TOBB UNIVERSITY OF ECONOMICS AND TECHNOLOGY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

BUILDINGS THAT ARE PART OF NATURE; A STUDY OF THE RELATIONSHIP BETWEEN ARCHITECTURE AND NATURE THROUGH THE CASES OF BUILDINGS

MASTER OF ARCHITECTURE

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Department of Architecture

Supervisor: Asst. Prof. Dr. Murat SÖNMEZ

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DECLARATION OF THE THESIS

I hereby declare that all the information presented in this thesis has been obtained and presented in accordance with ethical conduct and academic rules. Proper citations have been provided for the sources referenced, and the references have been accurately stated. Furthermore, I confirm that this thesis has been prepared in compliance with the thesis writing guidelines of TOBB ETU Graduate School of Natural and Applied Sciences.

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TEZ BİLDİRİMİ

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Özge BAYAM GÜMÜŞ

ABSTRACT

Master of Architecture

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Uncontrolled urbanization and the resulting conflict with nature have led to global issues affecting the entire world and ecosystem. Climate crises, depletion of natural resources, and disruption of ecological balance are among the primary problems. While humans play a significant role in the emergence of these problems, architecture has become a crucial profession in preserving ecological balance. Innovative, sustainable attitudes, and approaches towards environmental and climate issues need to be developed through architecture. Just as nature offers unlimited possibilities to humans, buildings and people are also expected to provide unlimited opportunities to nature. It is of great importance that future generations efficiently utilize the opportunities offered by nature while producing built environments. When closely examined, the claim that buildings labeled as green or sustainable are in harmony with nature can be questionable. This thesis aims not only to explore self-sufficient buildings but also to investigate how buildings can be truly designed to be in harmony with nature and possess qualities that are in symbiosis with it. Initially, a conceptual framework encompassing ecological psychology, ecological architecture, and regenerative architecture will be discussed to explore the relationships between buildings and nature. Through these readings, the mutual interaction and exchange that should exist between buildings and nature will be revealed, and research will focus on how buildings should not just adapt to nature but coexist with it.

In the continuation of the study, it is important not only to address this conceptual framework but also to examine current practices. Frequently used green building certification systems, awards, and principles will be scrutinized to evaluate whether they serve merely as a 'marketing tool' or if they genuinely provide adequate scope for evaluating buildings as integrated with nature. Based on all these readings and analyses, the developed holistic approach aims to define the qualities that a nature-integrated building should possess. Buildings with green building certification and those labeled as green/ecological/regenerative without certification will be selected. They will be evaluated and interpreted using the created holistic approach: the Nature-Integrated Building Evaluation Approach. Consequently, an inference will be made as to whether the buildings currently designated as sustainable/green/ecological are a part of nature, and their deficiencies will be highlighted, emphasizing the crucial role that nature should play in future architectural endeavors. This study aims to foster the adoption of a more solution-oriented and sustainable approach to global environmental problems, encouraging the design of built environments as structures that are not only integrated with nature but also have a positive impact on the environment. The integration of technological advancements and tools with environmental awareness will ease the process of designing buildings that not only emphasize eco-friendliness but also make a favorable impact on the environment.

Keywords: Nature-integrated, Ecological architecture, Regenerative, Architecture, Nature

ÖZET

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DOĞANIN PARÇASI OLAN BİNALAR;
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Kontrolsüz kentleşme ve doğa arasındaki çatışma sonucunda tüm dünyayı ve ekosistemi etkileyen sorunlar ortaya çıkmaktadır. İklim krizleri, doğal kaynakların yok olması ve ekolojik dengenin bozulması başlıca sorunlar arasında yer almaktadır. Bu sorunların ortaya çıkmasında insanlar büyük rol oynarken; mimarlık ise ekolojik dengenin korunmasında önemli bir meslek haline gelmektedir. Çevre ve iklim sorunlarına karşı yenilikçi, sürdürülebilir tutum ve yaklaşımların mimarlık aracılığıyla geliştirilmesi gerekmektedir. Doğa insanlara sınırsız olanaklar sunarken aynı şekilde binaların ve insanların da doğaya sınırsız olanaklar sağlaması beklenmektedir. Gelecek nesillerin yapılı çevreler üretirken doğanın sunduğu imkanları en verimli şekilde kullanması büyük önem taşımaktadır. Günümüzde yeşil veya sürdürülebilir bina olarak nitelendirilen yapıların doğa ile iç içe olduğu iddiası yakından incelendiğinde sorgulanabilir bir hal almaktadır. Bu tez sadece kendi kendine yeten binaların değil, gerçek anlamda doğa ile iç içe olan binaların nasıl tasarlanabileceği ve hangi niteliklere sahip olması gerektiğini araştırmayı hedeflemektedir. İlk olarak, binalar ve doğa arasındaki ilişkileri keşfetmek için ekolojik psikoloji, ekolojik mimari ve rejeneratif mimariyi içeren kavramsal çerçeve tartışılacaktır. Bu okumalar sayesinde bina ve doğa arasında olması gereken karşılıklı etkileşim ve değişim ortaya çıkarılacaktır, binaların doğaya adapte olması değil, doğa ile hemhal olması üzerine araştırmalar yapılacaktır. Çalışmanın devamında, sadece bu kavramsal çerçevenin ele alınması değil, aynı zamanda mevcut uygulamaların da incelenmesi önemlidir. Günümüzde sıkça kullanılan yeşil bina sertifikasyon sistemleri, ödüller ve prensipleri incelenecek; bu sistemlerin sadece bir "pazarlama aracı" mı yoksa gerçekten doğayla bütünleşik binaların değerlendirilmesinde yeterli kapsamı sağlayıp sağlamadığı değerlendirilecektir. Tüm bu okumalar ve analizler temelinde geliştirilen bütünsel yaklaşım, doğayla bütünleşen bir binanın sahip olması gereken nitelikleri tanımlamayı amaçlamaktadır. Yeşil bina sertifikasına sahip olan ve sertifikasız ancak yeşil/ekolojik/rejeneratif olarak etiketlenen binalar seçilecek ve oluşturulan "Doğayla Bütünleşik Bina Değerlendirme Yaklaşımı" kullanılarak değerlendirilip yorumlanacaktır. Sonuçta, mevcut olarak sürdürülebilir/yeşil/ekolojik olarak nitelendirilen binaların doğanın bir parçası olup olmadığına dair bir sonuca varılacak ve çıkarımlarda bulunulacaktır. Bu çalışma ile gelecekte yapılacak mimarlık çalışmalarının, çevre ile uyumlu ve doğayı destekleyen bir yaklaşımı benimsemesi böylece küresel çevre sorunlarına karşı çözümcül bir bakış açısı geliştirilmesi istenmiştir. Teknolojik yeniliklerin ve araçların çevresel bilinç ile harmanlanması, binaların sadece çevre dostu değil, aynı zamanda çevreye olumlu katkı sağlayan yapılar olarak tasarlanmasını sağlayacaktır.

Anahtar Kelimeler: Doğayla bütünleşik, Ekolojik mimari, Rejeneratif, Mimarlık, Doğa

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1. INTRODUCTION

Urbanization in today's world; can be seen as a result of conflict with nature. Today, it is possible to talk about a great climate crisis, an uncontrolled urbanization, deterioration of the ecological balance and natural resources that are gradually depleting. The construction, use, and demolition of buildings can have a significant environmental impact, due to the use of materials, energy, and water, as well as the generation of waste. These activities cause climate change, air pollution, water pollution and other environmental problems.

Human activities are the main cause of climate change and that causes serious environmental problems. The scientific consensus on this issue is strong, with 97% of experts agreeing that climate change is caused by human activities. (Emekci, 2021b) The architectural profession has a critical place in the face of these climate crises and global problems. With the developing technology and increasing population, cities are growing, but in this process, it is inevitable that natural areas will be destroyed and the negative effects on the environment will increase. In this context, innovative, sustainable and nature-friendly approaches to environmental and climate problems should be developed through architecture.

In today's world, there is an increase in the production and approach of green and sustainable buildings as a solution to all the problems encountered. The real question is to what extent these buildings labeled as green or sustainable truly integrate with nature.

The aim of this thesis is to research the qualities that buildings need to possess to be an integral part of nature. It seeks to answer the question of not only producing self-contained structures but also understanding how buildings can be designed to be in harmony with nature, contribute to and enhance nature. The study will investigate not only the adaptation of buildings to nature but also their integration with nature, mutual interaction, change, and development.

The scope of this study aims to create an environmentally compatible and nature-supporting perspective to contribute to future architectural projects. The research will start by thoroughly examining fundamental concepts that form the conceptual framework, such as ecological psychology, ecological architecture, and regenerative architecture. These concepts will provide crucial theoretical tools to understand the interaction and integration between nature and buildings.

Furthermore, alongside the conceptual framework, the current widely used green building certification systems, awards, and principles will be analyzed to evaluate whether they serve as a marketing tool and to emphasize their strengths and weaknesses. Additionally, an assessment will be made on whether these systems may not provide sufficient coverage in evaluating buildings as an integral part of nature. Based on all the readings and analyses, the developed holistic approach aims to define the qualities that a nature-integrated building should possess.

Buildings that possess a green building certificate and those labeled as green/ecological/regenerative buildings without certification will be selected. They will be evaluated and interpreted using the created holistic approach: the Nature-Integrated Building Evaluation Approach. Thus, while evaluating the buildings' connection with nature, the impact of having or not having a certificate will also be examined. In the end, it will be inferred whether the buildings currently designated as sustainable/green/ecological are a part of nature, and their deficiencies will be highlighted, emphasizing the crucial role nature should play in future architectural endeavors.

This thesis aims to foster the adoption of a more solution-oriented and sustainable approach to global environmental problems, encouraging the design of built environments as buildings that are not only integrated with nature but also have a positive impact on the environment. The integration of technological advancements and tools with environmental awareness will ease the process of designing buildings that not only emphasize eco-friendliness but also make a favorable impact on the environment.

2. CONCEPTUAL FRAMEWORK: EXAMINING THE RELATIONSHIPS BETWEEN BUILDINGS AND NATURE

2.1 Ecological Psychology

The guiding basic principle of ecology; “All organisms in the struggle for survival are in constant interaction with the environment, including other organisms and non-living beings, and try to adapt to it.”(Mumcu et al., 2019) Ecological psychology deals with how human behavior and experiences are related to their daily environment. Ecological psychology is an approach to understanding cognition and perception that emphasizes the relationship between an organism and its environment. It rejects the idea of a passive perceiver and instead focuses on the active engagement and interaction between the organism and its surroundings (Lobo et al., 2018). Nothing or no one can be defined or isolated from or outside the environment. The principles of this relationship, which includes mutual interaction and exchange, are revealed by ecological psychology. Psychology has to deal with the “individual”, but ecology is “the relationship between the organism and its environment.” Considering ecology and psychology together, they offer opportunities to connect or break the bond between human and environment (Thompson, 2003). There are some approaches in the field of ecological psychology.

> “These approaches influenced two separate lines of research and theory in psychology, both calling themselves ‘ecological,’ one emphasizing perception and the other, behavioral adaptations. The perception research is most closely identified with J. J. Gibson and the behavioral studies with R. Barker” (Charles, 2012).

The two studies analyze the relationship between humans and the environment using different methods. At the heart of the common points of the two approaches lies a form of analysis on human-environment interaction. Barker proposes "behavioral positions", while Gibson proposes "possibilities" as a form of analysis and reveals its characteristics (Mumcu et al., 2013).

In summary, Ecological Psychology is an approach that aims to understand the interactions of individuals with their daily environments and the effects of these interactions on human behavior and experiences. Nothing and no one can be independent or isolated from the environment. This relationship involves principles of mutual interaction and exchange, and these principles have been revealed by ecological psychology. When ecology and psychology come together, they provide opportunities to strengthen or weaken the bond between humans and the environment.

2.1.1 Behavioral setting theory

According to Roger G. Barker's study about Behavioral Setting Theory (1968), it is appropriate to observe the effects of the environment on people in their natural environment rather than in a laboratory environment.

> "In short, while ecological psychology considers the environment and humans as an inseparable whole, it tries to understand the behavior of the human being in the daily environment in which he/she occurs, without disturbing the flow and with the observation technique, by making use of the basic principles and research approaches of the science of ecology" (Mumcu et al., 2019).

Behavior typically does not correspond to a single environmental event at a given time, but rather is compatible with or constrained by the environmental setting. There is a general convenience between the behavior and the immediate environment (Heft, 1989). Behavioral setting theory suggests that behavior is shaped by the characteristics and affordances of the setting in which it takes place. For example, a classroom setting may have different behavioral expectations and opportunities compared to a workplace setting (Awamleh & Hasirci, 2022)

It is the environment itself, not the personalities of the individuals, that directs the behavior of the people. Users of behavior environment may change, but the environment is permanent (Barker, 1968, as cited in Alparslan Kardeş, 2016). The individual changes the environment, and the environment changes the behavior and experiences of the individual. It is argued that the environment and the subjects living in it cannot be evaluated independently of each other. Behavioral setting theory and architecture are related in that behavioral settlement theory provides framework for understanding how the physical and social environment influences human behavior, and architecture plays an important role in shaping the built environment in which individuals interact. The theory emphasizes the reciprocal relationship between individuals and their environment, suggesting that behavior is influenced by the characteristics of the setting, including architectural elements. Architecture can be seen as a manifestation of affordances, providing the physical affordances that support and shape human activities and experiences(Ula et al., 2022).

2.1.2 Affordance theory

Gibson (1986) examined visual perception from an ecological perspective in his study named “The Ecological Approach to Visual Perception”. This theory reflects its support for an interdependence or ecological perspective on the relationship between people and their environment (Heft,2001, as cited in Mumcu et al., 2013).

> “The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does”(Gibson, 1979).

According to Gibson (1979), the environmental context both affects and is affected by the individual. The environment allows organisms to make all kinds of movements.

Affordance theory is a concept that focuses on the relationship between an individual's abilities and the features of their environment. It suggests that affordances are not properties of either the environment or the individual, but rather relational and perceivable (Chemero, 2003). “Affordances are opportunities for action offered by the environment that are specific to an individual's capabilities-his or her effectivities” (Vaz et al., 2017).

All living things that can move make their environment more suitable for them. Man changes the structure and shape of his environment to change the possibilities it offers him. In this way, he facilitates access to the things that are beneficial to him, and reduces or removes the harmful ones. In fact, it can make life easier for oneself and more difficult for other organisms (Alparslan Kardeş, 2016). Gibson did not do detailed studies on architecture and possibility, but emphasized the need to concentrate on the theory of possibility in architectural theory.

> "Architecture and design do not have a satisfactory theoretical basis. Can an ecological approach to the psychology of behavior and perception provide the necessary theoretical grounding?" (Gibson, 1979)

Living things have affordances and diversity that the environment they live in provides them. It is also possible to relate this interaction that Gibson has established between animals and the environment, between structures and human/structures and nature. As a prime example; thousands of years ago, people used caves for shelter. The fact that the caves are protected from weather conditions has provided a shelter for people.

> Since ancient times, in any environment, people have sought food, water, shelter, etc. and they tried to detect landscapes that could afford them what they needed. The ecological approach frames this process: people inherently look for certain characteristics in the environment that can afford them what they need, desire, or expect (Gibson, 1979; Norman, 1999, as cited in Roshani, 2020).

Creating a space is the first step for people to realize their behaviors and actions in the space, as well as to develop the relationship that they will establish with the space, defined by spatial behaviors. The concept of affordance, with its strong quality, is essential in environmental and urban design theory. In this sense, spatial design is an important opportunity for people to interact and communicate with space and other people. The influence and direction of the concept of "spatial affordance" is very important in the fiction and design of public spaces where people are in contact with each other and the designer is involved in their arrangement, apart from the user himself (Kahraman, 2014). People use different materials and methods when designing spaces. For instance, since transparency is required in houses, windows are used and it is possible to see the outside, but at the same time, a privacy affordance is provided with curtains and walls.

Buildings provide a variety of high-level affordances, such as affording shelter from the elements, affording aesthetics to occupants and passers-by, storing things, affording comfort to residents through climate management, and so on. sustain the weight of occupants, as well as furniture, finish materials, utility routing, and, in some situations, drainage (Maier et al., 2009). Gibson (1976) mentioned that ‘Why that are intertwined with nature both interact with nature and become suitable for nature as they take the characteristics of nature. It establishes a mutual interaction and has man changed the shapes and substances of his environment? To change what it affords him.’ As a result, architects and designers not only create new products or buildings, but they can also create new affordances that have the potential to modify patterns of human behavior and even entire sociocultural practices. How buildings and structures evaluate the affordances provided by the environment will be analyzed in the following sections.

“The installation’s various affordances solicit visitors to explore different standing positions in an experimental work landscape”(Sánchez, n.d.).(Figure 2.1)(Figure 2.2)

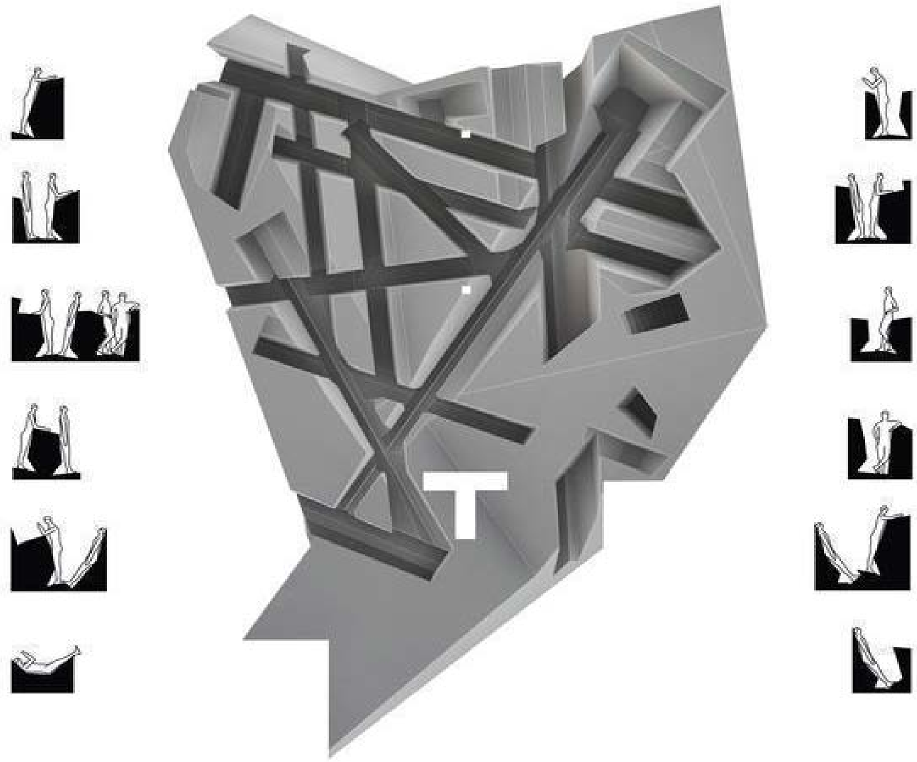


Figure 2.1: The End of Sitting. (The End of Sitting - RAAF, 2020)

Figure 2.2: The End of Sitting. (The End of Sitting - RAAF,

Ecological psychology provides the theoretical foundation for understanding how organisms perceive and interact with their environment, while affordance theory offers a specific framework for studying the action possibilities that the environment presents to the organism. Together, these concepts contribute to our understanding of the dynamic relationship between individuals and their environment, highlighting the active role of perception and action in shaping cognition and behavior (Rietveld et al., 2018; Thomas & Riley, 2014; Wilson, 2002).

