PLANNING and DESIGN
FROM DIFFERENT PERSPECTIVES

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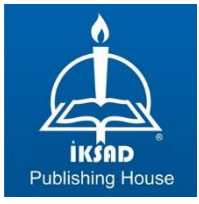

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PREFACE

The original value of the book is to reveal the approaches of different disciplines in the fields of planning and design to the four subject identified. Subjects to be covered within the framework of the book; aesthetics, biomimicry/biomimetry, rehabilitation (good life, livability, quality of life) and utopia (futuristic approaches, virtual universe). Identified subjects; It is common in the field of planning and design and can be interpreted differently. These subjects are discussed in the chapters compiled in the disciplines of industrial design, landscape architecture and urban and regional planning.

In Part I, there are chapters related to the subject of aesthetics. Accordingly, the subject of aesthetics is discussed in the discipline of industrial design in chapter I, landscape architecture in chapter II, and city planning in chapter III. In all three disciplines, the subject of aesthetics is evaluated in terms of form, appearance and perception. In other words, in all three disciplines, the subject is addressed in terms of sensory perception.

In Part II, there are chapters about biomimicry. The process of reflecting biomimicry to design is at 3 levels. These 3 levels are organism level, behavior level and ecosystem level. In Chapter IV which belong to the industrial design, it is seen that biomimicry affects the design at the organism and behavior level. On the other hand, It is discussed that all three levels of biomimicry affect the design in the landscape architecture which is at chapter V and in the urban planning in chapter VI.

Chapter III includes chapters on rehabilitation. The subject of rehabilitation is generally defined in the context of health services and the built environment. In this context, while industrial design is discussed in both physical and mental health fields (in Chapter VII); It is discussed in the context of mental health and the built environment in the field of landscape architecture (in Chapter VIII) and urban planning (in Chapter IX).

In Part IV, there are chapters about utopia. While the subject of utopia is handled with a rational and futuristic approach in industrial design (in Chapter X); in landscape architecture (in Chapter XI) and in urban planning (in Chapter XII), it has been examined in philosophical and sociological dimensions within the framework of the ideal city-ideal society discussion.

We would like to thank the authors who contributed to the realization of this study with their chapter articles. We would also like to thank Assoc. Prof. Dr. Seyithan SEYDOŞOĞLU and IKSAD Publishing staff for their support and knowledge during the formation and publication stages of the book We hope that the book will be useful both to our colleagues in the planning and design professions and to everyone who is interested in the subject.

Editors

December, 2022

CHAPTER I

NEW DIMENSIONS OF AESTHETIC IN PRODUCT DESIGN

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THE DEVELOPMENT OF AESTHETIC THOUGHT

Aesthetics is an interdisciplinary field that has been researched and studied by philosophers, psychologists and artists for many years. Before aesthetic was used as word, Plato's approach to object beauty consisting of proportion, harmony and unity (Roggman, 1990) and Aristotle's definition of the basic elements of beauty as order, symmetry and precision (Roggman, 1990) pioneer to later aesthetic definitions. The essence of aesthetics is claimed as the 'presence or absence of beauty' (Levy & Czepiel, 1974). Armstrong (2004) thinks that aesthetics revolves around the nature and value of beauty and art. In the 19th century and the middle of the century, objective beauty was seen as the center of aesthetics. The meaning of the word aesthetic generally refers to beauty and art (Montague, 2017).

The German philosopher Alexander Gottlieb Baumgarten, who first used the term aesthetics (Sinmaz, 2009), which comes from the Greek words 'aisthesis' (sensation, sensible perception) or 'aisthanesthai' (perceiving with the senses), defined aesthetics as the science of sensory knowledge. According to Baumgarten, aesthetics is considered as a science of sensory perception as well as being a theory of art (Sinmaz, 2009). Sensory perception is one of our ways of judging, feeling and knowing this world (Montague, 2017). The aesthetic value process acquired by sensory perception causes judgment and behavior. Aesthetics is concerned with emotions, concepts, and judgments that appreciate art or objects considered beautiful and sublime (Blackburn, 1994).

PRODUCT DESIGN AND AESTHETIC

Researchers who consider the aesthetic perspective as an objective feature have developed many aesthetic design rules such as Gestalt principles that describe harmony, beauty and order (Baxter, 1995). Aesthetics in design is

related to perceptions of beauty (Leder et al., 2004; Candi et al., 2017) and how a product appeals to the senses (Liu et al., 2017; Candi et al., 2017).

The definition of aesthetics in the design serving consumption can be explained from the perspective of consumer psychology. In consumer psychology, aesthetics is used to describe the form of objects, people, or consumption environments (Patrick & Hagtvedt, 2011). Considering that the form is perceived and defined by sensory means, it can be said that the consumer psychology approach and Baumgaerten's approach are compatible. Therefore, aesthetics in design is a process that is perceived through sensory interaction and causes an emotion, a judgment, and a behavior.

The aesthetic process includes a series of cognitive evaluations of an object (Shi et al., 2021), which can result in sensory pleasure (Handy et al., 2008; Shi et al., 2021). Therefore, aesthetic design is an important tool for marketers. With the realization of the power of interaction between the user and the product, marketing research on aesthetics increased in the second half of the 20th century (Mumcu & Kimzan, 2015). An aesthetic design has also been proven by studies that attract the attention of the consumer and affect consumer expectations (Hoegg & Alba, 2011). Aesthetics can increase consumers' desire to acquire or interact with products (Verganti, 2009).

Brakus et al (2009) emphasizes the importance of sensory interactions of consumers/users with products and states that user and product interaction affect behaviors. This interaction and aesthetic process that emerges through sensory perception is critical in influencing consumer behavior. Aesthetics in design perceived by sensory means, which is a necessity that serves to satisfy users, is the point of differentiation between brands (Hagtvedt & Patrick, 2014).

SENSORY PERCEPTION OF AESTHETICS IN DESIGN

Aesthetics, which is used for differentiation in design, affects consumer perceptions as a visual design element and is evaluated by consumers in terms of aesthetics. Aesthetic perception follows a hierarchical strategy that suggests people classify the aesthetic level of an object through pattern recognition based on visual cues without describing all the details of the object (Berlyne & Crozier, 1971).

Aesthetics is not only related to visual appearance but also to other senses such as touch and taste, which act as stimuli in terms of both cognitive and emotional responses (Bloch, 1995; Wagner, 1999; Swilley, 2012; Toufani et al., 2017). In other words, it is the art of creating aesthetic nonverbal responses and communicating through the senses in design (Newkirk & Crainer, 2003; Mumcu & Kimzan, 2015). In design, aesthetics is perceived with clues, which are nonverbal communication tools. These silent communication tools and design elements that create both cognitive and emotional responses are forms, color, material, texture, measure, sign, symbol, and sound (Sevgül, 2007). These tools can be more generally referred to as sensory cues.

Aesthetics and Sensory Code of Design

Form, color, material, texture, measure, sign, symbol, and sound, which are elements of product design, are communication tools and clues that enable a product to be perceived by sensory means. Sensory perception of a product design occurs with visual, auditory, and tactile experience (Sevgül, 2007). The product perceived by different sensory means creates an aesthetic value for the user.

Product aesthetics, acquired through visual experience, often plays a fundamental role in ideas about the sensory character of products (Workman

& Caldwell, 2007). Visual aesthetics is one of the most important factors affecting consumer perception in many ways. Consumers may perceive a product as beautiful based on their first impression, and the perception of 'beautiful is good' associates beauty with quality (Shi et al., 2021). Product appearance affects the perception of quality and shows the function and ease of use of a product (Creusen et al., 2010). In the visual perception process, form is an important aesthetic value element that affects the user, providing information about the product and product quality. Forms can present messages about products. Content is the message that an artist wants to give to his buyers, the source of the aesthetic concern he wants to arouse in them (Erinç, 1998). Therefore, the form perceived by sensory means is the source of the aesthetic, quality, usage, and content perception of the product. A form with aesthetic value is associated with quality and functionality by the user.

Another design element and aesthetic value element perceived by the visual senses in the product is color. Color conveys the meanings of quality to consumers and consumers buy what is perceived as quality (Kauppinen & Luomala, 2010). Color can create aesthetic value in the product. A pink-colored printer may be perceived as aesthetically pleasing, different, and attractive by the user, while a beige printer may be perceived as ordinary by the user (Sevgül, 2007).

Touch, which is one of the perception ways, can affect the evaluation of a product when no other information about a product is available. Individuals accept soft forms in everything from animals to machine interfaces (Cleminshaw, 1989). Not only tactile aesthetics is created by hand touching. This aesthetic creates the feeling of caress at the psychological level (Sevgül, 2007).

Products are produced innumerable for countless users. For this reason, the design should be able to cause a common taste and aesthetic perception.

According to Tunalı (2004), this common taste creates aesthetic value and aesthetic norm. Aesthetic value and aesthetic norm are influenced by sociocultural, historical, and technological factors (Frascara & Crozier, 1996). Not all people's attitudes towards similar products, their aesthetic judgments, that is, their communication with the product are the same. The aesthetic value created by the design elements (form, color, material, texture, measure, sign, symbol, sound) that we perceive through sensory means may vary according to social differences.

Aesthetics, Form, Function and Meaning

Aesthetics is one of the ways we judge, feel, and know this world; reveals its content, use, and function (Montague, 2017). According to utilitarian approaches, visual aesthetics is a tool to achieve the goal. It serves aesthetics, function, and meaning in product design. There is an interaction between form, function, and meaning. It reveals the content, use, and function through the aesthetic form, which is perceived by sensory means focusing on the form (Figure 1). This circular connection and its effect on the user is the core value of aesthetics in product design (Montague, 2017).

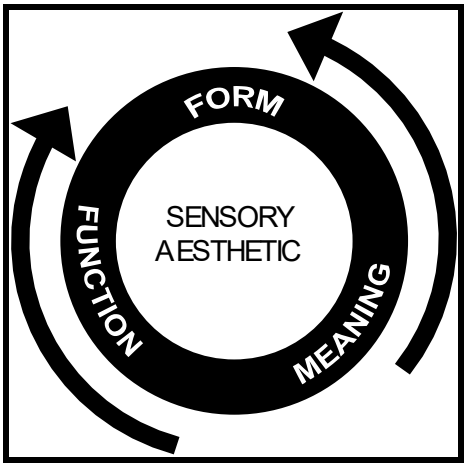

Figure 1 Interaction of Sensory Aesthetics, Function, Form and Meaning

Source :(adapted from Montague, 2017)

Recent research has shown that aesthetic products have been perceived to perform better as well as perceived as attractive. Aesthetics also contributes to the content of the product and creates a positive motivation for the user (Ürgen, 2006). Thus, aesthetics was accepted as part of the function. It is a tool for the perception of aesthetic meaning and function.

The product design, which is constructed using form, color, material, texture, size, sign, symbol, and sound, is perceived and interpreted by the individual by marking the aesthetic value of the product, its functions, and meanings. Aesthetics is one of the most important treasures of a designer. A product has an aesthetic function. A product excites and pleases the user with its aesthetic meaning (Papanek, 1971). The aesthetic function is a tool that provides the individual's psychological satisfaction. Tunalı (2004) states that if a person experiences his/her own feelings by transferring them to objects if he/she takes pleasure from it, he/she evaluates that object as beautiful. This pleasure creates aesthetic value and aesthetic perception in the individual. Aesthetic perception is not a simple sensory event; on the contrary, it means grasping the spiritual existence in a process, starting from sensation and consisting of interpretation, evaluation, and aesthetic satisfaction (Tunalı, 2004). The cyclical connection between form, meaning, and function in product design and its impact on the user is the fundamental value of aesthetics in product design (Montague, 2017). Traditional approaches argue that aesthetic value begins and continues with design elements. However, it can be said that changing products, systems, and services and aesthetic value are beyond the design elements perceived through sensory means.

AESTHETIC BY EXPERIENCE IN DESIGN: NEW DIMENSIONS OF AESTHETIC

Aesthetic value begins with sensory perception. The aesthetic value that emerges as a result of perception through sensory means initiates the interaction between the user and the product. Form and size, the first impression and aesthetic value of a product in the mind of the user are formed, and the user interacts with the product (Mumcu & Kimzan, 2015). With aesthetic value, the user is encouraged to experience the product. The aesthetic value does not end with sensory perception, it continues as the user experiences the product. As the experience continues, so does the aesthetic value.

The tendency of aesthetic value to be interactive separates the aesthetic evaluation of products from the aesthetic evaluation of art and brings difficulties to the explanation of engineering aesthetics (Ürgen, 2006). Before the user begins to experience the product, the aesthetic perceived by sensory means creates a sense of beauty in the user. The desire to experience occurs or does not occur in the user. The user starts using the product. While the user is using the product, or in other words, experiencing it, the user begins to feel pleasure apart from beauty. The aesthetic value that starts with beauty continues with the aesthetic value that gives pleasure.

In brief, the aesthetic value of a product does not arise only from sensory perception. ‘The aesthetic value of a product or system can also come from interaction. The user actively interacts with the object, tests it, communicates. For example, before buying a new car, not only is the car in a parking lot, but a test drive is always made to see if it offers the excitement of driving to the user' (Ürgen, 2006). After the user experiences the product, it creates an aesthetic value. For this reason, aesthetic value is formed not only by sensory perception but also by the user's use and experience of the product

(Honderich, 1995). When traditional headphones are compared to high-performance headphones, it is argued that it is not the technical and functional features that distinguish the two, but the aesthetic value behind the design (Lam et al., 2016). The aesthetic value of the headset does not create design elements that are perceived by sensory means. The aesthetic value that emerges in the headset is not related to the user experience either; It is about social, personal and technological meaning and content. Consumers listening to music with their headphones derive many personal meanings that make their daily lives beautiful (Lam et al., 2016).

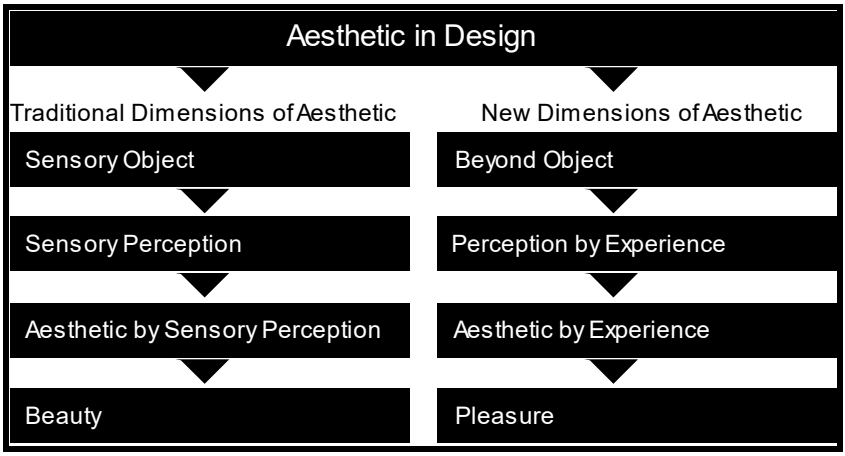

Figure 2: Aesthetic Appraisel in Product Design

Designer and architect Andrea Branzi states that objects are in a process of change, apart from their formal and physical design (Candi, 2008). With the changing understanding of industrial design, it can be said that the dimensions of aesthetic value in design are beyond the object, perceived by experience, evaluated as aesthetic by experiencing, and a sense of pleasure awakened in the user (Figure 2). The aesthetic value perceived by sensory means and resulting in beauty continues with the user experience and results in pleasure. The aesthetic value created in the product and the sense of pleasure arising from the experience of the products enable the user to continue his interaction

with the product and a sustainable aesthetic value can be mentioned (Figure 3).

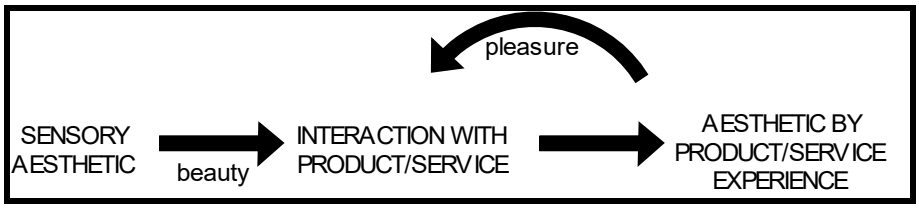

Figure 3: Nesw Aesthetic Value Process in Product Design

Aesthetic value, which is evaluated as beauty in product design and perceived through sensory means, is similar to the traditional definition of aesthetics and aesthetic value perceived in art. However, consumers' inferences about the product are mainly related to how they interact with the product (Mumcu & Kimzan, 2015). As the user's product experience continues, the aesthetic value, which is considered as pleasure, continues, and the aesthetic value gained through this experience is specific to the design discipline.

DISCUSSION

It can be said that aesthetic value, which first emerged in art, took place in marketing research after its effects on user behaviors were noticed. Studies on aesthetics in marketing research started in the second half of the 20th century. Companies that want to make a difference in their products and services have started to use aesthetics as a differentiation tool (Mumcu & Kimzan, 2015). Aesthetics used for differentiation has been seen as a tool perceived by sensory means, creating a value and making the product more special. The design elements perceived by sensory means have served the aesthetic value that attracts the user.

Although the importance of aesthetics is emphasized in design, a designer makes design decisions for aesthetic value based on his guesses and instincts or the decisions of trend analysts (Noblet, 1993; Liu, 2003). There is also a

lack of a scientific and theoretical basis or framework to explain design decisions that will provide aesthetic value perceived through sensory means (Liu, 2003). In terms of aesthetic value perceived through sensory means, the discipline of design is similar to art and is only explained by the sense of beauty.

Along with the changing definition of industrial design, aesthetics in design should be reconsidered and the perceived aesthetic value beyond the object should be discussed. According to the new definition, it can be said that it is not sufficient to consider only the sense of beauty in the discussion of aesthetics in design. The old and new definitions of the industrial design discipline are as follows;

> *Definition of Industrial Design before 2015 by WDO*
>
> *An industrial designer is a person who is qualified with education, technical knowledge, experience and visual sensitivity to determine the materials, mechanisms, shapes, colors, surface finishes and decoration of objects that are quantitatively reproduced by industrial processes.*
>
> *Definition of Industrial Design in 2015 by WDO*
>
> *Industrial Design is a strategic problem-solving process that develops successful business models and ensures a better quality of life with innovative products, systems, services and experiences.*

In the new definition, an aesthetic that is not related to form, material, color, texture, or mechanism can be mentioned. In accordance with the new definition, it is argued that design is beyond the object (Candi, 2008) and is more about the experience than the physical object (Mitchell, 1993; Redström, 2006; Candi, 2008). If it is an aesthetic pleasure, users also feel pleasure when they experience products, services, and systems.

Studies on aesthetics in the discipline of design are mostly related to the aesthetic value perceived through sensory means and emerging as beauty. Based on the new definition of industrial design, more work needs to be done on the aesthetic value of products beyond the object of the product design discipline. For this reason, if an aesthetic design is aimed, the aesthetic value perceived with experience should also be taken into account. It is necessary to discuss the new dimensions of aesthetic value that are perceived beyond the object, outside the sensory ways, and that arouses pleasure in the user.

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CHAPTER II

AESTHETIC PERCEPTION ON AKDAMAR CHURCH FACADES

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INTRODUCTION

Aesthetics in architecture; It is a scientific-based value system built with objective value judgments that determine the form and content, and it is the highest level that the spirit can reach in the constructed structure, both with art and with desires. If this level maintains its position even after centuries and challenges the future, it means that aesthetics in architecture has been duly applied.

The first written architectural theory book, "Ten Books on Architecture", written by Vitruvius in 25 BC, mentions the expected characteristics of the architect and the basic principles of architecture. It has been stated that the architect should have knowledge of grammar, logic, arithmetic, geometry, astronomy, music, painting, medicine, philosophy, history, law and architecture and that the basic principles of architecture are based on order, arrangement, harmony, symmetry, convenience and economy. The usefulness, aesthetics and durability that Vitruvius has formulated as utilitas, venustas and firmitas, which are accepted as the basic triple trivet today, are also important for the emergence of a good building, namely architecture, which Vitruvius mentioned in his work (Vitruvius- S. Güven ,Ed.).

In the structures built with this understanding, which has survived from the classical period, the effort to dominate every stage from A to Z and transform the building from being just a pile of stones suitable for its function into a culture that extends to infinity is clear. When the works of various periods are examined, it is seen that this effort and sensitivity is kneaded with the perception of aesthetic value, and as the intensity of aesthetic value increases in the works, works that reach centuries later with the excitement and energy of the first day are revealed.

We understand and appreciate this approach better, which deals with architecture with a high level of consciousness, especially when we examine the works that have been included in the UNESCO World Heritage list and are on the candidate list. One of these rare works is the Akdamar Church, designed by the Vaspurakan King Gagik I. Between 915-921 and implemented by the monk architect Manuel.

1.AKDAMAR CHURCH

Akdamar Church is located on Akdamar Island, approximately 3 km from Gevaş Cove, in the province of Van, Gevaş, Turkey. Akdamar Island, which is located in the east of our country and located in Lake Van, which is the largest soda lake in the world, has a length of 1.5 km, a width of 0.5 km, a total coastal length of 3 km, and a surface area of 70,000 m2 (Anonymous,2022) (Kaya et al. 2013).

The geographical structure of the island consists of a rugged topographic area and its climate is milder than the neighboring geographies with the effect of the lake. This situation causes the almond trees (Amygdalus trichamygdalus [Hand.-Mazz.] Woronow), which are densely found on the island, to bloom early in spring (April-May). Therefore, while the surrounding mountains are covered with snow, the church and its surroundings become a visual feast for local visitors and tourists, making it a more popular focal point. The use of photos taken in the field on social media platforms and photo contests is an indicator of this. When the popularity of this precious building on the international platform increases and is examined in more detail, it is seen that the building, which was built at the beginning of the 10th century, was designed with an astonishing aesthetic perception. When we examine the building, we witness that this structure, which was built centuries ago, goes beyond the need to create churches and living spaces suitable for the current conditions of the period.

In written sources, it is written that Akdamar Holy Cross Monastery consists of a church built at different times, two chapels, two jamatuns, bell tower, monk cells, social facilities, a cemetery and a pier. It has also been reported that a palace church, the Church of the Holy Cross, was located at the center of the monastery block that developed over time. Of these structures, only the eastern apse of the Saint Stephanos Chapel has survived, and the monk cells and social facility have been destroyed. The main church, the Saint Sergius Chapel, the northern and cathogicos Thomas Jamatunu, and the bell tower, which make up the Holy Cross Church block, have survived to the present day, despite local and minor deteriorations (Figure 1) (Güzel, 2004).

Figure 1 Akdamar Holy Cross Monastery

Reference: Van Provincial Directorate of Culture and Tourism, 2022.

Akdamar Church shaped squaresquare-shaped central dome shaped fourand a four-leaf clover-shaped cross plan. The four arms extending from the center to the sides are surrounded by four semicircular niches on the inside. The interior opens to the outside with the two-mhigh meteretermeter-high doors in the niches in the North, South and West directions (Figure 2) (İpşiroğlu, 2003).

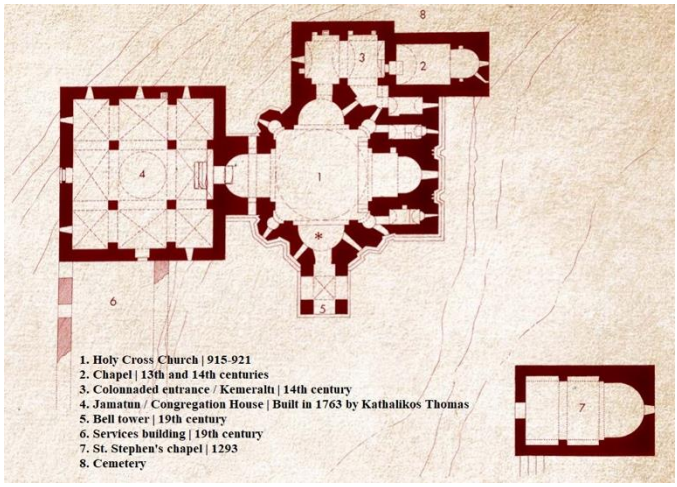

Figure 2 Akdamar Church Architectural Plan

Reference: T.R. Communications Department, 2020.

The four cross arms protruding from the central square plan are covered with gable roofs. A square plan and nine-section jamatun measuring 12.70 m / 12.30 m is attached to the western cross arm, a three-story bell tower on four piers measuring 1.90 m * 1.20 m was attached to the southern cross arm and the columnar entrance measuring 7.65 m* 2.60 m is joined to the northern cross arm. The top of the transept square is seated on the hemispheres of four niches, is cylindrical from the inside and is covered with a sixteen-sided dome drum from the outside. There are eight rectangular windows with round arches on the tops under the niches on the hexadecimal dome drum and the top of the drum is covered with a pyramidal cone. Dome transitions in the interior are made with pendentives. The peak point of this dome is 20.40 m above the ground. From the eastern quarters of the quarter circle niches at the corners of the square shape, there is access to the equally sized side rooms to the left and right of the apse. These small niches form polygonal plan shaped corner towers on the exterior, covered up with cones (Figure 3) (İpşiroğlu, 2003).

Figure 3 Akdamar Church

Reference: Orijinal, 2022.

Akdamar church architecture is a re-application of early Christian church architecture and is an early phase of the architectural style Hripsime. The biggest feature that distinguishes the building from similar churches today is the stone plastic reliefs that the architect combined with his imagination and equipped all four facades of the church. Historian Tomas Artsruni defines the Akdamar Church as a masterpiece in his work The History of the Artsrunis and explains in detail how the architect turned an ordinary building into a first-class work of art with an aesthetic approach (İpşiroğlu, 2003).

2.STONE PLASTIC ORNAMENTS ON THE FACADES OF AKDAMAR CHURCH

On the façades of this church, dedicated to the Holy Cross where Jesus Christ was stretched, various beings that look as if they were coming to life from the façade were carved in the form of reliefs on the façade. In the building, which has an important place in Christian art, the stone plastic reliefs on the 4 main belts at various levels on the facade stones reflecting different colors

depending on the daylight from season to season were used for facade decoration (Figure 4).

