang , C.-Y. (2010). *The Benefits of Outdoor Activities for Children with Autism. Unpublished Manuscript, Department of Horticulture, National Taiwan University.* Access Adress <https://www.researchgate.net> (10.05.2024)
- Çelik, A., & Çalışkan , H. (2021). Peyzaj Mimarlığı Odağında Şifa Bahçesi Konulu Bir Araştırma. *ÇOMÜ Ziraat Fakültesi Dergisi*, 2(9), 295-308.
- Deveci, M., & Terzi, D. (2023). *Otizm Spektrum Bozukluğunda Duyusal Sorunlar Ve Duyu Bütünleme Çalışmaları.* In E. D. Karabatak, In book: Eğitim ve Bilim 2023-II, 384 Access Adress <https://www.researchgate.net/> (11.05.2024)
- Finnigan, K. A. (2023). *Neuro-Inclusive Spaces: Sensory-Responsive Environments.* University of Colorado. (Master's thesis) Access Adress <https://www.proquest.com/>
- Gaines, K., Bourne, A., Pearson, M., & Kleibrink, M. (2016). *Designing For Autism Spectrum Disorders.* Routledge.
- Gentil-Gutiérrez, A., Cuesta-Gómez , J., Rodríguez-Fernández P., & González-Bernal J. (2021). Implication of the Sensory Environment in Children With Autism Spectrum Disorder: Perspectives from School. *Int J Environ Res Public Health.*, 14(18), p. 7670. doi:10.3390/ijerph18147670. Access Adress <https://www.mdpi.com/1660-4601/18/14/7670> (19.04.2024).

- Gezer, H. (2012). Mekanı Kavrama Sürecinde Algılama Bileşenleri. *İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi*(21), 1-10. Access Adress <https://www.proquest.com/> (15.05.2024).
- Goncalves, A., & Monteiro, P. (2023). Autism Spectrum Disorder and Auditory Sensory Alterations: A Systematic Review on the Integrity of Cognitive and Neuronal Functions Related to Auditory Processing. *Journal of Neural Transmission*, 3(130), 325-408. Access Adress <https://link.springer.com/> (05.05.2024)
- Hussein, H. (2009). Sensory Garden in Special Schools: The Issues, Design and Use. *Journal of Design and Built Environment*, 1(5), 77-95. Access Adress <https://ajba.um.edu.my/index.php/jdbe/article/view/4974>
- Karakaş, S. (2017). Prof. Dr. Sirel Karakaş Psikoloji Sözlüğü Access Adress <https://www.psikolojisozlugu.com/> (11.04.2024)
- Kavaz, M. (2022). Parents' View on Accessible School Design for Individuals with Autism Spectrum Disorder (ASD). *International Journal of Innovative Engineering Applications*, 1(6), 129-137.
- Kyriacou C, Forrester-Jones R,& Triantafyllopoulou P. Clothes,. (2023) Sensory Experiences, and Autism: Is Wearing the Right Fabric Important *Autism Dev Disord*. 53(4):1495-1508. doi: 10.1007/s10803-021-05140-3.
- Marco, E., Hinkley, L.,Tepesi S.,& Nagarajan S.S. (2011). Sensory Processing in Autism: A Review of Neurophysiologic Findings. *Pediatr Res* 69, 48–54 Access Adress <https://doi.org/10.1203/PDR.0b013e3182130c54> (11.04.2024)
- McCormick, C., Hepburn, S., Young,, G., & Rogers, S. (2016). Sensory Symptoms in Children With Autism Spectrum Disorder, Other Developmental Disorders and Typical Development: A Longitudinal Study. *Autism*, 5(20), 572-579.
- Mostafa, M. (2021). *The Autism Friendly University Design Guide*. Autism Friendly DCU, Published by Autism Friendly DCU of Dublin City University, Ireland. Access Adress <https://www.researchgate.net/>(01.04.2024)

- Mueller, I., & Tronick, E. (2020). *Sensory Processing and Meaning-Making in Autism Spectrum Disorder*. In book *Autism 360°*, 255-267. Access Address <https://www.elsevier.com> (01.04.2024)
- Ohannesson B, Mitchell V&Schoen S.A (2021) The Experience of Children with Sensory Over-responsivity. *J Child Dev Disord*.7 No.7 Acces Adress <https://childhood-developmental-disorders.imedpub.com/> (12.04.2024)
- Randell , E., Wright , M., Milosevic , S., Gillespie , D., Brookes-Howell , L., & Busse-Morris , M. (2022). Sensory İntegration Therapy For Children With Autism and Sensory Processing Difficulties: The Senita RCT. *Health Technol Assess*, 26(29). Acces Adress <https://orca.cardiff.ac.uk/id/eprint/151436/> (15.04.2024)
- Roley, S., Mailloux, Z., & Miller, K. (2007). Understanding Ayres Sensory İntegration. *OT Practice*, 7(12) Acces Adress https://digitalcommons.sacredheart.edu/ot_fac/15/ (10.05.2024)
- Tola G, Talu V, Congiu T, Bain P, & Lindert J. (2021) Built Environment Design and People with Autism Spectrum Disorder (ASD): A Scoping Review. *Int J Environ Res Public Health*. 19;18(6):3203. doi:10.3390/ijerph18063203 Acces Adress <https://www.mdpi.com/1660-4601/18/6/3203> (01.05.2024)
- Türer, F., & Köse, S. (2023). Nörogelişimsel Bozukluklar ve Duyusal İşleme. *Turkish Journal of Child & Adolescent Mental Health*, 2(30). Acces Adress <https://openurl.ebsco.com/> (12.04.2024)

Nagehan SEVEN

e-mail: nagehandundar022@gmail.com

Educational Status: Doctorate (Ph.D.) Student

License: Suleyman Demirel University Department of Landscape Architecture

Degree: Bachelor of Science (BSc)

Doctorate: Ankara University, Graduate School of Natural and Applied Sciences, Landscape Architecture

Prof.Dr. H. İlksen TAZEBAY ALLIBE

e-mail : tazebay@ankara.edu.tr

Educational Status: Doctorate Degree (Ph.D.)

License: Ankara University Department of Landscape Architecture
Landscape Architecture

Degree: Bachelor of Science (BSc)

Doctorate: Ankara University, Graduate School of Natural and Applied Sciences

Evaluation of Planning and Design Principles for Hospital Gardens in İzmir and Sustainable Design Recommendations

Dr. Lecturer Meltem GÜNEŞ TİGEN ¹ 

¹Tekirdağ Namık Kemal University, Faculty of Fine Arts, Design and
Architecture, Department of Landscape Architecture, Değirmenaltı
Campus, Tekirdağ/Türkiye.
ORCID: 0000-0001-5487-5548
E-mail: mgunes@nku.edu.tr

Emeritus Prof. Dr. Bahar TÜRKYILMAZ ² 

²Ege University, Faculty of Agriculture, Department of Landscape
Architecture, İzmir/Türkiye
E-mail: baharturkyilmaztahta@gmail.com

Citation: Güneş Tigen, M. & Türkyılmaz, B. (2024). Evaluation of Planning and Design Principles for Hospital Gardens in İzmir and Sustainable Design Recommendations. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:15, 368-403. ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13887070>

1. Introduction

1.1. Overview of Healthcare Services and Hospital Design

Healthcare encompasses a broad range of medical services designed to eliminate harmful factors affecting human health, support community recovery and protection, treat patients, and restore individuals with reduced physical and mental abilities to their normal state (Yılmaz, 2006; Güneş, 2006). Hospitals, as specialized units within private or public healthcare institutions, aim to provide the highest level of medical services. Beyond patient care, they also play a role in safeguarding community health, combating illnesses, conducting research, and training future healthcare professionals (Yılmaz, 2006; Güneş, 2006).

Effective design in healthcare facilities offers numerous advantages, contributing to better patient outcomes and improved operational efficiency. According to the World Health Organization (2013), well-designed healthcare environments can enhance patient comfort, reduce stress, and promote faster recovery. Features such as natural lighting, accessible layouts, and therapeutic spaces have been shown to positively impact patient well-being and staff performance (World Health Organization, 2013).

Haggard, Morris, and Roberts (2016) emphasize that incorporating social interaction areas into healthcare facilities can significantly improve connections among patients, visitors, and staff. These areas play a critical role in fostering supportive communities that enhance emotional well-being and overall satisfaction (Haggard, Morris, & Roberts, 2016).

Clare Cooper-Marcus (2005) highlights the role of aesthetic and therapeutic elements in hospital gardens, noting that features such as seating areas, shading, and water elements create calming environments that support healing and improve patient experiences (Cooper-Marcus, 2005).

Hospital gardens serve as crucial spaces for patients, healthcare workers, and visitors to unwind away from the hospital environment. The advantages of hospital gardens include reduced stress for patients, staff, and visitors, decreased pain, lower depression levels, enhanced quality of life for chronic and terminally ill patients, better way-finding, cost savings, increased patient mobility and self-sufficiency, greater patient satisfaction, and higher job satisfaction among staff (Ulrich, 1999; see Table 1). These benefits illustrate the positive effects of hospital gardens on both physical and emotional health in healthcare settings.

Table 1. Advantages to Healthcare Facilities (Ulrich, 1999)

Likely Benefits	Highly Probable	Possible
Reduced stress for patients, staff, and visitors	√	
Decreased pain for patients	√	
Lower depression levels	√	
Enhanced quality of life for chronic and terminally ill patients	√	
Better way-finding	√	
Cost savings		√
Increased patient mobility and self-sufficiency		√
Greater patient satisfaction		√
Higher job satisfaction among staff		√

The integration of well-thought-out design elements in healthcare facilities, including hospital gardens and social interaction spaces, is

essential for enhancing patient and staff well-being. By addressing both functional and aesthetic needs, healthcare environments can significantly improve overall care quality and operational effectiveness. These considerations highlight the importance of strategic design in fostering a supportive and healing atmosphere in healthcare settings.

These gardens can be categorized into four main design features (Yılmaz, 2006; Güneş, 2006)

1. Areas Designed for Social Interaction

Spaces intended for social engagement help foster a sense of community among patients and reduce feelings of isolation. Features such as seating arrangements, shaded areas, and communal gathering spots encourage meaningful interactions, supporting mental well-being. Social spaces also enhance the overall experience within the healthcare environment, making it more welcoming and supportive.

2. Outdoor Spaces that Provide a Connection with Nature

Environments that offer a strong connection to nature can have significant psychological and emotional benefits. Areas with various plant species, water elements, and natural textures create peaceful and restorative settings. These spaces allow patients to experience the calming effects of nature, which is crucial for stress reduction and recovery.

3. Zones Designated for Health and Physical Activity

Incorporating areas for physical activity encourages patients to exercise, benefiting both physical and mental health. These zones may include walking paths, exercise stations, or rehabilitation gardens, all designed to improve overall well-being. Providing opportunities for physical activity helps enhance mobility, strength, and mood.

4. Viewing Spots Meant to Offer Pleasant Scenery from Inside the Building

Spots that provide aesthetically pleasing views from within the building enhance the visual experience for patients and staff. Such areas can offer visual escapes and create a more positive and relaxing atmosphere within the healthcare facility. Viewing spots not only provide visual interest but also support a connection with the external natural environment.

Incorporating these features into garden designs significantly enhances the therapeutic benefits of these spaces. By addressing physical, psychological, and emotional needs, these gardens can transform the patient experience and support better health outcomes.

1. 2. Impact of Design Qualities on Mood

The design quality of hospital gardens significantly influences patient mood and emotional well-being. Key design principles, color, lighting, spatial arrangement, and the incorporation of natural elements, play a crucial role in enhancing the therapeutic potential of these spaces and guiding the development of supportive healthcare environments.

Color and Mood: Colors impact psychological states. Warm colors such as red and orange can energize and stimulate, while cool colors like blue and green have calming effects (Kaplan & Kaplan, 1989). Kaplan and Kaplan (1989) emphasize that incorporating natural colors like green and blue in hospital gardens can create a soothing environment that enhances emotional well-being.

Lighting and Its Effects: Exposure to natural light improves mood and reduces stress. Ulrich (1991) demonstrates that environments rich in natural light support stress recovery more effectively compared to urban

settings. Designing hospital gardens to maximize natural light, along with thoughtful use of artificial lighting, can significantly impact patient mood and comfort.

Spatial Arrangement and Comfort: The spatial layout and ergonomic features of a garden influence mood and psychological comfort. Marcus and Barnes (1995) found that thoughtful spatial arrangements, including comfortable seating and clear pathways, positively affect mood. Ensuring that hospital garden spaces are accessible and comfortable helps reduce anxiety and increase patient satisfaction.

Natural Elements and Therapeutic Benefits: Integrating natural elements such as plants, water features, and greenery is crucial for creating a calming and restorative environment. Lovell and Taylor (2013) highlight the benefits of vegetation in improving air quality, reducing stress, and promoting a sense of well-being. Marcus and Barnes (1995) also note that trees and plants in garden design have significant therapeutic benefits and positively affect mood.

Social Interaction and Community Spaces: Areas that facilitate social interaction are vital for enhancing mood and emotional support. Haggard, Morris, and Roberts (2016) found that social interaction areas in healthcare settings significantly improve connections among patients, visitors, and staff. Adding community spaces and interactive features in hospital gardens can foster a sense of belonging and support overall emotional well-being.

Historical Context and Evolution: The development of healthcare design has shifted from focusing solely on functionality to incorporating elements that enhance patient comfort and emotional health. Gergen (1994)

discusses this evolution, illustrating how design principles have adapted to prioritize psychological well-being alongside functional needs.

Sustainability and Design Practices: Sustainable design practices also contribute to mood enhancement. Lovell and Taylor (2013) argue that sustainable design, including eco-friendly materials and energy-efficient systems, benefits both the environment and users' emotional well-being. Integrating sustainable practices into hospital garden design can enhance both aesthetic appeal and therapeutic value.

The impact of design qualities on mood is significant and multifaceted. Designing with considerations for color, lighting, spatial arrangement, natural elements, and social interaction ensures that hospital gardens support emotional well-being and recovery. Future design practices should continue to integrate these principles to enhance the overall therapeutic potential of healthcare environments.

Marcus and Barnes (1995) identified qualities in hospital garden design that affect mood changes. Their study found that using trees and other plants was 69% effective in improving mood.

Table 2. Percentage of Participants Indicating Benefits from Various Qualities in Hospital Gardens (Marcus & Barnes, 1995):

Qualities	Percentage
Trees and plants	69%
Features involving auditory, olfactory, or tactile sensations	38%
Psychological or social aspects	50%
Visual qualities (beyond plant materials)	26%
Practical features	17%

Additional qualities that aid mood enhancement are summarized in Table 2, highlighting the importance of natural elements and social interaction areas in strengthening the therapeutic impact of hospital gardens. Their

research underscores the importance of incorporating not just plant life but also social interaction areas, outdoor spaces that connect with nature, zones designated for health and physical activity, and viewing spots offering pleasant scenery. These design features collectively strengthen the overall impact of hospital gardens on health and recovery. Therefore, considering these elements in hospital garden design can provide both aesthetic and therapeutic benefits, making these spaces more effective in supporting patient well-being and recovery.

1.3. Literature on Hospital Garden Design

The reviewed literature highlights the ongoing evolution and advancement in healthcare design, as well as the significant impact of environmental factors on patient well-being and recovery. Research indicates a distinct transition from functional designs to spaces that enhance comfort, support social interaction, and promote emotional and physical healing.

Kaplan and Kaplan (1989) highlighted the importance of incorporating natural elements into design to promote mental recovery and well-being, emphasizing how environmental preferences and experiences contribute to restorative effects

Ulrich (1991) found that natural environments facilitate faster and more complete stress recovery compared to urban settings, highlighting both physiological and emotional benefits of nature.

Gergen (1994) reviewed the shift in healthcare design from functionality to focusing on patient comfort and well-being, driven by changes in healthcare services and user needs.

Marcus and Barnes (1995) found that trees and plants in hospital gardens are highly effective in improving mood, highlighting their therapeutic benefits in healthcare settings.

Ulrich (1999) found that natural views, light, and aesthetic features are crucial for reducing patient stress and anxiety, accelerating recovery, and improving satisfaction. He also highlighted the importance of functional features like lighting and seating, as well as environmental sustainability, for enhancing overall effectiveness in healthcare settings.

Preiser and White (2005) highlighted the importance of incorporating user feedback into healthcare design to improve functionality and patient satisfaction, demonstrating that user-informed design changes lead to better outcomes.

Atabeyoğlu and Bulut (2006) examined outdoor hospital designs in Erzurum, identifying key factors like accessibility, comfort, safety, aesthetics, social interaction areas, noise control, and clear signage. They emphasized the importance of tailoring design to local conditions to improve functionality and user satisfaction.

Lovell and Taylor (2013) highlighted that sustainable design practices, including incorporating vegetation, improve air quality, save energy, and enhance community well-being, emphasizing their importance in healthcare environments.

Haggard, Morris, and Roberts (2016) emphasized the need for healthcare environments that encourage social interaction to improve patient recovery and emotional well-being. Clare Cooper-Marcus (2005) similarly highlighted the importance of aesthetic and therapeutic garden features, such as shading, seating, and water elements, to enhance healing and

patient experiences. Both sources stress designing environments that support physical and emotional health.

In summary, these studies emphasize the importance of integrating natural elements, user feedback, and sustainable practices into healthcare design. They highlight how thoughtful design can improve both functional needs and emotional and physical health outcomes, underscoring the critical role of design in enhancing healthcare environments.

In this context, based on the findings from the existing literature, the aim and scope of this study have been defined. Accordingly, the objective of this study is to evaluate and compare hospital gardens in İzmir based on predefined planning and design criteria. The focus is on assessing various aspects such as aesthetic and therapeutic features, functional and environmental attributes, design and usage principles, and management and operational aspects. By scoring the gardens on 17 criteria, this study aims to identify their strengths and areas for improvement, providing a comprehensive evaluation of how well they meet user needs and design standards.

2. Material and Method

The primary material of the research consists of four hospitals located in İzmir and affiliated with the İzmir Provincial Health Directorate. The parcel areas and the percentage distribution of garden areas for these hospitals were approximately calculated based on information obtained from the hospitals' websites and Google Earth Pro, as presented in Table 3. The selection criteria for these hospitals included the presence of gardens and their relatively adequate size. The location of İzmir within

Turkey and the placement of these hospitals within the city center are illustrated in Figure 1.

Written and visual literature, as well as on-site observations and examinations related to the research area, including photographs, maps, and other documents, were utilized as supplementary materials throughout the study.

Table 3. Parcel areas and the percentage distribution of garden areas for the hospitals under study

Hospital name	Parcel area (m²)	Garden areas (%)
İzmir Katip Çelebi University Atatürk Education and Research Hospital	54000	30-49
İzmir Democracy University Buca Seyfi Demirsoy Training and Research Hospital	132000	<30
Health Sciences University (HSU) Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital	100000	50-69
Health Sciences University (HSU) İzmir Tepecik Education and Research Hospital	40.000	30-49



Figure 1. The location of İzmir within Turkey and the placement of these hospitals within the city center (<https://izmir.ktb.gov.tr/TR-77436/izmir-il-haritasi.html> ; Google Earth Pro, 2024)

The methodology of the study consists of five main stages: literature review, determination of planning and design criteria, observation, and evaluation. In the initial stage, a comprehensive review of national and international literature was conducted focusing on hospital gardens. This review aimed to gather information on planning and design principles and standards by examining hospital gardens in various cities. In the second stage, four categories were established for hospital garden planning and design criteria, resulting in a total of 17 criteria. The observation stage involved the use of field observations, photographs, maps, and other relevant documents to support the analysis process. In the findings and evaluation stage, the current state of hospital gardens was assessed, and a foundation was laid for formulating improvement recommendations. Each stage is detailed as follows:

Information Collection Stage: The primary sources for the study included written and visual literature. Existing research on hospital garden design, standards, and innovative approaches was reviewed. Relevant studies conducted in Turkey on similar topics were also examined. This process involved evaluating standards and design principles for hospital gardens in different cities and analyzing how these standards are applied to hospital gardens in İzmir.

Design Criteria Classification: In this study, the planning and design criteria for hospital gardens have been developed based on Güneş's (2006) work, *Examination of Planning and Design Principles for Hospital Gardens: A Case Study of İzmir*, and further refined within the framework of relevant literature. This approach aims to provide a more systematic and objective framework for the design processes. Accordingly, four

categories and 17 criteria have been defined and are described in Table 4. This methodology seeks to offer a comprehensive framework for the effective design and evaluation of hospital gardens.

Table 4. Categorization and Description of Hospital Garden Design Criteria (Adapted from Güneş, 2006)

Category	Desing Criteria	Description
Aesthetic and Therapeutic Features	Shading Elements	Structures or vegetation providing shade to enhance user comfort and protect from the sun.
	Seating Elements	Benches, chairs, and other seating arrangements that provide rest areas within the garden.
	Water Features or Ornamental Fountains	Decorative elements that improve aesthetic appeal and create a soothing atmosphere.
	Fountain	Specific type of water feature serving as a visual focal point.
	Use of Plant Materials	Incorporates various plants to enhance visual appeal, provide shade, and improve air quality.
	Children's Play Area	Designated space for children's activities, promoting play and engagement in a safe environment.
	Functional and Environmental Features	Lighting
Trash Bin		Waste disposal units that maintain cleanliness and hygiene in the garden.
Pathways		Design and layout of walkways to guide users through the garden safely and conveniently.
Accessibility Features		Design elements ensuring that the garden is accessible to all users, including those with disabilities..
Boundary - Enclosure Elements		Design elements at the hospital's entry point to facilitate ease of access and navigation.

Design and Usage Principles	Sports Facility	Areas or equipment for physical activities, encouraging health and exercise.
	Kiosk or Cafeteria	Facilities offering food and beverages, enhancing the social and recreational aspects of the garden.
	Hospital entrance and entry unit	Features that define and enclose garden spaces, providing privacy and security.
Management and Operational Features	Paving	Materials used for pathways and surfaces, affecting durability, accessibility, and visual appeal.
	Parking Lot	Designated area for vehicle parking, facilitating access and convenience for visitors.
	Maintenance	Activities and practices related to the upkeep and preservation of the garden's functionality and aesthetics, including regular inspections, repairs, seasonal planting, and resource management.

Observation Stage: Four hospital gardens of varying sizes, located in the Buca, Karabağlar, and Konak districts of İzmir, were selected for detailed observation of their physical characteristics. To provide a spatial context, general views obtained via Google Earth Pro and more detailed views from Google Maps were presented. Additionally, photographs taken from various angles were included to enhance the understanding of each hospital garden's area. Observations were conducted based on established criteria for landscape planning and design. Gardens were assessed and categorized as unsatisfactory, satisfactory, good, or excellent, with any criteria that were not applicable or absent noted as 'not present.' The findings are presented in tabular form. This evaluation and graphical presentation were conducted to gain a detailed understanding of how each hospital's garden performs across various design and functionality criteria.

Quantification of Evaluation Indicators: The scoring methodology employed by Li and Ju (2020) was adapted for evaluating hospital gardens. Prior to the evaluation, 17 criteria were established, categorized into four main groups: aesthetic and therapeutic features, functional and environmental features, design and usage principles, and management and operational features. Each hospital garden's design, facilities, equipment, and plant arrangements were thoroughly examined based on these 17 criteria. Each criterion was rated as “unsatisfactory,” “satisfactory,” “good,” “excellent,” or “not present,” with corresponding scores assigned: ‘not present’ received a score of 0, ‘unsatisfactory’ a score of 1, ‘satisfactory’ a score of 2, ‘good’ a score of 3, and ‘excellent’ a score of 4. This scoring system aligns with the methodology used by Li and Ju, effectively translating qualitative data into quantifiable measures.

In the findings and evaluation stage: During this phase, the total score for each hospital was determined based on the specified scoring system. Additionally, the number of criteria that each hospital fulfilled as “unsatisfactory,” “satisfactory,” “good,” “excellent,” or “not present” was identified. Finally, the scores for the 17 criteria were compiled according to the four main groups and evaluated comparatively for each hospital. Based on the obtained scores, the strengths and areas for improvement within each hospital garden were identified. The analysis is presented graphically, clearly illustrating the distribution of criteria and performance for each hospital.

3. Findings and Discussion

3.1. İzmir Katip Çelebi University (İKÇU) Atatürk Education and Research Hospital

The hospital, which began operations in 1851, started serving with a capacity of 900 beds on a 54-dunam site in 1982 (https://izmiraturkeah.saglik.gov.tr/?_Dil=2). The weather photographs for the hospital area are shown in Figure 2.

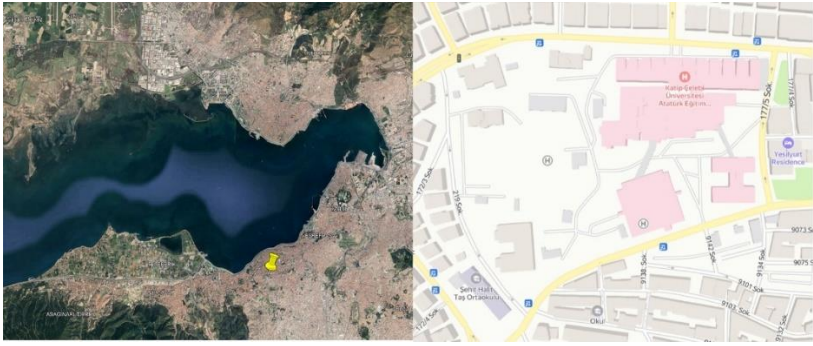


Figure 2. General location of İKÇU Atatürk Education and Research Hospital and close-up aerial views

As for the garden ground paving, asphalt has been used for the paths, while predominantly interlocking paving stones have been used for the walkways. Accessibility features for individuals with disabilities are inadequate. A raised surface of 15-20 cm has been constructed at the entrance to the hospital building, which poses a hazard for users with temporary or permanent disabilities, as well as for elderly, pregnant, and child users. The garden includes a small parking area designated solely for staff use; however, this parking area is insufficient even for the staff.

The grassed areas within the garden are generally well-maintained. Shading is primarily provided by coniferous trees. Besides the use of trees and shrubs, flowering plants have also been incorporated to enhance the

garden's colorful appearance. The list of plants, updated from Güneş's 2006 study and identified in the area, is as follows:

Pinus sp., *Cupressus sp.*, *Acacia cyanophylla*, *Schinus molle*, *Phoenix canariensis*, *Juniperus sabina*, *Yucca filamentosa*, *Nerium oleander*, *Viburnum tinus*, *Ligustrum vulgare*, *Pyracantha coccinea*, *Washingtonia sp.*, and *Buxus sempervirens*. Images showing different angles of the hospital garden are presented in Figure 3.



Figure 3. Images Showing Different Angles of the Garden of İKÇU Atatürk Education and Research Hospital (Source: Author, 2024)

3.2.İzmir Democracy University (İDU) Buca Seyfi Demirsoy Training and Research Hospital

The hospital commenced operations in 2002 as "Social Insurance Institution Buca Seyfi Demirsoy Hospital" and was renamed to its current title, "T.C. Ministry of Health Buca Seyfi Demirsoy Training and Research Hospital" in 2020. The main building has a built-up area of 40,000 square meters and a bed capacity of 455. Additionally, the Women and Children's Diseases Additional Service Building has a built-up area of 22,953 square meters and a bed capacity of 137 (https://bucadh.saglik.gov.tr/?_Dil=2).

The weather photographs for the hospital area are shown in Figure 4.