2.2 Integrate Definition

The dictionary definition of integrate is;

> "to form, coordinate, or blend into a functioning or unified whole **:** UNITE" (URL-1)

When talking about blending architecture and nature, only a few elements, such as landscape design and green methods are considered. While these strategies are significant in design, there are more ways to unite architecture and nature. Contemplating fauna, appreciating the five elements of nature, adopting eco-friendly materials, and considering the building's impact on the environment are all examples of integrating nature into architecture(Karnik, n.d.). In recent years, the importance given to nature has been decreasing and as a result, consequences such as climate crises and natural resource deficiencies arise. At this point, architects should integrate buildings into nature and consider as a united whole.

> “Architecture is essentially an extension of nature into the man-made realm, providing the ground for perception and the horizon of experiencing and understanding the world. It is not an isolated and self-sufficient artifact; it directs our attention and existential experience to wider horizons” (Pallasma, 2005).

It is necessary to have an understanding that respects nature's structural cycle, accurately evaluates the affordances supplied by nature, and moves away from a human-centered perspective. Cities are more than just places where people live; they also impact the environment via the decisions they make. When a structure/building/artifact is properly placed in nature, it interacts with other living and non-living organisms, opening up new affordances.

Nature can continue to exist without humans, but humans cannot live without nature. Therefore, an understanding of architecture that respects and enhances the nature and conforms to its flow and habits needs to be developed. It is not enough to consider living spaces and architectural elements alone, designs that adopt nature, environment, climate, and conditions must be created (Emekci, 2021a).

Quotes from famous architects emphasizing the bond between architecture and nature:

“Form must have a content, and that content must be linked with nature.” Alvar Aalto (URL-2)

“We should attempt to bring nature, houses, and human beings together in a higher unity” Mies van Der Rohe (URL-3)

“Study nature, love nature, stay close to nature. It will never fail you.” Frank Lloyd Wright (URL-4)

2.3 Ecology and Architecture

2.3.1 Ecology

The concept of ecology began to develop as a specialized discipline within biology starting from the second half of the 19th century. The term "ecology" ("Ökologie") was introduced in 1866 by Ernst Haeckel, a German scientist. It originates from the Greek words "Oikos," meaning home, and "logos," meaning study or science (Balasubramanian, 2019). As a result, the term "ecology" emerged to replace the word "biology," which was used to study the relationships between organisms and their environment. Nowadays, the concept of ecology has extended beyond the boundaries of natural sciences and has become an interdisciplinary field encompassing applied sciences and social sciences. Therefore, there are various definitions of ecology that can be encountered.

Ecology examines the relationships between living organisms and their environment as a whole. In ecological terms, the term "environment" encompasses everything related to the studied individuals, including both living and non-living components. Ecological relationships encompass not only the interactions between organisms and the abiotic environment but also the interactions among living organisms themselves (Özüer, 2012).

Barry Commoner was one of the most renowned ecologists in the 1960s, 70s, and 80s. In his book "The Closing Circle," he presents four laws of ecology(Commoner, 1971).

i. Everything is connected to everything else.
   Ecosystems and organisms are interconnected. Every living and non-living component is interdependent, and a change can impact other related elements.
ii. Everything has to go somewhere.
   The cyclic flow of energy and matter in ecosystems. Nothing is created or destroyed; instead, it is transformed into different forms.
iii. Nature knows best.
   Human interventions in natural systems can result in significant disruptions and devastations.
iv. There is no such thing as a free lunch.

> Everything comes at a cost. Since the Industrial Revolution, fossil fuels such as coal and oil, extracted in large quantities from underground, have provided cheap sources of energy for years. However, today, the price of this extravagance is being paid with climate change. Therefore, everything is interconnected, and every action in nature has consequences.

If humanity aims to live in harmony with nature, it should base the rules that will shape future societies on ecology. Moreover, the solution to the environmental crisis lies in the establishment of a new society rooted in ecological principles. "The idea that nature is a realm of resources to be exploited for human ends is a myth that has had a devastating impact on the planet. If humanity is to survive, it must learn to live in harmony with nature, not in opposition to it. This means basing the rules that will shape future societies on ecological principles." (Bookchin, 1982)

Ecology is a fascinating and significant branch of science that greatly affects humanity. Individuals and civilizations may effectively protect the world and its inhabitants by grasping basic ecological concepts.

Numerous advantages are provided by ecology, including:

- Understanding the natural world: Ecology offers insights into how ecosystems work, allowing for educated resource management, the preservation of endangered species, and the reduction of climate change's negative effects.

- Supporting sustainable lifestyles: Ecology helps to create behaviors and structures that reduce environmental damage and support long-term well-being by examining the complex relationships between species and their surroundings.

- Fostering an appreciation for nature: Ecology reveals the complex interactions between living things and their environments, deepening one's understanding of the wonder and complexity of the natural world.

Ecology plays a vital role in advancing knowledge and guiding actions aimed at preserving and protecting the planet. By embracing ecological principles, it is possible to work collectively towards a sustainable future that harmonizes human activities with the intricate dynamics of the natural environment.

2.3.2 Ecological architecture

The industrialization that occurred after World War II, driven by a narrow focus on economic development and excluding human considerations, has led to the emergence of a consumer society. This has resulted in rapid urbanization, escalating population issues, and a prolonged global environmental problem.

The techno-centric approach, prevalent from the late 19th century to the mid-20th century, suggested solving human problems in line with technological advancements. Subsequently, a human-centric approach was adopted, placing human interests above all else. This human-centric approach, with its emphasis on prioritizing human benefits, has led to the loss of balance in nature(İncedayı, 2004).

When humans interact with the physical and chemical characteristics of the ecosystem, they also interact with other species. In periods without technological advancements, such as obtaining nutrition, lighting, heating, and climate control, all comfort-related needs were met through natural resources. In those times, it would be possible to say that humans were part of the global ecosystem. However, today it is a fact that this interaction leads to one-sided gains that cause destruction in nature.

Therefore, it would not be wrong to say that humans exhibit a parasitic attitude, benefiting from nature without contributing and without being an integral part of nature. Most of the interventions made by humans to sustain their life activities result in permanent disruptions in the ecosystem (Türkmenoğlu Bayraktar, 2011).

The environmental disasters caused by these selfish approaches, or the uncertainties caused by the insufficiency of resources, have prompted a change in human behavior. Humans are no longer opposing nature, but are adopting a harmonious and cooperative approach with nature. Thus, the human-centric approach has resulted in numerous environmental damages, prompting the development of new architectural approaches in the field of architecture.

Ecological architecture is an architectural design approach that emphasizes efficient utilization of natural resources and sensitivity to the natural environment. It can be considered as a broader architectural approach encompassing sustainable architecture and green architecture concepts. While green architecture focuses on performance-driven design, sustainable architecture encompasses economic and social dimensions, promoting a harmonious relationship with nature and a greater social consciousness. Ecological architecture, on the other hand, represents a holistic architectural mindset that encompasses all of these aspects, integrating an ecological perspective (Hagan, 2001). The terms "green" and "green building" encompass more than just physical elements like rooftop gardens or adding greenery to structures. They represent a broader concept and symbolize the use of natural environmental resources in a way that preserves the ecological balance without causing harm. Green building is also referred to as ecological building, energy-saving building, sustainable building, and a return to nature in construction(Cheng & Dou, 2015).

Buildings have been found to have a significant impact on ecosystem changes, consuming up to 50% of the energy, 40% of the raw materials, 50% of ozone-depleting chemicals, 80% of arable land, and 50% of the water used(Ayaz, 2002). Ecological architecture can be defined as a construction method that considers the physical environment in its biological, cultural, and psychological dimensions, and aims to provide economic, social, and environmental benefits through considerations of: location, water and energy efficiency, material and resource utilization and the entire life cycle of the building(Aytis & Ozcam, 2010).

In ecological architecture, the emphasis is placed on creating designs that not only optimize resource efficiency but also consider the overall well-being of the environment and the society. This approach aims to minimize negative environmental impacts, promote biodiversity, and foster a balance between human activities and the natural world. Ken Yeang, a globally recognized expert in ecology and architecture, mentioned that;

> “We shouldn’t just look at new buildings but at existing stock building because that’s an even greater problem than the new buildings being built. The renovation of existing buildings and making them green is just as important as designing new green buildings.” (Yeang, 2007)

Thus, ecological architecture encompasses the entire process from resource utilization to production, usage to demolition, and assimilation into natural cycles. By adopting ecological principles, architects strive to create buildings and spaces that are in harmony with their surroundings.

As Ken Yeang stated, that “I think buildings should imitate ecological systems. Ecological systems in nature before we had human beings interfere with them exist in a state of stasis – they are self-supporting, self-sustaining.” (Yeang, 2007) He means that buildings should be designed to imitate ecological systems. These systems are self-supporting and self-sustaining, meaning they can produce their own energy, recycle their own waste, and maintain their own populations. By learning from these systems, buildings can be designed to be more sustainable.

Ecological architecture seeks to:

- Establish living environments that prioritize respect for nature and humans.
- Enable the sustainable utilization of natural resources.
- Design structures that align with current environmental data.
- Enhance the incorporation of renewable energy sources in buildings.
- Create self-sustaining constructions by harnessing emerging technologies.
- Embrace the revitalization of existing buildings in line with ecological principles, reducing the need for excessive construction and promoting sustainable practices.

Ecological design is based on the principle of sustainability, aiming to ensure the sustainable use of natural resources and leave a healthy environment for future generations. It plays a crucial role in addressing environmental issues, combating climate change, and shaping a more sustainable future.

Understanding the functioning of ecological systems and incorporating these systems into the design process can lead to a powerful approach in architectural production. Thus, architecture will contribute to establishing and strengthening the balance between nature, buildings, and humans. Through this production, environmental and ecological issues can be minimized, and steps toward improving nature can be taken by making a positive contribution. In this regard, ecological architecture holds a significant stance. Producing buildings by understanding ecology and the environment is crucial for both nature and humanity.

2.3.3 Building ecology

Building Ecology is a study that examines the interdependencies and interactions between buildings and the natural environment. Its objective is to understand how natural systems impact buildings and how buildings affect the natural environment. The aim of building ecology is to discover ways to design and construct harmonious relationships between buildings and nature that are mutually beneficial and supportive of life (Graham, 2005). It argues that ecological considerations should be present throughout the entire building process, from design to construction to demolition. “Buildings consume 40% of our planet's materials and 30% of its energy. Their construction uses up to three million tonnes of raw materials a year and generates 20% of the soild waste stream.” (Graham, 2002). Building ecology defines the relationship that should exist between buildings and nature, and seeks to minimize the environmental impact of buildings by using sustainable materials, conserving resources, and creating healthy indoor environments.

Peter Graham is known for his book "Building Ecology: First Principles for a Sustainable Built Environment," which provides a comprehensive overview of ecologically sustainable building.

According to Graham (2002), Building ecology is;

- The study of how our built home effects our natural home;
- The study of the interdependencies and effect of building and natural environments on each other;
- About discovering the interactions between building and nature and the effects of those interactions.

According to Graham (2002), there are three principles for Building Ecology (Figure 2.3):

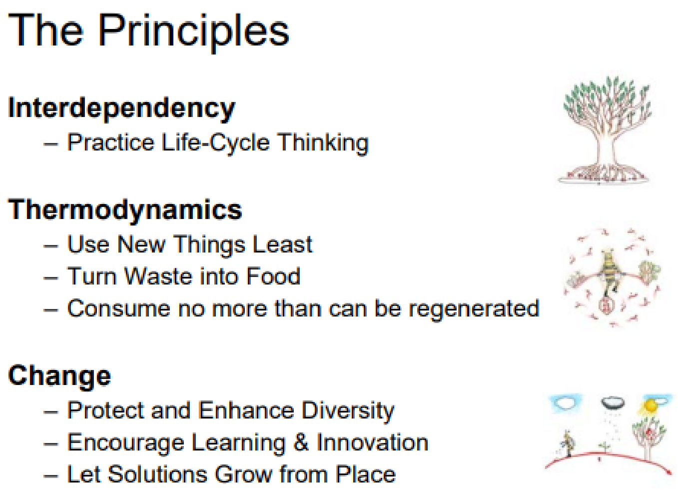


Figure 2.3: The Principles of Building Ecology.

There is interconnectedness among all elements in the built environment and the natural world. The relationships and dependencies between buildings, ecosystems, and human activities should be taken into account. These relationships have profound effects on people's lives, the integrity of the built structures, and the health of the surrounding natural environment. The well-being of individuals is interconnected with the well-being of others and the overall ecological equilibrium (Graham, 2005). Ways to create a harmonious relationship between buildings and nature must be found in order to design and construct buildings that are mutually beneficial and life-supporting.

Furthermore, Hal Levin, is a Research Architect, “coined the term ‘building ecology’ in the late 1970s (first published an article by that title in 1981), focusing on the dynamic and interdependent relationships between buildings, their occupants, and the larger environment” (URL-5)

Hal Levin, focuses on creating buildings that are not only energy-efficient but also promote the health and well-being of occupants while minimizing their environmental impact. This approach considers the interrelationships between buildings, ecosystems, and human health, seeking to create a sustainable built environment that supports ecological balance and resilience.

> “A healthy building is one that adversely affects neither the health of its occupants nor the larger environment. The construction, operation, use, and ultimate disposition of a building must have minimal adverse effects on the natural environment or ultimately it will adversely affect people whether indoors or out. Buildings are healthy only if their effects on their occupants and the larger environment are benign.” (Levin, 1995)

Building Biology and Ecology Institute (YBE) defines Building Ecology as follows: Building Ecology examines the relationships between buildings and the natural ecosystem and explores how architecture should be. Within the discipline of Building Ecology, the environmental impacts of the construction sector, ranging from the embedded energy consumed in building construction to carbon footprint, operational cycles, and recycling performance, are studied. The discipline of "building ecology" also encompasses the integration of nature-conserving performances(Akman, n.d.).

2.3.4 Building biology

Over the years, people have produced caves or shelters in the natural environment to meet their shelter needs. Then they started to create the built-environment by producing buildings, and with the increase in the built environment, unhealthy environments and pollution started to occur both inside and outside the building.

This complex relationship between human, building and environment has interrupted the most basic function of the building, providing a healthy environment for a healthy life to its occupants. The demand for creating healthy constructions underscores the requirement for a scientific investigation that encompasses the building itself, its surroundings, and its occupants, while also identifying the interconnections among them. Research in this field, known as 'building biology' originated several years ago in certain Western European nations. (Balanlı & Öztürk, 2006)

Dr. Hubert Palm, a German medical doctor, conceptualized the idea of building biology in the 1960s. This pioneering concept for ecological architecture led to the emergence of architectural movements and organizations in the field of building biology in southern Germany in the 1970s. Notably, the Architecture & Environment Association (B.A.U.) and the Building Biology & Architecture Association (BAB) were among the first organizations in this region. These organizations are recognized as the precursor institutions to the present-day German Institute for Building Biology & Ecology (IBN) (Akman, n.d.). Schneider who is the founder of The Institute of Building Biology + Sustainability IBN mentioned that "Building biology is the study of the holistic relationships between humans and their built environment. The aim is to create a healthy, natural, sustainable, and beautifully designed living and working environment." (Schneider, n.d.)

It was founded by And Akman, the Building Biology and Ecology Institute (YBE), which is the Turkish partner of the Building Biology Institute. In particular, it has a perspective that includes examining the effects of buildings on people and the environment and interventions that can be made against these effects. This institute aims to establish the balance between building-nature and people by producing principles to be applied in the production of the built environment and principles and understandings that do not endanger human health, but also minimize the impact on the natural environment.

There are 25 basic principles of Building Biology and within the framework of these principles, Institutes provide consultancy services all over the world. In order to set an example in Turkey, Kadıovacık Biohouse was built by And Akman by considering all these principles. The principles of Building Biology will be examined in detail in the following sections. These principles cover both the effects of buildings on the user and the effects of the building on the ecosystem.

Building biology is defined as "a scientific field that tries to prevent negative effects on people's lives by determining the relationships between the building, its environment and its users, and also determines and controls the rules that will guide the design, construction and use of buildings"(Balanlı & Öztürk, 1995b).

The approach examines the interaction between the built environment and humans, aiming to create a healthy building. A healthy building is achieved through harmonious integration with both its surroundings and its occupants.

Building biology principles take into account many principles, including indoor air quality, exposure to natural light, electromagnetic radiation, building materials, and the overall ecological impact of construction. Building biology seeks to create, construct and maintain structures that support the physical, mental and emotional well-being of building occupants by promoting environmentally friendly and sustainable techniques. Building biology can be understood as the interaction between living and non-living spaces in the environment, which includes all the relationships between buildings and people (Balanlı & Öztürk, 1995a). Producing healthy buildings is crucial for the holistic practice of ecological architecture.

2.4 Regenerative Architecture

The root word "regenerative" consists of "re-" meaning "again" and "generate" meaning "to bring into existence." Thus, the fundamental meaning of the word "regenerative" is "the capacity required to bring something back into existence." (Samancı, 2015)

Regenerative design is an important concept for the modern world, offering an approach that advances environmental sustainability even further. This design philosophy argues that built environments should not only refrain from harming the environment but actively improve it. It carries the goal of creating a healthier world for future generations, not just solving current issues.

Understanding the differences between regenerative design and sustainable design is crucial. Sustainable architecture limits resource usage (net-zero), while regenerative design aims to renew resources. Regenerative architecture requires a forward-thinking approach. Beyond sustainable design, regenerative buildings aim to reverse ecological damage and have a positive impact on the natural environment (net-positive). This approach necessitates architects to think not only about reducing resources but also about design strategies that regenerate and recover resources.

Regenerative design is an approach to designing systems that aim to be more efficient, robust, and beneficial for all living organisms compared to the systems they replace. It's a comprehensive design philosophy that considers how all living systems are interconnected. (Du Plessis & Hes, 2014)

According to Du Plessis ,who is the expert in Regenerative design, (Du Plessis, 2022) Regenerative design have three main goals:

- The primary goal of regenerative design is to revitalize ecosystems and urban neighborhoods, fostering the emergence of new, complex ecosystems that enhance urban biodiversity and the ecological foundation of cities.
- Beyond ecological aspects, regenerative design aims to enrich social and cultural systems, giving back more than what is taken, not only in material or resource terms but also by empowering the various aspects of human systems through contributive practices that enhance the well-being and healthy functioning of the social-ecological system.
- Regenerative design's ultimate objective is to create connections, reconnecting humans with nature, forging bonds among individuals within their communities, and facilitating connections among various communities of life, both within and outside urban environments.