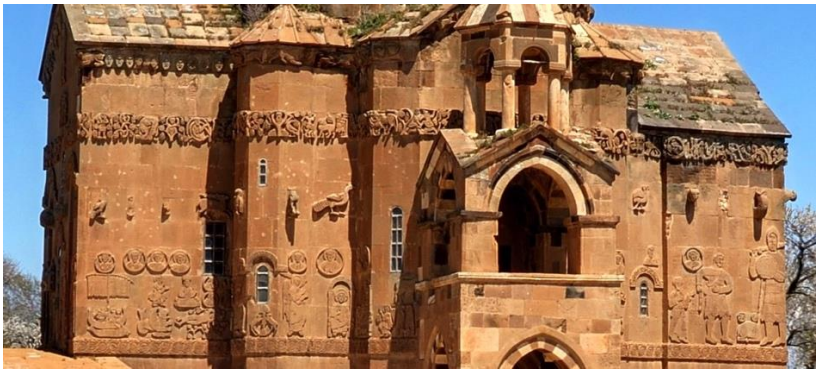

Figure 4 Akdamar Church Facade Details

References: Orijinal, 2022.

In the first belt, where the conical cone of the dome and the arms of the church cross are placed under the roof eaves, running in succession the dogs, hounds, rabbits, lions, goats, wild boars, birds and human head reliefs are carved. The directions of these animals are facing John on the east side, Matthew on the west side, Mark on the north side and Luke on the south side which is located in the middle of the gable roof forehead of the arms of the cross (Figure 5) (Artsruni, 1985).

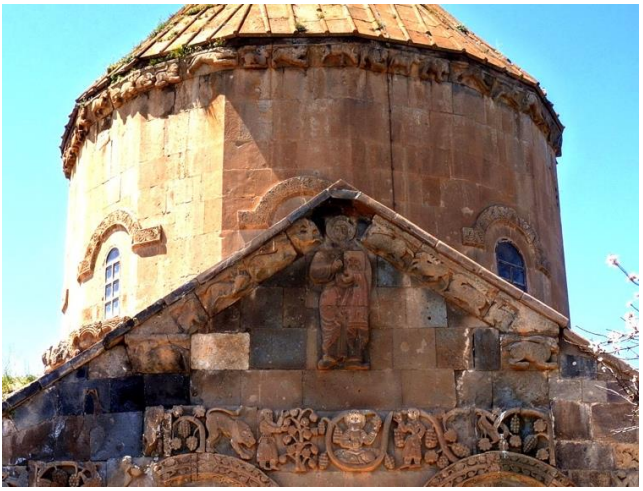

Figure 5 Akdamar Church Facade Details

Reference: Orijinal, 2022.

In the thicker and more protruding second belt, it is seen that there are human and animal figures placed between vine branches and bunches of grapes, and epic details from rural life, vintage, various hunting scenes and animal lives. In the middle of this belt on the eastern façade, the seated king presented by the palace guards, among the grape clusters and by the pomegranate tree, which is considered the representative of holiness and abundance in the Torah, are depicted (Belli, 2007). Although the pomegranate fruit depicted here has a symbolic meaning for many civilizations, Armanum means "Pomegranate Land" in a Semitic language and continues its existence under the name Armenia. In this sculpture, the king and pomegranate tree symbols are used side by side to create the perception of the "king of pomegranate land" successfully.

The third generation consists of animal sculptures, which are placed on a level but sparsely, shown from the front and sides facade as if trying to get out from inside the church. In the medallion, which is located in the middle of this belt on the eastern side, there are the first man and the first prophet Adam and right next to it there are lines from the book of Genesis of the Torah which "and Adam gave names to all the cattle, the birds of the sky and every wild animal" (Jones, 1994). In the story of creation in the Torah, it is written that Allah created animals from the soil in order to relieve the loneliness of the prophet and make them suitable helpers, and allowed the prophet to name them. In this generation, only the prophet Adam and animals were depicted, and the perception of "the prophet Adam who had sovereignty over animals" was emphasized with the clever use of art in architecture (Figure 6).

Figure 6 Akdamar Church Facade Details

Reference: Orijinal, 2022.

In the fourth generation at the bottom, which is wider, it is seen that religious scenes are animated and the heads and names of saints are carved in the medallions. One of the most important sculptures is the king Gagik, standing to the left of the middle window on the west side, presenting a church model to Jesus standing on the right of the window, and the stone reliefs around which there are serafim angels raising their hands in a prayer position (İpşiroğlu, 2003). This relief, which is especially depicted as if it reveals the purpose of constructing the church, clearly shows the effort to apologize by pleasing the prophets and saints at the beginning of the 10th century (Fig. 7).

Undoubtedly, the idea of pleasing these sacred beings has been much more challenging than the idea of pleasing human beings, and as a result, it has brought timelessness and originality to the building with aesthetic touches. On the other hand, it is clearly seen that no motif is there by chance on the facades of the building, which were designed with care and consciousness in the most appropriate way. Religious parables reenacted on church facades and statues of prophets and saints, whom they believe to be saviors, were given at the lowest level, perhaps providing keeping the religious sensitivity of the people as the nearest point to eye level at as possible.

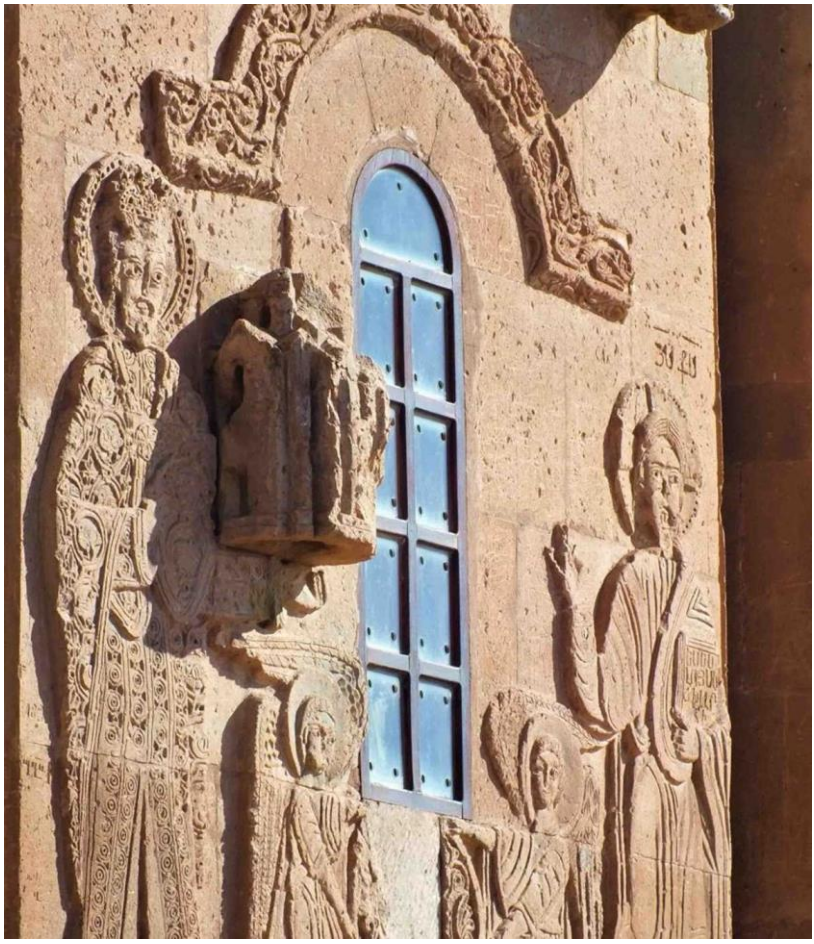

Figure 7 Akdamar Church Facade Details

Reference: Official Turkish Museums, 2022.

On the south façade, where the bell tower is located, respectively the story of the Prophet Jonah, the scene of the sacrifice of Abraham and Isaac, the prophet Mose with the Ten Commandments tablets in his hand, the goats climbing the tree of life, the Prophet sitting on the throne in the niche covered with an ornate arch and Mary is seen sitting on the throne with the child Jesus in her arms between two angels (Figure 8, 9,10) (Belli, 2007).

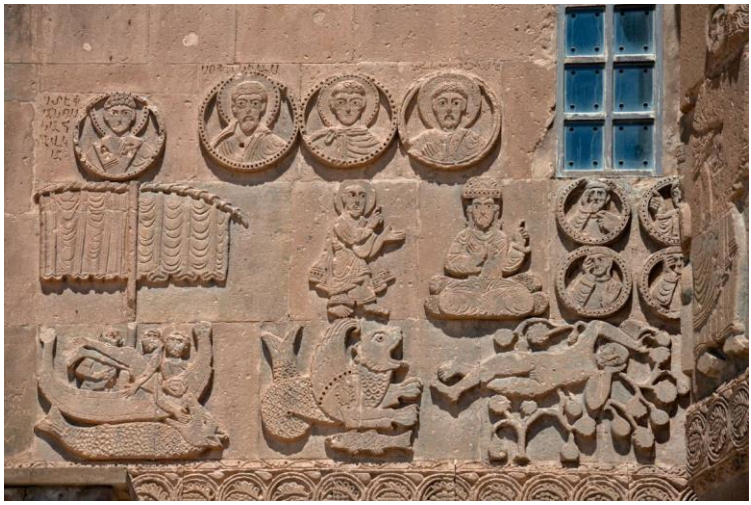

Figure 8 Akdamar Church Facade Details

Reference: Orijinal, 2022.

Figure 9 Akdamar Church Facade Details

Reference: Orijinal, 2022.

Figure 10 Akdamar Church Facade Details

Reference: Orijinal, 2022.

The belt connection in Akdamar church was used in three different ways. The first one is seen provide on above the windows that fill the interior with daylight, the second one is under the triangular spaces in the bell tower and the arms of the cross, and the third one on the figure of Jesus sitting on his throne which is one of the stone plastic ornaments on the facade. The visual perception was increased by emphasizing this figure, which is located in the niche closed with an arch, with the depth of light (T.R. Communications Department, 2020).

In the continuation of the front, the Vaspurakan princes Hamazasp and his brother Sahak, who was martyred by not turning from their religion against all oppression, respectively, the prophet David standing in front of the king of Israel, Saul, and his struggle with Goliath, who appeared to be bigger and

stronger than himself, are depicted. On the façade, the religiosity of the King's ancestors in general is repeatedly emphasized by relief (Jones, 1994).

The moment of war, which depicts that the weak can defeat the strong, was described so accurately and appropriately with facial expressions, body proportions, decoration details on the clothes and war tools in the hands that the eye and mind neither need anything nor find excess in them. Even if you sit in front of it for hours, you will see that the endless dance of shadow and light that starts on the plastic stone reliefs with the first light of the day tells you new stories every minute. These flamboyant facades, which you watch enjoying from every stonving, without getting bored and tired, takes away you hundreds of years before the time period you are in. In the meantime, it offers you a lot of information from palace life to daily life, religious beliefs, saints, prophets, animals and plants, by using skillful art in architecture, at the top notes of aesthetics (Figure 11).

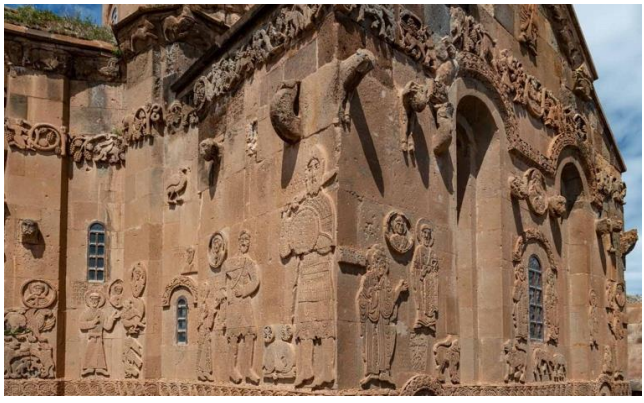

Figure 11 Akdamar Church Facade Details

Reference: Orijinal, 2022.

On the eastern façade, which is the continuation of this belt, it is seen that the prophet John the Baptist on the far left and Elijah on the far right presented by pointing with their hands the saints on the medallions and the apostles Thadeus and Bartholomeus, who brought the first Bible to the basin. In the

continuation of this belt, which turns to the northern front, there is Samson, who is mentioned in Jewish mythology, who is believed to take his power from his hair and who killed the Palestinian with the jawbone of a donkey in his hand, the Prophets of the Torah and, again Samson smashed the mouth of a lion scene is located. On the left side of the middle window on the arm of the northern cross, Adam and Eve, naked with their stomachs swollen, eating fruit from the forbidden tree, and on the right side of the window, at the scene devil is the form of a snake which entwined with the forbidden tree and, the devil approached Eve to provide trick her into eating the forbidden fruit. The depiction of Adam and Eve's stomachs as swollen in this scene is an important detail to emphasize that they cannot digest the forbidden fruit (Figure 12) (Güzel, 2004).

Figure 12 Akdamar Church Facade Details

Reference: Akdamar Memorial Museum, 2022.

In the remaining continuation of the cross arm, it is respectively depicted that from 3 saints, Saint Theodoros killed a snake under his horse, Saint Georgios killed a human under his horse's feet, and Saint Sergios killed a lion under his horse's feet (Figure 13) (Öney, 1989).

Figure 13 Akdamar Church Facade Details

Reference: Official Turkish Museums, 2022.

In the continuation of the wall, prophet David who was about to defeat the lion that attacked his flock by holding his mouth and three Hebrew youths, who were thrown into the flaming furnace because they did not worship the statue made by the Nebuchadnezzar, the king of Babylon, are depicted but thanks to the angels sent nothing happened to them. In this depiction, the young people's feet are chained and their hands appear in a praying position, and from the expression of comfort on their faces, a sign of trust in God's infinite might is read (Güzel, 2004). His ability to reflect the details of the stories and the psychological reflections in the faces by masterfully processing the stone has undoubtedly transformed the façade into a book that can be read with pleasure for hours or a photograph that can be watched. On the last relief of this generation, Daniel, who was even though faithfully devoted to his king, was thrown into the lions' den because he was caught praying to his God, but was not injured with God's protection, is depicted (Figure 14).

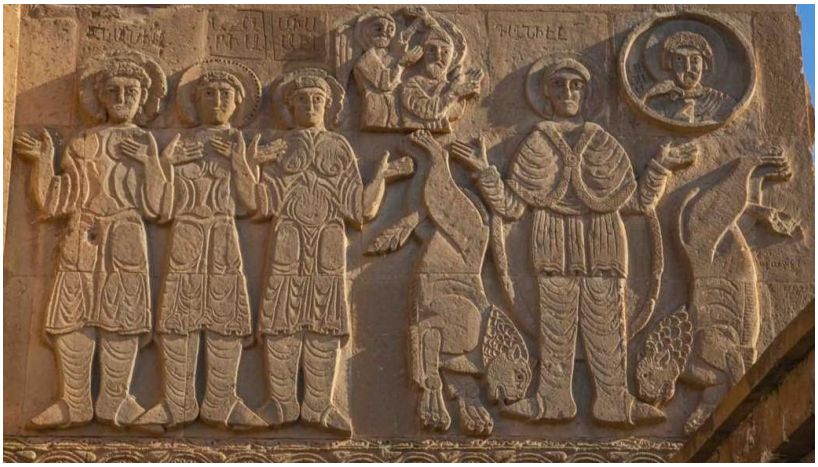

Figure 14 Akdamar Church Facade Details

Reference: Official Turkish Museums, 2022.

When we examine the building in more detail, it is seen that the body depictions and facial expressions, which include the details of the goods, are arranged according to the height most suitable for the normal perspective of the person and depicted in larger sizes. This situation allowed the stone plastics to be seen more clearly without fatigue. While the animal and human head depictions, which are the repetitions of each other, are located in a narrow belt at the top, in the most intense stories, the saint and prophet head depictions in the medallion are given in the widest and lowest belt. On the other hand, the important messages to be emphasized on the front are placed in high-level centers. For example; In the uppermost centers of the first generation of the cross-arm façades, four Gospel writers carrying Bibles in their hands, Ioannes on the east façade, Matheus on the west façade, Mark on the north façade, and Luke on the south façade. In the middle of the second generation eastern façade, the seated king presented by the palace guards among the grape clusters and the pomegranate tree, which is considered to be the representative of holiness and abundance in the Torah, are depicted next to it. The first man and the first prophet Adam are depicted in the medallion in the middle of the third generation east façade.

As stated in Ernest Neufert's book of building design knowledge, as the viewing distance decreases, the perceptibility of the artifact, which is worth seeing, decreases (Neufert, 2008).

Therefore, an aesthetic perception can be created with a more accurate technique by establishing the balance of viewing distance and object height outside the space. By positioning the Akdamar Church in the heart of the island and leaving its four sides open, the architect allowed its facades to be perceived better.

Another issue affecting the aesthetic perception on the facade is the feeling of depth created in plastic stone reliefs. When we look at the depth of the stone plastic reliefs, it is seen that the relief technique is applied in less dosage as the motifs get larger and diluted, and the dose is increased in the relief technique for smaller and denser figures. In this way, smaller and denser figures located at the top elevations of the façade are provided that perceived more impressively from afar. The second and fourth generations, which are close to each other, are more clearly dissociated in perception, as the animal heads in the third generation appear as if they were popping out from the facade by giving more depth. Church walls, regardless of their style, functionality and structure, serve as carriers for these stone ornaments, which are spread all over the church facades. These ornaments, which seem to hang in the air, are sculptures placed on the wall surface on flat stone plates (İpşiroğlu, 2003).

RESULT

Architecture; while it includes great variability according to society, time and place, the aesthetic values that it benefits from at the common point affect the existence and life of the person directly or indirectly by arousing stronger emotions, associations and thoughts. Just as people affect the character, form,

use and wealth of buildings, buildings also affect people's character, social behavior and daily life. The stronger this effect is, the more valuable the architectural work will be and the more value is found in it to be preserved and passed on to future generations. Encountering such architectural works is also important in terms of connecting with the existential problems that are ignored during the hustle and bustle of daily life. While the works that have to be done in daily life alienate people from themselves, architectural wonders help people connect with their existence and enrich the world of meaning. In addition, it has been seen that, no matter how important the functionality, durability and technique used in the designed structure, the building cannot be gained a reputation without ensuring that the structure interacts with the mind and emotion and arouses excitement in the person.

The lack of beauty (aesthetics) in Vitrullius' triple trivet causes the structure to move away from meaning and alienate the interacting individual. Today's cities; It is full of many structures produced with the aiming of durability with the aim of economic, functional and ergonomic concerns. However, the cities and countryside created by these structures are insufficient to feed the world of meaning, which is the basic need of all humanity, and cause people to become alienated from themselves and their environment. Today, Akdamar Church could have turned into an ordinary structure among the works of the 10th century without all these stories told on the plastic stone reliefs on its exterior and the footprints of those past lives. However, with its meticulously crafted details and aesthetic touches, the building establishes a deep bond between us, from its king to its architects, artisan and people. Passing through or temporality, interacting with other thoughts, and connecting with the mental worlds of people who lived in different ages enable us to understand, imagine, and manifest in the same space as them. This approach will contribute to gain originality of modern architecture and today's architects,

which are in an existential crisis, to the extent that they interact with such structures.

For centuries, it has been aimed to increase aesthetics by using the best proportions to achieve balance and beauty in architecture, art and sculpture. In line with this goal, the Golden Ratio, which is called the highest measure of the aesthetic beauty of a building or work of art, has existed since the day the world was founded, but it is not known exactly when it was discovered. Although it is not known whether or not this information was mastered at the time the Church was built in this geography, the balance of measurements used in the stone plastic reliefs on the facade shows that the aesthetic perception of the architect was extremely strong.

In every period, it has been an effort of human beings to produce what is pleasing to the eye and soul. On the basis of this situation, there is the subconscious desire of the person to do what is best for his psychology by revealing various reasons. If we can say the artist, is a master who transforms and processes the subconscious. While the emotions that are in the subconscious and transferred from generation to generation turn into existence in the hands of the artist, that is, the architect, materially encountering what we have inside transforms us.

When it comes to architecture, the aesthetic perception of the period has been put forward by architects for centuries with various designs and applications, either original or influenced by many architectural movements, and has reached the present day. In this context, Akdamar Church is both an early stage of the Hripsime type, which is the style of the early Christian church architecture, and an original work with details on its facades. At the same time, it is understood from the reliefs on the church's outer walls that aesthetics existed in Anatolia and Mesopotamia, which had hosted many

civilizations long before the age of enlightenment when it circulated in daily life in Europe.

Presenting the Akdamar Church model to Jesus with the hope of forgiveness, depicting the faces of many saints and prophets in medallions, delicately processing the stories of the prophets, and including lines from the book of creation are an effort to make the invisible visible with pictures. As a believer, the architect put forth his best and, in accordance with his purpose, almost portrayed the message that salvation in a religious building can only be possible by believing in God, by moving the walls beyond the carrier feature.

Although we are hundreds of years ahead technologically and scientifically, it is difficult to capture the perfect effect obtained from the plastic stone reliefs on the exterior walls that highlight the original form of Akdamar Church in most works in today's architecture. Is the underlying reason for this difficulty an inadequate perception of beauty or is it the subconscious mind that puts the beauty behind the robustness and functionality by simplifying it? Let's face it, it shouldn't be very easy to accommodate and integrate many disciplines in one work. However, an architecture that is planned with an easy-going understanding does not drown in details, does not push the limits of the mind, or does not give peace with its simplicity will always be incomplete and inappropriate.

On the other hand, not placing Vitruvius' triple trivet on the ground properly may be a reason for this. We are faced with the fact that the structures suitable and useful for Venustas are not touching the ground in terms of durability in earthquakes while structures suitable and durable for Venustas limit us in terms of movement with ability, and the building is only an engineering work but cannot approach architecture. As a result, the fact that many structures of our age are far from Venustas, compels us to live an anxious and joyless daily life that we are a part of.

The responsibility felt for the future at every stage of the building should be reflected in all the assets outside the building, with its architecture, statics, art and culture. In an architecture lacking in aesthetics, perception stretches an opaque fabric in front of this reflection, and as the degree of opacity increases, the palpability of the building decreases, the bond established with the building weakens and the building turns into an ordinary object over time. When we read the same event backwards, it can be said that the ordinary becomes extraordinary in the buildings where architecture meets art, spaces with a soul and a lot of beauty are produced, and an original and living masterpiece is formed. Because the human soul always seeks the beautiful and when it's beautiful also again seeks the absolute beauty.

I would like to thank Asst. Prof. Ekin OKTAY and my dear wife Dr. Cevdet ŞAHİN for their contributions to the study.

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CHAPTER III

AESTHETICS AND IDENTITY RELATIONSHIP IN URBAN SPACE

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INTRODUCTION

Although some opinions suggest that the concept of aesthetics is qualitative and unique, researchers in the planning discipline, as in other fields, continue to work on general principles and methods for the evaluation of aesthetics. In this process, the idea emerged that the concept of urban aesthetics consists of physical features, that the image and identity elements of the place in the historical process have positive effects on people, and that aesthetic understanding also depends on the positive emotional evaluations of the individual. This necessitates considering the evaluation of the concept of urban aesthetics more comprehensively and variously. At this point, what the concept of aesthetics and urban aesthetics mean for the individual since the beginning of history, how it has changed, and the effects of the change and transformation in the urban space on the individual should be understood correctly.

Streets and avenues are important components of urban identity and image. Cities are changing and transforming in line with economic, social, and political decisions in the historical process, and this process can affect the visual aesthetic quality of streets and avenues in cities positively or negatively. The preservation, improvement, and development of the visual aesthetic qualities of streets and avenues ensure the sustainability of the visual character of the city, increase the quality of life of individuals, and mediate the formation of collective identity, belonging to the place, and strong city images. Since all these variables will change the dimensions of the relationship that the individual has established with the urban space, they can affect their positive or negative feelings at the point of evaluation of urban aesthetics.

1.THE CONCEPT OF AESTHETICS AND URBAN AESTHETICS

In its simplest form, the concept of aesthetics can be defined as seeking beauty in nature and art (Berlyne, 1971). Aesthetics is defined as positive emotional evaluations or reactions in psychology (Ulrich, 1983; Wohlwill, 1974). Berleant (2005) defines urban aesthetics as a state of unity in which the urban built environment and people are in constant communication. Aesthetic quality is one of the most important values in the successful construction of the physical environmen (Averill, 1998).

According to Porteous (1996), the aesthetic category is at the top of Maslow's hierarchy of needs. People whose basic needs such as shelter, security, income, and emotional are met will focus more on aesthetic elements. Nevertheless, aesthetics is an important need for the individual and social enjoyment of life and satisfaction (Tarım, 2014).

Figure 1: Hierarchy of Needs

Source: Porteous, 1996; as cited in Tarım, 2014)

The level of satisfaction reveals a sense of belonging. In societies where a sense of belonging is established, the environment of trust and peace is

allocated and the effect of aesthetics on the city is revealed (Yılmaz et al., 2022). Urban spaces with aesthetic value in the city are more memorable. The concept of aesthetics is of great importance in terms of branding the city, directing investments, and attracting the population (Yerliyurt, 2002; Kaypak, 2013).

According to Jackson (1970), aesthetics is a basic need. He argues that cities should start the task of “providing a satisfying aesthetic sensory experience" to society (Tekel, 2021). According to Kaplan (1978), for individuals, an aesthetic area fills their basic needs and provides active space (Çakcı, 2007).

The aesthetic quality is related to the harmony of the physical environment (created by human hands like historical artifacts, social facilities, and residences) and the natural environment (like nature and green areas) and the visual elements that shape them (Akyuz, 2016). Urban aesthetics is not only about bringing visuality to the forefront but also the preservation of cultural values, the natural environment provides the needs of urban dwellers and the capability of urban dwellers to feel free in the city.

2.DEVELOPMENT OF URBAN AESTHETICS IN HISTORICAL PROCESS

Historically the notion of urban aesthetics dates to the first settlements. The studies demonstrate the first cities were established and designed not only for shelter but also with aesthetic concerns which are proved by the present-day urban ruins. Çatalhöyük (which belongs to the Neolithic and Chalcolithic Age between 7000-6500 BC), and the ancient city of Ephesus (which was created in the Polished Stone Age and was one of the twelve cities of Ionia in the Classical Greek Period), are among the examples that contain the aesthetic elements (Hale, 2014). In the Çatalhöyük settlement, the houses mostly consist of two rooms, and all the daily activities like eating, drinking, sitting,

and sleeping were done in the same room. The houses adjacent to each other formed a neighborhood, while courtyards were in the middle of the neighborhood. The items obtained during the excavations showed that these places were cultic (Sevin, 2016; as cited in Aktan, 2018). In the Neolithic Age, people produced goods for their use like in other periods by attaching an aesthetic value to them, which is confirmed by the reliefs and paintings found on the walls of the houses (Saygın, 2017). Red, black, and yellow colors are predominantly used in the wall paintings and the carpet reveals the geometrical patterns, human and animal figures, hunting scenes, and the environment. The most important painting is the drawing of the first city plan (KBB, n.d.). In the first settlements, the concept of "aesthetics" was not directly mentioned under the title of "aesthetics", but the geometric forms, importance to gardens, treatments of plants for different use, human-nature relationship as a basis, etc. revealed the importance given to aesthetics. In the Egyptian civilization, geometric forms are at the forefront of open space design, courtyards, and religious places such as temples and mausoleums occupy a large place in the city. Especially in religious buildings like pyramids, importance was given to the magnificence, grandeur, and beauty. During this period the plans and structure were not only created to meet the needs alone, but the visual, rich, and flamboyant stance shows the aesthetics were given importance (Erdoğan, 2006).