Figure 4. General location of İDU Buca Seyfi Demirsoy Training and Research Hospital and close-up aerial views

The garden's ground paving includes concrete tiles and interlocking paving stones. However, there are areas where the paving is in poor condition. Accessibility features for individuals with disabilities are inadequate and poorly maintained. Tactile surfaces have not been correctly installed in some areas, which poses a risk to visually impaired users. The garden contains spacious parking areas for both staff and visitors.

The grassed areas within the garden are generally well-maintained. Shading is predominantly provided by coniferous trees. In addition to trees

and shrubs, flowering plants have been used to enhance the garden's colorfulness. The list of plants, updated from Güneş's 2006 study and identified in the area, is as follows:

Pinus sp., *Cupressus sp.*, *Juniperus sabina*, *Yucca filamentosa*, *Nerium oleander*, *Viburnum tinus*, *Ligustrum vulgare*, *Pyracantha coccinea*, and *Buxus sempervirens*. Images showing different angles of the hospital garden are presented in Figure 5.

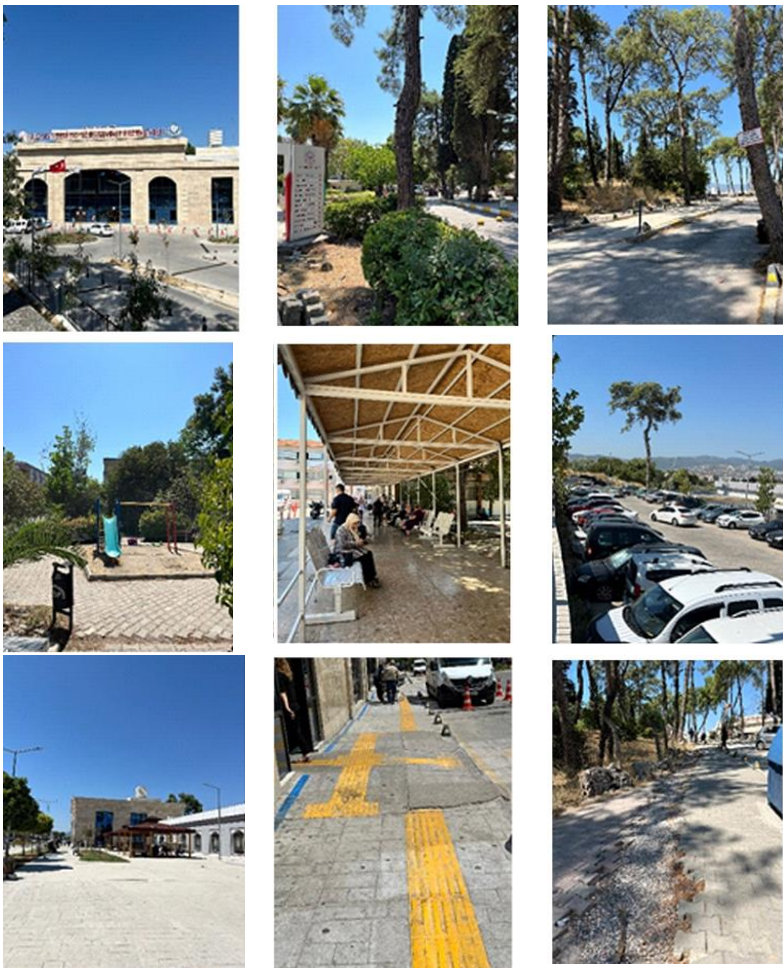


Figure 5. Images Showing Different Angles of the Garden of İDU Buca Seyfi Demirsoy Training and Research Hospital (Source: Author, 2024)

3.3. Health Sciences University (HSU) Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital

The hospital was reorganized under this name in 2000 and currently has 22 service buildings with a bed capacity of 430. Since 2015, it has continued to serve as the Health Sciences University Dr. Suat Seren Chest Diseases and Surgery Training and Research Hospital (https://izmirgoguseah.saglik.gov.tr/?_Dil=2). The weather photographs for the hospital area are shown in Figure 6.

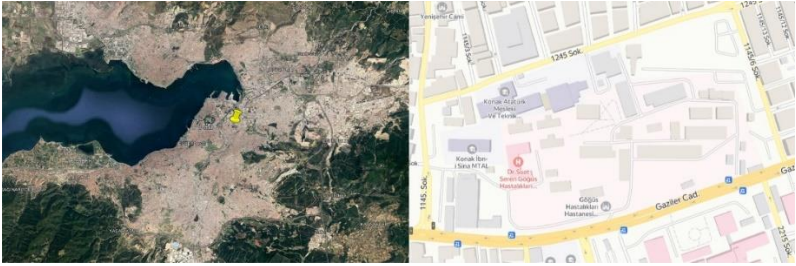


Figure 6. General location of HSU Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital and close-up aerial views.

The hospital entrance, framed by dense pine trees creating a natural garden appearance, has solved the parking issue with parking areas established on both sides of the entrance. The garden's ground paving predominantly consists of asphalt and interlocking paving stones. Expansive grassed areas are present between the walking path and the hospital building. There are two separate entrances, one at the back of the hospital building. The waiting area at the clinic entrance features seating units and a decorative fountain surrounded by plants, which helps prevent boredom for waiting individuals.

Accessibility features are available, but they are limited and poorly maintained in other areas of the garden. For those staying at the hospital

for extended periods, pathways through the green areas offer opportunities for walking and relaxation. The garden's spacious and well-maintained grassy areas, shaded by coniferous trees, provide a calming effect. Seating elements placed around the area offer opportunities for rest and observation of the surroundings. The list of plants, updated from Güneş's 2006 study and identified in the area, is as follows:

Pinus sp., *Cupressus sp.*, *Acacia cyanophylla*, *Schinus molle*, *Phoenix canariensis*, *Juniperus sabina*, *Yucca filamentosa*, *Nerium oleander*, *Viburnum tinus*, *Ligustrum vulgare*, *Pyracantha coccinea*, *Washingtonia sp.*, *Acer negundo*, *Euonymus japonica*, and *Buxus sempervirens*. Images showing different angles of the hospital garden are presented in Figure 7.

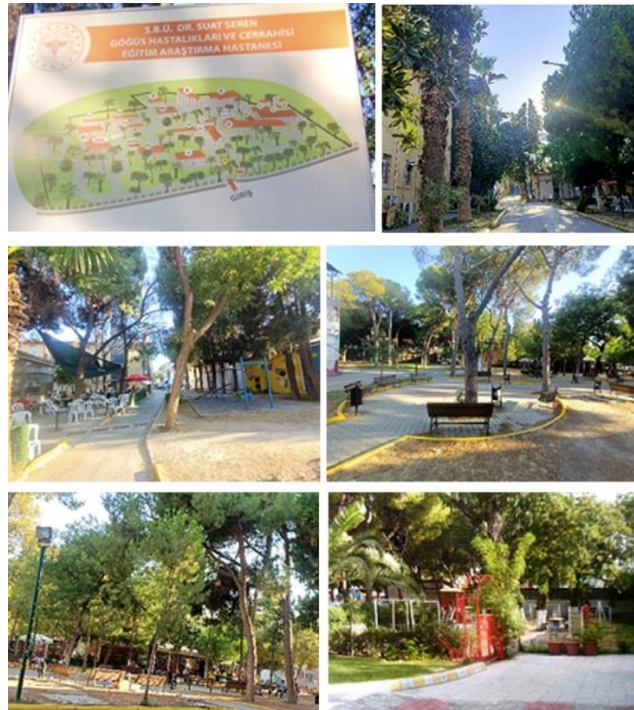


Figure 7. Images Showing Different Angles of the Garden of HSU Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital (Source: Author, 2024)

3.4. Health Sciences University (HSU) İzmir Tepecik Education and Research Hospital

The hospital was inaugurated in 1971. Since 2016, it has been operating as a university hospital under the Health Sciences University, with a bed capacity of 910 and a built-up area of 100,671 square meters (<https://tepecikeah.saglik.gov.tr/EN-471893/tepecik-trainingandresearch-hospital.html>).

The weather photographs for the hospital area are shown in Figure 8.

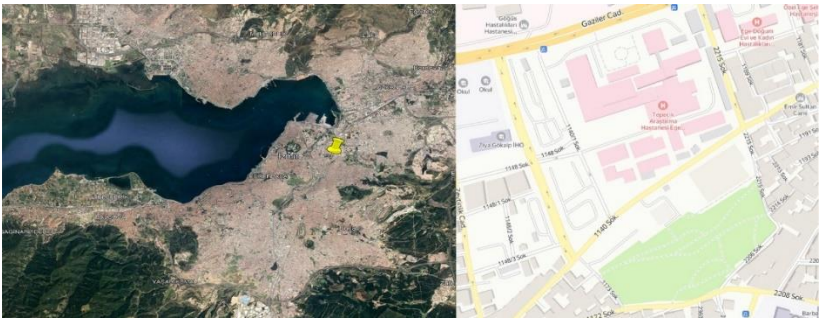


Figure 8. General location of HSU İzmir Tepecik Education and Research Hospital and close-up aerial views

The front entrance of the hospital building experiences heavy traffic. In this area, seating arrangements have been created within the green space to provide a natural environment where individuals can escape the noisy external surroundings and relax. The garden's ground paving primarily consists of asphalt and interlocking paving stones. The grassed areas between the walking path and the hospital building are kept spacious. Accessibility features are provided at the building's entrance and exit points; however, these features are either lacking or in poor condition in other areas of the garden. The garden features a small parking area reserved exclusively for staff, but it is inadequate even for their needs.

The area around the building is surrounded by planting. Additional seating units have been placed on the large grassed areas, offering a space for those staying in the hospital for extended periods to observe their surroundings. In the rear garden, tree-form plants are used solely for shading purposes. In contrast, the front garden features a vibrant and dynamic space created with wall-hanging ivy, tree and shrub-form plants, and seasonal flowers. The presence of palm trees further adds to the appeal of the space. Shading in the garden is primarily provided by coniferous trees, creating a dense shade. Besides the use of trees and shrubs, flowering plants are also incorporated to enhance the garden's colorful and lively appearance. Overall, the grassed areas are well-maintained. The list of plants, updated from Güneş's 2006 study and identified in the area, is as follows: *Pinus sp.*, *Acer sp.*, *Nerium oleander*, *Viburnum tinus*, *Ligustrum vulgare*, *Acacia cyanophylla*, *Schinus molle*, *Phoenix canariensis*, *Juniperus sabina*, *Washingtonia sp.*, and *Buxus sempervirens*. General view and images showing different angles of the hospital garden are presented in Figure 9 and Figure 10.



Figure 9. General view of the Garden of HSU İzmir Tepecik Education and Research Hospital (<https://tepecikeah.saglik.gov.tr/EN-471893/tepecik-training-and-research-hospital.html>)



Figure 10. Images Showing Different Angles of the Garden of HSU İzmir Tepecik Education and Research Hospital (Source: Author, 2024)

The four hospitals examined according to the established criteria were categorized based on the quality of these criteria as 'unsatisfactory,' 'satisfactory,' 'good,' 'excellent,' or 'not present.' The observation results, which illustrate how the quality ratings of each criterion are distributed for each hospital, are presented in Table 5. It provides a visual representation of which criteria were rated at each quality level and how these criteria are distributed across the hospitals, thereby offering a basis for identifying potential areas for improvement and comparing design practices. This analysis was conducted to understand how the hospital gardens perform in various aspects of design and functionality. Table 4 provides a visual representation of which criteria were rated at each quality level and how these criteria are distributed across the hospitals, thereby offering a basis

for identifying potential areas for improvement and comparing design practices.

Table 5. Observational criteria for landscape planning and design

Category	Criteria for landscape planning and design	İKÇ University Atatürk Education and Research Hospital	İDU Buca Seyfi Demirsoy Training and Research Hospital	HSU Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital	HSU İzmir Tepecik Education and Research Hospital
Aesthetic and Therapeutic Features	Shading elements	good	good	good	good
	Seating elements	unsatisfactory	good	good	good
	Water features or ornamental fountains	not present	not present	not present	not present
	Fountain	not present	not present	not present	satisfactory
	Use of plant materials	satisfactory	good	excellent	excellent
	Children's play area	not present	satisfactory	unsatisfactory	not present
Functional and Environmental Features	Lighting	satisfactory	good	good	unsatisfactory
	Trash bin	satisfactory	excellent	satisfactory	excellent
	Pathways	satisfactory	good	excellent	excellent
	Accessibility features	unsatisfactory	good	good	unsatisfactory
	Boundary - Enclosure elements	excellent	good	good	good
Design and Usage Principles	Sports facility	not present	not present	good	not present
	Kiosk or cafeteria	good	good	good	good
	Hospital entrance and entry unit	satisfactory	good	unsatisfactory	unsatisfactory
Management and Operational Features	Paving	satisfactory	good	good	good
	Parking lot	unsatisfactory	excellent	excellent	unsatisfactory
	Maintenance	satisfactory	good	good	good

4. Conclusion and Suggestions

4.1. Conclusions

This study aimed to evaluate and compare hospital gardens in İzmir based on predefined planning and design criteria. The goal was to assess the aesthetic and therapeutic features, functional and environmental attributes, design and usage principles, and management and operational aspects of these gardens to identify their strengths and areas for improvement. A total of 17 criteria were used to score each hospital garden, employing a scoring system ranging from 0 to 4, as detailed in the methodology. This scoring system provided a range of scores for each garden, and the results are illustrated in Figure 11.

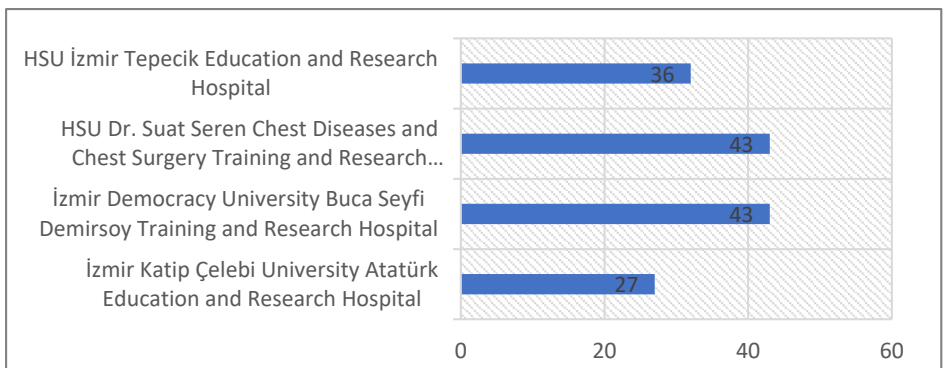


Figure 11. Scores Achieved by Hospital Gardens Based on Evaluation Results

Figure 12 visually presents the results of the evaluation, showing how each hospital is rated across 17 criteria including 'unsatisfactory,' 'satisfactory,' 'good,' 'excellent,' and 'not present'.

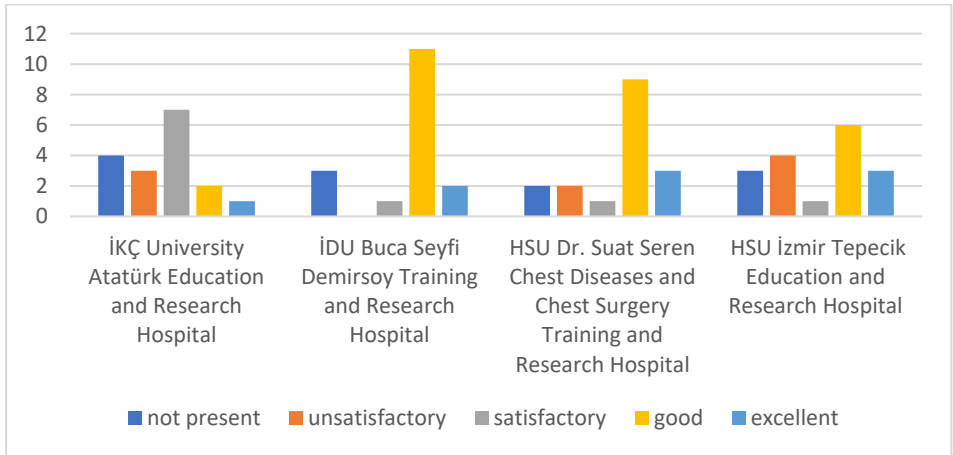


Figure 12. Distribution of Quality Ratings Across 17 Criteria for Evaluated Hospitals

This study aimed to establish planning and design criteria for hospital gardens through an examination of four selected hospital garden examples in İzmir. The comprehensive evaluations conducted have yielded the following conclusions:

- HSU Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital demonstrated the highest performance in ‘excellent’ criteria, achieving a score of 43 points, which is the highest among the evaluated hospitals.
- İDU Buca Seyfi Demirsoy Training and Research Hospital also attained a score of 43 points and exhibited the highest number of ‘good’ criteria, making it another top-performing hospital in the study.
- HSU İzmir Tepecik Education and Research Hospital possesses the highest number of ‘excellent’ criteria, achieving a score of 36 points, however, it also has the highest number of ‘unsatisfactory’ criteria.

- İKÇU Atatürk Education and Research Hospital received the lowest score of 27 points. It has the highest number of ‘satisfactory’ criteria and also the highest count of ‘not present’.

The study highlights the strengths and weaknesses of hospital gardens based on the established criteria. Gardens with higher scores better meet user needs and design standards; conversely, lower scores and a higher number of 'not present' criteria indicate areas that require improvement.

Figure 13 provides a comprehensive assessment of hospital gardens based on four main categories: aesthetic and therapeutic features, functional and environmental features, design and usage principles and management and operational features. It details the scores each hospital received within these categories, highlighting their strengths and weaknesses while enabling comparisons among them. The results indicate that "HSU İzmir Tepecik Training and Research Hospital" scored the highest in aesthetic and therapeutic features; "İDU Buca Seyfi Demirsoy Training and Research Hospital" achieved the highest scores in functional and environmental aspects; and "HSU Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital" excelled in design and usage principles. Finally, in the management and operational features category, "İDU Buca Seyfi Demirsoy Training and Research Hospital" and "HSU Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital" received the highest scores.

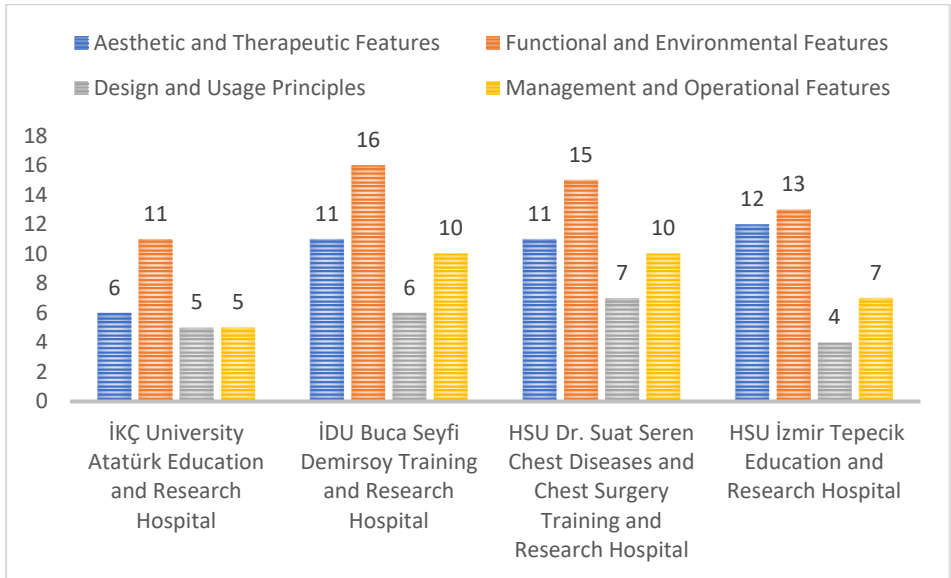


Figure 13. Score Distribution of Evaluated Hospitals by Aesthetic, Functional, Environmental, Design, and Management Categories

1.2.Suggestions

The findings of this study highlight various strengths and areas for improvement in the design and functionality of hospital gardens in İzmir. In this context, the following recommendations are provided to enhance the quality of hospital gardens and achieve more effective design and management:

- It is recommended that the criteria for hospital garden design be made more detailed and comprehensive. In addition to existing criteria, factors such as sustainability, environmental impact, accessibility, and social interaction should be considered. According to Marcus (2005) and Ulrich (1999), developing comprehensive criteria based on these principles ensures that design standards meet contemporary needs.

- Collecting and integrating user feedback into the design and functionality of hospital gardens is crucial. User experiences and suggestions can provide valuable insights for design improvements. Atabeyoğlu and Bulut (2006) emphasizes the importance of incorporating user feedback to enhance garden usability and satisfaction.
- Incorporating elements such as energy efficiency, water conservation, and native plant species should be prioritized. Research by Kızıltan (2015) and Özdemir (2018) underscores the importance of environmental sustainability in garden design.
- Effective plant arrangements in hospital gardens are crucial for supporting user relaxation and social interaction. Currently, green hues dominate, and white and cream-colored plants are commonly used (Seyidoğlu Akdeniz, 2020). However, according to Seyidoğlu Akdeniz (2020), it is recommended to include plants with blue, pink, and yellow tones. These colors can evoke feelings of infinity, a desire for life, vitality, and affection, thus enhancing the therapeutic environment of hospital gardens.
- Plants used in the garden should not be those that release pollen into the air. Instead, choose plants that provide shade, create light and color patterns, and produce pleasant sounds even with a light breeze. Consider plants with varying seasonal blooming times. Plants should offer a range of colors, textures, and forms. Additionally, select plants that are fragrant, attract birds and butterflies, are resilient to the climate, and produce wind and leaf sounds. Functional aspects such as

creating separation, unity, a sense of enclosure, covering walls, and climbing should also be considered (Sakıcı, 2009).

- Investigating and applying innovative and contemporary design approaches is recommended. Modern design strategies such as technological advancements, modular designs, and user-centered solutions can enhance the functionality and aesthetics of gardens. For instance, Barton and Pretty (2010) examine the impact of innovative methods in environmental design on health and well-being.
- In addition to these recommendations, implementing regular monitoring and maintenance processes is essential for maintaining the quality and functionality of hospital gardens. Specifically, addressing criteria that received low scores or were marked as 'not present' through targeted maintenance and renovation efforts is necessary.
- Compliance with Legal Regulations: When planning and designing hospital gardens, adherence to existing legal regulations, such as the Turkish Health Buildings Regulation (2007) (Türkiye Cumhuriyeti Sağlık Bakanlığı, 2007), is essential. This regulation aims to ensure that healthcare facilities are planned and constructed to support effective service delivery. The design of hospital gardens should consider the accessibility, safety, technical standards, and sustainability outlined in the regulation. The regulation provides a fundamental reference for enhancing design functionality and comfort. However, reviewing and updating existing regulations is crucial to meet the modern needs of healthcare facilities' outdoor spaces. Continuously updating and expanding legal frameworks is a critical step in reflecting best practices and standards in hospital garden design.

Acknowledgements and Information Note

This book chapter is derived from the master's thesis titled "*Examination of Planning and Design Principles for Hospital Gardens: A Case Study of İzmir*" by Güneş (2006), completed at the Department of Landscape Architecture, Institute of Science, Ege University. While preserving the core perspective of the original thesis, this updated work includes a revised literature review, updated photographs, and new field observations and examinations.

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Atabeyođlu, Ö., & Bulut, Y. (2006). Hastanelerin dış mekan tasarımları ve Erzurum kenti örneđi. *Kent ve Sađlık Sempozyumu*, 267-268, Bursa.
- Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for mental health? A multi-study analysis. *Environmental Science & Technology*, 44(10), 3997-4005. <https://doi.org/10.1021/es903741d>
- Buca Training and Research Hospital: Ministry of Health. (2024). *Buca Training and Research Hospital*. İzmir. Access Address (01.06.2019): https://bucadh.saglik.gov.tr/?_Dil=2
- Cooper-Marcus, C. (2005). *Healing gardens: Therapeutic benefits and design recommendations*. John Wiley & Sons.
- Cooper-Marcus, C., & Barnes, M. (1995). *Gardens in healthcare facilities: Uses, therapeutic benefits, and design recommendations*. The Center for Health Design.
- Gergen, K. J. (1994). Historical development of healthcare design: A review. *Health Environments Research & Design Journal*, 2(3), 21-33. <https://doi.org/10.1177/193758670400200303>
- Güneş, M. (2006). *Hastane bahçeleri planlama ve tasarım ilkelerinin İzmir ili örneğinde irdelenmesi* (Yüksek Lisans Tezi, Ege Üniversitesi, Fen Bilimleri Enstitüsü, Peyzaj Mimarlığı Anabilim Dalı), 173 s., Bornova/İzmir.
- Haggard, R. K., Morris, N. H., & Roberts, M. (2016). *Social interaction in healthcare environments: Designing for connection and support*. *Journal of Environmental Psychology*, 44, 136-145. <https://doi.org/10.1016/j.jenvp.2015.11.003>
- İzmir Atatürk Training and Research Hospital: Ministry of Health. (2024). *İzmir Atatürk Training and Research Hospital*. İzmir. Access Address (12.06.2019): https://izmiraturkeah.saglik.gov.tr/?_Dil=2
- İzmir Chest Diseases and Chest Surgery Training and Research Hospital: Ministry of Health. (2024). *İzmir Chest Diseases and Chest Surgery Training and Research Hospital*. İzmir. Access Address

- (10.06.2019):https://izmirgoguseah.saglik.gov.tr/?_Dil=2
- İzmir İl Kültür ve Turizm Müdürlüğü (2024). *İzmir İl Haritası*. Access Adress (14.07.2024): <https://izmir.ktb.gov.tr/TR-77436/izmir-il-haritasi.html>
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge University Press.
- Kızıltan, B. (2015). *Sustainable design in hospital gardens: Theoretical framework and practical applications*. *Journal of Environmental Design*, 34(2), 45-56.
- Li, C. F., & Ju, P. (2020). Recreation spatial equity: An empirical study based on residents' experience in Shenzhen. *Current Urban Studies*, 8, 320-336. <https://doi.org/10.4236/cus.2020.82018>
- Lovell, S. T., & Taylor, J. R. (2013). Vegetation for environmental health: Benefits and design strategies. *Urban Ecosystems*, 16(1), 127-142. <https://doi.org/10.1007/s11252-012-0276-2>
- Özdemir, S. (2018). *Environmental impact of hospital garden design*. *Landscape and Urban Planning*, 47(1), 12-25. <https://doi.org/10.1016/j.landurbplan.2018.03.002>
- Preiser, W. F. E., & White, E. T. (2005). Design interventions and user feedback in healthcare environments. *Journal of Architectural and Planning Research*, 22(2), 105-120.
- Sakıcı, Ç. (2009). *Ruh ve Sinir Hastalıkları Hastanesinde tedavi edici peyzaj tasarımları* (Yüksek lisans tezi, Karadeniz Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Peyzaj Mimarlığı Anabilim Dalı). Trabzon, Türkiye.
- Seyidoğlu Akdeniz, N. (2020). Woody landscape plants used in the design of hospital gardens and their sensory effects on users. *Journal of Bartın Faculty of Forestry*, 22(1), 47-62. <https://doi.org/10.24011/barofd.619469>
- Tepecik Training and Research Hospital: Ministry of Health. (2024). *Tepecik Training and Research Hospital*. İzmir. Access Address (08.06.2024):<https://tepecikeah.saglik.gov.tr/EN-471893/tepecik-training-and-research-hospital.html>

- Türkiye Cumhuriyeti Sağlık Bakanlığı. (2007). *Sağlık Yapıları Yönetmeliği* [Health Buildings Regulation]. Retrieved from <http://www.resmigazete.gov.tr/eskiler/2007/11/20071109-1.htm>
- Ulrich, R. S. (1991). Effects of health facility interior design on wellness: Theory and recent scientific research. *Journal of Health Care Design*, 3, 97-109. [Reprinted in: Marberry, S.O. (Ed.) 1995. *Innovations in Healthcare Design*. New York: Van Nostrand Reinhold, pp. 88-104.]
- Ulrich, R. S. (1999). Effects of gardens on health outcomes: Theory and research. In C. Cooper-Marcus & M. Barnes (Eds.), *Healing Gardens: Therapeutic Benefits and Design Recommendations* (pp. 27-86). John Wiley.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11(3), 201-230. [https://doi.org/10.1016/S0272-4944\(05\)80184-7](https://doi.org/10.1016/S0272-4944(05)80184-7)
- World Health Organization (WHO). (2013). *Guidelines on health care facility design*. World Health Organization.
- Yılmaz, O. (2006). *Basılmamış ders notu*. Ankara Üniversitesi, Peyzaj Mimarlığı Bölümü, Ankara.