At the core of regenerative design lies a perspective that acknowledges the complex interdependence of all forms of life. This necessitates treating components as part of a whole rather than in isolation during the design process. For instance, a building project encompasses not only the building itself but also its energy consumption, water cycle, and vegetation. This requires the design to consider the entire ecosystem rather than solely focusing on the physical environment.

A regenerative building and regenerative design process should not only improve but enhance the surrounding natural environment by increasing the quality of life of the biotic and abiotic components of the environment.(Brown, 2018) Regenerative design draws inspiration from the workings of nature and aims to apply the principles of natural systems to the built environment. While structures aim to strengthen local ecosystems and enhance biodiversity, this approach ensures that constructed environments serve as a tool not only to meet their own needs but also to enhance nature. Regenerative architecture goes beyond sustainable design by aiming to reverse damage to the natural environment and leave a positive impact on the environment. Buildings are viewed as part of the environment and function as part of a larger ecosystem by producing and sharing resources. A system thinking approach is adopted in the design process and innovative solutions are developed by taking inspiration from nature. This approach ensures that the construction industry has the potential to not only “do less bad” but also “do good”, aiming to effectively combat the climate and biodiversity crises. (Gattupalli, 2023)

2.5 Nature-Integrated Architecture

The concept of sustainable architecture has become quite popular in today's world. The word 'sustainability' implies the continuation of life, and sustainable architecture aims to minimize the environmental impact of buildings while also striving to use energy resources at a minimum level. Thus, the goal is for buildings to sustain themselves and be referred to as net-zero buildings by annually zeroing out energy consumption.

Ecological architecture and regenerative architecture represent more comprehensive and forward-thinking approaches than sustainable architecture. These concepts take the principles of sustainable architecture to the next level, taking into account not only minimizing damage to the environment, but also actively contributing to the improvement of the environment.

When ecological and regenerative architecture is examined in detail, it is seen that these concepts provide valuable information about the features that a building should contain in order to be truly an integral part of nature. Their purpose goes beyond the concept of building existing in a self-sustaining cycle; The idea is emerging that buildings should play an active and positive role in enhancing nature, supporting ecosystems and improving the overall environment.

According to this view, it is argued that tackling global challenges is not only necessary by reducing negative impacts on the environment, but also by buildings that actively develop and improve nature. Therefore, ecological and regenerative architecture encourages thinking beyond sustainability in the traditional sense and adopting a vision where buildings become catalysts for ecological restoration and regeneration. The aim is not just for buildings to minimize harm to the environment, but also to make a positive contribution to the environment. For a building to be a part of nature, it's not enough for it to exist within a self-sustaining cycle; it must also contribute positively to nature, ecosystems, and the environment.

The aim of this study is to examine the qualities that buildings integrated with nature should possess. It has been revealed that ecological and regenerative architecture, by taking sustainable architecture a step further, should have broader qualities for buildings to become integrated with nature. While sustainable architecture generally focuses on the qualities of buildings such as energy, water, material-resource usage, waste management, and indoor air quality, buildings integrated with nature need to have broader qualities that encompass these attributes as well, as indicated by the readings.

These buildings should;

- improve nature,
- enhance biodiversity,
- settle in suitable site,
- increase greenery on the site while primarily preserving existing greenery and habitats.
- have a proportionate scale that is harmonious with their surroundings
- include qualities that enhance their connection with nature.

While exploring the characteristics of buildings that are integrated with nature, especially in the context of sustainability, some leading certification systems, awards, and principles with global validity will be evaluated. The most powerful and well-known tool that identifies itself as the criteria for sustainable architecture, LEED, BREEAM, and YES-TR green building certification systems will be examined to determine whether they truly possess features that integrate nature and the building. The fact that these certifications are score-based and the most highly regarded systems worldwide actually demonstrates that they are marketing tools. In the field of sustainability, while seeking to discover the extent to which these green building certification systems with such global validity are connected to the criteria that link nature and the building, deficiencies in this field will also be highlighted, and the qualities that a building in harmony with nature should have will be discussed. All of these discussions will be guided by the conceptual framework. Ecological and regenerative architecture approaches aim to integrate buildings with nature, so it is crucial to understand how the most widely recognized certification systems in the world perceive the nature-building relationship.

3. EXAMINING GREEN BUILDING CERTIFICATIONS AND SUSTAINABILITY PRINCIPLES

Global problems such as climate crises, inefficient use of energy resources, and uncontrolled urbanization have made it inevitable for the construction and building sector to adopt new approaches. In contrast to traditional architectural and construction practices, a design approach that is sensitive to nature, and respectful to the environment, ecology, and human beings has begun to emerge. Within the scope of sustainable architecture, numerous certification systems have been developed to promote the production and design of sustainable, green, and environmentally friendly buildings. There are several valid score-based certification systems implemented by various organizations worldwide. This thesis will examine three different green building certification systems. LEED (Leadership in Energy and Environmental Design) is developed by the U.S. Green Building Council (USGBC), BREEAM (Building Research Establishment Environmental Assessment Method) is developed by the Building Research Establishment (BRE) in the United Kingdom. YeS-TR (Yeşil Sertifika Sistemi) is developed by the Turkish Ministry of Environment, Urbanization, and Climate Change. The reason for examining three green building certification programs from the United States, United Kingdom and Turkey is to compare the methods used in various parts of the world.

LEED, BREEAM, and YES-TR green building certification systems are based on a scoring approach associated with specific criteria and standards related to sustainability, energy and water efficiency, material and resource use, indoor air quality, and other factors. Buildings earn certain points by meeting these criteria, and the total score determines the level of certification they will achieve. As the score increases, the building's certification level also rises.

The fact that the three certification systems serve as marketing tools and employ scoring systems is actually contrary to ecological and regenerative architecture. While buildings earn points for meeting the criteria in green building assessment systems, the real connection of that building with its environment is often questioned. Having features such as minimal energy usage and the use of environmentally friendly materials may make a building sustainable and minimize its impact on the environment. However, what contributions and improvements does that building truly make to nature? The extent to which sustainable green building certification systems address and prioritize the 'natural' aspect is a question that needs to be answered. The lack of close alignment between certification systems and being in harmony with nature, as well as substantial criticism from many experts, arises as a result. Buildings can accumulate points and attain certification by fulfilling specific criteria, but what is the actual contribution of these buildings to nature? Or, due to their focus on certification, their contribution to sustainability remains somewhat ambiguous. “A low score obtained from one category can be compensated by a higher score in other categories to certify the building as environmentally sensitive. A good or a very good label does not mean that the building pushes the edge towards an environmental project” (Ruhi Sipahioğlu, 2012)

The main aim of examining the LEED, BREEAM, and YES-TR green building certification systems is to be able to draw conclusions from the criteria of leading certification systems in the field of 'sustainability,' which are so popular and widely recognized. These systems have been selected for use as a kind of library. It is acknowledged that they have shortcomings in terms of the relationship between nature and buildings, but at the same time, they possess criteria that minimize harm to nature. By tabulating the criteria that are common and non-common to the three certification systems, a discussion will be formed regarding the qualities that constitute a building's integration with nature.

In addition to the scoring system, narrative and holistic principles defined by leading organizations will also be examined. One of them is the evaluation checklist used by the Committee on the Environment (COTE) of the American Institute of Architects (AIA) to select the most innovative and sustainable buildings each year. The second one is the principles adopted by the Institute of Building Biology + Sustainability (IBN) based in Germany and present in many countries, especially in Turkey. While certification systems approach building analysis quantitatively, narrative evaluations such as AIA's sustainable building award criteria and Building Biology principles focus on a broader and more holistic perspective, considering aspects like design quality, community connection, and integrated into the natural environment. AIA's award criteria evaluate how sustainable design is integrated with excellence, while

Building Biology principles assess aspects related to indoor environmental quality, health, and harmony with the natural environment. These principles play an important role in evaluating the ecological performance of projects with a more in-depth and holistic perspective, not just scoring-based criteria.

The purpose of examining the AIA COTE TOP TEN Awards in addition to certification systems is, once again, for the sustainability awards given by a leading organization in the field to possess more comprehensive and strong connections with nature compared to certification systems. Unlike a scoring system, this award system, which has more narrative features and criteria, also includes evaluation criteria related to a building's connection with nature, in addition to its sustainable qualities. A detailed examination of all these evaluation criteria will expose the shortcomings in certification systems while helping us understand what qualities a building integrated with nature should have.

Finally, by examining the Building Biology Principles of the Institute of Building Biology, the relationship between the user and the built environment will be explored. Building biology principles have principles that care about the impact of the building on user health while also having qualities that include the impact of the building on its surroundings and the ecosystem. Thus, it ensures a more holistic understanding. It is important to examine these principles, especially for strengthening the relationship between nature and the building, so that it can guide what qualities buildings that are in harmony with nature should have.

In addition to examining the three certification systems, the criteria that a building must have to minimize its impact on nature will be determined. More importantly, it will be evaluated whether they have or lack criteria that involve the relationship between nature and the building. Then, as a result of examining the AIA COTE TOP TEN Awards and Building Biology Principles, an evaluation will be made regarding what qualities a nature-integrated building should have to go beyond self-sufficiency, provide a positive contribution to nature, and improve it.

3.1 LEED BD+C New Construction v.4.1

"LEED (Leadership in Energy and Environmental Design), developed by the U.S. Green Building Council (USGBC) in 1998, is a third-party green building certification program and the globally recognized standard for the design, construction and operation of high-performance green buildings and neighborhoods. The rating system approach focuses on efficiency and leadership to deliver the triple bottom line returns of "people, planet and profit."”(URL-6). LEED is the most widely used green building certification program in the world. There are more than 100,000 LEED certified buildings in more than 160 countries. LEED certificate is valid for all kinds of buildings and building phases, certification can be made from different categories. These are: LEED for Building Design and Construction, LEED for Operations and Maintenance, LEED for Interior Design and Construction, LEED for Building Design and Construction, LEED for Neighborhood Development. (URL-6) These categories are again divided into categories within themselves.

For example; LEED for Building Design and Construction:

BD+C: New Construction, BD+C: Core and Shell

BD+C: Data Centers, BD+C: Healthcare

BD+C: Hospitality, BD+C: Retail

BD+C: Schools

It consists of BD+C: Warehouses and Distribution Centers categories.

As it is understood, the LEED Certificate is quite comprehensive and can be used for any type of structure. Within the scope of this study, LEED for Building Design and Construction: New Construction criteria will be examined. These criteria are called LEED V4.1 BD+C for short and table generated according to data. (Table 3.3) Certification is based on a point system and each category/ sections and credits have points. These criteria cover a wide range of topics mostly related to sustainability. In order to get a certification, the project must meet the required criteria while earning points. LEED V.4.1 BD+C has 6 main categories and 2 additional categories (Table 3.1) and explanations of each category given in table (Table 3.2)

Table 3.1: LEED BD+C New Construction v.4.1 Categories.

	LEED v.4.1 BD+C Categories
1.	Location and transportation
2.	Sustainable sites
3.	Water efficiency
4.	Energy and atmosphere
5.	Materials and resources
6.	Indoor environmental quality
7.	Innovation (additional)
8.	Regional priority (additional)

The total score of 6 main and 2 additional categories in LEED is 110. (Figure 3.1) Regional priority and innovation categories qualify as additional points, and the sum of the two is 10 points. There are 4 different degrees that the buildings can get with the points they collect. These are 'certified', 'silver', 'gold' and platinum. (Figure 3.2)

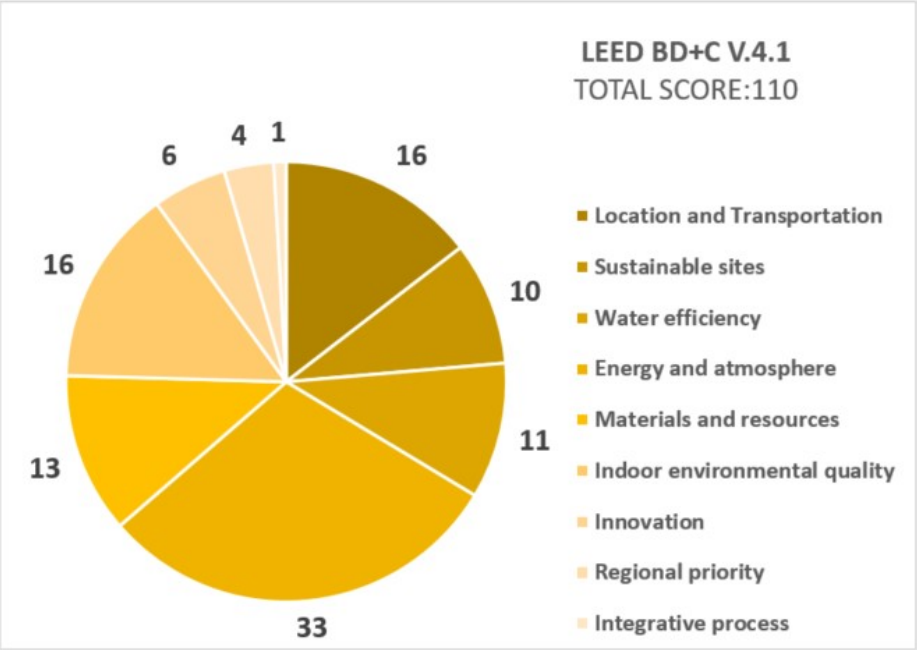


Figure 3.1: LEED BD+C v.4.1 Category score graph.

Table 3.2: LEED V.4.1 BD + C (Anh, 2013)

LEED BD+C New Construction v.4.1	
LOCATION AND TRANSPORTATION	The Location and Transportation (LT) category rewards thoughtful decisions about building location, with credits that encourage compact development, alternative transportation, and connection with amenities, such as restaurants and parks.
SUSTAINABLE SITES	The Sustainable Sites (SS) category rewards decisions about the environment surrounding the building, with credits that emphasize the vital relationships among buildings, ecosystems, and ecosystem services. It focuses on restoring project site elements, integrating the site with local and regional ecosystems, and preserving the biodiversity that natural systems rely on.
INTEGRATIVE PROCESS	Integrative Process (IP) category requires early analysis of energy, site, and water systems to inform design .By promoting this analysis before the completion of schematic design, LEED v4 encourages the exploration of sustainable design, constructio,n and ongoing operations at project inception, rather than on the construction site or during occupancy when changes become increasingly expensive and complex.
WATER EFFICIENCY	The Water Efficiency (WE) section addresses water holistically, looking at indoor use, outdoor use, specialized uses, and metering. The section is based on an "efficiency first" approach to water conservation. As a result, each prerequisite looks at water efficiency and reductions in potable water use alone. Then, the WE credits additionally recognize the use of nonpotable and alternative sources of water
ENERGY AND ATMOSPHERE	The Energy and Atmosphere (EA) category approaches energy from a holistic perspective, addressing energy use reduction, energy-efficient design strategies, and renewable energy sources
MATERIALS AND RESOURCES	The Materials and Resources (MR) credit category focuses on minimizing the embodied energy and other impacts associated with the extraction, processing, transport, maintenance, and disposal of building materials. The requirements are designed to support a life-cycle approach that improves performance and promotes resourceefficiency. Each requirement identifies a specific action that fits into the larger context of a life-cycle approach to embodied impact reduction
INDOOR ENVIRONMENTAL QUALITY	The Indoor Environmental Quality (EQ) category rewards decisions made by project teams about indoor air quality and thermal, visual, and acoustic comfort. Green buildings with good indoor environmental quality protect the health and comfort of building occupants. High-quality indoor environments also enhance productivity, decrease absenteeism, improve the building's value, and reduce liability for building designers and owners.This category addressess the myriad design strategies and environmental factors—air quality, lighting quality, acoustic design,control over one's surroundings—that influence the way people learn, work, and live.
INNOVATION	Sustainable design strategies and measures are constantly evolving and improving. New technologies are continuallyintroduced to the marketplace, and up-to-date scientific research influences building design strategies. The purposeof this LEED category is to recognize projects for innovative building features and sustainable building practices andstrategies
REGIONAL PRIORITY	To provide an incentive for the achievement of credits that address geographically specific environmental, social equity, and public health priorities

Table 3.3: LEED BD+C v.4.1 Checklist. (Anh, 2013)

LEED V4.1 BD+C		
CREDITS	**CHECKLIST**	**SCORE (POINTS)**
IP	Integrative Process	**1**
	Location and Transportation	**16**
LT 01	Sensitive Land Protection	1
LT 02	High Priority Site and Equitable Development	2
LT 03	Surrounding Density and Diverse Uses	5
LT 04	Access to Quality Transit	5
LT 05	Bicycle Facilities	1
LT 06	Reduced Parking Footprint	1
LT 07	Electric Vehicles	1
	Sustainable Sites	**10**
SS P1	Construction Activity Pollution Prevention	Required
SS 01	Site Assessment	1
SS 02	Protect or Restore Habitat	2
SS 03	Open Space	1
SS 04	Rainwater Management	3
SS 05	Heat Island Reduction	2
SS 06	Light Pollution Reduction	1
	Water Efficiency	**11**
WE P1	Outdoor Water Use Reduction	Required
WE P2	Indoor Water Use Reduction	Required
WE P3	Building-Level Water Metering	Required
WE 01	Outdoor Water Use Reduction	2
WE 02	Indoor Water Use Reduction	6
WE 03	Optimize Process Water Use	2
WE 04	Water Metering	1
	Energy and Atmosphere	**33**
EA P1	Fundamental Commissioning and Verification	Required
EA P2	Minimum Energy Performance	Required
EA P3	Building-Level Energy Metering	Required
EA P4	Fundamental Refrigerant Management	Required
EA 01	Enhanced Commissioning	6
EA 02	Optimize Energy Performance	18
EA 03	Advanced Energy Metering	1
EA 04	Grid Harmonization	2
EA 05	Renewable Energy	5
EA 06	Enhanced Refrigerant Management	1
	Materials and Resources	**13**
MR P1	Storage and Collection of Recyclables	Required
MR 01	Building Life-Cycle Impact Reduction	5
MR 02	Environmental Product Declarations	2
MR 03	Sourcing of Raw Materials	2
MR 04	Material Ingredients	2
MR 05	Construction and Demolition Waste Management	2
	Indoor Environmental Quality	**16**
IEQ P1	Minimum Indoor Air Quality Performance	Required
IEQ P2	Environmental Tobacco Smoke Control	Required
IEQ 01	Enhanced Indoor Air Quality Strategies	2
IEQ 02	Low-Emitting Materials	3

Table 3.3: continued

IEQ 03	Construction Indoor Air Quality Management Plan	1
IEQ 04	Indoor Air Quality Assessment	2
IEQ 05	Thermal Comfort	1
IEQ 06	Interior Lighting	2
IEQ 07	Daylight	3
IEQ 08	Quality Views	1
IEQ 09	Acoustic Performance	1
	Innovation	**6**
IN 01	Innovation	5
IN 02	LEED Accredited Professional	1
	Regional Priority: Specific Credit	**4**
RP 01	Regional Priority: Specific Credit	1
RP 02	Regional Priority: Specific Credit	1
RP 03	Regional Priority: Specific Credit	1
RP 04	Regional Priority: Specific Credit	1
TOTALS		**110**
Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110		

Figure 3.2: LEED Certification values. URL-7

3.2 BREEAM International New Construction v.6.0

Building Research Establishment Environmental Assessment Method, also known as BREEAM, is another well-known and applied green building certification and rating system. It was created in 1990 by the Building Research Establishment (BRE) in the United Kingdom and has now spread to a number of other nations.