In the Greek civilization, it is seen that the cities were planned in a certain order based on symmetry, axiality, and certain proportions based on some mathematical calculations. The cities located on hills are dominated by geometric forms, while the settlements on the slopes by organic texture. Although the form of the settlement varies according to the topography, design principles emphasized balance, meaningful repetition, and hierarchy. The visual diversity and richness in the buildings were given great importance and geometric patterns and floral motifs were used on the facades. Mosaic

tiles, decorative floor coverings, and landscape design in urban spaces have made the city aesthetically rich. In Roman civilization, authority influenced the human-nature relationship which reflects the city plans and design principles. Aesthetic and livable cities were created by evaluating the built and natural environment together (Akyüz, 2016).

In Medieval Period cities, the natural elements directly influenced the urban plans. Settlements were generally situated on steep slopes, riverbeds, and Islands and surrounded by fortification walls for defense reasons. Influenced by rationalism, cities were shaped in geometric form and a 'hierarchy' was developed in open spaces. The squares were designed with colorful monumental elements, inscriptions, obelisks, and green areas. Prominent buildings such as castles, churches, and monasteries matched the landscape features of the settlement (Günay and Salman, 1994; as cited in Akyüz 2016; Pirenne, 2014). In this period, aesthetics was designed from the point of view of harmonizing the natural resources common in the city and its surroundings with the buildings. Topiary was obtained by trimming certain plants and was used in many public spaces like gardens and open-air theatres (Erdoğan, 2006).

In Seljuk cities, which left their mark in Anatolia during the medieval period, were built for defense purposes, and importance was given to castles, fortifications, mosques, and the green areas decorating them in the organic texture. The various arts, ornamental motifs and other elements used enriched the cities in terms of aesthetics and gave the identity to the city. Stone and brick, which are natural materials, were used extensively and especially monumental buildings and complexes were built from these natural materials (Hasol, 2021). Details such as flamboyant crown gates under the plain appearance of the cities, surprise places within the residential area, meaningful gaps between residences and monumental trees, assembly places

backed by fountains, shed light on the aesthetic understanding of this period (Kuban, 2021).

In the Renaissance period, the increase in the population in the cities and thus the growth of the cities resulted in high and flamboyant buildings, wide boulevards, widening roadways, and vista points (Günay and Salman, 1994; as cited in Akyüz 2016). In this period, due to free thoughts and enlightenment, there were radical changes in the understanding of urban aesthetics. It was also known as the "Art Age" due to aesthetic components such as scale, dimension, proportion, and harmony, and the spaces produced in this period were considered works of art. Geometric forms and formal and aesthetic orientations prepared the ground for the creation of the ideal city model (Kostof, 1991; as cited in Kürkçüoğlu, 2010).

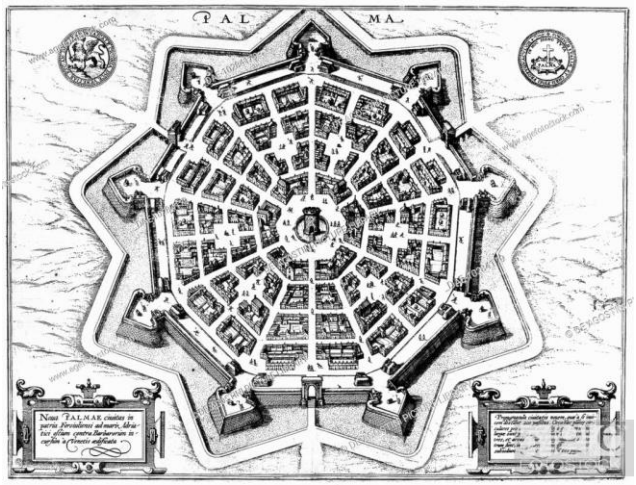

Figure 2: Palmanova ideal city

Source: Url 1

In the Ottoman period, the urban texture was shaped according to topography, climate, and geographical data. As a result, a rich urban image that is in harmony with nature and integrated with the environment is achieved. Under the influence of natural factors, the streets give birth to surprise spaces with

their curved structure that expands and narrow. Some buildings like mosques, madrasahs, complexes, inns, and hammams were at the forefront, while residential areas were seen as simple, and modest, but not similar to each other (Kuban, 2021; Kömürcüoğlu, 2019). At the same time, important urban green areas such as orchards, vineyards, and promenade areas were included in this period, apart from actively used residential gardens. Cansever (2016) explains this by emphasizing the religious beliefs of this period and argues that *"the main duty of man is to beautify the world"* and that the environment he created should be viewed as a *"vision of paradise"*.

Industrial Revolution cities were the first example of uncontrolled and unplanned urbanization. New settlements came into existence to meet the housing demand for the workers employed in industrial areas and these settlements were far from aesthetic perception. During this period, illegal construction increased in cities like London and Manchester, where the industry was at the forefront, and many areas were plundered to meet basic needs and leaving urban aesthetics aside (Akyüz, 2016).

In response to the problems experienced after the Industrial Revolution and the negative impact of urban aesthetics, the reorganization of cities has come to the agenda. Some approaches where aesthetics were at the forefront were adopted like a beautiful city, garden city, and practical city (Çubuk, 2001). In this period, the search for solutions to urban problems led to the emergence of complex approaches to urban aesthetics. Camillo Sitte argues that it is not possible to do the planning under a technical or mathematical title alone and is of the view that when it is considered as a technical subject alone, the aesthetic and artistic part is ignored (Sitte, 2019). In the Beautiful City approach, plans that will beautify the city and improve the quality of urban life are taken with aesthetic concerns and it is thought that cities will become more attractive and restore the economy (Şahin, 2008). The garden city

movement is aimed to add aesthetic richness to the natural resources by considering the advantages of rural and urban life together and promoting aesthetics to dominate the city (Howard, 2019). When it comes to the practical city movement, objectivity and standardization have been put forward by moving away from aesthetic concerns as the focus is on function rather than aesthetics. (Şahin, 2008). In today's cities, the understanding of aesthetics has transformed with the evolution of commercial buildings into shopping malls, business centers into skyscrapers, and residences into multi-story complexes and residences. The unique areas of cities such as the traditional Bazar and the gallery are also affected by this transformation and lost their values (Hasol, 2021). The construction of the same commercial units, housing, and business areas in all cities without taking into account the natural features causes the loss of both aesthetic perception and urban identity. However, it is seen that urban aesthetics is a fundamental element that supports basic needs and provides qualified services, brings harmony to the environment, and as a result, adds identity to the city.

3.EVALUATION OF URBAN AESTHETICS

The level of urban aesthetics is measured by the characteristics of some elements that make up the built environment and how these elements are constructed (Akkerman, 2000). Urban elements that are analyzed are urban furniture, landscape elements, natural building elements, and reinforcement elements. According to their design, harmony, order, rhythm, continuity, clarity, human scale, complexity, unity, and proportion are discussed (Lynch, 1960; Berlyn, 1974; Rapoport, 1977; Tibbalds, 1992; Hillier and Hanson, 1997; Kaplan, Taşkın and Önenç, 2006; Nasar, 1998; as cited in Tekel, 2021).

Urban aesthetics plays an important role in the senses of individuals as it determines the qualities of the space. Urban areas with different aesthetic values leave certain traces in the individual’s memory and have a

psychological effect on the place (Nasar, 1994). People differentiate some places from others because of urban aesthetics. The components of urban aesthetics can help in analyzing this differentiation. It is not possible to present a single-component matrix because, in the process, the components have changed with time as seen in Table 1.

Table 1: Components of Visual Quality in Urban Aesthetics

	Arnheim (1977)	**Lynch (1984)**	**Lang (1987)**	**Baker (1989)**	**Moughtin (1995)**	**Weber (1995)**	**Nasar (1998)**	**Günay (1999)**
Figure-Ground	X	X				X	X	X
Meronymy	X							
Layout	X		X	X	X		X	
Symmetry		X	X		X			
Hierarchy		X				X	X	
Form-Shape		X						X
Harmony			X	X	X		X	
Simplicity			X					
Continuity				X				
Rhythm				X	X		X	
Complexity Level	X			X			X	
Unity			X		X			
Ratio				X	X		X	X
Scale					X		X	X
Contrast					X			
Colour							X	
Perceptual Stagnation						X		

Source: Created using Tekel, 2021.

Even if the components are the same, Nasar (1994) explains aesthetic level changes according to the individual's perception and cognition understanding. According to Cullen (1961), the evaluation of urban aesthetics is not sufficient only by explaining the components (Tekel, 2021). The meaning that the individual establishes with the city and his/her relationship with the space plays a role in the evaluation of urban aesthetics. Tang and Long (2019)

stated that individuals find attractive places with high levels of urban aesthetics and connect with them.

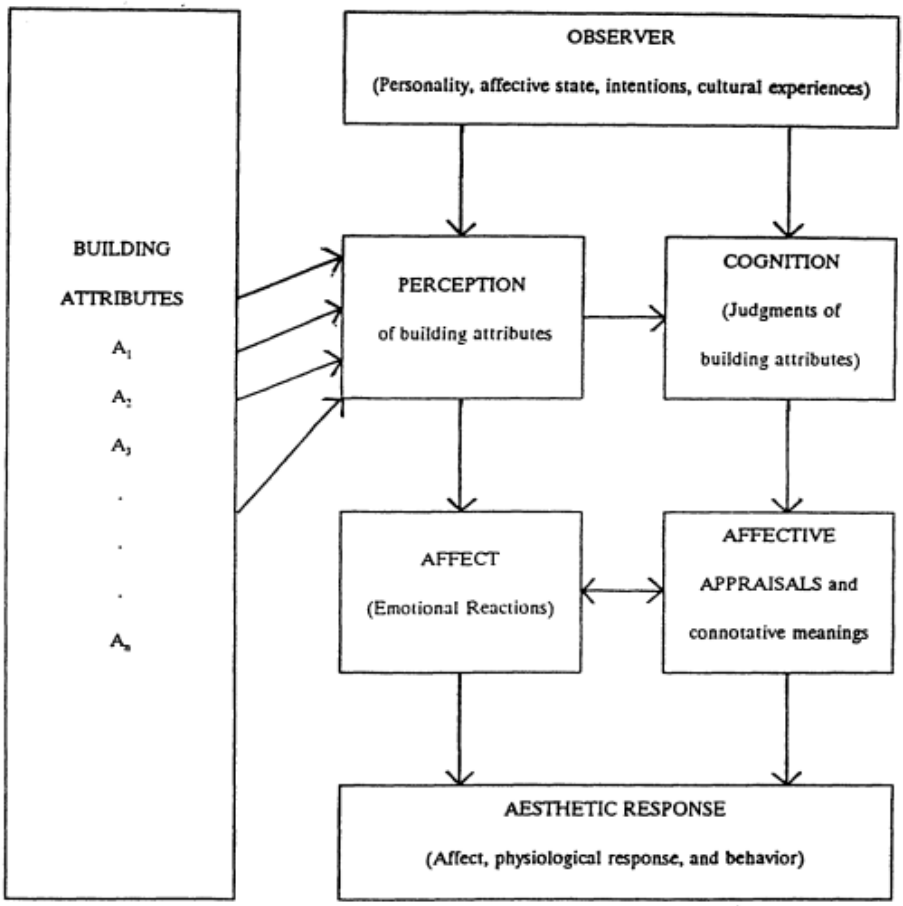

Figure 3: Perception Process of Aesthetics

Source: Nasar, 1994

In summary, the evaluation of urban aesthetics can be divided into three parts; the characteristics of the urban built environment, the way the urban built environment comes together, and the way individuals perceive it. Due to globalization, different societies are living together in cities, therefore the perception of individuals can be very diverse. In the planning process, especially in public spaces, approaches should be adopted that consider the needs of all urbanites, where the individual can connect with the city. As a

result, spaces with high urban aesthetic levels will contribute to the collective memory of the city (Samin, 2019).

CONCLUSION

Since the beginning of existence, human beings have always sought what is beautiful for themselves and aimed to reach that, even during the fulfillment of basic needs and its effects have been reflected in living spaces. Protection of human scale in urban space, observing the human-nature relationship, and making the space active and livable are the results of the reflection of aesthetics on the space. In today's cities, the search for both functional and aesthetic solutions continues depending on the changing technology and living conditions. In recent years, rapid change and transformation is observed in cities, especially in developing countries which emphases on the protection, improvement, and development of urban aesthetics and quality in a holistic sense, especially streets, avenues, and squares. However, the process of change sometimes leads to the destruction of the character, identity, and memory of the place. Cities that lose their identity become ordinary and lose their original values, which brings along many problems like security issues, and degradation of the quality of life and environment. Spaces that are erased from the memories of the individuals lose their belongingness due to transformation.

Urban aesthetics is an element that affects basic needs in increasing the level of satisfaction with life. When the historical development process of cities is examined, it shows that this has been going on in this way since the existence of humanity. Urban aesthetics should be seen as an important concept that deals with the city in terms of physical, historical, sociocultural, and natural aspects, as well as a tool that protects the original values of the city and urban policies according to it.

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CHAPTER IV

BIOMIMICRY AND INDUSTRIAL/PRODUCT DESIGN: A BIBLIOMETRIC SNAPSHOT

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THE TERM "BIOMIMICRY"

People have attempted a variety of methods over the years to solve issues effectively. Specifically, in order to make a difference and improve their designs' effectiveness, designers and engineers headed towards creative and inventive ideas. To achieve this, nature was a significant source of inspiration (Altun, 2011).

Since the beginning of time, mankind has had a tradition of learning from nature. Since nature is the foundation of design, as it is in everything else, imitating these dynamics to enhance living environments could offer efficient and effective solutions. One of the main features of nature inspired design was to create sustainable forms and structures that could stand up to variable, harsh and competitive conditions (Ginsberg et al., 2013).

In 1962, the word "biomimicry" had its first public use. The broadest definition of biomimicry, which is made up of the Latin words "bios" and "mimikos" (Volstad and Boks, 2012). The term biomimicry consists of the words "bio" and "mimicry"; "bio" means life, nature or life, while "mimicry" means imitation (Benyus, 1997). From this perspective, biomimicry can actually be expressed as innovation inspired by nature (Kennedy, 2004; Shimomura, 2010). However, biomimicry is more than merely copying or taking design cues from nature. The word "biomimicry" is defined in the literature according to three criteria: the first, imitating form or function; the second, imitating natural processes; and the third, imitating natural systems (Benyus, 1997).

"Learning from nature" is the central message of all related ideas, including bionics, biomimetics, biomimicry, biodesign, biomechanics, and organic design. Designers have turned to methods like learning from nature and mimicking nature in their hunt for answers as a result of the solutions they

have found to issues shared by all living things in nature (Karabetça, 2016; Yıldız, 2012). The study of "biomimicry" has developed as a result of technological advancements that drew inspiration from nature.

Different movements began to emerge in the early 1990s, taking inspiration from natural design in the 1970s and industrial ecology in the 1980s. The science of biomimicry emerged around the end of the 1990s. The word "biomimicry" was originally coined by Janine Benyus in her book "Biomimicry: Innovation Inspired by Nature" published in 1997.

THE BASIC PRINCIPLES OF BIOMIMICRY

Biomimicry seeks to create innovative solutions that are inspired by nature. With modern tools and capacities, we may now evaluate Nature's 3.8 billion years of experience (Volstad and Boks, 2012; Ginsberg et al., 2013). In order to find answers to human issues, a new science called biomimicry looks at, mimics, and draws inspiration from the models found in nature. Such models are;

- benefitting from sunlight
- using of the energy needed
- creating a form suitable for the function
- recycling everything
- promoting rewarding cooperation
- investing in diversity
- utilizing local elements
- keeping excesses away and
- pushing the limits (Benyus, 1997).

It is crucial that within these guidelines, infrastructures, processes, and products may all adhere to this natural design route. It alludes to using nature as a guide, model, and mentor. Biomimicry is based on two basic principles.

The first of these is the principle of self-creation/actualization. According to this principle, all living beings act with the impulse to maintain and enlarge their own existence. The second principle is the principle of least resistance. According to this principle, if possible, living things prefer ways that consume less energy or have fewer obstacles (Mathews, 2011).

Biomimicry philosophy is based on four main areas of study. The first of these is the study of what nature is. The second area of study is nature as a model. According to Dicks (2016), the imitation of nature in terms of design by examining what it reveals and accepting it as a resource are among the main areas of study of the philosophy of biomimicry. The third is nature as a criterion. The criteria and limitations presented by natural processes can be accepted as an ethical standard for innovation. Nature can show us what will work and what won't, so it's possible to use nature as a benchmark for “right” innovation. The fourth area of study is nature as a mentor. In this respect, nature can be considered as the main source of knowledge. It may be possible to take human beings from the focus of knowledge and place nature, and to see humans as an agent who learns from nature and follows nature’s virtue (Dicks, 2016).

BIOMIMICRY AND DESIGN

Biomimetic design is a method in which design problems are easily solved by using biological resources, opening the horizons of the designer by gaining different perspectives and inspiring innovative ideas (Yıldız, 2012). It will be more accurate for future generations and the world if the designs are made in line with sustainability and inspired by nature. Biomimicry involves the design and the designer in the process, and aims to develop creative and sustainable solutions inspired by nature (Söğüt and Aytar Sever, 2019).

Biomimicry in the design context refers to the thorough observation of nature's functional, formal, and material creations in order to generate design ideas that would improve the quality of life by fusing the meanings inspired by nature's constructions with innovative design processes. Biomimicry, also known as biomimesis, is the "conscious imitation of nature's creativity" and is sometimes referred to as "nature-inspired innovation" (Benyus, 1997). It is the imitation of life and nature via design, and it is a significant source of innovation which enables the finding of design solutions by taking the forms, processes and systems of nature as examples (Kennedy, 2004).

By incorporating the solution from nature into the current design, biomimicry develops the design problem to find a better solution. Imitation of nature pertains to the creative application of natural principles to the processes involved in making products and does not necessitate a straight transfer of observation of nature to any product (Volstad and Boks, 2012).

Biomimicry, particularly as a result of studies in the biological sciences, has provided a fruitful environment for the formation of new technology products. Consequently, biomimicry has contributed significantly to numerous industries (Sekerci and Tastan, 2022). It is possible to come across many design solutions that is inspired by nature in diverse fields from transportation to household goods, from electronics to hand tools, from garments to stationary products.

CLASSIFICATIONS FOR THE USE OF BIOMIMICRY IN DESIGN

The designers who want to utilize biomimicry for answering to the design problems rely on two approaches which are problem-based approaches (the design approach that question biology or design looking to biology) and

solution-based approaches (biology influencing design) (Biomimicry Guild, 2007; El-Zeiny, 2012).

Problem-based approaches are described as “direct approach”, "top-down approach”, “design that questions biology”, or “problem driven inspired design”. The designers tries to find a solution to the design challenge at hand by comparing and associating them with the existential in nature (Yazıcıoğlu, 2020).

Solution-based design approaches are referred as “indirect approach”, “bottom-up approach”, and “biology affecting design”. The collaboration between designers and biologists is a crucial design strategy since design challenges like ecosystems, species, and life cycles, which are the research domains of biologists (Radwan and Osama, 2016).

Form, process, and ecosystem are the three layers of biomimicry that may be used to solve a design challenge within the two methods outlined (Biomimicry Guild, 2007). Form and process are elements of an organism or environment that may be imitated while studying it. However, the ecosystem is what might be investigated to find for certain features to imitate. For problem-based design and solution-based design in the context of biomimicry, there are three levels: organism level, behavioral level and ecosystem level. The organism level includes an organism such as a plant or animal which can be mimicked. At the behavioral level, inspiration can be drawn from one or more aspects of how an organism behaves. The third level, the ecosystem level, aims to imitate the successfully maintained ecosystems (Zari, 2007).

The organism, behavior, and ecology are the three layers of imitation, according to an analysis of current biomimetic technology. The organism level involves simulating all or a portion of a single organism, such as a plant or animal. The second level of behavior mimicry may involve translating a

specific component of an organism's behavior or how it pertains to a wider environment. The third stage involves imitating whole ecosystems and the universal ideas that underlie their successful operations. There are additional five potential dimensions to the imitation inside each of these layers. The design may mimic nature in some ways, such as in the way it appears (shape), feels (material), is built (construction), operates (process), or performs (function) (Zari, 2007).

RESEARCH METHODOLOGY

This study used a database of scientific literature and science survey analysis to examine publications and research orientations in biomimicry and industrial/product design. A study topic's growth and potential for the future may be ascertained via bibliometric analysis. The expansion of multidisciplinary partnerships has been investigated using bibliometric approaches, which have also been utilized to determine links between logical advancement and methodological changes. The study approach offers comprehensive quantitative and statistical scientific data on the decision-making processes.

The linkages, patterns, and partnerships between the subjects were shown by network maps using the bibliometric data from the search results obtained using the pertinent keywords in the WoS (Web of Science) database. The functional analysis and scientific mapping serve as the foundation for the bibliometric analysis in this study. A visual portrayal of the conceptual, intellectual, and social structures of study disciplines is called scientific mapping (Cobo et al., 2011). This technique makes it possible to analyze bibliographic data depending on the author, document, source, institution, country, and Figure 1 describes the study's approach.

The study's bibliometric analysis was done using the VOSviewer application. The software program for analyzing and visualizing bibliographic collections is called VOSviewer. VOSViewer uses its own algorithm, a modularity-based clustering method based on the smart local movement algorithm, which is comparable to multi-dimensional scaling (Van Eck and Waltman, 2010; Waltman et al., 2010).

In this study, the publications in the field of "biomimicry" and "industrial/product design" which are in the Web of Science database were evaluated. Data were collected on 20.09.2022 and the search did not involve time limitations for publications, in other words the search involved all times publications. The search keywords used in the study is as follows: TI=biomimicry OR biomimetic(s) OR bio-inspired OR AB=biomimicry OR biomimetic(s) OR bio-inspired OR AK= biomimicry OR biomimetic(s) OR bio-inspired and TI= "industrial design" or AK= "industrial design" or KP= "industrial design" or (TI= "product design" or AK= "product design" or KP= "product design"

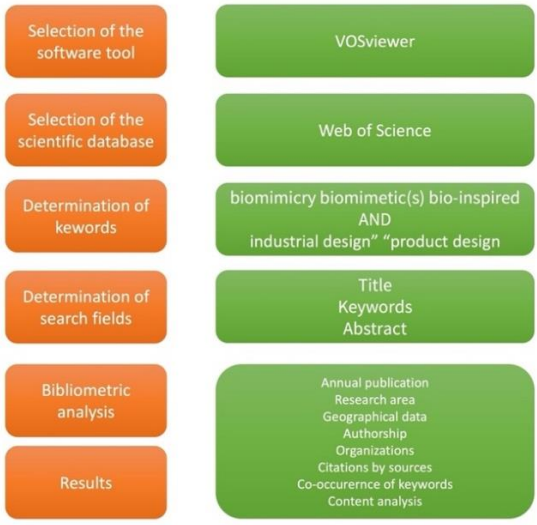

Figure 1: Methodology of the study

The following research questions are the main focus of the study:

- How are papers generated on “biomimicry” and “industrial/product design” distributed, and what kinds of documents are they by year?
- What is the situation with academics, institutions, and nations that are heavily researching “biomimicry” and “industrial/product design”?
- What are the bibliometric trends for published papers on “biomimicry” and “industrial/product design” such as book chapters, symposia, and articles?
- Which publications, prominent publishers, and noteworthy conferences are most active in the fields of “biomimicry” and “industrial/product design”?
- Which articles on “biomimicry” and “industrial/product design” have the most citations?
- What are the prevailing arguments for and against “biomimicry” and “industrial/product design”?
- What are the widely held agreements on “biomimicry” and “industrial/product design”, and what are the general patterns of the subjects covered so far?

RESULTS AND DISCUSSION

The results of the study’s bibliometric analysis will be presented in the form of a broad overview, including annual publications, research areas, geographic regions, authorship, organizations, citations between publications, the co-occurrence of keywords and, finally, content analysis for all the documents. The information is organized under the topics below.

Annual Publications

40 documents were accessed through Web of Science, and these 40 documents were cited 258 times across 243 distinct publications (Figure 2).

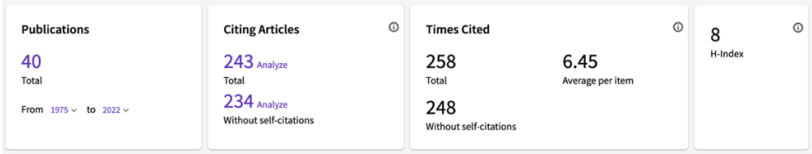

Figure 2: Citations of articles: citing articles and the count of citation

It has been noted that 119 distinct authors, 21 different nations, and 54 different institutions have all conducted relevant research. These publications were published as 25 articles, 14 proceedings papers, 4 book chapters, and 2 review articles when they were categorized by kind. (The total exceeds 40 publications due to the reason that a document may be classified as in the same class as both articles and book chapters in the Web of Science environment)

The distribution of publications by year is shown in Figure 3, which shows that study on the issue has gotten more serious and there have been more articles published in recent years. Seven articles were published in 2020, which is the most ever. The findings indicate that further investigation into industrial/product design and biomimicry is required. On the other hand, the rise in publications shows that there is a rising interest in this area.

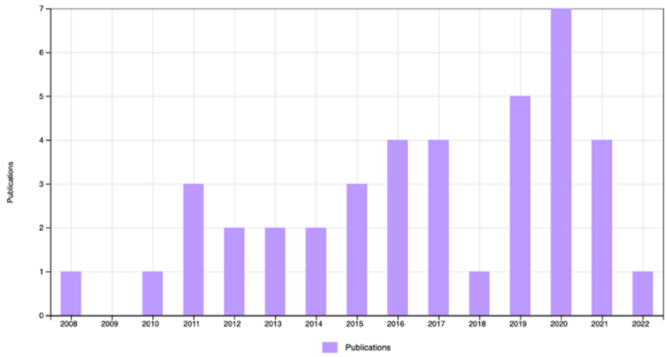

Figure 3: Annual number of publications related to biomimicry and industrial/product design

Research Area

The tree map diagram in Figure 4 shows how publication regarding "industrial/product design and biomimicry" are categorized thematically. The topic that has received the greatest investigation, as shown by the graph, is "Mechanical Engineering" (23%).