Dr. Öğretim Üyesi Meltem GÜNEŞ TİGEN

Educational Status: PhD in Landscape Architecture

License: Landscape Architect

Degree: Master of Landscape Architecture

Doctorate: PhD in Landscape Architecture from Ankara University (Graduated: 2017)

Professional experiences:

Assist Prof. Dr., 2021-devam, Tekirdağ Namık Kemal University, Faculty of Fine Arts, Design and Architecture University, Department of Landscape Architecture

Dr. Research Assistant., 2018-2021, Tekirdağ Namık Kemal University, Faculty of Fine Arts, Design and Architecture University, Department of Landscape Architecture

Research Assistant, 2012-2018, Ankara University, Faculty of Agriculture, Department of Landscape Architecture

Research Assistant 2010-2012, Tekirdağ Namık Kemal University, Faculty of Fine Arts, Design and Architecture University, Department of Landscape Architecture

Prof. Dr. Bahar TÜRKYILMAZ

Educational Status: PhD in Landscape Architecture

License: Landscape Architect

Degree: Master of Landscape Architecture

Doctorate: PhD in Landscape Architecture from Ege University (Graduated: 1991)

Professional experiences:

Prof. Dr. 2006, Ege University, Faculty of Agriculture, Department of Landscape Architecture

Associate Prof, 1995-2006, Ege University, Faculty of Agriculture, Department of Landscape Architecture

Assist Prof. Dr. 1992-1995, Ege University, Faculty of Agriculture, Department of Landscape Architecture

Research Assistant 1984-1992, Ege University, Faculty of Agriculture, Department of Landscape Architecture

Recreational Flow Experience and Perceived Wellness in Extreme Sports

Res. Assist. Eminsafa DİLMAÇ¹ 

¹ Sakarya University of Applied Sciences, Faculty of Tourism, Department of Recreation Management, Sakarya, Türkiye.

ORCID: 0000-0002-5136-9217

E-mail: eminsafadilmac@subu.edu.tr

Assoc. Prof. Dr. Nurgül TEZCAN KARDAŞ² 

² Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation, Sakarya, Türkiye.

ORCID: 0000-0002-9483-2013

E-mail: nurgultezcan@subu.edu.tr

Citation: Dilmaç E. & Tezcan Kardaş N. (2024). Recreational Flow Experience and Perceived Wellness in Extreme Sports. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:16, 404-431 ISBN: 978-625-367-855-5. Iksad Publications.

DOI: <https://doi.org/10.5281/zenodo.13875145>

1. Introduction

In contemporary society, individuals seeking diverse experiences are increasingly turning to extreme sports as a form of recreation. Extreme sports elevate adrenaline levels, enhance individuals' abilities to overcome challenges, and contribute to their sense of well-being. However, these sports also involve various risks and potential fatal dangers. Despite these hazards, athletes participate in extreme sports to seek meaning, excitement, and unique experiences, accepting the inherent risks. Extreme athletes are often characterized as extraordinary individuals in pursuit of thrill and action (Ekinci, 2023).

Extreme sports hold a significant place in the tourism and recreation industry and have gained increasing popularity in recent years. Participants in extreme sports aim to feel good by experiencing different sensations during the activities. Therefore, individuals engaging in extreme sports are driven by the pursuit of achieving a state of flow (Celsi, Rose, and Leigh, 1993). Csikszentmihalyi (1977) defines the flow experience as a holistic emotional state and optimal experience achieved when individuals concentrate fully on the task at hand, dedicating their complete attention and focus. In this experience, individuals feel a sense of unity in their mental and emotional states and become fully immersed in the activity.

From the perspective of the tourism and recreation industry, extreme sports are recognized for providing participants with diverse experiences and benefits that enhance well-being. People who spend their leisure time engaging in recreational activities generally aim to gain unique experiences and improve their well-being. The recreational flow experience encountered during extreme sports enables individuals to feel

entirely present in the moment and alters their perception of how time passes.

A review of the flow experience literature reveals that studies often focus on the relationship between flow experience and self-efficacy, positive and negative affect, life satisfaction, life quality, motivation, and subjective and psychological well-being. Although these studies are related to various dimensions of perceived wellness, there is a noticeable lack of research specifically examining recreational flow experience and perceived wellness. Therefore, this study aims to explore extreme sports from the perspective of recreational flow experience and well-being within the recreational paradigm. To align with the study's objective, a comprehensive compilation of books, theses, and articles on flow experience and well-being perception in extreme sports has been undertaken.

2. Literature Review

In line with the purpose and content of this research, it is considered essential for readers to gain an understanding of recreational flow experience and perceived wellness. This section of the study aims to provide information on the relevant literature within the theoretical framework of the research.

2.1. Extreme Sports as a Recreational Activity

Recreation encompasses a wide variety of activities, experiences, and sports through which people can relieve stress, have fun, and gain pleasure and benefit. Among these activities are extreme sports. Extreme sports can be defined as recreational activities that, compared to other sports, carry a higher risk of injury and death, push boundaries, and involve feelings of

excitement, challenge, and adventure (Breivik, Roth, and Jørgensen 1998; Fletcher, 2008; Willig, 2008). Extreme sports are distinguished from other sports by high concentration, a sense of freedom, intense excitement and adventure, and the requirement for significant risk and challenging skills. In the literature, they are also referred to as adventure sports, adrenaline sports, action sports, or high-risk sports (Puchan, 2005; Şimşek, 2010, p.22).

Extreme sports predominantly fall under outdoor recreation activities. Examples of extreme sports activities include paragliding, freediving, base jumping, ice climbing, mountain biking, rock climbing, zorbing, kite surfing, skydiving, windsurfing, bungee jumping, cave diving, canyoning, whitewater rafting, snowboarding, luge racing, parkour, air diving, kiteboarding, off-road racing, freestyle skiing, mountaineering, scuba diving, snow sailing, and freestyle motocross.

Today, extreme sports, which have gained significant popularity, boost adrenaline levels, enhance challenge management, strengthen connection to nature, and offer learning opportunities. They help participants discover their talents, push performance limits, and experience a range of emotions and sensations (Brymer and Gray, 2009; Kerr and Houge Mackenzie, 2012; Larkin and Griffiths, 2004).

Recreational activities provide opportunities for various experiences. An example of these experiences is the flow experience, where participants become so absorbed in the recreational activity that they lose track of time and focus solely on the activity. These experiences, where individuals derive pleasure and happiness in the moment, are called flow experiences (Csikszentmihalyi, 1988). Extreme sports are highly effective in

facilitating recreational flow and are often chosen by adventure and adrenaline seekers today (Ekinici, 2023). The physical/mental challenge and struggle inherent in extreme sports provide an opportunity to experience recreational flow. Moreover, the primary goal for individuals participating in extreme sports is to attain the flow experience (Celsi, Rose, and Leigh, 1993). In light of this information, examining the concept of flow experience is of great importance.

2.2. The Concept of Flow Experience

Csikszentmihalyi (1977, p. 36) defines the flow experience as a holistic emotional state and optimal experience that individuals achieve when they concentrate all their interest and focus on the task at hand. During a flow experience, the individual feels a complete sense of control over the action (Csikszentmihalyi, 1977). The flow experience can be described as a holistic experience during any activity, where the skills are sufficient to meet the challenges aimed at a specific goal, the actions are under the individual's control, and the individual is completely absorbed in the activity, deriving great enjoyment (Canan, 2021; Csikszentmihalyi, 1990, p. 71; Csikszentmihalyi, 2021; Nah et al., 2014, p. 83). Athletes participate in sports activities for various purposes. For instance, it can be said that the purpose of individuals engaging in extreme sports is to experience flow (Celsi, Rose, and Leigh, 1993). The physical and mental challenges and struggles inherent in sports provide the opportunity to experience flow.

2.3. Recreational Flow Experience

Recreational activities facilitate the experience of flow, a subjective and positive state akin to optimal experience. Flow occurs when individuals become fully engrossed in an activity, losing track of time and shutting off

non-functional thoughts (Jang, 2016). This experience involves complete concentration and immersion in the activity, with individuals deriving pleasure and enjoyment without being aware of time passing. The recreational flow experience is characterized by this deep engagement and emotional state during voluntary participation.

Both outdoor recreation and sports recreation, including extreme sports, are highly conducive to recreational flow experiences. Extreme sports participants often feel as though time flies during the activity. Additionally, the pleasure and optimal performance state that arise from being fully immersed in the moment, without thinking about anything else, can be described as a recreational flow experience (Alba and Williams, 2013, pp. 8-9). In this state, environmental factors and various thoughts in the mind are filtered out, concentration on the activity is at its peak, and feelings of pleasure and happiness occur (Csikszentmihalyi, 2021). After defining the concept of recreational flow experience, it is important to understand flow theory.

2.4. Flow Theory

The flow experience occurs when an individual's skills are balanced with the challenges they face during a recreational activity. This process represents the functioning of flow theory (Csikszentmihalyi, 2021). Flow theory, introduced by psychology professor Mihaly Csikszentmihalyi in his book "Beyond Boredom and Anxiety" (1975), suggests that experiencing flow is related to an individual's ability to feel happiness, control their inner life, direct their attention towards a specific goal, and handle challenges with their skills. Individuals in a state of flow experience some of the most enjoyable moments of their lives and derive significant

pleasure from their experiences (Csikszentmihalyi, 2021). Flow theory, which focuses on personal experiences, has emerged as a subset of positive psychology, emphasizing well-being, happiness, and flourishing alongside motivational theories. It holds an important place within positive psychology (Alex Linley et al., 2006; Kefor, 2015; Seligman and Csikszentmihalyi, 2000).

Individuals are attracted to extreme sports through both intrinsic and extrinsic motivation. For flow to occur, there must be a balance between the activity's difficulty and the athlete's skills and abilities. As individuals overcome challenges, their skills improve, leading them to seek more difficult challenges. This illustrates that flow is a dynamically goal-directed system (Csikszentmihalyi and Massimini, 1985, p. 127; Moneta and Csikszentmihalyi, 1996, p. 279).

Extreme sports involve high life-threatening risks, yet athletes embrace these risks to fully experience adventure and excitement. Activities like mountaineering, paragliding, and surfing are autotelic experiences. The risks and sacrifices associated with these sports often lead to unforgettable moments of flow, which contribute to their appeal.

2.4.1. Three-channel flow experience model

The model discussed by Csikszentmihalyi (1975) addresses the anxiety that arises when the difficulty level of an activity exceeds an individual's skill and the boredom that occurs when the difficulty level is below the individual's skill. According to the three-channel flow model, the balance between skills and challenges results in the experience of flow and the transition into the flow channel. As shown below, Figure 1 presents the three-channel flow experience model.

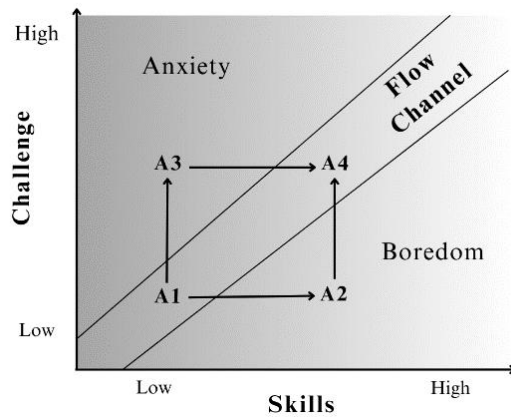


Figure 1: Three-Channel Flow Experience Model (Csikszentmihalyi, 1975)

The three-channel flow experience model for extreme athletes can be summarized as follows (Csikszentmihalyi, 2021):

"A1": At the start, the athlete, such as an extreme skier, has minimal skills and finds the primary challenge is staying upright on the snow. This level may provide low-intensity flow but is temporary.

"A2": As skills improve, staying upright becomes easy, and the athlete seeks greater challenges. This boredom occurs when the challenge no longer matches their skills.

"A3": When attempting more complex tasks like skiing on uneven terrain, the athlete may face anxiety if their skills are insufficient to handle the increased difficulty. "A4": To experience flow, the athlete must find tasks that match their skills or improve their skills to meet higher challenges. In "A4," flow is more complex and represents optimal performance compared to "A1."

Both "A1" and "A4" involve flow but differ in complexity and performance level. As skills develop, the athlete seeks greater challenges

to maintain flow, moving beyond boredom or anxiety. If challenges are too low or skills are inadequate, motivation drives the athlete to seek new challenges or improve skills to experience flow again.

2.5. The Dimensions of Flow Experience

The generally accepted nine dimensions of the flow experience have been established. These dimensions are classified as follows: "*challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, total concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience*" (Csikszentmihalyi, 1990; Jackson & Marsh, 1996; Nakamura & Csikszentmihalyi, 2002, p. 90).

2.5.1. Challenge skill balance: This dimension refers to the balance between the difficulty of an activity that requires attention and skill to perform an action, and the individual's level of skill. If the action performed and the perceived level of difficulty exceed the individual's abilities, anxiety will arise; if the individual's abilities surpass the perceived level of difficulty, boredom will occur. Therefore, maintaining a balance between these two factors will facilitate the experience of flow (Aubé, Brunelle, & Rousseau, 2014, p.121; Jackson & Marsh, 1996, p.18).

1. Action-awareness merging: This dimension entails individuals fully immersing themselves in the activity they are engaged in, becoming absorbed and focused on the task at hand. As a result of this concentration, the individual reaches a level where they almost perform the action spontaneously without consciously thinking about the task within the activity (Csikszentmihalyi, 2021; Jones et al., 2000).

2. **Clear goal:** This dimension involves the presence of clear and specific goals set by the individual during the activity, and knowing what needs to be done to achieve these goals (Jackson & Marsh, 1996; Csikszentmihalyi, 1998).

3. ***Unambiguous feedback:*** This dimension involves receiving clear, understandable, and prompt feedback for individuals to grasp their performance within the activity they are engaged in (Celsi, Rose, & Leigh, 1993, p.11). It's essential to note that the dimension of clear and immediate feedback is particularly crucial for recreational extreme sports enthusiasts. If an athlete doubts themselves and their performance, their motivation dwindles, and they may enter the boredom channel.

4. ***Total concentration on the task at hand:*** The dimension of focusing on the present task during the ongoing experience, disregarding all negative aspects of life, constitutes the element of concentration on the task at hand in the flow experience. In the state of flow experienced after a high degree of concentration, the individual expends all their attention and energy on executing the action and fulfilling the task.

5. ***Sense of control:*** In this dimension of flow, individuals experience a sense of control where they feel that they have control over their actions within the activity (Jackson & Marsh, 1996). Feeling in control during the activity, the individual continues the experience feeling safe rather than dwelling on the possibility of failure. For example, individuals engaged in extreme sports consciously immerse themselves in situations where the risk is high and safety is low for the sake of fun and adventure. Despite all these risk factors, athletes can experience flow because they feel a sense of control (Csikszentmihalyi, 1990; Csikszentmihalyi, 2021; Rettie, 2001).

6. Loss of self-consciousness: In this dimension, individuals become fully absorbed in the activity, free from self-concern and unrelated anxiety. Flow occurs when individuals lose self-consciousness, focusing solely on the task rather than on their self-concept. This loss of self-awareness allows for more instinctive and confident actions, leading to new skills, experiences, and achievements (Csikszentmihalyi, 1990; Csikszentmihalyi, 2021; Jackson & Marsh, 1996).

7. Transformation of time: During the flow experience, time seems to flow differently, often feeling detached from reality. Individuals focused on the activity may perceive time as passing faster than it actually does, demonstrating the dimension of time transformation (Csikszentmihalyi, 1990). In engaging and enjoyable activities, people become so absorbed that their perception of time changes, making it feel like time is moving more quickly (Arnould & Price, 1993; Nakamura & Csikszentmihalyi, 2002). For instance, a skydiver might perceive their flight time as shorter than it actually is.

8. Autotelic experience: Autotelic experience is defined as a self-sufficient and inherently rewarding activity where the experience itself is the reward, driven by intrinsic motivation rather than external benefits (Csikszentmihalyi, 2021, p.107). The nine dimensions of flow offer insights into its mechanisms, processes, and outcomes. During flow, individuals find pleasure and enjoyment in their activities, which boosts enthusiasm and confidence. In recreational activities like extreme sports, flow improves motivation and satisfaction. Flow is associated with well-being, including motivation, happiness, and optimism, and is studied in positive psychology. It is a state of mental well-being that enhances one's

overall sense of well-being, though anxiety or boredom can have negative effects. Understanding flow's relationship with perceived wellness is essential.

2.6. Wellness Concept

Wellness concept was first introduced by author Halbert L. Dunn in 1959 in his book "High-Level Wellness." Dunn (1961) defines wellness as an integrated process aimed at maximizing an individual's potential to achieve optimal health, well-being, and quality of life, while avoiding illness. Wellness is based on a lifestyle where the individual's physical, psychological, emotional, spiritual, social, and intellectual dimensions are balanced and interconnected (Adams, Bezner, & Steinhardt, 1997). Wellness is not merely the absence of illness but is described as a state of complete well-being, encompassing physical, mental, and social aspects, in the pursuit of optimal health and a healthy lifestyle (Rothmann & Ekkerd, 2007, p.35).

Wellness entails individuals seeking peace and happiness in their journey of life, discovering themselves and their abilities towards a healthy life, and realizing their potential, leading to a holistic perspective on life in various domains. This lifestyle includes physical health alongside mental well-being, social relationships, positive emotions, perceptions, and expectations. A holistic state of wellness emerges as a result of the harmonious development of physical, social, psychological, emotional, spiritual, and intellectual perceptions of well-being.

2.7. Perceived Wellness

Perceived wellness is grounded within the theoretical framework of five main components: Perceptual Foundations, Integrated Systems,

Multidimensionality, Salutogenic Orientation, and Dispositionality. Understanding the components of well-being is crucial for grasping the concept of well-being.

Perceptual foundations refer to individuals' perceptions of well-being. Integrated systems perspective and multidimensionality entail the simultaneous operation of physical, spiritual, psychological, social, emotional, and intellectual parameters concerning individual well-being, with these dimensions interconnected. Salutogenic orientation involves focusing on the origins of health and well-being, moving away from illness, and increasing actions that promote well-being. Dispositionality, on the other hand, can be defined as an individual's perception, attitude, and inclination towards themselves and their surroundings (Adams et al., 1997; Depken, 1994; Dunn, 1961; Tsai, 2004).

Perceived wellness is based on individuals' self-perceptions of well-being. These perceptions offer valuable and consistent insights, which can also predict future health conditions, highlighting the importance of focusing on how people perceive their well-being. Perceptions serve as the foundation for cognitive restructuring, aiding in a deeper understanding and expression of oneself, surroundings, emotions, and thoughts (Adams et al., 1997; Adams et al., 2000; Idler & Kasl, 1991). Perceptions can evolve into beliefs, beliefs into attitudes, and attitudes into behaviors. Perceptions, attitudes, and beliefs about well-being underpin physical responses and behaviors. Research highlights the importance of these perceptions in well-being (Kobasa, 1979; Wethington & Kessler, 1986). Perceptions help individuals better understand and express themselves, their environment, and their emotions and thoughts. Through life

experiences, these perceptions and attitudes shape perceived wellness within the context of various well-being dimensions.

When examining the benefits of recreational activities, it is evident that they have positive effects on well-being. Considering the benefits of recreation, it becomes apparent that it is closely related to positive psychology and well-being (Beard & Ragheb, 1983; Gürsoy & Sevin, 2021).

2.8. Dimension of Wellness

In this section, the definitions and characteristics of the six dimensions of perceived wellness, namely "physical, spiritual, psychological, social, emotional, and intellectual," will be examined.

2.8.1. Physical wellness

Physical well-being refers to individuals' positive conditions, perceptions, awareness, and expectations regarding their physical health (Adams et al., 1997, p.210). It includes factors like regular exercise, a healthy diet, and quality sleep. Physical well-being reflects the interplay between an individual's physical state, their health perception, and their preferences. Those with high physical well-being find it easier to engage in health-related activities, feel more physically fit, and maintain a more positive view of their physical condition.

2.8.2. Spiritual wellness

Spiritual well-being encompasses both existential and religious dimensions. The existential dimension involves an individual's relationship with themselves and the external world, as well as a search for meaning. The religious dimension pertains to the individual's relationship with the Creator. Spiritual well-being reflects the satisfaction, fulfillment,

and contentment derived from life and one's connection with the Creator. High levels of spiritual well-being are linked to having a sense of purpose, positive perceptions of life's meaning, awareness, hopefulness, love, inner peace, and self-awareness.

2.8.3. Psychological wellness

Psychological well-being refers to individuals' tendency towards optimism and having positive expectations towards events or situations encountered in life. Additionally, perceptions that the experienced events will have positive outcomes explain psychological well-being. Individuals with high levels of psychological well-being are those who consistently strive against challenges encountered throughout their lives, maintain a positive outlook towards experiences, and exhibit optimistic and consistent behaviors towards the situations they encounter.

2.8.4. Social wellness

Social well-being is the perception of receiving support, love, and feeling valued from family, friends, or acquaintances in one's social circle when needed (Adams et al., 1997; Cohen & Wills, 1985; Milroy et al., 2013). Engaging in social activities such as recreational activities that impact and enhance one's life is among the most significant factors determining social well-being.

2.8.5. Emotional wellness

Self-esteem can be described as the overall sense of value that an individual perceives about themselves. Feeling appreciation, satisfaction, self-worth, and self-approval contribute positively to emotional well-being (Adams et al., 1997). Emotional well-being is defined by the ability of individuals to control their emotions, adapt to challenges, and make

healthy decisions without relying on others in the face of situations, experiences, and events encountered in their lives.

2.8.6. Intellectual wellness

Intellectual well-being is defined as the exploration and development of one's mental abilities, knowledge, skills, and hidden talents through stimulating and thought-provoking activities (Hettler, 1980; Naz & Rehman, 2013). Individuals pursuing intellectual well-being focus on nurturing curiosity, critical thinking, learning, and analysis. This internal renewal and engagement with interests contribute to a more fulfilling life and provide energy (Adams et al., 1997, p. 211; Naz & Rehman, 2013; Roscoe, 2009, pp. 219-220).

2.9. Flow Experience and Wellness in Extreme Sports

When examining studies on flow experiences, it's evident that the outcomes of flow experiences are associated with better performance (Bakker, 2008; Engeser & Rheinberg, 2008; Sokolowski et al., 2000), positive subjective experiences (Csikszentmihalyi, 1975), positive emotional states, happiness, subjective well-being, and mood (Clarke & Haworth, 1994; Eisenberger et al., 2005; Fullagar & Kelloway, 2009; Steele & Fullagar, 2009), life satisfaction, contentment, and quality of life (Asakawa, 2004; Clarke & Haworth, 1994), and socialization (Massimini et al., 1988), positively impacting well-being. Research indicates that recreational activities in natural settings such as green spaces, forests, seas, lakes, and rivers have positive benefits on well-being and welfare. Outdoor activities provide positive outcomes from physical, psychological, and social perspectives (Eigenschenk et al., 2019; White et al., 2016). Studies suggest that environments like the sea, lakes, and rivers may have positive

psychological and emotional effects on human health (Gascon et al., 2017; White et al., 2020). These findings underscore the significance of the relationship between outdoor extreme sports activities and well-being within the tourism and recreation industry.

Csikszentmihalyi (1990) noted in his studies on flow experiences that factors such as happiness and motivation during participation in activities positively influence well-being, particularly psychological well-being. Brymer and colleagues (2009) found in their study with rock climbers that extreme sports foster a sense of closeness between athletes and nature, which can increase respect and sensitivity to nature and support environmental sustainability. Gros (2020) suggests that the intensity of pleasure derived from repetitive movements in an activity diminishes over time, resulting in a decrease in the quality of the experience. To maintain the freshness of the experience, Gros suggests changing the type of activity or ensuring variety in movement. As athletes' skills improve, there is an increased likelihood of boredom and a loss of initial enjoyment. This state of boredom makes it difficult for individuals to focus on the activity and their skills, hindering the flow channel. A person who does not enjoy the activity will experience a decrease in happiness, motivation, and excitement levels. Therefore, it can be said that as the level of boredom increases, perceived wellness decreases. McCurdy et al. (2022) reported a negative relationship between boredom and well-being. Similarly, Boateng et al. (2021) found a negative relationship between boredom and anxiety levels and psychological well-being. Dursun et al. (2020) found that an increase in leisure boredom negatively affects emotional well-being.

Extreme sports can boost brain chemicals like serotonin and endorphins, improving mood, enhancing perceived wellness, and reducing stress. Regular exercise also increases self-confidence, reduces anxiety, and improves mental performance. However, in extreme sports, perceived difficulty might surpass skills, raising anxiety levels and causing doubts about performance. This heightened anxiety can negatively impact well-being, especially in competitive sports or excessive exercise. Therefore, individuals should be aware of their limits and choose activities they feel comfortable with.

In the face of difficulty in an activity, it is expected that individuals will challenge themselves and balance the perceived difficulty with their skills. In this case, the individual's confidence increases, they distance themselves from anxiety, and gain motivation. Otherwise, if the individual's ability falls below the perceived difficulty level, they enter the anxiety channel. This situation may not always produce negative results. Brymer and Schweitzer (2013) suggest that perceived anxiety in extreme sports can enhance the quality of the experience. Additionally, for recreational flow experiences to occur, it is expected that there will be a sufficient level of performance anxiety, rather than the absence of anxiety, and that the level of difficulty in the activity will be balanced with the skills (Engeser & Rheinberg, 2008; Ullén et al., 2010). The absence of anxiety implies that the individual's skills exceed the level of difficulty in the activity. This leads to boredom and makes it difficult to experience flow. Similarly, excessively high anxiety also prevents entry into the flow channel. In conclusion, for recreational flow experiences to occur and to derive enjoyment, pleasure, and happiness from the activity, there must be an

adequate level of performance anxiety (Csikszentmihalyi, 1975; Fullagar et al., 2013).