Similar to LEED, BREEAM seeks to evaluate and certify a building's performance in terms of sustainability across a number of criteria. According to the building's intended function and the various nations, the BREEAM Certification system offers numerous schemes like that:

1. BREEAM New construction
2. BREEAM Refurbishment and fit-out
3. BREEAM In-use

4. BREEAM Communities
5. BREEAM Infrastructure
6. Home Quality Mark

Moreover, these categories standards are varied according to the location. Some countries have their own BREEAM standards. In this study, the standards of BREEAM International New Construction – V.6.0 will be examined, so that it will be easier to compare with other certificate programs. A table has been created according to the main and sub-headings of BREEAM. (Table 3.6)

It has 10 main categories (Table 3.4) and explanations of each category given in table. (Table 3.5)

Table 3.4: Breeam International New Construction v.6 Categories.

	BREEAM NC v.6 Categories
1.	Management
2.	Health and Wellbeing
3.	Energy
4.	Transport
5.	Water
6.	Materials
7.	Waste
8.	Land use and Ecology
9.	Pollution
10.	Innovation (additional)

Table 3.5: Breeam International New Construction v.6 Categories. (BREEAM International New Construction, 2021)

BREEAM International New Construction v.6	
TRANSPORT	This category encourages better access to sustainable means of transport for building users. Issues in this section focus on the accessibility of public transport and other alternative transport solutions (cyclist facilities, provision of amenities local to a building) that support reductions in car journeys and, therefore, congestion and CO_2 emissions over the life of the building.
LAND USE AND ECOLOGY	This category encourages sustainable land use, habitat protection and creation, and improvement of long term biodiversity for the building's site and surrounding land. Issues in this section relate to the reuse of brownfield sites or those of low ecological value, mitigation and enhancement of ecology and long term biodiversity management.
MANAGEMENT	This category encourages the adoption of sustainable management practices in connection with design, construction, commissioning, handover and aftercare activities to ensure that robust sustainability objectives are set and followed through into the operation of the building. Issues in this section focus on embedding sustainability actions through the key stages of design, procurement and initial occupation from the initial project brief stage to the appropriate provision of aftercare.
WATER	This category encourages sustainable water use in the operation of the building and its site. Issues in this section focus on identifying means of reducing potable water consumption (internal and external) over the lifetime of the building and minimising losses through leakage.
ENERGY	This category encourages the specification and design of energy efficient building solutions, systems and equipment that support the sustainable use of energy in the building and sustainable management in the building's operation. Issues in this section assess measures to improve the inherent energy efficiency of the building, encourage the reduction of carbon emissions and support efficient management throughout the operational phase of the building's life.
MATERIALS	This category encourages steps taken to reduce the impact of construction materials through design, construction, maintenance and repair. Issues in this section focus on the procurement of materials that are sourced in a responsible way and have a low embodied impact over their life including extraction, processing and manufacture, and recycling.
HEALTH AND WELL BEING	This category encourages the increased comfort, health and safety of building occupants, visitors and others within the vicinity. Issues in this section aim to enhance the quality of life in buildings by recognising those that encourage a healthy and safe internal and external environment for occupants.
INNOVATION	The innovation category provides opportunities for exemplary performance and innovation to be recognised that are not included within, or go beyond the requirements of the credit criteria. This includes exemplary performance credits, for where the building meets the exemplary performance levels of a particular issue.
WASTE	This category encourages the sustainable management (and reuse where feasible) of construction and operational waste and waste through future maintenance and repairs associated with the building structure. By encouraging good design and construction practices, issues in this section aim to reduce the waste arising from the construction and operation of the building, encouraging its diversion from landfill. It includes recognition of measures to reduce future waste as a result of the need to alter the building in the light of future changes to climate.
POLLUTION	This category addresses the prevention and control of pollution and surface water run-off associated with the building's location and use. Issues in this section aim to reduce the building's impact on surrounding communities and environments arising from light pollution, noise, flooding and emissions to air, land and water.

BREEAM encompasses ten different categories, each assigned a specific percentage, which may vary across countries. The combined percentage of these categories totals 110%. (Figure 3.3) Similarly to LEED certification, the Innovation category is an additional and weighs 10 percent. There are different degrees of certification based on the BREEAM percentage score. These are 'pass', 'good', 'very good', 'excellent' and, 'outstanding'. (Figure 3.4)

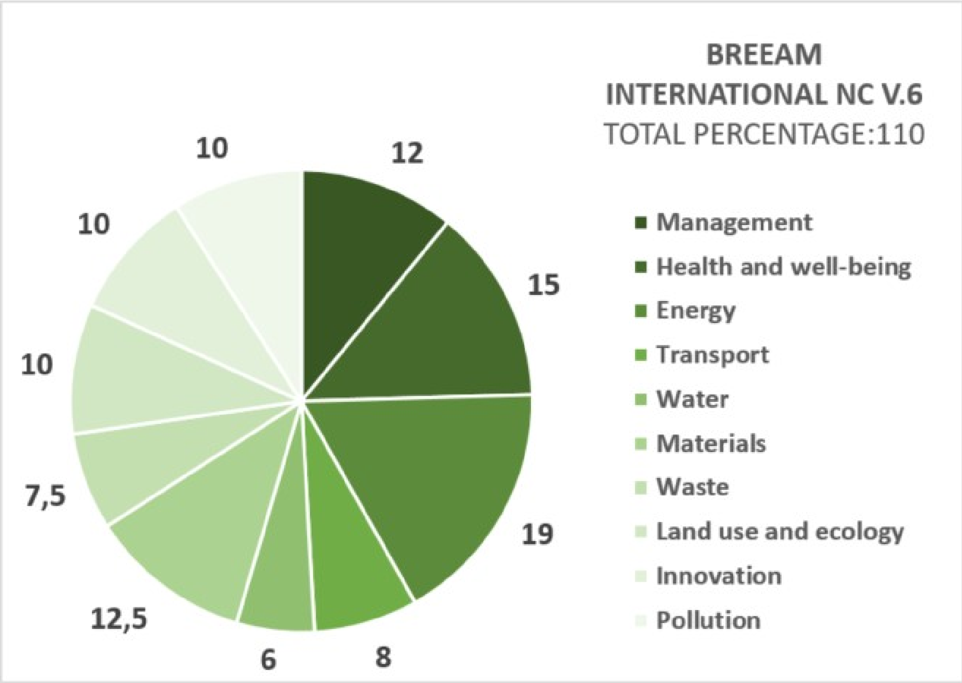


Figure 3.3: Breeam International N.C. v.6 Category score graph.

Table 3.6: Breeam International New Construction v.6 Checklist. (BREEAM International New Construction, 2021)

BREEAM INTERNATIONAL NEW CONSTRUCTION v.6		
CREDITS	**CHECKLIST**	**PERCENTAGE**
	Management	**12**
Man 01	Project brief and design	
Man 02	Life cycle cost and service life planning	
Man 03	Responsible construction practices	
Man 04	Commissioning and handover	
Man 05	Aftercare	
	Health and Wellbeing	**15**
Hea 01	Visual comfort	
Hea 02	Indoor air quality	
Hea 03	Safe containment in laboratories	
Hea 04	Thermal comfort	
Hea 05	Acoustic performance	
Hea 06	Accessibility	
Hea 07	Hazards	
Hea 08	Private Space	
Hea 09	Water quality	
	Energy	**19**
Ene 01	Reduction of energy use and carbon emissions	
Ene 02a	Energy monitoring	
Ene 02b	Energy monitoring	
Ene 03	External lighting	
Ene 04	Low carbon design	
Ene 05	Energy efficient cold storage	
Ene 06	Energy efficient transport systems	
Ene 07	Energy efficient laboratory systems	
Ene 08	Energy efficient equipment	
Ene 09	Drying space	
Ene 10	Flexible demand side response	
	Transport	**8**
Tra 01	Public transport accessibility	
Tra 02	Proximity to amenities	
Tra 03	Alternative modes of transport	
Tra 04	Maximum car parking capacity	
Tra 05	Travel plan	
Tra 06	Home office	
	Water	**6**
Wat 01	Water consumption	
Wat 02	Water monitoring	
Wat 03	Water leak detection and prevention	
Wat 04	Water efficient equipment	
	Materials	**12,5**
Mat 01	Life cycle impacts	
Mat 02	Hard landscaping and boundary protection	
Mat 03	Responsible sourcing of construction products	
Mat 04	Insulation	
Mat 05	Designing for durability and resilience	

Table 3.6: continued

Mat 06	Material efficiency	
	Waste	**7,5**
Wst 01	Construction waste management	
Wst 02	Recycled aggregates	
Wst 03	Operational waste	
Wst 04	Speculative finishes	
Wst 05	Adaptation to climate change	
Wst 06	Functional adaptability	
	Land use and ecology	**10**
LE 01	Site selection	
LE 02	Ecological value of site and protection of ecological features	
LE 03	Minimising impact on existing site ecology	
LE 04	Enhancing site ecology	
LE 05	Long term impact on biodiversity	
	Pollution	**10**
Pol 01	Impact of refrigerants	
Pol 01	NOx emissions	
Pol 03	Surface water run-off	
Pol 04	Reduction of night time light pollution	
Pol 05	Reduction of noise pollution	
	Innovation	**10**
Inn 01	Innovation	10
TOTALS		**110**
Unclassified < 30 **Pass** ≥ 30 **Good** ≥ 45 **Very Good** ≥ 55 **Excellent** ≥ 70 **Outstanding** ≥ 85		

BREEAM rating		% score
Outstanding	★★★★★	≥85
Excellent	☆★★★★	≥70
Very good	☆☆★★★	≥55
Good	☆☆☆★★	≥45
Pass	☆☆☆☆★	≥30
Unclassified	☆☆☆☆☆	<30

Figure 3.4: Breeam ratings. URL-8

3.3 YES-TR – New Construction v.1

There are many internationally recognized certification systems for sustainable buildings and settlements, including LEED and BREEAM. These systems are actively used in Turkey, and the Ministry of Environment and Urbanization has developed a national certification system, the National Green Certificate System (YeS-TR), to disseminate energy efficient, environmentally friendly building and settlement practices at national and local levels.

YeS-TR is based on the internationally recognized certification systems, and it evaluates and certifies buildings and settlements that are compatible with nature, suitable for climate data and the region, consume as much energy and water as needed, use renewable energy resources, and are designed with a holistic approach. The evaluation and certification process began in 2023, and a national evaluation guide has been created that includes two separate criteria systems: building and campus. Within the scope of this study, building (new construction) criteria will be examined. (Table 3.9)

It has 6 main categories (Table 3.7) and explanations of each category given in table. (Table 3.8)

Table 3.7: YES-TR New Construction v.1 Categories

	YES-TR NC v.1 Categories
1.	Integrated Building Design, Construction and Management
2.	Indoor environment quality
3.	Materials and Life Cycle
4.	Energy
5.	Water and Waste
6.	Innovation (Bonus category)

Table 3.8: YES-TR New Construction v.1 Categories. (TC. Çevre ve Şehircilik Bakanlığı, n.d.)

YES-TR New Construction v.1	
INTEGRATED BUILDING DESIGN, CONSTRUCTION AND MANAGEMENT	The general purpose of the BBT module is to ensure that both new and existing buildings to be built with the goal of sustainable green buildings; by creating an integrated project delivery process with the participation of all project stakeholders, where the entire system and process is planned from the beginning of the project; is to ensure that it is designed, constructed and managed in accordance with performance expectations.
WATER AND WASTE	The general purpose of the SAY module; Ensuring sustainable and effective use of water in buildings and taking into account the evaluation of alternative water resources (such as rain water, gray water). In addition, ensuring the separate collection of wastes originating from houses in buildings, planning and implementation of their management; to increase awareness, efficiency, productivity and satisfaction on the subject.
ENERGY	The general purpose of the EKV module is to design new buildings and renovate existing buildings; to ensure that measures to improve building energy performance are included. For this purpose; It is aimed to optimize the use of energy in buildings by reducing the energy need of buildings, using energy effectively and evaluating solutions for the use of renewable energy sources, and making use of appropriate resources.
MATERIALS AND LIFECYCLE	The purpose of the 'Construction Material and Life Cycle Assessment' is to determine and present the criteria that will minimize the environmental impact of the materials to be used in the realization of sustainable buildings. These criteria generally aim to reduce the use of exhaustible and non-renewable natural resources, to reduce all kinds of solid, liquid and gaseous wastes that are released as a result of technological and industrial production processes and mix with air, soil and water, and to eliminate the negative effects on human health in the buildings where the selected materials are applied.
INDOOR ENVIRONMENTAL QUALITY	The general purpose of the IOC main module; In addition to providing health and comfort for users through passive (such as natural lighting, natural ventilation, passive air conditioning, architectural acoustics) and active systems (such as artificial lighting, active ventilation, heating systems) by including evaluations and measures aimed at improving visual, auditory, thermal comfort conditions and indoor air quality in the design process; to increase awareness, efficiency, productivity and satisfaction on the subject.
INNOVATION	In the INO module; It aims to encourage all innovative or remedial practices that increase environmental and vital quality, target a conscious building user profile, and include solutions and trainings for raising consumer awareness.

A table consisting of main categories and sub-criteria has been prepared. (Table 3.8) There are certain percentages allocated to each category, and certification grades are calculated based on the percentages collected by buildings. Total percentage is 110. (Figure 3.5) The YeS-TR certification system aims to create certificates in "pass," "good," "very good," and "national superiority" certificate degrees for sustainable green buildings and green settlements. (Figure 3.6) The system is a valuable tool for promoting sustainable building practices in Turkey, and it has the potential to make a positive impact on the environment.

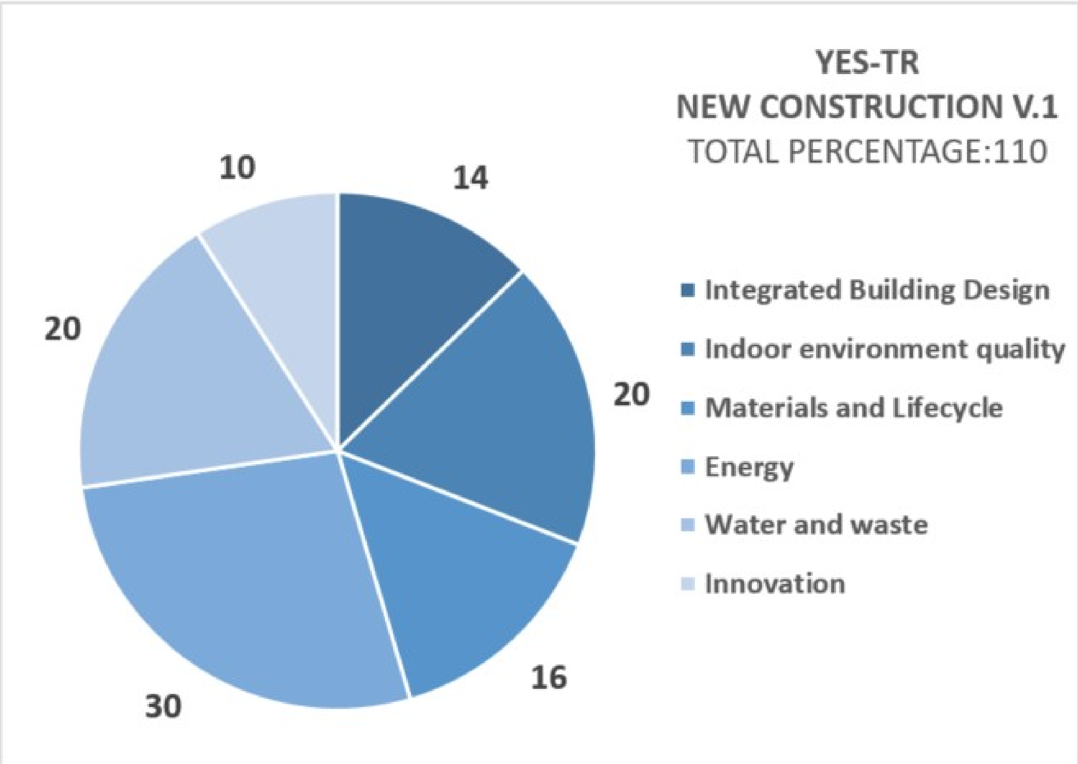


Figure 3.5: YES-TR New Construction v.1 Category score graph.

Table 3.9: YES-TR New Construction v.1 Checklist. (TC. Çevre ve Şehircilik Bakanlığı, n.d.)

YES-TR		
CREDITS	**CHECKLIST**	**PERCENTAGE**
	Integrated Building Design, Construction and Managemer	**14**
BBT 01	Project management	
BBT 02	Integrated design	
BBT 03	Preparation of construction documents	
BBT 04	Construction	
BBT 05	Control, commissioning and acceptance	
BBT 06	Operation, maintenance, measurement and facility management	
	Indoor environment quality	**20**
İOK 01	Visual comfort	
İOK 02	Auditory comfort	
İOK 03	Thermal comfort	
İOK 04	Air quality	
	Materials and Life Cycle	**16**
YMD 01	Building material life cycle assessment	
YMD 02	Healthy product notice	
YMD 03	Hazardous radiation emission	
YMD 04	Responsible use of resources	
YMD 05	Local resource use	
YMD 06	Use of reused, remedy or recycled material	
YMD 07	Use of durable material	
	Energy	**30**
EKV 01	Building energy performance	
EKV 02	Renewable energy technologies	
	Water and Waste	**20**
SAY 01	Water management	
SAY 02	Waste management	
	Innovation	**10**
İNO 01	Engineering and design solutions that improve the quality of life	
TOTALS		**110**
Certified: 32 to 40 points, **Good:** 40 to 55 points, **Very Good:** 55 to 75 points, **National Supremacy:** 75 to 110		

CERTIFIED:	GOOD:	VERY GOOD:	NATIONAL SUPREMACY:
32 to 40 points	40 to 55 points	55 to 75 points	75 to 110 points

Figure 3.6: YES-TR Ratings.

3.4 American Institute of Architects: COTE Top Ten Awards Checklist

The American Institute of Architects is a professional organization for architects in the United States and the committee on the Environment presents. The COTE (The Committee on the Environment) Top Ten awards, the industry's best-known award program for sustainable design excellence. U.S licensed architect can enter the competition with completed new buildings, renovations, interior architecture, restorations and urban plans. Projects can be located anywhere in the world. Projects will be evaluated on a broad and inclusive definition of design quality, which takes into account performance, aesthetics, community connection, and resilience as well as environmental stewardship. Each year, ten innovative projects are recognized for their integration of design excellence with environmental performance.(URL-9). Checklist of award (Table 3.11) demonstrates the qualities that sustainable and ecological buildings should have.