Figure 4: Annual number of publications related to biomimicry and industrial/ product design

Mechanical engineering has the most publications (9), and manufacturing engineering comes in second with (6). Table 1 also displays the contributions from the other areas.

Table 1. The highest number of publications in Web of Science Categories

	Category	**Record Count**		**Category**	**Record Count**
1	Engineering Mechanical	9	19	Chemistry Physical	1
2	Engineering Manufacturing	6	20	Computer Science Artificial Intelligence	1
3	Engineering Industrial	5	21	Computer Science Information Systems	1
4	Engineering Multidisciplinary	5	22	Development Studies	1
5	Education Educational Research	4	23	Ecology	1
6	Education Scientific Disciplines	4	24	Engineering Civil	1

7	Green Sustainable Science Technology	4	25	History Philosophy of Science	1
8	Materials Science Multidisciplinary	3	26	Logic	1
9	Business	2	27	Metallurgy Metallurgical Engineering	1
10	Engineering Biomedical	2	28	Multidisciplinary Sciences	1
11	Engineering Environmental	2	29	Physics Applied	1
12	Environmental Sciences	2	30	Physics Condensed Matter	1
13	Environmental Studies	2	31	Psychology Educational	1
14	Management	2	32	Regional Urban Planning	1
15	Materials Science Biomaterials	2	33	Robotics	1
16	Operations Research Management Science	2	34	Social Sciences Interdisciplinary	1
17	Architecture	1	35	Sport Sciences	1
18	Art	1			

Geographical Area

The nations having publications in the pertinent field are shown in Table 2 below. Only the USA published 10 of the 40 studies that were analyzed, despite 16 different countries having contributed, which highlights how inadequate such research is in many nations. The USA, Italy, China, and the Netherlands top the list for publications on biomimicry and industrial/product design. In this field, 50% of the publications come from these four nations.

Table 2. The countries with publications in the relevant field

County	**Documents**	**County**	**Documents**
USA	10	BRAZIL	1
ITALY	4	COLOMBIA	1
PEOPLES R CHINA	4	FRANCE	1

NETHERLANDS	3	PORTUGAL	1
NORWAY	3	GERMANY	1
CANADA	3	GREECE	1
NORTH MACEDONIA	3	IRELAND	1
ENGLAND	2	LEBANON	1
DENMARK	2	PAKISTAN	1
MALAYSIA	2	SOUTH KOREA	1
INDIA	1		

Top-ranking nations demonstrate that those with advanced economies and technologies are more engaged in this area. Publications from certain nations are only available as single-country publications. The United States, which has the top ranking, works with China, the Netherlands, and Denmark, which have the highest publication ranking in the area. The results of the analysis of the articles on industrial/product design and biomimicry were grouped into three clusters based on the countries involved in the collaborations: the red cluster includes the United States, Denmark, and Lebanon; the green cluster includes the Netherlands and Ireland; and the blue cluster includes China and Pakistan. Figure 5 depicts the relationship between nations and partnerships, while Figure 6 illustrates the international citation network. United States (65), England (62), China (50), Norway (23) and Italy (21) are the five nations with the most citations (Table 3).

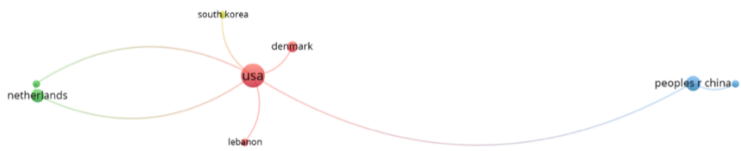

Figure 5: Collaboration network between countries

Figure 6: Citation network between countries

Table 3. Citation and countries

County	Citations	County	Citations
USA	65	COLOMBIA	4
ENGLAND	62	FRANCE	4
PEOPLES R CHINA	50	PORTUGAL	4
NORWAY	23	DENMARK	3
NETHERLANDS	21	GREECE	3
ITALY	13	LEBANON	3
SOUTH KOREA	8	CANADA	2
PAKISTAN	7	INDIA	1
GERMANY	5	IRELAND	0
NORTH MACEDONLA	5	MALAYSIA	0
BRAZIL	4		

Authorship

The top 10 writers with the most citations for their publications on industrial/product design and biomimicry are displayed in Table 4 and Figure 7 respectively. According to the cluster network's findings, "Mestre, Ana and Cooper, Tim" have received the most citations (62). The identification of the most influential writers was taken into consideration in this section of the investigation. The top 10 papers on industrial/product design and biomimicry are included in Table 5.

Table 4. The top ten writers with the most citations

Authors	Documents	Citations
COOPER, TIM	1	62
MESTRE, ANA	1	62

CHEN, GIAN	1	34
HUANG, JIAGI	1	34
JIANG, HAO	1	34
LI, LEI	1	34
LIU, JIKAI	1	34
YU, HUANGCHAO	1	34
ZOU, BIN	1	34
DE PAU, INGRID C.	1	31

Table 5. Ten publications with the most citations

Rank	Title, Authors, Year	Citation
1	Circular Product Design. A Multiple Loops Life Cycle Design Approach for the Circular Economy (Mestre, A and Cooper, T, 2017	62
2	A survey of design methods for material extrusion polymer 3D printing (Huang, JQ; Chen, Q; (...); Yu, HC, 2020)	34
3	Comparing Biomimicry and Cradle to Cradle with Ecodesign: a case study of student design projects, (de Pauw, IC; Karana, E; (...); Poppelaars, F, 2014)	31
4	On the use of Biomimicry as a Useful Tool for the Industrial Designer (Volstad, NL and Boks, C, 2012)	23
5	5 Assessing sustainability in nature-inspired design (de Pauw, IC; Kandachar, P and Karana, E, 2015)	15
6	Introducing students to bio-inspiration and biomimetic design: a workshop experience (Santulli, C and Langella, C, 2011)	13
7	Aesthetic product design combining with rough set theory and fuzzy quality function deployment (Kang, XH, 2020)	9
8	Life's Principles as a Framework for Designing Successful Social Enterprises (Patel, S and Mehta, K, 2011)	9
9	A systematic approach for new technology development by using a biomimicry-based TRIZ contradiction matrix (Lim, C; Yun, D; (...); Yoon, B,2018)	8
10	Tensile Strength and Flexural Strength Testing of Acrylonitrile Butadiene Styrene (ABS) Materials for Biomimetic robotic Applications (Khuong, TL; Gang, Z; (...); Rizwan, M, 2014)	7

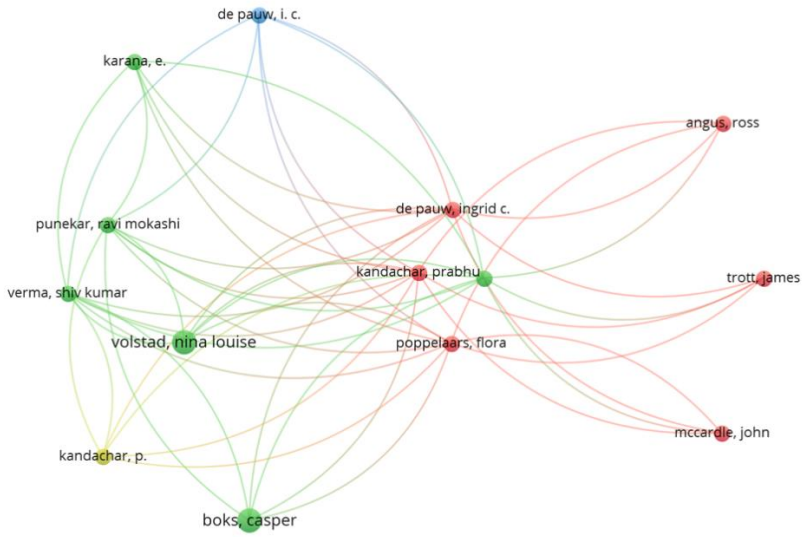

Figure 7. Most cited authors network

Organizations

Table 6 displays the performance of businesses with two or more publications in terms of industrial/product design and biomimicry. The most active research institution in the region, according to the number of publications (3) is Delft University of Technology. The other institutions have one or two publications, whereas the Norwegian University of Science and Technology, Penn State University in the US, the University of Cyril and Methodius in North Macedonia, and Technology University of Denmark all have two. The nations are represented on the list of organizations that have conducted research in the domains of industrial/product design and biomimicry. Table 5 shows that Nottingham Trent University has the most citations, with 62; National University of Technology in Pakistan (34); Shandong University in China (34); University of Pittsburg in the United States (34); and Norwegian University of Science and Technology (34) are the next highest, with 34 each (Table 7). The collaborative network between the organizations is seen in Figure 8.

Table 6. The organizations' performance with two or more publications in terms of biomimicry and industrial/product design

Organization	**Documents**	**Citations**
DELFT UNIVERSITY OF TECHNOLOGY	3	1
NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY	2	1
PENN STATE UNIVERSITY	2	1
CYRIL AND METHODIUS UNIVERSITY	2	1
DENMARK TECHNICAL UNIVERSITY	2	0

Table 7. The performance of organizations with the highest number of citations

Organization	**Documents**	**Citations**
NOTTINGHAM TRENT UNIVERSITY	1	62
NATIONAL UNIVERSITY OF DEFENCE TECHNOLOGY	1	34
SHANDONG UNIVERSITY	1	34
PITSSBURGH UNIVERSITY	1	34
NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY	2	23
DELFT UNIVERSITY OF TECHNOLOGY	3	21

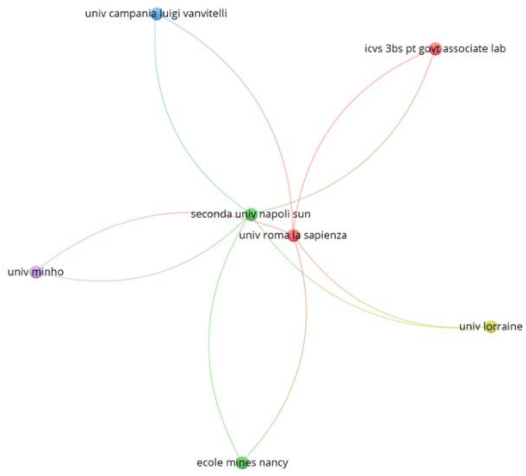

Figure 8. Organizations' citation network

Citation by Sources

The publishers with more than one publication are International Journal of Technology and Design Education, FME Transactions and Journal of Mechanical Design. The highest citation rate belongs to the Design Journal (62). The journals indicated in Table 8 are where the majority of publications categorized as biomimicry and industrial/product design are published.

Table 8. Journals as the primary venues for publications categorized as "biomimicry" and "industrial/product design"

Source	Documents	Citations
INTERNATIONAL JOURNAL OF TECHNOLOGY AND DESIGN EDUCATION	2	19
FME TRANSACTIONS	2	5
JOURNAL OF MECHANICAL DESIGN	2	5
THE DESIGN JOURNAL	1	62
VIRTUAL AND PHYSICAL PROTOTYPING	1	34
JOURNAL OF CLEANER PRODUCTION	1	31
SUSTAINABLE DEVELOPMENT	1	23
INTERNATIONAL JOURNAL OF SUSTAINABLE ENGINEERING	1	15
JOURNAL OF SOCIAL ENTREPRENEURSHIP	1	9
JOURNAL OF INTELLIGENT & FUZZY SYSTEMS	1	9

Co-Occurrence of Keywords

The network diagram displays the keywords and their connections within the relevant articles (Figure 9). The terms that appeared at least three times in each of the chosen articles were the keywords that were examined. Ten out of the 193 keywords met the requirement. 10 keywords were ultimately found in 3 clusters as a consequence.

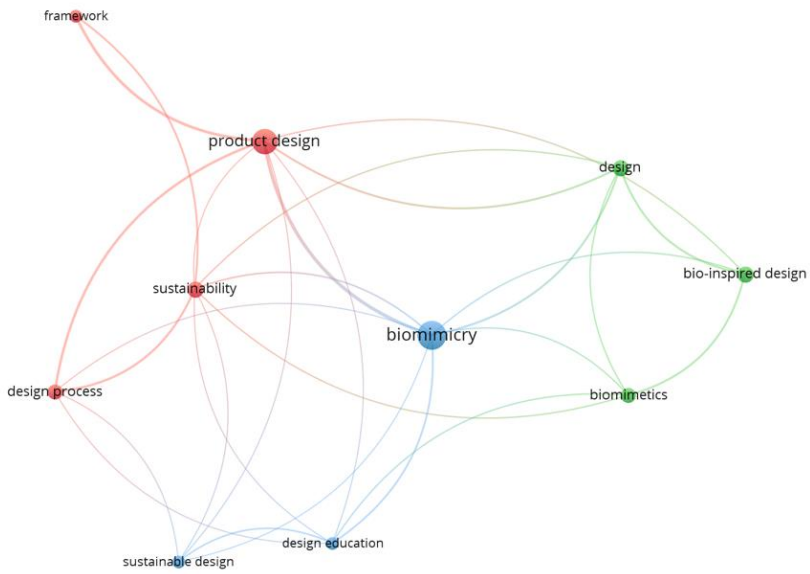

Figure 9. Co-occurrence of the keywords

Analysis of the Selected Articles' Content

The content of abstracts of the 40 papers were analyzed in terms of classifications that is introduced and discussed by Biomimicry Guild (2007), El-Zeiny, (2012), Radwan and Osama (2016) and Zari (2007) (Table 9). These classifications were biomimetic approach, biological phenomena, and further enriched by discussing the transition of the biomimicry principles to product/industrial design and issues to be solved:

- biomimetic approaches are classified as:

Solution-based approach involves bio-based strategies and design influenced by biology

Problem-based approach involves design strategies that questions biology, looks to biology for inspiration, or uses bio-inspired tactics.

- biological phenomena are analyzed based on two factors:

Levels include organism level, behavioral level, and ecosystem level (function)

Dimensions include what something appears like (shape), what it is composed of (material), how it is formed (construction), how it operates (process), or what it is capable of doing.

- transition of the biomimetic approaches to product/industrial design addressed by the publications
- issues addressed by the publications

Table 9. Publication list is sorted by relevance from 1 to 40

Rank in list when sorted by relevance	Publication	biomimetic approach	Biological phenomena		transition of the biomimetic approaches to product/ industrial design	Issues addressed
			Level: organism, behavioral, ecosystem	Dimension: form, material, construction, process, function		
1	Introducing Students to Bio-Inspiration and Biomimetic Design: A Workshop Experience	problem-based approach	organism	function	pedagogy, education	multi-functionality
2	Application of Bio-Inspired Design to Minimize Material Diversity	problem-based approach	organism	process	manufacturing	enhancing additive manufacturing processes
3	Challenges and Opportunities in Geometric Modeling of Complex Bio-Inspired Three-Dimensional	solution-based approach	organism	construction structure	geometric modeling, additive manufacturing	a new geometric modeling technique developed by am for bio-inspired

	Objects Designed or Additive Manufacturing					geometries
4	Bioform - Learning at The Intersection of Science and Design	problem-based approach	organism	form and function	pedagogy, education	bio-inspired design pedagogical approach and its impact on the student's design practice and proposes
5	Bio-inspired Back Support System for Backpacks	problem-based approach	organism	form and structure (the seahorse's skeleton, its ability for weight bearing while maintaining flexibility	functionality and ergonomics	school backpacks
6	Down To the Bone: A Novel Bio-Inspired Design Concept	solution-based approach	organism	construction	the bone's excellent mix of strength, toughness, and lightweight makes it ideal for structural applications	the most recent innovations in bone-inspired product design, architecture, and clothing
7	Circular Product Design. A Multiple Loops Life Cycle Design Approach for The Circular Economy	problem-based approach solution-based approach	organism, behavioral, ecosystem	all	circular product design multiple loops	creation, use, and dissemination of practical product solutions and design paradigms to

						aid the shift to a circular economy
8	Biomimicry - A Useful Tool for The Industrial Designer? Shedding Light on Nature as A Source of Inspiration in Industrial Design	problem-based approach	organism behavioral ecosystem	all	a card deck showcasing classified sources of inspiration for design ideas as a biomimicry tool for designers	a review on perceived benefits (enlarge solution space) and pitfalls (reductive or bombastic approach) of biomimicry
9	On The Use of Biomimicry as A Useful Tool for The Industrial Designer	problem-based approach	organism behavioral ecosystem	all	a card deck that serves as a biomimicry tool for designers by showing classified sources of ideas for design solutions	a review on perceived benefits (enlarge solution space) and pitfalls (reductive or bombastic approach) of biomimicry
10	Aesthetic Product Design Combining with Rough Set Theory and Fuzzy Quality Function Deployment	problem-based approach	organism	form	bio-inspired method	the styling of butterfly concept for blender
11	Bio-Inspired Approach for Innovative Design of Knee Protectors for Recreational Sports	problem-based approach	organism	structure	a virtual 3d model of an inventive knee protection was inspired by the armadillo's shell, which was made of collagen fiber-	a knee protector for light recreational sports

					connected tiles	
12	Bio-Inspired Fibre Composite Structures - Principles for Fabrication and Design	problem-based approach	organism	material and construction	highly efficient structures	semi-transparent pavilion spanned 8 m for a thickness of only 4.6 mm and weighed, despite its considerable size, less than 320 kg
13	Do Greener Products Earn More Green? Examining Biomimicry Along with Incremental and Radical Sustainable Product Innovations for UX Designs	problem-based approach	all	all	environmental-friendly, user-friendly innovations	a concept for a product that combines sustainable product design, user experience design, and biomimicry
14	Proposed Framework of Biomimetic Features Database System to Aid Product Conceptual Design	problem-based approach	all	all	a database as a tool to assist and motivate designers to include elements of nature at the conceptual design stage of products	a biomimetic characteristics database system's suggested framework
15	. Biomimicry ss a Meta-Resource and Megaproject A Literature	solution-based approach	all	all	nature as a mega-resource and meta-resource that is	intellectual and epistemological tendencies and

	Review				continuously replenishable and productive	frameworks that have arisen around biomimicry across disciplines and have acted as its forerunners
16	Design From Nature: Development of A Database to Support Product Development	problem-based approach	all	all	the database assists them by providing various visual design features that could be adopted from nature to solve design problem and improve creativity in product design	a database with biomimetic design feature information
17	Materials Selection for A Bio-Inspired and Symbolic Product: The Trentino Winter Universiade 2013 Torch 'Gentian of Alps'	problem-based approach	organism	form	accentuate the event's symbolic and constructive elements	a torch for the Olympics and Universiade with a biomorphic look
18	Universities And Business Incubators. Hybrid Of Knowledge in The Development of The Product	solution-based approach problem-based approach	all	all	university-industry collaboration	the relationship between industrial research, which involves the selection of

	Design					materials and the development of sophisticated techniques, and academic research, which focuses on the design of novel bio-inspired products and replicates the logic, structures, and morphologies inspired by nature, biology, and environment.
19	Biomimicry Design Thinking Education: A Base-Line Exercise in Preconceptions of Biological Analogies	problem-based approach	all	all	education, pedagogy, foundational assignment completed by students in the minor in design with nature	the creation of a workable instructional program leveraging improbable nature parallels using the biomimicry thinking process
20	Biomimicry: Nature's Design Process Versus the Designer's Process	problem-based approach	all	all	comparison of traditional and biomimetic design approaches	uses of biomimicry in manufacturing and product design, as well as one in architecture
21	Introducing Biomimetic	problem-based	all	all	education, pedagogy	disseminating useful

	Approaches to Materials Development and Product Design for Engineering Students	approach				concepts and real examples of biomimetic principles and tools for the development of new materials, new/improved design and fabrication strategies, and innovation methodologies
22	Application Of a Six-Step Bionic Strategy for Achieving Product Segmentation	problem-based approach	organism and behavior	function	a solar street light designed with the intention of achieving distinctive aesthetics and segmentation (modularity)	tools for systematizing obtained bionic data can help to speed up the creation of bionic products
23	A Survey of Design Methods for Material Extrusion Polymer 3D Printing	problem-based approach	organism	construction, structure	topological optimization, bio-inspired design, design driven by evolutionary algorithms, and geometric modeling	approaches for general design-for-additive manufacturing, especially in light of how well they fit the material extrusion process
24	Nature Inspired Design-A Review from An Industrial Design Perspective	problem-based approach	-	-	demonstrates the value of the design community extending design science-based methodologies	for nature-inspired goods, previous research is mostly focused on functional

					to find innovative solutions for nature-inspired goods	features, with insufficient attention paid to form-related issues
25	A Systematic Approach for New Technology Development by Using a Biomimicry-Based TRIZ Contradiction Matrix	problem-based approach	-	-	a tool to help professionals solve technical issues and create new technologies by considering both biological and technological answers	a methodical procedure to build a TRIZ contradiction matrix based on biomimicry that may be used to generate new ideas for technology by resolving contradiction via biological answers
26	Comparing Biomimicry and Cradle to Cradle with Ecodesign: A Case Study of Student Design Projects	problem-based approach	-	-	the requirement for such tools throughout the design phase, in order to prevent unexpected environmental effects of the designs over the product life cycle	comparison of the design approaches ecodesign, cradle to cradle, and biomimicry
27	The Nature as An Inspiration to Encourage Users to Extend the Life of Packaging	problem-based approach	organism	construction, structure	pedagogy: how can students utilize biomimicry to create durable packaging by using research	fruit served as a source of inspiration for the creation of packaging, resulting in sketches of new concepts.

					techniques and natural structures?	
28	Life's Principles as a Framework for Designing Successful Social Enterprises	problem-based approach	-	-	business enterprises	the design of sustainable technology and business systems is guided, informed, and benchmarked by the laws of nature as represented in life's principles
29	Assessing Sustainability in Nature-Inspired Design	problem-based approach	-	-	a tool that allows engineers and designers to evaluate the creation of ecologically friendly solutions	current life-cycle-based product assessments now include two additional components: evaluating sustainability criteria and evaluating "achievement, " or the degree to which these criteria have been met. additionally, the product context must be considered when evaluating positive effects
30	Circular Product Design:	problem-based	-	-	multiple usage cycles,	having understanding

	Strategies, Challenges and Relationships with New Product Development	approach			emotional durability, and biomimicry are additional design tactics introduced to ecodesign list by the circular product design methodology	of circular product design processes, methodologies, and tools
31	Introducing The Principles of Biomimicry and Use of Biomaterials in Design Education	solution-based approach	organism	construction, structure	education, pedagogy	design students use maize starch and mycelium (molding) to create a unique and ecological light (3d printing)
32	Biomimicry In Product Design Through Materials Selection and Computer Aided Engineering	solution-based approach	organism	construction, structure	a strategy that explains how nature may serve as a source of inspiration for the creation of a product	the case study and presentation of the existing methods led to the creation of a garden chaise lounge that has the shape of a scorpion
33	The Application of Biomimetic Materials on Industry Design Research	solution-based approach	all	material	-	the sensible utilization of materials by nature
34	Transdisciplinary Design Practices in	-	-	-	biologist/designer collaboration	the influence of life sciences

	Education: A Complex Search for Innovation in Nature				in biomimicry	collaboration on design education and the need for more effective strategies to promote them
35	Tensile Strength and Flexural Strength Testing of Acrylonitrile Butadiene Styrene (ABS) Materials for Biomimetic Robotic Applications	problem-based approach	all	all	biomimetic robots	the sensible utilization of materials by nature
36	Do Student Trials Predict What Professionals Value in Sustainable Design Practices?	-	-	-	-	students and experts were asked to compare their views on the ways that each design technique contributed to sustainability, creativity, and overall value
37	Sustainable Electronic Product Design	-	-	-	case studies, innovative concepts, and methods for creating such a more sustainable electronic product	technological products in a way that benefits society, the environment, and the economy
38	Biologically Inspired Design	-	-	-	integrating DfE design	when combining

	for Environment				for environment or ecodesign) and BID (biologically inspired design)	DfE and BID for the design of goods and systems, synergies and possible trade-offs between the two techniques must be taken into account
39	Solving Global Problems Using Collaborative Design Processes	-	-	-	biological solution analogies for idea generation	collaborative design process
40	Models and Ideology in Design	-	-	-	biomimicry as a model that serve ideological functions	designers that use biomimicry view it as a set of principles to reflect and advance in their creations

CONCLUSION

"Learning from nature" is not new to mankind. Nature is the starting point for imitating its dynamics to enhance living environments which serves for fruitful and powerful answers. In the early 1990s diverse movements emerged involving bionics, biomimetics, biomimicry, biodesign, biomechanics, and organic design. Designers grasped the importance of learning from nature and mimicking nature for answers as a result of the solutions they have found to issues shared by all living things in nature

Biomimicry is the use of ideas, solutions or systems from nature to solve design problems. It provides promising solutions to design problems. In the reviewed publications it is seen that many approaches are problem-based in

which the design approach question biology, look to biology to develop bio-inspired strategies. This shows that multi-disciplinary collaborations are required to achieve their way which is solution-based approach in which biology Influences design to develop bio-based strategies.

Classifications that formed a basis for the discussion in this study were biomimetic approach, and their transfer to product/industrial design. Biomimetic approach diverse in two branches as problem-based approach which means that design inquires biology, and solution-based approach in which biology inspires design. Biological phenomena are composed of levels which are organism, behavioral, ecosystem levels and additional dimensions for imitating nature inside each of these layers which are form, material, construction, process and function of the designed artefact.

As it is seen from these publications additive manufacturing comes to the forefront as a promising application for biomimicry. Another important outcome of the publications is the education feet, since it is important to help the biomimicry approach to spread among next generations. It related and thus compared to other environmental approaches such as eco-design or cradle to cradle approaches. All of them arrived with different outcomes in the particular case studies. It is also emphasized to be an important element for circular design life cycles. It can be also approached as a model for serving ideologic functions through the values it presents to the designers.

Finally, it is important to note that this study focused the terms “biomimicry” and “industrial/product design”. In the broader sense of design, there were more publications which involves other design fields such as architecture, interior design, etc. Nevertheless, the study specifically searched the aforementioned terms. It is important to note that, the design philosophy regarding biomimicry and publications around this issue were much in number which many of them were not involved in this study due to the

specific search terms which inquired the relation between biomimicry and industrial/product design; since the applications specific to industrial/product design involving a biomimetic approach were the central issue.