3. Conclusion and Suggestions

Today, recreational flow experience plays a significant role in maximizing the experience in increasingly popular extreme sports. Developing a stronger connection to the activity, achieving peak individual performance, and obtaining maximum enjoyment or happiness from the activity depend on the flow experience during extreme sports. When the athlete's skill level is in harmony with the current difficulty level of the activity, the activity allows the individual to enjoy it without feeling strained; however, if this situation becomes continuous, the individual may become bored and lose concentration. At this point, to reestablish the flow experience, the individual's attention will need to be directed to a more complex or challenging task. As the individual surpasses the current level of difficulty, their skills improve; however, if the difficulty faced is far beyond their skills, they will experience anxiety and worry. This balance allows the individual to surpass difficulties by using their skills optimally and experience the flow. Therefore, if the individual's abilities and skills exceed the challenges, boredom may occur, while if they fall short, anxiety may arise.

Overcoming various physical challenges during the activity will increase the individual's physical well-being. Simultaneously, with the improvement of mental state and the attainment of different emotions, the perception of psychological and emotional well-being will also increase. Individuals with increased psychological well-being will have positive expectations towards events and situations in life. Athletes with increased

emotional well-being will develop the ability to control their emotions, adapt to challenges, and make healthy decisions without relying on others. Additionally, individuals will be able to elevate their spiritual well-being to higher levels with a spiritual well-being state related to the meaning of life. Considering that extreme sports build self-confidence in individuals, they will become more social within society, thereby increasing their level of social well-being. Exploring their mental abilities, seeking ways to develop their knowledge and skills, and enhancing their hidden talents and personalities through inspiring and thought-provoking activities will also increase their perception of intellectual well-being.

Recreational flow experience and well-being perception are crucial in extreme sports across air, land, and water. Future research should explore these relationships across various sports, conditions, and measurement methods. Additionally, training and seminars for extreme athletes can help them manage their flow experience. Given the risks associated with extreme sports, focusing on risk management, decision-making, and wellness education can aid in athlete development.

Acknowledgements and Information Note

This study is derived from the master's thesis written by Eminsafa DİLMAÇ in the Department of Recreation at Sakarya University of Applied Sciences, Graduate School. The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Adams, T. B., Bezner, J. R., Drabbs, M. E., Zambarano, R. J., & Steinhardt, M. A. (2000). Conceptualization and measurement of the spiritual and psychological dimensions of wellness in a college population. *Journal of American college health, 48*(4), 165-173.
- Adams, T., Bezner, J., & Steinhardt, M. (1997). The conceptualization and measurement of perceived wellness: Integrating balance across and within dimensions. *American Journal of health promotion, 11*(3), 208-218.
- Alba, J.W., & Williams, E.F. (2013). Pleasure P rinciples: A review of research on hedonic consumption. *Journal of Consumer Psychology, 23*(1), 2-18.
- Alex Linley, P., Joseph, S., Harrington, S., & Wood, A. M. (2006). Positive psychology: Past, present, and (possible) future. *The Journal of Positive Psychology, 1*(1), 3-16.
- Arnould, E. J., & Price, L. L. (1993). River magic: Extraordinary experience and the extended service encounter. *Journal of consumer Research, 20*(1), 24-45.
- Asakawa, K. (2004). Flow experience and autotelic personality in Japanese college students: How do they experience challenges in daily life? *Journal of Happiness Studies, 5*(2), 123-154.
- Aubé, C., Brunelle, E., & Rousseau, V. (2014). Flow experience and team performance: The role of team goal commitment and information exchange. *Motivation and Emotion, 38*(1), 120-130.
- Bakker, A. B. (2008). The work-related flow inventory: Construction and initial validation of the WOLF. *Journal of Vocational Behavior, 72*(3), 400-414.
- Beard, J. G., & Ragheb, M. G. (1983). Measuring leisure motivation. *Journal of leisure research, 15*(3), 219-228.
- Breivik, G., Roth, W. T., & Jørgensen, P. E. (1998). Personality, psychological states and heart rate in novice and expert parachutists. *Personality and Individual Differences, 25*(2), 365-380.
- Brymer, E., & Gray, T. (2009). Dancing with nature: Rhythm and harmony in extreme sport participation. *Journal of Adventure Education & Outdoor Learning, 9*(2), 135-149.

- Brymer, E., & Schweitzer, R. (2013). Extreme sports are good for your health: a phenomenological understanding of fear and anxiety in extreme sport. *Journal of health psychology, 18*(4), 477-487.
- Canan, S. (2021) *İnsanın Fabrika Ayarları – 1 Beden*. (16. Baskı). İstanbul: Tuti Kitap.
- Celsi, R.L. Rose, R.L., & Leigh, T.W. (1993). An exploration of high-risk leisure consumption through skydiving. *Journal of Consumer Research, 20*(1), 1-23.
- Clarke, S. G., & Haworth, J. T. (1994). ‘Flow’experience in the daily lives of sixth-form college students. *British Journal of Psychology, 85*(4), 511-523.
- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310-357.
- Csikszentmihalyi M. (1990). *Flow: The psychology of optimal experience*. New York: HarperCollins.
- Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. Washington: Jossey-Bass.
- Csikszentmihalyi, M. (1977). *Beyond boredom and anxiety*. (Second Printing). San Francisco: Jossey-Bass.
- Csikszentmihalyi, M. (1988). The flow experience and its significance for human psychology. In M. Csikszentmihalyi & I. S. Csikszentmihalyi (Eds.), *Optimal experience: Psychological studies of flow in consciousness* (ss. 15–35). Cambridge University Press.
- Csikszentmihalyi, M. (2021). *Akış: Mutluluk bilimi*. (8. Baskı). (Barış Satılmış, Çev.). Ankara: Buzdağı Yayınevi.
- Csikszentmihalyi, M., & Massimini, F. (1985). On the psychological selection of bio-cultural information. *New Ideas in Psychology, 3*(2), 115-138.
- Depken, D. (1994). Wellness through the lens of gender: A paradigm shift. *Wellness Perspectives, 10*(2), 54-69.
- Dunn, H. L. (1961). *High level wellness*. Arlington: R. W. Beatty.
- Dursun, M., Yarayan, Y. E., Arı, Ç., Ulun, C., & Adas, S. K. (2021). Covid-19 in Turkey: Leisure boredom, psychological resilience, physical activity

and emotional state. *International Journal of Educational Research and Innovation*, 15, 460-486.

- Eigenschenk, B., Thomann, A., McClure, M., Davies, L., Gregory, M., Dettweiler, U., & Inglés, E. (2019). Benefits of outdoor sports for society. A systematic literature review and reflections on evidence. *International journal of environmental research and public health*, 16(6), 937.
- Eisenberger, R., Jones, J. R., Stinglhamber, F., Shanock, L., & Randall, A. T. (2005). Flow experiences at work: For high need achievers alone?. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, 26(7), 755-775.
- Ekinci, E. (2023). *Macera arayışı, akış deneyimi ve serbest zaman tatmini ilişkisi: Açık alan rekreasyon katılımcıları üzerine bir araştırma*. (Yayımlanmamış doktora tezi), Ankara Üniversitesi, Sağlık Bilimleri Enstitüsü, Ankara.
- Engeser, S., & Rheinberg, F. (2008). Flow, performance and moderators of challenge-skill balance. *Motivation and Emotion*, 32(3), 158-172.
- Fletcher, R. (2008). Living on the edge: The appeal of risk sports for the professional middle class. *Sociology of sport journal*, 25(3), 310-330.
- Fullagar, C. J., & Kelloway, E. K. (2009). Flow at work: An experience sampling approach. *Journal of Occupational and Organizational Psychology*, 82(3), 595-615.
- Fullagar, C. J., Knight, P. A., & Sovern, H. S. (2013). Challenge/skill balance, flow, and performance anxiety. *Applied Psychology*, 62(2), 236-259.
- Gascon, M., Zijlema, W., Vert, C., White, M. P., & Nieuwenhuijsen, M. J. (2017). Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. *International journal of hygiene and environmental health*, 220(8), 1207-1221.
- Gros, F. (2020). *Yürümenin felsefesi*. (15. Baskı). (Albina Ulutaşlı, Çev). İstanbul, Kolektif Kitap.
- Gürsoy, Ö., & Sevin, H. D. (2021). Boş zaman aktivitelerine katılım ile algılanan wellness (esenlik) ilişkisi. *OPUS International Journal of Society Researches*, 18(42), 5444-5479.

- Hettler, B. (1980). Wellness promotion on a university campus. *Family & Community Health, 3*(1), 77-95
- Idler, E. L., & Kasl, S. (1991). Health perceptions and survival: do global evaluations of health status really predict mortality?. *Journal of Gerontology, 46*(2), 55-65.
- Jackson, S. A., & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The Flow State Scale. *Journal of Sport and Exercise Psychology, 18*(1), 17-35.
- Jang, K. (2016). 대학생 스키리조트 이용객의 여가몰입, 여가이득, 생활만족과 재방문의도의 관계(Relationships Between Leisure Flow, Leisure Benefits, Life Satisfaction and Revisit Intention of College Student Customers in Ski Resort). *한국콘텐츠학회논문지(Journal of the Korean Contents Association), 16*(9), 254-266.
- Jones, C. D., Hollenhorst, S. J., Perna, F., & Selin, S. (2000). Validation of the flow theory in an on-site whitewater kayaking setting. *Journal of Leisure Research, 32*(2), 247-261.
- Kefor, T. (2015). *Arts students in flow: An interpretative phenomenological analysis*. (Unpublished doctoral dissertation). Massachusetts: College of Professional Studies Northeastern University, Boston.
- Kerr, J. H., & Houge Mackenzie, S. (2012). Multiple motives for participating in adventure sports. *Psychology of sport and exercise, 13*(5), 649-657.
- Kobasa, S. C. (1979). Stressful life events, personality, and health: an inquiry into hardiness. *Journal of Personality and Social Psychology, 37*(1), 1-11.
- Larkin, M., & Griffiths, M. D. (2004). Dangerous sports and recreational drug-use: rationalizing and contextualizing risk. *Journal of community & applied social psychology, 14*(4). 215-232.
- Massimini, F., Csikszentmihalyi, M., & Delle Fave, A. (1988). Flow and biocultural evolution. In M. Csikszentmihalyi & I. S. Csikszentmihalyi (Eds.), *Optimal experience: psychological studies of flow in consciousness*. New York: Cambridge University Press.
- McCurdy, A., Stearns, J. A., Rhodes, R. E., Hopkins, D., Mummery, K., & Spence, J. C. (2022). Relationships between physical activity, boredom proneness, and subjective well-being among UK adults during the

- COVID-19 pandemic. *Journal of Sport and Exercise Psychology*, 44(3), 189-197.
- Milroy, J. J., Orsini, M. M., D'Abundo, M. L., & Sidman, C. L. (2013). College students' perceived wellness among online, face-to-face, and hybrid formats of a lifetime physical activity and wellness course. *American Journal of Health Education*, 44(5), 252-258.
- Moneta, G. B., & Csikszentmihalyi, M. (1996). The effect of perceived challenges and skills on the quality of subjective experience. *Journal of Personality*, 64(2), 275-310.
- Nah, F. F. H., Eschenbrenner, B., Zeng, Q., Telaprolu, V. R., & Sepehr, S. (2014). Flow in gaming: literature synthesis and framework development. *International Journal of Information Systems and Management*, 1(1-2), 83-124.
- Nakamura, J., & Csikszentmihalyi, M. (2002). The concept of flow. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 89-105). New York: Oxford University Press.
- Naz, A. S., Rehman, R., Katpar, S. J., & Hussain, M. (2014). Intellectual wellness awareness: a neglected area in medical universities of Pakistan. *Journal of the Pakistan Medical Association*, 64(9), 993-997.
- Puchan, H. (2005). Living "extreme": Adventure sports, media and commercialisation. *Journal of Communication Management*, 9(2), 171-178.
- Rettie, R. (2001). An exploration of flow during internet use. *Internet Research*, 11(2), 103-113.
- Roscoe, L. J. (2009). Wellness: A review of theory and measurement for counselors. *Journal of Counseling & Development*, 87(2), 216-226.
- Rothmann, S., & Ekkerd, J. (2007). The validation of the perceived wellness survey in the South African police service. *SA Journal of Industrial Psychology*, 33(3), 35-42.
- Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, 55(1), 5-14.
- Sokolowski, K., Schmalt, H. D., Langens, T. A., & Puca, R. M. (2000). Assessing achievement, affiliation, and power motives all at once: The

- Multi-Motive Grid (MMG). *Journal of Personality Assessment*, 74(1), 126-145.
- Steele, J. P., & Fullagar, C. J. (2009). Facilitators and outcomes of student engagement in a college setting. *The Journal of Psychology*, 143(1), 5-27.
- Şimşek, K. Y. (2010). Dünya Spor Endüstrisinde Ekstrem Sporların Gelişimi ve Yeri. *CBÜ Beden Eğitimi Ve Spor Bilimleri Dergisi*, 5(1), 21-27.
- Tsai, C.Y. (2004). *The relationship between leisure participation and perceived wellness among taiwanese adult ages 55-75 years*. (Unpublished doctoral dissertation). University of the Incarnate Word, Texas.
- Ullén, F., de Manzano, Ö., Theorell, T., & Harmat, L. (2010). 10 The physiology of effortless attention: Correlates of state flow and flow proneness. *Effortless attention: A new perspective in the cognitive science of attention and action*, 205-218.
- Wethington, E., & Kessler, R. C. (1986). Perceived support, received support, and adjustment to stressful life events. *Journal of Health and Social behavior*, 27(1), 78-89.
- White, M. P., Elliott, L. R., Gascon, M., Roberts, B., & Fleming, L. E. (2020). Blue space, health and well-being: A narrative overview and synthesis of potential benefits. *Environmental Research*, 191, 110169.
- White, M. P., Elliott, L. R., Taylor, T., Wheeler, B. W., Spencer, A., Bone, A., ... & Fleming, L. E. (2016). Recreational physical activity in natural environments and implications for health: *A population based cross-sectional study in England*. *Preventive medicine*, 91, 383-388.
- Willig, C. (2008). A phenomenological investigation of the experience of taking part in extreme sports. *Journal of health psychology*, 13(5), 690-702.

Res. Assist. Eminsafa DİLMAÇ

E-mail: eminsafadilmac@subu.edu.tr

Educational Status: Ph.d. Candidate

License: Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation (2016-20)

Degree: Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation (2020-23)

Doctorate: Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation (2023- ongoing)

Professional experiences: Eminsafa Dilmaç is a Research Assistant in the Department of Recreation Management at the Faculty of Tourism at Sakarya University of Applied Sciences. Conducting academic studies in the fields of recreation philosophy and recreation sociology, Dilmaç holds coaching certificates in swimming, athletics, tennis, and wellness. In addition to serving as a recreation specialist in youth camps, he is also interested in outdoor recreation and extreme sports.

Assoc. Prof. Dr. Nurgül TEZCAN KARDAŞ

E-mail: nurgultezcan@subu.edu.tr

Educational Status: Associate Professor

License: Kocaeli University School of Physical Education and Sports Department of Physical Education Teaching (1999-2003)

Degree: Sakarya University Institute of Social Sciences Physical Education and Sports Education (2003-07)

Doctorate: Düzce University Institute of Health Sciences Physical Education and Sports (PhD) (in collaboration with Kocaeli University) (2014-15)

Professional experiences: Nurgül Tezcan Kardeş has been working as an associate professor at Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Recreation since 2020. Nurgül's research focuses on therapeutic recreation, digitalization in sports, artificial intelligence, sport tourism and gymnastics.

Investigation of the Post-Earthquake Use of Open and Green Areas Used for Recreation in the "January 24, 2020, Elazığ Earthquake"

Ömer Faruk BAŞGÜN ¹ 

¹Elazığ Municipality, Directorate of Parks and Gardens, 23100.

Elazig/Türkiye.

ORCID: 0000-0002-3315-0182

E-mail: farukbasgun@gmail.com

Prof. Dr. Yahya BULUT ² 

²Atatürk University, Faculty of Architecture and Design, Department of Landscape Architecture. Erzurum/Türkiye

ORCID: 0000-0003-0255-1001

E-mail: ybulut@atauni.edu.tr

Citation: Başgün Ö.F. & Bulut Y. (2024). Investigation of the Post-Earthquake Use of Open and Green Areas Used for Recreation in the "January 24, 2020, Elazığ Earthquake". Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:17, 432-462. ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13887107>

1. Introduction

Earthquakes are natural disasters that have serious devastating impacts on human life and settlements. Re-establishing a sustainable life after these disasters is of critical importance. Especially in regions where urbanization is increasing rapidly, open and green areas used for recreation play an important role in post-disaster emergency management and recovery processes. In the post-disaster process, recreation areas undertake many critical functions such as sheltering, gathering, logistical support and psychological relief (Akdağ 2002; Allan et al. 2013). The 6.8 magnitude earthquake that occurred in Elazığ on January 24, 2020 revealed the role of open and green areas used for recreation in disaster management. Earthquakes are among the natural disasters that are increasing and causing great destruction worldwide. The effectiveness of the methods and strategies used in disaster management in such major disasters determines the resilience of societies against disasters. The use of open and green spaces after disasters is an important part of disaster management and the effective use of these spaces plays a critical role in post-disaster response and recovery processes. In the literature, studies on the use of open and green areas after earthquakes show that these areas assume various functions (Kadioğlu 2008; Kawakami 2020). In Elazığ, especially Kültürpark, which is the largest recreation area in the city center with an area of 180,000 m², many recreation areas in the city center and especially between the building islands served as temporary shelter areas after the earthquake. Especially Kültürpark has become one of the most actively used areas after the earthquake in terms of its size and ease of transportation. In this area, many services such as crisis center, disaster

coordination center, food and aid distribution center and temporary shelter area were provided to earthquake victims. This situation has shown that recreation areas play a very critical role in disasters in addition to their usual duties in cities. This study aims to evaluate the effectiveness of such areas in disaster management by examining the use of open and green spaces after the Elazığ earthquake. There are significant gaps in the literature on how effectively such areas are used after earthquakes and what can be done to improve these areas (Sahin et al. 2014; Bhandari et al. 2021). This study, based on the case of Elazığ, aims to contribute to the development of future disaster preparedness and response strategies.

1.1. The Concept of Disaster

Disasters are events that cause material and moral losses to societies and states. Disasters are also natural, technological or human interventions that negatively affect societies by interrupting the normal flow of life (Akdağ 2002; Allan et al. 2013). In order for an event to be characterized as a disaster, it must cause losses in societies and settlements. In addition, it must adversely affect the ordinary flow of life and damage one or more settlements. As seen in these definitions, the concept of disaster is defined as the consequences of an event rather than an event that occurs. The seriousness of disasters is measured by the magnitude of physical, material and moral losses they cause for people (Kadıoğlu 2008; Kawakami 2020). Disasters are one of the most important issues for which it is essential for people to be seriously prepared.

Disasters can cause mass deaths in the places where they occur. In countries where disasters occur frequently, being prepared for disasters is of great importance (Çeber 2005; Kapucu and Özerdem 2013; Guha-Sapir

et al.2015). Measures to be taken against disasters can reduce their possible effects. Therefore, societies should be prepared for disasters in order to reduce the effects of disasters. Turkey is geographically susceptible to natural disasters such as earthquakes, floods and landslides. Along with these, man-made disasters also occur (Sahin et al. 2014; Bhandari et al. 2021). Disaster preparedness policies should be developed to reduce material and moral disaster losses. In 2004, the United Nations Development Program (UNDP) carried out the Disaster Risk Reduction for Development program. In the report prepared, countries experiencing disasters were analyzed. In terms of exposure to disasters, it is seen that only 11% of the current population of less developed countries is affected by disasters. However, it is determined that approximately 53% of this rate results in death.

Turkey is exposed to many disasters due to its geographical location. Among these disasters, there are many different natural and man-made disasters. According to the data published by the Turkish Statistical Institute in 2020 (Figure 1), the disasters occurring in Turkey are as follows according to the frequency of occurrence:

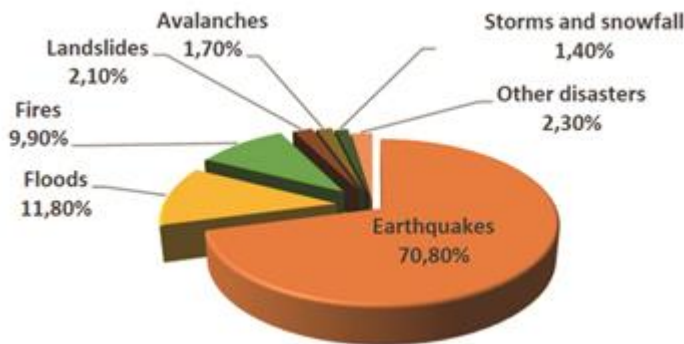


Figure 1. Types of Disasters in Turkey (TUIK, 2020)

When we look at the data, it is understood that the most common type of disaster in Turkey is earthquake. Another common type of disaster is floods. Fires are also a common type of disaster in Turkey and have increased in recent years. Other types of disasters occur less frequently than these. Most of the disasters in Turkey are natural disasters. Earthquake is the most common natural disaster especially due to fault lines. For this reason, earthquake preparedness is given great importance in disaster management studies. In addition, earthquakes are undoubtedly the most destructive disasters. Earthquakes often cause secondary disasters. Tsunamis, floods, fires and landslides are typical secondary disasters that occur after earthquakes, but technological disasters can also occur (Elazığ Fire Department Archive, 2023). An analysis of earthquakes in Turkey in the last century shows that a devastating earthquake occurs almost every ten years (Erkoç 2004; Sarıçam 2019). In Turkey, the first thing that comes to mind when disaster is mentioned is earthquake. Measures taken against disasters are generally thought to be earthquake-oriented. In addition to earthquakes, damages caused by natural disasters such as landslides, floods and landslides also affect residential areas in Turkey. These disasters cause a financial loss of around 3 percent of the national income every year. This loss generally refers to the damages caused by the disaster as a result of the disaster. Disasters also cause indirect losses. Considering the environmental consequences of disasters, labor force and production losses, Turkey suffers more damage in many aspects (Akyel 2007). Disasters (drought, landslides, floods, sea level rise, etc.) are expected to increase in the coming years due to global climate change (Kadioğlu 2008; Sarıçam 2019). In order to minimize disaster

damages in Turkey, disasters should be handled within the scope of science-based disaster management principles. Not only an earthquake-oriented perspective should be adopted, but all disasters should be addressed. It is also important to consider the indirect effects of these disasters. Disaster management in Turkey should be handled from all aspects and a planning approach should be adopted by determining the frequency of disaster events for each region. In addition, considering that open and green areas are used after disasters, urban parks and open green areas should be prioritized in disaster management.

1.2. Functions of Urban Green Spaces after Disasters

Disasters are the general name given to events that cause physical, economic and social losses to people and stop or interrupt the ordinary flow of life. Urban centers are the places where people live most frequently around the world today. These are the regions where the destructive feature of disasters causes the most destruction. This situation has increased the importance of urban green space planning that is resistant to disasters. The design of open-green areas and disaster parks that can be used in case of disaster has gained importance (Rung et al. 2011). Open and green areas lose their pre-disaster functions and assume different functions after disasters (Alawi, 2023). Green areas have ecological, economic, social and recreational functions in a city. These areas become vital areas after a disaster (Yıldırım et al, 2021). Urban green spaces are the areas where people reconnect with life after a disaster.

Urban open and green areas undertake important tasks such as emergency transportation, gathering areas, aerial access, storage, distribution of search and rescue materials after a disaster. They become life-saving areas

by meeting sheltering needs, setting up temporary tents or hosting container cities (Nappi et al. 2015; Kahyaoğlu 2016). After disaster events, open and green areas primarily provide life safety. They then become areas where life is re-established (Kırçın et al. 2017; Uddin et al. 2018). Most people instinctively feel the need to go out to open green spaces when they feel threatened by disaster. Even if the houses they live in are not damaged, they prefer to stay outside for a while for safety reasons (Ogawa, 2014; Korgavuş and Ersoy 2015). The lack of open-green areas in cities is also a problem in terms of disaster risks (Ozcan et al. 2013). Non-residential spaces such as open green areas, open sports areas, open parking lots, open city squares should be accessible, of appropriate size and especially left empty. For this reason, attention should be paid to allocate such areas in zoning plans in settlement areas (Allen 2013; Park et al. 2020).

The type of disaster is an important factor in the selection of gathering areas after the disasters occur. The area to be selected should be close to residential areas and health services. In addition, features such as the area where drinking and utility water can be found should also be taken into consideration. These areas may vary according to the type of disaster (Rung et al. 2011). For example, after a tsunami, the gathering area that can be selected is usually a high area around the city, away from the coast. However, after an earthquake, areas close to residential areas and city infrastructure should be preferred as gathering and sheltering areas. Water springs in various locations in disaster areas have an important place in the selection of gathering and evacuation areas after the disaster. For example, the city center water network may not work for a while after an earthquake.

In such cases, water sources can be used for drinking and public purposes (Allan et al. 2013).

The vast majority of public parks and city squares play a vital role as gathering and sheltering areas after disasters. Monumento de la Revolucion Square and its surroundings became the center of search and rescue operations during the 1985 8.4 magnitude earthquake in Mexico, one of the largest earthquakes in the world. These areas have the characteristics of being the first shelter for people fleeing from damaged houses and the center of search and rescue operations. The ability to accommodate different people with different needs is one of the characteristics of a good urban park. In an earthquake event, the functionality of parks and public spaces becomes critical (Rung et al.2011; Allan et al. 2013; Sariçam 2019). Even in disasters such as the Central Niigata Prefecture and Hanshin Awai Earthquake, which were among the major earthquakes in Japan, park areas became the epicenter of rescue efforts. For example; Ookuni Park both prevented the spread of fire in Nagata region and was used as the center of disaster prevention efforts (Masuda 2014; Ogawa 2014). Creating safe and sustainable cities against disasters is among the important criteria during the planning studies of cities across Japan. In big cities, fires after earthquakes cause great damage. For this reason, open-green space planning is seen as the key point of Japanese urban planning. The first collective urban plan was created in the form of master plans after the great Kanto disaster. The Kanto disaster affected more than half of Tokyo's population of 2,309,000 at the time. The main purpose of the planning project studies after this disaster was how to build a city resistant to natural disasters and fire, taking into account

the economic and cultural aspects (Masuda,2014). The Japanese government adopted the method of separating the dense urban fabric with open spaces such as parks, green areas, wide tree-lined roads. After the disaster in Japan, approximately 1 million 570 thousand people escaped to parks and saved their lives, showing that trees and open spaces prevented the spread of fire. Many disasters are also accompanied by fires (Atalay2008; Alawi 2023).

In Japan, sports fields in city parks have been actively used as shelters for citizens who lost their homes due to the tsunami after disasters. City parks with large open-green areas served as a sheltered and safe area where disaster coordination activities and health equipment were kept. Since the transportation system in the city did not work after the disaster, national park areas outside the urban areas were used as shelters for many people who could not go home (Ogawa 2014; Park et al. 2020). Recovery is the process of economic, social and physical recovery after a disaster. This period may be long, but it also provides an opportunity to correct the mistakes made. Disaster risk reduction efforts can yield quick results if they are initiated by taking into account the events that occurred after the disaster (Berke et al. 1993; Allan et al. 2013).

1.3. New approaches to disasters for green spaces used for recreation

Although the concept of disaster park is a new subject, it is an open green space planning that is open to development and change and has rare examples. Developing, expanding and increasing the application of disaster parks is very important for the welfare of countries and cities, public peace, safety of life and property. Disaster parks are more common in some far eastern countries with high earthquake intensity such as Japan.

Disaster parks in Turkey are far from what they should be, focused on a single disaster type and planned only for educational purposes.

