

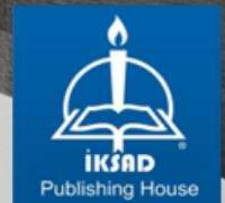
# Architectural Science Spatial Design and Planning Researches

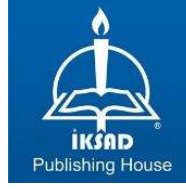
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November 10, 2024





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## **Architectural Sciences, Spatial Design and Planning Researches**

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## PREFACE

This book, titled "Architectural Sciences: Spatial Design and Planning Research," is an important step toward understanding the comprehensive nature of spatial design and planning research as an emerging interdisciplinary academic field. Rather than being limited to knowledge specific to the discipline of architecture, this field encompasses interactions among various disciplines, such as social sciences, environmental sciences, aesthetics, and technology. Adopting an interdisciplinary approach enables a more holistic analysis of space, considering its social, cultural, and technical aspects; studies that address the existence, social functions, and sustainability of space can only gain meaning within this type of integrated framework.

Spatial design and planning have been transforming the influence of rapidly changing environmental, cultural, and technological dynamics, especially since the beginning of the 21st century. With the rise of digital technologies, artificial intelligence and sustainability concerns, this field is becoming more complex every day and is leading to the emergence of innovative ideas that challenge the boundaries of traditional design approaches. In this context, the book brings together both philosophical approaches that examine spatial analyses in-depth and the development processes of modern architectural criticism, offering different perspectives to the reader.

This book highlights the value of interdisciplinary approaches that consider space not only in its physical form but also through its social, cultural, and aesthetic dimensions. Space is a multilayered

concept that brings together different disciplines, including architecture, social sciences, environmental sciences, philosophy, aesthetics, and technology. The topics covered in this book provide a comprehensive perspective on both historical and contemporary issues in spatial design, shedding light on the multifaceted structure of the field. Unlike traditional academic books, this multi-authored work is not limited to a single perspective; each author enriches the field with information and perspectives from their author's field of expertise. This approach brings together various ways of thinking about the social, philosophical, aesthetic, and technical dimensions of space, providing readers with a multidimensional understanding. By incorporating multiple authors, this book stands apart from classical single-author academic works. In interdisciplinary studies, multi-author studies broaden and deepen access to knowledge by bringing together different perspectives, not just a single view.

Each author's expertise in various fields illuminates different aspects of spatial design and planning research, providing readers with a multidimensional perspective. This book aims to bridge knowledge gaps in the field of spatial design and planning by addressing both philosophical and aesthetic approaches, as well as contemporary issues such as sustainability and technology. The book chapters examine issues such as the place of space in the context of cultural heritage, urban identity, and sustainable design, the establishment of narrative and spatial relationships, and material evaluation in the product lifecycle, while also offering

creative and innovative solutions to current problems in spatial design.

The book chapters are examined within a wide framework, from conceptual definitions of space to aesthetic control, from philosophical critiques to the quest for cultural continuity in architectural education, from sustainable children's spaces to the impact of artificial intelligence on architectural design. This multifaceted content offers readers the opportunity to understand space from different dimensions, with each chapter providing unique insights and perspectives on the field of spatial design and planning.

In the first section, titled "Architecture and Philosophy: Concepts Definitions Boundaries", the philosophical foundations of architecture are handled and the basic concepts, definitions and boundaries used in spatial and building design are investigated. In the second chapter, "The Philosophy of Architectural Criticism in the Early 21st Century", the philosophical background of architectural criticism in the early 21st century is examined and the contributions of critical methods to modern architecture are evaluated. In the third chapter, titled "The Spatial Narrative and The Narrative Space in Architecture", how spatial narrative is established and how narrative space is created is investigated. In the fourth chapter, titled "Aesthetic Control in Architecture: Concepts, Definitions and Tools", the importance of aesthetic control in architecture, the concepts, definitions and tools used to provide this control and the role of aesthetics in the design process are discussed. The fifth section, "Searching For 'Cultural

Continuity' In Architectural Education" focuses on the search for "cultural continuity" in architectural education; the preservation of cultural heritage in the education process and its transfer to the future are handled. The sixth section, "Sustainable Awareness in Sustainable Children's Spaces," focuses on designing children's spaces in harmony with nature and sustainably; how sustainable awareness can be achieved in these areas is discussed. In the seventh chapter, titled "Brief History of AI in Architectural Design and Future Directions", the brief history of artificial intelligence in the field of architectural design is handled and how artificial intelligence can be integrated into design processes in the future is evaluated. In the eighth chapter, "Discourses and Practices on Housing in Istanbul During the Ottoman Modernization Process in the Early 20th Century", housing practices in Istanbul during the Ottoman modernization process are examined in a social context. In the ninth chapter, "The Role of The Architect in Disaster: Examining Proactive Approaches Through Shigeru Ban's Architectural Products", the role of the architect in disasters is handled and proactive approaches are evaluated through the architectural products developed by Shigeru Ban for disasters. The tenth chapter, "Historical Development of Orchestral Layout", investigates the historical development of the orchestral layout and the role of spatial design in this process. In the eleventh chapter, "Evaluation of the 'Material' in the Context of the 'Product Cycle' during Design and Planning Process", the evaluation of the material within the product cycle in the design and planning processes is handled in terms of its sustainable and functional use.

In the twelfth chapter, “A New Conceptual Proposal on The Problem of Originality in The Reproduction of Historical Form in Architecture”, a discussion is presented on the problem of originality in the reproduction of historical forms in architecture; the concepts of history and originality are evaluated from a new perspective. In the thirteenth chapter titled “An Overview of Sub-level Commercial Spaces on Bağdat Street”, the urban impacts and environmental connections of the sub-level commercial areas on Bağdat Street are analyzed. In the fourteenth chapter, “The Artistry and Ecological Synchrony of Planting Design: From Conceptualization to Floral Composition in the Case Study of Sivas Urban Park”, artistic and ecological harmony in plant design is handled and how plant compositions can be designed in harmony with nature is investigated through the example of Sivas Urban Park. In the fifteenth chapter, “Searching Colour Dimension of Anonymity in Architectural Design: A Review on 'Architecture Without Architects Exhibition””, the color and anonymity dimensions in architecture are investigated within the framework of the “Architecture Without Architects Exhibition” and the role of these two concepts in spatial design is questioned. In the sixteenth chapter, titled “The Borromean Knot: A Lacanian Perspective for Architectural Design Theory”, the application of the Borromean knot to architectural design theory from a Lacanian perspective is investigated; a new understanding of spatial design is presented through the relations between psychology and architecture. Finally, in the seventeenth chapter, “Monumental and Historical Religious Buildings in the Contexts of Cultural Heritage, Urban Identity, and

Sustainable Design” monumental religious buildings built in Konya during the Anatolian Seljuk and Ottoman Periods are investigated in the context of cultural heritage, urban identity, and sustainable design, and the value of the buildings in these contexts is explained.

This comprehensive book provides a broad perspective on spatial design and planning research through contributions from various disciplines, allowing readers to explore the multifaceted nature of the field. Aiming to cultivate a well-rounded understanding of architecture and spatial design, it bridges historical, social, and technological contexts to offer readers an interdisciplinary viewpoint. It aims to provide the reader with an interdisciplinary perspective by building bridges between historical, social and technological contexts to develop a multifaceted understanding in the field of architecture and spatial design.

The book “Architectural Sciences Spatial Design and Planning Researches” will be an indispensable reference source for researchers, designers and students who follow developments in academic circles. The book aims to contribute not only to the development of spatial design and planning discipline but also to provide new perspectives to the knowledge in this field with its multi-faceted and interdisciplinary approach. It has a unique value in terms of providing a roadmap on how space will be perceived and designed in the future, especially in terms of guiding the new generation of academic studies. We believe that the book will be a valuable and original work in terms of providing an interdisciplinary contribution to the field of spatial design and

planning and especially in terms of guiding the new generation of academic studies.

We would like to thank all those who contributed to the completion of the book, thank Neriman Gül ÇELEBİ for carefully reading all the texts and making the necessary formal corrections, and for her unique support in preparing the typesetting, and thank the authors, the section referees, İKSAD Publishing House, and Prof. Dr. Atila GÜL who is the General Coordinator of the Architectural Sciences book series.

We hope our book “Architectural Sciences, Spatial Design and Planning Research” will be useful to readers.

10.11.2024

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<b>CONTENTS</b>		<b>Pages</b>
<b><u>CHAPTER 1</u></b>		
Architecture And Philosophy: Concepts Definitions Boundaries		<b>1-83</b>
<i>Ufuk DOĐRUSÖZ</i>		
<hr/>		
<b><u>CHAPTER 2</u></b>		
The Philosophy of Architectural Criticism in the Early 21st Century		<b>84-143</b>
<i>Tolga SAYIN</i>		
<hr/>		
<b><u>CHAPTER 3</u></b>		
The Spatial Narrative and The Narrative Space in Architecture		<b>144-163</b>
<i>Selim ÖKEM</i>		
<hr/>		
<b><u>CHAPTER 4</u></b>		
Aesthetic Control in Architecture: Concepts, Definitions and Tools		<b>164-193</b>
<i>Tarık Emre KIRHALLI, Rifat Gökhan KOÇYIĐIT</i>		
<hr/>		
<b><u>CHAPTER 5</u></b>		
Searching For “Cultural Continuity” In Architectural Education		<b>194-219</b>
<i>Güldehan Fatma ATAY, İkbal Ece POSTALCI, Fatma Sinem ÖZGÜR</i>		
<hr/>		

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**CHAPTER 6**

Sustainable Awareness in Sustainable Children's Spaces **220-266**

*Serhat ANIKTAR*

---

**CHAPTER 7**

Brief History of AI in Architectural Design and Future Directions **267-296**

*Zeynep Canan AKSU CERAN, Tolga SAYIN*

---

**CHAPTER 8**

Discourses and Practices on Housing in Istanbul During the Ottoman Modernization Process in the Early 20th Century **297-343**

*Beyza Nur BATI, Ayşe Derin ÖNCEL*

---

**CHAPTER 9**

The Role of The Architect in Disaster: Examining Proactive Approaches Through Shigeru Ban's Architectural Products **344-367**

*Betül İrem TARAKÇI, Şebnem ERTAŞ BEŞİR*

---

**CHAPTER 10**

Historical Development of Orchestral Layout **368-398**

*Derin Hilal BİLMEZ*

---

**CHAPTER 11**

Evaluation of the 'Material' in the Context of the 'Product Cycle' during Design and Planning Process **399-427**

*Ürün BİÇER, Erkan AVLAR*

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**CHAPTER 12****428-474**

A New Conceptual Proposal on The Problem of Originality in The Reproduction of Historical Form in Architecture

*Elifcan DUYGUN, Rifat Gökhan KOÇYİĞİT*

---

**CHAPTER 13**

An Overview of Sub-level Commercial Spaces on Bağdat Caddesi **475-516**

*Hale GÖNÜL, İkbal Ece POSTALCI*

---

**CHAPTER 14**

The Artistry and Ecological Synchrony of Planting Design: From Conceptualization to Floral Composition in the Case Study of Sivas Urban Park **517-535**

*Şükran ŞAHİN, Gözde OK*

---

**CHAPTER 15**

Searching Colour Dimension of Anonymity in Architectural Design: A Review on “Architecture Without Architects Exhibition” **536-576**

*Ayşegül KURUÇ*

---

**CHAPTER 16**

The Borromean Knot: A Lacanian Perspective for Architectural Design Theory **577-642**

*Haluk ULUŞAN*

---

**Chapter 17**

Monumental and Historical Religious Buildings in the Contexts of Cultural Heritage, Urban Identity, and Sustainable Design **643-672**

*Neriman Gül ÇELEBİ, Ümit ARPACIOĞLU*

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## Sustainable Awareness in Sustainable Children's Spaces

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## 1. Introduction

Nowadays, the increasingly consumption-oriented life culture drives people to new searches in order to protect rapidly depleting natural resources. For example, the use of energy based on fossil fuels cause environmental damages such as climate change, the destruction of ecology, and natural resources and the rapid depletion of fossil fuels is an important problem (Çelebi & Arpacıoğlu, 2022). A society that consumes more than it produces cannot be said to use existing resources efficiently. Using sustainable and renewable resources efficiently for a sustainable life is important (Özcan, Çelebi & Arpacıoğlu, 2022). From this perspective, it can be said that sustainable architecture has become a necessity rather than a luxury. This approach, which aims to reduce resource consumption, is possible by building structures that are environmentally compatible, protect and protect human health, and promote economic justice (Tavşan & Yanılmaz, 2019). In order to build sustainable buildings, sustainable awareness must be created at all levels of society, and children are at the most important level.

The social and physical environment is effective in child education. According to Piaget, knowledge is obtained through interaction with the environment. In this context, children learn as a result of their interactions with their physical environment and their communication with individuals in their social environment. Today, child-focused education approaches, which are based on the relationships established with the environment and the experiences gained, developed on the basis of factors such as children's development levels, needs, and the characteristics of the environment they live in, and based on the principle of learning by doing on their own, are

implemented throughout the world. By providing education in an environment where the child's decisions and freedom of choice are respected, the child is given a sense of responsibility from an early age. Through activities that allow for individual and group work, independent thinking, decision-making and implementation skills, as well as the ability to participate in decision-making within the community and adapt to the decisions taken, are developed. In this way, children, who are the building blocks of society, are raised from a young age as conscious generations who are curious, inquisitive, able to take responsibility, and sensitive to the environment (Çınar & Yamaçlı, 2019).

The child's behavior is determined by the places/physical environment he/she is in rather than his/her characteristics such as personality and intelligence. For this reason, the immediate surroundings of residences, urban spaces such as schools and children's playgrounds, and all children's places where children interact and constitute their physical environment, are of great importance in becoming a member of society, socializing and developing. In line with its importance in the development of the child, making the physical environment more livable for the child has gained importance, especially in Northern European countries, and various studies, projects and practices are carried out in these countries. The most prominent of these efforts are Child Friendly city initiatives. Other studies and applications can be examined under the headings of streets, school gardens, children's playgrounds and the child's transportation between school and home.

The needs program for children, especially for children, is specialized; In all children's places such as learning environments, children's museums,

children's libraries, children's hospitals, children's centers, children continue their perceptual-cognitive development as well as their physical development. Children are in their simplest dreams in their intuitive perception. They learn in the simplest way through play. In this context, all children's spaces are learning environments. If it is desired to raise awareness of sustainability in children, all children's spaces must be designed as sustainable and all criteria that ensure sustainability must be clearly expressed in a way that will guide children to learn by experiencing. Because children reinforce learning by doing and experiencing. For example, the most important goal of creating a green children's library is to promote environmental literacy. Environmental literacy means knowing environmentally friendly practices and turning them into behavior. Measurable gains from environmental literacy education will be green practices such as recycling, energy saving and nature conservation.

### **1.1. Sustainability**

The word “sustainability” is a concept that has no equivalent in the Turkish dictionary published by the Turkish Language Association. The English meaning of this word is defined as "the capacity to be permanent". At the same time, this word also expresses “dependence on an optional external factor”. In other words, the sustainability of something depends on its preferential use by a will, even if all conditions are suitable (Bulut & Polat, 2019).

The concept of sustainability was included for the first time in the World Charter for Nature document adopted by the International Union for Conservation of Nature (IUCN) in 1982. According to this condition; “It

is envisaged that the ecosystem, organisms, land, sea and atmospheric resources used will be managed in a way that will achieve optimum sustainability, but this will be done in a way that does not endanger the integrity of ecosystems and species.” (Kamaraj et al., 2019). The concept of 'sustainability' was defined in the Brundtland Report prepared by the World Commission on Environment and Development in 1987 as "meeting today's needs without depriving future generations of their ability to meet their needs" and has been widely used since then.

In this context, it is possible to come across many different definitions of sustainability. Tekeli (2001) defined sustainability as a widely accepted moral principle that emerged within the environmental movement and whose content is constantly being redefined within the political process. İncedayı (2004), on the other hand, accepts sustainability as basically a reform process in the mind, but says, “Like every thought process, sustainability requires a political choice or attitude. "Unless today's environmentally unsustainable consumption patterns are changed on political, economic and cultural basis, questioning a sustainable environment will remain an empty goal." He expressed it with an approach like (Tavşan & Yanılmaz, 2019). Sustainability is ensuring the continuity of the diversity and self-reproduction of ecological systems. Sustainability is an understanding that causes changes in the thought system without reducing living standards. This change occurs with the formation of a society that moves from a consumerist society to one that takes social responsibilities, is environmentally sensitive and produces economical solutions (Bulut & Polat, 2019).

The starting point of the concept of sustainability focuses on preventing environmental problems that arise in parallel with economic and technological developments and protecting the ecosystem. Sustainability, which is the slogan for the 21st century, promises the hope of social evolution towards a more equitable and rich world in preserving the natural environment and cultural achievements for future generations (Kamaraj et al., 2019).

Sustainable development means meeting the needs of the present without consuming or harming the resources of the generations that will replace us in the future. According to the definition made by UNCED (1992), sustainable development; “It is the organization and improvement of people's living standards in a way that contributes to the living space around them.” Sustainable development refers to keeping values alive and at the same time developing continuously, and it is an important concept in terms of providing all humanity with the right to live in a healthy environment, which is one of the fundamental rights defined by the United Nations. When the goals and scope of sustainable development are examined, it is seen that future generations are constantly mentioned (Bulut & Polat, 2019).