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CHAPTER V

THE PLACE AND SIGNIFICANCE OF BIOMIMICRY IN LANDSCAPE ARCHITECTURE

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INTRODUCTION

This study examines the place and importance of biomimicry to develop a new perspective on existing problems in landscape architecture. In this context, the goal is to create a general perspective for practitioners, planners, and designers to rethink urban, cultural, and ecological landscape areas. It offers to co-exist with nature through biomimicry and looks to designs through a nature-inspired approach. In this study, it is suggested that today biomimicry in landscape architecture will produce solutions to landscape designs, increase efficiency, and enable sustainable decisions to be taken in this framework. In the present study, the concept of biomimicry and its potential as a design tool to generate new ideas in the landscape architecture profession are explained and its importance in landscape designs is emphasized.

1.BIOMIMICRY

The term biomimicry derives from the Greek words 'bios' (life) and 'mimesis' (imitation). It is a new discipline that examines the best ideas in nature and then mimics designs and the process to solve human problems (Ölgen 2020).

Biomimicry refers to the direct study of nature and ecosystems to inspire solutions to environmental problems. It is based on modelling all kinds of natural concepts and assets in nature, whether animate or inanimate. It is an explorative tool for problem-solving, which integrates design and ecological disciplines (Sandzen 2015). According to Benyus (2005), biomimicry is an innovative approach that seeks sustainable solutions to human problems by taking the time-tested patterns and strategies of nature as an example. When the biomimicry approach is adopted in the form design stage, it is seen to be mostly adapted in form. The products that emerge as a result of the direct adaptation of forms are imitations of nature. Although biomimicry requires

design thinking, it is a solution to real life problems. When biomimicry principles are used in design, the final products can turn out to be a mimic of nature (Ölgen 2020)

In the middle of the 20th century, biomimicry practices became a special tool for academic and professional practices. The evolution of these practices towards design thinking coincides. Form creation process in design is a process in which many different fields can be used as a source of inspiration. In this sense, biomimicry brings nature and design together (Ölgen 2020). Designers look to nature for mutually beneficial relationships between nature and the environments to be designed (Sandzen 2015).

1.1 Biomimicry in Design

Many of the simple-structured designs that facilitate life were actually created by observing nature. Design is the process of solving a problem. Therefore, when designing, the problem should be determined correctly. A design process compatible with nature will be created based on the notion of “How did nature find solutions to similar problems while solving the problem?” (Inner 2019).

The basis of the recognition of biomimetics as a branch of science was underpinned by an electrical engineer named George de Mestral living in Switzerland. On a day when George de Mestral was hiking in the Alps with his dog, the plant known as "Burdock, Burr" stuck to his dog's fur and his own pants. He had an idea when he noticed that this plant was barely separating from his clothes and from his dog. Inspired by the burr, he created the Velcro Fastener, which is widely used in the clothing industry today and is referred to as "hook and loop fastener" in the local language (Figure 1). Thus, mentioning about copying or imitating nature, he revealed the first scientific experience of biomimetics.

Figure 1: Burr and Velcro Fastener

Source: Genç 2013

The Sikorsky Corporation was inspired by the dragonfly when designing the H5 Dragonfly. The corporation studied the flight of the dragonfly. As a result of these investigations, it developed the helicopter (Figure 2) (Inner 2019).

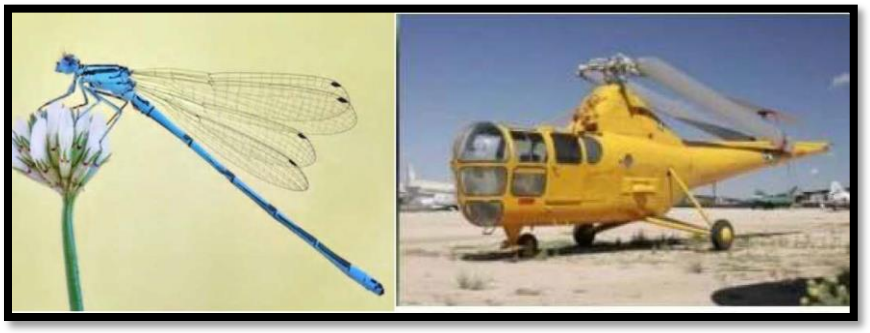

Figure 2: Dragonfly and H5 Dragonfly

Source: Inner 2019

The vehicle developed by the engineers of the Mercedes company is the bionic car with the lowest drag coefficient in its class. The structure of the vehicle is biomimetic. The engineers who undertook the design of the vehicle reached the boxfish when they looked to nature to make a spacious, safe vehicle with good aerodynamics. Despite its box-like shape thanks to the

skeletal system that protects its head and body, this fish attracted the attention of engineers with its ability to swim quickly in water. The engineers who examined the fish noticed that its aerodynamic structure was very effective. They decided to take advantage of this robust yet aerodynamic creature. (Figure 3) The automobile they produced by imitating the aerodynamics and bone structure of the boxfish reached the lowest drag coefficient among vehicles of that size (El Ahmar 2011).

Figure 3: Bionic Car and the Boxfish

Source: El Ahmar 2011

Biomimicry is an approach which has recently been used in architectural designs inspired by nature, as well as in industrial design and engineering fields. One of the best examples of this, La Sagrada Familia, whose construction started in 1882 and was taken over by Architect Antoni Gaudi in 1883, is a basilica that was left unfinished after the architect died in 1926. Gaudi, who lived in the 19th century, studied natural forms and systems in detail and used them in his designs. With hyperbolic and parabolic vaults and arches, helical piers and inclined columns, he designed systems that can stand in a balanced way without the need for internal or external support (Figure 4) Gaudi was able to understand the diversity of forms in nature and approached design problems with the solutions he found in this diversity (Ölgen 2020)

Figure 4: La Sagrada Familia, Barselona-Spain

Source: Ölgen 2020

The Rome Congress Centre and Hotel, La Nuvola, whose structure was designed by the Fuksas architectural firm, was completed in 2016. The outer shell of the building has a permeable structure, so the mass inside can be perceived from the outside. This inner shell, located in the centre of the building, is called the "cloud", and the structure is called by this name. The cloud is designed as a walking path, and the auditorium is reached by passing through it. This amorphous inner shell, as the name suggests, refers to the 'clouds' in nature. (Figure 5) In the design, the rationalist architecture of the region in the 1930s was reflected with the outer shell, and the organic architectural texture of Rome with the amorphous structure inside.

Figure 5: La Nuvola, Rome-Italy

Architect Mick Pearce designed the Eastgate Centre using termite ashes as a model. It is also the first building in the world to have ventilation and cooling. This type of ventilation used in the building has led to a decrease in the money to be spent on cooling has decreased considerably and allows also self-cooling without harming the nature (Genç 2013)

Figure 6: Eastgate Centre and termite towers

Source: Yıldız, 2012

2.BIOMIMICRY IN LANDSCAPE ARCHITECTURE

Landscape architecture provides opportunities for the practice of biomimicry components in the fields of architecture and ecology, as a multidisciplinary design branch that deals with natural and cultural resources and the physical

environment for human benefit, safety, health and comfort within the framework of aesthetics and science, and supports biodiversity that creates space and living environment.

Today, rapid urbanization as well as population growth result in an increase in environmental problems such as air and water pollution, etc.. In order to find solutions to such problems, ecologically sound landscape designs that can increase the quality and quantity of soil, air, water, and wildlife habitats and reduce the effects of erosion and flooding can be produced by observing natural systems. In order to produce these designs, a biomimicry approach that takes nature as an example can be used. Biomimicry can be observed in suspension bridges, lighting elements, and solar panels.

Tissues that connect muscles to bones, namely tendons, are examples of biomimicry inspired in suspension bridge construction.

Tendons gain an extremely hard structure thanks to the collagen-based fibers that form them. Another feature of these fibers is the way they are knitted to each other. The tendon between the elbow and the wrist consists of tangled bundles of cables, just like the ropes that carry the suspension bridge. The steel rope technology used in today's suspension bridges has been developed by mimicing the structure of the tendons in the human body. Hauling ropes in suspension bridges consist of cable bundles, as in our muscles (Gertik 2012).

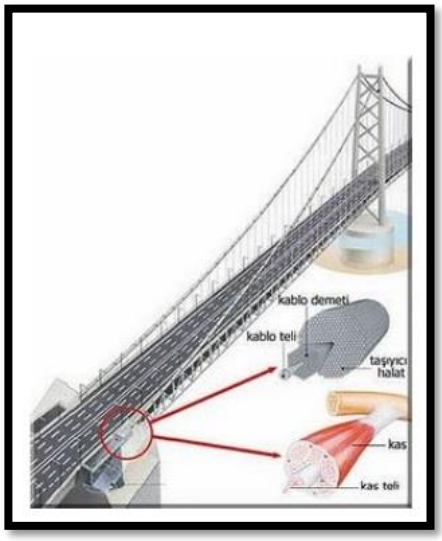

Figure 7: Suspension Bridge

Source: Gertik 2012

The solar-powered street lamp used in Australia is inspired by the flower of the eucalyptus tree. In daylight, solar cells collect sunlight and store it in the battery compartment inside the cone-shaped area. After sunset, electricity is transferred from hundreds of energy-efficient tubules and the light spreads downwards, illuminating the street (Yıldız 2012).

Figure 8: Eucalyptus flower- street lamp

Source: Yıldız 2012

The Lotus Temple, designed by Decibel architecture, was inspired by the Lotus flower, the national flower of Vietnam (Figure 9). Every detail of this building, from its interior design to its landscaping and façade, was inspired by this plant. The leaves of the unopened lotus flower inspired the structure of the building (Figure 10). The Lotus form consists of a pentagonal grid system. This pentagon was chosen as a metaphor for the head, arms, and legs of a person lying down. This ratio is observed in many flower structures in nature, especially the lotus flower. Thus, a focus is established between nature and human (Inner 2019).

Figure 9: Lotus Temple

Source: İnner 2019

Figure 10: Unopened lotus flower

Source: İnner 2019

Within the scope of landscape ecology, which deals with the professional practice of landscape architecture and the relations between the elements that make up the landscape, the use of natural, cultural, and socio-economic values and the creation of a human-oriented, humane built environment with ecological approaches for sustainability is one of the most important elements (Demirbaş and Demirbaş 2019). .

The cycle of nature that works within itself and the basic principles of this cycle have started to be used in today's landscape and urban design practices to create a more sustainable as well as naturally-and-culturally-structured environment. In this context, the principles of biomimicry are significant in landscape designs in terms of environmental, ecological, social, and economic framework (Yeler 2015). These principles are as follows:

1)Economic Principles

- Increasing the probability of investment with accepted best-practiced designs
- Efficiency increase and cost reduction through the development of sustainable technologies
- Possible increases in land values through adaptable structures and lands
- Creating values from the creation and recycling of energy
- Attractiveness for investors and users
- Integrating contention with the latest cost-saving initiatives
- Higher land values with green infrastructure
- Repetition of common elements in successful designs

2)Environmental Principles

- Possibilities of minimizing carbon emissions with accepted associated best practice

- Using free places for temporary spaces
- Reducing environmental impacts
- Reducing impacts on environment
- Reducing possible damage to the environment

3)Ecological Principles

- Ensuring connected developments within local infrastructure networks
- Increasing green infrastructure by using temporary spaces such as parks
- Creating a set of green space typologies
- Creating green spaces that renew themselves with local plant species
- Repeating common elements in successful design

4) Social Principles

- Providing social and cultural facilities and opportunities
- Increasing social welfare through the formation of social networks
- Repeating elements in successful social activities
- Increasing the quality of social life (Yeler 2015)

Landscape arrangements are made within the framework of these principles in urban designs. For example, in Lavasa, India, a design was prepared to protect the city from floods with the canal system that makes use of anthills, by evaluating the climate of the region, soil structure, plant and animal varieties, transpiration, and water filtration (Figure 11). The foundations of the buildings are planned to hold the slopes tightly like the roots of the trees, and the roofs are planned to prevent soil erosion. Business and residential areas are brought together in the city, allowing mixed uses and different functions (Yeler 2015).

Figure 11: Lavasa, India

Source: Kaya vd. 2018

The world's first "zero-carbon" city, Masdar city, the construction of which started in the Abu Dhabi desert in the United Arab Emirates, is estimated to be completed in 2023. Giant solar sunflower umbrellas proposed by LAVA (Laboratory for Visionary Architecture) are planned to create livable places throughout the year (Figure 12). These branched structures shade spaces, move with the sun, store heat and release it at night. 82% of the city's energy needs are met by solar energy, 17% by a system that converts food wastes into energy, and 1% by wind turbines. In the city, where gasoline vehicles are not allowed to enter, the residents of the city will use private vehicles or public transportation, special rapid transportation systems that use clean energy. Trees that will bring fresh air and desert wind to the streets will be strategically placed around the city (Yeler 2015).

Figure 12: Masdar city, the UAE

Source: Yeler 2015

CONCLUSION

A biomimetic approach to architectural and landscape design is the creation of natural forms, processes, and systems that can be incorporated into design as sustainable solutions. In addition to environmental factors and effects in design, it requires the development of new design methods. This approach encompasses integrated design processes of form, material, and structure instead of treating them as separate elements. It offers a new framework for solidly constructed design that connects and integrates ecology in landscape designs.

All systems are constantly updated and developments act in harmony with each other to provide maximum functionality. If this is applied to landscape designs, it may become possible to produce designs that are much more advanced in terms of environmental and sustainable performance and are associated with and affected by their environment. They link sustainability, flexibility, and form and can result in highly responsive design solutions that are aesthetically appealing, effective, and educational.

The practice of biomimicry in designs allows further training for its users on the highly unique natural systems for which these structures are designed.

Biomimicry is an important strategy in which design can imitate nature in the built environment. It can be seen in ecological design strategies such as the duplication and re-creation of natural wetland systems.

As a result, it is observed that biomimicry can be used both in form and system-oriented in architectural and landscape designs. Examples of natural forms, architecture, and landscape are structurally reflected in the structure. When the starting point taken from nature is abstracted and passed through the filter of the designer and the result is transformed into a product, original works emerge.

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CHAPTER VI

BIOMIMICRY FROM THE VIEWPOINT OF URBAN PLANNING

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INTRODUCTION

People used nature as a guide both in the nomadic life and after the sedentary life. They applied what they learned from nature for a more comfortable life. Afterwards, the development of humanity has put nature in danger of destroying it. What we learned from this process is that in the early days of humanity, while there was a lot of effort to be inspired by nature and to understand nature, nature was completely forgotten for a while. In another sense, people have turned their backs on nature. For example, the increase in industrialization with the industrial revolution has caused global warming, which is one of the main debates today. Thus, as people encountered various problems that they could not get out of, they again entered the process of searching for solutions inspired by nature. As a matter of fact, the solution to the global warming problem is with the sustainability approach. The concept of biomimicry explains exactly this situation. In other words, understanding nature means learning about nature and reflecting existing solutions in nature to design (Ter ve Derman, 2018; Güneş, 2018).

Although biomimicry is defined as imitating nature, it actually refers to the research of scientific knowledge and laws that explain nature and its reflection on designs. The main thing in biomimicry is to understand what the design principles in nature are. These principles are the main guiding principle (Steadman, 2008). It is important to understand the principles of design in balance with nature and to include them in the plan, as qualities such as being specific to the local area and reflecting the characteristics of the region subject to planning are always sought in the city planning discipline. Because the urban planning process is a multidimensional process that covers the physical, social, economic and cultural contexts in the designed area. The important thing at this point is to produce concrete solutions to the abstract concepts and problems encountered with a design approach.

In this section, along with the concepts of biomimicry, the relationship between the concept of biomimicry and design from space will be explained and its effects on urban planning and approaches will be discussed. As a result of the literature review for the study, it has been seen that there are very few studies in the field of city planning, but it is more discussed in the field of architecture.

1.CONCEPTUAL APPROACH TO BIOMIMICRY

In the ongoing period since the Industrial Revolution, the design of the built environment is based on human-based learning. In this process, due to the attitude of man to dominate nature, the bond with nature has been broken. The design approaches adopted in response to the changing and transforming needs with the Industrial Revolution are designs devoid of thinking about the future. In order to solve the problems caused by this situation, the process of being inspired by nature has come to light again (Kenny et al., 2012). Biomimicry, which emerged in 1982 but was clearly defined towards the end of the 1990s, derives from the Greek words bios: life and mimesis: to imitate. When it comes to its essence, Leonarda da Vinci's statement in 1482 "Those who are inspired by a model other than nature, where all the teachings are found, are trying in vain" evokes biomimicry. Subsequently, D'arcy Wentworth Thompson (1917), Jack Elwood Steele (1960), Otto Schmitt (1974) and Janine Benyus (1997) talk about biomimicry in direct or indirect forms. Biomimicry adopts to approach all problems from the perspective of nature (Lenau, Orrù, & Linkola, 2018). Janine Benyus proposed a methodological approach to biomimicry in her book "Biomimicry: Innovation Inspired by Nature" published in 1998. She emphasized that when solving a problem of biomimicry, not only certain plant or animal species should be considered, but all classes including bacteria and fungi. At the same time, Benyus emphasized that 3 basic questions should be asked in order to use

nature as a mentor: What would nature do here? What would nature not do here? Why and why not? (Benyus, 2002; Baumesiter, 2014). Maibritt Pedersen Zari (2010) defines biomimicry as imitating the behavior of an organism, organism or entire ecosystem in terms of form, material, production method, process strategies or function. The mimicry mentioned here is not the copying of organisms as they are; includes interpretations, adaptations and derivations from biology (Vincent et al., 2006).

Biomimicry has emerged with the adaptation of natural systems to artificial systems. Biomimicry basically has 3 dimensions (Özen, 2016):

I. The nine principles of nature: The Nine Principles of Nature were defined by Benyus (2002). These 9 principles reflect the common features of every system in nature. For this reason, it is stated that designers should consider these principles.

II. Nature as organism level (form), behavior level and ecosystem level: It refers to three main levels of biomimicry to be applied in solving a design problem (Benyus, 2002; Pedersen-Zari, 2007).

III. Biomimicry design spiral: The biomimicry design spiral created by Carl Hastrich is based on the expressions Benyus used while explaining biomimicry (Özen, 2016).

2.BIOMIMICRY AND SPATIAL DESIGN

Following the principles of biomimicry in design has both positive and challenging aspects. Developing understandable and easy-to-follow principles in biomimicry is important in terms of facilitating practice (Mul, 2011). At the same time, biomimicry helps to generate ideas other than standardized designs and solutions (Mazzoleni, 2011). Biomimicry principles should not be considered in isolation. For example; evaluating it together with technology

both enriches the designs and contributes to the production of sustainable models (Freixas, 2011). While doing all these, the unique situations of the cities and the emphasis on locality should not be forgotten. Buck (2017) links one of the challenging aspects of biomimetic design with poorly defined problems. Because problems and potentials that are not well defined cannot find a solution or a solution in nature. Buck also criticizes the designers at this point. For example; one of the challenges of the biomimetic design process is that designers oversimplify complex biological functions or focus on a single biological function. (Buck, 2017).

Biomimetic designs have two starting points: 1) problem-to-solution design, top-down design, questioning biology, problem-to-biology, problem-based (Speck & Speck, 2008; Gebeshuber & Drack, 2008; Helms et al., 2009) and 2) design that goes from solution to problem, bottom up, biology that influences design, from biology to design, solution-based (Baumesiter, 2014; Speck and Speck, 2008; Gebeshuber and Drack, 2008; Helms, Vattam, and Goel, 2009). In the biology approach that affects design, planners, designers and biologists observe nature and determine the characteristics and behaviors of organisms without seeking a solution to a problem, and create designs that meet existing needs. In this model, nonlinear steps are followed and the output of each stage also affects the previous stages. Therefore, this approach model is the most suitable model for a more sustainable city model (McDonough, 2002; Helms et al., 2009). In the design approach that questions biology, planners and designers define the problem; Working in collaboration with biologists, they find and observe the most suitable organism in nature for this problem and find a solution (Buck, 2017). The three processes common to both approaches are defined as problem, nature and solution. Both approaches go to the point they want to reach by following these three processes in different ways (Öztoprak, 2020).

The approaches in these two groups follow the same design process: from the beginning to end and the end to beginning. Steps in this process are:

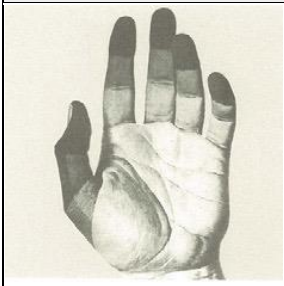
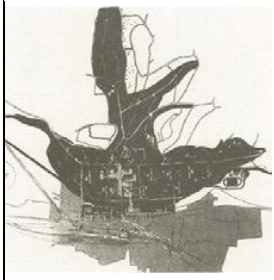
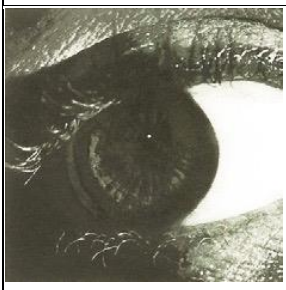
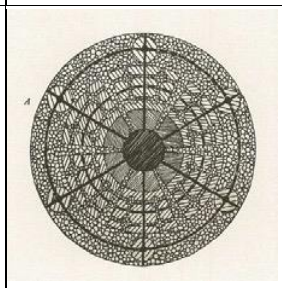
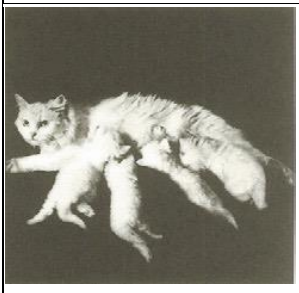
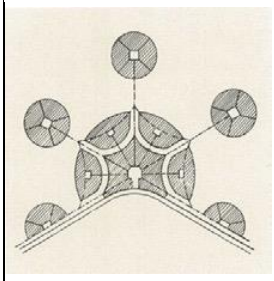
- Defining the problem
- Abstraction of the problem
- Researching biological analogies
- Identification of biological solutions
- Transfer of principles
- Application of the principles

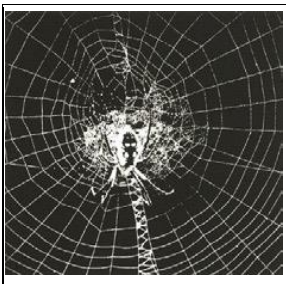
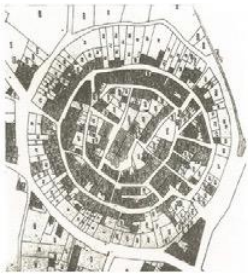
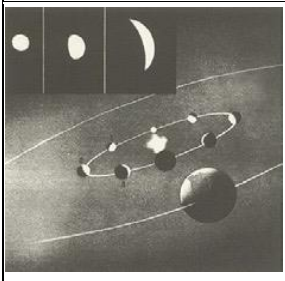
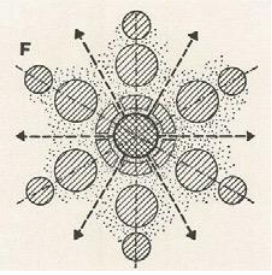
In addition, there are three main levels of biomimicry that can be applied in biomimetic design, which are mentioned under the title of "Conceptual Approach to Biomimicry": organism level (form), behavior level and ecosystem level (Benyus, 2002). The form level is the first level of biomimicry and involves inspiration from part or all of a particular organism. Inspiring organisms only by their forms may not work as well as the organism itself. Only the imitation of form is a start for sustainability. Only inspiration from form leads to a reduction in the potential of biomimicry. With the deepening of the biomimicry approach at the form level, the behavior level biomimicry approach emerges. This approach examines both the form and behavior of living things. At this level, how the organism behaves and how it relates to its environment is discussed (Benyus, 2002). Here, the most complex and most suitable level for the urban planning scale is the ecosystem level. Because the ecosystem level expresses the necessity of considering the residential areas in a holistic way. However, considering all the parts in the system and their relations with each other, sustainable settlements that work in continuity and harmony can be created (Radwan & Osama, 2016; Graham, 2003; Kibert et al., 2002; Korhonen, 2001). At the ecosystem level,

biomimicry creates an environmental performance-enhancing effect. If cities are designed as a system and act as a system, it is expected that the environmental performance of cities will increase (Benyus, 1997; De Grood et al., 2002; Mcdonough and Braungart, 2002).

In studies which are about cities, the urban system is mostly associated with the human body. The lungs in the human body are often associated with forests in the urban system and the circulatory system with transportation. In other words, there is a metaphor established between cities and the human body. In this context, Guerreiro (2011) likens cities to living organisms. He asserts that this organism is a super-organism to which it is attached. From this point of view, the city and the ecosystem it is connected to are defined. As a matter of fact, Newman and Jennings (2008) define cities as sustainable ecosystems. It is stated that cities live in interaction with each other just like people. Structures, transportation links, infrastructure, open green spaces, plants and animals in the urban system form a part of this system in interaction. In addition, Oswald Mathias Ungers (2013) in his book "Morphologie-City Metaphors" includes city-scale plans and schemes, as well as natural images that evoke them. In his book, Ungers questions the urban space through imagination, image, metaphors, models, analogies, signs, symbols and allegories. The reason for doing this is to reveal the importance of taking nature as a reference in urban design. To give examples of comparisons in his book; He likens the human hand to Saint-Die's reconstruction plan, the structure of the human eye to a concentric radial city plan, the spinal system of living things to the linear city of Berlin, and the image that emerges when a cat nurses its kittens to an autonomous suburban urban setup. These analogies and more are shown in Table 1.

Table 1 Analogies, metaphors and imagery created by Ungers about cities

Object	Analogy-Metaphor-Imagery	Idea
		**Opening out** *Saint-Die's reconstruction plan - ,Fransa, Le Corbusier, 1945*
		**Center** *Concentric radial urban systemi, 1910*
		**Backbone** *Lineer Cityt, Berlin*
		**Dependency** Autonomous suburban city - Unwin,1910

		**Network** *Cadastral plan, Bram*
		**Cell Structure** *Riverside's plan, 1890*
		**Planetary System** Core city system
		***Growth*** *Tenecmitlen*

Source: Ungers, 2013 cited by Avinç & Selçuk, 2019

City planning is a discipline that has both tangible and intangible working areas at different scales. Strategies and decisions are created at the upper scale, this part refers to the intangible working area of planning. For upper-scale plans, examples can be given as Development Plans, Spatial Strategy

Plans, Regional Plans within the planning system. As you move from the lower scale, the implementation phase begins. However, the stage of producing tangible studies on the planning area begins. Sub-scale plans, on the other hand, can be given as examples of Master Plan and Implementary Development Plan. While the design phenomenon cannot be mentioned in the upper scale plans, the design phenomenon begins to occur in the lower scale plans. Spatial designs in the lower scale; It covers different scale designs such as streets, neighborhoods, squares, urban furniture. It is important that all of these scales are in harmony and continuity. A harmony and continuity is observed in nature at all scales and in all dimensions. Nature; It has successful designs, principles and systems in which the principle of sustainability is at the forefront. For this reason, correct and successful designs are designs with certain common principles. In this case, it is important to produce designs inspired by nature correctly and to find solutions to problems that arise in any dimension of design with inspiration from nature. For example, if an application in another city is taken and applied directly to solve the problem that arises in one system of the city, the problem will not be solved. Instead, a more successful result can be obtained if the causes of this problem in the system are investigated, the root of the problem is examined, and a solution is produced by being inspired by the systems in nature. In addition, simply following the principles of biomimicry will not be enough. Biomimetic design and biomimicry principles should be evaluated together with other principles and design principles in the field of city planning.