The use of parks and open green spaces after disasters has led people to create disaster parks in disaster-prone areas. When we look at such parks, they are normally areas that meet the recreational needs of people. After disasters, these areas serve as the epicenter of disaster management. Structural areas in parks occupy less space than green areas. Thus, it is possible to reach larger open spaces in parks. For this reason, approximately 80% of a park area should be reserved as open and green areas, taking into account extraordinary situations. In addition, since parking areas are generally open to public, there are no problems such as obtaining permission or property rights to create temporary structures (Masoumi 2017; Sarıçam 2019). Active green areas where recreational needs and demands of the public are met before the disaster should be increased by considering green area planning and design criteria. These areas should be made functional with urban equipment that can be used after the disaster (Alawi 2023). After the great Kanto earthquake in Japan in 1923, survivors took refuge in forests and agricultural areas due to the fire risk in the city center. After this disaster, the need for open and green spaces in urban areas became mandatory. In Japan, especially in recent years, it is considered important to plan parks that can meet the need for shelter and refuge after disasters (Masuda 2014). While planning disaster parks, it is necessary to pay attention to planning disaster parks at different city scales (neighborhood, district, region, city, etc.). Transportation system, accessibility, logistics and administrative relations should be determined and these stakeholders should work in a coordinated manner

(Ogawa 2014; Masoumi 2017). Each neighborhood should have at least one disaster park area (Walz et al. 2021; Yıldırım et al. 2021). Neighborhood parks can be used as areas where health services can be provided, food can be served, storage services and temporary shelter areas with different statuses during or after the disaster. Therefore, they should be connected to the main transportation network (Xu et al. 2016; Yıldırım et al. 2021). After the disaster, non-residential urban areas such as parks and green areas should be close to the population they will serve and large enough. They should be sustainable and accessible, especially kept empty (Ogawa 2014; Korgavuş and Ersoy 2015). A transportation network should be provided to connect disaster parks from main and secondary roads, and road widths should be minimum 12 meters. This type of park area should be close to uses such as rivers, waterways, natural gas lines and electricity networks (Masoumi 2017). In case of a disaster, power lines should be taken underground in order not to break and damage the environment (Ogawa 2014). Disaster parks should be determined in scale within the scope of the population that they can serve for temporary and emergency sheltering. The width of the park should be planned as minimum 2000 m² within the city and 5000 m² outside the city (Masoumi 2017). While designing disaster parks, areas suitable for use as temporary settlement areas and of sufficient size should be preferred (Çavuş 2013). Disaster parks should have helipad, food distribution hall, administrative building, plumbing and drinking water. There should be necessary number of toilets and showers. These services can be accepted as mobile or built-in. Solar cells and solar platforms should be used for the electricity need of the disaster park (Masuda 2014).

Japan's disaster parks are cleverly conceived survival spaces, especially during post-disaster turmoil. Electric scooters and phone charging stations can run on solar power in the event of a power outage. There are also public stalls for cooking in the parks. One of Japan's best-known disaster parks is the Rinkai disaster park in Tokyo. It is an epicenter for Tokyo where emergency services can be directed. Covering 33000 m², it is a large park with power points and internet connections, mobile toilets and heating facilities. This disaster park is a leading center for disaster response activities (Xu et al. 2016; Yıldırım et al. 2021). A park that can be used in disasters is also planned in Hyogo region of Japan. This disaster park is a central park covering the whole Hyogo region. It is thought to function as a core point to protect people from the effects of disasters such as earthquakes, floods, typhoons and to create temporary shelters (Ogawa 2014). This park is named “Miki Disaster Prevention Park”. A tennis court built with steel construction, wall surfaces covered with grass and designed in the form of a dome can be an emergency center (Masuda 2014). In addition to all these criteria, disaster parks also adapt to the ordinary lives of people. Park Hikarigaoka, which was completed in 1940, was designed as a disaster park with the capacity to support 270,000 people when disasters occur while meeting people's recreational needs. Nakano Central Park is another disaster park that integrates with the city with its disaster mitigation feature in the area where centers such as workplaces, restaurants and meeting rooms are located.

Disaster parks and similar open-green space applications are gaining importance in many developed countries, especially in Japan. Such parks are increasingly seen as an important component of urban planning. These

areas are designed for the division of dense urban areas and for post-disaster use (Ogawa 2014). In Turkey, there is not yet a city plan and practice for the use of open-green spaces during and after disasters. Only some parks are called “earthquake parks” and there are areas that are mainly for educational purposes and are evaluated on the basis of a single disaster. However, it is necessary to identify the types of disasters that threaten cities and plan such areas for these disasters by taking into account the most common disasters. Disaster parks can be spread throughout the city by considering population density, transportation and water resources. In this way, it is possible to create a green space system resistant to disasters.

While planning disaster parks, urban reinforcement elements, building elements and plants to be located in the parks should be selected for disasters. They should be planned in a way to ensure sustainable use by taking disaster and post-disaster into consideration. More functional urban reinforcement elements should be designed instead of standard urban reinforcement elements within the scope of disasters. Renewable energy should be used in disaster parks. The possibility of power lines not working after the disaster should be taken into consideration. In this study, the post-disaster utilization status of Kültür Park in the city of Elazığ, where disasters are experienced intensively, was investigated by considering the mentioned factors. It is aimed to re-evaluate Kültür Park within the scope of disaster prevention and post-disaster utilization. The research to be conducted within the scope of this study will set an example for the creation of safer and more resilient urban areas against disasters in the city

of Elazığ. It will also bring a new dimension to the studies to be carried out on this subject.

2. Material and Method

2.1. Material

In this study, Elazığ was considered as the material. The population of Elazığ is 588.088 (TUIK 2023). The altitude of the city, which is located within the borders of the Upper Euphrates Department of the Eastern Anatolia Region, is 1067 meters high. According to the archaeological remains in the city, the history of the city dates back to the Paleolithic period, which dates back to 10,000 BC. Even 4000 years ago, it was an ancient settlement called Isuva in the ruins (Elazığ Provincial Directorate of Culture and Tourism 2022).

The amount of green space per capita in Elazığ is 8.74 m² (Demircan and Başgün 2022). There are more than 300 large and small city parks in Elazığ city center. When we look at the general situation of Elazığ's territory, 50% of it is covered with meadows and pastures, 28% with agricultural areas, 12% with forests and 10% with water surfaces (dams and lakes). 87% of agricultural lands are irrigable. There are 123,043 hectares of forests in the province. *Fraxinus sp.*, *Juglans regia* (walnut), *Alnus glutinosa* (alder), *Juniperus sp.* (juniper) and *Celtis australis* (hackleberry) species are found in the higher elevation parts of the city. *Salix sp.* (willow) and *Populus sp.* (poplar) trees are found in streams and rivers (Elazığ Municipality, 2022). In this study, data obtained from various sources were used to analyze the geographical, demographic, economic and cultural characteristics of Elazığ province. Geographical data included topographic maps and satellite images obtained from the General Command of Mapping and

NASA's Landsat program, and climate and weather information obtained from the General Directorate of State Meteorological Affairs. Demographic data were obtained from the Turkish Statistical Institute and the General Directorate of Migration Management of the Ministry of Interior and include information on population size, age distribution, gender ratios and migration movements. Economic data are obtained from Elazığ Provincial Directorate of Agriculture and Forestry and Elazığ Chamber of Commerce and Industry, and include information on the province's agriculture, animal husbandry, industry and trade activities. Cultural data was obtained from the Ministry of Culture and Tourism, Elazığ Provincial Directorate of National Education and Provincial Directorate of Health, and includes information on the province's cultural heritage, touristic attractions, educational institutions and health services. With these materials, a multi-faceted analysis of Elazığ has been made. The location of Elazığ province in the world and in Turkey is shown below (Figure 2).

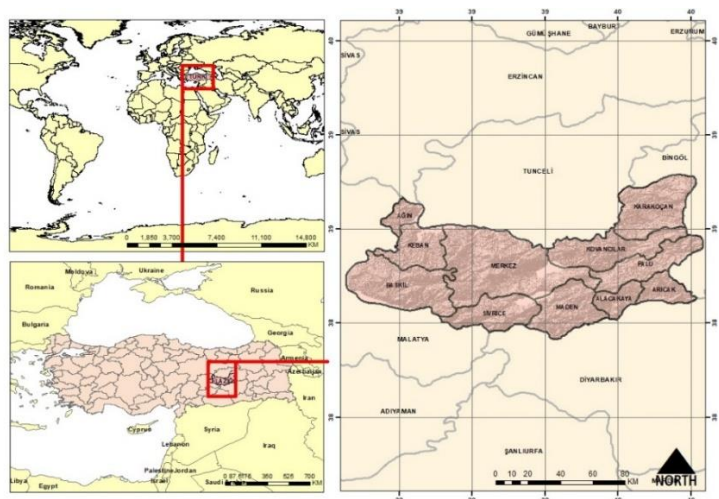


Figure 2. Location Map (Source: Author)

2.2. Method

Document-based research techniques, geographical information systems, remote sensing and three-dimensional modeling were used in this project. In the document-based research method, thesis studies, books, articles and internet sources related to the subject were collected in text, visual or figural form. In the empirical analysis method, objectively collected data were analyzed using measurement tools. In the research, data were also collected from secondary sources and literature review technique was utilized. In the literature search, university libraries, publications and the internet were utilized. In addition, photographs and documents on how green areas and city parks were used in the Elazığ earthquake before and after the disaster were collected and analyzed. In addition, field analyses of the seismicity maps of the study area were created using ArcGIS 10.7.1 program.

This study used a qualitative research method to evaluate the use of open and green spaces after the January 24, 2020 Elazığ earthquake. Within the scope of the research, how open and green spaces were used after the earthquake in Elazığ and the role of these spaces in disaster management were examined. The data obtained were evaluated by content analysis method.

3. Findings and Discussion

Many studies have shown that urban parks and open green spaces are effective in ensuring the safety of people during disasters (Alawi et al. 2023; Shrestha et al. 2018). For example, Alawi et al. (2023) showed that open green spaces increase the safety of people during earthquakes. Zimmermann et al. (2016) [36] also showed that urban parks and open

green spaces reduce the spread of flood waters during floods. The planning and design of urban parks and open green spaces in disaster-prone areas may differ depending on the type of disaster. For example, during earthquakes, structural areas can be divided into open green spaces in areas with high-rise buildings (Alawiet al. 2018; Rahman et al. 2023). During floods, the construction of urban parks and open green spaces at high altitudes can reduce the effects of flood waters (Zimmermann et al. 2016). Urban parks and open green spaces are important places in the context of disasters and careful planning and design of these areas in areas where disasters are expected. Especially in areas where disasters are frequent, existing green areas should be made suitable for sheltering in case of disaster by making some additions considering the disasters. In this way, the effects of disasters can be reduced by ensuring the safety of people. Before planning a disaster park in a city, it is necessary to examine the disasters that frequently occur in the city. Disaster park planning should be made according to the types of disasters experienced. In addition, existing green areas can be re-evaluated according to the disasters experienced and their use can be planned in case of a disaster. In the studies conducted, it has been observed that Elazığ province is mostly affected by earthquakes. Therefore, earthquakes are discussed in this study. In addition, secondary disasters experienced with earthquakes and the measures that can be taken are emphasized.

The intensity of earthquakes in Elazığ is quite high. One of the most important reasons for this situation is the fault lines passing through the city. The intensity of earthquakes is also quite high in districts such as Sivrice, Kovancılar, Palu, Maden where active fault lines pass through the

city. As can be seen, earthquakes in Elazığ are generally caused by fault lines. Traces of fault lines can be seen on the ground after earthquakes in Elazığ region (Figure 3).



Figure 3. Traces Formed in Areas Where Fault Lines Are Located During Earthquakes in Elazığ, (Anadolu Ajansı, 2023)

Earthquakes caused by underground fault lines occur frequently in Elazığ province. Most of these earthquakes are caused by the Eastern Anatolia Fault line. These fault lines were formed as a result of fracture and slippage between the African and Eurasian continents (Figure 4).

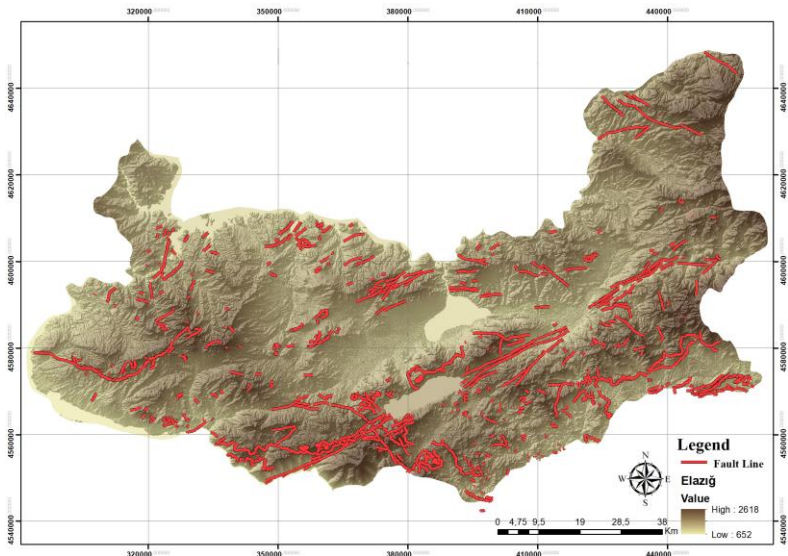


Figure 4. Elazığ Province Fault Line Map (Source: Author)

Most of the earthquakes in the Elazığ region are caused by the influence of the Eastern Anatolian Fault. For this reason, earthquake intensity is high in the Elazığ region. The magnitude of earthquakes in the Elazığ region is generally between 5.0 and 6.5. Large earthquakes are also common in the region (Peker and Şanlı 2022).

When the depths of earthquakes in Elazığ are analyzed, it is seen that the depth of earthquakes with magnitude 3.5 and above is between 18 and 1 km. Earthquake depth indicates how deep the source of the earthquake is from the surface (Özcan et al. 2013). The magnitude and intensity of the earthquake are affected not only by the depth but also by the amount of energy at the source of the earthquake. The depth of an earthquake is closely related to its intensity at the surface. Generally, deep earthquakes are felt less, while shallow earthquakes can cause more damage. For this reason, it is important to examine the structures in Elazığ region in terms of earthquake safety and to make necessary arrangements. In addition, people living in the region need to be aware of earthquakes and receive training on how to cope with earthquakes.

The frequency of earthquakes in Elazığ is high. For example, a total of 207 earthquakes occurred in Elazığ between 2000-2019. The magnitude of these earthquakes is generally between 4.0 and 6.5. Large earthquakes are frequently observed in the region. For example, the 6.0 magnitude earthquake that occurred in Elazığ province in 2010 caused serious damage in the region (Akar and Güleç 2020). The location and magnitude of the earthquakes are shown on the map below (Figure 5).

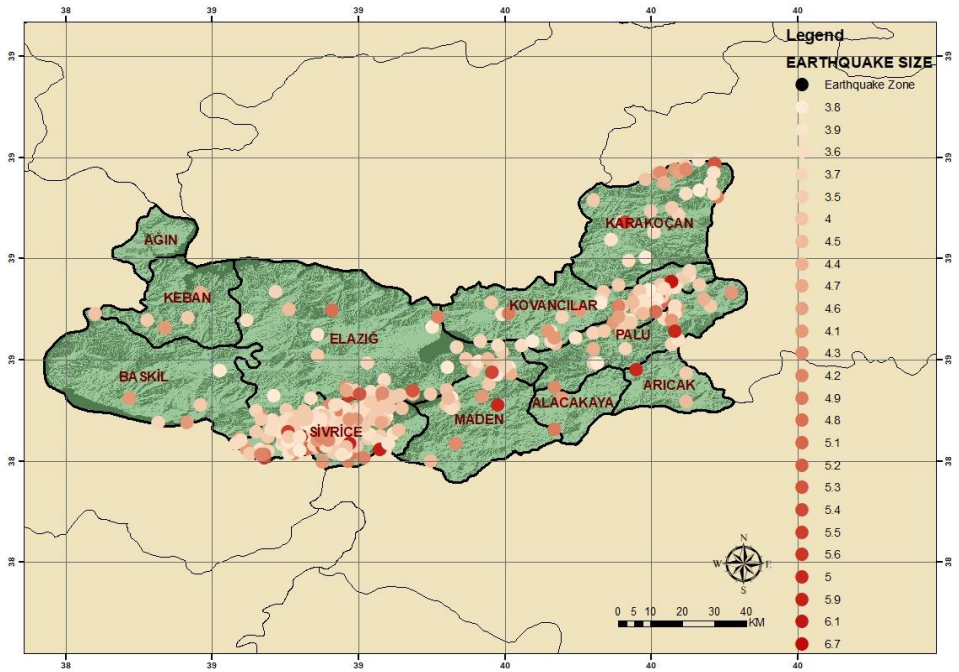


Figure 5. Elazığ Province Earthquake Location and Intensity Map, Source: Author

3.1. Elazığ Earthquake that occurred on January 24, 2020

On January 24, 2020, an earthquake with a magnitude of 6.8 in Elazığ caused serious damage and losses in the region (Zulfikar 2020). The earthquake occurred within the borders of Sivrice district of Elazığ and was also felt from nearby areas (Elazığ Municipality 2022). According to AFAD data, 41 people lost their lives in the earthquake. In addition, 1,607 people were injured in the earthquake. Many nearby cities were affected by the earthquake in Elazığ. After the earthquake, thousands of collapsed or heavily damaged buildings were identified as a result of the surveys conducted in Elazığ and Malatya provinces. January 24, 2020 Elazığ earthquake is an earthquake that occurred in eastern Turkey and caused

serious damage in the region. In the post-earthquake response and recovery efforts, the use of open and green spaces in the city is a striking example. After the Elazığ earthquake, it was observed that open and green spaces in the city were used for various purposes. In particular, parks and squares used as gathering areas provided safe spaces for earthquake victims. In addition, these areas were also used as temporary shelter centers. It is seen that open spaces were used effectively after the earthquake and these spaces play a critical role in disaster management.

It has been determined that open and green spaces play an important role in providing psychosocial support and increasing social resilience after the earthquake. After the Elazığ earthquake, events and activities organized in these areas contributed to the psychological recovery process of earthquake victims.

Planning and utilization of open and green spaces in disaster management play an important role in post-earthquake response and recovery processes. The importance of planning open spaces in post-disaster response and recovery processes has been observed in various disasters. In the case of the Elazığ earthquake, it was observed that open and green spaces were effectively utilized.

During the Elazığ earthquake, recreational green areas in the city were used intensively from the moment of the earthquake. This situation, which was not planned in advance, caused many problems and secondary disasters. For example, the largest park in the city, Kültür Park, with an area of 180.000 m², was the most used urban park. This recreation area hosted earthquake victims for 45 days (Elazığ Municipality, 2022). In this process, since the park was not planned for disasters, some additional

disasters occurred. These secondary disasters caused earthquake victims to experience fire, flood and similar dangers in Kültür Park. At the end of 45 days, since the recreation area was not suitable for this kind of use, huge economic losses were experienced. This situation has once again shown the importance of urban recreational green spaces, which are seen as the first place of escape after disasters. In cities where disasters are experienced intensively, these areas should be planned and organized for disasters.

4. Conclusion and Recommendations

This study aims to evaluate the post-disaster use of open and green spaces used for recreational purposes through the example of the January 24, 2020 Elazığ earthquake. The findings show that open and green spaces play a critical role in disaster management and contribute significantly to post-disaster response and recovery processes through their effective use. In future disaster preparedness and response strategies, more attention should be paid to the planning and utilization of open and green spaces. It is recommended that local governments should make the necessary planning and arrangements in order to use such areas more effectively in the disaster management process.

Today, the world population is mainly concentrated in urban centers. This situation makes urban centers more vulnerable to disasters. Mass deaths and injuries occur in these areas during disasters or emergencies. In these painful events, the first areas where people think of taking shelter are usually open green areas. Urban parks and open green spaces are important tools to reduce the impacts of disasters (Jayakody et al.2018). The presence of urban parks and open green spaces in city centers should be increased.

Thus, it is possible to create healthier and safer urban areas. Green spaces are open shelters where people seek a safe place after a disaster. The presence of green areas and city parks is important. However, it is not enough to have such areas in areas with high disaster risk. At the same time, such areas should be planned by considering the disaster risk (Ronagh et al. 2012; Satake 2014). Since some green areas are not suitable for post-disaster use, many negativities arise. Secondary disasters, health problems and material losses are the main ones.

Disasters should be taken into consideration in the planning and design of green areas in cities with high disaster risk. The types of disasters that may occur should be determined and measures should be taken for these disasters. Secondary disasters that may occur should also be taken into consideration. New urban parks and green areas should be planned in a way that they can be transformed into disaster parks. On the other hand, existing urban parks can be made suitable for sheltering in case of disaster by various additions and arrangements.

According to the researches conducted so far, it is seen that Elazığ has a long history of natural disasters. The most intensely experienced disaster type in Elazığ is earthquake. Therefore, earthquakes were prioritized in this study. Analyses conducted in provinces that are more exposed to different types of disasters can also be applied to other types of disasters. In the study, it was understood that earthquakes are experienced very close to residential areas and with destructive intensity. It was also observed that the people affected by the earthquake were also exposed to secondary disasters in temporary settlements. After the earthquake, people sheltering in temporary settlements were also affected by fire, flooding and

epidemics. In Elazığ, which has been exposed to destructive earthquakes in the past, it was observed that green areas were used intensively during disasters. However, it is understood that a holistic planning and project design for disasters should be made in these green areas. In addition, the lack of urban furniture that can be used in disaster situations in green areas also causes problems. It is essential to re-plan and reorganize green areas considering disaster situations.

Kültür Park in Elazığ city center is an urban park that was planned without considering disaster situations. However, only four years after its construction, it was used as a temporary settlement area after the disaster. It was observed that many problems such as secondary disasters and diseases occurred during this duty. It is seen that Elazığ is a city where many disasters, especially earthquakes, are experienced. For this reason, green areas in the city center should be re-planned by taking disasters into consideration. Parks should be made suitable for post-disaster use with new arrangements and additions. It is inevitable that Kültür Park, which is located on dense urban islands, will be used after future disasters. For this reason, Kültür Park and similar open green areas should be re-evaluated by taking disaster situations into consideration.

Acknowledgements and Information Note

Authors present their special thanks to “USGS, AFAD, and Elazig Municipality Fire Department” for sharing their data free of charge. The authors expressed their special thanks to a part of Ömer Faruk BAŞGÜN’s PhD thesis (Reference No: 10458578).

This research was supported by the Administration System of Scientific Research Project (BAP), Ataturk University of TURKIYE (BAP (LÜTP) Project No: FDK-2022-10570).

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article.

Ethical approval is not required for this article. No human or animal specimens were used in this work. The environment is not damaged.

All authors have read and agreed to the published version of the manuscript.

References

- AFAD. (2020). AFAD activity report after the Elazig earthquake. Retrieved from <https://www.afad.gov.tr/uploads/files/elazig-depremi-sonrasi-afad-faaliyet-raporu.pdf>
- Akdağ, S. E. (2002). Disaster management with financial structure and control dimensions (1st ed.). Ankara: Turkish Court of Accounts.
- Akyel, R. (2007). *Disaster management system: A research on the determination and solution of the problems encountered in Turkish disaster management* (Doctoral dissertation, Çukurova University, Institute of Social Sciences, Adana).
- Allan, P., Bryant, M., Wirsching, C., Garcia, D., & Rodriguez, M. T. (2013). The influence of urban morphology on the resilience of cities following an earthquake. *Journal of Urban Design*, 18(2), 242-262. <https://doi.org/10.1080/13574809.2013.7728816>.
- Alawi, M., Chu, D., & Hammad, S. (2023). Resilience of public open spaces to earthquakes: A case study of Chongqing, China. *Sustainability*, 15(2), 1092. <https://doi.org/10.3390/su15021092>
- Anadolu Ajansı. (2023). Elazığ'da fay hattındaki zemin sıvılaşması havadan görüntülendi. Anadolu Ajansı. Retrieved from <https://www.aa.com.tr/tr/asrin-felaketi/elazigda-fay-hattındaki-zemin-sivilasmasi-havadan-goruntulendi/2828615>
- Atalay, H. (2008). *Use of urban open and green areas in case of earthquake, Küçükçekmece-Cennet district example* (Master's thesis, Istanbul Technical University, Institute of Science and Technology, Istanbul).
- Berke, P. R., Kartez, J., & Wenger, D. (1993). Recovery after disaster: Achieving sustainable development, mitigation, and equity. *Disasters*, 17, 93-109.
- Bhandari, C., Dahal, R. K., & Timilsina, M. (2021). Disaster risk understanding of local people after the 2015 Gorkha earthquake in Pokhara city, Nepal. *Geoenvironmental Disasters*, 8(2). <https://doi.org/10.1186/s40677-020-00173-9>
- Çavuş, G. (2013). *Examination of open-green area system principles and standards in earthquake zones in the example of Bolu province*

- (Doctoral dissertation, Ankara University, Institute of Science and Technology, Ankara).
- Çeber, K., & Dunlupcu, M. A. (2008). Turkey's financial structure in disaster management. *Turkish Journal of Administration*, 65-80.
- Demircan, N., & Basgun, Ö. F. (2022). Investigation of Elazig Province in terms of European Green Capital Award criteria. *ATA Journal of Planning and Design*, 6(1), 27-39. <https://doi.org/10.5152/Planarch.2022.220103>
- Elazig Provincial Directorate of Culture and Tourism. (2022). Retrieved from <http://elazig.ktb.gov.tr/>
- Elazig Fire Department Archive. (2023). Fire department documents.
- Guha-Sapir, D., Hoyois, P., & Below, R. (2015). EM-DAT: The CRED/OFDA international disaster database. *Université catholique de Louvain*, Brussels, Belgium.
- Jayakody, R. R. J. C., Amaratunga, D., & Haigh, R. (2018). *Plan and design public open spaces incorporating disaster management strategies with sustainable development strategies: A literature synthesis*. MATEC Web of Conferences, 229. <https://doi.org/10.1051/matecconf/201822904001>
- Kadioğlu, M. (2008). *Basic principles of modern, integrated disaster management*. In *Basic principles of disaster mitigation* (M. Kadioğlu & E. Özdamar, Eds.). JICA Turkey Office, Publication No: 2, 1-34.
- Kahyaoğlu, B. (2016). *A study on natural disaster and education park planning in Tekirdağ city* (Master's thesis, Namık Kemal University, Institute of Science and Technology, Department of Landscape Architecture, Tekirdağ).
- Kapucu, N., & Ozerdem, A. (2013). Managing disasters and complex emergencies: Lessons learned from around the world. *Springer Science & Business Media*.
- Kawakami, N., Fukasawa, M., & Sakata, K., et al. (2020). Onset and remission of common mental disorders among adults living in temporary housing for three years after the triple disaster in Northeast Japan: Comparisons with the general population. *BMC*