It has ten main categories (Table 3.10)

Table 3.10: COTE Top Ten Award Checklist.

	COTE Top Ten Award Checklist
1.	Design for integration
2.	Design for equitable communities
3.	Design for ecosystems
4.	Design for water
5.	Design for economy
6.	Design for energy
9.	Design for well-being
10.	Design for resources

Table 3.11: COTE Top ten awards checklist. (URL-10)

American Institute of Architecture
CHECKLIST
Design for Integration
Good design elevates any project, no matter how small, with a thoughtful process that delivers both beauty and function in balance. It is the element that binds all the principles together with a big idea. What was the concept or purpose behind this project, and how did the priorities within the nine other principles inform the unique approach to this project? How does the project engage the senses and connect people to place? What makes this a project that people will fight to preserve? What design strategies provide multiple benefits across the triple bottom line of social, economic, and environmental value?
Design for Equitable Communities
Design solutions affect more than the client and current occupants. Good design positively impacts future occupants and the larger community. What is the project's greater reach? How does this project contribute to creating a diverse, accessible, walkable, just, and human-scaled community? Who might this project be forgetting? How did the design process and outcome remove barriers and promote inclusion and social equity, particularly with respect to vulnerable communities? What opportunities exist in this project to include, engage, and promote human connection? How does the design support health and resilience for the community during times of need or during emergencies?
Design for Ecosystems
Good design mutually benefits human and nonhuman inhabitants. How does the design support the ecological health of its place over time? How does the design help users become more aware and connected with the project's place and regional ecosystem? How does the design build resilience while reducing maintenance? How is the project supporting regional habitat restoration?
Design for Water
Good design conserves and improves the quality of water as a precious resource. How does the project use water wisely, addressing efficiency and consumption while matching water quality to appropriate use? How do the project's water systems maintain function during emergencies or disruptions? How does the project handle rainfall and stormwater responsibly? How does the project contribute to a healthy regional watershed?
Design for Economy
Good design adds value for owners, occupants, community, and planet, regardless of project size and budget. How does the project provide abundance while living within its means? How do the design choices balance first cost with long-term value? How was the performance of this project improved in ways that were cost and design neutral?
Design for Energy

Table 3.11: continued

Good design reduces energy use and eliminates dependence on fossil fuels while improving building performance, function, comfort, and enjoyment. How do passive design strategies contribute to the project's performance and form? How does the project exceed building code efficiency standards to approach net zero energy and net zero carbon? Is the project powered by clean, renewable energy sources? How does the project provide for continuous performance improvements over its lifetime?
Design for Well-being
Good design supports health and well-being for all people, considering physical, mental, and emotional effects on building occupants and the surrounding community. How does the design encourage a healthy lifestyle? How does the project provide for greater occupant comfort? How is the project welcoming and inclusive for all? How does the project connect people with place and nature? How does material selection reduce hazards to occupants?
Design for Resources
Good design depends on informed material selection, balancing priorities to achieve durable, safe, and healthy projects with an equitable, sustainable supply chain to minimize possible negative impacts to the planet. What factors or priorities were considered in making material selection decisions? How were materials and products selected and designed to reduce embodied carbon and environmental impacts while enhancing building performance? How was material selection used to reduce hazards and support equitable labor practices in the supply chain? How does the project promote zero waste throughout its life cycle? How does the project celebrate local materials and craft? How long will the project last, and how does that affect which materials were chosen?
Design for Change
Adaptability, resilience, and reuse are essential to good design, which seeks to enhance usability, functionality, and value over time. How does the project address future risks and vulnerabilities from social, economic, and environmental change? How is the project designed for adaptation to anticipate future uses or changing markets? How does the project address passive survivability and/or livability?
Design for Discovery
Every project presents a unique opportunity to apply lessons learned from previous projects and gather information to refine the design and construction process. How did the design process foster a long-term relationship between designers, users, and operators to ensure design intentions are realized and the building project performance can improve over time? How were performance data and experiential stories shared, even if the findings fall short of the vision? How were lessons learned through construction administration shared to project teams? What strategies promote a sense of discovery and delight?

This award from the American Institute of Architects is considerably more than a scoring system when compared to three certification programs. In contrast to the previously considered certification schemes, the American Institute of Architects' standards clearly demonstrate a strong human focus. It emphasizes on the occupants' comfort inside the building and the affordances it offers. At the same time, economy, which is not found in three certification systems, is an important principle for this award.

Within the framework of enhancing the ecosystem, which is crucial for ecological architecture, this award system aims to develop a mutually beneficial relationship between human and non-human existence. Therefore, as noted in the study's earlier sections, it highlights the need for ecological architecture to create a harmonious interaction between human nature and building.

3.5 Institute of Building Biology + Sustainability: 25 Principles of Building Biology

As mentioned in the building biology section Institute of Building Biology + Sustainability aims to provide principles to create a holistic approach to building that considers the impact of the built environment on human health and the environment.

It has been deduced that 3 certification systems do not sufficiently address the effects of the built environment on humans. It has been observed that there are some approaches to users in the award system provided by the American Institute of Architects. Unlike all these, it is emphasized that the built environment has significant effects on human life and the environment in the list of 25 principles of building biology revealed by the Building Biology Institute. (Table 3.12) (Table 3.13)

Table 3.12: Principles of Building Biology.

	Principles of Building Biology
1.	Socially Connected and Ecological Sound Communities
2.	Sustainable Environmental Performance
3.	Human-based Design
4.	Thermal and Acoustic Comfort
5.	Healthy Indoor Air

Table 3.13: Principles of Building Biology. (URL-11)

Principles of Building Biology
CHECKLIST
Socially Connected and Ecological Sound Communities
Design the infrastructure for well-balanced mixed-use: short distances to work, shopping, schools, public transit, essential services, and recreation
Create a living environment that meets human needs and protects the environment
Provide sufficient green space in rural and urban residential areas
Strengthen regional and local supply networks as well as self-sufficiency
Select building sites that are located away from sources of contamination, radiation, pollutants, and noise
Sustainable Environmental Performance
Minimize energy consumption and use renewable energy
Avoid causing environmental harm when building new or renovating
Conserve natural resources and protect plants and animals
Connection to nature.
Choose materials and life cycles with the best environmental performance, favoring regional building materials
Provide the best possible quality of drinking water
Human-based Design
Take harmonic proportion and form into consideration
Nurture the sensory perceptions of sight, hearing, smell, and touch
Maximize daylighting and choose flicker-free lighting sources and color schemes that closely match natural light
Base interior and furniture design on physiological and ergonomic findings
Promote regional building traditions and craftsmanship
Thermal and Acoustic Comfort
Strive for a well-balanced ratio between thermal insulation and heat retention as well as indoor surface and air temperatures
Use humidity-buffering materials
Keep the moisture content of new construction as low as possible
Prefer radiant heat for heating
Optimize room acoustics and control noise, including infrasound
Healthy Indoor Air
Supply sufficient fresh air and reduce air pollutants and irritants
Avoid exposure to toxic molds, yeasts, and bacteria as well as dust and allergens
Use materials with a pleasant or neutral smell
Minimize exposure to electromagnetic fields and wireless radiation
Use natural, nontoxic materials with the least amount of radioactivity

When the principles of building biology are examined, it is clear that a healthy indoor climate is essential. Other certification and award systems also emphasize the importance of the interior, but the principles of building biology place a greater emphasis on the precautions that must be taken indoors. For example, it is important to measure for any harmful molds, germs, dust, or electromagnetic waves indoors and build accordingly. Using natural materials is important because it reduces environmental impact, while also improving indoor acoustics and thermal insulation. The harmony of scale and forms is emphasized, as is the importance of the built environment and architecture. At the same time, emphasis is placed on environmental, energy, and water issues. Minimizing energy consumption and using renewable resources are encouraged. Protecting natural resources and the environment is very important. Predicting adequate green spaces in rural and urban settlements is one of the important principles mentioned.

4. FROM THEORY TO PRACTICE: EVALUATING NATURE INTEGRATED BUILDINGS

4.1 Discussion of Nature-Integrated Architecture

The objective is to develop a comprehensive approach towards achieving a state of harmonious integration with nature in the context of buildings, following the evaluation of three distinct green building certification systems, awards, and principles. During the development of this comprehensive approach, the extents of all examined systems will be considered. Both complementary and non-complementary aspects within these systems will be examined, thus enabling the synthesis of an approach guided by the conceptual framework. The goal is to provide interpretations on the qualities believed to be necessary for buildings to be a part of nature.

Two stages have been determined for the deductions to be made. Firstly, the three green building certification systems will be evaluated individually, as they all have scoring systems to assess and certify buildings. Subsequently, the findings from the three green certification systems will be combined with the more qualitative principles and criteria of the AIA COTE Top Ten Awards and Building Biology principles. While examining the three certification systems, tables will be created regarding the criteria that are common or not common in all three. Thanks to these tables created, interpretations will be made especially with the understanding of ecological and regenerative architecture, so that inferences can be made regarding the adequacy of the certification systems for being a nature-integrated building. With these inferences, AIA Cote Top Ten Awards and Building Biology Principles will be evaluated, and finally, as a result of all these evaluations, an approach will be created regarding the qualities that are thought to be within the scope of nature-integrated architecture.

4.1.1 Evaluation of LEED, BREEAM and YES-TR certifications

When examining the common and non-common criteria of LEED, BREEAM and YES-TR certification systems, it is possible to make important inferences. By analyzing the context of: LEED BD+C New Construction v.4.1 scheme, BREEAM

International New Construction v.6 scheme, and YES-TR New Construction v.1 scheme, it has been found that all three systems share common main category headings. However, it was concluded that some main categories are not common across all three systems. A table was created by comparing the main category headings, allowing the identification of the categories that are common in the three certification systems. Despite differences in category names, categories that have similar content were paired across the systems. As a result, a final list of main category headings that are common to all three systems was created. (Table 4.1) The definitions of these main category headings were developed through content analysis of the three certification systems. Main categories: (1) Management, (2) Land Use, Site, and Transportation, (3) Water, (4) Energy (5) Material Resources and Waste, (6) Indoor Environment and Well-being, and (7) Innovation.

Table 4.1: Synthesized Categories of three certificates.

	CERTIFICATES				Synthesized Categories
	LEED BD+C New Construction v.4.1	BREEAM International New Construction v.6	YES-TR New Construction v.1		
CATEGORIES	INTEGRATIVE PROCESS	MANAGEMENT	INTEGRATED BUILDING DESIGN, CONSTRUCTION & MANAGEMENT	1	MANAGEMENT
	SUSTAINABLE SITES	LAND USE AND ECOLOGY		2	LAND USE, SITE AND TRANSPORTATION
	LOCATION AND TRANSPORTATION	TRANSPORT			
	WATER EFFICIENCY	WATER	WATER AND WASTE	3	WATER
	ENERGY AND ATMOSPHERE	ENERGY	ENERGY	4	ENERGY
	MATERIALS AND RESOURCES	MATERIALS	MATERIALS AND LIFECYCLE	5	MATERIALS AND RESOURCES
	INDOOR ENVIRONMENTAL QUALITY	HEALTH AND WELL BEING	INDOOR ENVIRONMENTAL QUALITY	6	INDOOR ENVIRONMENT AND WELL-BEING
	INNOVATION	INNOVATION	INNOVATION	7	INNOVATION
	REGIONAL PRIORITY	WASTE			
		POLLUTION			

Synthesized Categories:

1. Management: is very crucial for project management and process. Criteria such as the involvement of experts in the field, post-construction maintenance, controls, project management, and integrated design are among the most important categories when starting the construction of a building.

2. Land Use, Site and Transportation: includes criteria such as land selection, land environment protection, transportation to the land, bicycle use, and rainwater management in the land. The selection of the site, its location, its proximity to the activities and facilities around it are crucial for future and environment. Conservation of the ecological value of the selected land is a must-have feature for the balance of nature and environment.

3. Water: management covers both outdoor and indoor water use. While the use of sustainable methods such as the use of rain water and gray wastewater is encouraged, it is noteworthy that equipment that will use water efficiently should also be preferred.

4. Energy: The minimum energy use of the building and the use of renewable energy technologies are important points for ecological architecture. High efficiency heating, ventilation and air conditioning (HVAC) systems should be used, and even natural methods should be preferred so that minimum energy use can be achieved. Passive systems should be used, control of sunlight, use of well insulation. Renewable energy sources such as solar panels should be integrated into the structures. Energy use can also be optimized by the use of automation systems.

5. Materials and resources: is also a very important criterion of ecological architecture. All three certification systems encourage the use of recyclable, reusable materials and appropriate resources, while emphasizing the importance of the building's life cycle. In addition to the use of materials, the management of construction and demolition wastes are criteria for all three certificates.

6. Indoor Environment and Well-being: Indoor comfort is crucial for occupants, optimizing good conditions for occupants enhance the productivity and prosperity of them. Thus, visual comfort, indoor air quality, thermal comfort and auditory comfort should be provided.

7. Innovation: Engineering and design solutions that increase quality of life

Many of the categories that should be within the scope of sustainable architecture are found in these three certification systems. However, there are some deficiencies about especially in ‘ecological’, ‘nature-integrated’ and ‘regenerative architecture’ topics. In the next section the deficiencies will be interpreted. After the main category titles were defined and determined, all the sub-criteria common to the three certification systems were placed under the categories. As a result, a table was created from the criteria common to all three. (Table 4.2) While creating the common criteria table, each main heading and subheadings of the three systems were examined in detail. For example, Construction and demolition waste management sub-title in the Materials and Resources category in LEED corresponds to the Construction Waste management sub-title in the Waste category in BREEAM, while in YES-TR it corresponds to the waste management sub-title in the Water and Waste management category. As can be seen from this example, while the subheadings overlap, there may be differences in the main headings. Therefore, all common and corresponding sub-headings were re-examined and placed under the main heading categories created by synthesis. A common criteria table was created by cross-checking the main and sub-headings.

When analyzing the main and sub-headings that are common to each other, some important inferences can be made according to sustainable architecture principles. To illustrate; site selection, water consumption, waste management, use of resources, selection of materials, renewable energy source usage, energy optimization, and indoor environmental quality are necessary to create sustainable buildings.

Table 4.2: Common criteria of three certificates.

CATEGORIES (SECTIONS)		LEED BD+C - NC (v.4.1)		BREEAM International New Constructions (v.6)		YES -TR	
		CREDIT CODE	CREDIT TITLE	ISSUE ID	ISSUE TITLE	CREDIT CODE	CREDIT TITLE
1	Management	IP	Integrative Process	Man 01	Project brief and design	BBT 01	Project management
		IN 2	LEED Accredited Professional			BBT 02	Integrated design
		EA P1	Fundamental Commissioning and Verification	Man 04	Commissioning and handover	BBT 06	Control, commissioning and acceptance
		EA 1	Enhanced Commissioning	Man 05	Aftercare	BBT 05	Operation, maintenance, measurement and facility management
2	Land Use, Site and Transportation	LT 4	Access to Quality Transit	Tra 01	Public transport accessibility	BBT 01	Project management
		LT 3	Surrounding Density and Diverse Uses	Tra 02	Proximity to amenities		
		LT 5	Bicycle Facilities	Tra 03	Cyclist facilities		
		SS P1	Construction Activity Pollution Prevention	LE 02	Ecological value of site and protection of ecological features	BBT 04	Construction
		LT 1	Sensitive Land Protection			BBT 02	Integrated design
		LT 2	High Priority Site	LE 01	Site selection	BBT 01	Project management
		SS 4	Rainwater Management	Pol 03	Surface water run-off	SAY 01	Water management
3	Water	WE P2 + WE 2	Indoor Water Use Reduction	Wat 01	Water consumption	SAY 01	Water management
		WE P3	Building-Level Water Metering	Wat 02	Water monitoring		
		WE 4	Water Metering				
		WE P1 + WE 1	Outdoor Water Use Reduction	Wat 04	Water efficient equipment		
		WE 3	Optimize Process Water Use				
4	Energy	EA P2	Minimum Energy Performance	Ene 01	Reduction of energy use and carbon emissions	EKV 01	Building energy performance
		EA 2	Optimize Energy Performance				
		EA 5	Renewable Energy Production			EKV 02	Renewable energy technologies
5	Material Resources and Waste	MR P1	Storage and Collection of Recyclables	Wst 03	Operational waste	SAY 02	Waste management
		MR 1	Building Life-Cycle Impact Reduction	Mat 01	Life cycle impacts	YMD 01	Building material life cycle assessment
		MR 2	Environmental Product Declarations				
		MR 3	Sourcing of Raw Materials	Mat 03	Responsible sourcing of materials	YMD 04	Responsible use of resources
						YMD 06	Use of reused, remedy or recycled material
		MR 5	Construction and Demolition Waste Management	Mat 06	Material efficiency	SAY 02	Waste management
				Wst 01	Construction waste management		
6	Indoor Environment and Wellbeing	IEQ 6	Interior Lighting	Hea 01	Visual comfort	İOK 01	Visual comfort
		IEQ 7	Daylight				
		IEQ 8	Quality Views				
		IEQ P1	Minimum Indoor Air Quality Performance	Hea 02	Indoor air quality	İOK 04	Air quality
		IEQ 1	Enhanced Indoor Air Quality Strategies				
		IEQ 2	Low-Emitting Materials				
		IEQ 3	Construction Indoor Air Quality Management Plan				
		IEQ 4	Indoor Air Quality Assessment				
		IEQ 5	Thermal Comfort	Hea 04	Thermal comfort	İOK 03	Thermal comfort
		IEQ P3	Minimum Acoustic Performance	Hea 05	Acoustic performance	İOK 02	Auditory comfort
		IEQ 9	Acoustic Performance				
7	Innovation	IN 1	Innovation	Inn 01	Innovation	İNO 01	Engineering and design solutions that improve the quality of life

4.1.1.1 Deficiencies about nature-building relationship

Sub-headings that cannot be included in the previous table are accepted as non-common criteria in all three systems. A table including these non-common criteria was produced. (Table 4.3) These non-common criteria reveal the differences and deficiencies between certification systems.

When the approaches of ecological architecture and regenerative architecture are based, in the LEED and BREEAM certificate; it is crucial to have criteria such as improving the ecology of the existing land, protecting it and causing minimal environmental damage. To illustrate, in LEED SS01-Site assessment, SS02-Protect or restore habitat, and in BREEAM LE03-Minimising impact on existing site ecology, LE04-Enhancing site ecology, LE05-Long term impact on biodiversity sub-headings are found. The absence of sufficient criteria regarding land and environmental sensitivity in the YES-TR certificate can be interpreted as a negative approach for nature integrated and ecological architecture. It can be inferred that there is a significant deficiency in the criteria in this category. Regenerative and ecological architecture have an approach that contributes to and improves nature. It can be deduced that the evaluation systems lack sufficient criteria focused on enhancing and contributing to nature.