City planning requires multidisciplinary work. Along with the biomimicry discussions, the need for urban planners to work with biologists has emerged. Because the analysis of natural systems, it is necessary to decide at what scale of the design from which organism to be inspired. City planners are lacking in terms of the knowledge required to understand the working principles of

nature. Therefore, interdisciplinary cooperation is essential (Von Meijenfeldt, 2014).

3.EXAMPLES OF BIOMIMETIC DESIGN AT THE SCALE OF CITY PLANNING

Biomimetic design is used in the urban planning discipline. The examples here are divided into two category: the ones that have started to be implemented and the futuristic/utopian ideas. Known examples of biomimetic design which are implemented; India-Lavasa City, China-Langfang District, Kalundborg city in Denmark, Meixi Lake in China. Futuristic projects based on biomimicry include Lilypad, Syph, Green Float, Recipro and Ultima Tower.

3.1 Implemented Examples

The city of Lavasa in India is affected by monsoon rains, receives heavy rainfall in certain months of the year and experiences drought in other months. As a solution, monsoon forests that were known to exist in deforested areas were imitated. Thus, the retention time of the water without evaporation is extended. In addition, a canal system inspired by anthills was developed to protect the city from floods. Thus, the erosion problem in the region was prevented (Rossin, 2010).

The local ecosystem of the Langfang region of China has been disrupted as a result of deforestation and intense urbanization. As a result, rainwater can not hold on to the soil and groundwater dries up. Biological research has been carried out to create a design model that takes natural water cycles as an example for the city's water scarcity. It has been redesigned with reference to the old water beds and water flow charts in the region. Thus, both the water problem was solved and new landscape areas were brought to the city with the redesigned green cover (Lazarus and Crawford, 2011).

An industrial ecosystem was developed by symbiosis method in Kalundborg, Denmark. Thanks to this system, all institutions and organizations ensure the exchange of waste products in industrial production. In other words, the waste product of one organization becomes the raw material of another organization. Thanks to this system, together with the reduction of resource consumption, negative effects on the environment have also been reduced (Valentine, 2016).

Based on the knowledge that slime molds build channels on the shortest path to reach the food; in Tokyo, a mathematical model was created to help design efficient transportation networks in residential areas. In fact, in the experiment, the similarity of the channels formed by slime molds to reach the food was similar to Tokyo's rail system map (Tero et al., 2010; URL-1).

Meixi Lake, which is planned as a new residential district in Wuhan, China, was inspired by local ecosystems, just like in Lavasa. Buildings in the area are designed in different sizes and shapes, like trees in a forest, to allow each residence to receive at least two hours of sunlight (URL-7).

3.2 Futuristic Examples

Lilypad is a biomimicry-based urban idea which is designed by Vincent Callebaut. Inspired by the leaf of the Amozonia Victoria Regia plant. The population of the city was determined as 50,000 and it was designed as a self-sufficient city. There is a city setup that provides its energy from renewable resources, collects rain water and uses all wastes for recycling. There are residences, workplaces and entertainment areas in the city. There is a lake in the center and three ports around the city (URL-6).

Figure 1 Lilypad

Source: URL-6

Syph is an underwater city inspired by jellyfish. All functions, especially sustainable agriculture, food production, industry and energy production, have been designed in the city (URL-5).

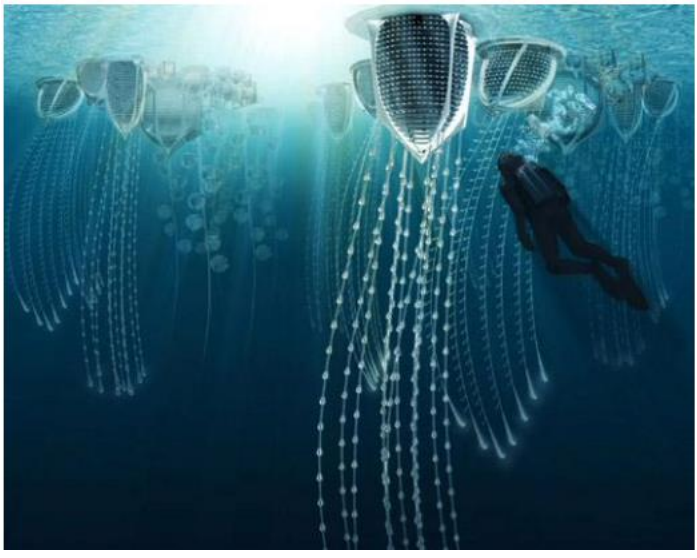


Figure 2 City of Syph

Source: URL-5

Green Float, on the other hand, is a botanical city inspired by lotus and dandelion plants for the equatorial region. The city, whose diameter is 3000 meters, floats in the ocean like a lotus. Life in harmony with nature such as

dandelions and the growth of plants, animals and people according to natural rules and maintaining the balance of order in nature are key concepts for the botanical city. A walkable compact village within a radius of 1 kilometer is defined as a cell (area). Cells make up modules (cities) and modules make up units (countries). A cell consists of a 30-storey residential area, low-rise houses by the water and mixed buildings with business-residential functions. It covers a total population of 50,000. The skyscraper city is in the form of an inverted cone so that the ground surface receives more sunlight. There are green and aquatic open spaces on the ground. Food production and consumption areas are close to each other and there is a self-sufficient nutrient cycle with the riches of land and sea. Nature is also used in advanced technologies. It absorbs carbon dioxide like a single leaf that uses the sun for photosynthesis. Resources are recycled by converting waste into energy. The floating structure is constructed at sea with interconnected honeycomb-like structures made of desalinated magnesium alloy (URL-4).

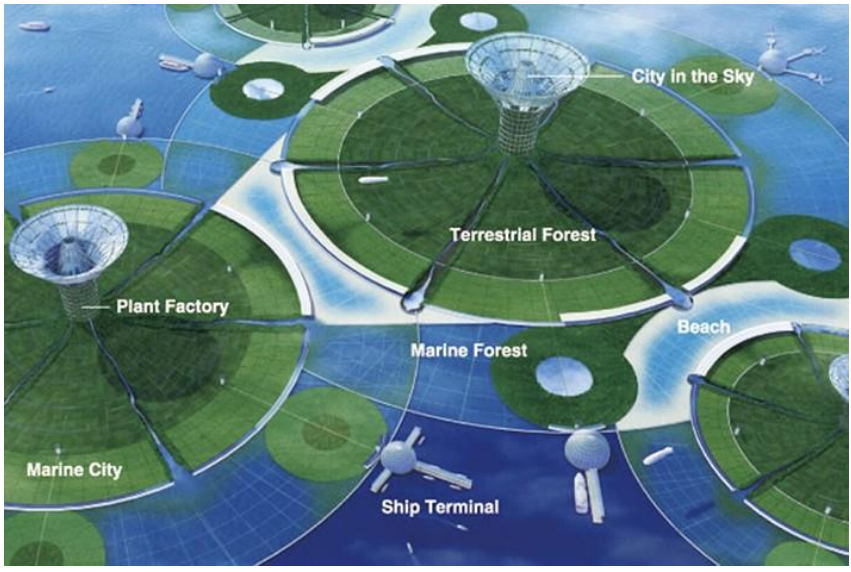


Figure 3 Green Float

Source: URL-4

Recipro is designed like a skyscraper containing all the functional layers of the city in a vertical tree. The city, which is designed as a sustainable and self-sufficient vertical structure; It includes residential, commercial and public spaces. Just like the branches of the tree, various elements of the city also develop outward from the center of the structure (URL-3).

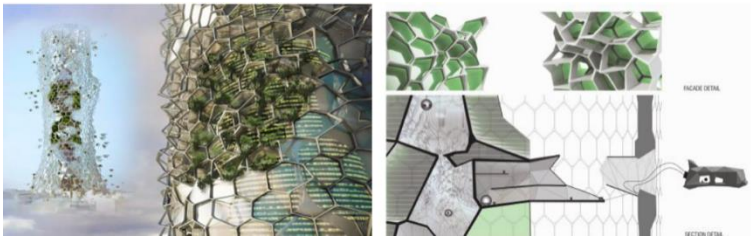


Figure 4 Recipro

Source: URL-3

Ultima Tower is a vertical city model inspired by termite nests and the way the tree carries water from its roots to its leaves. The whole structure is designed like a big ecosystem. With the basic principle of sustainability, there is no pollutant in the city where renewable energies are used (URL-2).

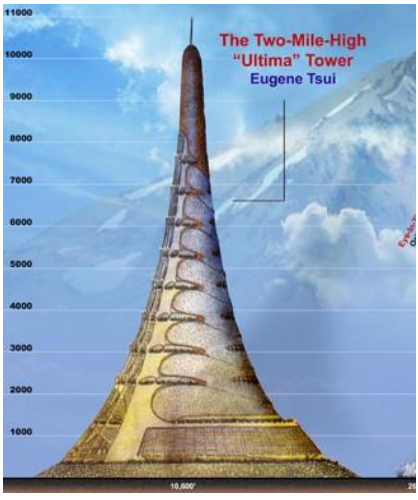


Figure 5 Ultima Tower

Source: URL-2

In Table 2, the applied and futuristic examples described above are presented. In the table, the organism inspired by the samples, the biomimetic solution achieved and the level of biomimetry used are given.

Table 2 Design Examples Using Biomimicry

DESIGN	**INSPIRED ORGANISM/ SYSTEM**	**BIOMIMETIC SOLUTION**	**BIOMIMICRY LEVEL WHICH USED**
Lavasa, Indian	Monsoon forest ecosystem, local anthills, Banyan fig tree leaf	Forests hold soil and water, prevent erosion and reduce evaporation. The roofs of the buildings are inspired by the shape of the fig leaf to facilitate the flow of water. The shape of the anthills was used to control the flow of water during the rainy season.	Organism, behavior and ecosystem level
Langfang, China	Waterbeds, water flow charts	Water has a cyclical system. As a reflection of this system, there are certain flow traces both underground and above ground.	Behavior and ecosystem level
Kalundborg Industrial Symbiosis, Denmark	Symbiosis means coexistence among various organisms, each of which can benefit from the other.	Nitrogen-fixing bacteria live in the root hairs of legume plants, where they convert nitrogen to ammonia. The plant uses the ammonia for growth and development, the bacteria have a suitable place for nutrients and	Behavior level

		growth. This example has shaped the waste product of one organization in the field of industrial production to form the raw material of another.	
Tokyo, Japan	Slime mold	A similarity has been established between the network formed by slime molds to reach the food and the transportation system.	Behavior and ecosystem level
Meixi Lake, Çin	Forest	Designing all residences at different heights so that all residences can receive sunlight	Organism level
Lilypad	Amozonia Victoria Regia plant	Inspired by the form of the leaf of the plant.	Organism level
Syph	Jellyfish	An underwater city model inspired by the jellyfish, an organism that can survive underwater	Organism and behavior level
Green Float	Lotus and Dandelion Plant	The growth of animals and humans, such as water lily, floating on the water, such as the dandelion plant, according to natural rules,	Organism and behavior level

		thus maintaining the balance in nature.	
Recipro	Tree	A vertical system like a tree, with the trunk of the tree at a center and urban functions extending like branches coming out of the trunk.	Organism level
Ultima Tower	Termitarium and tree	An urban fiction inspired by termite nests in form and using the principle of transporting water from the roots of the tree to the top for the urban infrastructure system.	Organism and behavior level

CONCLUSION

Nature has always been a guide for people. While this has been the case since the nomadic life, at sometimes people have moved away from nature, in other words, they have turned their backs on nature. However, especially after the negative process experienced after the Industrial Revolution, man turned his face to nature again. In all design disciplines, this situation emerges as inspiration from nature. This situation, which we see frequently in the historical process, has recently been defined as biomimicry in the literature. Biomimicry basically aims to understand nature and reflect this to the design. This situation emerges at three levels the organism, behavior and ecosystem level to integrate the nature into design. The form level is the most basic level of biomimicry, while the system level is the most complex. While the form

level requires inspiration only from the shape (form) of the organism, the ecosystem level is based on both the functioning of the living thing within itself and the relationship it establishes with its environment. Although the form level is frequently encountered in design disciplines, it is thought that biomimicry will give better results at the ecosystem level in the city scale.

The fact that the city has different dimensions (physical, economic and social) and behaves like a system consisting of different dynamics is effective in this idea. The study area of the city planning consists of both tangible and intangible scales. While expressing the examples of plans in which policies and decisions are developed, which are described as intangible scales; plan examples with high spatial reflection are pointed out as tangible scales. Therefore, in the urban planning discipline, biomimicry is an approach that can be used in plan types with high spatial reflection. As a matter of fact, there are examples that make use of biomimetry at the urban planning scale. When these examples are examined, it is seen that they are inspired by both the place and some organisms or systems. Biomimicry is mostly found in the samples at the organism or behavior level. Although there are examples of system-level biomimicry, they are few in number. Particularly successful examples emerge with inspiration from both the local dynamics and the systems of some organisms in order to find solutions to the problems occurring in the urban system. Because the most important data that provides input to the design at the urban planning scale is the current situation. For this reason, designs inspired by nature based on the current situation will be the most successful examples in terms of designs in which the biomimicry approach is adopted.

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CHAPTER VII

REHABILITATION IN PRODUCT DESIGN

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REHABILITATION MEANING

The dictionary meaning of the word rehabilitation is discussed from the perspective of architecture and health. One of the dictionary meanings of rehabilitation is to improve a structure, rehabilitate a derelict structure (Cambridge, n.d.), or restore a structure, place, or field of activity (Oxford, n.d.). According to this definition, it is understood that the word is defined from the perspective of architecture. In accordance with its dictionary meaning, the rehabilitation of the building in the discipline of architecture is used to restore or repair an existing building or area, and it is very similar to renovating the building. Rehabilitation in architecture is a process that aims to adapt a building to a new use while preserving its historic parts or features (Johnston, 2020). In brief, the focus of the rehabilitation process in the discipline of architecture is the architectural structure, the land, and its features.

Another dictionary meaning of the word rehabilitation is explained in terms of health. The dictionary definition of rehabilitation in health is the process of returning to a healthy or good way of life, or the process of helping someone to do this after they have been in prison, been very ill (Cambridge, n.d.). Or it is the act of starting to consider that somebody is good or acceptable after a long period during which they were considered bad or unacceptable (Oxford, n.d.). The rehabilitation process in the health field focuses on the individual's health and wellbeing. The rehabilitation process in health is the health services provided for this purpose.

Rehabilitation in the architectural field focused on the building, area, and land, and in the health field focused on the individual can be defined with the words renewal, improvement, maintenance, and repair. Engineering and industrial design disciplines, which are close to the discipline of architecture,

are similar to health services in terms of the use of the word rehabilitation. In brief, the target of rehabilitation in design is people.

REHABILITATION IN DESIGN

The World Health Organization (2016) defines rehabilitation as a series of interventions that help individuals with or likely to have a disability to interact with their environment and achieve and maintain optimal functioning. Rehabilitation interventions include the provision of assistive devices such as physiotherapy, occupational therapy, speech therapy, orientation and mobility training, social work, medical rehabilitation, prosthetics, orthotics, wheelchairs, hearing aids, and white canes (WHO, 2015).

According to the definition and interventions of rehabilitation made by WHO (2016), it is seen that rehabilitation is mostly considered as activities that help the lives of people with disabilities. Design for the disabled, on the other hand, serves these activities and aims to help increase the quality of life of the individual.

In the 20th century, two main approaches have emerged in the field of disability design. The aim of both approaches is to increase the independence of the individual, improve the quality of life, and reduce the physical and behavioral barriers between people with and without disabilities (Hoening et al., 2003). One of the approaches has been to remove the barriers in front of people with disabilities. Universal design, which is a more holistic perspective that ensures the integration of all people with each other, has been adopted (De Couvreur & Goossens, 2011). Later, universal design started to be considered as a design method. The second approach was the rehabilitation movement initiated to improve the quality of life of disabled veterans. This modern rehabilitation movement, led by surgeons, required multidisciplinary scientific and engineering studies in rehabilitation (Brandt & Pope 1997). This

approach came to be known as rehabilitation engineering and resulted in the development of assistive technologies (AT) (De Couvreur & Goossens, 2011).

Rehabilitation engineering serves the health strategy. Therefore, the human/individual/user is the focus of attention. These products, which serve the health sector so that the person or the user can reach the state before a condition or a disease, are called AT (assistive technology), rehabilitation devices/system/service/products for humanity. The main goal of these non-commercial studies has been the quality of life.

AT products, which have become widespread with the developments in the industry and technology, are mostly designed for physical rehabilitation activities. AT products are focused on improving the independence, satisfaction and quality of life of users (Medola et.all, 2018). In Figure 1, AT products emphasize not only the disability itself, but also the need to take into account the characteristics, needs, and potentials of people integrated with the environmental context.

The power of technology is used in non-profit rehabilitation engineering that lacks aesthetics and it has the feature of technological invention. It aims to meet the needs of both patients and healthcare professionals with R&D studies mostly for the rehabilitation of disabled individuals. However, these studies for problem determination are carried out in rehabilitation institutions. For this reason, there are difficulties in incorporating the experiential knowledge of disabled users into the design processes (De Couvreur & Goossens, 2011). However, people who use these products do not live in institutions but in communities. It can be said that rehabilitation engineering does not give importance to user-oriented innovation as much as it gives importance to technology-oriented innovation.

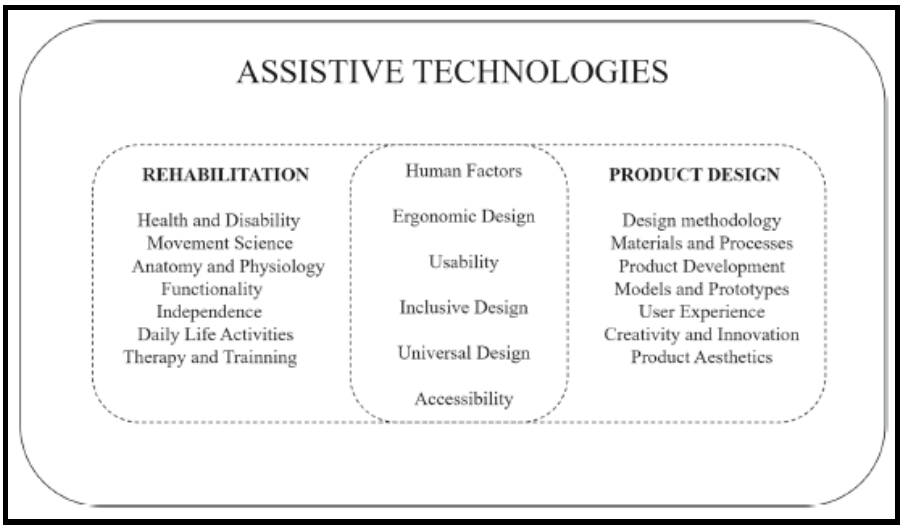

Figure 1: Collaboration based on design and rehabilitation in assistive technologies

Source: (Medola et.all, 2018)

In the architecture of rehabilitation centers designed for people's health, it is seen that the number of studies that attach importance to patient experience has increased. Architectural projects are being developed that focus on the patient experience, considering the psychological and social needs of the patient, as well as the physical and spatial mechanical needs of the patient, scientifically proven to have a positive relationship between design and wellbeing in architecture (Guy, n.d.).

Products/systems/services serving rehabilitation should develop innovative solutions for the psychological and social needs of individuals, unlike the utilitarian, technological and security needs of the past. Because a health activity aims at the individual's physical, sensory and psychological wellbeing. In this context, the goal of rehabilitation is not only physical improvement. It would be wrong to consider rehabilitation in terms of physical deprivation and deficiency, and it would not be correct to examine disability only in terms of physical, sensory, and cognitive titles. 15% of the

world's population live with some form of disability that includes long-term physical, mental or sensory impairments and experience significant difficulties in functioning (WHO, 2015). However, as these individuals, along with the aging population, diabetes, cardiovascular diseases, and mental illness are included in the disability rates, disability rates in the world are constantly increasing. For this reason, products, services, and systems can be developed in the designs made for rehabilitation, not only for physical and sensory cognitive deprivation but also for the psychological rehabilitation of emotional individuals, as well as feeling good, and wellbeing. For the development of these products, user-oriented innovation should be considered together with technology-oriented innovation.

Not only the physical, sensory, and cognitive experiences of people, who are social beings living in society, but also their psychological and emotional experiences will contribute to their rehabilitation process. However, in the field of engineering and industrial design, solutions are generally developed for the above-mentioned physiotherapy, occupational therapy, speech therapy, orientation and mobility training, social work, rehabilitation medicine, and rehabilitation interventions such as prosthetics, orthotics, wheelchairs, hearing aids, white canes. In the next part of this study, the products designed in the field of rehabilitation were examined.

REHABILITATION IN DESIGN COMPETITIONS

There are very few academic and professional studies on rehabilitation in the field of design. In order to investigate whether the products designed for rehabilitation are technology-oriented or user-oriented, and to which individuals these products develop solutions for which needs, 'A'Design Award', 'German Innovation Award', 'If Design Award', category titles and results were used.

The category titles of the competitions and the winning products in these titles were examined. Since the word rehabilitation was not used in the main titles, sub-categories were also examined. It was determined that the word rehabilitation was not used in some of the competitions and therefore words that could be related to rehabilitation were also searched. These words are health, wellbeing and AT used in the previous parts of the study. If there are similar words other than rehabilitation, health, wellbeing, AT in sub-categories, they are shown in bold in Table 1. The purpose of this classification is to discuss which words the concept of rehabilitation is used in design.

The main categories in which the word rehabilitation and related words are used are listed in Table 1 together with their subcategories. The winning products in these categories are listed in Table 2, Table 3, and Table 4. For which needs of the users the listed products are designed are explained in the comment heading in the table. The purpose of this review is to show and interpret the designs made according to which requirements. Contest data were obtained from online sources and the results of the last years were used. The year in which each project was made is indicated in the table. The results of the previous years of some competitions could not be reached and were not added to the list.

Table 1. Using the terms of health, wellbeing, at and rehabilitation in the categories of design competitions

Competition	**Category**	**Sub-Category**
A'Design Awards	Social Design	Aid, Arts & Culture, Communication, Community, Education, Environment, Peace, Poverty, **Wellbeing,** Sustainability, Design for Society, **Social Wellbeing, Design for Elders and others.**

A'Design Awards	Wearable Technologıes Desıgn	**Healthcare Devices,** Wearable Cameras, Smart Garments, Smart Watches
German Innovation Award	Medical & **Health**	Pharmaceutical drugs, **rehabilitation**, patient care
If Design Awards	Medicine / **Health**	**Assisted living products, assisted living technology**, clinical and laboratory equipment, hospital, medical / healthcare devices and equipment, **rehabilitation** and more.

According to Table 1, it is seen that the word rehabilitation is not used in the main category titles of any of the competitions. It is seen that the word health is used closest to rehabilitation. According to Table 1, while the words health, wellbeing, AT and rehabilitation are handled in the main category of health in the German Innovation Award, If Design Awards competitions, they take place in two different main categories in the A'Design Awards. These main categories are divided into Social Design and Wearable Technologies. In the A'Design Awards competition, the word rehabilitation was not used, instead the words Wellbeing, Social Wellbeing, Design for Elders and others, Healthcare Devices were used. According to sub-category titles, wellbeing and health device are not evaluated in the same category. Accordingly, it can be said that health is classified in terms of technology and social aspects. It can be said that the sub-categories of Wellbeing, Social Wellbeing, Design for Elders and others specified in the Social Design category of the A'Design Awards include the wellbeing of individuals, social wellbeing, and designs for

the elderly. It can be said that it covers Healthcare Devices, Wearable Cameras, Smart Garments, Smart Watches sub-categories and technological and smart health products in the Wearable Technologies Design category. Again, when the titles are examined in the A'Design Awards competition, it can be said that user-oriented innovation is also targeted together with technology-oriented innovation, but technology-oriented innovation is generally targeted in other competitions. It can be said that the categories of A'Design Awards cover physical, sensory and cognitive, psychological and emotional rehabilitation, while the category mostly covers physical, sensory and cognitive rehabilitation in the If Design Awards, German Innovation Award competition.

The winning designs in the categories determined in Table 1 are shown in Table 2, Table 3, and Table 4. Each table belongs to a competition and the winning products related to the research topic are listed. It has been added to the table by interpreting which needs of the user correspond to the designs.