Public Health, 20(1271). <https://doi.org/10.1186/s12889-020-09378-x>

- Kırçın, P. N., Çabuk, S. N., Aksoy, K., & Çabuk, A. (2017). *A research on increasing the possibilities of using green areas as post-disaster gathering areas in our country*. 4th International Conference on Earthquake Engineering and Seismology, October 11-13, 2017, Anadolu University, Eskisehir.
- Korgavuş, B., & Ersoy, E. (2015). *Examination of the adequacy of urban open and green areas of Kadıköy district in a possible Istanbul earthquake*. International Burdur Earthquake and Environment Symposium, May 7-9, 2015, Mehmet Akif Ersoy University, Burdur.
- Masoumi, M. (2017). Innovating a new idea namely: Disaster park (multi-use park). *International Journal of Scientific Study*, 5(3), 5-10. <https://doi.org/10.17354/ijssJuneI/2017/02>
- Masuda, N. (2014). Disaster refuge and relief urban park system in Japan. *Landscape Architecture Frontiers*, 2(4), 52+. Retrieved from <https://link.gale.com/apps/doc/A454485946/AONE?u=anon~d31d1792&sid=googleScholar&xid=da8f43aa>
- Nappi, M. M. L., & Souza, J. C. (2015). Disaster management: Hierarchical structuring criteria for selection and location of temporary shelters. *Natural Hazards*, 75, 2421–2436. <https://doi.org/10.1007/s11069-014-1437-4>
- Ogawa, N. (2014). *Disascape to Preemptive Landscape: Resilient Parks for Earthquake Disaster Management* (Master's thesis, Soka University of America).
- Özcan, N. S., Erdin, H. E., & Zengin, H. (2013). *Geographic Information Systems (GIS) in Evaluating the Usability of Open and Green Field Systems in Cities in the Context of Disaster Management: The Case of İzmir*. In TMMOB Geographic Information Systems Congress (pp. 11-13). Ankara.
- Park, C. L., & Blake, E. C. (2020). Resilience and Recovery Following Disasters: The Meaning Making Model. In S. Schulenberg (Ed.), *Positive Psychological Approaches to Disaster* (pp. 1-24). *Springer*. https://doi.org/10.1007/978-3-030-32007-2_2

- Peker, A. E., & Sanli, I. (2022). Earthquake and Migration Relationship: 24 January 2020 Elaziğ Earthquake Case. *Firat University International Journal of Economics and Administrative Sciences*, 6(1), 125-154. <https://doi.org/10.5152/Planarch.2022.220103>
- Rahman, M., Asikunnaby, Chaity, N. J., et al. (2023). Earthquake Preparedness in an Urban Area: The Case of Dhaka City, Bangladesh. *Geoscience Letters*, 10(1), 27. <https://doi.org/10.1186/s40562-023-00281-y>
- Ronagh, H. R., & Behnam, B. (2012). Investigating the Effect of Prior Damage on the Post-earthquake Fire Resistance of Reinforced Concrete Portal Frames. *International Journal of Concrete Structures and Materials*, 6(3), 209–220. <https://doi.org/10.1007/s40069-012-0025-9>
- Rung, A. L., et al. (2011). Escaping to and Being Active in Neighbourhood Parks: Park Use in a Post-Disaster Setting. *Disasters*, 35(2), 383–403. <https://doi.org/10.1111/j.1467-7717.2010.01217.x>
- Sahin, M., & Tari, E. (2000). The August 17 Kocaeli and the November 12 Duzce Earthquakes in Turkey. *Earth, Planets and Space*, 52(8), 753–757. <https://doi.org/10.1186/BF03352277>
- Sarıçam, S. (2019). Kentsel Açık-Yeşil Alanların Afet Sonrası İşlevleri. *GSI Journals Serie B: Advancements in Business and Economics*, 2(1), 1-15. <https://doi.org/10.1016/j.ijdr.2021.102425>
- Satake, K. (2014). Advances in earthquake and tsunami sciences and disaster risk reduction since the 2004 Indian Ocean tsunami. *Geoscience Letters*, 1(15). <https://doi.org/10.1186/s40562-014-0015-7>
- Shrestha, S. R., Sliuzas, R., & Kuffer, M. (2018). Open spaces and risk perception in post-earthquake Kathmandu city. *Applied Geography*, 93, 81–91. <https://doi.org/10.1016/j.apgeog.2018.02.016>
- Turkish Medical Association (2023). Settlement rules for temporary shelters (tent towns) in natural disaster areas. Retrieved from <https://www.ttb.org.tr/sted/sted0999/st099916.html>
- Turkish Statistical Institute (TUIK) (2021). Disaster statistics. Retrieved from <https://biruni.tuik.gov.tr/medas/?kn=98&locale=tr>

- Uddin, M. S., Ahmad, M. M., & Warnitchai, P. (2018). Surge dynamics of disaster displaced populations in temporary urban shelters: Future challenges and management issues. *Natural Hazards*, 94, 201–225. <https://doi.org/10.1007/s11069-018-3383-z>
- USGS (2021). Earthquakes. USGS Natural Hazards. Retrieved from <https://www.usgs.gov/> (Accessed Date: 15.03.2023).
- Walz, Y., Janzen, S., Narvaez, L., Ortiz-Vargas, A., Woelki, J., Doswald, N., & Sebesvari, Z. (2021). Disaster-related losses of ecosystems and their services: Why and how do losses matter for disaster risk reduction? *International Journal of Disaster Risk Reduction*, 63, 102425. <https://doi.org/10.1016/j.ijdr.2021.102425>
- Xu, J., Yin, X., Chen, D., An, J., & Nie, G. (2016). Multi-criteria location model of earthquake evacuation shelters to aid in urban planning. *International Journal of Disaster Risk Reduction*, 20, 51–62. <https://doi.org/10.1016/j.ijdr.2016.10.009>
- Yildirim, Y., Keshavarzi, G., & Aman, A. R. (2021). Can urban parks help with disaster risk reduction through educational awareness? A case study of Hurricane Harvey. *International Journal of Disaster Risk Reduction*, 61, 102377. <https://doi.org/10.1016/j.ijdr.2021.10237760>
- Zimmermann, E., Bracalenti, L., Piacentini, R., & Inostroza, L. (2016). Urban flood risk reduction by increasing green areas for adaptation to climate change. *Procedia Engineering*, 161, 2241–2246. <https://doi.org/10.1016/j.proeng.2016.08.822>
- Zulfikar, A. C. (2020). Evaluation of strong ground motion data of 24 January 2020 Elazig earthquake. *Journal of Çukurova University Faculty of Engineering and Architecture*, 35(3), 821-834. <https://doi.org/10.21605/cukurovaummfd.846809>

Ömer Faruk BAŞGÜN

E-mail: farukbasgun@gmail.com

Educational Status: Landscape Architecture PhD Student

License: Bachelor's Degree in Landscape Architecture

Degree: Master's degree in Landscape Architecture

Doctorate: -

Professional experiences: Landscape Architect

Prof. Dr. Yahya BULUT

E-mail: ybulut@atauni.edu.tr

Educational Status: Professor

License: Landscape Architecture

Degree: Landscape Architecture

Doctorate: Landscape Architecture

Professional experiences: Atatürk University

The Role of Floristic Diversity in Urban Landscapes

Res. Ass. Tuba Gül DOĞAN ¹ 

¹Düzce University, Faculty of Forestry, Department of Landscape Architecture, Konuralp Campus, Düzce/Türkiye
ORCID: 0000-0003-2114-2334
E-mail: tubaguldogan@duzce.edu.tr

Prof. Dr. Engin EROĞLU ² 

² Düzce University, Faculty of Forestry, Department of Landscape Architecture, Konuralp Campus, Düzce/Türkiye
ORCID: 0000-0002-1777-8375
E-mail: engineroglu@duzce.edu.tr

Citation: Doğan, T.G. & Eroğlu, E. (2024). The Role of Floristic Diversity in Urban Landscapes. Göktuğ T.H. (Eds.). **Architectural Sciences and Outdoor Recreation**. 2024, Chapter:18, 463-508 ISBN: 978-625-367-855-5. Iksad Publications.
DOI: <https://doi.org/10.5281/zenodo.13882818>

1. Introduction

Urbanization is a complex process that has both positive and negative impacts (Kowsarik, 2011; Hou et al., 2023). On the one hand, urbanization destroys and fragments natural ecosystems, causes the spread of non-native species, disrupts and alters ecosystem processes, and upsets natural disturbance regimes (McKinney, 2006). On the other hand, through design, urbanization creates social and economic opportunities, establishes centers of art and culture, and creates truly unique ecological spaces (Anderson et al., 2013). Cities are not landscapes devoid of plant and animal life but rather new habitats with unique plant and animal communities. In fact, cities can be an important part of the Convention on Biological Diversity (CBD) in meeting the goal of preventing biodiversity loss. This contribution includes three main components: 1) maintaining ecosystem services in cities; 2) protecting urban biodiversity and promoting sustainable urban design; and 3) raising awareness and guiding decision-making to create habitats for plants, animals, and people.

Floristic diversity refers to the variety and richness of the plant species in a given region. It encompasses the number, composition, distribution, and ecological relationships of the plant species (Haq et al., 2023). Floristic diversity is a key indicator of the health and sustainability of ecosystems, and is an important component of biodiversity (Ekren & Çorbacı, 2022; Bera, 2023). Floristic diversity in a region supports the continuity of ecosystem services, such as the functioning of natural ecosystems, soil quality, the water cycle, and habitat provision. This also ensures that ecosystems are resilient to environmental changes and stressors (Grizzetti et al., 2019; Hou et al., 2023). Floristic diversity is of great importance not

only as a biological value but also for aesthetic, cultural, and economic values (Bera, 2023).

Floristic diversity in urban landscapes is a critical factor that positively affects the ecological, social, and economic structure of cities. High floristic diversity improves the quality of ecosystem services by increasing biodiversity in urban areas. Diverse plant species in urban landscapes can improve air quality, filter water, stabilize soils, and provide habitats for biodiversity (Audrey et al., 2008; Grizzetti et al., 2019). In addition, floristic diversity enhances the quality of urban life by providing aesthetically rich and peaceful spaces for city dwellers (Shwartz et al., 2014). Parks, gardens, and green spaces help people reduce their stress levels and improve their physical health by interacting with nature. This diversity also plays an important role in mitigating the effects of climate change on urban areas (Andersson et al., 2017; Selanon & Chuangchai, 2023). For example, diverse vegetation regulates the microclimate of cities and reduces the heat-island effect. Consequently, maintaining and increasing floristic diversity in urban landscapes is important for sustainable urban planning and human well-being.

This chapter explores the diverse roles of floristic diversity in urban environments and its ecological, social, and economic implications. This emphasizes the importance of preserving and promoting plant diversity within urban areas and highlights strategies for managing urbanization to support biodiversity. By examining the intricate interplay between urban growth and floristic diversity, this chapter provides a comprehensive understanding of how cities can be designed to foster both human and ecological well-being. Moreover, it investigates the effects of climate

change on urban plant diversity and presents case studies on successful practices. Ultimately, it advocates for the integration of biodiversity into urban development plans and underscores the need for continued research on this topic. Implementing these approaches can ecologically, aesthetically, and functionally enhance urban areas.

2. Floristic Diversity in Urban Landscapes

Floristic diversity refers to the richness and variety of plants in urban environments (Salinitro et al., 2018). Urban areas are often characterized by large expanses of concrete and asphalt, but they also support a diverse range of plant species. The presence of floristic diversity in urban landscapes can be as high as that in natural and semi-natural areas. This diversity is found in various areas such as urban green spaces, parks, gardens, roadsides, and even rooftops (Doğan & Eroğlu, 2020; Perivoliotis et al., 2023; Szlavecz et al., 2011).

Floristic diversity in cities is crucial for the maintenance of ecosystem services. For example, diverse plant species play a vital role in absorbing and breaking down airborne pollutants, which helps improve the air quality (Paudel & States, 2023). Additionally, different plant species are effective in retaining and filtering water, which helps increase the water retention capacity of urban areas (Dunnett et al., 2008). Furthermore, floral diversity provides a biological solution for managing stormwater as it allows water to infiltrate the soil and nourish the groundwater source (Shi et al., 2024). Another important aspect of floristic diversity in urban landscapes is aesthetic and recreational value. The presence of diverse plant species increases the visual appeal of urban areas and positively affects human psychology. The presence of different plant species in urban green spaces

allows people to establish a closer relationship with nature, which in turn increases their overall well-being (Jogan et al., 2022; McIntyre et al., 2000). Additionally, the presence of diverse plant species contributes to biodiversity conservation in urban areas. Different plant species provide habitats for a variety of animal species, which helps preserve the biological richness of urban ecosystems (Planchuelo et al., 2019).

The promotion of flora in urban environments is a key aspect of sustainable urban development. The selection of plant species in cities should be carefully considered, as the use of native and regional species helps to maintain biodiversity, whereas exotic and invasive species can negatively impact ecosystems (Berthon et al., 2021; English et al., 2022). Thus, it is crucial to strategically manage floral diversity in urban landscape designs.

3. The Ecological Role of Floristic Diversity

The importance of floristic diversity or the variety of plants within ecosystems extends beyond its role in sustaining ecological functions and the overall health of ecosystems (Andersson et al., 2017; Homeier et al., 2013). Floristic diversity is evident across all ecosystems, from tropical rainforests to Arctic tundras, where it not only contributes to the aesthetic appeal of landscapes but also supports the ecological balance and functioning of these environments (Chhetri & Shrestha, 2019; English et al., 2022).

Floristic diversity plays a crucial role in enhancing the resilience of ecosystems by providing a wide range of species with unique adaptations to environmental stressors such as drought, pests, and diseases (Lüscher et al., 2022). This diversity functions as a buffer against environmental fluctuations as different plant species possess distinct mechanisms for

coping with challenges, thereby ensuring the stability of the ecosystem. For example, in temperate forests, the variety of tree species helps mitigate the impact of specific pests or diseases on the entire forest ecosystem (Boyd et al., 2013; Trogisch et al., 2021). Furthermore, floristic diversity significantly contributes to soil health via nutrient cycling, organic matter accumulation, and microbial activity. Plant roots at various soil depths enhance the soil structure, fertility, and stability (Spohn et al., 2023). This improvement in water retention capacity is crucial for sustaining agricultural productivity and mitigating climate impacts such as erosion. The regulation of the water cycle is a critical function of diverse plant communities (Gaberáček & Murlis, 2011). By facilitating infiltration into the soil and groundwater recharge, plants reduce surface runoff and minimize flood risks, particularly in urban areas that face water management challenges. In addition, plants influence the local climate by moderating temperature extremes and evapotranspiration rates, thereby contributing to climate regulation (Spohn et al., 2023; Tan et al., 2015). Floristic diversity also supports biodiversity conservation by providing habitat and food resources for a wide range of animal species and promoting complex ecological interactions and food webs (Brockerhoff et al., 2017). This enhances the overall ecosystem stability and resilience while contributing to carbon sequestration and mitigating climate change impacts by absorbing carbon dioxide from the atmosphere. In urban environments characterized by dense infrastructure and high human population densities, preserving and enhancing floristic diversity is crucial, despite environmental degradation and loss of natural habitats (Pandey & Ghosh, 2023; Prajapati et al., 2023). Urban green spaces with

diverse vegetation mitigate urban heat island effects, regulate the local climate, and improve air quality by absorbing pollutants and producing oxygen (Gunawardena et al., 2017). They also act as noise buffers, benefiting densely populated areas by reducing the noise pollution (Yang et al., 2010). Madrid, Spain offers a successful example of urban forests and green corridors. The city has created large green spaces, such as Retiro Park, and green corridors with a variety of plant species. These projects maintain ecological balance and reduce the heat island effect in the city. Madrid's green infrastructure strategies aim to increase urban floristic diversity and strengthen ecosystem services.

Urban floristic diversity is crucial for supporting biodiversity conservation by providing habitat for urban-adapted species and promoting genetic diversity and population resilience (Perry & Cox, 2024). Green spaces contribute to the well-being of urban communities by enhancing mental health, reducing stress levels, and promoting physical activity among residents (Pasanen et al., 2023). However, urban floristic diversity faces threats such as habitat fragmentation (Rahman, 2023) and invasive species, necessitating integrated urban planning for the preservation and expansion of green infrastructure (Semeraro et al., 2017). Plant community diversity plays a fundamental role in maintaining ecological balance, enhancing ecosystem resilience, supporting biodiversity, and promoting human well-being in both natural and urban ecosystems (Quijas et al., 2010; Sandifer et al., 2015). Therefore, protecting and promoting diverse plant communities is essential for sustainable development and the creation of resilient, livable cities amid ongoing environmental challenges.

4. Social and Economic Importance of Floristic Diversity

Urban floristic diversity is a critical element in the social and economic aspects of urban life (Hope et al., 2003). The presence of green spaces including parks, gardens, and nature reserves allows individuals to maintain and strengthen their connections with the natural World (Mcintyre et al., 2000). Green spaces improve the overall quality of life in urban areas (Giannico et al., 2021), reduce stress, promote mental well-being, and encourage physical activity (Douglas et al., 2017). Urban floristic diversity plays a crucial role in preserving biodiversity and maintaining the ecological balance of urban ecosystems. The variety of plant life improves air quality, reduces the impact of urban heat islands, and contributes to stormwater management, ultimately benefiting the economy ((English et al., 2022; Perry & Cox, 2024). Urban green spaces attract tourists and increase property value, thus contributing to local economies. Urban agriculture and horticultural activities encourage the production of local products and create employment opportunities within the city (Antrop, 2004).

The social and economic importance of floristic diversity ranges from ecosystem stability and resilience to cultural and aesthetic values, and from economic meaning to sustainable development (Figure 1). Floristic diversity improves ecosystem function and contributes to nutrient cycling, soil formation, and water regulation. Additionally, diverse plant communities are more resilient to pests, diseases, and extreme weather events, provide habitats for fauna, and support the fight against climate change (Tilman et al., 1997). Plants play an important role in the traditions and identities of many communities, providing aesthetic value in urban and

rural areas and creating opportunities for tourism and recreation (Francini et al., 2022; Zhang et al., 2023). Economically, floristic diversity supports agricultural productivity, provides pharmaceutical and biotechnological resources, and provides raw materials for various industries. Moreover, the economic value of ecosystem services is high (Schaub et al., 2020; Tilman et al., 1996). In the context of sustainable development, incorporating floristic diversity into urban planning contributes to climate change adaptation and food security. Conservation and restoration initiatives preserve natural resources for future generations, which is an important step toward achieving sustainable development goals (Barrico & Castro, 2016; Ignatieva et al., 2023).

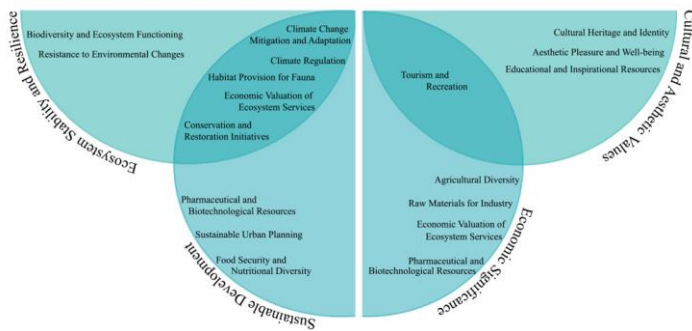


Figure 1. Integrated Assessment of Floristic Diversity (Ecosystem Functionality, Cultural and Aesthetic Value, Economic Impact, and Sustainability) (Tilman et al., 1997; Barrico & Castro, 2016; Francini et al., 2022; Ignatieva et al., 2023; Zhang et al., 2023)

4.1. Ecosystem Stability and Resilience

The significance of floristic diversity is rooted in the ability to maintain ecosystem stability and resilience. Ecosystems that harbor a rich array of plant species are better equipped to withstand environmental perturbations such as climate change, pests, and diseases (Boyd et al., 2013). A diverse

range of plant species guarantee that ecological operations, including nutrient cycling, soil development, and water purification, are sturdy and efficient. Resilience is essential for ensuring ecosystem services that bolster human societies, including clean air and water, fertile soils, and natural resources for sustenance and medication (Boyd et al., 2013; Oguh et al., 2021).

4.2. Cultural and Aesthetic Values

Floristic diversity also embodies cultural and aesthetic value. Plants have played a pivotal role in human culture and customs in millennia, functioning as providers of sustenance, medicine, shelter, and spiritual inspiration. Diverse cultures across the globe have cultivated unique knowledge and practices related to local flora, contributing to biodiversity conservation through traditional ecological knowledge (Sinthumule, 2023; Tribot et al., 2018). Furthermore, a rich array of plant species enriches the aesthetic appeal of landscapes, parks, and gardens, enhancing quality of life and offering recreational opportunities that foster mental and physical well-being (Ashinze et al., 2024).

4.3. Economic Significance

From an economic perspective, floristic diversity underpins several industries and economic activities. The agriculture, forestry, pharmaceuticals, and biotechnology sectors rely heavily on plant biodiversity for crop improvement, genetic resources, and the development of new drugs and products (Finger & Buchmann, 2015; Schaub et al., 2020). Wild plant species directly contribute to livelihoods through sustainable harvesting and trade, supporting local economies, particularly in rural areas (Cromwell et al., 1999). Therefore, the loss of

plant diversity can have profound economic consequences, affecting sectors that depend on diverse biological resources for innovation and resilience.

Floristic diversity is an important attraction for tourists and recreational activities in cities. Parks, gardens, and green spaces with a variety of plant species have become places of interest to both local and foreign tourists. Botanical gardens, flower festivals, and theme parks in particular have the potential to attract tourists, which in turn stimulates the local economy. Tourism revenue increases local job opportunities and brings economic vitality to cities. Property values can increase in areas where floristic diversity is encouraged. Quality management of green spaces and landscaping increases the real estate value. This creates attractive opportunities for both investors and developers. Moreover, innovative projects such as green roofs and vertical gardens add value to cities and their implementation contributes to the diversification of economic activities.

Floristic diversity positively affects public health and well-being in cities. Increasing green space reduces stress levels, has positive effects on mental health, and encourages physical activity. This can reduce health expenditure and alleviate health-related economic burdens. Furthermore, a healthy and happy society provides economic gain in terms of efficiency and productivity. Various plant species play important roles in the provision of ecosystem services. These services include improving the air quality, regulating the water cycle, and reducing soil erosion. Green spaces save energy by lowering the temperature of cities, which in turn reduces the energy costs. For example, buildings in the shade of trees consume less

energy, which reduces the energy costs. Furthermore, these ecosystem services can reduce the infrastructure costs in cities, resulting in indirect economic savings. Floristic diversity contributes to increasing local job opportunities. Professional groups such as landscape architects, gardeners, landscape designers, and botanists specialize in the design, maintenance, and management of green spaces. This increases the job opportunities that contribute to local economies. Furthermore, educational institutions and community centers offer educational programs on floristic diversity, raising public environmental awareness and developing a green workforce. Green spaces allow community members to come together and engage in social interaction. Parks and gardens with a variety of plant species provide ideal spaces for community activities and social activities. This contributed to increasing social capital and strengthening community ties. Social interactions promote social cohesion and cooperation, which, in turn, support economic vitality. Floristic diversity enhances the cultural and aesthetic value of a city. Various plant species have inspired artists, designers, and architects. This will contribute to the promotion of cultural events and art projects. Cultural richness increases the tourist attractiveness of cities and supports their economic development.

Through examples from around the world, it is possible to sample the various aspects of floristic diversity that contribute to the economy. For instance, in India, the diverse flora in the Western Ghats significantly contribute to crop improvement by providing genetic resources for various crops, including spices and medicinal plants. This biodiversity supports the major agricultural and export sectors. In Brazil, the Amazon Rainforest, with its vast array of plant species, plays a crucial role in

breeding new crop varieties and enhancing agricultural resilience. In the Netherlands, Keukenhof Gardens, renowned for its extensive tulip displays, attracts millions of tourists each year and contributes significantly to the local economy. Similarly, in Japan, cherry blossom festivals (“*Prunus serrulata*”) are major tourist attractions that boost the local economy and highlight the cultural and aesthetic values of plant diversity. In the United Kingdom, well-managed parks such as Hyde Park and Kew Gardens in London enhance property values and make the city a more desirable place to live and work in. In Singapore, the Gardens by the Bay project features innovative green spaces, such as vertical gardens and green roofs, which not only increase property value, but also contribute to urban sustainability. In Australia, green spaces such as Melbourne’s Royal Botanic Gardens offer significant health benefits to residents, including reduced stress and improved mental health, which contribute to lower healthcare costs. In Turkey, the rich biodiversity of the Anatolian region contributes to crop improvement by providing genetic resources for various agricultural products including medicinal herbs and spices. This diversity supports Turkey's agricultural and export market. In the Mediterranean region of Turkey, the sustainable harvesting of herbs and aromatic plants, such as thyme and oregano, supports local economies and traditional livelihoods.

4.4. Sustainable Development

The effects of urban floristic diversity on Sustainable Development are extensive, and can substantially bolster the environmental, social, and economic sustainability of cities (Barrico & Castro, 2016). The preservation of floristic diversity is vital for achieving the Sustainable

Development Goals (SDGs) established by the United Nations, particularly those related to poverty alleviation, food security, health, and biodiversity conservation (Blicharska et al., 2019; Niesenbaum, 2019). It is imperative to implement conservation initiatives aimed at preserving plant species diversity to maintain ecological equilibrium and guarantee long-term sustainability of natural resources. The adoption of sustainable land-use practices, the formulation of conservation strategies, and international cooperation are necessary to protect floristic diversity for future generations.

5. Floristic Diversity in Urban Landscape Management and Planning

The effective management of floristic diversity in urban landscape management and planning is critical for maximizing the ecosystem services, aesthetic values, and social benefits of cities (Anderson et al., 2013; Doğan & Eroğlu, 2022).

Urban landscapes face challenges such as habitat fragmentation, pollution, climate change, and the introduction of invasive species, which can significantly impact floristic diversity. To mitigate these challenges, urban planning must incorporate green spaces, biodiversity corridors, and sustainable landscaping practices. Integrating native plant species and promoting green infrastructure such as green roofs, vertical gardens, and urban forests are essential components of urban landscape management. The implementation of adaptive management practices that respond to changing environmental conditions and urban development pressure is crucial. Regular monitoring and assessment of floristic diversity can help to identify trends and inform management decisions. Urban landscape management plans should be dynamic and allow for adjustments based on

new data and changing circumstances. Economic considerations, such as the cost-effectiveness of different management strategies and the potential for green spaces to increase property values and attract tourism, should also be taken into account. The integration of floristic diversity into urban planning not only enhances ecological and aesthetic values but also contributes to the overall well-being and resilience of urban communities. Table 2 provides a structured overview of the key aspects and strategies for managing floristic diversity in urban landscapes, highlighting the interconnectedness of ecological, social, and economic factors.