In order to better understand sustainable development, it is important to examine the basic framework of the subject in more depth. According to Van den Branden (2012), sustainable development;

1- It aims to meet the basic needs of all people and expand the opportunity to fulfill their desires for a better life. This means that societies should aim to meet human needs by both increasing productive potential and providing fair opportunities for all.

2- It meets today's needs without compromising the ability of future generations to meet their own needs.

3- It does not endanger the natural systems that support life on Earth: atmosphere, waters, soils and creatures.

Economic efficiency, social justice and environment are the three basic components of sustainable development. The difficult part that has not been taken into account sufficiently until now is the integration of environmental and social dimensions into today's economic model. In order to achieve this integrity in sustainable development, everyone's participation must be ensured, precautions must be taken before it is too late to take action, and awareness of protection and responsibility must be established (Bulut & Polat, 2019).

The rapid population growth after the industrial revolution and World War II caused some changes in the lifestyles and needs of societies. Mass production, which has become a necessity with population growth, has led to uniformity in designs. Until this period, designs were made by craftsmen, but from this period onwards, they were left in the hands of designers in order to prevent monotony (Tavşan & Yanılmaz, 2019).

The environmental impact of the product has not been taken into account in product design for a long time. However, the rapid depletion of resources and the sudden increase in environmental pollution have brought the concept of eco-design to the agenda. Discussions on the environment have gained importance due to the impact of global threats in the 21st century. Eco-design approaches, considered in a wide scope, have given rise to the concept of 'sustainable design' over time. Sustainable design is evaluated according to the performance of the product from its production

to the end of its life. In this context, a sustainable design should include basic criteria such as being renewable, providing heat and energy savings, minimizing waste, ease of maintenance and repair, and easy assembly features (Tavşan & Yanılmaz, 2019).

Various definitions have been made by different researchers for sustainable architecture, which is also referred to as green architecture and ecological architecture in the literature. According to Oktay (2002), although sustainability is considered new conceptually, it is very old as a world view. The use of local data such as vegetation, topography and especially climatic features in design has been one of the smart solutions that constructionists have emphasized and used since the time when the first building examples appeared. Sev (2009), in his book "Sustainable Architecture", defines sustainable architecture as "one that prioritizes the use of renewable energy resources, is environmentally friendly, uses energy, water, materials and the area effectively, taking into account future generations, in its current conditions and in every period of its existence." defined as "all activities of creating structures that protect people's health and comfort". To summarize; It can be said that sustainable architecture is to consider the benefits of the environment in which the building is located throughout its life cycle by using existing resources and conditions in a production-oriented manner rather than consumption (Tavşan & Yanılmaz, 2019).

One of the criteria of sustainable architecture is that construction systems cooperate with ecological systems throughout the life of the building and allow the design to complete its life cycle with minimal damage to the environment. Building materials and components cause harmful effects on

the environment due to the natural resources they consume throughout their life cycle and the emissions generated at various stages of this cycle (Çelebi & Arpacioğlu, 2023). A sustainable building designed for its purpose should provide a minimum destructive and maximum positive impact on the environment. Ensuring sustainability in the building is directly related to criteria such as the building consuming the least amount of energy during construction and use, being able to produce self-sufficient energy, and having technology that will contribute to the environment when necessary. Thanks to these criteria, the building contributes to sustainable architecture.

Sustainability is not always an approach that can be applied at the new building design stage. Demolishing and rebuilding buildings that have expired over time is an anti-sustainability action. Some changes to be made in the structure, materials and space organization of existing old buildings will provide significant savings in terms of materials, energy and resources and contribute to economic development (Tavşan & Yanılmaz, 2019).

For a livable environment, the aim of protecting the ecosystem should be prioritized while meeting the comfort and needs of the user in the phases of buildings from construction to use and demolition. Green ergonomics; As a concept that has recently emerged with sustainable development processes, it is related to the importance of the human factor in reducing consumption and protecting the environment. Green ergonomics focuses on the interaction of human systems and nature. According to this definition; While green buildings take care of the welfare of both ecological systems and those who use these buildings; should be designed as environmentally friendly buildings (Kızıllkan & Türkyılmaz, 2021).

According to Kim and Rigdon (1998), sustainability in the context of architecture is achieved with three basic principles:

1. Conservation of resources; reduce, reuse and recycle,
2. Life cycle,
3. Humane design.

Kohler (1999) stated that sustainable buildings consist of ecological, economic, social and cultural sustainability components and that these components are sustainable building design principles. In 1999, C.I.B. (International Council for Research and Innovation in Building and Construction) explained the concepts of ecological, economic, social and cultural sustainability in more detail; It has revealed the basic goals in sustainable buildings. These goals are; reducing the use of resources, protecting and improving the environment and natural environment, ensuring human health and comfort at the highest level, and taking into account the socio-economic, cultural and political realities of the place.

Becker (1999) explains sustainability in three basic categories:

1. Economic processes,
2. Social processes, patterns and factors,
3. Decision-making process and institutional arrangements.

Sachs (1999) divides sustainability into four parts:

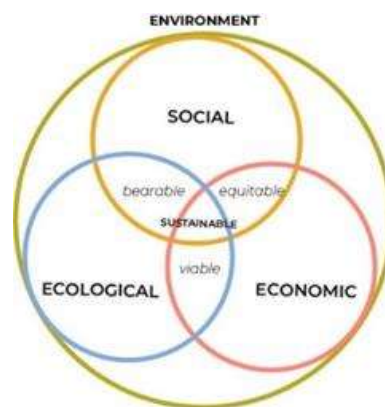
1. Social sustainability and its result, cultural sustainability,
2. Ecological sustainability,
3. Economic sustainability,
4. It is political sustainability.

According to Williamson (2003) and Bilge (2007), the data that gave rise to the concept of sustainability are divided into three:

1. Ecological data,
2. Economic data,
3. Political, social-cultural data.

According to Pressoir (2008), sustainability consists of three components:

1. Ecological sustainability,
2. Economic sustainability,
3. Social and cultural sustainability (Figure 1).



**Figure 1.** Sustainability components (Url-1)

## **1.2. Children, Environment and Space**

Children are defined as important actors in their current and future lives. Attitudes and behavioral characteristics developed in children at a young age lay the groundwork for future behaviors. In a study conducted by Costa, Barcala-Furelos, Abelairas-Gomez & Arufe-Giraldez (2015), the effect of a structured physical education program on the psychomotor development of preschool children was examined. The research was conducted by applying a 24-week program including balance and coordination skills with 95 three-year-old children attending public kindergartens in Portugal, 47 of whom were divided into the experimental group and 48 of whom were divided into the control group. As a result of the research, the importance of psychomotor movements in terms of

helping children recognize their own bodies and supporting all areas of development, especially cognitive development, was emphasized, and after the program applied to children who were almost at the same level in terms of psychomotor development at the beginning of the study, those in the experimental group improved coordination, balance and body posture compared to those in the control group. It has been observed that there is a significant increase in flexibility and endurance skills.

In the first stage of life, learning is associative and rapid. The first phase of life, from the prenatal period until approximately age eight, creates tremendous potential for developmental growth. In the study conducted by Lehl, Kluczniok & Rossbach (2016) to examine the role of quality pre-school education in improving mathematics skills in primary school, it was determined that children who received adequate and quality education in mathematics in the pre-school period showed higher success in mathematical skills in the primary school period compared to children who did not receive it (Bulut & Polat, 2019).

During childhood, individuals' communication with architecture generally focuses on educational environments. Architecture cannot be considered independently of social relations. In this context, the relationship established between the child and architecture arises through the child's experience of architecture. Conscious and well-designed educational environments support child education and the learning process. When viewed from the perspective of the social aspect of architecture, the right to participation, which means that children have a say in the issues that concern them, is used in the formation of the social and physical environment, and when it is used in the formation of the social and physical

environment, children who have these experiences learn better; they develop a sense of belonging, ownership and responsibility; They are known to exhibit democratic and entrepreneurial behavior. In this context, the child's participation in architecture in educational environments occurs when the child experiences architecture from an early age. The social and physical environmental experiences that children begin to acquire from an early age in well-designed environments are the first step in creating a sustainable future (Çınar & Yamaçlı, 2019).

The awareness of providing a livable environment for today's and future generations can be conveyed more effectively through training given from an early age. Early childhood education has an important position among other education processes. Basic habits and cognitive abilities are rapidly formed between the ages of 0-6. While pre-school education generally begins in the family and home environment until the age of three, there are many studies that emphasize the importance of programs in kindergartens or kindergartens for children to gain emotional and behavioral development between the ages of 3-6 (Kızıllkan & Türkyılmaz, 2021).

Because of the value judgments and behaviors that generally begin to form in people's childhood, it is important for people to meet nature at an early age and to develop respect and love for nature. Learning in this affective field paves the way for the formation of environmentally friendly behaviors to protect the environment. For example, by making preschool children play nature-loving games, they become aware of the beauties of nature with all their sense organs; In this way, they can learn that nature is a value and make efforts to protect it (Bulut & Polat, 2019).

### **1.3. Sustainability and Children's Spaces**

Talking to children about sustainability and raising sustainability awareness in children is an extremely important issue. First, we need to help our children understand what sustainability is. Although sustainability is a broad concept, it is fundamentally based on realizing how we affect our Earth and understanding what kind of world we leave to future generations.

This concept can appear in every area of our lives. Sustainability can appear in many parts of our lives, from recycling to gardening or the items we plan to use. The best way for children to learn is to teach them by doing. If we want our children to live in a better world in the future, we need to at least take precautions from now on and ensure that our children internalize sustainability.

The view that children's spaces should be considered as a learning material in itself increases the value of sustainable space designs. Educator Taylor, who advocates this view, argues in his quote titled "Learning environment as a three-dimensional textbook" that "the building itself and the surrounding landscape are not a passive area, but can be an active learning tool for physics, geometry and learning." Children and parents learn to "read the environment" on many levels, interact with it and learn from it". The concept of ecology mentioned by Taylor is closely related to the "sustainability education" discussed in this study. One of the main arguments of the study is that ecological and environmental sustainability is largely related to architecture. can be provided; and this view can be conveyed to children through places (Taşcı, 2015).

According to UNESCO's "Education for a Sustainable Future" program, an ideal environmental education program requires the development of values and understanding of the subject rather than a passive transfer of knowledge. In this respect, "architecture" is very instructive in terms of the organization of the built environment and the relationship of the built environment with the natural environment. Treating the built and natural environments as a must-read book and using them as learning materials are ideal methods for sustainability education; Because it is a known fact that not every child can learn by reading books or listening to their teachers. Von Glaserfeld argues that knowledge is formed through active experiences. According to Glaserfeld, knowledge is related to the student's experiences and the environment in which the student creates this knowledge. In other words, acquiring knowledge and understanding is directly related to experience or life. In this respect, sustainable spaces are easy-to-reach concrete materials that are ideal for teaching many concepts to children. A children's place that meets sustainability criteria can make it easier to teach the child many useful things such as green environmental awareness, energy saving, and simple measures to ensure thermal Comfort (Taşcı, 2015).

- Sustainable children's spaces that will raise awareness in the context of sustainability must be shaped within the framework of certain criteria. These criteria can generally be listed as follows:
- Choosing the appropriate land (a land that will have the least negative impact on the ecosystem and is suitable for designing buildings in accordance with sustainable criteria, where users will be protected from external pollution sources, etc.),

- Preparation of a comprehensive transportation plan that pollutes the environment less (should start at the land selection stage),
- Minimizing the life cycle (construction, operation, maintenance-repair, demolition) costs of the building,
- Integrating passive systems (greenhouses, roof windows, heat-storing walls, solar chimneys, etc.) and active systems (solar collectors, photovoltaic systems, etc.) into the structure to reduce energy requirements,
- It has sustainable features such as rainwater collection, roof gardens, natural ventilation systems, sufficient daylight, construction with ecological and local materials, acoustic comfort, and good indoor air quality,
- Implementation of materials reuse and recovery policies during and after building construction (reducing and managing waste),
- The building is also an educational tool for sustainability awareness and is included in educational programs,
- Designing open spaces that enable the child's relationship with nature and offering different experience environments,
- Be accessible and safe for everyone,
- Ensuring that people in the immediate vicinity benefit from the building facilities (Tavşan & Yanılmaz, 2019).

In this context, the basic features that children's spaces should have in the sustainable development process are as follows:

### **Structural Features:**

**Transparency:** Removing the thick walls that draw boundaries between nature and buildings.

**Energy Efficient:** Thanks to low energy systems, heating, cooling, etc. reducing energy consumption.

**Ventilation:** Improving the air quality in indoor environments through the use of natural ventilation systems.

**Lighting:** Use of adequate daylight.

**Water Conservation:** Storing rainwater and preventing water waste in the building.

**Material Selection:** Use of environmentally friendly materials.

**Color and Texture Selection:** Appropriate color and texture selection that supports the child's development and education.

**Acoustic Comfort:** Creating calm educational environments where optimum acoustic comfort is provided.

### **Functional Features:**

**Variability:** Evaluating all environments designed with changeable-transformable planning that allow different user groups to do different activities in an area at the same time as an educational tool.

**Equality:** All children should benefit equally from the opportunities provided in educational environments, under the same conditions.

**Sharing:** Sharing the opportunities provided by designed educational environments with the society.

**Belonging:** Creating a sense of ownership of the educational environment in children thanks to simple-structured elements that can be adjusted according to need and allow use in different physical sizes.

**Holistic Harmony:** If the education system follows a certain philosophy that requires special design, providing integrity throughout the structure thanks to the architectural form shaped in accordance with that philosophy.

**Freedom:** Enabling the child to decide, choose and act freely with his/her free will.

**Environmental Awareness:** Thanks to the educational environments created in open and closed areas, the child can touch nature and develop environmental awareness.

**Health:** Planning of food and beverage, agriculture and sports areas that provide children with healthy living habits from an early age.

**Cooperation:** Cooperation and communication achieved as a result of moving educational environments to work areas belonging to different professional groups (Çınar & Yamaçlı, 2019).

Designing all children's spaces with a sustainable approach means creating sustainability awareness in children. For example, the water crisis is one of the issues that frequently comes to the fore and raises concerns about the future. Talking to children about the importance of water may not be enough for them to fully understand this issue. Learning that the buildings we live in collect rainwater when it rains and that this water can later be used for watering plants, cleaning the garden, etc. by living with the spaces and buildings they are in will increase sustainable awareness. In this context, considering children's spaces within the scope of sustainable design will play an active role in increasing sustainable awareness..

## **2. Material and Method**

In this study, which reveals the methods for creating sustainability awareness in children, examples of sustainably designed children's spaces

and structures were identified and analyzed in the context of the following criteria determined within the scope of the sustainability criteria in theory. These criteria; The selection of the residential area was determined as follows: water conservation, energy and atmosphere, transportation, natural lighting, natural ventilation, building form, appropriate materials and construction system, space organization, building envelope and sustainability awareness.

Children's spaces, which were analyzed in the context of the determined sustainability criteria, were questioned about the approaches of sustainable practices applied at the building and space scale to create sustainability awareness in children.

### **3. Findings and Discussion**

Within the scope of the study, 6 examples of sustainably designed children's spaces and structures were identified and analyzed in the context of the criteria determined within the scope of sustainability criteria. While determining the examples, attention was paid to ensure that they were specialized children's spaces for children with different functions such as education, health and culture. 2 of the analyzed samples are kindergarten samples from abroad and 1 is a kindergarten sample from home. Other examples include a children's hospital, a children's museum and a children's center.

#### **3.1. Fuji Kindergarten - Japan**

Completed in 2007, the kindergarten, which won the 2017 Moriyama RAIC International Award, hosts 600 children aged 2-6. Adopting the Montessori learning approach, the school adopts an educational approach that offers children the opportunity to move freely around learning

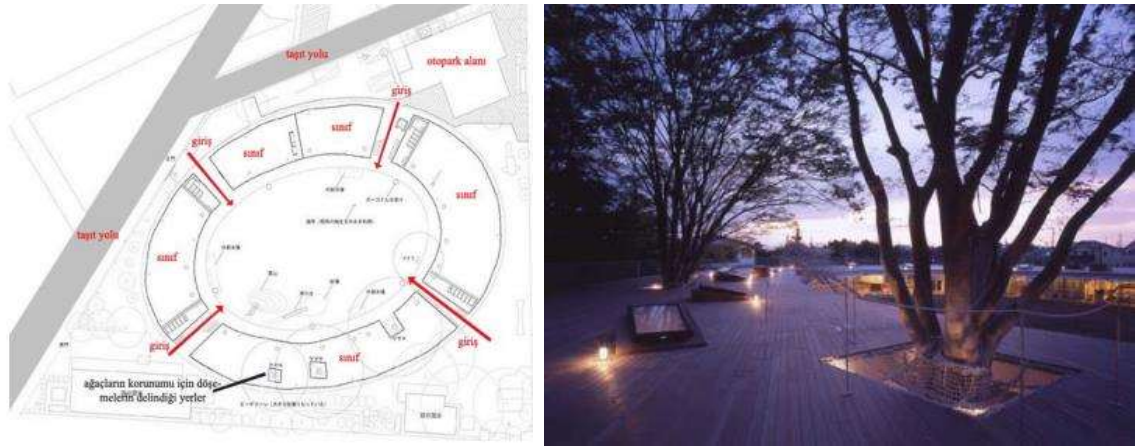
environments and learn through discovery. Architect Takaharu Tezuka designed this sustainably designed structure as a continuous space that allows children to learn and play without restriction (Tonguç, 2012).