The criteria for the use of durable materials, which are included in the BREEAM and YES-TR certificate but not in the LEED certificate, are very important: in BREEAM the criteria is MAT05-Designing for durability and resilience, and in YES-TR the criteria is YMD07-Use of durable material. It is essential for ecology and the environment that structures and materials remain strong and durable throughout their life cycle. At the same time, the use of building materials and products extracted and produced from the local environment; it is important to reduce the environmental impacts caused by the transportation of products. Local material usage is included in YES-TR: YMD05-Local resource use criteria.

When the three certification processes are examined in the energy section, it is found that the BREEAM certificate has more energy-related requirements. Although using renewable energy sources and using the least amount of energy possible are requirements shared by all three certificate systems, the BREEAM certificate includes more in-depth principles. In order to understand and apply regenerative architecture perspective, energy section should be improved, since net-positive approach is more essential for nature-integrated design.

In these certification systems, which tend to avoid harming nature or minimize harm, there is observed emphasis on the self-sufficiency of the building. However, in the approach of architecture integrated with nature, the aim is to go beyond the self-sufficiency of buildings and enable them to make a positive contribution to nature.

Table 4.3: The criteria that are not common among three certificates.

The criteria that are not common among LEED, BREEAM, and YES-TR certifications		
LEED	LT 06	Reduced Parking Footprint
	LT 07	Electric Vehicles
	SS 01	Site Assessment
	SS 02	Protect or Restore Habitat
	SS 03	Open Space
	SS 05	Heat Island Reduction
	SS 06	Light Pollution Reduction
	EA P3	Building-Level Energy Metering
	EA P4	Fundamental Refrigerant Management
	EA 01	Enhanced Commissioning
	EA 03	Advanced Energy Metering
	EA 04	Grid Harmonization
	EA 06	Enhanced Refrigerant Management
	MR 04	Material Ingredients
	RP 01	Regional Priority: Specific Credit
BREEAM	Man 02	Life cycle cost and service life planning
	Man 03	Responsible construction practices
	Hea 03	Safe containment in laboratories
	Hea 06	Accessibility
	Hea 07	Hazards
	Hea 08	Private Space
	Hea 09	Water quality
	Ene 02a	Energy monitoring
	Ene 02b	Energy monitoring
	Ene 03	External lighting
	Ene 04	Low carbon design
	Ene 05	Energy efficient cold storage
	Ene 06	Energy efficient transport systems
	Ene 07	Energy efficient laboratory systems
	Ene 08	Energy efficient equipment
	Ene 09	Drying space
	Ene 10	Flexible demand side response
	Tra 04	Maximum car parking capacity
	Tra 05	Travel plan
	Tra 06	Home office

Table 4.3: continued

	Wat 03	Water leak detection and prevention
	Mat 02	Hard landscaping and boundary protection
	Mat 04	Insulation
	Mat 05	Designing for durability and resilience
	Wst 02	Recycled aggregates
	Wst 04	Speculative finishes
	Wst 05	Adaptation to climate change
	Wst 06	Functional adaptability
	LE 03	Minimising impact on existing site ecology
	LE 04	Enhancing site ecology
	LE 05	Long term impact on biodiversity
	Pol 01	Impact of refrigerants
	Pol 01	NOx emissions
	Pol 04	Reduction of night time light pollution
	Pol 05	Reduction of noise pollution
YES-TR	BBT 03	Preparation of construction documents
	YMD 02	Healthy product notice
	YMD 03	Hazardous radiation emission
	YMD 05	Local resource use
	YMD 07	Use of durable material

Ecological and regenerative architecture are a design approach that minimizes environmental impact and even contributes to the development of the environment. A comparison of three certification systems reveals deficiencies in terms of environmental, land, and ecological factors. Developing biodiversity, increasing greenery, protecting habitats, and integrating with nature are all essential aspects of nature integrated and ecological architecture. In addition to environmental sensitivity, the use of local materials and resources, as well as the use of durable and long-lasting products, are important ecological, environmental, and sustainability criteria. While having some criteria related to nature and ecosystems in LEED and BREEAM is important, it is not sufficient for a fully nature-integrated building design. It is highly important for buildings to integrate with and improve nature. When examining these three certification systems, it is found that LEED and BREEAM include some criteria in this regard, while YES-TR does not, which is a negative situation for nature-integrated architecture. It can be inferred that there are not enough criteria for a 'nature-integrated' building in these three certification systems. This indicates that there are some shortcomings in the most widely recognized systems worldwide. Instead of a building simply earning points, it is expected that the building should minimize harm to its surroundings and provide contributions that enhance nature. This way, buildings can potentially develop solutions for environmental issues through their contributions to the environment. While green building certification systems are considered a positive step in this direction, it can be concluded that they are not entirely sufficient for fully integrating with nature in building design.

4.1.2 Evaluation of COTE top ten awards and building biology principles

In addition to scoring and certified systems, an international award that is a pioneer in its field and the principles of an international institute were also examined. The checklist applied in the COTE Top Ten Awards (Most Innovative and Sustainable Buildings) organized every year by the American Institute of Architects (AIA), which has an important place in the field of architecture in the world, and the Building Biology principles developed by the Institute of Building Biology + Sustainability (IBN), which exists in many countries in the world, provide the opportunity to analyze ecological architecture in more detail. It has been seen that they have many common approaches with green building certificates, but they have also been observed that they have important criteria, especially on occupants and ecology issues.

Within the scope of ecological and regenerative architecture, it is emphasized that not only the relationship between human and building, but also the relationship between built environment and non-human is mutual. COTE TOP TEN awards emphasize that there should be an indispensable relationship between human, environment and building. When compared with three certification systems; there are common points in the categories of water use, energy use, material-resource use, and indoor quality.

However, the exact equivalents of the titles 'design for integration', 'design for equitable communities', 'design for ecosystems', 'design for energy', 'design for change', 'design for discovery' are not found in the three certification systems. At this point, it is possible to deduce that there are some deficiencies in certification systems, especially in the context of environment, built environment, ecology and occupants.

Finally, 25 principles applied by the Institute of Building Biology and Sustainability in many countries in the world for a healthy building and sustainable buildings were examined. Building biology is concerned with the design of healthy, beautiful, and long-lasting structures in ecologically sound and socially integrated societies. Building biology principles, unlike other certification systems, care about the effects of the built environment on humans and the natural environment. It specifically studies the effects of interior space on human health and comfort. It also considers the effects of the building on its environment. It has a lot in common with the green building certificates and COTE TOP TEN awards reviewed, but the Institute for Building Biology; it can make a difference by taking a more holistic approach and examining the effects of the indoor products on the environment, as well as on the interior, human comfort and health. When the principles are examined, especially the interior quality, energy use, material and resource use coincide with all other criteria examined. However, the principles of the connection to be established with ecology and the environment: 'Connection to nature', 'conserve natural resources and protect plants - animals', 'create a living environment that meets human needs and protects the environment' are found to be missing in green certification systems. When compared with the checklist of the AIA COTE TOP TEN awards, it has been determined that the concepts of ecology, environment and human relations overlap more.

All these criteria and principles that are valid in the world have a great contribution to the production of green, sustainable, and ecological buildings. They guide architects from the stage of designing the building to the construction stage. However, it is noteworthy that all these criteria and principles differ from each other at some points. Within the scope of this study, the differences and similarities of the criteria and principles examined were determined.

4.1.3 Evaluation of nature-integrated architecture

In summary, it has been concluded that the main categories revealed by the synthesis of the three certification systems have equivalents in the AIA checklist and building biology principles, while the concepts of ecology, environment, nature, and building relations, which are especially emphasized in the AIA and building biology principles, do not have a satisfactory correspondence in the three certification systems. As a result of blending all the criteria/principles examined and the conceptual framework, an evaluation approach was interpreted. With this approach, which aims to take the sustainability criteria and principles examined one step further, it is suggested that the buildings contribute to and develop the nature in addition to their self-sufficiency. With this evaluation approach it will be tried to interpret not only the self-sufficiency status of the building, but also the state of being intertwined with and developing nature. Thus, an answer is sought to the question of whether the buildings are a part of nature. The holistic approach generated under the leadership of the readings and the criteria and principles examined.

As mentioned earlier, ecological and regenerative architecture seeks to establish a harmonious link between the built environment, the natural environment, and people. While aiming to make good use of the affordances provided by the environment, it should also provide affordances for the environment to develop. A mutual interaction and change between nature and building is considered as affordance, so that nature and building can be integrated. In addition to adapting the building to nature, building production in integration with nature can make the building a part of nature. Systems specializing in sustainable architecture, recognized worldwide, have been thoroughly examined, and specific principles that sustainable architecture-oriented buildings need to adhere to have been deduced. These principles can be considered indispensable for the sustainable architecture approach. For the perspective of Nature-integrated architecture, which takes sustainable architecture to the next level, it has been inferred that buildings should possess certain qualities that strengthen their relationship with nature. In the sustainable architecture approach, the significance of a building's energy, water, material-resource usage, and indoor environmental quality is evident. In addition to these concepts, it can be inferred that the concept of 'Integrated Green Project Management' should be incorporated into ecological and regenerative building design. Alongside the examination of five distinct evaluation systems and the conceptual framework, a comprehensive approach has been formulated for Nature-integrated architecture.

Ecological architecture aims to use energy, water, and other resources carefully, to use renewable energy sources and to adhere to passive design principles in order to have the least negative impact on the environment during the design and construction of buildings. Indoor quality is very important as it concerns human comfort and health as well as environmental sustainability. The aim of ecological and regenerative architecture is to create nature-integrated buildings that harm the environment as little as possible, while protecting and improving/enhancing the environment.

As a result; 'Nature integrated building evaluation approach' has been developed under the leadership of the examined criteria and considering ecological-regenerative architectural and psychology methods. This holistic approach consists of 5 main parts. (Table 4.4) All these main sections have been created in the light of ecological/regenerative architecture perspective and with the inferences made as a result of the evaluation of the examined green certification systems, checklist, and principles.

Table 4.4: Nature Integrated Building Evaluation Approach Main Categories.

NATURE INTEGRATED BUILDING EVALUATION APPROACH
ENERGY USAGE
WATER USAGE
INDOOR ENVIRONMENTAL QUALITY
MATERIALS AND RESOURCES
INTEGRATED GREEN PROJECT MANAGEMENT

Energy Usage, Water Usage, Indoor Environmental Quality and Materials and Resources categories are found to be common across all examined evaluation systems. Therefore, it can be inferred that these categories are essential for the sustainable, ecological, regenerative, and nature-integrated architecture approaches. In addition to these categories, the 'Integrated Green Project Management' category, believed to be necessary for the Nature-integrated architecture approach, has been included. This category aims to provide insights and evaluations on the relationship between buildings and nature, thus facilitating an understanding of the state of being an integrated building with nature. A comprehensive 'Nature-integrated architecture evaluation approach' incorporating all these categories has been synthesized and developed. The definitions and contents of the main categories were produced based on the principles of ecological/regenerative architecture and all the examined systems. As a result of the study it is aimed to discuss the buildings with the 'Nature integrated building evaluation approach' prepared and infer whether buildings are part of nature. (Table 4.10)

The definitions of the five main categories and sub-categories in the approach are as follows.

ENERGY USAGE

The Energy Usage category has two sub-categories: Renewable energy sources and Building energy performance. Renewable energy sources include photovoltaic panels. In these ways, the building can get the energy it needs from natural resources. The building energy performance category emphasizes optimal energy usage in buildings. The category has five sub-headings: passive sunlight control, high levels of insulation, natural ventilation, passive climate control, and energy-efficient lighting equipment. (Table 4.5)

Sub-categories are:

Table 4.5: Energy Usage Category.

ENERGY USAGE
Renewable Energy Resources:
1. Photovoltaic panels
Building Energy Performance :
1. Passive Sunlight control
2. High levels of insulation
3. Natural ventilation
4. Passive climate control
5. Energy efficient lighting equipment

Renewable Energy Resources:

i. **Photovoltaic panels**: can convert sunlight into electricity.

Building Energy Performance:

i. **Passive Sunlight Control (High-Performance Windows):** The use of advanced features in windows to optimize natural light while controlling heat gain or loss.

ii. **High Levels of Insulation:** Proper building insulation reduces heat transmission, allowing for more efficient temperature regulation and decreasing the need for excessive heating or cooling.

iii. **Natural Ventilation:** Natural ventilation is the practice of designing buildings to allow for the flow of fresh air, allowing for natural cooling and enhanced indoor air quality.

iv. **Passive Climate Control (Passive System Solutions for Heating & Cooling):** Using design components and materials that optimize temperature management, such as thermal mass or passive cooling approaches, to reduce dependency on mechanical systems.

v. **Energy-Efficient Lighting Equipment:** Selecting lighting fixtures that use less energy, such as LED lights, to reduce power use while maintaining acceptable lighting levels. Automation systems can be used also.

WATER USAGE

The Water Usage section consists of three sub-categories: Rainwater management, Grey water management, and Water efficient equipment. It is crucial that the building uses water correctly and effectively. Rainwater can be collected and used in a variety of ways, which is very advantageous for the building and its surroundings. Similarly, less environmental resources may be used by the collection, treatment, and reuse of grey wastewater. Finally, efficient water consumption is ensured by the building's water equipment selection. (Table 4.6)

Sub-categories are:

Table 4.6: Water Usage Category.

WATER USAGE
Rainwater Management
Greywater Management
Water Efficient Equipment

Rainwater Management: Rainwater can be collected, stored, and used inside the building for a variety of uses such as irrigation, toilet flushing, and other non-potable applications. It can also be used for garden irrigation, which minimizes reliance on freshwater resources while also protecting water resources. Stormwater management also contributes to the reduction of stormwater runoff and its associated environmental impacts.

Greywater management: Greywater is wastewater produced from non-potable sources such as sinks, showers, and washing machines that can be collected, treated, and reused. Treated gray water can be reused for garden irrigation or toilet flushing so that gray water management reduces freshwater demand, and improves water efficiency and wastewater treatment plants. reduces the load on it.

Water-efficient equipment: Water consumption can be reduced by choosing water-efficient equipment and fixtures for the building such as low-flow toilets, faucets, and shower heads. These water-efficient fixtures use new designs and technology to reduce water usage while maintaining adequate performance. The building helps conserve natural resources by reducing water use.

INDOOR ENVIRONMENTAL QUALITY

Indoor environmental quality is crucial for occupants. Occupants in the buildings experience visual comfort, acoustic comfort, thermal comfort, and air quality continuously, so one of the significant principles of ecological architecture is indoor environmental quality. (Table 4.7)

Sub-categories are:

Table 4.7: Indoor Environmental Quality Category.

INDOOR ENVIRONMENTAL QUALITY
Visual Comfort
1. Control of glare from sunlight
2. Daylighting
Acoustic Comfort
1.The use of acoustic and insulation products
Air Quality
1. Natural Ventilation
2. Mechanic Ventilation
Thermal Comfort
1.Heating-Cooling System

Visual Comfort: is concerned with providing inhabitants with a visually pleasing environment. Controlling glare from sunlight through techniques like louvers, overhangs and double facade.It's aim is to maintain adequate daylighting through wide and controlled windows, and give occupants a good visual field by the connection to the natural outdoor environment.

Acoustic Comfort: is concerned with noise reduction and the creation of a tranquil environment. The use of acoustic and insulation solutions reduces unwanted noise and improves acoustic comfort within the building.

Air Quality: has a considerable impact on the health and well-being of occupants. The air quality criteria include both natural and mechanical ventilation. Natural ventilation encourages the movement of fresh air, whereas mechanical ventilation provides proper air exchange and filtration within the building.

Thermal Comfort: is maintaining appropriate temperatures within the building. A well-designed heating and cooling system aids in temperature regulation and occupant comfort.

MATERIALS AND RESOURCES

The choice of materials and resources used in a building can have a significant impact on its environment and surrounding. Material and resource considerations in ecological building design are critical for minimizing environmental effects, enhancing energy efficiency, decreasing waste, encouraging health and well-being, supporting local economies, and assuring long-term building sustainability. It is critical in the development of buildings that contribute to a more sustainable future, are environmentally conscious, and make effective use of resources. (Table 4.8)

Sub-categories are:

Table 4.8: Materials and Resources Category.

MATERIALS AND RESOURCES
Local resource use
Use of reusable or recyclable materials
Use of sustainable/natural building materials
Use of durable material
Low waste production during construction

Local Resource use: encourages the use of locally sourced materials, reduces the environmental impact of transportation, and supports the local economy.

Use of reusable or recyclable materials: emphasizes the importance of waste reduction and encourages the selection of materials that can be reused or recycled at the end of their life cycle, thereby minimizing the amount of waste sent to landfills.

Use of sustainable/natural building materials: encourages the use of sustainable natural materials such as responsibly sourced wood, bamboo, straw, and recycled materials. These materials are environmentally friendly, renewable, and have low volumetric energy.

Use of durable materials: The emphasis is on choosing durable materials with longer service life. Durable materials reduce the need for frequent replacements, resulting in less waste generation and lower overall environmental impact.

Low waste production during construction: aims to minimize the generation of waste during the construction process. Strategies include efficient materials management, recycling of construction waste, and use of prefabricated or modular components to reduce waste on site.

INTEGRATED GREEN PROJECT MANAGEMENT

The 4 categories explained in detail above are the categories that exist in almost all certificate/award systems within the scope of sustainable architecture. However, the 5th category, the Integrated Green Project Management category, has been revealed as an approach that is thought to exist within the scope of Nature-integrated architecture.

It is a holistic and necessary approach that supports ecological and regenerative architectural practices. Approaches such as the selection and use of land, the protection of ecological balance, the proportion/scale harmony of the building with its environment, the use of green areas, the enhancement of biodiversity, and the connection of the building with nature are crucial for the implementation of nature-integrated architecture. With the Integrated green project management, it is aimed to strengthen the relationship between the building and its surroundings and make the building a part of nature. (Table 4.9)

Sub-categories are:

Table 4.9: Integrated Green Project Management Category.

INTEGRATED GREEN PROJECT MANAGEMENT
Land Use
1. Site Selection
2. Protection of ecological features of site
Proportion
1.The proportion of building to land
Environmental Intervention
1. Providing sufficient green spaces
2. Enhancing biodiversity
3. Connection to nature
4. Green roof

Land use:

i. **Site Selection:** It considers factors such as choosing a suitable location, proximity to infrastructure, transportation networks, and meeting human needs. This approach minimizes transportation-related environmental impacts and supports efficient land use planning.

ii. **Protection of Ecological Features:** Priority is given to the protection of ecological features in the field. This includes protecting natural habitats, bodies of water, and vegetation to preserve biodiversity and ecological balance.

Proportion:

i. **The proportion of building to land:** The building and its surrounding structures must coexist in harmony and balance. The proportions of the building formed when interacting with nature should be designed without disturbing the natural environment and balance. The balance of proportion and scale also includes efficient land use, leaving space for green spaces, landscaping, and open space use.