Table 2. A'Design Awards winners according to the categories in Table 1

Competition	**Sub-Category**	**Design**	**Tags by Designer**	**Comment by Author**
A'Design Awards 2021 - 2022 Period Winners	Social Design/ Aid, Arts & Culture, Communication, Community, Education, Environment, Peace, Poverty, **Wellbeing,** Sustainability, Design for Society, **Social Wellbeing, Design for Elders and others.**	Clothes (2022)	allinclusive, Socialdesign	**Social Rehabilitation For Disabled**
A'Design Awards 2021 - 2022 Period Winners	Wearable Technologıes Desıgn/**Healthcare Devices,** Wearable Cameras, Smart Garments, Smart Watches	Breath Metabolic Tracker(2022)	Wearable Device, metabolic tracker, respiratory, biometrics, fitness	Assistive Technology Device for Healthcare for Everybody

Table 3. German Innovation Award winners according to the categories in Table 1

Competition	**Sub-Category**	**Design**	**Tags by Designer**	**Comment by Author**
German Innovation Award	Medical & Health Pharmaceutical drugs, **rehabilitation**, patient care	LifePad (2022)	First aid for emergency	Device for Healthcare
		Nano-structure technology for lenses (2022)		Device for Healthcare
		Disposable contact lens for children (2022)		Device for Healthcare
		Blood pressure monitor (2022)		Assistive Technology Device for Healthcare for Everybody
		World's first wheelchair without any obstacles. (2022)		**Physical Rehabilitation Wellbeing for Disabled**
		The Adapt Air breast prosthesis (2021)	Individually adjustable silicone breast prosthesis for women	**Physical Rehabilitation Wellbeing for Cancer Patient**
		Blood glucose self-monitoring (2020)	Continuous glucose monitoring	Assistive Technology Device for Healthcare for Everybody
		Detect Cardiac Disease (2020)	Digital Health sector.	Assistive Technology Device for Healthcare for Everybody
		Clever health app (2020)	Digital therapy for digital therapy	Assistive Technology Device for Healthcare for Patient
		Portable Aquatic Lift (2018)	Portable, free-standing pool lift for disabled	**Physical Rehabilitation For Disabled**
		Carbonhand (2018)	With a lack of strength in the hand due to trauma or disease	**Physical Rehabilitation for Disabled**
		Challanger (2018)	The prosthetic sport foot	**Physical Rehabilitation for Disabled**

When the subject of the winning designs in the determined categories is examined, it is seen that the products related to health are generally aimed at

individuals with physical disabilities and aim to reduce their physical disabilities. It is also noteworthy that only the health problems experienced by physically disabled individuals are discussed. Different from the other competitions, when the designs made in the Social Design category in Table 2 are examined, it can be interpreted that rehabilitation is handled in terms of wellbeing and social wellbeing. When the terms used in the category titles and the designs made are examined together, designs with user-oriented innovation are found in the social wellbeing and wellbeing categories. In the rehabilitation sub-category, products for technology and physical disability were designed.

Table 4. If design awards winners according to the categories in Table 1

Competition	**Sub-Category**	**Design**	**Tags by Designer**	**Comment by Author**
If Design Awards	Medicine / Health / **Assisted living products, assisted living technology**, clinical and laboratory equipment, hospital, medical / healthcare devices and equipment, **rehabilitation** and more.	Smart Rehabilitation Bike (2022)	Physiotherapy instrument	**Physical Rehabilitation**
		Rebless (2022)	Rehabilitation device	**Physical Rehabilitation**
		Waterproof smart power calf prosthesis (2022)	Prosthesis	**Physical Rehabilitation**
		Zdeer Cupping & Scraping smart device (2022)	TCM healthcare product	**Physical Rehabilitation**
		WHILL Model F - Foldable Personal EV (2022)	Foldable electric vehicle	**Physical Rehabilitation**
		Haier High-end Electric Wheelchair (2022)	Wheelchair	**Physical Rehabilitation**
		Haier Electric Wheelchair (2022)	Wheelchair	**Physical Rehabilitation**
		Wizz (2020)	Electric walker	**Physical Rehabilitation**
		Moonbird (2021)	Wellness tool	**Wellness and Rehabilitation**

Rehabilitation Not Only Physical

When the results of the competition are examined, it can be said that there is a relationship between rehabilitation and wellbeing. Researchers agree that wellbeing should be one of the main goals of rehabilitation (Bracke, 2001). Wellbeing can be divided into cognitive, positive (joy, pleasure) and negative (anxiety, sadness) emotional aspects such as general life satisfaction and living space satisfaction (Fuhrer, 1996). The cognitive aspect includes general life satisfaction and life space satisfaction (Fuhrer, 1996).

The dictionary meaning of wellbeing is the individual's of feeling healthy and happy apart from physical sensory cognitive wellbeing (Cambridge, n.d.). The sense of wellbeing that arises by meeting the psychological and emotional needs of the individual provides healing (Guy, n.d.). Wellbeing is a part of rehabilitation, wellbeing is a goal of rehabilitation. The use of the term wellbeing can be effective for designers to design user-oriented products other than technology-focused innovative products that provide physical rehabilitation.

Contrary to the rehabilitation solutions developed for individuals with physical disabilities in the competitions reviewed above, Designer Salih Berk has developed a product aimed at psychological rehabilitation due to the emotional difficulties experienced by cancer patients during the treatment process (Anadolu Agency, 2015). For the psychological rehabilitation of patients, designer Salih Berk İlhan has designed a technological mirror that activates when they smile. The product is both user- and technology-oriented innovation. The designer has developed a product for the individual to feel good (Anadolu Agency, 2015). In other words, a user-oriented rehabilitation product was designed that takes into account the wellbeing of an individual who has lost his physical health during the treatment process.

DISCUSSION

Rehabilitation is a building activity that restores a person's physical and mental capacities and brings the quality of life as close as possible to the level that existed before the disease (Greenblatt & Simon, 1999). While the designs that serve rehabilitation activities are handled under the titles of AT (assistive technology), and rehabilitation devices/systems/services/products, these products aim at the quality of life, wellbeing, and human health. Although there are rehabilitation devices/systems/services/products that meet the emotional and psychological needs of individuals, solutions are mostly developed for the rehabilitation of the physically disabled. While technology-oriented innovative products are in the majority, the user-oriented innovation approach is in the minority.

When the academic and professional studies on rehabilitation in the field of design are examined, it is seen that there are mostly products or assistant products aimed at eliminating or reducing the physical disability for individuals with physical disabilities. The design of products that will meet the physical needs of individuals with disabilities undoubtedly contributes to the social rehabilitation of individuals. Although the emotional needs of the users are indirectly met, more technology-oriented R&D studies are carried out while designing the products.

In the case of disability, only physically disabled individuals should not come to mind, and when rehabilitation is mentioned, only disabled individuals should not be considered. Some diseases such as physical, auditory, mental and visually impaired individuals, the elderly, cancer and diabetes should also be included in the scope of rehabilitation. Products and services should be developed for both physical and emotional rehabilitation of people.

When the problems addressed by the winners in design competitions are examined, it can be said that technological products are at the forefront. In the sub-categories of Wellbeing, unlike the other categories, it was seen that the psychological and social rehabilitation of the individual was handled. If rehabilitation is healing, it's not just physical. Any illness can also be referred to as an emotional experiential healing after safety.

More products, systems and services should be designed to serve this strategy, as people with disabilities need rehabilitation due to some form of disease, old age or auditory mental physical loss and vision loss in the future. In these designs, products, systems and services that will provide emotional, psychological and social rehabilitation apart from physical rehabilitation should be developed.

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CHAPTER VIII

EXAMINATION OF OPEN-GREEN LANDS IN THE CONTEXT OF QUALITY OF LIFE, THE CASE OF SİİRT

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SUMMARY

Urbans have been open to change and transformation at many points since the development was observed, and they quickly keep this order in both destructive and constructive sense. Due to the lack of a control mechanism for this change and transformation in our country, urban life could not develop in the desired and required norms. It is observed that dissatisfaction arises due to the fact that the structures who are supposed to serve the urban cannot fully meet the needs of the citizens. It is assumed that there are basically 2 main factors of quality of life, one of them is personal satisfaction in the literature. It is confirmed that the concept of personal satisfaction is a phenomenon belonging to urban life.

The concept of urban quality of life is a term that can be expressed under the influence of objective and subjective factors. Emotions that can define personal fulfillment, such as passion, expectations, happiness, satisfaction, are described as factors that affect subjective quality of life; physical, social, and economic factors can be described as factors that affect objective quality of life.

In this study, while the components that make up the subjective quality of life are not taken into account, open-green lands, which can be defined as the objective component, are examined in the city of Siirt.

INTRODUCTION

Since the formation of the concept of the urban, the rate of population living in urbans has been changing with an ever-increasing speed. This increase reflects positively or negatively on the urban and its inhabitants. One of these reflections is the concept of livability, which takes social welfare as a reference. The concept of livability has recently emerged as a subject that has been more researched and discussed. According to Karaer; When we talk

about the health of a urban, we understand that that urban meets the livability criteria. Livable urbans; It includes many factors from the functionality of the spaces to natural resources, economy and social structure. Creating spaces that are aesthetically and functionally balanced directly affects the livability in urbans (Baltutar and Artar, 2022).

The concept of livability, which is related to the quality of urban life, is in the interest of academic disciplines and professional fields such as psychology, sociology, environmental sciences, economics, planning, architecture, engineering, health and public administration. Life quality; It is formed as a result of the characteristics of the urban environment, the evaluations and expectations of the individuals regarding the said features. Quality of life can be defined as perceptions consisting of an individual's interaction with an environment that responds to his/her needs (Tepe,2018)

According to Erdem et al., 2009; livable urban are defined as cities associated with farmland surrounding urban forests, where there is 8-18 m2 of green tissue per person living in the city, and where the social and cultural texture comprises 2/3 of the city under public structures, meaning that construction facilities comprise 20-22% of the city.

The pandemic process, which has recently affected the whole world, has created a basis for deepening discussions and research on urban quality of life. Although there are countries that seem to be ready for this process, the results have actually put serious pressure on humanity. For this reason, it has been revealed that especially indoor spaces do not meet the needs in terms of livability, open and green spaces should be developed and their quality should be increased. According to Yıldızcı 1982, the open space is a space free of construction within or outside the urban, which is reserved for specific land use such as agricultural land, forests, shrubs, lakes, or parks, gardens, squares, sports grounds, playgrounds etc. (Altunkasa, 2004).

Green areas; In urban and rural areas, it is called a common use area such as sightseeing, wooded road, which is reserved for people to rest, travel, children to play and organized by city administrations in order to prevent these places from gaining a densely structured appearance. From another point of view, green areas; existing open areas are defined as surface areas covered or combined with vegetative elements. According to this definition, every green area is an open area, but not every open area can be called a green area (Dissart et al., 2000).

Green areas are components that affect the quality of life in urban environments aesthetically and functionally. The functions of open - green lands have a great importance in the formation of healthy and high quality urban environments, which are absolutely necessary for urbanization. These functions occur physically, aesthetically, socially, psychologically, economically and ecologically in urban life. In terms of the benefits they provide to the physical structure of the urbans and their spatial characteristics, and their socio-psychological effects on the urban people; It is possible to classify them under general headings as physical and socio-psychological.

It is mentioned in many literatures that the standard values of open-green areas in urbans are not taken into account. Based on this information, size and distribution ratios were calculated in order to determine the efficiency of active green space facilities (parks, playgrounds and sports fields) in the urban center of Siirt. The presence of active green space, per capita values were obtained at the level of neighborhoods and indexed. Rather than the fact that any component of the urban green areas (urban park, sightseeing area and forest, children's playground) is larger in number or area, its per capita person/m2 level in the urban has been taken into account in the study. The aspects of active green areas that can be physically evaluated, such as the

variety, distance, and maintenance of the activities they contain, were not considered.

OPEN-GREEN AREAS OF SİİRT

The main material of the study is the open-green areas of the urban center of Siirt. Siirt, located at the northeast end of Turkey's Southeastern Anatolia Region, is surrounded by Şırnak and Van from the east, Batman and Bitlis from the north, Batman from the west, and Mardin and Şırnak from the south. The region suddenly rises after the plains of Southeastern Anatolia, and the eastern and northern parts receive abundant precipitation. For this reason, the province, which is surrounded by the Muş Güneyi Mountains in the north and the Siirt Doğu Mountains in the east, constitutes one of the important catchment areas of the Tigris River. The entire territory of the urban falls into the Tigris Basin. The basin is the fourth largest catchment area of the country after the Euphrates, Kızılırmak and Sakarya Basins. Siirt is surrounded by plateaus covered with rich meadows that receive abundant precipitation in summer and winter (Anonymous, 2022)

The continental climate prevails in Siirt and the four seasons are experienced with their most distinctive features. Winters are harsher and rainier in the eastern and northern regions, and warm in the south and southwest regions. Summers are hot and dry. The method of the study consists of literature review and data analysis. Literature review: definition of quality of life, determination of indicators, urban green space standards and compliance with these standards within the framework of literature and resource research on the subject and criteria were evaluated in international examples. Again, at this stage, information was obtained about the geographical location, natural data and socio-economic structure of the urban of Siirt.

Analysis of the data: Population data obtained from Siirt Municipality Parks and Gardens Directorate and Turkish Statistical Institute (TurkStat) and observation studies in the area were analyzed and the distribution and adequacy of open-green areas in the neighborhoods in the urban center were revealed. Urban open-green areas in the research; The urban park, promenade and forest are classified as children's playgrounds. Within the scope of this classification, the existing open-green space existence of 23 neighborhood units in the adjacent area was examined in terms of per capita values, the spatial distribution and realization level of open-green space uses were determined, and future-oriented sustainable urban development strategies were tried to be determined. In the study, in order to obtain the amount of total open and green areas per capita, the data obtained from the Directorate of Parks and Gardens of Siirt Municipality were compiled and proportioned to the total population of the urban center. At the neighborhood scale, it is indexed for the park areas by proportioning to the population of the neighborhood.

The open -green spaces are divided into two groups, which are functional and passive, into two groups, in terms of location and non-residential, and in terms of the grading of the green system, into five groups: residential playgrounds, neighborhood unit parks, neighborhood parks, neighborhood unit parks, and urban parks. Green area types, contents, activity types and areal sizes; It varies from country to country and even from urban to urban, according to the physical characteristics of cities such as population density, settlement characteristics, topography, vegetation and climatic conditions served. Especially in European countries, based on the view that as the population increases, the settlements will move away from nature, it is envisaged to increase the amount of green space per capita (Öztürk and Özdemir) (Table 1).

Table 1. Recommended standards for green areas and sports fields in foreign countries

COUNTRY	Location Size	Person/m2
USA	Zonal	34
	Urban	68
	Urban	40
Germany	Neighborhood Unit	5,8
	Neighborhood	7,5-8,5
	District	15
Finland	Kusan Koski 44,500 (Including Forest Area)	47,4
France	3.000-4.500	17
	6.000-9.000	17,5
	35.000	25,3
	Mass Urban	23,29
	Urban	25
	100.000	23
Netherlands	Urban (1930)	6,5
	Urban (1935)	15
	Urban (1980)	20,5
	Residential Areas	9,5
	Urban Region	30
Iran	Tehran	20,66
Switzerland	Urban	40-56
Italy	Zonal	8
	Urban	15
	Milan	24
England	Zonal	14
	Urban	40
	New Urbans (Commission Proposal) (Open Space)	94
	New Town Open Area	28
	70.000 (Tremel City)	28,1
	15.000-25.000	22
	New Urbans (Ing.+Wales)	44,92
	New Urbans (Scotland)	42,08

Poland	5.000	7
	15.000	9
	50.000	10
	100.000	12
	250.000	14
	Warsaw (Open Area)	48,5
S.S.C.B.	10.000	19
	7.600	22
Tanzania	Open Space in Settlements with Density of 25-75 People	20-13
	Open Space in Settlements with Density of 100-250 People	10-4,8

Source: Ersoy,2015

Green areas in Turkey are determined by the Zoning Law No. 3194. The standard, which was specified as a minimum of 7.0 m2 per person in 1985, was increased to a minimum of 10.0 m2 per person with the change in regulation in 1999. Active green areas in the Zoning Law; parks, children's gardens and playgrounds. Uses such as recreation areas, botanical and zoo gardens, woods that can be used for recreation, afforestation areas also constitute other green areas apart from active green areas (Öztürk and Özdemir, 2013). According to Ersoy (2015); When we look at the amount of green areas and sports fields per capita in some selected provinces in Turkey, it is observed that the amounts in the mentioned regulation are far below (Table 2).

Table 2. Green spaces and sports per capita in selected urbans

Urbans	**Population**	**m2/person**
Kars	53.473	1,82
Erzincan	58.473	1,28
Elazığ	108.337	1,87
Aydın	50.551	1,82
Kütahya	62.060	0,93
Balıkesir	85.032	1,37

Denizli	83.583	1,01
Antakya	95.135	1,56
Antalya	95.135	4,32
Mersin	114.302	1,17
Edirne	54.885	0,70
K.Ereğlisi	46.137	3,27

Source: Ersoy,2015

The study assessed open-green areas on the border of the mujahideen area (urban park, sightseeing area and forest, children's playground). Data on open and green spaces in the city center of Siirt, where a total of 23 neighborhoods are located, are given in Table 3.

Table 3. Distribution of Open-Green Areas in Siirt Urban Center by Districts (2020)

Neighborhood Name	**Total Active Green Area (m2)**	**Total Passive Green Area (m2)**	**Urban Park, Travel Area and Forest (Number)**	**Children's Playground (Unıt)**
V. Karani M.	18.000	51.000		
Barış M.	62.200	154.510	1	8
Afetevleri M.	11.000	347.570		
Koperatif M.	20.365	48,900		6
Bahçelievler	55.000	17.785	1	4
Yeni M.	9.270	57.384		2
Alan M.	2.935	18.375		1
Çal M.	6.722	32.760		1
Conkbayır M.	0			
TınaztepeM.	641	641		
Ülkü M.	0	0		
Batı M.	0	0		
Karakol M.	0	0		
Sakarya M.	0	0		
Dumlupınar M.	12.000	0		
Ulus M.	5.855	7.483		2
İnönü M.	1.238	1.238		1
Algül M.	2.875	2.878		1

Doğan M.	30.156	112.723		6
Halenze M.	0	0		

Source: Original, 2022.

According to the data obtained as a result of the joint work with the Siirt Municipality Parks and Gardens Directorate in 2020, there are 2 urban parks, excursion areas and forests, and 25 children's playgrounds within the borders of the municipality. Based on the information that the urban center of Siirt has an area of 632.5 km2, it corresponds to approximately 0.3% when compared to the total active green area. The population distributions obtained to measure the per capita amounts of open and green spaces at the neighborhood scale are given in Table 4.

Table 4. Population distribution of Siirt urban center according to neighborhoods

Neighborhoods	**Neighborhood population**
V. Karani M.	8.853
Barış M.	20.437
Afetevleri M.	11.575
Koperatif M.	23.899
Bahçelievler	27.866
Yeni M.	26.981
Alan M.	6.081
Çal M.	5.253
Conkbayır M.	3.916
TınaztepeM.	1.860
Ülkü M.	525
Batı M.	925
Karakol M.	521
Sakarya M.	1.493
Dumlupınar M.	3.085
Ulus M.	4.608
İnönü M.	992
Algül M.	3.082
Doğan M.	7.949
Halenze M.	439

Bağlar M.	631
Koçpınar M.	100
Yeni M.(Tansu Çiller M.)	1.010

Source: TurkStat, 2020.

Calculations were made to identify the values found in the neighborhood scale (m^2/person) with active green areas (Table 5).

Table 5. Active green area indices per capita at neighborhood scale

Neighborhoods	Active Green area	Neighborhood Population	Amount of green space per capita (Total area / Total Population)
V. Karani M.	18.000	8.853	2.03
Barış M.	62.200	20.437	3.04
Afetevleri M.	11.000	11.575	0.9
Koperatif M.	20.365	23.899	0.85
Bahçelievler	55.000	27.866	1.9
Yeni M.	9.270	26.981	0.34
Alan M.	2.935	6.081	0.4
Çal M.	6.722	5.253	1.27
Conkbayır M.	0	3.916	-
Tınaztepe M.	641	1.860	0.34
Ülkü M.	0	525	-
Batı M.	0	925	-
Karakol M.	0	521	-
Sakarya M.	0	1.493	-
Dumlupınar M.	12.000	3.085	3.8
Ulus M.	5.855	4.608	1.27
İnönü M.	1.238	992	1.24
Algül M.	2.875	3.082	0.9
Doğan M.	30.156	7.949	3.7
Halenze M.	0	439	-
Bağlar M.	0	631	-
Koçpınar M.	0	100	-
Yeni M.(Tansu Çiller M.)	0	1.010	-

Source: Original, 2022.

The distribution of open-green areas in Siirt urban center (Figure 1), which was created as a result of the obtained data, is seen. Accordingly, when the distribution of urban parks, sightseeing areas and forests and playgrounds is calculated according to the population, they remain below the standard values.

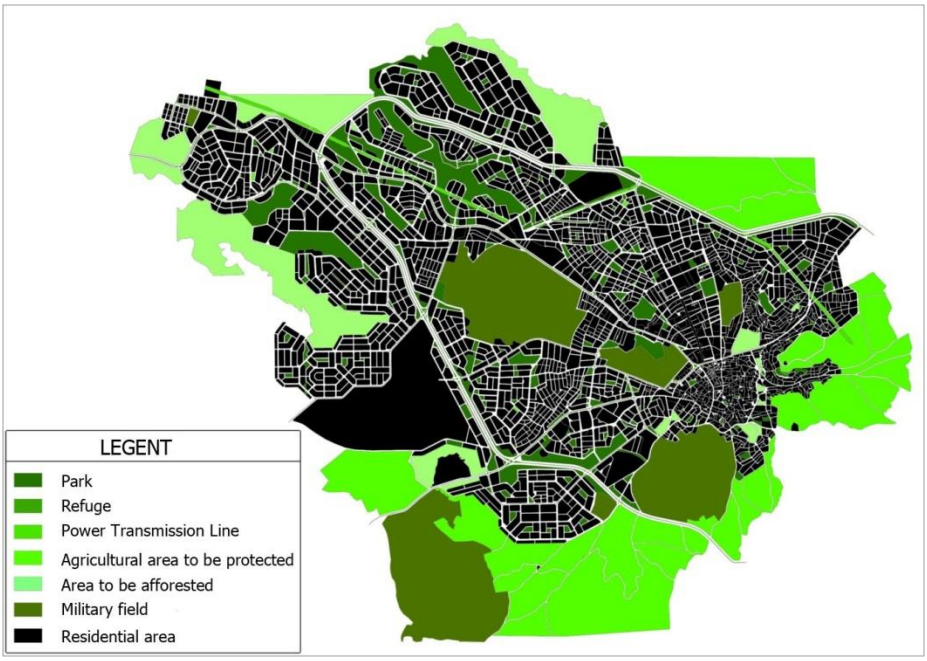

Figure 1. Distribution of open-green areas in the center of Siirt

Source: Original, 2022.

CONCLUSION AND RECOMMENDATIONS

According to the World Bank data; The rate of population living in urban areas in Turkey in 2020 has been calculated as 76%. Today, nearly half of the world's population lives in urban areas, and this ratio is projected to increase to two-thirds by 2050. Approximately 75% of the population in Europe lives in cities (Anonymous, 2022). In this context, increasing the quality of life in

cities will affect the psychology of the citizens positively and indirectly lead to the development of the city in matters such as economy and belonging.

In today's world, where most of the world's population lives in urban, increasing the quality of life in urban's plays an important role in increasing the happiness of the citizens. What is necessary to achieve a higher quality of life in urbans is regular, innovative approaches and determination at the management level.

In the formation of livable urbans, open-green areas play a major role in the protection of the natural structure of urbans, shaping the physical structure, creating a corridor effect in the ventilation of the urban. In addition to these; The city also contributes to issues such as establishing the relationship between human and nature and socializing people.

In order to remove the obstacles to achieving the quality of life in Turkey, solutions that will reduce urban problems should be produced and implemented, urban participation should be encouraged, a process of change should be initiated in local administrations and the municipality should be accepted as the decisive actor in Urban Quality of Life with sustainable decisions (Ören Ersin,2012). In order to improve the existing urban order and most importantly, to make neighborhoods quality and sustainable living environments, a new urban order should be established, and for this, systematic planning based on innovative approaches and models should be made(Godbey et al., 2005).

Looking at the data of the study, it has been determined that the open and green areas in the city center are not sufficient and the distribution of open and green areas on the basis of neighborhoods is not proportional (Figure 1). Except for the urban-wide data, the data obtained revealed the open-green space distribution of a total of 23 neighborhoods. According to these results;

In 13 of the 23 neighborhoods in the urban center of Siirt, there are no urban parks, walking areas, forests, or children's playgrounds. There are no active green areas in 9 neighborhoods. The dense population of these neighborhoods causes the per capita amounts to be insufficient. Considering that the total per capita amount of open and green areas stipulated by the Zoning Law No. 3194 is 10 m2/person, it is clearly seen that the amount per person in the city center is 1.2 m2/person and this value is far below the standard value.

The result of the study points to a common problem both for the city of Siirt and for many cities in the country. The fact that the per capita values for open and green areas are below the standard values of the Zoning Law shows that it is actually a result of the effectiveness of the Zoning Plans on open and green areas. It is seen in Table 1 that the figures stipulated by the Zoning Law in Turkey are very low when compared to developed countries. Despite this, it reveals that the values emerging in the city center of Siirt are almost equal to the standard values in the country, but they are insufficient. This study, which is prepared in order to attract the attention of local administrations and local people to these problems and to emphasize the importance of open-green areas and environmental quality in planning, is intended to be the basis for the studies to be carried out in the future. It is thought that the data obtained as a result of the study, which started with the perspective that open and green spaces are not sufficient, can be used to reveal other criteria of urban life quality, which is focused on social benefit.

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CHAPTER IX

FIVE DIFFERENT WORLDS WITHIN 260 METERS OF SECTION: EVALUATION OF SPATIAL STRUCTURE OF AMASYA CITY CENTER

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INTRODUCTION

The aim of this book chapter is to introduce a sui generis condition of the urban space in Amasya city and to find and put the reasons for this situation, on a reasonable basis. Although the claim is entirely based on the personal perception of an urban planning professional working over than 30 years, it will be revealed that it is a subject worth to investigate in the planning and design field. It is a reality that liveability and urban life quality are the focal points while evaluating such a situation.

The subject area takes place in the center of the Amasya city where the first settlement of Amasya was located. According to the current division of districts, it is within the borders of Hatuniye District to the north of Yeşilırmak river, Dere district to the south and takes a little part of Yüzevler district. The area covers an area of approximately 14.1 hectares, with 470 meters starting from Yavuz Selim Square to the Municipality Park built right next to the Sultan Beyazıt religious complex, covering 300 meters in its widest cross-sectional area. Regarding the main theme, the cross-sectional length is more important than the size of the area. In this area, which has a section of 300 meters at its widest point, “5” different worlds (seperate urban space parts), as to say an analogy, are the focus of this book chapter. (See fig.1) Over the bridge connecting the land parts in this area, through which Yeşilırmak river as called the “Alçak” Bridge, length of this section decreases to 260 meters. In other words, when anyone walks 260 meters, he/she comes across “5” totally different urban spaces or as an analogy, “5” different or seperate worlds. These parts are listed briefly and will be explained in detail in the following sections.

Figure 1. Location of the Subject Area in Amasya City Center (Produced by the Author Using Google Earth)

When one travels from north to south, the first of these places is the settled part of the historical Hatuniye District, just below the Harşena Mountain. Although Harşena Mountain was the first settlement in the Neolithic age, Hatuniye District located to the north of the river, has been the first settlement and core of the city of Amasya since the Roman period. This part of the Hatuniye District, which is called as the "Inner City" or "Yalıboyu Houses", is one of the most important touristic locations of the city. The part of Hatuniye District with buildings inside is approximately 835 meters long and its widest part is 77 meters between the railway and the river. There is the Amasya-Samsun railway line between the Harşena Mountain and Hatuniye District, serves as a threshold between the Mountain and the District.