The building is in a central location. The annex to the school, called "circulation around the tree", built between the building and the street next to Fuji Kindergarten, offers children a place to play while waiting for their shuttles after school. In addition, not only kindergarten students but all children can benefit from this structure (Figure 2) (Tonguç, 2012).



**Figure 2.** Fuji Kindergarten general view and site plan (Tonguç, 2012)

While designing the building, attention was paid to the preservation of the existing Zelkova trees in the surrounding area. The existing land was preserved and the design was made to suit flat land conditions. Daylight, prevailing wind, etc. are taken into account in the design. Climatic optimization has been achieved by taking into account the climatic characteristics. The preservation of trees on the land also protects the building from climatic factors. The structure is designed so that school officials can easily observe children. Adequate lighting is provided around the school. (Figure 3) (Tonguç, 2012).



**Figure 3.** Fuji Kindergarten plan and roof (Tonguç, 2012)

The water required for landscape irrigation is provided by rainwater on the roof. By minimizing the use of covered surface areas in landscape design, the flow of rainwater to groundwater is ensured. Care was taken to select local plants that do not require much watering. Rainwater was collected and used in landscape irrigation with efficient irrigation methods. Thus, the use of clean water for irrigation purposes has been reduced.

Solar energy is utilized through the use of photovoltaic panels. The building was designed in the central area, close to residential areas. Transportation axes have been determined and transportation opportunities to the building by vehicle, on foot or by bicycle have been provided. Parking areas are designed close to the road, away from children's playgrounds. By providing alternative transportation opportunities, parking areas have been reduced to a minimum level; Appropriate parking arrangements have been made for bicycles and service vehicles. The use of heavy and solid arcade building elements around the building, which would prevent students' visibility and negatively affect their safety, was avoided. The use of public transportation is encouraged, and playgrounds

are arranged in areas where children will wait for the shuttles so that they can have a pleasant time (Tonguç, 2012).

In order to make the best use of natural lighting, plenty of glass, sliding and collapsible joinery was used on the facade of the building. Controllable natural ventilation is also provided with this approach. Skylights are designed to ensure that interior spaces benefit from sufficient natural light. The terrace also serves as an eaves and is used for shading purposes in the building. The building can make the most of natural lighting. Artificial lighting is intended to supplement natural lighting. The spaces are painted in light colours (Figure 4) (Tonguç, 2012).



**Figure 4.** General view from Fuji Kindergarten (Tonguç, 2012)

### **3.2. Agriculture Kindergarten – Vietnam**

Historically an agricultural country, Vietnam has faced environmentally damaging changes as it transitioned to a production-based economy. Increasing drought, floods and salinization endanger food supplies, while large numbers of motorcycles cause daily traffic congestion and air pollution in cities. Rapid urbanization deprives Vietnamese children of green spaces and playgrounds, and therefore of their relationship with nature. Agriculture Kindergarten has a concept that counters these problems. Located next to a large shoe factory and designed for 500 children of factory employees, the building is a prototype of sustainable education spaces in tropical climates and is designed as a permanent green

roof, offering children the experience of food and agriculture as well as a large playground reaching into the sky (Figure 5) (Akaevren & Yavuz, 2023).



**Figure 5.** General view from the Agriculture Kindergarten (Url-2)

The green roof is shaped like a triple ring surrounding three courtyards inside as safe play areas. An experimental vegetable garden has recently been realized on its hill. Five different vegetables were planted in a 200 m<sup>2</sup> garden for agricultural education. All functions are hosted under this roof. As the roof descends towards the courtyard, it provides access to the upper floor and vegetable gardens, where children learn about the importance of agriculture and reconnect with nature (Figure 6) (Akaevren & Yavuz, 2023).



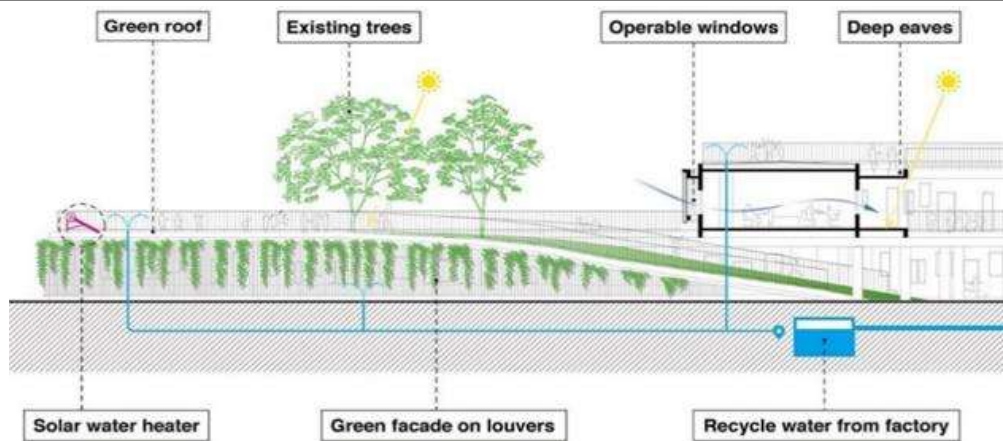
**Figure 6.** General view from the Agriculture Kindergarten (Url-2)

The building is made of a continuous narrow strip with windows that can be opened on two sides, maximizing cross ventilation and natural lighting. In addition, architectural and mechanical energy saving methods, including but not limited to, have been extensively implemented. A green roof was used for insulation, a green facade for shading and solar water heating. These devices are designed to be visible and play an important role in the sustainable education of children. Factory wastewater is recycled to water greens and flush toilets (Figure 7) (Akaevren & Yavuz, 2023).



**Figure 7.** General view from the Agriculture Kindergarten (Url-2)

As a result, the kindergarten operates without air conditioning in the classrooms, despite being located in a harsh tropical climate. According to post-occupancy records published 10 months after completion, the building saves 25% energy and 40% fresh water compared to baseline building performance, greatly reducing operating cost. The building was designed for the children of low-income factory workers, so the construction budget was quite limited. Therefore, a combination of local materials (brick, tiles) and low-tech construction methods are applied, which helps minimize environmental impact and support local industry (Figure 8) (Akaevren&Yavuz, 2023).



**Figure 8.** Agriculture Kindergarten sustainability approach (Url-2)

Architectural and mechanical energy saving methods are extensively applied, including but not limited to. Green roof, PC-concrete louver for shading, recycling materials, water recycling, solar water heating have been applied. These devices are visibly designed for children to play their important role in sustainable education. The building was designed to maximize natural ventilation through a computational fluid dynamics analysis. Double insulation was applied to the building to save energy. The building's water is heated by solar energy, and filtered water from the nearby factory is used to irrigate the garden and playgrounds. Large windows on both sides of the building not only bring daylight in, but also provide natural air flow, eliminating the need for a ventilation system (Akaevren & Yavuz, 2023).

### **3.3. Bahriye Üçok Kindergarten – Türkiye**

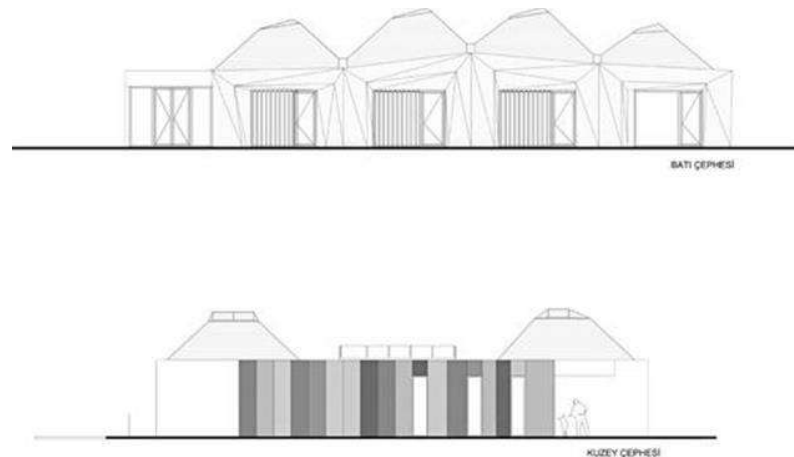
Bahriye Üçok Kindergarten, which is Türkiye's first ecological home, was built with a completely environmentally friendly design, from its construction to its interior furnishing and basic infrastructure such as energy and water. 110 children between the ages of 3 and 6 receive service in the kindergarten, which has 5 classrooms with an average area of 25 -

30 m<sup>2</sup>. The garden of Bahriye Üçok Ecological Kindergarten, consisting of a total of 1208 m<sup>2</sup> of closed and 1633 m<sup>2</sup> of open area, is also designed to suit the development of children (Figure 9).



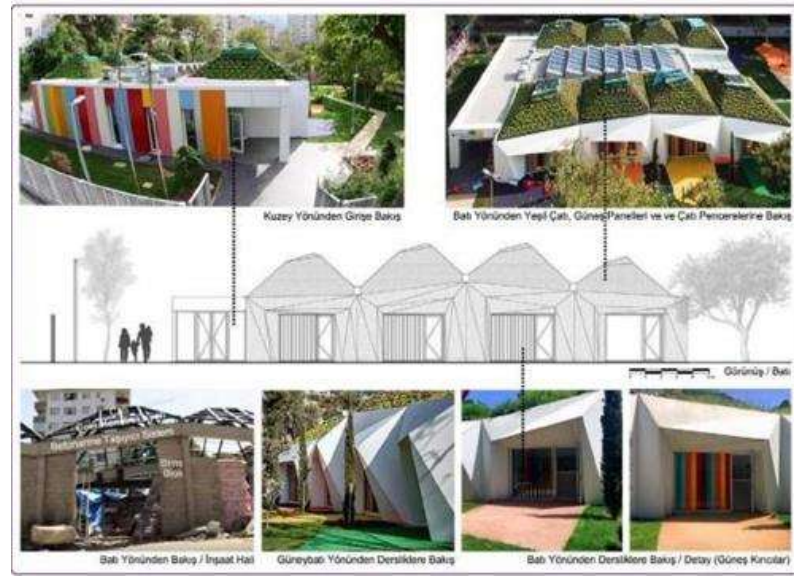
**Figure 9.** General view from Bahriye Üçok Kindergarten (Kızıllkan & Türkyılmaz, 2021)

The child explores and learns about his environment by playing games. While designing the building, the idea of "a house obtained with an origami game" was the starting point, based on the issues of "game" and "image", and the building shell was shaped accordingly. The forms and functional approaches created on the building facade and roof are essentially shaped within the framework of this idea. A friendly playhouse has been created for children, suitable for their own scale (Figure 10) (Kızıllkan&Türkyılmaz, 2021).



**Figure 10.** Bahriye Üçok Kindergarten facades (Kızıllkan & Türkyılmaz, 2021)

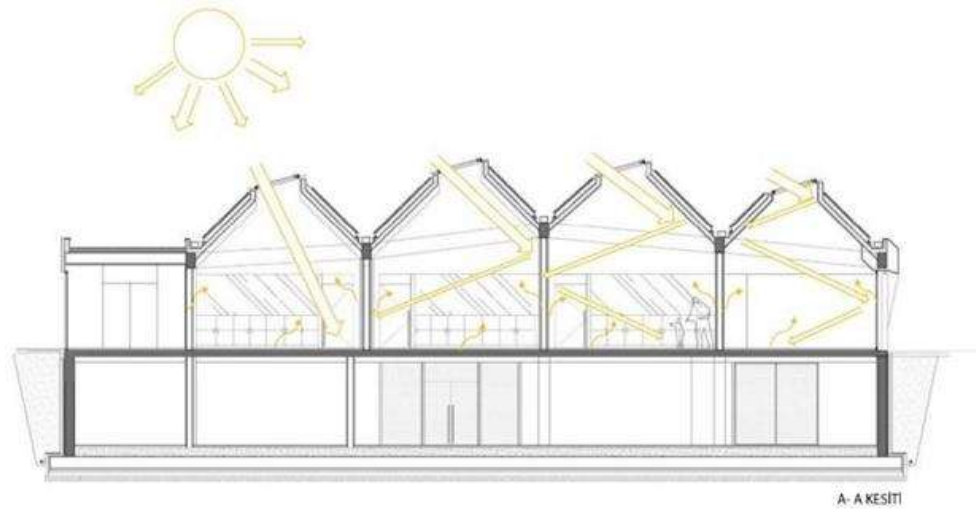
The building consists of two floors. One floor of the building is located underground with an ecological approach. Heating consumption was reduced by placing areas that do not functionally need daylight and have low circulation needs in the basement. The areas remaining above ground have been greened as open playgrounds for children and as a source of oxygen for the ecosystem. The trees and vegetation around the building act as a barrier that reduces the sound level between the playground and the surrounding residences. In addition, apart from the positive effect of green on human psychology, the green environment also allows various types of natural life to live (Figure 11) (Kızıllıkan & Türkyılmaz, 2021).



**Figure 11.** General view from Bahriye Üçok Kindergarten (Kızıllıkan & Türkyılmaz, 2021)

The school meets the criterion of designing a minimum of 50% of the land as green space, which is required to meet the LEED criteria for the protection and development of natural life. The building's light color facade paint, green roof and green land reduce the heat island effect, unlike the high-rise buildings and asphalt roads in the surrounding area. In order

to reduce light pollution, lighting in buildings and land should be minimized and the damage to the environment caused by lighting at night should be reduced. The exterior of the school is not illuminated. Functional lighting poles are used outdoors only to ensure safety and visual comfort (Figure 12).



**Figure 12.** Bahriye Üçok Kindergarten sectional drawing (Kızıllkan & Türkyılmaz, 2021)

It is possible to benefit from solar energy in a building thanks to passive and active solar systems. The investment cost of passive solar systems is lower than active systems. It is also possible to reduce heating costs by using these systems correctly in buildings. While some of the sunlight received into the building is used immediately, some of it is emitted by radiation or transport from the floor and walls (Kızıllkan & Türkyılmaz, 2021).

Unlike active solar systems and passive solar systems, solar energy is obtained through technical equipment. This obtained and stored energy is used to meet the heating, hot water and electricity needs of the building. An example of active energy use at Bahriye Üçok Kindergarten is the

application of photovoltaic solar panels. Photovoltaic solar panels, placed towards the south facade to receive maximum sunlight, are used to meet the electricity needs of the building by converting sunlight into electrical energy (Kızıllkan & Türkyılmaz, 2021).

Purifying rainwater through green building principles, especially with the application of green roofs, reducing the load of the sewage system by using rainwater, making efficient use of solar energy and natural light, reducing the reflections that create the greenhouse effect by not reflecting the sun's rays, reducing energy consumption with the correct light direction and insulation values. savings, oxygen production with green roof layers, heating-cooling costs and carbon dioxide emissions are reduced with insulation systems (Figure 13) (Kızıllkan & Türkyılmaz, 2021).



**Figure 13.** General view from Bahriye Üçok Kindergarten (Kızıllkan & Türkyılmaz, 2021)

Movable sunshades were added to the façade in order to reduce the sunlight reaching the learning spaces located on the south and west facades of the land. Such smart building technologies provide advantages in terms of both cost and comfort. In addition, the building form on the west façade

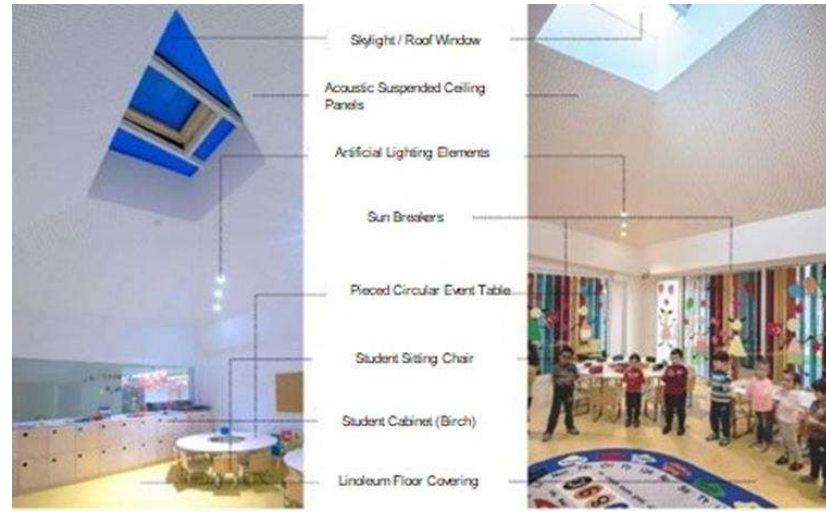
was shaped to break sunlight. In this way, sunlight, which varies according to climatic characteristics, is allowed to be received into the space in a controlled manner. Its softness, like that of the northern light, was targeted. We created a section that will be used as a winter garden on the side facing the south facade, and an island wall that can be heated on the lower floor. There are precast surfaces on the facade. Although the form of these precasts appears to be a free form, each angle was designed as a sunshade to eliminate the negative effects of the sun coming from the south side. It is also supported by photovoltaic panels to generate electrical energy (Figure 14-15) (Kızıllkan & Türkyılmaz, 2021).



**Figure 14.** General view from Bahriye Üçok Kindergarten (Kızıllkan & Türkyılmaz, 2021)

In a building, large amounts of water are used as a result of activities such as cooking, washing, cleaning or irrigation used in wet areas. Reusing water from depleting sources after use and systems that reduce existing water use are important elements in sustainable building design. Using rainwater in or around the building, controlling the amount of water used in the building, and ensuring that gray water is purified and used are approaches that reduce water consumption. In the kindergarten, rainwater is stored and used for garden irrigation and toilet bowls in wet areas.

Additionally, water consumption can be reduced with sensor taps or gradual flush systems used in wet areas (Kızıllkan & Türkyılmaz, 2021).