Table 1. Key Aspects and Strategies for Managing Floristic Diversity in Urban Landscapes

Aspect	Description	Examples / Strategies
Ecosystem Services	Benefits provided by urban green spaces such as air and water purification, climate regulation, and pollination (Scholars et al., 1915; Daily et al. 1997).	<ul style="list-style-type: none"> - Planting diverse native species - Establishing green roofs and vertical gardens - Creating biodiversity corridors
Aesthetic Values	Visual and sensory enjoyment derived from diverse and vibrant urban landscapes (Chhetri & Shrestha, 2019; English et al., 2022).	<ul style="list-style-type: none"> - Designing public parks with varied plantings - Incorporating seasonal plant displays - Enhancing streetscapes
Social Benefits	Improved mental health, recreational opportunities, and community cohesion (Anderson et al., 2013; Doğan & Eroğlu, 2022).	<ul style="list-style-type: none"> - Developing community gardens - Organizing public nature walks - Supporting urban agriculture
Challenges	Issues such as habitat fragmentation, pollution, climate change, and invasive species (Audrey et al., 2008; Berthon et al., 2021; Rahman 2023).	<ul style="list-style-type: none"> - Implementing green infrastructure-Promoting sustainable landscaping practices - Using resilient plant species

Community Engagement	Involving local residents in biodiversity conservation and urban greening efforts (Pasanen et al., 2023; Perry & Cox, 2024).	<ul style="list-style-type: none"> - Citizen science projects - Public awareness campaigns - Partnerships with local organizations
Adaptive Management	Flexible strategies that adjust to changing conditions and new information (Semeraro et al., 2017).	<ul style="list-style-type: none"> - Regular monitoring of plant diversity - Dynamic management plans - Responsive urban planning policies
Economic Considerations	Financial aspects including cost-effectiveness of management strategies and economic benefits of green spaces (Hope et al., 2003; Bera, 2023)	<ul style="list-style-type: none"> - Assessing property value increases - Evaluating tourism potential - Analyzing cost-benefit of different approaches

The management of floristic diversity involves various strategies to ensure that cities are ecologically and aesthetically balanced, sustainable, and functional. This process requires an accurate measurement, understanding, and diversity management.

5.1. Measurement of Floristic Diversity

To effectively manage floristic diversity, it is necessary to accurately measure it in urban areas (Audrey et al., 2008; Li et al., 2020; Morgenroth et al., 2016). Diversity is measured using various methods and techniques to determine the diversity and distribution of plant species (Stohlgren, 2008). These methods include:

1. Field Surveys: Systematic field studies are conducted to determine the presence, density, and distribution of various plant species by directly examining the vegetation. These surveys are often used to map vegetation

cover and assess the species diversity in a given area (Stohlgren, 2008; Almalki et al., 2022).

2. **Imaging and Remote Sensing:** Large-scale analyses of vegetation cover and diversity in urban areas can be performed using satellite imagery and aerial photography (Almalki et al., 2022). This method enables the rapid assessment of large areas and helps to understand the distribution of local plant species (Varga et al., 2015).

3. **Biological Indicator Measurements:** Specific biological indicators of floristic diversity can be used to measure the richness and diversity of plant species (Bull et al., 2013; Marshall et al., 2020). For example, statistical tools such as the Shannon-Wiener diversity index assess the diversity and evenness of plant species (Table 2).

Table 2. Specific biological indicators used to measure the richness and diversity of floristic diversity.

Species Richness	Total number of plant species found in a given area. Species richness is the most basic indicator of floristic diversity (Elton 1927).
Shannon-Wiener Diversity Index	An index that measures species richness and evenness. It considers both the number of species and the distribution of species populations (Shannon, 1948).
Simpson's Diversity Index	An index that measures the probability of a species being found by randomly selected individuals. Low values indicate high diversity and high values indicate low diversity (Simpson, 1949).
Evenness	It measures whether the distribution of individuals of a species is even or not. Higher evenness indicates that all species have similar densities (Pielou 1966).
Alpha Diversity	Measurement of species diversity in a particular habitat or region. This is often expressed in terms of species richness or the Shannon-Wiener index (Whittaker, 1960).
Beta Diversity	Differences in species diversity between different regions or habitats were measured. A high beta diversity indicates that different species are found in different regions (Whittaker, 1960).

Gamma Diversity	Refers to the total diversity of species found in all habitats of a large-scale region (Whittaker, 1960).
Endemism	The number and proportion of plant species unique to a particular region were only found in that region. Endemic species are important indicators of the regional floristic diversity (Hooker 1853).
Functional Diversity	The capacity of plant species to contribute to ecosystem functions is measured. Functional diversity assesses the impact of species on ecosystem functions and processes (Díaz & Cabido, 2001; Petchey & Gaston, 2006).
Phylogenetic Diversity	The evolutionary history and phylogenetic diversity of plant species were measured. This considers the phylogenetic differences between the species (Faith 1992).

These biological indicators can help assess the various dimensions of floristic diversity and ecosystem health.

5.2. The importance of measurement

Measuring plant diversity in urban landscapes is a critical aspect of effective management and conservation (Marshall et al., 2020). This process provides data that are essential for making informed decisions regarding the management and planning of urban landscapes (Macivor, 2017). The data gathered through measurements helps to identify the areas containing plant species and which species require protection (Stohlgren, 2008). This information is useful in providing targeted ecosystem services and identifying potential threats.

Measuring diversity is a crucial step in the development of effective conservation strategies (Stohlgren, 2008). This information is used to locate threatened plant species and establish protected areas (Francini et al., 2022). In addition, measurement data can be used to monitor and evaluate changes in plant diversity over time. This monitoring helps understand the impact of urban development and environmental changes on vegetation. Measuring floristic diversity is a vital component of

effective urban landscape management and conservation (Humphries et al., 1995; Marshall et al., 2020).

6. Effects of Climate Change on Urban Floristic Diversity

Climate change poses a significant environmental challenge, with far-reaching consequences for all ecosystems, including urban floristic diversity (Pandey & Ghosh, 2023). Plant diversity in urban areas is crucial for sustaining ecosystem functions and enhancing the aesthetics and functional value of cities (Macivor, 2017). Climate change impacts on urban floristic diversity have both short- and long-term consequences (Weiskopf et al., 2020), making it essential to understand these impacts for sustainable urban planning.

6.1. Temperature Increases and Distribution of Plant Species

Increases in global temperatures significantly affect the distribution of plant species in urban areas (Dambros et al., 2020; Tóth et al., 2019). Temperature increases alter the natural range of plants and may encourage some species to adapt to warmer climates, while causing others to decline (Anderson & Song, 2020). This profoundly affects the structure of the plant communities and ecosystem functions.

6.1.1. Change in the distribution of plant species

Increases in temperature tend to change the natural distribution of plant species (Anderson & Song, 2020; Viterbi et al., 2020). For instance, warmer climate plants may spread to previously cold climate regions because of temperature increases. This trend may cause warm climate plants to become more common in urban areas, whereas cool climate plants may decline or disappear.

In particular, warm-climate species, such as tropical and Mediterranean plants, may become more common in urban environments (Matesanz & Valladares, 2014). For example, cities in Southern California are home to more Mediterranean plant species as temperatures increase. On the other hand, cold climate plants, such as those originating from Siberia, may decline or disappear because they cannot adapt to such changes (Harrison, 2020). It is possible that this situation may reverse under different environmental conditions. For example, Wang (2022) found that the spatial distribution of “*Cymbalaria muralis*” in Switzerland (Figure 2) increased between 1768-1900, 1901-2000 and 2001-mid 2022.

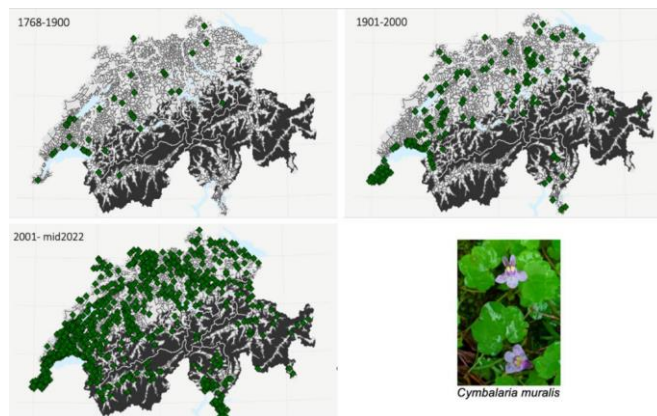


Figure 2. A Map of Switzerland with georeferenced occurrences of *C. muralis* (indicated as green diamonds) across three time periods (Wang 2022).

6.1.2. Decline in ecosystem functions

The impact of temperature increase on the growth and flowering times of plants may have detrimental consequences with respect to the continuity of ecosystem services (Huang et al., 2016). For example, alterations in flowering time may affect pollinator interactions. Pollinators are essential for plant reproduction and preservation of ecosystem functions.

Temperature increases can advance or delay plant flowering times, which can influence pollinator activities (Hegland et al., 2009). Specifically, an early onset of flowering may hinder the access of certain pollinators to these flowers, thereby reducing the pollination success of the plants. Specifically, the early onset of flowering may hinder the access of certain pollinators to these flowers, thereby reducing the pollination success of the plants. Moreover, these changes in flowering phenology can have cascading effects (Dorji et al., 2020) throughout the food web. For example, if pollinators are unable to find adequate food sources because of altered flowering schedules, their populations may decline, which in turn affects other species that rely on them for survival. Disruption of ecological interactions can result in reduced biodiversity and diminished ecosystem resilience. Additionally, the altered timing of flowering can impact plant-pollinator networks by creating a mismatch in mutualistic relationships, leading to reduced efficiency in pollination services and potentially affecting agricultural yields and natural plant communities.

6.1.3. Adaptation capacity of species

Temperature increases pose a challenge to the plants' ability to adjust. Some plants can undergo genetic changes or develop physiological adaptations to tolerate high temperatures (Gray & Brady, 2016; Weiskopf et al., 2020). For example, some plants may adopt water-saving strategies or develop special protective mechanisms in their leaves to endure heat stress. Nevertheless, not all plants possess these adaptations; consequently, some species cannot adjust (Harrison, 2020) to temperature increases. This can result in a decline in plant diversity or even complete extinction of certain species.

6.1.4. Spatial distribution and habitat loss

Increases in temperature affect the spatial distribution of plants, and can lead to habitat loss (Brooks et al., 2002). In mountainous regions, as temperatures increase, plants may migrate to higher altitudes. However, such migration may be limited and may lead to species extinction (Red & Barb, 2011) if suitable new habitats cannot be found in plants. Additionally, rising temperatures in urban areas can cause plants to lose their natural habitats (Yin et al., 2021), thereby reducing diversity.

6.1.5. Hot island effect and adaptation of plant species in cities

The hot island effect causes higher temperatures in urban areas than in the surrounding areas (Deilami et al., 2018). These temperatures test the adaptability of urban vegetation and ensure that only species that can adapt to high temperatures survive (Lanza & Stone, 2016). The hot island effect can reduce plant species diversity and affect ecosystem functions (Čeplová et al., 2017; Jogan et al., 2022). For example, plants common in urban areas must develop special adaptations to adapt to the hot island effect. These adaptations may include leaf structures (Munaf et al., 2023) that can withstand high temperatures, and water-conserving root systems.

6.2. Precipitation Patterns and Water Availability

Climate change has significant implications for urban floristic diversity, particularly in terms of precipitation patterns and water availability (Čeplová et al., 2017; Harrison, 2020). Changes in rainfall can affect plant health, growth, and distribution, necessitating effective management of urban green spaces to maintain biodiversity (Dunnett et al., 2008; Lundholm et al., 2010).

6.2.1. Altered precipitation patterns

Climate change is anticipated to lead to more erratic and unpredictable precipitation patterns, with some regions experiencing increased rainfall and others facing prolonged drought (Bolan et al., 2024; Korell et al., 2021; Spohn et al., 2023). For example, prolonged dry periods can lead to soil degradation and reduced water availability, thereby adversely affecting plant health and survival. This variability can create challenges for urban plant species that are not adapted to such changes, potentially resulting in shifts in the species composition (Bolan et al., 2024; Zhang et al., 2023).

6.2.2. Drought stress and plant resilience

More intensive increases or decreases in precipitation can lead to significant water-related urban hazards, including droughts and severe water shortages (IPCC, 2013). Extended periods of drought can have severe consequences for urban plant species, particularly those that are not drought tolerant (Silva et al., 2013; Zhang et al., 2023). Drought stress can lead to decreased plant vigor, increased susceptibility to pests and diseases, and increased mortality rates (Navarro-Cerrillo et al., 2022). While some plants may develop adaptations, such as deeper root systems or reduced leaf area, to conserve water, not all species can make these adjustments, leading to a decline in diversity (Navarro-Cerrillo et al., 2022; Zia et al., 2021).

6.2.3. Increased flooding and waterlogging

Increased rainfall and extreme weather events can result in more frequent flooding and waterlogged soil (Furtak & Wolińska, 2023). Urban plants that are not adapted to saturated conditions may suffer root rot and other water-related stresses (Czaja et al., 2020). However, flood-tolerant species

may become more prevalent, potentially altering the composition of urban plant communities (Ruas et al., 2022).

6.2.4. Urban water management and plant health

Effective urban water management practices, such as the implementation of green infrastructure (e.g., rain gardens, green roofs, and permeable pavements), can mitigate the impacts of altered precipitation patterns on urban plants (Palermo et al., 2023). These practices help manage excess water during heavy rainfall (Nair, 2021) and provide supplemental irrigation during dry periods (Oweis & Hachum, 2006), thereby supporting plant health and diversity (Oral et al., 2020).

6.3. Increased CO² Levels and Plant Growth

The growth and physiology of urban plants are affected by atmospheric CO² levels, which are primary drivers of climate change. Although elevated CO² levels can stimulate photosynthesis and growth in some plant species, the overall impact on urban floristic diversity is complex and context-dependent. It is important to consider several factors. Increased CO² levels can enhance photosynthesis and growth in many plant species, potentially leading to an increase in biomass production (Seeda 2021; Nunes, 2023). This effect, known as CO² fertilization, can benefit urban plants, especially those limited by other resources (de Wergifosse et al., 2020). However, the extent of this benefit varies among species and can be influenced by other environmental factors such as nutrient availability and water stress (Godde et al., 2021). It should be noted that the response of different plant species to elevated CO² can lead to changes in competitive interactions within urban plant communities, which can affect the overall diversity of these communities (Reich et al., 2001). This is a

significant issue for the management of urban ecosystems under changing CO² conditions (Pandey & Ghosh, 2023). Additionally, the response of different plant species to elevated CO² can also lead to changes in the nutrient content of plants, which can affect the health and growth of these plants as well as the animals and humans that rely on them for food (Idso & Idso, 2001). Urban plants with altered nutrient profiles may have reduced resilience to environmental stresses and pests, which is a crucial consideration in managing these ecosystems (Dambros et al., 2020; O’Riordan et al., 2021). Finally, it is important to consider the potential effects of rising CO² levels on invasive species, which may be favored by enhanced growth conditions. Managing these species in urban areas is an issue that must be addressed in the context of increasing CO² levels.

7. Conclusion and Suggestions

Floristic diversity, which refers to the variety and richness of plant species in a region, is a crucial component of ecosystem health and sustainability. In urban areas, diverse plant communities contribute to the maintenance of ecosystem services such as air and water purification, soil stabilization, and habitat provision. These services are essential for the well-being of urban populations and resilience of urban ecosystems. The presence of diverse plant species also enhances the aesthetic and recreational value of urban spaces, thereby contributing to the overall quality of life in cities. The ecological role of floristic diversity is particularly significant. Diverse plant communities enhance ecosystem resilience by providing a range of species with different adaptations to environmental stressors. This diversity acts as a buffer against environmental fluctuations, thereby ensuring the stability of ecosystem functions. Several key

recommendations can be made to enhance and preserve floristic diversity in urban landscapes. Urban planning should prioritize the integration of diverse plant species into public and private green spaces. This includes the use of native and regionally adapted plant species to enhance the local biodiversity and ecosystem resilience. Green infrastructure, such as green roofs, vertical gardens, and urban forests, should be integrated into urban design to maximize the ecological benefits of floristic diversity. In densely concreted cities, suitable breeding or accommodation areas for other species are unavailable. This can result in changes to the spatial distribution of species or species extinction. To avoid these negative consequences, nature-based solutions should not be organized as typical rooftop gardens or vertical gardens. In areas where urban biodiversity is prioritized, it is important to include nests suitable for bird species in roof gardens in areas where bird species or migration routes are located. This approach plays a critical role in enhancing and protecting the biodiversity in cities. Portland, Oregon, USA is known for its innovative practices in green infrastructure and urban agriculture. The city has a wide range of green roofs, vertical gardens, and community gardens. Portland's green infrastructure strategies improve air quality, enhance water management, and promote social interaction. Additionally, urban agricultural projects increase urban floristic diversity by supporting local food production. Efforts to promote sustainable urban agriculture should be prioritized to increase the availability of locally grown produce and to support plant diversity. The development of community gardens, rooftop farms, and urban orchards can enhance urban floristic diversity, while providing social and economic benefits. It is crucial to establish policies and

incentives to encourage sustainable urban agriculture and ensure its long-term viability. Raising public awareness of the importance of floristic diversity is essential for its preservation. Developing educational programs and community outreach activities can inform residents of the benefits of diverse plant species and encourage their participation in conservation efforts. Schools, community centers, and local organizations can play a vital role in promoting environmental education. To address the impact of climate change on urban floristic diversity, climate-resilient landscaping practices should be adopted. These include selecting plant species that are tolerant to changing climatic conditions, implementing water-efficient irrigation systems, and using sustainable soil management techniques. Collaboration between urban planners, landscape architects, ecologists, and climate scientists is necessary to develop adaptive strategies. Effective conservation policies and regulations are crucial for protecting urban floristic diversity. Governments at all levels should enact laws to safeguard natural habitats, restrict the spread of invasive species, and promote the use of native plants. Establishing and maintaining urban conservation areas and green belts can help preserve critical habitats and ecological corridors. Continued research on urban floristic diversity is necessary to understand its dynamics and to develop effective management strategies. Collaboration between universities, research institutions, and government agencies can help conduct studies on urban plant communities, climate change impacts, and the effectiveness of conservation practices. Supporting innovation in green infrastructure technologies and sustainable landscaping techniques can enhance urban biodiversity. Engaging the community in efforts to preserve and enhance urban floristic diversity is

crucial. Community-based initiatives, such as tree-planting programs, habitat restoration projects, and citizen science activities, can foster a sense of stewardship and collective responsibility among community members. Local governments and organizations should facilitate community participation by providing resources, training, and support to ensure the success and sustainability of these initiatives. Regular monitoring and evaluation of urban floristic diversity and related conservation efforts are essential for tracking the progress and identifying areas for improvement. Establishing comprehensive monitoring programs that track changes in plant diversity, ecosystem services, and climate impacts will provide valuable data for informed decision making. Adaptive management approaches should be employed to respond to emerging challenges and opportunities and to ensure the effectiveness of conservation efforts.

Changes in precipitation patterns due to climate change pose significant challenges to urban floristic diversity. To address these challenges, it's crucial to diversify plant species with varying water requirements and resilience, thereby ensuring a robust urban plant community. Implementing rainwater harvesting systems captures and stores rainwater for use during dry periods, providing a reliable water supply. Green infrastructure, such as green roofs, rain gardens, and permeable pavements, helps manage stormwater and mitigate the effects of erratic precipitation. Incorporating drought-resistant native plants and xeriscaping principles can reduce water demand and enhance resilience to drought conditions. Efficient irrigation systems, such as drip irrigation and soil moisture sensors, optimize water use and minimize waste. Applying mulch retains soil moisture, regulates temperature, and improves soil

health, further supporting plant resilience. Effective urban water management practices are essential for maintaining plant health and diversity. Developing integrated water management plans that address both water scarcity and excess, incorporating green infrastructure and efficient irrigation practices, is key. Regular monitoring of soil moisture levels and plant health allows for prompt identification and resolution of water-related issues. Including a variety of species that respond differently to elevated CO² ensures a balanced plant community, while regular pruning manages excessive growth and maintains healthy plant structures. The response of different plant species to elevated CO² can lead to changes in competitive interactions within urban plant communities. Regular monitoring of plant communities to detect shifts in species composition and implementing adaptive management practices allows for quick responses to changes. Restoring degraded urban habitats supports a diverse range of plant species and enhances ecosystem stability. Prioritizing the use of native plants in urban landscaping reduces the likelihood of invasive species becoming established.

In conclusion, the preservation and promotion of floristic diversity in urban landscapes is fundamental to achieving sustainable urban development. By integrating diverse plant species into urban planning, promoting sustainable agriculture, enhancing public awareness, and adopting climate-resilient landscape projects, cities can foster their ecological, social, and economic benefits. Strong conservation policies, continued research, and community involvement are essential to ensure the long-term sustainability of urban floristic diversity. Through such efforts, urban areas can become vibrant, resilient, and healthy environments for

both people and nature. Despite their critical importance, floristic diversity faces numerous threats, including habitat loss, climate change, invasive species, pollution, and overexploitation. Effective conservation strategies require interdisciplinary approaches integrating ecological knowledge, policy frameworks, and community engagement. Protected areas, botanical gardens, seed banks, and restoration projects are essential tools for preserving plant diversity and mitigating the impact of global environmental change.

Acknowledgements and Information Note

The article complies with national and international research and publication ethics.

Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

- Almalki, R., Khaki, M., Saco, P. M., & Rodriguez, J. F. (2022). Monitoring and Mapping Vegetation Cover Changes in Arid and Semi-Arid Areas Using Remote Sensing Technology: A Review. *Remote Sensing*, *14*(20). <https://doi.org/10.3390/rs14205143>
- Anderson, J. T., & Song, B. H. (2020). Plant adaptation to climate change—Where are we? *Journal of Systematics and Evolution*, *58*(5), 533–545. <https://doi.org/10.1111/jse.12649>
- Anderson, P. M. L., Okereke, C., Rudd, A., & Parnell, S. (2013). Regional assessment of Africa. In *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities: A Global Assessment*. https://doi.org/10.1007/978-94-007-7088-1_23
- Andersson, E., Borgström, S., & McPhearson, T. (2017). *Nature-Based Solutions to Climate Change Adaptation in Urban Areas*. 51–64. <https://doi.org/10.1007/978-3-319-56091-5>
- Antrop, M. (2004). Landscape change and the urbanization process in Europe. *Landscape and Urban Planning*, *67*(1–4), 9–26. [https://doi.org/10.1016/S0169-2046\(03\)00026-4](https://doi.org/10.1016/S0169-2046(03)00026-4)
- Ashinze, U.K., Edeigba, B.A., Umoh, A.A., Bui, P.W. & Daraojimba, A.I. (2024). Urban green infrastructure and its role in sustainable cities: A comprehensive review. *World Journal of Advanced Research and Reviews*, *21*(2), 928–936. <https://doi.org/10.30574/wjarr.2024.21.2.0519>
- Audrey, M., Porcher, E., Devictor, V., Arnal, G., Moret, J., Wright, S., & Machon, N. (2008). Evaluation of floristic diversity in urban areas as a basis for habitat management. In *Applied Vegetation Science* (Vol. 11, Issue 4). <https://doi.org/10.3170/2008-7-18530>
- Barrico, L., & Castro, P. (2016). Urban biodiversity and cities' sustainable development. *World Sustainability Series*, *June*, 29–42. https://doi.org/10.1007/978-3-319-32318-3_3
- Bera, B. (2023). “species diversity: components, importance, threats and conservation.” *January 2022*.
- Berthon, K., Thomas, F., & Bekessy, S. (2021). The role of ‘nativeness’ in urban greening to support animal biodiversity. *Landscape and Urban*

- Blicharska, M., Smithers, R. J., Mikusiński, G., Rönnbäck, P., Harrison, P. A., Nilsson, M., & Sutherland, W. J. (2019). Biodiversity's contributions to sustainable development. *Nature Sustainability*, 2(12), 1083–1093. <https://doi.org/10.1038/s41893-019-0417-9>
- Bolan, S., Padhye, L. P., Jasemizad, T., Govarthanam, M., Karmegam, N., Wijesekara, H., Amarasiri, D., Hou, D., Zhou, P., Biswal, B. K., Balasubramanian, R., Wang, H., Siddique, K. H. M., Rinklebe, J., Kirkham, M. B., & Bolan, N. (2024). Impacts of climate change on the fate of contaminants through extreme weather events. *Science of the Total Environment*, 909(November 2023). <https://doi.org/10.1016/j.scitotenv.2023.168388>
- Boyd, I. L., Freer-Smith, P. H., Gilligan, C. A., & Godfray, H. C. J. (2013). The consequence of tree pests and diseases for ecosystem services. *Science*, 342(6160). <https://doi.org/10.1126/science.1235773>
- Brockerhoff, E. G., Barbaro, L., Castagneyrol, B., Forrester, D. I., Gardiner, B., González-Olabarria, J. R., Lyver, P. O. B., Meurisse, N., Oxbrough, A., Taki, H., Thompson, I. D., van der Plas, F., & Jactel, H. (2017). Forest biodiversity, ecosystem functioning and the provision of ecosystem services. *Biodiversity and Conservation*, 26(13), 3005–3035. <https://doi.org/10.1007/s10531-017-1453-2>
- Brooks, T. M., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A. B., Rylands, A. B., Konstant, W. R., Flick, P., Pilgrim, J., Oldfield, S., Magin, G., & Hilton-Taylor, C. (2002). Habitat loss and extinction in the hotspots of biodiversity. *Conservation Biology*, 16(4), 909–923. <https://doi.org/10.1046/j.1523-1739.2002.00530.x>
- Bull, J. W., Suttle, K. B., Gordon, A., Singh, N. J., & Milner-Gulland, E. J. (2013). Biodiversity offsets in theory and practice. *Oryx*, 47(3), 369–380. <https://doi.org/10.1017/S003060531200172X>
- Čeplová, N., Kalusová, V., & Lososová, Z. (2017). Effects of settlement size, urban heat island and habitat type on urban plant biodiversity. *Landscape and Urban Planning*, 159, 15–22. <https://doi.org/10.1016/j.landurbplan.2016.11.004>
- Chhetri, N. B. K., & Shrestha, K. K. (2019). Floristic Diversity and

- Important Value Indices of Tree Species in Lower Kanchenjunga Singhalila Ridge Eastern Nepal. *American Journal of Plant Sciences*, 10(01), 248–263. <https://doi.org/10.4236/ajps.2019.101019>
- Cromwell, E., Cooper, D., & Mulvany, P. (1999). Agriculture, biodiversity and livelihoods: issues and entry points. *Natural Resources Perspectives*, 38(April), 1–34.
- Czaja, M., Kołton, A., & Muras, P. (2020). The complex issue of urban trees-stress factor accumulation and ecological service possibilities. *Forests*, 11(9), 1–24. <https://doi.org/10.3390/F11090932>
- Dambros, C., Zuquim, G., Moulatlet, G. M., Costa, F. R. C., Tuomisto, H., Ribas, C. C., Azevedo, R., Baccaro, F., Bobrowiec, P. E. D., Dias, M. S., Emilio, T., Espirito-Santo, H. M. V., Figueiredo, F. O. G., Franklin, E., Freitas, C., Graça, M. B., d’Horta, F., Leitão, R. P., Maximiano, M., ... Magnusson, W. E. (2020). The role of environmental filtering, geographic distance and dispersal barriers in shaping the turnover of plant and animal species in Amazonia. *Biodiversity and Conservation*, 29(13), 3609–3634. <https://doi.org/10.1007/s10531-020-02040-3>
- de Wergifosse, L., André, F., Goosse, H., Caluwaerts, S., de Cruz, L., de Troch, R., Van Schaeybroeck, B., & Jonard, M. (2020). CO2 fertilization, transpiration deficit and vegetation period drive the response of mixed broadleaved forests to a changing climate in Wallonia. *Annals of Forest Science*, 77(3). <https://doi.org/10.1007/s13595-020-00966-w>
- Deilami, K., Kamruzzaman, M., & Liu, Y. (2018). Urban heat island effect: A systematic review of spatio-temporal factors, data, methods, and mitigation measures. *International Journal of Applied Earth Observation and Geoinformation*, 67(November 2017), 30–42. <https://doi.org/10.1016/j.jag.2017.12.009>
- Díaz, S., & Cabido, M. (2001). Vive la différence: Plant functional diversity matters to ecosystem processes. *Trends in Ecology and Evolution*, 16(11), 646–655. [https://doi.org/10.1016/S0169-5347\(01\)02283-2](https://doi.org/10.1016/S0169-5347(01)02283-2)
- Doğan, T.G. & Eroğlu, E. (2020). Evaluation of Woody Species According to Different Urban Area Usage Characteristics: Case of Düzce City Center. *Düzce Üniversitesi Bilim ve Teknoloji Dergisi*. 8, 290-305.