Environmental Intervention:

i. **Providing Sufficient Green Space:** It is crucial to have plenty of green space within the project area. It is expected that there will be an increase in green space production, especially between the state before the building is built and the state after it is built. This includes the integration of parks, gardens, and landscaped areas that increase the well-being of users and environmental benefits. It ensures that the building is integrated with the environment.

ii. **Enhancing Biodiversity:** Promoting biodiversity is an important consideration. It is tried to create habitats that support various plant and animal species by contributing to the protection and development of biodiversity at the project site.

iii. **Connection to nature:** It is emphasized that a strong bond should be established between the building and the natural environment. This can be achieved through nature views, access to the green, and design elements that allow the inclusion of natural elements and develop a harmonious relationship with the environment. At the same time, it is aimed to integrate the building into nature.

iv. **Green Roof:** Including a roof garden or green roof provides additional green space, reduces the runoff of rainwater, increases energy efficiency, enhancing biodiversity and improves the overall environmental performance of the building.

Table 4.10: Nature Integrated Building Evaluation Approach.

NATURE INTEGRATED BUILDING EVALUATION APPROACH	
BUILDING ID	**BUILDING PLAN & IMAGES**

1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	**RAINWATER MANAGEMENT**	**VISUAL COMFORT**	**LOCAL RESOURCE USE**
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	USE OF REUSABLE OR RECYCLABLE MATERIALS
BUILDING ENERGY PERFORMANCE	**GREYWATER MANAGEMENT**	Daylighting (Large windows)	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
Passive sunlight control (High performance windows)		**ACOUSTIC COMFORT**	USE OF DURABLE MATERIAL
High levels of insulation	**WATER EFFICIENT EQUIPMENT**	The use of acoustic and insulation products	LOW WASTE PRODUCTION DURING CONSTRUCTION
Natural ventilation		**AIR QUALITY**	
Passive Climate Control (passive system solutions for heating&cooling)		Natural ventilation	
Energy - efficient lighting equipment		Mechanic ventilation	
		THERMAL COMFORT	
		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	**PROPORTION**	**ENVIRONMENTAL INTERVENTION**	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

(green)	If the buildings comply with the criteria, the criteria are marked in green.
(red)	If the buildings do not comply with the criteria, the criteria are marked in red.
(yellow)	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

4.2 Building Inventory and Evaluations

4.2.1 Building inventory

Through this holistic evaluation approach system, some selected buildings will be examined. While preparing the inventory of the buildings, green certificated buildings and non-certificated but mentioned as sustainable/ecological/regenerative buildings were selected. The purpose of evaluating both certified and non-certified buildings is to make inferences about the attitude of certification systems in the context of Nature-Integrated Architecture. It is desired to evaluate the interaction of certified and non-certified buildings with nature.

These buildings are:

- Haut Amsterdam – BREEAM Outstanding
- EWE & Bursagaz Headquarter – LEED Platinum
- Turkish Contractors Association HQ – LEED Platinum
- Bahriye Üçok Ecological Kindergarten – LEED Platinum
- VanDusen Botanical Garden Visitor Centre – LEED Platinum
- Modular Unit MU50
- Sumu Yakushima Regenerative Residence
- New Forest House
- Kadıovacık Biohouse - Institute of Building Biology and Ecology Head Office

The aforementioned Institute of Building Biology; operates as the Building Biology and Ecology Institute in Turkey. The institute building, which they designed and produced by adopting the 25 principles of building biology and ecology, will also be included in the building inventory and examined with the evaluation Approach.

9 Buildings in the building inventory were evaluated and interpreted by the 'Nature integrated building evaluation approach'. 9 evaluation tables were created (Table 4.11 to Table 4.19) in order to understand which qualities the buildings have.

4.2.2 Building evaluations

Energy use, Water use, Material-resource use and Indoor quality categories in the evaluation approach are available in almost all sustainable certificate/award systems. These categories are indispensable for sustainable-ecological-green and regenerative architecture. In addition, the 5th category that this thesis wants to focus on, the Integrated Green Project Management category, aims to evaluate the status of buildings as a part of nature. In this category, qualities that move sustainable architecture forward and are considered indispensable for Regenerative/ecological and Nature-Integrated architecture are included. Therefore, when evaluating and interpreting buildings, it is important whether they have the qualifications in the 5th category, as well as their success in the first 4 categories. If buildings exhibit a positive approach towards the qualities in the 5th category in addition to the first 4 categories, it is possible to describe that building as a part of nature. However, if the buildings are successful in the first 4 categories but inadequate in the 5th category, it is thought that it may be correct to describe that building as a sustainable/green building instead of characterizing it as nature-integrated architecture. Because in the nature-integrated architecture approach, it is expected that buildings enhance, improve, and contribute to nature.

Table 4.11: Nature Integrated Building Evaluation Approach-Bahriye Üçok Ecologic Kindergarten

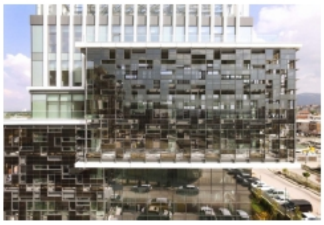
NATURE INTEGRATED BUILDING EVALUATION APPROACH	
BUILDING ID	BUILDING PLAN & IMAGES
BAHRİYE ÜÇOK ECOLOGIC KINDERGARTEN **Architects:** Dilekci Architects (DDA) **Area:** 1.200 m2 **Year:** 2016 **Location:** Turkey **Type:** Education **LEED Platinum**	 

1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
BUILDING ENERGY PERFORMANCE			USE OF REUSABLE OR RECYCLABLE MATERIALS
Passive sunlight control (High performance windows)		Daylighting (Large windows)	
	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY	USE OF DURABLE MATERIAL
		Natural ventilation	
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

(green)	If the buildings comply with the criteria, the criteria are marked in green.
(red)	If the buildings do not comply with the criteria, the criteria are marked in red.
(yellow)	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.12: Ecological Building Evaluation Approach - EWE&Bursagaz HQ

NATURE INTEGRATED BUILDING EVALUATION APPROACH			
BUILDING ID	BUILDING PLAN & IMAGES		
EWE & BURSAGAZ HEADQUARTERS **Architects:** Tago Architects **Area:** 9,500 m² **Year:** 2016 **Location:** Turkey **Type:** Office **LEED Platinum**	  		
1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
BUILDING ENERGY PERFORMANCE		Daylighting (Large windows)	USE OF REUSABLE OR RECYCLABLE MATERIALS
Passive sunlight control (High performance windows)			
	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY	USE OF DURABLE MATERIAL
		Natural ventilation	
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	
5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

	If the buildings comply with the criteria, the criteria are marked in green.
	If the buildings do not comply with the criteria, the criteria are marked in red.
	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.13: Nature Integrated Building Evaluation Approach – The Modular Unit MU50

NATURE INTEGRATED BUILDING EVALUATION APPROACH			
BUILDING ID	BUILDING PLAN & IMAGES		
The Modular Unit, MU50 **Architects:** Teke Architects **Area:** 50 m2 **Year:** 2019 **Location:** Turkey **Type:** House	 		
1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
BUILDING ENERGY PERFORMANCE		Daylighting (Large windows)	USE OF REUSABLE OR RECYCLABLE MATERIALS
Passive sunlight control (High performance windows)	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY Natural ventilation	USE OF DURABLE MATERIAL
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

	If the buildings comply with the criteria, the criteria are marked in green.
	If the buildings do not comply with the criteria, the criteria are marked in red.
	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.14: Nature Integrated Building Evaluation Approach - Sumu Yakushima Regenerative Residence

NATURE INTEGRATED BUILDING EVALUATION APPROACH	
BUILDING ID	**BUILDING PLAN & IMAGES**
Sumu Yakushima Regenerative Residence **Architects:** Tono Inc. **Area:** 162 m2 **Year:** 2022 **Location:** Japan **Type:** Hotels	 

1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
BUILDING ENERGY PERFORMANCE		Daylighting (Large windows)	USE OF REUSABLE OR RECYCLABLE MATERIALS
Passive sunlight control (High performance windows)	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	
High levels of insulation		The use of acoustic and insulation products	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
Natural ventilation		AIR QUALITY	
		Natural ventilation	USE OF DURABLE MATERIAL
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

	If the buildings comply with the criteria, the criteria are marked in green.
	If the buildings do not comply with the criteria, the criteria are marked in red.
	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.15: Nature Integrated Building Evaluation Approach – Turkish Contractors Association HQ

NATURE INTEGRATED BUILDING EVALUATION APPROACH	
BUILDING ID	**BUILDING PLAN & IMAGES**
TURKISH CONTRACTORS ASSOCIATION HQ **Architects:** Avcı Architects **Area:** 6.900 m² **Year:** 2013 **Location:** Turkey **Type:** Office **LEED Platinum**	 

1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
BUILDING ENERGY PERFORMANCE			USE OF REUSABLE OR RECYCLABLE MATERIALS
Passive sunlight control (High performance windows)		Daylighting (Large windows)	
	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY	USE OF DURABLE MATERIAL
		Natural ventilation	
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

(green)	If the buildings comply with the criteria, the criteria are marked in green.
(red)	If the buildings do not comply with the criteria, the criteria are marked in red.
(yellow)	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.16: Nature Integrated Building Evaluation Approach – VanDusen Botanical Garden Visitor Centre

NATURE INTEGRATED BUILDING EVALUATION APPROACH		
BUILDING ID	BUILDING PLAN & IMAGES	
VANDUSEN BOTANICAL GARDEN VISITOR CENTRE **Architects:** Perkins&Will **Area:** 19.483 m² **Year:** 2011 **Location:** Canada **Type:** Visitor Centre **LEED Platinum**		

1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
			USE OF REUSABLE OR RECYCLABLE MATERIALS
BUILDING ENERGY PERFORMANCE		Daylighting (Large windows)	
Passive sunlight control (High performance windows)	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY	USE OF DURABLE MATERIAL
		Natural ventilation	
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

(green)	If the buildings comply with the criteria, the criteria are marked in green.
(red)	If the buildings do not comply with the criteria, the criteria are marked in red.
(yellow)	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.17: Nature Integrated Building Evaluation Approach – New Forest House

NATURE INTEGRATED BUILDING EVALUATION APPROACH			
BUILDING ID	BUILDING PLAN & IMAGES		
NEW FOREST HOUSE **Architects:** PAD Studio **Area:** 120 m² **Year:** 2009 **Location:** United Kingdom **Type:** House	 		
1.ENERGY USAGE	**2.WATER USAGE**	**3.INDOOR ENVIRONMENTAL QUALITY**	**4.MATERIALS AND RESOURCES**
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
BUILDING ENERGY PERFORMANCE		Daylighting (Large windows)	USE OF REUSABLE OR RECYCLABLE MATERIALS
Passive sunlight control (High performance windows)			
	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY	USE OF DURABLE MATERIAL
		Natural ventilation	
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	
5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

	If the buildings comply with the criteria, the criteria are marked in green.
	If the buildings do not comply with the criteria, the criteria are marked in red.
	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.18: Nature Integrated Building Evaluation Approach – Haut Amsterdam

BUILDING ID	BUILDING PLAN & IMAGES
HAUT AMSTERDAM **Architects:** Team V Architecture **Area:** 14500 m² **Year:** 2022 **Location:** The Netherlands **Type:** Mixed-use BREEAM OUTSTANDING	  

1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
BUILDING ENERGY PERFORMANCE		Daylighting (Large windows)	USE OF REUSABLE OR RECYCLABLE MATERIALS
Passive sunlight control (High performance windows)	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	
			USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY	USE OF DURABLE MATERIAL
		Natural ventilation	
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

	If the buildings comply with the criteria, the criteria are marked in green.
	If the buildings do not comply with the criteria, the criteria are marked in red.
	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Table 4.19: Nature Integrated Building Evaluation Approach – Kadıovacık Biohouse

NATURE INTEGRATED BUILDING EVALUATION APPROACH			
BUILDING ID	BUILDING PLAN & IMAGES		
KADIOVACIK BIOHOUSE **Architects:** And Akman & Mehmet Şenol **Area:** 226 m² **Year:** 2019 **Location:** Turkey **Type:** Office **Institute of Building Biology and Ecology Head Office**			

1.ENERGY USAGE	2.WATER USAGE	3.INDOOR ENVIRONMENTAL QUALITY	4.MATERIALS AND RESOURCES
RENEWABLE ENERGY RESOURCES	RAINWATER MANAGEMENT	VISUAL COMFORT	LOCAL RESOURCE USE
Photovoltaic panels		Control of glare from sunlight (louvers, overhangs, double facade etc.)	
			USE OF REUSABLE OR RECYCLABLE MATERIALS
BUILDING ENERGY PERFORMANCE		Daylighting (Large windows)	
Passive sunlight control (High performance windows)	GREYWATER MANAGEMENT	ACOUSTIC COMFORT	USE OF SUSTAINABLE/NATURAL BUILDING MATERIAL
High levels of insulation		The use of acoustic and insulation products	
Natural ventilation		AIR QUALITY	USE OF DURABLE MATERIAL
		Natural ventilation	
Passive Climate Control (passive system solutions for heating&cooling)	WATER EFFICIENT EQUIPMENT	Mechanic ventilation	
		THERMAL COMFORT	LOW WASTE PRODUCTION DURING CONSTRUCTION
Energy - efficient lighting equipment		Heating-cooling system	

5.INTEGRATED GREEN PROJECT MANAGEMENT			
LAND USE	PROPORTION	ENVIRONMENTAL INTERVENTION	
SITE SELECTION (BASED ON PROXIMITY TO INFRASTRUCTURE, TRANSPORTATION, HUMAN NEEDS)	PROPORTION OF BUILDING TO LAND	PROVIDE SUFFICIENT GREEN SPACES	CONNECTION TO NATURE
PROTECTION OF ECOLOGICAL FEATURES OF SITE		ENHANCING BIODIVERSITY	GREEN ROOF

(green)	If the buildings comply with the criteria, the criteria are marked in green.
(red)	If the buildings do not comply with the criteria, the criteria are marked in red.
(yellow)	If it is uncertain whether the buildings comply with the criteria or not, the criteria are marked in yellow.

Bahriye Üçok Ecological Kindergarten: Bahriye Üçok Ecological Kindergarten is a LEED Platinum award-winning structure located within the city. The building demonstrates notable achievements in the first four LEED categories. Moreover, it incorporates several features from the fifth category, suggesting it approaches a state of being closely integrated with nature. The building's site selection, proportion and its relationship with the surrounding land and environment are successful. It promotes permaculture through its provision of green spaces and encourages users to establish a connection between the structure and the natural world. With its green areas, green roof, and agricultural spaces, it enhances biodiversity and can be inferred to increase the percentage of green areas in the neighborhood where it is situated.

EWE & Bursagaz Headquarter: EWE & Bursagaz HQ is a LEED Platinum award-winning structure located within the city. The building can be considered relatively successful in the first 4 categories, but it can be said that it is not sufficient, especially in terms of material use and natural ventilation. It is possible to infer that it is not particularly qualified against the concepts in the 5th category and is inadequate within the scope of nature-integrated architecture. It does not contain sufficient qualities such as scale harmony of the building with its environment, need for green space, contribution to nature, etc., thus it can be seen that the building has not established a strong bond with nature. This is an interpretation of the fact that the building's LEED Platinum certification does not necessarily indicate that the building is a part of nature.

Turkish Contractors Association HQ: Turkish Contractors Association HQ is a LEED Platinum award-winning structure located within the city. The building is quite successful in the first 4 categories, it only has deficiencies in the materials and resources categories. That the building has deficiencies in its connection with nature can be seen with its deficiencies in the 5th category. Although the building is successful in terms of its location and scale, it does not have enough green areas and approaches to improve the ecology and environment. While the building appears to have good qualities in energy, water use and interior quality, it has deficiencies in the material-resource and integrated green project management categories. Considering that the building has a LEED Platinum certificate, it can be inferred that the certificate also has deficiencies in its approach to its connection with nature.

Haut Amsterdam: The location of the Haut Amsterdam building is highly qualified and the building has the BREEAM Outstanding certificate. It can be said that the building has a good qualification in the first 4 categories. When the qualifications in the 5th category are examined, it can be concluded that it increases biodiversity thanks to the green roof and bird-bat cages, but the building does not provide sufficient green space, thus it does not fully have the approaches that will contribute sufficiently to nature. It is a building with BREEAM's highest score certificate, but it can be interpreted that it is not a full part of nature.

The VanDusen Botanical Garden Visitor Center: The VanDusen Botanical Garden Visitor Center project is an example of regenerative architecture and has a LEED Platinum certificate. It is possible to say that the building is quite successful in all categories. The building advances its self-sufficiency and has the qualities of improving and improving nature with its regenerative architecture approach. It can be said that this building, which is very successful in the first 4 categories, is fully qualified in the 5th category. Roof garden, gardens and green areas enabled the building to replace its vegetation and at the same time improve nature by increasing biodiversity. The connection of the building with its surroundings has been strengthened with the architectural approach, and it has been possible to say that it is an exemplary building within the scope of nature-integrated architecture.

The Modular Unit MU50: The MU50 house consists of modular units, so the house can be placed in any country/city/location. Its modularity shows that the building can quickly adapt to nature and cause minimal damage. The building has a good qualification in the first 4 categories, especially the use of materials and energy show the high performance of the building. In the 5th category, it is possible to say that the building has an above-average qualification. In particular, the modular construction of the building, disconnected from the ground, ensures that the building causes minimum damage to the environment. In this way, the building can establish a good bond with nature, but it can be inferred that the building should have more features that will contribute to nature, increase biodiversity and be open to development in this regard.

Kadıovacık Biohouse: Kadıovacık Biohouse was built as the office building of the Turkish Institute of Building Biology and Ecology. It was built based on 25 building biology principles adopted by the institute. Thanks to this, it is possible to say that the building is user-friendly and provides a very healthy interior. The building is very successful in the first 4 categories thanks to its adoption of these principles. The building's construction phases, indoor health, materials, energy and water usage have a very good performance. With this high performance, it causes minimum damage to nature. In the 5th category, it is possible to say that it is relatively sufficient to create the bond between the building and nature, but it can be inferred that improvements need to be made in some of its qualities, especially in terms of contribution and development to the environment. It cannot exactly be said that the building is a part of nature.

Sumu Yakushima Regenerative Residence: Sumu Yakushima Regenerative Residence was built as an example of regenerative architecture. The structure is located in the forest and since it is disconnected from the ground, the damage caused by the structure to the environment and nature is minimized. While the structure is seen to be quite successful in the first 4 categories, it also exhibits a high performance in the 5th category. Constructing the building disconnected from the ground allowed plants to grow and rainwater to flow. For instance, there is burned wood under the foundation of every building, and the carbonized surface encourages the growth of mycelium, which stimulates the growth of tree roots and helps strengthen the soil. In this way, biodiversity can be increased while trees grow and develop. It can be inferred that this building is an example of nature-integrated architecture and is a part of nature.

New Forest House: New Forest House is a building located in the forest and its connection with nature is very strong. It is a housing project built to support, develop and improve natural life. While the building has good success in the first 4 categories, it also has a very high performance in the 5th category. The building is a very successful example that shows that people can live in harmony with nature without harming it. It is possible to say that the building causes minimal damage to nature, starting from its construction phase. An ecological living space has been created with a green roof to further enhance the protection of natural fauna and habitat. At the same time, distant parts of the site have been revegetated to support local wildlife, so that the building becomes a part of nature, utilizing its opportunities in a mutually positive way.