**Figure 15.** Bahriye Üçok Kindergarten sustainability approach (Kızıllkan & Türkyılmaz, 2021)

When the entire kindergarten is examined in terms of material and furniture selections, it is observed that both children's health and sustainability criteria are taken into consideration. Wood is used extensively throughout the space, such as furniture, door and window joinery, and stair covering. Wood is a natural material that does not require much energy during processing, its waste does not harm the environment and can even be reused. Pastel colored tones were preferred as much as possible in the building designed as a kindergarten structure. Light-colored birch wood furniture, off-white aluminum joinery, white acoustic panels and wall paint, mustard yellow/green tones non-toxic linoleum flooring material, wooden covering on the stairs and non-slip matte ceramic tiles in wet areas were preferred. Mainly rainbow colors were used in outdoor equipment and white composite material was used in the building exterior cladding (Kızıllkan&Türkyılmaz, 2021).

### 3.4. Brooklyn Children's Museum– USA

Seeking expanded capacity to serve a growing audience of children and families, the Brooklyn Children's Museum wanted a new public presence that would contribute to the vitality of the surrounding community. Rafael Viñoly Architects responded by creating a structure that differs from its context, in color as well as physical form, yet remains welcoming and deferential to the museum's existing built environment (Figure 16) (Brooklyn Children's Museum, n.d.).



**Figure 16.** General view from the Brooklyn Children's Museum (Url-3)  
The Brooklyn Children's Museum is New York City's first LEED certified museum and the first to tap geothermal wells for heating and cooling purposes (Figure 17) (Brooklyn Children's Museum, n.d.).



**Figure 17.** General view from the Brooklyn Children's Museum (Url-3)

The Museum is covered in 8 million yellow tiles that reflect the heat of the sun to keep the Museum cool in the summer. Brooklyn Children's Museum has lots of large windows to let light in so the Museum doesn't have to turn on all the lights on a sunny day. But light brings heat, so the windows were designed with tile overhangs to prevent direct sunlight from letting too much heat inside.

The Museum uses low-flow faucets and toilets. Low-flow faucets add air to the water as it flows so you get a steady stream without using so much water. The men's restrooms actually have waterless urines; no water is used to flush these. The Museum's system automatically adjusts to accommodate the number of visitors in each space at any given time. When visitors are in the Museum, the fewer ventilation system will slow down, reducing energy costs (Figure 18) (Brooklyn Children's Museum, n.d.).



**Figure 18.** General view from the Brooklyn Children's Museum (Url-3)  
When people enter the Museum's offices, classrooms, and restrooms, motion sensors turn the lights on. When they leave, the lights turn off automatically. The Museum also uses super efficient, cool-burning low-energy light bulbs. Daylight sensors regulate the amount of artificial lighting needed at any given time. Photoelectric cells dim indoor lights

when there is an abundance of natural light and brighten the electric lighting at night or in cloudy weather.

The Museum features an innovative geothermal system that draws stable-temperature water from Brooklyn's underground aquifers to a series of air handlers that control the temperature of the building. The water stays about 14C year-round, so it's cooler than the air in summer and warmer than the air in winter. When the water enters the building, it reduces the need for air-conditioning in the summer and heating in the winter (Figure 19) (Brooklyn Children's Museum, n.d.).



**Figure 19.** General view from the Brooklyn Children's Museum (Url-3) Photovoltaic (PV) systems convert solar energy into electrical power. The solar energy captured through PV panels reduces the cost of supplying electrical energy to the building. Renewable and Whenever possible, the Museum uses materials that are renewable or recycled. The stairs and upstairs floorboards are made of bamboo, a resource that's renewable because of how quickly bamboo grows.

The boards in the beach boardwalk aren't wood; they're recycled plastic bottles. The collections cases in the Global Beats Exhibit are made from sunflower seed hull. The soil in the Community Garden isn't real soil – the pieces are cut from recycled corkboards. The bark on the trees in

Neighborhood Nature is made from recycled tires. The roof tiles on the Pizza Shop are made from reclaimed wood and recycled vinyl (Brooklyn Children's Museum, n.d.).

### **3.5. Arena Children's Center – Australia**

Designed by CohenLeigh Architects, Arena Children's Center is located in the growing suburb of Officer in South East Melbourne. This hugely popular early learning center successfully meets the demand for modern early learning spaces in the growing community while being a colorful and memorable piece of urban architecture (Figure 20) (Arena Children's Centre, n.d.).



**Figure 20.** General view from the Arena Children's Center (Url-4)

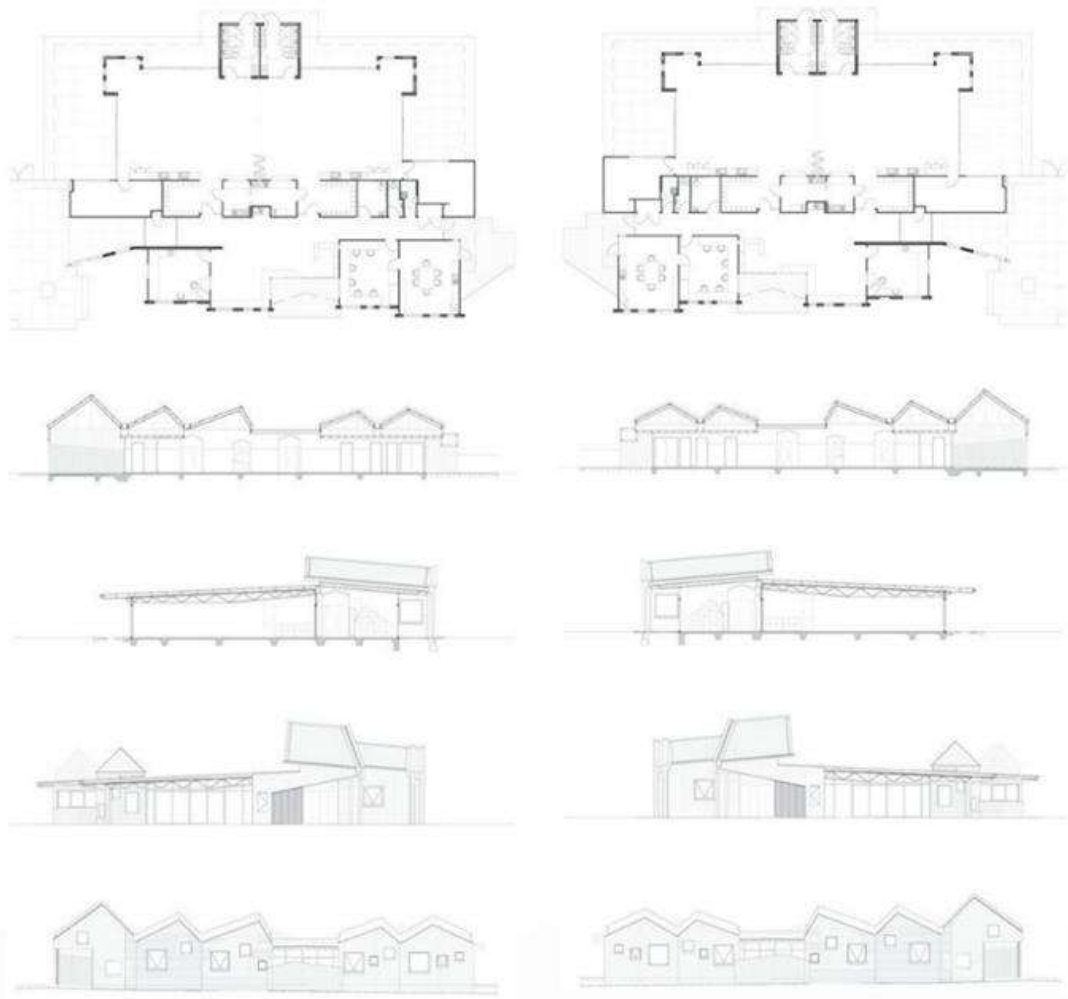
Spending time away from home can be daunting for children, especially for the first time. The design focuses on the concept of 'home' to help children feel comfortable. A fun, lively and memorable series of "house"

shapes becomes a theme that extends into the interiors (Figure 21) (Arena Children's Centre, n.d.).



**Figure 21.** General view from the Arena Children's Center (Url-4)

Arena Children's Centre's brick façade with tinted glass is inspired by the simple, familiar shapes of houses often drawn by children. It also refers to the housing patterns of growing suburbs. The design of the interior spaces centers around a sensory and physical progression through the educational progression of the early learning centre, using color themes and brick interaction as tactile elements that help guide children (Figure 22) (Arena Children's Centre, n.d.).



**Figure 22.** Arena Children's Center project drawings (Url-4)

Facilities include two licensed playrooms, mother-child and healthcare facilities, a kitchen, staff areas and amenities. The orientation and placement of internal playrooms ensures each room has a strong connection to outdoor spaces for flexible indoor/outdoor activities, taking advantage of natural light, fresh air and engagement with the landscape, while a large outdoor play area offers challenging play options that cater to children's needs (Figure 23) (Arena Children's Centre, n.d.).

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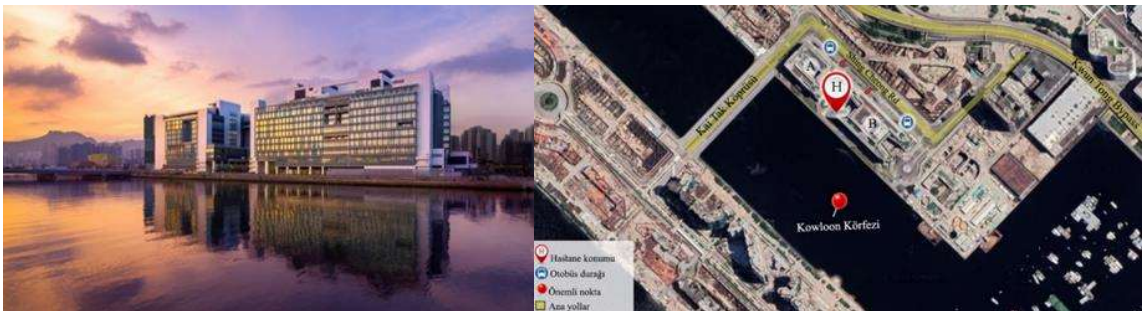
**Figure 23.** General view from the Arena Children's Center (Url-4)

Environmentally sustainable design is a key driver in the quest to create a comfortable learning environment. Orientation, natural ventilation, deep eaves and shading control all contribute to keeping artificial heating/cooling to a minimum and providing fresh air. Combined with rooftop solar power, water harvesting, low-VOC paints, energy-efficient lighting and timed water fixtures, the buildings' environmental performance is exemplary for society (<https://www.arch2o.com/arena-childrens-centre-cohenleigh-architects/>, 2024).

### **3.6. Hong Kong Children's Hospital – Hong Kong**

Hong Kong Children's Hospital was built in 2017 in Hong Kong by Billard Leece Partnership, Simon Kwan and Associates Architectural Firms. The hospital building is located in Kowloon Bay and has an uninterrupted sea view with its long façade. There is no emergency room or general outpatient clinic in the hospital. The overall design goal of the hospital is to create a home-like, comfortable, child-friendly environment that can

provide the best patient-centered clinical practices to meet the needs of patients and families. The hospital structure, which has 11 floors, consists of two buildings: "Teaching and Research Building" (Block A) and "Clinical Services Building" (Block B). The two blocks are connected to each other from the 2nd, 3rd and 9th floors by three bridges. Block A is mainly used for education, scientific research and operating rooms, and block B is used for various wards and outpatient departments. In addition to the indoor parking lot at the hospital, there are 2 bus stops near the hospital. The passenger drop-off area opens onto a large green area with a direct view of the port, providing a sense of comfort for users. A continuous pedestrian walkway is provided to connect all main entrances and the functional area (Figure 24) (Dabbagh, 2023).



**Figure 24.** General view from Hong Kong Children's Hospital (Dabbagh, 2023)

The hospital lobby is covered with floor-to-ceiling glass, providing natural lighting and sea views. It also opens directly to the garden overlooking the harbour. The building has a clear and well-directed circulation model with simple and effective planning. Natural light and view are provided in the patient rooms through large glass windows (Figure 25) (Dabbagh, 2023).



**Figure 25.** General view from Hong Kong Children's Hospital (Dabbagh, 2023)

Animal graphics that attract the child's attention were used in different parts of the hospital, such as examination rooms, elevators, x-ray and MRI rooms. Attractive waiting areas with playgrounds are found on the clinic floors to create a comfortable and fun environment for children. Colorful seating areas suitable for all age groups are provided in the waiting areas (Figure 26) (Dabbagh, 2023).



**Figure 26.** General view from Hong Kong Children's Hospital Dabbagh, 2023)

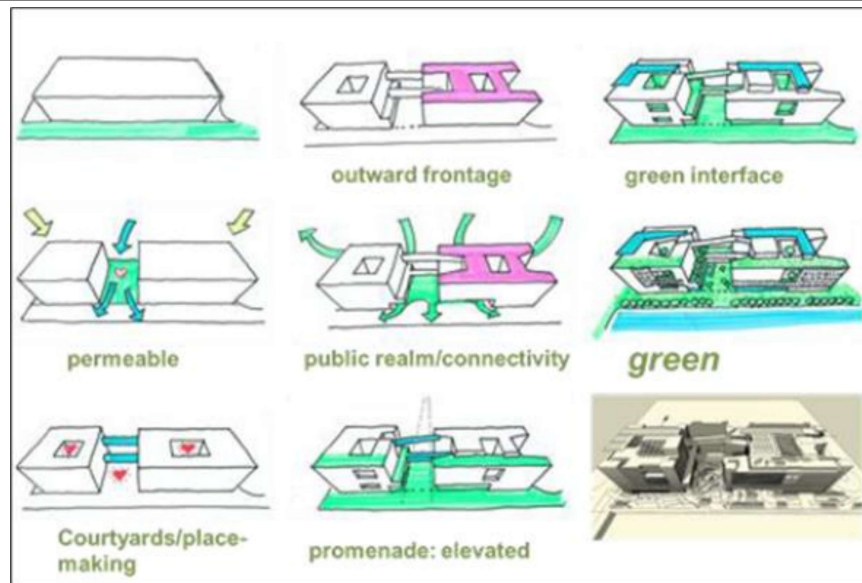
Many landscaping arrangements have been made on the ground floor, terraces and roofs in order to reduce the heat effect in the building and improve the air quality in the surrounding area. The hospital's central rehabilitation garden connects to the adjacent coastline, improving public connectivity and the provision of shared spaces. In the rehabilitation garden, there are animal topiary frames (animal-shaped vegetal sculpture)

such as monkeys, rabbits and flamingos, as well as different play and seating areas. Vertical greening in garden areas has a therapeutic effect, helping to reduce stress, evoke sympathy and balance emotions. Internal courtyards were created in the hospital to maximize daylight utilization, natural ventilation and connection with the external environment (Figure 27) (Dabbagh, 2023).



**Figure 27.** General view from Hong Kong Children's Hospital (Dabbagh, 2023)

The concept of sustainability is widely featured in hospital architectural design. It contains a series of environmental protection and energy-saving devices and improves environmental greening. The building form was designed as twin towers to improve the permeability of the building and pedestrian circulation. To ensure thermal and visual comfort, shading elements on the southwestern façade, efficient sanitary fixtures to increase water efficiency and reduce water consumption, rainwater recycling systems to reduce irrigation water consumption, regional cooling system, photovoltaic panels, high quality lighting systems and environmentally friendly materials were used (Figure 28) (Dabbagh, 2023).



**Figure 28.** Hong Kong Children's Hospital sustainability approach (Dabbagh, 2023)

#### 4. Conclusion and Suggestions

Although sustainability is a broad and comprehensive word, we need to adopt behavioral practices that will minimize the damage we cause to the world. Therefore, sustainability appears as a set of good and sensitive actions. While involving children in this process, we need to bridge the gap between the abstract idea of sustainability and the real-world effects of actions.

While building this bridge, it is important that the spaces where children live are designed in accordance with sustainability criteria and that children's awareness of sustainable structures and environments is raised through these spaces. When examples of sustainable children's spaces with different functions were analyzed, it was determined that all examples mastered the basic sustainable design criteria (Table 1).

**Table 1.** Analysis of examples of sustainable children's spaces (Anıktar, 2024)

Sustainability Criteria	Fuji Kindergarten	Agriculture Kindergarten	Bahriye Üçok Kindergarten	Brooklyn Children's Museum	Arena Children's Center	Hong Kong Children's Hospital
Selecting the Residential Area	X	X	X	X	X	X
Water Conservation	X	X	X	X	X	X
Energy and Atmosphere	X	X	X	X	X	X
Transport	X	X	X	X	X	X
Natural Lighting	X	X	X	X	X	X
Natural Ventilation	X	X	X	X	X	X
Building Form	X	X	X	X	X	X
Appropriate Material and Construction System	X	X	X	X	X	X
Space Organization	X	X	X	X	X	X
Building Shell	X	X	X	X	X	X
Providing Sustainability Awareness	X	X	X	X	X	X

According to Table 1, not all sustainable children's space examples meet only sustainable design criteria. In addition, all sustainable practices implemented at the building and space scale are planned clearly enough to be noticed by children. Sustainability-themed curricula and activity arrangements should be made in order to strengthen awareness, especially in educational buildings and learning environments. Again, in order to strengthen awareness, the theme of sustainability should be addressed and game designs should be made in the context of the concept of games, which play the most active role in learning. Based on the awareness that

every place children are in is also a learning environment, awareness can be created by transferring many concepts that affect future generations, such as the concept of sustainability, to children through places.