DOI: 10.29130/dubited.634559

- Doğan, T.G., & Eroğlu, E. (2022). Using GIS and the Diversity Indices: A Combined Approach to Woody Plant Diversity in the Urban Landscape. *Vegetation Index and Dynamics*. <https://doi.org/10.5772/intechopen.96908>
- Dorji, T., Hopping, K. A., Meng, F., Wang, S., Jiang, L., & Klein, J. A. (2020). Impacts of climate change on flowering phenology and production in alpine plants: The importance of end of flowering. *Agriculture, Ecosystems and Environment*, 291(6), 106795. <https://doi.org/10.1016/j.agee.2019.106795>
- Douglas, O., Lennon, M., & Scott, M. (2017). Green space benefits for health and well-being: A life-course approach for urban planning, design and management. *Cities*, 66(April), 53–62. <https://doi.org/10.1016/j.cities.2017.03.011>
- Dunnett, N., Nagase, A., Booth, R., & Grime, P. (2008). Influence of vegetation composition on runoff in two simulated green roof experiments. *Urban Ecosystems*, 11(4), 385–398. <https://doi.org/10.1007/s11252-008-0064-9>
- Düzce, D., & Merkezi, K. (2020). *Düzce Üniversitesi Bilim ve Teknoloji Dergisi Evaluation of Woody Species According to Different Urban Area*. 8, 290–305.
- Ekren, E., Çorbacı, Ö.L. (2022). An Investigation on Plants with Allergic Pollen: The Case of Rize Urban Open Green Areas. *Mimarlık Bilimleri ve Uygulamaları Dergisi*. 7(2):693-706. DOI: 10.30785/mbud.1124560
- English, J., Barry, K. E., Wood, E. M., & Wright, A. J. (2022). The effect of urban environments on the diversity of plants in unmanaged grasslands in Los Angeles, United States. *Frontiers in Ecology and Evolution*, 10(October), 1–10. <https://doi.org/10.3389/fevo.2022.921472>
- Finger, R., & Buchmann, N. (2015). An ecological economic assessment of risk-reducing effects of species diversity in managed grasslands. *Ecological Economics*, 110(February 2015), 89–97. <https://doi.org/10.1016/j.ecolecon.2014.12.019>
- Francini, A., Romano, D., Toscano, S., & Ferrante, A. (2022). (Reeder,

- 2013). *Earth (Switzerland)*, 3(4), 1258–1274.
- Furtak, K., & Wolińska, A. (2023). The impact of extreme weather events as a consequence of climate change on the soil moisture and on the quality of the soil environment and agriculture – A review. *Catena*, 231(February). <https://doi.org/10.1016/j.catena.2023.107378>
- Gaberáček, A., & Murlis, J. (2011). The role of vegetation in the water cycle. *Ecohydrology and Hydrobiology*, 11(3–4), 175–181. <https://doi.org/10.2478/v10104-011-0046-z>
- Giannico, V., Spano, G., Elia, M., D’Este, M., Sanesi, G., & Laforteza, R. (2021). Green spaces, quality of life, and citizen perception in European cities. *Environmental Research*, 196(December 2020), 110922. <https://doi.org/10.1016/j.envres.2021.110922>
- Godde, C. M., Mason-D’Croz, D., Mayberry, D. E., Thornton, P. K., & Herrero, M. (2021). Impacts of climate change on the livestock food supply chain; a review of the evidence. *Global Food Security*, 28(December 2020), 100488. <https://doi.org/10.1016/j.gfs.2020.100488>
- Gray, S. B., & Brady, S. M. (2016). Plant developmental responses to climate change. *Developmental Biology*, 419(1), 64–77. <https://doi.org/10.1016/j.ydbio.2016.07.023>
- Grizzetti, B., Liqueste, C., Pistocchi, A., Vigiak, O., Zulian, G., Bouraoui, F., De Roo, A., & Cardoso, A. C. (2019). Relationship between ecological condition and ecosystem services in European rivers, lakes and coastal waters. *Science of the Total Environment*, 671, 452–465. <https://doi.org/10.1016/j.scitotenv.2019.03.155>
- Gunawardena, K. R., Wells, M. J., & Kershaw, T. (2017). Utilising green and bluespace to mitigate urban heat island intensity. *Science of the Total Environment*, 584–585, 1040–1055. <https://doi.org/10.1016/j.scitotenv.2017.01.158>
- Haq, S. M., Khoja, A. A., Lone, F. A., Waheed, M., Bussmann, R. W., Mahmoud, E. A., & Elansary, H. O. (2023). Floristic composition, life history traits and phytogeographic distribution of forest vegetation in the Western Himalaya. *Frontiers in Forests and Global Change*, 6(June), 1–17. <https://doi.org/10.3389/ffgc.2023.1169085>
- Harrison, S. (2020). Plant community diversity will decline more than

- increase under climatic warming. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1794). <https://doi.org/10.1098/rstb.2019.0106>
- Hegland, S. J., Nielsen, A., Lázaro, A., Bjerknes, A. L., & Totland, Ø. (2009). How does climate warming affect plant-pollinator interactions? *Ecology Letters*, 12(2), 184–195. <https://doi.org/10.1111/j.1461-0248.2008.01269.x>
- Homeier, J., Werner, F. A., Gawlik, J., Peters, T., Diertl, K.-H. J., & Richter, M. (2013). *Plant Diversity and Its Relevance for the Provision of Ecosystem Services. September 2014*, 93–106. https://doi.org/10.1007/978-3-642-38137-9_8
- Hope, D., Gries, C., Zhu, W., Fagan, W. F., Redman, C. L., Grimm, N. B., Nelson, A. L., Martin, C., & Kinzig, A. (2003). Socioeconomics drive urban plant diversity. *Proceedings of the National Academy of Sciences of the United States of America*, 100(15), 8788–8792. <https://doi.org/10.1073/pnas.1537557100>
- Hou, Y., Li, J., Li, G., & Qi, W. (2023). Negative effects of urbanization on plants: A global meta-analysis. *Ecology and Evolution*, 13(4), 1–9. <https://doi.org/10.1002/ece3.9894>
- Huang, J., Yu, H., Guan, X., Wang, G., & Guo, R. (2016). Accelerated dryland expansion under climate change. *Nature Climate Change*, 6(2), 166–171. <https://doi.org/10.1038/nclimate2837>
- Humphries, C. J., Williams, P. H., & Vane-Wright, R. I. (1995). Measuring biodiversity value for conservation. *Annual Review of Ecology and Systematics*, 26(1), 93–111. <https://doi.org/10.1146/annurev.es.26.110195.000521>
- Idso, S. B., & Idso, K. E. (2001). Effects of atmospheric CO₂ enrichment on plant constituents related to animal and human health. *Environmental and Experimental Botany*, 45(2), 179–199. [https://doi.org/10.1016/S0098-8472\(00\)00091-5](https://doi.org/10.1016/S0098-8472(00)00091-5)
- Ignatieva, M., Dushkova, D., Nilon, C., Haase, D., Knapp, S., & Bittorf, N. (2023). *Integrating Biodiversity in Urban Planning and Design Processes* (Issue March). <https://doi.org/10.57699/hd4s-e705>
- Jogan, N., Kůzmič, F., & Šilc, U. (2022). Urban structure and environment impact plant species richness and floristic composition in a Central

- European city. *Urban Ecosystems*, 25(1), 149–163.
<https://doi.org/10.1007/s11252-021-01140-4>
- Korell, L., Auge, H., Chase, J. M., Harpole, W. S., & Knight, T. M. (2021). Responses of plant diversity to precipitation change are strongest at local spatial scales and in drylands. *Nature Communications*, 12(1), 1–7. <https://doi.org/10.1038/s41467-021-22766-0>
- Kowarik, I. (2011). Novel urban ecosystems, biodiversity, and conservation. *Environmental Pollution*, 159(8–9), 1974–1983. <https://doi.org/10.1016/j.envpol.2011.02.022>
- Lanza, K., & Stone, B. (2016). Climate adaptation in cities: What trees are suitable for urban heat management? *Landscape and Urban Planning*, 153(September), 74–82. <https://doi.org/10.1016/j.landurbplan.2015.12.002>
- Li, X., Jia, B., Zhang, W., Ma, J., & Liu, X. (2020). Woody plant diversity spatial patterns and the effects of urbanization in Beijing, China. *Urban Forestry and Urban Greening*, 56(October), 126873. <https://doi.org/10.1016/j.ufug.2020.126873>
- Lundholm, J., MacIvor, J. S., MacDougall, Z., & Ranalli, M. (2010). Plant species and functional group combinations affect green roof ecosystem functions. *PLoS ONE*, 5(3). <https://doi.org/10.1371/journal.pone.0009677>
- Lüscher, A., Barkaoui, K., Finn, J. A., Suter, D., Suter, M., & Volaire, F. (2022). Using plant diversity to reduce vulnerability and increase drought resilience of permanent and sown productive grasslands. *Grass and Forage Science*, 77(4), 235–246. <https://doi.org/10.1111/gfs.12578>
- Macivor, J. S. (2017). Urban Biodiversity. *Urban Biodiversity*, November. <https://doi.org/10.9774/gleaf.9781315402581>
- Marshall, E., Wintle, B. A., Southwell, D., & Kujala, H. (2020). What are we measuring? A review of metrics used to describe biodiversity in offsets exchanges. *Biological Conservation*, 241(November 2019), 108250. <https://doi.org/10.1016/j.biocon.2019.108250>
- Matesanz, S., & Valladares, F. (2014). Ecological and evolutionary responses of Mediterranean plants to global change. *Environmental and Experimental Botany*, 103, 53–67.

<https://doi.org/10.1016/j.envexpbot.2013.09.004>

- Mcintyre, N. E., Knowles-Y, K., & Hope, D. (2000). Urban ecology as an interdisciplinary field: differences in the use of "urban" between the social and natural sciences. *Urban Ecosystems*, 4(1997), 5–24. <http://www.isinet.com>
- McKinney, M. L. (2006). Urbanization as a major cause of biotic homogenization. *Biological Conservation*, 127(3), 247–260. <https://doi.org/10.1016/j.biocon.2005.09.005>
- Morgenroth, J., Östberg, J., Konijnendijk van den Bosch, C., Nielsen, A. B., Hauer, R., Sjöman, H., Chen, W., & Jansson, M. (2016). Urban tree diversity-Taking stock and looking ahead. *Urban Forestry and Urban Greening*, 15, 1–5. <https://doi.org/10.1016/j.ufug.2015.11.003>
- Munaf, A., Irfeey, M., Chau, H., Mahusoon, M., Sumaiya, F., Wai, C. Y., Muttill, N., & Jamei, E. (2023). *Sustainable-Mitigation-Strategies-for-Urban-Heat-Island-Effects-in-Urban-Areas_2023_Multidisciplinary-Digital-Publishing-Institute-MDPI.pdf*.
- Nair, S. (2021). *Challenges in urban water management in a changing environment case study from a growing tropical city To cite this version* : HAL Id : hal-03296160.
- Navarro-Cerrillo, R. M., González-Moreno, P., Ruiz-Gómez, F. J., Sánchez-Cuesta, R., Gazol, A., & Camarero, J. J. (2022). Drought stress and pests increase defoliation and mortality rates in vulnerable *Abies pinsapo* forests. *Forest Ecology and Management*, 504(October 2021). <https://doi.org/10.1016/j.foreco.2021.119824>
- Niesenbaum, R. A. (2019). The integration of conservation, biodiversity, and sustainability. *Sustainability (Switzerland)*, 11(17). <https://doi.org/10.3390/su11174676>
- Nunes, L. J. R. (2023). The Rising Threat of Atmospheric CO2: A Review on the Causes, Impacts, and Mitigation Strategies. *Environments - MDPI*, 10(4). <https://doi.org/10.3390/environments10040066>
- O’Riordan, R., Davies, J., Stevens, C., Quinton, J. N., & Boyko, C. (2021). The ecosystem services of urban soils: A review. *Geoderma*, 395(August), 115076. <https://doi.org/10.1016/j.geoderma.2021.115076>

- Oguh, C. E., Obiwulu, E. N. O., Umezina, O. J., Ameh, S. E., Ugwu, C. V., & Sheshi, I. M. (2021). Ecosystem and Ecological Services; Need for Biodiversity Conservation-A Critical Review. *Asian Journal of Biology, April*, 1–14. <https://doi.org/10.9734/ajob/2021/v11i430146>
- Oral, H. V., Carvalho, P., Gajewska, M., Ursino, N., Masi, F., van Hullebusch, E. D., Kazak, J. K., Exposito, A., Cipolletta, G., Andersen, T. R., Finger, D. C., Simperler, L., Regelsberger, M., Rous, V., Radinja, M., Buttiglieri, G., Krzeminski, P., Rizzo, A., Dehghanian, K., ... Zimmermann, M. (2020). A review of nature-based solutions for urban water management in European circular cities: A critical assessment based on case studies and literature. *Blue-Green Systems*, 2(1), 112–136. <https://doi.org/10.2166/bgs.2020.932>
- Oweis, T., & Hachum, A. (2006). Water harvesting and supplemental irrigation for improved water productivity of dry farming systems in West Asia and North Africa. *Agricultural Water Management*, 80(1-3 SPEC. ISS.), 57–73. <https://doi.org/10.1016/j.agwat.2005.07.004>
- Palermo, S. A., Turco, M., Pirouz, B., Presta, L., Falco, S., De Stefano, A., Frega, F., & Piro, P. (2023). Nature-based solutions for urban stormwater management: An overview. *IOP Conference Series: Earth and Environmental Science*, 1196(1). <https://doi.org/10.1088/1755-1315/1196/1/012027>
- Pandey, B., & Ghosh, A. (2023). Urban ecosystem services and climate change: a dynamic interplay. *Frontiers in Sustainable Cities*, 5. <https://doi.org/10.3389/frsc.2023.1281430>
- Pasanen, T. P., White, M. P., Elliott, L. R., van den Bosch, M., Bratman, G. N., Ojala, A., Korpela, K., & Fleming, L. E. (2023). Urban green space and mental health among people living alone: The mediating roles of relational and collective restoration in an 18-country sample. *Environmental Research*, 232(June), 116324. <https://doi.org/10.1016/j.envres.2023.116324>
- Paudel, S., & States, S. L. (2023). Urban green spaces and sustainability: Exploring the ecosystem services and disservices of grassy lawns versus floral meadows. *Urban Forestry and Urban Greening*, 84, 127932. <https://doi.org/10.1016/j.ufug.2023.127932>
- Perivoliotis, D., Arvanitis, I., Tzavali, A., Papakostas, V., Kappou, S.,

- Andreakos, G., Fotiadi, A., Paravantis, J. A., Souliotis, M., & Mihalakakou, G. (2023). Sustainable Urban Environment through Green Roofs: A Literature Review with Case Studies. *Sustainability (Switzerland)*, *15*(22), 1–25. <https://doi.org/10.3390/su152215976>
- Perry, G., & Cox, R. D. (2024). Opportunities for Biodiversity Conservation via Urban Ecosystem Regeneration. *Diversity*, *16*(3). <https://doi.org/10.3390/d16030131>
- Petchey, O. L., & Gaston, K. J. (2006). Functional diversity: Back to basics and looking forward. *Ecology Letters*, *9*(6), 741–758. <https://doi.org/10.1111/j.1461-0248.2006.00924.x>
- Planchuelo, G., von Der Lippe, M., & Kowarik, I. (2019). Untangling the role of urban ecosystems as habitats for endangered plant species. *Landscape and Urban Planning*, *189*(September 2018), 320–334. <https://doi.org/10.1016/j.landurbplan.2019.05.007>
- Prajapati, S. K., Kumar, V., Dayal, P., & Srivastava, R. (2023). Carbon Sequestration : A key strategy for climate change mitigation towards a sustainable future. *Emerging Trends in Climate Change*, *2*(2), 1–14. <https://doi.org/10.18782/2583-4770.128>
- Quijas, S., Schmid, B., & Balvanera, P. (2010). Plant diversity enhances provision of ecosystem services: A new synthesis. *Basic and Applied Ecology*, *11*(7), 582–593. <https://doi.org/10.1016/j.baae.2010.06.009>
- Rahman, M. M. (2023). Impact of Habitat Fragmentation on the Diversity of Flora and Fauna of Bangladesh. *SSRN Electronic Journal*, *June*. <https://doi.org/10.2139/ssrn.4451469>
- Red, I., & Barb, R. C. (2011). *Table 7 : Species changing IUCN Red List Status (2010-2011)*. 2009(July), 2010–2012.
- Reich, P. B., Knops, J., Tilman, D., Craine, J., Ellsworth, D., Tjoelker, M., Lee, T., Wedin, D., Naeem, S., Bahaeddin, D., Hendrey, G., Jose, S., Wrage, K., Goth, J., & Bengston, W. (2001). Erratum: correction: Plant diversity enhances ecosystem responses to elevated CO₂ and nitrogen deposition. *Nature*, *411*(6839), 824–824. <https://doi.org/10.1038/35081122>
- Ruas, R. de B., Costa, L. M. S., & Bered, F. (2022). Urbanization driving changes in plant species and communities – A global view. *Global Ecology and Conservation*, *38*(July), e02243.

<https://doi.org/10.1016/j.gecco.2022.e02243>

- Salinitro, M., Alessandrini, A., Zappi, A., Melucci, D., & Tassoni, A. (2018). Floristic diversity in different urban ecological niches of a southern European city. *Scientific Reports*, 8(1), 1–10. <https://doi.org/10.1038/s41598-018-33346-6>
- Sandifer, P. A., Sutton-Grier, A. E., & Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services*, 12, 1–15. <https://doi.org/10.1016/j.ecoser.2014.12.007>
- Schaub, S., Buchmann, N., Lüscher, A., & Finger, R. (2020). Economic benefits from plant species diversity in intensively managed grasslands. *Ecological Economics*, 168(November 2019), 106488. <https://doi.org/10.1016/j.ecolecon.2019.106488>
- Scholars, P., Biology, C., Society, E., & Board, E. (1915). *Issues in Ecology*.
- Seeda, A.M.A., Abou El-nour, E.A.A., Yassen, A.A., Sahar, M.Z. (2021). Climatic changes and their effects on physiological and nutritional status of crop plants: importance and Strategies. A review. *Middle East Journal of Agriculture Research*, September. <https://doi.org/10.36632/mejar/2021.10.3.59>
- Selanon, P., & Chuangchai, W. (2023). The Importance of Urban Green Spaces in Enhancing Holistic Health and Sustainable Well-Being for People with Disabilities: A Narrative Review. *Buildings*, 13(8). <https://doi.org/10.3390/buildings13082100>
- Semeraro, T., Aretano, R., & Pomes, A. (2017). Green Infrastructure to Improve Ecosystem Services in the Landscape Urban Regeneration. *IOP Conference Series: Materials Science and Engineering*, 245(8). <https://doi.org/10.1088/1757-899X/245/8/082044>
- Shannon, C. E. (1948). A Mathematical Theory of Communication. *Bell System Technical Journal*, 27(3), 379–423. <https://doi.org/10.1002/j.1538-7305.1948.tb01338.x>
- Shi, L., Maruthaveeran, S., Yusof, M. J. M., Zhao, J., & Liu, R. (2024). Exploring Herbaceous Plant Biodiversity Design in Chinese Rain Gardens: A Literature Review. *Water (Switzerland)*, 16(11).

<https://doi.org/10.3390/w16111586>

- Shwartz, A., Turbé, A., Simon, L., & Julliard, R. (2014). Enhancing urban biodiversity and its influence on city-dwellers: An experiment. *Biological Conservation*, 171, 82–90. <https://doi.org/10.1016/j.biocon.2014.01.009>
- Silva, E. C., Albuquerque, M. B., Azevedo Neto, A. D. & Silva Junior, C. D. (2013). Drought and Its Consequences to Plants – From Individual to Ecosystem. *Responses of Organisms to Water Stress, June 2014*. <https://doi.org/10.5772/53833>
- Simpson, E. H. (1949). Measurement of Diversity. *Nature*, 688(1943), 688. <https://doi.org/10.1038/163688a0>
- Sinthumule, N. I. (2023). Traditional ecological knowledge and its role in biodiversity conservation: a systematic review. *Frontiers in Environmental Science*, 11(June), 1–15. <https://doi.org/10.3389/fenvs.2023.1164900>
- Spohn, M., Bagchi, S., Biederman, L. A., Borer, E. T., Bråthen, K. A., Bugalho, M. N., Caldeira, M. C., Catford, J. A., Collins, S. L., Eisenhauer, N., Hagenah, N., Haider, S., Hautier, Y., Knops, J. M. H., Koerner, S. E., Laanisto, L., Lekberg, Y., Martina, J. P., Martinson, H., ... Yahdjian, L. (2023). The positive effect of plant diversity on soil carbon depends on climate. *Nature Communications*, 14(1), 1–10. <https://doi.org/10.1038/s41467-023-42340-0>
- Stohlgren, T.J. (2008). *Measuring Plant Diversity: Lessons from the Field*. New York: Oxford University Press
- Szlavec, K., Warren, P., & Pickett, S. (2011). *Biodiversity on the Urban Landscape*. May 2014, 75–101. https://doi.org/10.1007/978-3-642-16707-2_6
- Tan, C. L., Wong, N. H., Jusuf, S. K., & Chiam, Z. Q. (2015). Impact of plant evapotranspiration rate and shrub albedo on temperature reduction in the tropical outdoor environment. *Building and Environment*, 94(P1), 206–217. <https://doi.org/10.1016/j.buildenv.2015.08.001>
- Tilman, D., Lehman, C. L., & Thomson, K. T. (1997). Plant diversity and ecosystem productivity: Theoretical considerations. *Proceedings of the National Academy of Sciences of the United States of America*,

94(5), 1857–1861. <https://doi.org/10.1073/pnas.94.5.1857>

- Tilman, D., Wedin, D., & Knops, J. (1996). Productivity and sustainability influenced by biodiversity in grassland ecosystems. *Nature*, 379(6567), 718–720. <https://doi.org/10.1038/379718a0>
- Tóth, E. G., Tremblay, F., Housset, J. M., Bergeron, Y., & Carcaillet, C. (2019). Geographic isolation and climatic variability contribute to genetic differentiation in fragmented populations of the long-lived subalpine conifer *Pinus cembra* L. in the western Alps. *BMC Evolutionary Biology*, 19(1), 1–17. <https://doi.org/10.1186/s12862-019-1510-4>
- Tribot, A. S., Deter, J., & Mouquet, N. (2018). Integrating the aesthetic value of landscapes and biological diversity. *Proceedings of the Royal Society B: Biological Sciences*, 285(1886). <https://doi.org/10.1098/rspb.2018.0971>
- Trogisch, S., Liu, X., Rutten, G., Xue, K., Bauhus, J., Brose, U., Bu, W., Cesarz, S., Chesters, D., Connolly, J., Cui, X., Eisenhauer, N., Guo, L., Haider, S., Härdtle, W., Kunz, M., Liu, L., Ma, Z., Neumann, S., ... Bruelheide, H. (2021). The significance of tree-tree interactions for forest ecosystem functioning. *Basic and Applied Ecology*, 55, 33–52. <https://doi.org/10.1016/j.baae.2021.02.003>
- Varga, K., Szabó, S., Szabó, G., Dévai, G., & Tóthmérész, B. (2015). Improved land cover mapping using aerial photographs and satellite images. *Open Geosciences*, 7(1), 15–26. <https://doi.org/10.1515/geo-2015-0002>
- Viterbi, R., Cerrato, C., Bionda, R., & Provenzale, A. (2020). Effects of temperature rise on multi-taxa distributions in mountain ecosystems. *Diversity*, 12(6), 1–20. <https://doi.org/10.3390/D12060210>
- Wang J. (2022). *The impact of climate change on plant distribution and niche dynamics over the past 250 years in Switzerland (Master's thesis/Ph.D. thesis)*. Institute of Plant Sciences, University of Bern. Accessed from database Access Address (21.05.2024): https://www.boga.unibe.ch/unibe/portal/microsites/micro_boga/content/e534323/e918618/e919031/e1175328/e1271023/MasterThesis_JessicaWang2022_ger.pdf
- Weiskopf, S. R., Rubenstein, M. A., Crozier, L. G., Gaichas, S., Griffis, R.,

- Halofsky, J. E., Hyde, K. J. W., Morelli, T. L., Morisette, J. T., Muñoz, R. C., Pershing, A. J., Peterson, D. L., Poudel, R., Staudinger, M. D., Sutton-Grier, A. E., Thompson, L., Vose, J., Weltzin, J. F., & Whyte, K. P. (2020). Climate change effects on biodiversity, ecosystems, ecosystem services, and natural resource management in the United States. *Science of the Total Environment*, 733. <https://doi.org/10.1016/j.scitotenv.2020.137782>
- Whittaker, R. H. (1960). Vegetation of the Siskiyou Mountains, Oregon and California. *Ecological Monographs*, 30(4), 407–407. <https://doi.org/10.2307/1948435>
- Yang, F., Bao, Z., Zhu, Z., & Liu, J. (2010). The investigation of noise attenuation by plants and the corresponding noise-reducing spectrum. *Journal of Environmental Health*, 72(8), 8–15.
- Yin, D., Ye, Q., & Cadotte, M. W. (2021). Habitat loss-biodiversity relationships are influenced by assembly processes and the spatial configuration of area loss. *Forest Ecology and Management*, 496(June), 119452. <https://doi.org/10.1016/j.foreco.2021.119452>
- Zhang, S., Xiong, K., Fei, G., Zhang, H., & Chen, Y. (2023). Aesthetic value protection and tourism development of the world natural heritage sites: a literature review and implications for the world heritage karst sites. *Heritage Science*, 11(1), 1–18. <https://doi.org/10.1186/s40494-023-00872-0>
- Zhang, T. Y., Di, D. R., Liao, X. L., & Shi, W. Y. (2023). Response of Forest Plant Diversity to Drought: A Review. *Water (Switzerland)*, 15(19). <https://doi.org/10.3390/w15193486>
- Zia, R., Nawaz, M. S., Siddique, M. J., Hakim, S., & Imran, A. (2021). Plant survival under drought stress: Implications, adaptive responses, and integrated rhizosphere management strategy for stress mitigation. *Microbiological Research*, 242(July 2020), 126626. <https://doi.org/10.1016/j.micres.2020.126626>

Res. Ass. Tuba Gül DOĞAN

E-mail: tubaguldogan@duzce.edu.tr

Educational Status: PhD

License: Department of Landscape Architercture in Ankara University

Degree: MSc in Department of Landscape Architercture

Doctorate: PhD

Professional experiences: Research Assistant at Duzce University

Prof. Dr. Engin EROĞLU

E-mail: engineroglu@duzce.edu.tr

Educational Status: Completed

License: Department of Landscape Architercture in Karadeniz Technical University

Degree: Prof. Dr. in Department of Landscape Architercture

Doctorate: Dr in Department of Landscape Architercture

Professional experiences: Proffessor at Düzce University



October 1, 2024