4.3 Deduction

All buildings were examined in detail with the 'Nature-integrated building evaluation approach' and some inferences were made as a result of the examinations. In addition to being self-sufficient, a building's integration with nature and features that can improve ecology can make that building a part of nature.

Energy use, water use, indoor quality and material use have a very important place in the interaction of buildings with the environment, these criteria ensure that buildings are self-sufficient, thus taking a great measure against consuming and polluting natural resources. However, while these criteria adapt the building to nature, this step is taken to a further point with the Integrated Green Project Management category. Thus, the building is integrated into the natural environment, intertwined with nature and interacts / exchanges with nature. Contribution of the buildings to nature beyond being self-sufficient will create a state of being in harmony with the building and nature. The choice of land where the buildings will be located is very important, being close to transportation and areas where daily needs will be met ensures that the building uses the land efficiently, thus minimizing its negative impact on the environment. On the other hand, it is necessary to protect the ecological features and balance existing in the land where the buildings are located.

The building, which is located in nature, needs to establish a balance with its environment. It is important that the buildings establish a balance with their surroundings in terms of proportion and scale, use the land efficiently and leave sufficient open space use. Increasing the ecology and biodiversity in and around the project area will enable the buildings to contribute to nature. At the same time, establishing a connection with nature through architectural design will ensure both the integration of the users with nature and the building in harmony with nature. Finally, the green roofs that will be included in the building design will increase the use of green on the surface of the building, enhance biodiversity, and improve the overall performance of the building.

In order for the building to be a part of nature, it must achieve success in all categories. In nature-integrated architecture, the contribution of the building to the natural environment and ecosystem is as important as its performance; ultimately, it is a holistic approach that encompasses all.

The presence of buildings with and without green building certification in the building inventory is preferred to facilitate certain comments and discussions. One such discussion revolves around how successful globally recognized and influential green building certification systems are in defining the relationship between nature and buildings. The previous sections of the thesis extensively discussed the shortcomings and criticisms of certification systems. Particularly, structures with the highest certification levels were examined, and in addition, buildings without certifications attributed to sustainability/ecology/regenerative were also scrutinized. Based on this evaluation, it can be inferred that there are shortcomings in green building certification systems.

When analyzing the EWE & Bursagaz building, it is observed that the building falls significantly short of being a part of nature. However, the building holds a LEED Platinum certification, suggesting that the LEED system may not sufficiently address the building's connection with nature. On the other hand, Vandusen Botanical Garden Visitor Center, with its LEED Platinum certification, is truly integrated with nature. The architect of this nature-integrated building challenges LEED by implying that such certification systems only measure compliance with specific criteria and adopt a 'less harm' approach. Peter Busby mentioned that “I'm not going to trash LEED. It's a remarkable tool, and it's caused remarkable change in the marketplace. But [LEED is] a tool that says what you're doing is less bad.” (Flint, 2015) However, the thesis advocates for a focus beyond obtaining specific certifications, encouraging the design of buildings that contribute to and improve the ecosystem rather than merely aiming for particular certificates.

By comparing these two contrasting examples, it is discovered that the LEED Platinum certification does not necessarily require buildings to have qualities that contribute to or enhance nature.

Another example, the Haut Amsterdam building, holds a BREEAM Outstanding certification; however, it is observed that this structure also lacks a sufficient connection with nature. At this point, it can be said that having the highest-level BREEAM certification is not strongly correlated with the level of integration between the building and nature. This thesis emphasizes that the relationship a building establishes with nature is indispensable and crucial for the building to be considered a part of nature.

In addition to certified buildings, other examined structures demonstrate that it is not mandatory to enter a rating system to be a nature-integrated building. For instance, the Sumu Yakushima building is an effective example of regenerative design, and the evaluation suggests a strong connection with nature. Another successful example is the New Forest House, which is a high-performing structure in terms of contributing to, improving, and enhancing nature.

5. CONCLUSION

No matter how much people try to change the opportunities offered by the environment, the environment offers, air, water, the structure of the earth, etc. cannot change it, but it can affect it negatively. Today, it is clearly seen that urbanization is in a negative change. In recent years, many negative situations such as climate crises, decrease/pollution of water, deterioration of air quality, and narrowing of living spaces of non-human living organisms have emerged. The main factor in the emergence of these situations is human beings and their interventions in the environment. At this point, architecture is a positive understanding and tool that can create awareness towards the environment. People have a selfish mindset and have adopted to put the environment and nature in the background. While the environment provides endless affordances for people; it is expected that people also enhance nature and that the objects/buildings they produce interact with nature. It is necessary to positively evaluate the affordances that nature has provided to people and to design buildings that interact positively with the environment.

Humans need to provide adequate opportunities for other living and non-living organisms in nature to live. It can be said that with increasing urbanization, human beings harm the affordances offered by nature. Unconsciously designing and constructing buildings and not evaluating the possibilities that nature provides for that building create undesirable results. It is a sense that should be created by architects that not only humans exist in this world, but that all organisms should live together with nature. It is not possible to evaluate the built environment, buildings, and people alone. While the environment provides endless affordances for people, people should evaluate the possibilities correctly in order not to harm the environment.

This study aims to investigate the idea of being a building in touch with nature, it also seeks to show that it is possible to contribute to nature through architecture. By examining the interaction and intertwining of buildings with nature, the conceptual framework highlights the necessity of not only adaptation but also integration with nature. This approach aims to support the design of buildings that go beyond sustainability criteria and contribute positively to the environment and improve nature.

At the beginning of the study, the focus was on the conceptual framework and sustainability criteria/principles. These two parts worked together to produce the approach for the building to be a part of nature. While the conceptual framework emphasizes the compatibility of buildings with the natural environment, sustainability criteria/principles provide approach to achieve this goal. These two parts form a strong foundation for the building to be a part of nature and to be designed and built accordingly.

With the conceptual framework, the concepts of ecological psychology, ecological architecture and regenerative architecture are examined in detail. Ecological psychology, through behavioral setting theory and affordance theory, has helped to understand the possibilities that the environment, building, and people interact with each other. The mutual reference between nature and the user in building production enables the users to understand their environment and to benefit from the opportunities provided by the environment while providing an opportunity for the environment. All these accords emphasize the importance of the harmony of buildings with the environment and people. While making use of the opportunities provided by the environment in the production of structures intertwined with nature, it is also expected to offer new opportunities to the environment. It is possible to do this with approaches that will improve the environment and ecology. The mutual interaction and change between nature and the building can create the situation of the building being a part of nature. Another subject within the conceptual framework, ecological architecture, is the approach of the building to develop ecology by contributing to nature while giving the least damage to the environment. The conceptual framework explained in detail the contexts necessary for the structures to be compatible with the natural environment and ecosystem.

In today's context, there are numerous green building assessment systems; however, the effectiveness of these evaluation systems in assessing the relationship between buildings and nature is a topic of debate. The examined certification systems/awards/principles have been thoroughly scrutinized regarding the nature-building relationship, revealing the deficiencies and competencies within valid systems. Based on these assessments, it has been found that there are insufficient criteria within certification systems to qualify the connection between nature and buildings. In light of this finding and the conceptual framework, a comprehensive approach defining the qualities a nature-integrated building should possess has been proposed. The aim of establishing such a comprehensive approach is to advance the building's self-sufficiency and integrate it into nature, taking it a step closer to being a part of the natural world. This holistic approach was created by combining and synthesizing the concepts of ecological architecture and regenerative architecture with analyzing sustainability assessment tools.

The evaluation approach created with this list of criteria has been used to evaluate whether the buildings have a design that contributes to the nature and is intertwined with nature by taking the self-sufficiency status of the buildings forward. During the evaluation process, 9 buildings were evaluated with this approach and the analysis demonstrates that the leading examples of green and sustainable buildings in the world and in Turkey have the potential to be a part of nature, but are still open to improvement in terms of their integration with nature. It has been particularly emphasized that not every building with a green building certificate can establish a sufficient connection with nature. It can be argued that there are not enough criteria in the certification systems to examine the relationship between nature and the building. Some certified buildings may be a part of nature, while the connection of some buildings with nature can be very weak. This suggests that the rating or scoring in certification systems may not be sufficient to make a building green or a part of nature. On the other hand, when uncertified buildings are examined, it is observed that they have strong connections with nature. This reveals that a building does not necessarily have to have a certificate to have a strong bond with nature. Understanding nature better, taking advantage of nature's affordances and taking into account the needs of the environment and other living things will shape architectural solutions in a way that both contributes to sustainability and increases the quality of life.

In conclusion, this study aims to contribute to the evaluation of future architectural projects with an environmentally compatible and nature-supporting perspective. The goal is not only self-sufficiency in building production but also prioritizing nature, aiming for the building to be a part of nature. Considering the shortcomings in nature within green certification systems, it was discovered that these certifications are not sufficient to evaluate the building as a part of nature. With this evaluation, a new perspective is aimed to be brought to architecture. The first four of the five categories in the integrated approach created are the fundamental principles of sustainable architecture, but with the added Integrated Green Project Management category, the aim is to take this a step further. Thus, an approach regarding the qualities a building should have to be a part of nature is revealed. This study aims to contribute to the adoption of a more solution-oriented and sustainable approach to global environmental problems. An approach that combines technological innovations with environmental awareness will encourage the design of built environments as buildings that are not only nature-integrated but also have positive effects on the environment.

REFERENCES

Akman, A. (n.d.). *Yapı Biyolojisi ve Ekolojisinin Temelleri Öğrenim Programı*.

Alparslan Kardeş, G. (2016). *DAVRANIŞ-MEKÂN UYUMU: BİLİŞSEL ESNEKLİK DÜZEYLERİ FARKLI ÖĞRENCİLERE GÖRE, OKUL ORTAMINDA OLANAKLILIKLARIN (AFFORDANCES) İNCELENMESİ*. ANKARA ÜNİVERSİTESİ EĞİTİM BİLİMLERİ ENSTİTÜSÜ.

Anh, H. (2013). *LEED V4 BDC Reference Guide*.

Awamleh, Z., & Hasirci, D. (2022). A Multi-Method Behavior Setting Analysis of a Protracted Refugee Camp in Jordan. *Environment and Behavior*. https://doi.org/10.1177/00139165221084726

Ayaz, E. (2002). *Yapılarda Sürdürülebilirlik Kriterlerinin Uygulanabilirliği*. *6*, 72–75.

Aytis, S., & Ozcam, I. (2010). *SÜRDÜRÜLEBİLİR TASARIM KAVRAMINDA TEMEL İLKELERİN YAPI ve TOPLUM ÖLÇEĞİNDE DEĞERLENDİRİLMESİ*.

Balanlı, A., & Öztürk, A. (1995a). *Yapı biyolojisi kavramına çevresistemden yaklaşım*. *159*, 37–39.

Balanlı, A., & Öztürk, A. (2006). *Yapı Biyolojisi, Yaklaşımlar*. YTÜ Basım-Yayın Merkezi.

Balanlı, A., & Öztürk, A. (1995b). *Yapı Biyolojisi: Kavram ve Kapsam*. Sağlıklı Kentler ve İnşaat Mühendisliği Sempozyumu.

Balasubramanian, A. (2019). *INTRODUCTION TO ECOLOGY*.

Bookchin, M. (1982). *The Ecology of Freedom*. Palo Alto: Cheshire Books.

***BREEAM International New Construction*.** (2021). BRE Global Ltd 2021.

Brown, M. (2018). *Sustainability, Restorative to Regenerative*.

Charles, E. (2012). Ecological Psychology. In *Encyclopedia of Human Behavior: Second Edition* (pp. 7–12). https://doi.org/10.1016/B978-0-12-375000-6.00142-7

Chemero, A. (2003). An Outline of a Theory of Affordances. *Ecological Psychology*. https://doi.org/10.1207/s15326969eco1502_5

Cheng, X., & Dou, Li. J. (2015). *Green Building Design*. https://doi.org/10.2991/ic3me-15.2015.121

Commoner, B. (1971). *THE CLOSING CIRCLE Nature, Man, and Technology*.

Du Plessis, C. (2022). *The City Sustainable, Resilient, Regenerative – A Rose by Any Other Name?* (pp. 23–48). https://doi.org/10.1007/978-3-030-97023-9_2

Du Plessis, C., & Hes, D. (2014). *Designing for Hope—Pathways to Regenerative Sustainability*. https://doi.org/10.4324/9781315755373

Emekci, S. (2021a). *NATURE-CENTERED DESIGN: A COMPARATIVE ANALYSIS IN CURRENT ARCHITECTURAL APPROACHES*.

Emekci, S. (2021b). *Sustainability in Architecture: Low-tech or High-tech?* (p. 111). https://doi.org/10.38027/ICCAUA2021216n14

Flint, A. (2015). *Can Regenerative Design Save the Planet?* Bloomberg.

Gattupalli, A. (2023). *What is Regenerative Architecture? Limits of Sustainable Design, System Thinking Approach and the Future*. Archdaily.

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*.

Graham, P. (2002). *Building Ecology: First Principles For A Sustainable Built Environment*. John Wiley & Sons.

Graham, P. (2005). Building Ecology – A systems approach for developing ecological literacy for students of building professions. *Proceedings 2005 World Sustainable Building Conference*, 4557–4562.

Hagan, S. (2001). *Taking Shape: A New Contract Between Architecture and Nature*. Architectural Press.

Heft, H. (1989). Affordances and the Body: An Intentional Analysis of Gibson's Ecological Approach to Visual Perception. *Journal for the Theory of Social Behaviour, 19*(1), 1–30. https://doi.org/10.1111/J.1468-5914.1989.TB00133.X

İncedayı, D. (2004). *Çevresel Duyarlık Bağlamında Davranış Biçimi Olarak "SÜRDÜRÜLEBİLİRLİK."*

Kahraman, M. D. (2014). Livability and Spatial Quality in terms of Human Needs and Spatial Affordances. *Planlama*, *24*(2), 74–84.

Karnik, P. (n.d.). *10 Examples of Buildings incorporating nature*. https://www.re-thinkingthefuture.com/designing-for-typologies/a3219-10-examples-of-buildings-incorporating-nature/

Levin, H. (1995). *Building Ecology: An Architect's Perspective—Plenary Lecture*.

Lobo, L., Heras-Escribano, M., & Travieso, D. (2018). The History and Philosophy of Ecological Psychology. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2018.02228

Maier, J., Fadel, G., & Battisto, D. (2009). An affordance-based approach to architectural theory, design, and practice. *Design Studies*, *30*, 393–414. https://doi.org/10.1016/j.destud.2009.01.002

Mumcu, S., Düzenli, T., & Tarakci Eren, E. (2019). EKOLOJİK YAKLAŞIMLI ÇEVRE-DAVRANIŞ ARAŞTIRMALARININ KONULAR VE

TEKNİKLER AÇISINDAN İÇERİK ANALİZİ. *Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *21*(3), 805–831.

Mumcu, S., Özbilen, A., & Yılmaz, S. (2013). Ekolojik yaklaşımlar doğrultusunda çevresel tercih modeli. *SDU Faculty of Forestry Journal*, 143–151.

Özüer, M. O. (2012). *MİMARİ TASARIMLARIN EKOLOJİK AÇIDAN GELİŞTİRİLMESİNE YÖNELİK ÖLÇÜTLER KILAVUZU ÖNERİSİ*.

Pallasma, J. (2005). *The Eyes of the Skin: Architecture and the Senses*. John Wiley and Sons Ltd.

Rietveld, E., Denys, D., & Westen, M. van. (2018). *Ecological-Enactive Cognition as Engaging With a Field of Relevant Affordances*. https://doi.org/10.1093/oxfordhb/9780198735410.013.3

Roshani, M. (2020). *SOCIAL AFFORDANCES OF RESIDENTIAL OPEN SPACES: CASE STUDY OF DIKMEN VALLEY, ANKARA*.

Ruhi Sipahioğlu, I. (2012). *SUSTAINABILITY IN ARCHITECTURE AND THE LIMITATIONS OF ENVIRONMENTAL ASSESSMENT TOOLS*. 283–293.

Samancı, B. (2015). *Rejeneratif Tasarım Yaklaşımına Giriş: Doğayı Anlamak, Doğayla Birlikte Tasarlamak*. Ekolojika.

Sánchez, D. (n.d.). *The End of Sitting / RAAAF*.

Schneider, W. (n.d.). *What is Building Biology?*

TC. Çevre ve Şehircilik Bakanlığı. (n.d.). *Yeşil Sertifika Değerlendirme Kılavuzu v1*.

Thomas, B. J., & Riley, M. A. (2014). Remembered Affordances Reflect the Fundamentally Action-Relevant, Context-Specific Nature of Visual Perception. *Journal of Experimental Psychology Human Perception & Performance*. https://doi.org/10.1037/xhp0000015

Thompson, B. (2003). Architectural Hermeneutics Harry and the Philosopher's Stone. *Environment and Behaviour*, *35*(4), 478–485.

Türkmenoğlu Bayraktar, N. (2011). *Ekoloji ve Mimarlık*. *6*, 95.

Ula, Z., Hayati, A., & Cahyadini, S. (2022). The Affordances for Dining Activities: Young Generations' Experience in Dwelling Environment. *Modul*. https://doi.org/10.14710/mdl.22.2.2022.80-90

Vaz, D., Silva, P., Mancini, M., Carello, C., & Kinsella-Shaw, J. (2017). Towards an ecologically grounded functional practice in rehabilitation. *Human Movement Science*, *52*, 117 132. https://doi.org/10.1016/j.humov.2017.01.010

Wilson, M. (2002). Six Views of Embodied Cognition. *Psychonomic Bulletin & Review*. https://doi.org/10.3758/bf03196322

Yeang, K. (2007). *Q&A: Ken Yeang interview* [Interview].

URL-1:https://www.merriam-webster.com/dictionary/integrate, Retrieved August 4, 2023

URL-2:https://www.brainyquote.com/quotes/alvar_aalto_600671, Retrieved July 30, 2023.

URL-3:https://www.brainyquote.com/authors/ludwig-mies-van-der-rohe-quotes, Retrieved July 30, 2023.

URL-4:https://www.brainyquote.com/lists/authors/top-10-frank-lloyd-wright-quotes, Retrieved July 30, 2023.

URL-5:https://www.hsph.harvard.edu/ecpe/faculty/hal-levin/, Retrieved May 6, 2022.

URL-6:https://www.usgbc.org/articles/green-building-101-what-leed, Retrieved June 18, 2023.

URL-7:https://dozr.com/blog/leed-certification-value-history, Retrieved July 15, 2023.

URL-8:https://bregroup.com/products/breeam/how-breeam-works/, Retrieved June 10, 2023.

URL-9:https://www.aia.org/awards/7301-cote-top-ten-awards, Retrieved October 10, 2022.

URL-10:https://www.aia.org/awards/7301-cote-top-ten-awards, Retrieved July 30, 2023.

URL-11:https://buildingbiology.com/principles-of-building-biology/, Retrieved July 30, 2023.