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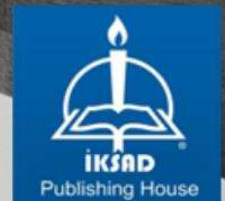
# Architectural Science Spatial Design and Planning Researches

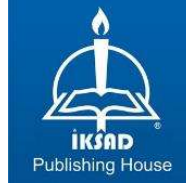
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November 10, 2024





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## **Architectural Sciences, Spatial Design and Planning Researches**

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## PREFACE

This book, titled "Architectural Sciences: Spatial Design and Planning Research," is an important step toward understanding the comprehensive nature of spatial design and planning research as an emerging interdisciplinary academic field. Rather than being limited to knowledge specific to the discipline of architecture, this field encompasses interactions among various disciplines, such as social sciences, environmental sciences, aesthetics, and technology. Adopting an interdisciplinary approach enables a more holistic analysis of space, considering its social, cultural, and technical aspects; studies that address the existence, social functions, and sustainability of space can only gain meaning within this type of integrated framework.

Spatial design and planning have been transforming the influence of rapidly changing environmental, cultural, and technological dynamics, especially since the beginning of the 21st century. With the rise of digital technologies, artificial intelligence and sustainability concerns, this field is becoming more complex every day and is leading to the emergence of innovative ideas that challenge the boundaries of traditional design approaches. In this context, the book brings together both philosophical approaches that examine spatial analyses in-depth and the development processes of modern architectural criticism, offering different perspectives to the reader.

This book highlights the value of interdisciplinary approaches that consider space not only in its physical form but also through its social, cultural, and aesthetic dimensions. Space is a multilayered

concept that brings together different disciplines, including architecture, social sciences, environmental sciences, philosophy, aesthetics, and technology. The topics covered in this book provide a comprehensive perspective on both historical and contemporary issues in spatial design, shedding light on the multifaceted structure of the field. Unlike traditional academic books, this multi-authored work is not limited to a single perspective; each author enriches the field with information and perspectives from their author's field of expertise. This approach brings together various ways of thinking about the social, philosophical, aesthetic, and technical dimensions of space, providing readers with a multidimensional understanding. By incorporating multiple authors, this book stands apart from classical single-author academic works. In interdisciplinary studies, multi-author studies broaden and deepen access to knowledge by bringing together different perspectives, not just a single view.

Each author's expertise in various fields illuminates different aspects of spatial design and planning research, providing readers with a multidimensional perspective. This book aims to bridge knowledge gaps in the field of spatial design and planning by addressing both philosophical and aesthetic approaches, as well as contemporary issues such as sustainability and technology. The book chapters examine issues such as the place of space in the context of cultural heritage, urban identity, and sustainable design, the establishment of narrative and spatial relationships, and material evaluation in the product lifecycle, while also offering

creative and innovative solutions to current problems in spatial design.

The book chapters are examined within a wide framework, from conceptual definitions of space to aesthetic control, from philosophical critiques to the quest for cultural continuity in architectural education, from sustainable children's spaces to the impact of artificial intelligence on architectural design. This multifaceted content offers readers the opportunity to understand space from different dimensions, with each chapter providing unique insights and perspectives on the field of spatial design and planning.

In the first section, titled "Architecture and Philosophy: Concepts Definitions Boundaries", the philosophical foundations of architecture are handled and the basic concepts, definitions and boundaries used in spatial and building design are investigated. In the second chapter, "The Philosophy of Architectural Criticism in the Early 21st Century", the philosophical background of architectural criticism in the early 21st century is examined and the contributions of critical methods to modern architecture are evaluated. In the third chapter, titled "The Spatial Narrative and The Narrative Space in Architecture", how spatial narrative is established and how narrative space is created is investigated. In the fourth chapter, titled "Aesthetic Control in Architecture: Concepts, Definitions and Tools", the importance of aesthetic control in architecture, the concepts, definitions and tools used to provide this control and the role of aesthetics in the design process are discussed. The fifth section, "Searching For 'Cultural

Continuity' In Architectural Education" focuses on the search for "cultural continuity" in architectural education; the preservation of cultural heritage in the education process and its transfer to the future are handled. The sixth section, "Sustainable Awareness in Sustainable Children's Spaces," focuses on designing children's spaces in harmony with nature and sustainably; how sustainable awareness can be achieved in these areas is discussed. In the seventh chapter, titled "Brief History of AI in Architectural Design and Future Directions", the brief history of artificial intelligence in the field of architectural design is handled and how artificial intelligence can be integrated into design processes in the future is evaluated. In the eighth chapter, "Discourses and Practices on Housing in Istanbul During the Ottoman Modernization Process in the Early 20th Century", housing practices in Istanbul during the Ottoman modernization process are examined in a social context. In the ninth chapter, "The Role of The Architect in Disaster: Examining Proactive Approaches Through Shigeru Ban's Architectural Products", the role of the architect in disasters is handled and proactive approaches are evaluated through the architectural products developed by Shigeru Ban for disasters. The tenth chapter, "Historical Development of Orchestral Layout", investigates the historical development of the orchestral layout and the role of spatial design in this process. In the eleventh chapter, "Evaluation of the 'Material' in the Context of the 'Product Cycle' during Design and Planning Process", the evaluation of the material within the product cycle in the design and planning processes is handled in terms of its sustainable and functional use.

In the twelfth chapter, “A New Conceptual Proposal on The Problem of Originality in The Reproduction of Historical Form in Architecture”, a discussion is presented on the problem of originality in the reproduction of historical forms in architecture; the concepts of history and originality are evaluated from a new perspective. In the thirteenth chapter titled “An Overview of Sub-level Commercial Spaces on Bağdat Street”, the urban impacts and environmental connections of the sub-level commercial areas on Bağdat Street are analyzed. In the fourteenth chapter, “The Artistry and Ecological Synchrony of Planting Design: From Conceptualization to Floral Composition in the Case Study of Sivas Urban Park”, artistic and ecological harmony in plant design is handled and how plant compositions can be designed in harmony with nature is investigated through the example of Sivas Urban Park. In the fifteenth chapter, “Searching Colour Dimension of Anonymity in Architectural Design: A Review on 'Architecture Without Architects Exhibition’”, the color and anonymity dimensions in architecture are investigated within the framework of the “Architecture Without Architects Exhibition” and the role of these two concepts in spatial design is questioned. In the sixteenth chapter, titled “The Borromean Knot: A Lacanian Perspective for Architectural Design Theory”, the application of the Borromean knot to architectural design theory from a Lacanian perspective is investigated; a new understanding of spatial design is presented through the relations between psychology and architecture. Finally, in the seventeenth chapter, “Monumental and Historical Religious Buildings in the Contexts of Cultural Heritage, Urban Identity, and

Sustainable Design” monumental religious buildings built in Konya during the Anatolian Seljuk and Ottoman Periods are investigated in the context of cultural heritage, urban identity, and sustainable design, and the value of the buildings in these contexts is explained.

This comprehensive book provides a broad perspective on spatial design and planning research through contributions from various disciplines, allowing readers to explore the multifaceted nature of the field. Aiming to cultivate a well-rounded understanding of architecture and spatial design, it bridges historical, social, and technological contexts to offer readers an interdisciplinary viewpoint. It aims to provide the reader with an interdisciplinary perspective by building bridges between historical, social and technological contexts to develop a multifaceted understanding in the field of architecture and spatial design.

The book “Architectural Sciences Spatial Design and Planning Researches” will be an indispensable reference source for researchers, designers and students who follow developments in academic circles. The book aims to contribute not only to the development of spatial design and planning discipline but also to provide new perspectives to the knowledge in this field with its multi-faceted and interdisciplinary approach. It has a unique value in terms of providing a roadmap on how space will be perceived and designed in the future, especially in terms of guiding the new generation of academic studies. We believe that the book will be a valuable and original work in terms of providing an interdisciplinary contribution to the field of spatial design and

planning and especially in terms of guiding the new generation of academic studies.

We would like to thank all those who contributed to the completion of the book, thank Neriman Gül ÇELEBİ for carefully reading all the texts and making the necessary formal corrections, and for her unique support in preparing the typesetting, and thank the authors, the section referees, İKSAD Publishing House, and Prof. Dr. Atila GÜL who is the General Coordinator of the Architectural Sciences book series.

We hope our book “Architectural Sciences, Spatial Design and Planning Research” will be useful to readers.

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<b>CONTENTS</b>		<b>Pages</b>
<b><u>CHAPTER 1</u></b>		
Architecture And Philosophy: Concepts Definitions Boundaries		<b>1-83</b>
<i>Ufuk DOĞRUSÖZ</i>		
<hr/>		
<b><u>CHAPTER 2</u></b>		
The Philosophy of Architectural Criticism in the Early 21st Century		<b>84-143</b>
<i>Tolga SAYIN</i>		
<hr/>		
<b><u>CHAPTER 3</u></b>		
The Spatial Narrative and The Narrative Space in Architecture		<b>144-163</b>
<i>Selim ÖKEM</i>		
<hr/>		
<b><u>CHAPTER 4</u></b>		
Aesthetic Control in Architecture: Concepts, Definitions and Tools		<b>164-193</b>
<i>Tarık Emre KIRHALLI, Rifat Gökhan KOÇYIĞIT</i>		
<hr/>		
<b><u>CHAPTER 5</u></b>		
Searching For “Cultural Continuity” In Architectural Education		<b>194-219</b>
<i>Güldehan Fatma ATAY, İkbal Ece POSTALCI, Fatma Sinem ÖZGÜR</i>		
<hr/>		

---

**CHAPTER 6**

Sustainable Awareness in Sustainable Children's Spaces **220-266**

*Serhat ANIKTAR*

---

**CHAPTER 7**

Brief History of AI in Architectural Design and Future Directions **267-296**

*Zeynep Canan AKSU CERAN, Tolga SAYIN*

---

**CHAPTER 8**

Discourses and Practices on Housing in Istanbul During the Ottoman Modernization Process in the Early 20th Century **297-343**

*Beyza Nur BATI, Ayşe Derin ÖNCEL*

---

**CHAPTER 9**

The Role of The Architect in Disaster: Examining Proactive Approaches Through Shigeru Ban's Architectural Products **344-367**

*Betül İrem TARAKÇI, Şebnem ERTAŞ BEŞİR*

---

**CHAPTER 10**

Historical Development of Orchestral Layout **368-398**

*Derin Hilal BİLMEZ*

---

**CHAPTER 11**

Evaluation of the 'Material' in the Context of the 'Product Cycle' during Design and Planning Process **399-427**

*Ürün BİÇER, Erkan AVLAR*

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---

**CHAPTER 12****428-474**

A New Conceptual Proposal on The Problem of Originality in The Reproduction of Historical Form in Architecture

*Elifcan DUYGUN, Rifat Gökhan KOÇYİĞİT*

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**CHAPTER 13**

An Overview of Sub-level Commercial Spaces on Bağdat Caddesi **475-516**

*Hale GÖNÜL, İkbal Ece POSTALCI*

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**CHAPTER 14**

The Artistry and Ecological Synchrony of Planting Design: From Conceptualization to Floral Composition in the Case Study of Sivas Urban Park **517-535**

*Şükran ŞAHİN, Gözde OK*

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**CHAPTER 15**

Searching Colour Dimension of Anonymity in Architectural Design: A Review on “Architecture Without Architects Exhibition” **536-576**

*Ayşegül KURUÇ*

---

**CHAPTER 16**

The Borromean Knot: A Lacanian Perspective for Architectural Design Theory **577-642**

*Haluk ULUŞAN*

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**Chapter 17**

Monumental and Historical Religious Buildings in the Contexts of Cultural Heritage, Urban Identity, and Sustainable Design **643-672**

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## Sustainable Awareness in Sustainable Children's Spaces

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## 1. Introduction

Nowadays, the increasingly consumption-oriented life culture drives people to new searches in order to protect rapidly depleting natural resources. For example, the use of energy based on fossil fuels cause environmental damages such as climate change, the destruction of ecology, and natural resources and the rapid depletion of fossil fuels is an important problem (Çelebi & Arpacıoğlu, 2022). A society that consumes more than it produces cannot be said to use existing resources efficiently. Using sustainable and renewable resources efficiently for a sustainable life is important (Özcan, Çelebi & Arpacıoğlu, 2022). From this perspective, it can be said that sustainable architecture has become a necessity rather than a luxury. This approach, which aims to reduce resource consumption, is possible by building structures that are environmentally compatible, protect and protect human health, and promote economic justice (Tavşan & Yanılmaz, 2019). In order to build sustainable buildings, sustainable awareness must be created at all levels of society, and children are at the most important level.

The social and physical environment is effective in child education. According to Piaget, knowledge is obtained through interaction with the environment. In this context, children learn as a result of their interactions with their physical environment and their communication with individuals in their social environment. Today, child-focused education approaches, which are based on the relationships established with the environment and the experiences gained, developed on the basis of factors such as children's development levels, needs, and the characteristics of the environment they live in, and based on the principle of learning by doing on their own, are

implemented throughout the world. By providing education in an environment where the child's decisions and freedom of choice are respected, the child is given a sense of responsibility from an early age. Through activities that allow for individual and group work, independent thinking, decision-making and implementation skills, as well as the ability to participate in decision-making within the community and adapt to the decisions taken, are developed. In this way, children, who are the building blocks of society, are raised from a young age as conscious generations who are curious, inquisitive, able to take responsibility, and sensitive to the environment (Çınar & Yamaçlı, 2019).

The child's behavior is determined by the places/physical environment he/she is in rather than his/her characteristics such as personality and intelligence. For this reason, the immediate surroundings of residences, urban spaces such as schools and children's playgrounds, and all children's places where children interact and constitute their physical environment, are of great importance in becoming a member of society, socializing and developing. In line with its importance in the development of the child, making the physical environment more livable for the child has gained importance, especially in Northern European countries, and various studies, projects and practices are carried out in these countries. The most prominent of these efforts are Child Friendly city initiatives. Other studies and applications can be examined under the headings of streets, school gardens, children's playgrounds and the child's transportation between school and home.

The needs program for children, especially for children, is specialized; In all children's places such as learning environments, children's museums,

children's libraries, children's hospitals, children's centers, children continue their perceptual-cognitive development as well as their physical development. Children are in their simplest dreams in their intuitive perception. They learn in the simplest way through play. In this context, all children's spaces are learning environments. If it is desired to raise awareness of sustainability in children, all children's spaces must be designed as sustainable and all criteria that ensure sustainability must be clearly expressed in a way that will guide children to learn by experiencing. Because children reinforce learning by doing and experiencing. For example, the most important goal of creating a green children's library is to promote environmental literacy. Environmental literacy means knowing environmentally friendly practices and turning them into behavior. Measurable gains from environmental literacy education will be green practices such as recycling, energy saving and nature conservation.

### **1.1. Sustainability**

The word “sustainability” is a concept that has no equivalent in the Turkish dictionary published by the Turkish Language Association. The English meaning of this word is defined as "the capacity to be permanent". At the same time, this word also expresses “dependence on an optional external factor”. In other words, the sustainability of something depends on its preferential use by a will, even if all conditions are suitable (Bulut & Polat, 2019).

The concept of sustainability was included for the first time in the World Charter for Nature document adopted by the International Union for Conservation of Nature (IUCN) in 1982. According to this condition; “It

is envisaged that the ecosystem, organisms, land, sea and atmospheric resources used will be managed in a way that will achieve optimum sustainability, but this will be done in a way that does not endanger the integrity of ecosystems and species.” (Kamaraj et al., 2019). The concept of 'sustainability' was defined in the Brundtland Report prepared by the World Commission on Environment and Development in 1987 as "meeting today's needs without depriving future generations of their ability to meet their needs" and has been widely used since then.

In this context, it is possible to come across many different definitions of sustainability. Tekeli (2001) defined sustainability as a widely accepted moral principle that emerged within the environmental movement and whose content is constantly being redefined within the political process. İncedayı (2004), on the other hand, accepts sustainability as basically a reform process in the mind, but says, “Like every thought process, sustainability requires a political choice or attitude. "Unless today's environmentally unsustainable consumption patterns are changed on political, economic and cultural basis, questioning a sustainable environment will remain an empty goal." He expressed it with an approach like (Tavşan & Yanılmaz, 2019). Sustainability is ensuring the continuity of the diversity and self-reproduction of ecological systems. Sustainability is an understanding that causes changes in the thought system without reducing living standards. This change occurs with the formation of a society that moves from a consumerist society to one that takes social responsibilities, is environmentally sensitive and produces economical solutions (Bulut & Polat, 2019).

The starting point of the concept of sustainability focuses on preventing environmental problems that arise in parallel with economic and technological developments and protecting the ecosystem. Sustainability, which is the slogan for the 21st century, promises the hope of social evolution towards a more equitable and rich world in preserving the natural environment and cultural achievements for future generations (Kamaraj et al., 2019).

Sustainable development means meeting the needs of the present without consuming or harming the resources of the generations that will replace us in the future. According to the definition made by UNCED (1992), sustainable development; “It is the organization and improvement of people's living standards in a way that contributes to the living space around them.” Sustainable development refers to keeping values alive and at the same time developing continuously, and it is an important concept in terms of providing all humanity with the right to live in a healthy environment, which is one of the fundamental rights defined by the United Nations. When the goals and scope of sustainable development are examined, it is seen that future generations are constantly mentioned (Bulut & Polat, 2019).

In order to better understand sustainable development, it is important to examine the basic framework of the subject in more depth. According to Van den Branden (2012), sustainable development;

1- It aims to meet the basic needs of all people and expand the opportunity to fulfill their desires for a better life. This means that societies should aim to meet human needs by both increasing productive potential and providing fair opportunities for all.

2- It meets today's needs without compromising the ability of future generations to meet their own needs.

3- It does not endanger the natural systems that support life on Earth: atmosphere, waters, soils and creatures.

Economic efficiency, social justice and environment are the three basic components of sustainable development. The difficult part that has not been taken into account sufficiently until now is the integration of environmental and social dimensions into today's economic model. In order to achieve this integrity in sustainable development, everyone's participation must be ensured, precautions must be taken before it is too late to take action, and awareness of protection and responsibility must be established (Bulut & Polat, 2019).

The rapid population growth after the industrial revolution and World War II caused some changes in the lifestyles and needs of societies. Mass production, which has become a necessity with population growth, has led to uniformity in designs. Until this period, designs were made by craftsmen, but from this period onwards, they were left in the hands of designers in order to prevent monotony (Tavşan & Yanılmaz, 2019).

The environmental impact of the product has not been taken into account in product design for a long time. However, the rapid depletion of resources and the sudden increase in environmental pollution have brought the concept of eco-design to the agenda. Discussions on the environment have gained importance due to the impact of global threats in the 21st century. Eco-design approaches, considered in a wide scope, have given rise to the concept of 'sustainable design' over time. Sustainable design is evaluated according to the performance of the product from its production

to the end of its life. In this context, a sustainable design should include basic criteria such as being renewable, providing heat and energy savings, minimizing waste, ease of maintenance and repair, and easy assembly features (Tavşan & Yanılmaz, 2019).

Various definitions have been made by different researchers for sustainable architecture, which is also referred to as green architecture and ecological architecture in the literature. According to Oktay (2002), although sustainability is considered new conceptually, it is very old as a world view. The use of local data such as vegetation, topography and especially climatic features in design has been one of the smart solutions that constructionists have emphasized and used since the time when the first building examples appeared. Sev (2009), in his book "Sustainable Architecture", defines sustainable architecture as "one that prioritizes the use of renewable energy resources, is environmentally friendly, uses energy, water, materials and the area effectively, taking into account future generations, in its current conditions and in every period of its existence." defined as "all activities of creating structures that protect people's health and comfort". To summarize; It can be said that sustainable architecture is to consider the benefits of the environment in which the building is located throughout its life cycle by using existing resources and conditions in a production-oriented manner rather than consumption (Tavşan & Yanılmaz, 2019).

One of the criteria of sustainable architecture is that construction systems cooperate with ecological systems throughout the life of the building and allow the design to complete its life cycle with minimal damage to the environment. Building materials and components cause harmful effects on

the environment due to the natural resources they consume throughout their life cycle and the emissions generated at various stages of this cycle (Çelebi & Arpacioğlu, 2023). A sustainable building designed for its purpose should provide a minimum destructive and maximum positive impact on the environment. Ensuring sustainability in the building is directly related to criteria such as the building consuming the least amount of energy during construction and use, being able to produce self-sufficient energy, and having technology that will contribute to the environment when necessary. Thanks to these criteria, the building contributes to sustainable architecture.

Sustainability is not always an approach that can be applied at the new building design stage. Demolishing and rebuilding buildings that have expired over time is an anti-sustainability action. Some changes to be made in the structure, materials and space organization of existing old buildings will provide significant savings in terms of materials, energy and resources and contribute to economic development (Tavşan & Yanılmaz, 2019).

For a livable environment, the aim of protecting the ecosystem should be prioritized while meeting the comfort and needs of the user in the phases of buildings from construction to use and demolition. Green ergonomics; As a concept that has recently emerged with sustainable development processes, it is related to the importance of the human factor in reducing consumption and protecting the environment. Green ergonomics focuses on the interaction of human systems and nature. According to this definition; While green buildings take care of the welfare of both ecological systems and those who use these buildings; should be designed as environmentally friendly buildings (Kızıllkan & Türkyılmaz, 2021).

According to Kim and Rigdon (1998), sustainability in the context of architecture is achieved with three basic principles:

1. Conservation of resources; reduce, reuse and recycle,
2. Life cycle,
3. Humane design.

Kohler (1999) stated that sustainable buildings consist of ecological, economic, social and cultural sustainability components and that these components are sustainable building design principles. In 1999, C.I.B. (International Council for Research and Innovation in Building and Construction) explained the concepts of ecological, economic, social and cultural sustainability in more detail; It has revealed the basic goals in sustainable buildings. These goals are; reducing the use of resources, protecting and improving the environment and natural environment, ensuring human health and comfort at the highest level, and taking into account the socio-economic, cultural and political realities of the place.

Becker (1999) explains sustainability in three basic categories:

1. Economic processes,
2. Social processes, patterns and factors,
3. Decision-making process and institutional arrangements.

Sachs (1999) divides sustainability into four parts:

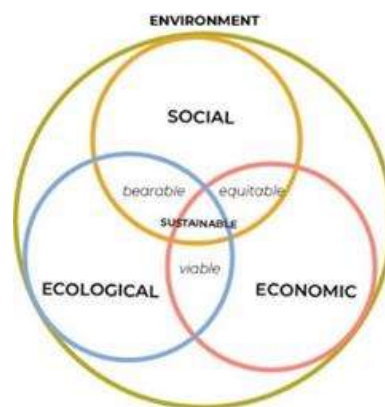
1. Social sustainability and its result, cultural sustainability,
2. Ecological sustainability,
3. Economic sustainability,
4. It is political sustainability.

According to Williamson (2003) and Bilge (2007), the data that gave rise to the concept of sustainability are divided into three:

1. Ecological data,
2. Economic data,
3. Political, social-cultural data.

According to Pressoir (2008), sustainability consists of three components:

1. Ecological sustainability,
2. Economic sustainability,
3. Social and cultural sustainability (Figure 1).



**Figure 1.** Sustainability components (Url-1)

## **1.2. Children, Environment and Space**

Children are defined as important actors in their current and future lives. Attitudes and behavioral characteristics developed in children at a young age lay the groundwork for future behaviors. In a study conducted by Costa, Barcala-Furelos, Abelairas-Gomez & Arufe-Giraldez (2015), the effect of a structured physical education program on the psychomotor development of preschool children was examined. The research was conducted by applying a 24-week program including balance and coordination skills with 95 three-year-old children attending public kindergartens in Portugal, 47 of whom were divided into the experimental group and 48 of whom were divided into the control group. As a result of the research, the importance of psychomotor movements in terms of

helping children recognize their own bodies and supporting all areas of development, especially cognitive development, was emphasized, and after the program applied to children who were almost at the same level in terms of psychomotor development at the beginning of the study, those in the experimental group improved coordination, balance and body posture compared to those in the control group. It has been observed that there is a significant increase in flexibility and endurance skills.

In the first stage of life, learning is associative and rapid. The first phase of life, from the prenatal period until approximately age eight, creates tremendous potential for developmental growth. In the study conducted by Lehl, Kluczniok & Rossbach (2016) to examine the role of quality pre-school education in improving mathematics skills in primary school, it was determined that children who received adequate and quality education in mathematics in the pre-school period showed higher success in mathematical skills in the primary school period compared to children who did not receive it (Bulut & Polat, 2019).

During childhood, individuals' communication with architecture generally focuses on educational environments. Architecture cannot be considered independently of social relations. In this context, the relationship established between the child and architecture arises through the child's experience of architecture. Conscious and well-designed educational environments support child education and the learning process. When viewed from the perspective of the social aspect of architecture, the right to participation, which means that children have a say in the issues that concern them, is used in the formation of the social and physical environment, and when it is used in the formation of the social and physical

environment, children who have these experiences learn better; they develop a sense of belonging, ownership and responsibility; They are known to exhibit democratic and entrepreneurial behavior. In this context, the child's participation in architecture in educational environments occurs when the child experiences architecture from an early age. The social and physical environmental experiences that children begin to acquire from an early age in well-designed environments are the first step in creating a sustainable future (Çınar & Yamaçlı, 2019).

The awareness of providing a livable environment for today's and future generations can be conveyed more effectively through training given from an early age. Early childhood education has an important position among other education processes. Basic habits and cognitive abilities are rapidly formed between the ages of 0-6. While pre-school education generally begins in the family and home environment until the age of three, there are many studies that emphasize the importance of programs in kindergartens or kindergartens for children to gain emotional and behavioral development between the ages of 3-6 (Kızıllkan & Türkyılmaz, 2021).

Because of the value judgments and behaviors that generally begin to form in people's childhood, it is important for people to meet nature at an early age and to develop respect and love for nature. Learning in this affective field paves the way for the formation of environmentally friendly behaviors to protect the environment. For example, by making preschool children play nature-loving games, they become aware of the beauties of nature with all their sense organs; In this way, they can learn that nature is a value and make efforts to protect it (Bulut & Polat, 2019).

### **1.3. Sustainability and Children's Spaces**

Talking to children about sustainability and raising sustainability awareness in children is an extremely important issue. First, we need to help our children understand what sustainability is. Although sustainability is a broad concept, it is fundamentally based on realizing how we affect our Earth and understanding what kind of world we leave to future generations.

This concept can appear in every area of our lives. Sustainability can appear in many parts of our lives, from recycling to gardening or the items we plan to use. The best way for children to learn is to teach them by doing. If we want our children to live in a better world in the future, we need to at least take precautions from now on and ensure that our children internalize sustainability.

The view that children's spaces should be considered as a learning material in itself increases the value of sustainable space designs. Educator Taylor, who advocates this view, argues in his quote titled "Learning environment as a three-dimensional textbook" that "the building itself and the surrounding landscape are not a passive area, but can be an active learning tool for physics, geometry and learning." Children and parents learn to "read the environment" on many levels, interact with it and learn from it". The concept of ecology mentioned by Taylor is closely related to the "sustainability education" discussed in this study. One of the main arguments of the study is that ecological and environmental sustainability is largely related to architecture. can be provided; and this view can be conveyed to children through places (Taşcı, 2015).

According to UNESCO's "Education for a Sustainable Future" program, an ideal environmental education program requires the development of values and understanding of the subject rather than a passive transfer of knowledge. In this respect, "architecture" is very instructive in terms of the organization of the built environment and the relationship of the built environment with the natural environment. Treating the built and natural environments as a must-read book and using them as learning materials are ideal methods for sustainability education; Because it is a known fact that not every child can learn by reading books or listening to their teachers. Von Glaserfeld argues that knowledge is formed through active experiences. According to Glaserfeld, knowledge is related to the student's experiences and the environment in which the student creates this knowledge. In other words, acquiring knowledge and understanding is directly related to experience or life. In this respect, sustainable spaces are easy-to-reach concrete materials that are ideal for teaching many concepts to children. A children's place that meets sustainability criteria can make it easier to teach the child many useful things such as green environmental awareness, energy saving, and simple measures to ensure thermal Comfort (Taşcı, 2015).

- Sustainable children's spaces that will raise awareness in the context of sustainability must be shaped within the framework of certain criteria. These criteria can generally be listed as follows:
- Choosing the appropriate land (a land that will have the least negative impact on the ecosystem and is suitable for designing buildings in accordance with sustainable criteria, where users will be protected from external pollution sources, etc.),

- Preparation of a comprehensive transportation plan that pollutes the environment less (should start at the land selection stage),
- Minimizing the life cycle (construction, operation, maintenance-repair, demolition) costs of the building,
- Integrating passive systems (greenhouses, roof windows, heat-storing walls, solar chimneys, etc.) and active systems (solar collectors, photovoltaic systems, etc.) into the structure to reduce energy requirements,
- It has sustainable features such as rainwater collection, roof gardens, natural ventilation systems, sufficient daylight, construction with ecological and local materials, acoustic comfort, and good indoor air quality,
- Implementation of materials reuse and recovery policies during and after building construction (reducing and managing waste),
- The building is also an educational tool for sustainability awareness and is included in educational programs,
- Designing open spaces that enable the child's relationship with nature and offering different experience environments,
- Be accessible and safe for everyone,
- Ensuring that people in the immediate vicinity benefit from the building facilities (Tavşan & Yanılmaz, 2019).

In this context, the basic features that children's spaces should have in the sustainable development process are as follows:

### **Structural Features:**

**Transparency:** Removing the thick walls that draw boundaries between nature and buildings.

**Energy Efficient:** Thanks to low energy systems, heating, cooling, etc. reducing energy consumption.

**Ventilation:** Improving the air quality in indoor environments through the use of natural ventilation systems.

**Lighting:** Use of adequate daylight.

**Water Conservation:** Storing rainwater and preventing water waste in the building.

**Material Selection:** Use of environmentally friendly materials.

**Color and Texture Selection:** Appropriate color and texture selection that supports the child's development and education.

**Acoustic Comfort:** Creating calm educational environments where optimum acoustic comfort is provided.

### **Functional Features:**

**Variability:** Evaluating all environments designed with changeable-transformable planning that allow different user groups to do different activities in an area at the same time as an educational tool.

**Equality:** All children should benefit equally from the opportunities provided in educational environments, under the same conditions.

**Sharing:** Sharing the opportunities provided by designed educational environments with the society.

**Belonging:** Creating a sense of ownership of the educational environment in children thanks to simple-structured elements that can be adjusted according to need and allow use in different physical sizes.

**Holistic Harmony:** If the education system follows a certain philosophy that requires special design, providing integrity throughout the structure thanks to the architectural form shaped in accordance with that philosophy.

**Freedom:** Enabling the child to decide, choose and act freely with his/her free will.

**Environmental Awareness:** Thanks to the educational environments created in open and closed areas, the child can touch nature and develop environmental awareness.

**Health:** Planning of food and beverage, agriculture and sports areas that provide children with healthy living habits from an early age.

**Cooperation:** Cooperation and communication achieved as a result of moving educational environments to work areas belonging to different professional groups (Çınar & Yamaçlı, 2019).

Designing all children's spaces with a sustainable approach means creating sustainability awareness in children. For example, the water crisis is one of the issues that frequently comes to the fore and raises concerns about the future. Talking to children about the importance of water may not be enough for them to fully understand this issue. Learning that the buildings we live in collect rainwater when it rains and that this water can later be used for watering plants, cleaning the garden, etc. by living with the spaces and buildings they are in will increase sustainable awareness. In this context, considering children's spaces within the scope of sustainable design will play an active role in increasing sustainable awareness..

## **2. Material and Method**

In this study, which reveals the methods for creating sustainability awareness in children, examples of sustainably designed children's spaces

and structures were identified and analyzed in the context of the following criteria determined within the scope of the sustainability criteria in theory. These criteria; The selection of the residential area was determined as follows: water conservation, energy and atmosphere, transportation, natural lighting, natural ventilation, building form, appropriate materials and construction system, space organization, building envelope and sustainability awareness.

Children's spaces, which were analyzed in the context of the determined sustainability criteria, were questioned about the approaches of sustainable practices applied at the building and space scale to create sustainability awareness in children.

### **3. Findings and Discussion**

Within the scope of the study, 6 examples of sustainably designed children's spaces and structures were identified and analyzed in the context of the criteria determined within the scope of sustainability criteria. While determining the examples, attention was paid to ensure that they were specialized children's spaces for children with different functions such as education, health and culture. 2 of the analyzed samples are kindergarten samples from abroad and 1 is a kindergarten sample from home. Other examples include a children's hospital, a children's museum and a children's center.

#### **3.1. Fuji Kindergarten - Japan**

Completed in 2007, the kindergarten, which won the 2017 Moriyama RAIC International Award, hosts 600 children aged 2-6. Adopting the Montessori learning approach, the school adopts an educational approach that offers children the opportunity to move freely around learning

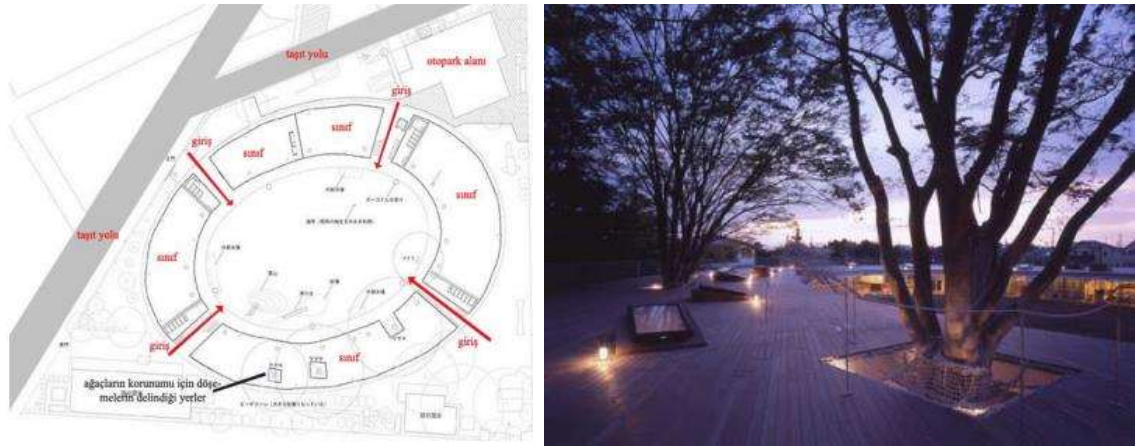
environments and learn through discovery. Architect Takaharu Tezuka designed this sustainably designed structure as a continuous space that allows children to learn and play without restriction (Tonguç, 2012).

The building is in a central location. The annex to the school, called "circulation around the tree", built between the building and the street next to Fuji Kindergarten, offers children a place to play while waiting for their shuttles after school. In addition, not only kindergarten students but all children can benefit from this structure (Figure 2) (Tonguç, 2012).



**Figure 2.** Fuji Kindergarten general view and site plan (Tonguç, 2012)

While designing the building, attention was paid to the preservation of the existing Zelkova trees in the surrounding area. The existing land was preserved and the design was made to suit flat land conditions. Daylight, prevailing wind, etc. are taken into account in the design. Climatic optimization has been achieved by taking into account the climatic characteristics. The preservation of trees on the land also protects the building from climatic factors. The structure is designed so that school officials can easily observe children. Adequate lighting is provided around the school. (Figure 3) (Tonguç, 2012).



**Figure 3.** Fuji Kindergarten plan and roof (Tonguç, 2012)

The water required for landscape irrigation is provided by rainwater on the roof. By minimizing the use of covered surface areas in landscape design, the flow of rainwater to groundwater is ensured. Care was taken to select local plants that do not require much watering. Rainwater was collected and used in landscape irrigation with efficient irrigation methods. Thus, the use of clean water for irrigation purposes has been reduced.

Solar energy is utilized through the use of photovoltaic panels. The building was designed in the central area, close to residential areas. Transportation axes have been determined and transportation opportunities to the building by vehicle, on foot or by bicycle have been provided. Parking areas are designed close to the road, away from children's playgrounds. By providing alternative transportation opportunities, parking areas have been reduced to a minimum level; Appropriate parking arrangements have been made for bicycles and service vehicles. The use of heavy and solid arcade building elements around the building, which would prevent students' visibility and negatively affect their safety, was avoided. The use of public transportation is encouraged, and playgrounds

are arranged in areas where children will wait for the shuttles so that they can have a pleasant time (Tonguç, 2012).

In order to make the best use of natural lighting, plenty of glass, sliding and collapsible joinery was used on the facade of the building. Controllable natural ventilation is also provided with this approach. Skylights are designed to ensure that interior spaces benefit from sufficient natural light. The terrace also serves as an eaves and is used for shading purposes in the building. The building can make the most of natural lighting. Artificial lighting is intended to supplement natural lighting. The spaces are painted in light colours (Figure 4) (Tonguç, 2012).



**Figure 4.** General view from Fuji Kindergarten (Tonguç, 2012)

### **3.2. Agriculture Kindergarten – Vietnam**

Historically an agricultural country, Vietnam has faced environmentally damaging changes as it transitioned to a production-based economy. Increasing drought, floods and salinization endanger food supplies, while large numbers of motorcycles cause daily traffic congestion and air pollution in cities. Rapid urbanization deprives Vietnamese children of green spaces and playgrounds, and therefore of their relationship with nature. Agriculture Kindergarten has a concept that counters these problems. Located next to a large shoe factory and designed for 500 children of factory employees, the building is a prototype of sustainable education spaces in tropical climates and is designed as a permanent green

roof, offering children the experience of food and agriculture as well as a large playground reaching into the sky (Figure 5) (Akaevren & Yavuz, 2023).



**Figure 5.** General view from the Agriculture Kindergarten (Url-2)

The green roof is shaped like a triple ring surrounding three courtyards inside as safe play areas. An experimental vegetable garden has recently been realized on its hill. Five different vegetables were planted in a 200 m<sup>2</sup> garden for agricultural education. All functions are hosted under this roof. As the roof descends towards the courtyard, it provides access to the upper floor and vegetable gardens, where children learn about the importance of agriculture and reconnect with nature (Figure 6) (Akaevren & Yavuz, 2023).



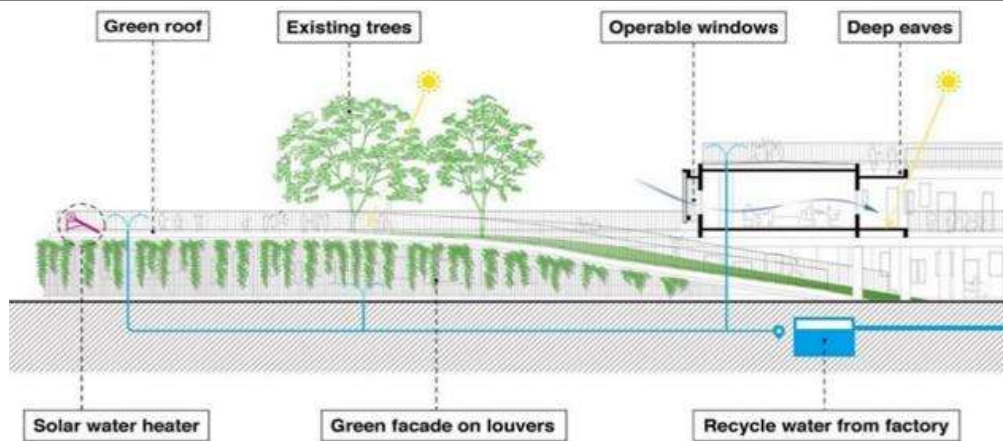
**Figure 6.** General view from the Agriculture Kindergarten (Url-2)

The building is made of a continuous narrow strip with windows that can be opened on two sides, maximizing cross ventilation and natural lighting. In addition, architectural and mechanical energy saving methods, including but not limited to, have been extensively implemented. A green roof was used for insulation, a green facade for shading and solar water heating. These devices are designed to be visible and play an important role in the sustainable education of children. Factory wastewater is recycled to water greens and flush toilets (Figure 7) (Akaevren & Yavuz, 2023).



**Figure 7.** General view from the Agriculture Kindergarten (Url-2)

As a result, the kindergarten operates without air conditioning in the classrooms, despite being located in a harsh tropical climate. According to post-occupancy records published 10 months after completion, the building saves 25% energy and 40% fresh water compared to baseline building performance, greatly reducing operating cost. The building was designed for the children of low-income factory workers, so the construction budget was quite limited. Therefore, a combination of local materials (brick, tiles) and low-tech construction methods are applied, which helps minimize environmental impact and support local industry (Figure 8) (Akaevren&Yavuz, 2023).



**Figure 8.** Agriculture Kindergarten sustainability approach (Url-2)

Architectural and mechanical energy saving methods are extensively applied, including but not limited to. Green roof, PC-concrete louver for shading, recycling materials, water recycling, solar water heating have been applied. These devices are visibly designed for children to play their important role in sustainable education. The building was designed to maximize natural ventilation through a computational fluid dynamics analysis. Double insulation was applied to the building to save energy. The building's water is heated by solar energy, and filtered water from the nearby factory is used to irrigate the garden and playgrounds. Large windows on both sides of the building not only bring daylight in, but also provide natural air flow, eliminating the need for a ventilation system (Akaevren & Yavuz, 2023).

### **3.3. Bahriye Üçok Kindergarten – Türkiye**

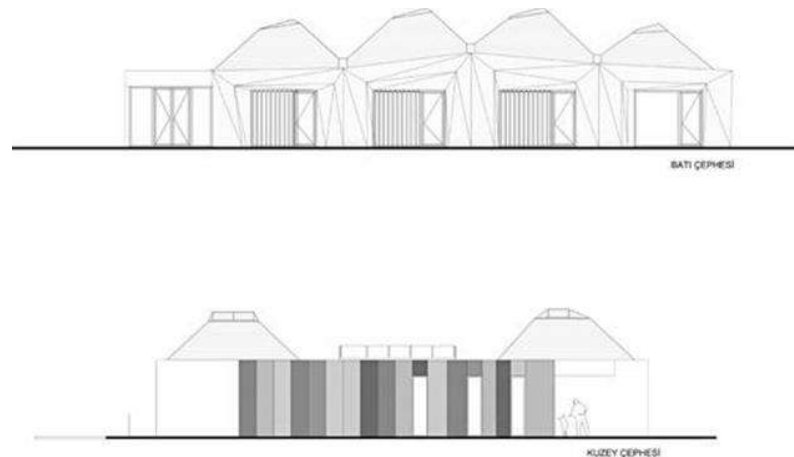
Bahriye Üçok Kindergarten, which is Türkiye's first ecological home, was built with a completely environmentally friendly design, from its construction to its interior furnishing and basic infrastructure such as energy and water. 110 children between the ages of 3 and 6 receive service in the kindergarten, which has 5 classrooms with an average area of 25 -

30 m<sup>2</sup>. The garden of Bahriye Üçok Ecological Kindergarten, consisting of a total of 1208 m<sup>2</sup> of closed and 1633 m<sup>2</sup> of open area, is also designed to suit the development of children (Figure 9).



**Figure 9.** General view from Bahriye Üçok Kindergarten (Kızıllkan & Türkyılmaz, 2021)

The child explores and learns about his environment by playing games. While designing the building, the idea of "a house obtained with an origami game" was the starting point, based on the issues of "game" and "image", and the building shell was shaped accordingly. The forms and functional approaches created on the building facade and roof are essentially shaped within the framework of this idea. A friendly playhouse has been created for children, suitable for their own scale (Figure 10) (Kızıllkan&Türkyılmaz, 2021).



**Figure 10.** Bahriye Üçok Kindergarten facades (Kızıllkan & Türkyılmaz, 2021)

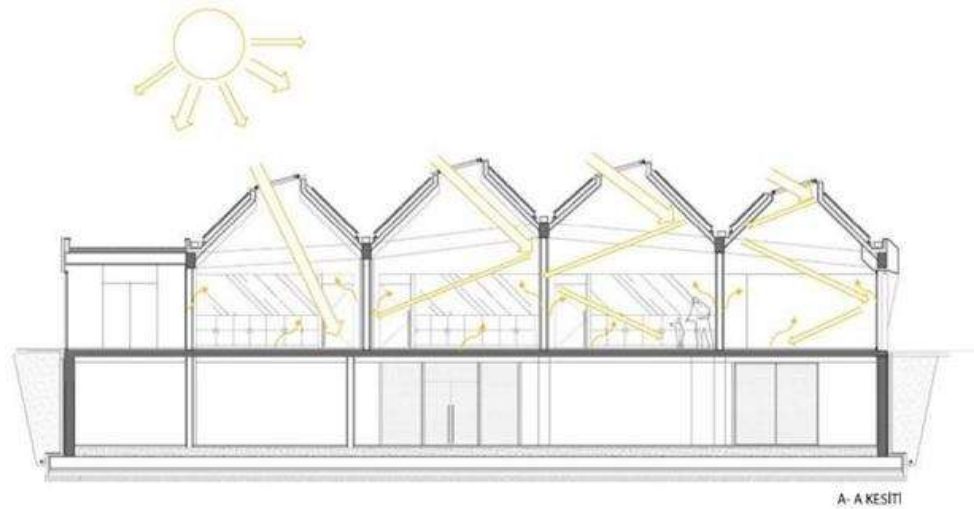
The building consists of two floors. One floor of the building is located underground with an ecological approach. Heating consumption was reduced by placing areas that do not functionally need daylight and have low circulation needs in the basement. The areas remaining above ground have been greened as open playgrounds for children and as a source of oxygen for the ecosystem. The trees and vegetation around the building act as a barrier that reduces the sound level between the playground and the surrounding residences. In addition, apart from the positive effect of green on human psychology, the green environment also allows various types of natural life to live (Figure 11) (Kızıllıkan & Türkyılmaz, 2021).



**Figure 11.** General view from Bahriye Üçok Kindergarten (Kızıllıkan & Türkyılmaz, 2021)

The school meets the criterion of designing a minimum of 50% of the land as green space, which is required to meet the LEED criteria for the protection and development of natural life. The building's light color facade paint, green roof and green land reduce the heat island effect, unlike the high-rise buildings and asphalt roads in the surrounding area. In order

to reduce light pollution, lighting in buildings and land should be minimized and the damage to the environment caused by lighting at night should be reduced. The exterior of the school is not illuminated. Functional lighting poles are used outdoors only to ensure safety and visual comfort (Figure 12).



**Figure 12.** Bahriye Üçok Kindergarten sectional drawing (Kızıllkan & Türkyılmaz, 2021)

It is possible to benefit from solar energy in a building thanks to passive and active solar systems. The investment cost of passive solar systems is lower than active systems. It is also possible to reduce heating costs by using these systems correctly in buildings. While some of the sunlight received into the building is used immediately, some of it is emitted by radiation or transport from the floor and walls (Kızıllkan & Türkyılmaz, 2021).

Unlike active solar systems and passive solar systems, solar energy is obtained through technical equipment. This obtained and stored energy is used to meet the heating, hot water and electricity needs of the building. An example of active energy use at Bahriye Üçok Kindergarten is the

application of photovoltaic solar panels. Photovoltaic solar panels, placed towards the south facade to receive maximum sunlight, are used to meet the electricity needs of the building by converting sunlight into electrical energy (Kızıllkan & Türkyılmaz, 2021).

Purifying rainwater through green building principles, especially with the application of green roofs, reducing the load of the sewage system by using rainwater, making efficient use of solar energy and natural light, reducing the reflections that create the greenhouse effect by not reflecting the sun's rays, reducing energy consumption with the correct light direction and insulation values. savings, oxygen production with green roof layers, heating-cooling costs and carbon dioxide emissions are reduced with insulation systems (Figure 13) (Kızıllkan & Türkyılmaz, 2021).



**Figure 13.** General view from Bahriye Üçok Kindergarten (Kızıllkan & Türkyılmaz, 2021)

Movable sunshades were added to the façade in order to reduce the sunlight reaching the learning spaces located on the south and west facades of the land. Such smart building technologies provide advantages in terms of both cost and comfort. In addition, the building form on the west façade

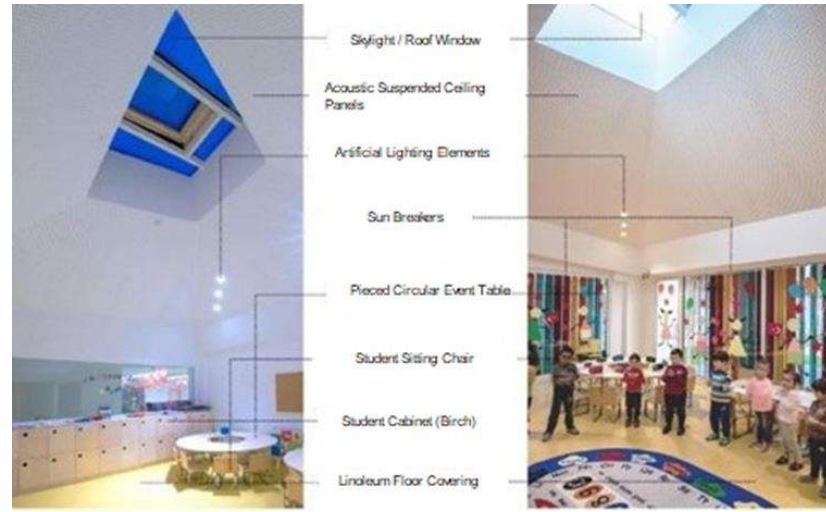
was shaped to break sunlight. In this way, sunlight, which varies according to climatic characteristics, is allowed to be received into the space in a controlled manner. Its softness, like that of the northern light, was targeted. We created a section that will be used as a winter garden on the side facing the south facade, and an island wall that can be heated on the lower floor. There are precast surfaces on the facade. Although the form of these precasts appears to be a free form, each angle was designed as a sunshade to eliminate the negative effects of the sun coming from the south side. It is also supported by photovoltaic panels to generate electrical energy (Figure 14-15) (Kızıllkan & Türkyılmaz, 2021).



**Figure 14.** General view from Bahriye Üçok Kindergarten (Kızıllkan & Türkyılmaz, 2021)

In a building, large amounts of water are used as a result of activities such as cooking, washing, cleaning or irrigation used in wet areas. Reusing water from depleting sources after use and systems that reduce existing water use are important elements in sustainable building design. Using rainwater in or around the building, controlling the amount of water used in the building, and ensuring that gray water is purified and used are approaches that reduce water consumption. In the kindergarten, rainwater is stored and used for garden irrigation and toilet bowls in wet areas.

Additionally, water consumption can be reduced with sensor taps or gradual flush systems used in wet areas (Kızıllkan & Türkyılmaz, 2021).

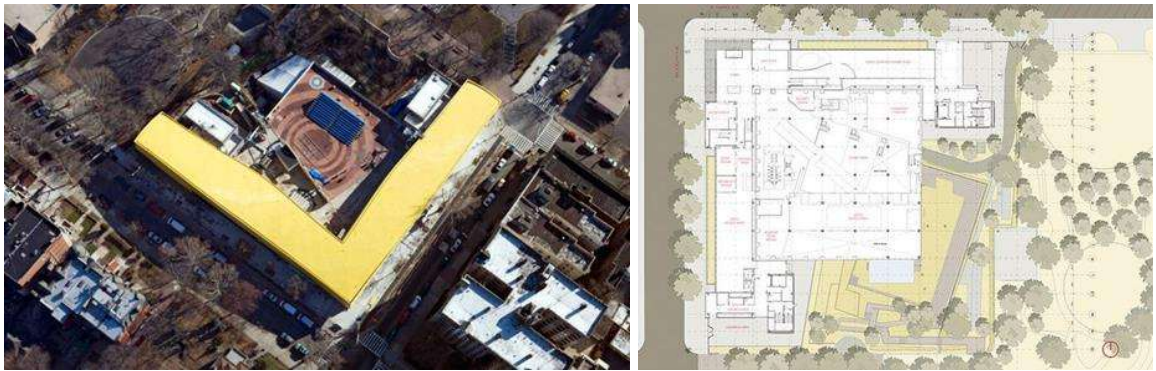


**Figure 15.** Bahriye Üçok Kindergarten sustainability approach (Kızıllkan & Türkyılmaz, 2021)

When the entire kindergarten is examined in terms of material and furniture selections, it is observed that both children's health and sustainability criteria are taken into consideration. Wood is used extensively throughout the space, such as furniture, door and window joinery, and stair covering. Wood is a natural material that does not require much energy during processing, its waste does not harm the environment and can even be reused. Pastel colored tones were preferred as much as possible in the building designed as a kindergarten structure. Light-colored birch wood furniture, off-white aluminum joinery, white acoustic panels and wall paint, mustard yellow/green tones non-toxic linoleum flooring material, wooden covering on the stairs and non-slip matte ceramic tiles in wet areas were preferred. Mainly rainbow colors were used in outdoor equipment and white composite material was used in the building exterior cladding (Kızıllkan&Türkyılmaz, 2021).

### 3.4. Brooklyn Children's Museum– USA

Seeking expanded capacity to serve a growing audience of children and families, the Brooklyn Children's Museum wanted a new public presence that would contribute to the vitality of the surrounding community. Rafael Viñoly Architects responded by creating a structure that differs from its context, in color as well as physical form, yet remains welcoming and deferential to the museum's existing built environment (Figure 16) (Brooklyn Children's Museum, n.d.).



**Figure 16.** General view from the Brooklyn Children's Museum (Url-3)  
The Brooklyn Children's Museum is New York City's first LEED certified museum and the first to tap geothermal wells for heating and cooling purposes (Figure 17) (Brooklyn Children's Museum, n.d.).



**Figure 17.** General view from the Brooklyn Children's Museum (Url-3)

The Museum is covered in 8 million yellow tiles that reflect the heat of the sun to keep the Museum cool in the summer. Brooklyn Children's Museum has lots of large windows to let light in so the Museum doesn't have to turn on all the lights on a sunny day. But light brings heat, so the windows were designed with tile overhangs to prevent direct sunlight from letting too much heat inside.

The Museum uses low-flow faucets and toilets. Low-flow faucets add air to the water as it flows so you get a steady stream without using so much water. The men's restrooms actually have waterless urines; no water is used to flush these. The Museum's system automatically adjusts to accommodate the number of visitors in each space at any given time. When visitors are in the Museum, the fewer ventilation system will slow down, reducing energy costs (Figure 18) (Brooklyn Children's Museum, n.d.).



**Figure 18.** General view from the Brooklyn Children's Museum (Url-3)  
When people enter the Museum's offices, classrooms, and restrooms, motion sensors turn the lights on. When they leave, the lights turn off automatically. The Museum also uses super efficient, cool-burning low-energy light bulbs. Daylight sensors regulate the amount of artificial lighting needed at any given time. Photoelectric cells dim indoor lights

when there is an abundance of natural light and brighten the electric lighting at night or in cloudy weather.

The Museum features an innovative geothermal system that draws stable-temperature water from Brooklyn's underground aquifers to a series of air handlers that control the temperature of the building. The water stays about 14C year-round, so it's cooler than the air in summer and warmer than the air in winter. When the water enters the building, it reduces the need for air-conditioning in the summer and heating in the winter (Figure 19) (Brooklyn Children's Museum, n.d.).



**Figure 19.** General view from the Brooklyn Children's Museum (Url-3) Photovoltaic (PV) systems convert solar energy into electrical power. The solar energy captured through PV panels reduces the cost of supplying electrical energy to the building. Renewable and Whenever possible, the Museum uses materials that are renewable or recycled. The stairs and upstairs floorboards are made of bamboo, a resource that's renewable because of how quickly bamboo grows.

The boards in the beach boardwalk aren't wood; they're recycled plastic bottles. The collections cases in the Global Beats Exhibit are made from sunflower seed hull. The soil in the Community Garden isn't real soil – the pieces are cut from recycled corkboards. The bark on the trees in

Neighborhood Nature is made from recycled tires. The roof tiles on the Pizza Shop are made from reclaimed wood and recycled vinyl (Brooklyn Children's Museum, n.d.).

### **3.5. Arena Children's Center – Australia**

Designed by CohenLeigh Architects, Arena Children's Center is located in the growing suburb of Officer in South East Melbourne. This hugely popular early learning center successfully meets the demand for modern early learning spaces in the growing community while being a colorful and memorable piece of urban architecture (Figure 20) (Arena Children's Centre, n.d.).



**Figure 20.** General view from the Arena Children's Center (Url-4)

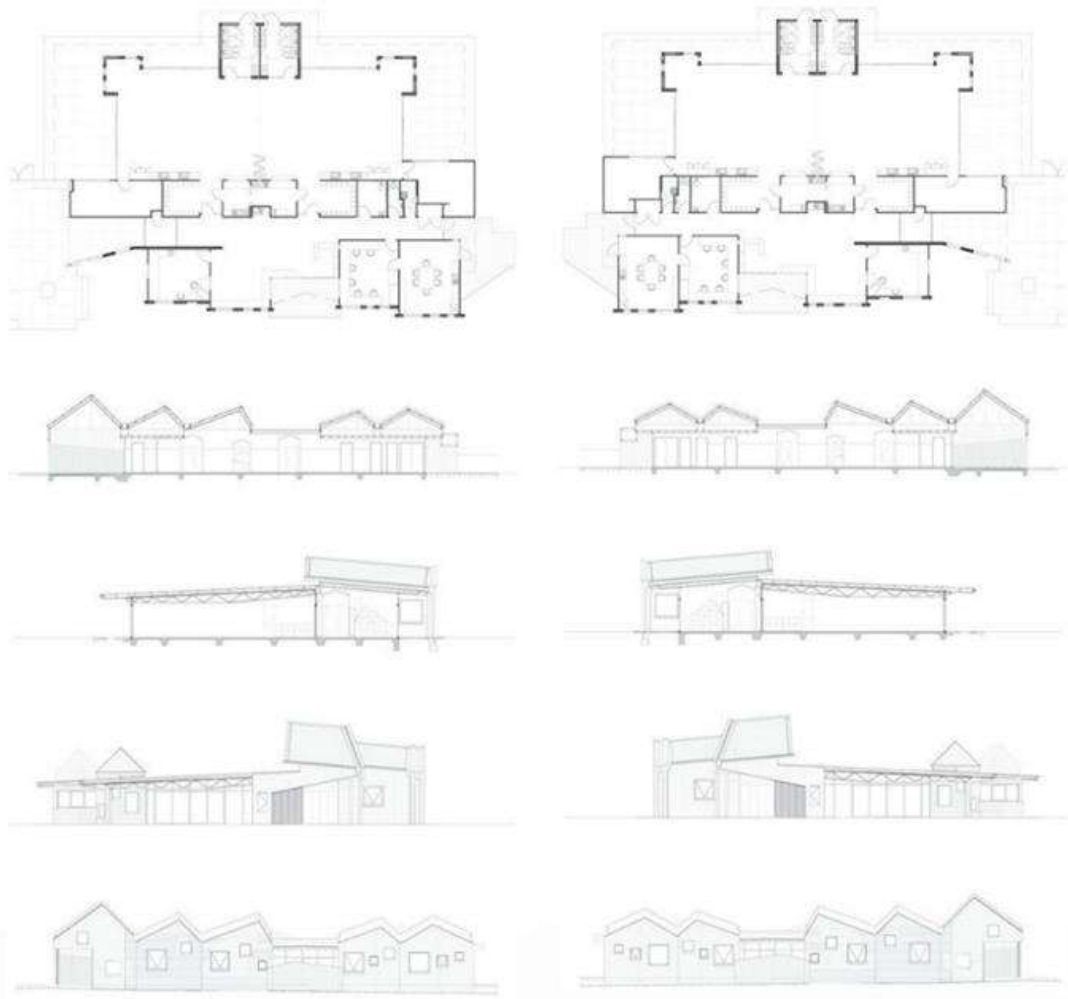
Spending time away from home can be daunting for children, especially for the first time. The design focuses on the concept of 'home' to help children feel comfortable. A fun, lively and memorable series of "house"

shapes becomes a theme that extends into the interiors (Figure 21) (Arena Children's Centre, n.d.).



**Figure 21.** General view from the Arena Children's Center (Url-4)

Arena Children's Centre's brick façade with tinted glass is inspired by the simple, familiar shapes of houses often drawn by children. It also refers to the housing patterns of growing suburbs. The design of the interior spaces centers around a sensory and physical progression through the educational progression of the early learning centre, using color themes and brick interaction as tactile elements that help guide children (Figure 22) (Arena Children's Centre, n.d.).



**Figure 22.** Arena Children's Center project drawings (Url-4)

Facilities include two licensed playrooms, mother-child and healthcare facilities, a kitchen, staff areas and amenities. The orientation and placement of internal playrooms ensures each room has a strong connection to outdoor spaces for flexible indoor/outdoor activities, taking advantage of natural light, fresh air and engagement with the landscape, while a large outdoor play area offers challenging play options that cater to children's needs (Figure 23) (Arena Children's Centre, n.d.).

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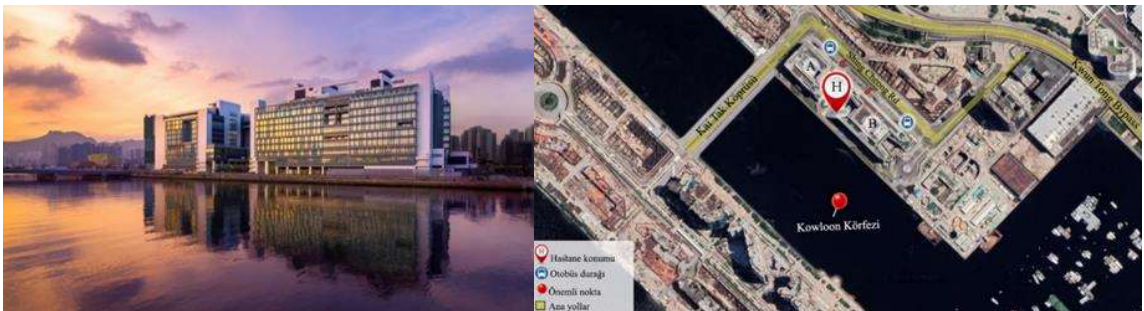
**Figure 23.** General view from the Arena Children's Center (Url-4)

Environmentally sustainable design is a key driver in the quest to create a comfortable learning environment. Orientation, natural ventilation, deep eaves and shading control all contribute to keeping artificial heating/cooling to a minimum and providing fresh air. Combined with rooftop solar power, water harvesting, low-VOC paints, energy-efficient lighting and timed water fixtures, the buildings' environmental performance is exemplary for society (<https://www.arch2o.com/arena-childrens-centre-cohenleigh-architects/>, 2024).

### **3.6. Hong Kong Children's Hospital – Hong Kong**

Hong Kong Children's Hospital was built in 2017 in Hong Kong by Billard Leece Partnership, Simon Kwan and Associates Architectural Firms. The hospital building is located in Kowloon Bay and has an uninterrupted sea view with its long façade. There is no emergency room or general outpatient clinic in the hospital. The overall design goal of the hospital is to create a home-like, comfortable, child-friendly environment that can

provide the best patient-centered clinical practices to meet the needs of patients and families. The hospital structure, which has 11 floors, consists of two buildings: "Teaching and Research Building" (Block A) and "Clinical Services Building" (Block B). The two blocks are connected to each other from the 2nd, 3rd and 9th floors by three bridges. Block A is mainly used for education, scientific research and operating rooms, and block B is used for various wards and outpatient departments. In addition to the indoor parking lot at the hospital, there are 2 bus stops near the hospital. The passenger drop-off area opens onto a large green area with a direct view of the port, providing a sense of comfort for users. A continuous pedestrian walkway is provided to connect all main entrances and the functional area (Figure 24) (Dabbagh, 2023).



**Figure 24.** General view from Hong Kong Children's Hospital (Dabbagh, 2023)

The hospital lobby is covered with floor-to-ceiling glass, providing natural lighting and sea views. It also opens directly to the garden overlooking the harbour. The building has a clear and well-directed circulation model with simple and effective planning. Natural light and view are provided in the patient rooms through large glass windows (Figure 25) (Dabbagh, 2023).



**Figure 25.** General view from Hong Kong Children's Hospital (Dabbagh, 2023)

Animal graphics that attract the child's attention were used in different parts of the hospital, such as examination rooms, elevators, x-ray and MRI rooms. Attractive waiting areas with playgrounds are found on the clinic floors to create a comfortable and fun environment for children. Colorful seating areas suitable for all age groups are provided in the waiting areas (Figure 26) (Dabbagh, 2023).



**Figure 26.** General view from Hong Kong Children's Hospital Dabbagh, 2023)

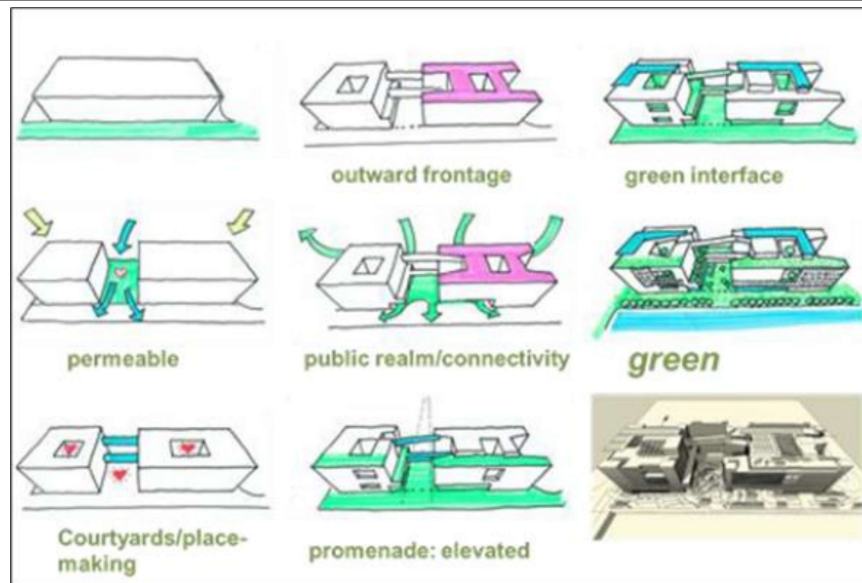
Many landscaping arrangements have been made on the ground floor, terraces and roofs in order to reduce the heat effect in the building and improve the air quality in the surrounding area. The hospital's central rehabilitation garden connects to the adjacent coastline, improving public connectivity and the provision of shared spaces. In the rehabilitation garden, there are animal topiary frames (animal-shaped vegetal sculpture)

such as monkeys, rabbits and flamingos, as well as different play and seating areas. Vertical greening in garden areas has a therapeutic effect, helping to reduce stress, evoke sympathy and balance emotions. Internal courtyards were created in the hospital to maximize daylight utilization, natural ventilation and connection with the external environment (Figure 27) (Dabbagh, 2023).



**Figure 27.** General view from Hong Kong Children's Hospital (Dabbagh, 2023)

The concept of sustainability is widely featured in hospital architectural design. It contains a series of environmental protection and energy-saving devices and improves environmental greening. The building form was designed as twin towers to improve the permeability of the building and pedestrian circulation. To ensure thermal and visual comfort, shading elements on the southwestern façade, efficient sanitary fixtures to increase water efficiency and reduce water consumption, rainwater recycling systems to reduce irrigation water consumption, regional cooling system, photovoltaic panels, high quality lighting systems and environmentally friendly materials were used (Figure 28) (Dabbagh, 2023).



**Figure 28.** Hong Kong Children's Hospital sustainability approach (Dabbagh, 2023)

#### 4. Conclusion and Suggestions

Although sustainability is a broad and comprehensive word, we need to adopt behavioral practices that will minimize the damage we cause to the world. Therefore, sustainability appears as a set of good and sensitive actions. While involving children in this process, we need to bridge the gap between the abstract idea of sustainability and the real-world effects of actions.

While building this bridge, it is important that the spaces where children live are designed in accordance with sustainability criteria and that children's awareness of sustainable structures and environments is raised through these spaces. When examples of sustainable children's spaces with different functions were analyzed, it was determined that all examples mastered the basic sustainable design criteria (Table 1).

**Table 1.** Analysis of examples of sustainable children's spaces (Anıktar, 2024)

Sustainability Criteria	Fuji Kindergarten	Agriculture Kindergarten	Bahriye Üçok Kindergarten	Brooklyn Children's Museum	Arena Children's Center	Hong Kong Children's Hospital
Selecting the Residential Area	X	X	X	X	X	X
Water Conservation	X	X	X	X	X	X
Energy and Atmosphere	X	X	X	X	X	X
Transport	X	X	X	X	X	X
Natural Lighting	X	X	X	X	X	X
Natural Ventilation	X	X	X	X	X	X
Building Form	X	X	X	X	X	X
Appropriate Material and Construction System	X	X	X	X	X	X
Space Organization	X	X	X	X	X	X
Building Shell	X	X	X	X	X	X
Providing Sustainability Awareness	X	X	X	X	X	X

According to Table 1, not all sustainable children's space examples meet only sustainable design criteria. In addition, all sustainable practices implemented at the building and space scale are planned clearly enough to be noticed by children. Sustainability-themed curricula and activity arrangements should be made in order to strengthen awareness, especially in educational buildings and learning environments. Again, in order to strengthen awareness, the theme of sustainability should be addressed and game designs should be made in the context of the concept of games, which play the most active role in learning. Based on the awareness that

every place children are in is also a learning environment, awareness can be created by transferring many concepts that affect future generations, such as the concept of sustainability, to children through places.

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