The second part is the Yeşilırmak river, which is a natural structure. The macroform of Amasya city shows a linear structure shaped by the Yeşilırmak river and surrounding mountains. As of 2020, the city macroform and the the subject area is seen at the figure below (See Figure 2). Regarding the city center, there are four bridges, two of them are pedestrian bridges, connecting the Hatuniye district to the center. While the two vehicle bridges are located at

the beginning and end of the Hatuniye District, the two pedestrian bridges are in between them.

Figure 2. Macroform of Amasya City and Observed Area (Produced by the Author Using Google Earth

The third part is the pedestrian walking section by the river, just across the Hatuniye District, which starts from the Yavuz Selim City Square and turns into a promenade after 270 meters and continues for about 500 meters with this feature. Right next to the pedestrian road, there is Ziya Paşa Boulevard with two vehicle lanes for each way. A part of the second lane of the road on the way from the square to the west is reserved as a 2-meters-wide bicycle path. There are several functional uses such as restaurants, boutique hotels and bank branches on the south-facing part of the road. 225 meters to the west from the "Alçak" Bridge, there is the newly built Municipal Park and Square. On the right side, there is the Sultan Beyazıt Mosque and Complex, one of the most important historical sites of the city of Amasya, covering an area of approximately 16.000 square meters.

The fourth part is the pedestrian shopping area, located within Dere District, also known as Kocacık Bazaar, and closed to vehicles except for service at certain times. This part covers an area of 4 hectares, approximately 500 meters long and 80 meters width. The area is starting from Yavuz Selim Square in the east ends with the Municipality Park in the west. In the area, the Bedesten bazaar, which was built in 1483 and restored in 1971 and 2012 (kulturportali.gov.tr) and, the historical Sarachane Mosque, built in 1372 and whose restoration project drawings were approved in 2017 (Akın and others. 2018), are in the Inventory of Conservation of Natural and Cultural Assets. There are also historical and special places such as the tomb of Igneci Baba. Again within the area, Amasya Revenue Office (Defterdarlık) is located on Ziya Paşa Boulevard.

The fifth and last part is Mustafa Kemal Paşa Avenue and the buildings on this road which mostly have commercial functions and service functions at the upper floors. The Avenue, which is 580 meters wide and 26 meters wide, from Meydan Junction to Beyazıt Complex, and its surroundings is the central business area of the city. The roadway is divided and has two lanes at each side.

1.THEORETICAL BACKGROUND: HOW TO SEARCH URBAN SPACE DIFFERENTIATION

The use of the urban space is much more than just a few specific activities or functions. It contains many instantaneous, changing, complex and different uses. The use of urban space is complex and variable. It is these complex relationships that make urban life a special and worthwhile experience. (Cullan, 1986 in Kahraman, 1998)

When considered all the theoretical studies about urban space concept, it can be seen that that they are basically grouped under several titles. The first is the

theoretical approaches that focus on how the urban space is formed and differentiated. Focus is to explain the dynamics of this process. The explanations of space philosophers such as Harvey, Lefebvre and Castells are important in this respect.

Harvey associates spatial differentiation with the reproduction of capitalist relations. He attributes a functional role to urban differentiation for the maintenance of the capitalist order, emphasizing that every urban space should also be seen as a space of conflict. (Kurban, Akman, 2019) Lefebvre argues that the production of space is determined by its exchange value rather than its use value. (Buruk, Günay,2018) It brings the distinction between perceived-designed-lived space. (Ghulyan,2017). Castells, on the other hand, is not only insist on the production process of cities; he argued that cities also have a distinctive role as centers of collective consumption, and stated that these processes are the main reason for the spatial form of the contemporary city (Castells, 1997 in Bıçkı, 2006).

The second group of studies is the studies focus on the aspects within the analysis phase of the urban space. Köseoğlu, in his reserach in 2012, explain the works of Krier who emphasizes historicity and analyzes the space typologically and morphologically, Alexander, who evaluates the urban space through functional relations and necessity and described as a structuralist, and Hillier, who tries to reveal social connections by creating mathematical and geometric representations of space (Köseoğlu, 2012). These are all the examples of the second group of studies defined.

A group of studies covers the discussions on which prominent features of urban space should be determined in order to develop strategies on urban space. Studies that interpret urban space as "positive and negative spaces, studies that examine urban space in terms of "picturesque" (a picture-like urbanism imagination), studies that examine urban space as "typo-

morphological", and studies that examine urban space as "place" are examples of these types of studies (İnceoğlu, Aytuğ, 2009).

The aim of all urban space-oriented studies such as the morphology of space, usage functions and form-function relations, the role of perception, the role and importance of urban images (referred to Kevin Lynch) in describing urban space is to examine the organization of urban space from various aspects, and to determine the predicted or unpredictable movements of people in the space. It is an effort to put these into certain scientific patterns.

Space is perceived with movement, as many researchers have stated (İnceoğlu, Aytuğ, 2009). The case of the Amasya city stands as a sui-generis condition and worth to investigated from different aspects. The fact that there are “5” different “worlds” (venues) in a 260-meters of section, is a situation that should be the subject of an in-depth research.

2.INFORMATION ON DIFFERENT URBAN SPACES IN THE LOCATION

2.1. World I: Hatuniye District (Yalıboyu Houses)

Hatuniye District is a historical part of Amasya, located between Harsena Mountain and Yeşilırmak (Iris River). Just north of the Hatuniye District is Harsena Mountain, where the first settlement of Hitites take place.

Both Harsena Mountain and the Rock Tombs, which are located behind the Yalıboyu houses in Amasya, were included in the tentative heritage list by UNESCO as both natural and cultural asset in 2015. (Birer, Adem, 2022) Efforts to create a Management Plan for permanent listing continues in 2022.

The neighborhood, which is known as the Hatuniye District, is the first core of the city of Amasya. Especially during the Roman and Byzantine periods, the area of the current neighborhood was the first settlement. In the Seljuk and

Ottoman periods, this core expanded and the settlement borders expanded. Because of this feature, Hatuniye District is the most historical neighborhood in the city of Amasya. Conservation awareness in Amasya started in 1979 when the Ministry of Culture determined the historical urban sites in the region in order to make an inventory of the European Cultural Heritage in Turkey, and 150 monumental and civil architectural examples were registered, most of which are located in the Hatuniye District (Türkoğlu,2006).

Hatuniye or Yalıboyu District is said as the main tourist spot where rows of half-timbered traditional Ottoman (Yalıboyu) houses, mosques, fountains, hamams and bridges were constructed on the Yeşilirmak River in 19thcentury (Dede, Arkun, 2018). In their tourism oriented research, Dede and Arkun identified that, most of the Yalıboyu Houses have been restored or reconstructed, and most of them are used as tourist facilities, such as hotels, cafes, restaurants, pubs, museums, and cultural institutions (Dede, Arkun, 2018). Tourism is very important and has a significant role for this part of the urban area as, “tourism is inevitable in historical cities with cultural heritage elements that are accepted as universal values of humanity” (Canbolat, Erbey, 2020) On the other hand, “the unique characteristics and unique conditions of each place, heritage site necessitates reconsidering with the context of the place in establishing the balance between conservation and tourism” (Canbolat, Koçak, 2022) This balance is seen as established for Hatuniye District as the tourism facilities provide opportunities and finances for conservation of the area.

28 out of 60 accomodation facility (hotel-motel-pansion) in Amasya city takes place in Hatuniye district. This value refers nearly the half the touristic facilities take place in the district. On the other hand these facilities hold about only the 22,2 % (509/2286) of total touristic bed capacity of the whole city.

These values show that facility sizes are small size in the Hatuniye district as its development is restricted due to being a historical site. On the other hand, charm of the area originates from the historical characteristics of the district.

Apart from tourist facilities, there are some residential houses and association offices, a grocery store and mini bazaar (Dede, Arkun, 2018) There are about 195 buildings in the district, which 154 of them are historical buildings. 4 of them are monumantal buildings. (Türkoğlu,2006) Besides, there are 83 registered building of civil architecture. 161 buildings are in full use currently. In Hatuniye District, 19% single-storey buildings, 87% two-storey, 8% three-storey and 3% three-storey and above buildings take place (Türkoğlu,2006). Avarage number of storeys in the district is “two”.

A vehicle road is passing through the middle of the district which the width of it is about 10 meters. This road is closed to vehicle traffic at day time while it is opened at nights. From the beginning of the road starting at the clock tower to the end of the district, total distance is about 840 meters. There are vacant parcels near to the end of area at west side. The function of buildings in the area is shown at figure 3.

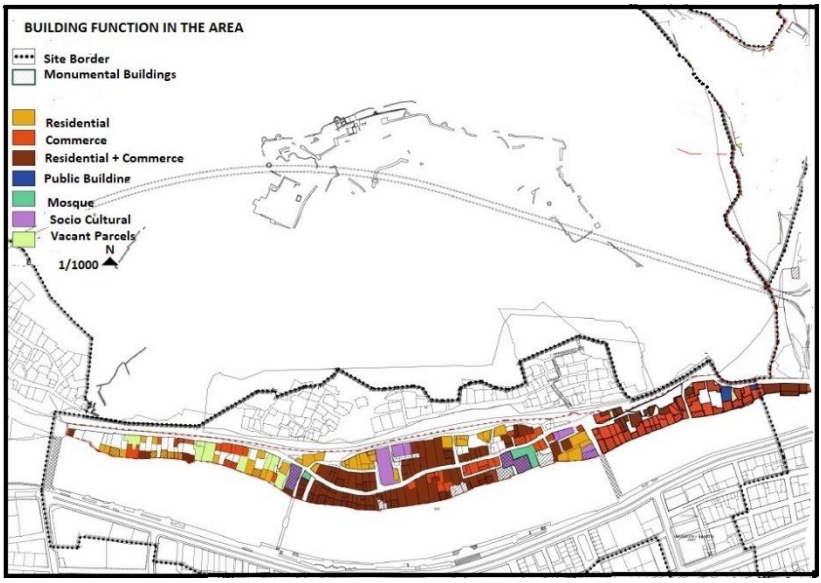

Figure 3. Land Use of Hatuniye District (Produced by the Urban Design Studio Students of Department of Urban Design and Landscape Architecture in Amasya University in 2020)

The neighborhood population of Hatuniye District, which was 866 in 2005 (2007 Amasya Revizyon İmar Planı Raporu), decreased to 125 by 2021 (https://www.nufusune.com/merkez-ilce-nufusu-amasya) This situation shows that especially residential areas were transformed to commercial uses such as touristic facilities or restaurants in recent years. Owe to the situation, especially in summer time, night population of the area can reach to the level of three thousand as the touristic center of Amasya. Anyone walk in the district can easily feels that he/she is walking in the streets of the small seaside towns in Medditerenean or Aegean Regions.

2.2 World II: Yeşilırmak (Iris River)

The most important hydrographic element in Amasya is Yeşilırmak, whose historical name is Iris. Its length from the place where it was born to the

Çarşamba (Samsun) delta, where it empties into the sea, is 519 kilometers (Elmacı, 2010).

The importance of Yeşilırmak for the city of Amasya comes from the fact that becoming a factor directly determines the macroform of the city, together with other topographical conditions. The city of Amasya has developed in the direction of a linear city form by expanding towards the west and east in the direction of the river since the 1950s. Due to the topographical conditions, this linear development caused the city to develop in a linear way by twisting like a snake body.

The width of the river in the city varies between 45 and 55 meters. While passing through the city, there are 6 meters ofa retaining flood protection walls at a distance of 7 kilometers. These walls were built between 1977-1980. The construction of the wall towards the west of Hacılar Square was started in 2018 and the construction of the wall, again on the east side, towards the village of Ziyaret was also started in 2018 and both was finished in 2021.

After 7 kilometres of distance, the river goes out of the macroform of Amasya city that is created by itself. As Yeşilırmak passes through the city, even local and special ecosystems have been formed within Yeşilırmak, especially beyond Hacılar Square.

There are two vehicle bridges and two pedestrian bridges connecting Hatuniye District to the southern part of the riverside. From starting these are, “Hükümet Bridge”, “Alçak” Bridge, “Madenus” Bridge and “İstasyon” Bridge. First and the last one are vehicle bridges and Madenus and Alçak Bridge is pedestrian bridges. “Alçak” Bridge is connecting the districts within the study area (Fig. 4) History of this bridge dates back to 3. Century of

Pontus Era. It was restorated in 1865, 1950 and 2009. (https://amasya.ktb.gov.tr/TR-283704/alcak-kopru.html)

Figure 4. "Alçak" Bridge on Yeşilırmak (Iris River) (from personal archive of the author)

In 2019, a pier was built in front of the Pirinççi Promenade, and boat and boat expeditions were started between the pier and the station bridge. This situation is important in terms of using Yeşilırmak from different perspectives. It is also important in terms of perceiving the Hatuniye District and Yalıboyu Promenade through Yeşilırmak (Iris River) (See fig.5).

Figure 5. A Boat on the Yeşilırmak River

Source: Ajans05 Facebook Page

2.3 World III: Yalıboyu Promenade and Ziya Paşa Boulevard

The 170-meter-long pedestrian sidewalk, which starts from the Government Bridge across Yavuz Selim Square and overlooks the Hatuniye District, takes the name of Yalıboyu Promenade and lies over 500 meters more reaching to Magdenus Bridge at the endpoint of the Beyazıt Mosque and Religious Complex (See fig.6).

Figure 6. Yalıboyu Promenade (Produced by the Author Using Google Earth)

In the design of the Promenade, small pockets have been opened, descending 5 steps, in order to ensure close contact with the river. In addition, in the amphitheater built in the area, various folk dances, sports activities, etc is performed open to public on certain days. (Canik, 2011) Yalıboyu Promenade can be described as the area where the users come to relax, walk and stroll and feel the river. (Canik, 2011) The amphitheater in the area has become a place that has an activity almost every day, especially during summer nights. In this state, the importance of this place comes to the fore in terms of the place where cultural activities are delivered to the public. Besides, it can also be said that the promenade area has a design that complies with the disability standards (Canik, 2011).

Next to the Promenade, there is Ziya Pasa Boulevard which is 18 meters long, with round trips and a traffic island between them. The right lane of the Boulevard is cut off to traffic after 19:30 o'clock in the evenings at the end of May and opened to pedestrian circulation until 01:00 o'clock at nights. Especially if the Ramadan months coincide with the Spring and Summer

seasons, the pedestrian activity on this road lasts until the first hours of the morning. Regardless of which neighborhood they live in, people meet on the promenade and have walk every night. During the daytime, it is a resting place for tourists coming with tours. Also, citizens are coming to banks, and shopkeepers and bank officers are coming to restaurants in day time.

Across the road, on the 770-meters road starting from the Yavuz Selim Square to the Sultan Beyazıt Complex, there are generally 1-3 storey buildings. These are especially trade and public buildings. Also on the route, historical Sarachane Mosque takes place, which has a history of nearly 650 years. In the part from the Yavuz Selim Square to the Sultan Beyazıt Mosque, there are Turk Telekom Building, Revenue Office, a PTT Branch, 3 bank branches, Chamber of Commerce and Industry Building, a cooperative building, 5 restaurants, 3 hotels and several food and clothing shops. Generally, the upper floors of buildings above 1 floor are used as accommodation facility. There are 8 food kiosks on the promenade of Ziya Paşa Boulevard overlooking the Hatuniye District.

The Municipality Business Center and building, right next to the Sultan Beyazıt complex on the road, were demolished in 2019 and the Belediye Square and single-storey commercial areas created in its place and put into service in 2022.

2.4 World IV: Kocacık Bazaar

Kocacık Bazaar (Fig.7), which is the commercial and shopping center of Amasya, between Ziyapasa Boulevard and Mustafa Kemal Pasa Avenue in the south, constitute the 4th place of the subject. The total bazaar area is about 4 hectares (40,000 square meters) and buildings in it are between 2 and 5 floors. In the bazaar, which is also known as the Dere district, there is Danişment Avenue, which is 18 meters long, connecting Mustafa Kemal Paşa

Street to Ziya Paşa Boulevard, and Özkan Yalçın Street, which is 12 meters wide, closed to vehicles. At the intersection of this pedestrian axis with the main street, there is the 900 square meters Bedesten Bazaar, which was restored and put into service in 2016. There are 18 building blocks in this part of the bazaar.

Figure 7. A View from Kocacık Bazaar (Source: https://tr.foursquare.com)

In addition to commercial use in the area, some plots also have mixed use of residential and commercial. As of 2021, a total of 950 people live in the Dere District. However, if we take into account that the borders of the Dere District are very wide and the existence of residential areas on the south of the main street, it will be revealed that the night population in the bazaar is quite low.

Except for the connection road and service times, this area is closed to traffic, especially during the daytime population and daytime human circulation is very high. This place, where people in the whole city of Amasya come at least a few times a week, is the center of the city due to this feature. The two squares on the west and east of the bazaar and the Beyazıt Complex right next to Bazaar increase the attraction and human circulation of this bazaar area. In this place, the ground floors are generally used as retail trade places, restaurants, cafes, doner shops, jewelry shops, and the upper floors are used as

hairdressers, lawyers, insurance, doctor offices and various education course places. This place, which is crowded during the day, becomes uninhabited at nights even in summer.

2.5 World V: Mustafa Kemal Paşa Avenue

Mustafa Kemal Paşa Avenue is the main vehicle road passing through the middle of Amasya City, dividing the city on the west-east axis. The part of the state road thakes the name of Mustafa Kemal Paşa Avenue between the Yavuz Selim Square and Amasya Park Shopping Mall. It's length between the junction point over the Square and Beyazıt Mosque is about 570 meters. The width of the road is about 25 meters. There are five pedestrian crossings between two sides within 570 meters length. There are 60 blocks located at the two side of the road within this distance. Especially blocks are organised at attached order. Number of stories of the existing buildings vary between 1 and 6. On the road, there is Bedesten Bazaar which dates back to 15th Century and restorated three times in 1865, 1971 and 2011. At the next of Bedesten, "Kilari Mosque" takes place which also dates back to 15th Century and restorated in 1992.

This avenue and the roads leading to this street and all the shops in the area form the core of the commercial center of the city of Amasya. Before the Amasya Freeway was put into operation in 2018, this road, which was used by heavy vehicles for intercity transportation, was causing both traffic and environmental problems. After the completion of the Freeway, the traffic congestion still continues, although it is freed from heavy vehicle traffic (See fig.8). This road, which connects the northern quarters of the city to the west, is crowded in terms of traffic at all hours of the day, except between midnight and early morning. Public busses for all routes in the city's transportation system must pass through this road. This route is definitely reached when anyone takes on the public bus from any part of the city. There are 6 public

transportation stops within the 570-meter section on the avenue. These stops constitute the most central and crowded stops of Amasya urban public transportation.

Figure 8. A scene from Mustafa Kemal Paşa Avenue (from personal archive of the author)

One of the biggest problems on the street, where pedestrian traffic is intense as well as vehicular traffic, is the difficulties faced by pedestrians due to the fact that the sidewalks are not too wide. The people living in Amasya definitely have a job in this region/area several times a week. In addition to this density, it has been determined that the sidewalks on this street are not very sufficient for disabled transportation. (Güremen, Dede, 2019) Again, as we understand from the same study, an average of 940 vehicles per hour and an average of 1800 pedestrians per hour, go along the avenue on a weekday (Güremen, Dede, 2019).

The functions in the area to support the pedestrian flow also highlight the importance of this street and the commercial uses on it for the city. The buildings on the street are used as a trade function, and the parts used as

residences have completely turned into commerce as of the end of the 2000s. While the ground floors are used for retail trade, the upper floors are used as hairdressers, doctor's offices, law offices or various office offices. On the avenue; the only private medical center of Amasya, a tuberculosis dispensary, 6 office buildings, 17 pharmacies (36 % of the total number of pharmacies in the city), 7 optical shops (35 % of the total number of optical shops in the city), 11 banks branches (78 % of the total bank branches in the city), 14 cash machines (40 % of the total cash machines in the city), 8 private doctor's offices (63 % of the total private doctor ofiices in the city), 11 dentist's offices (42 % of total dental offices in the city) doctor's offices, 17 insurance agencies (43% of the total insurance agencies in the city), 12 law offices (18 % of the total law offices in the city), 2 notaries (50% of the notaries in the city) take place on the zone. There are 2 private high schools, and many restaurants, and retail trade units.

DISCUSSION AND CONCLUSION

Analysis of urban space can be thought and executed with many different dimensions. There are many different interpretations and evaluations such as historicity analysis, morphological analysis, function analysis, imagination analysis, open-closed space analysis, visual perception analysis, can be involved into the process. The sui-generis situation mentioned in Amasya also emerges as a situation worth examining and researching from many different perspectives. Space, with one feature, is continuous over a certain distance. In the case described for Amasya, at every 50-55 meters which can be considered quite short distance for an urban space, the function, perception, lifestyle and movement style undergo radical changes and this situation repeats 5 times in a 260 meters section. It is the most important example of differentiation of space within a short distance in terms of quality of life and livability and their relationship with space.

In addition to the historicity of the place in question, the existence of Yeşilırmak, which is a natural element shapes the city, is the most important factor that reveals this sui-generis situation. The fact that it is located between the Harşena Mountain and Yeşilırmak, which is the threshold behind the Hatuniye District, and its historical features as the first settlement, makes the Hatuniye District different from the other areas of the city. In addition to these, one of the most important factors that differentiate this area is the fact that the Hatuniye District has a tourism-oriented position and that this area is so lively in terms of nightlife. So it can be said here that the function of the place also plays a very important role.

Yeşilırmak river is the natural element that contributes most to Amasya both as an urban form and as a way of life and lifestyle. In addition to being a determinant of the city form, it has also moved to a position that separates the functions, especially in the city center. The distinctive feature of Yeşilırmak should be seen as one of the biggest reasons for this sui-generis situation described for Amasya. The more it is integrated into the city life, the river provides benefits and adds beauty to the city more and more. It will be one of the important research topics to investigate whether there is such a spatial differentiation in different settlements with rivers passing through them, and to compare these settlements with Amasya.

Promenade, located just across the river, is one of the most important resting and strolling areas of the city to watch Yeşilımak and Hatuniye districts. In addition to this, it is the first open public space that comes to mind in the city as cultural activities are in execution. For small-scale concerts, and for any kind of exhibition, promenade is considered as a first place to reserve for.

The fourth different world, Kocacık bazaar, is important for its shopping function. While it is the most crowded place during the day, it becomes a functional space that becomes so uninhabitated at night compared to the

promenade, which is just 40 meters far away from it. One of the most important differences in all these areas is the movement and movement between night and day populations. The Mustafa Kemal Paşa Avenue, which is located just south of the bazaar, has a different appearance, it is a typical central street with heavy traffic, where people move very quickly, pedestrian and vehicular traffic cross each other. The determining factor in this place is the main street itself.

Related to the the 5 different parts of space in question, we can say that they are separated from each other in terms of morphology, function, and movement styles. As a natural element, although not located in the determined area; Harşena Mountain and Yeşilırmak, and as an artificial elements; pedestrian path and two main streets are main determinants for spatial differences. However, within the 260-meters section, five different functions such as housing & trade, trade, tourism, recreation and transportation stand out. In addition to the formed form and function, the speed and purpose of human movements in spaces is one of the biggest reasons for the different perception of space. This situation can be expressed as follows. (See figure 9)

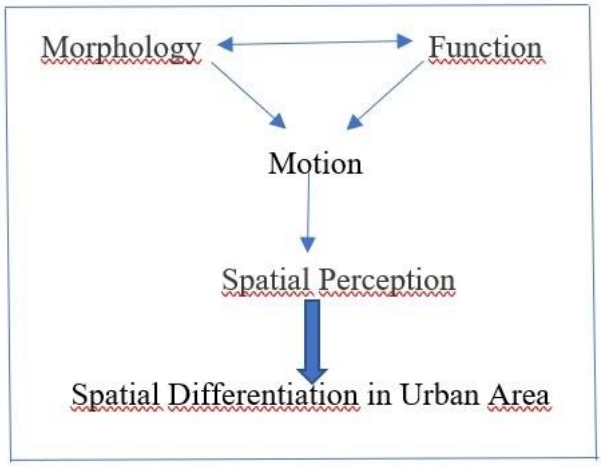

Figure 9. A Model for the Spatial Differentation in Amasya City Center

It is possible to explain spatial differentiation encountered as a unique sitauation in the city center of Amasya, according to the figure above. What is meant by the morphology part is the human-made structures as well as the constraints and obstacles that the natural structure presents. Roads or buildings are the formal elements that give the character of a built structure of a city. When such elements are combined with function, they trigger human movement, which creates the perception of space. Of course, supporting these determinations with research techniques such as surveys and interviews with the users who use this place will constitute the next phase of research of this this sui-generis and unique situation in the city center of Amasya.

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CHAPTER X

FUTURE CONCEPTS FOR FURNITURE DESIGN

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INTRODUCTION

Design fictions for the future aim to analyze people's past and present lives and create a design approach for the future. Changing living conditions as a result of rapidly developing technologies have made new design ideas an important need for the future.

Objects and products that meet our basic needs are often insufficient even in today's conditions. This has made the future setup an important part of the design. Producing solutions for possible future problems is an important case that has always existed for designers.

Digital technologies and new lifestyles primarily affect our living spaces. Furniture, which is an important part of our living spaces, is also directly affected by this situation. The aim of this study is to make an analysis of the place of furniture and how furniture is shaped in design fictions for the future life.

1.HISTORICAL VIEW OF FUTURE LIFE AND FURNITURE IDEAS

Although thinking about the future is one of the indispensable elements of design, from a historical point of view, it can be said that future ideas are much more prominent in some periods.

As a result of the technological developments experienced during the industrial revolution, all life habits have changed rapidly. This change has led to the emergence of avant-garde art movements.

In the field of art, the term avant-garde is used to mean innovative people or experimental works. The avant-garde attitude, with its structure that provokes revolutionary thoughts, has also spread to the fields of architecture and design, which are in contact with art in a short time. It is the art movement in

which the fictions of the imaginary future have been observed most intensely in the century, in the context of replacing the established order that it has demolished with its own design (Büyüktopçu, 2017). The avant-garde movements include art movements such as Cubism, De Stijl, Futurism, Surrealism and Dada in the 20th century.

Among them, the current directly concerned with the future was Futurism. The future perspective has influenced many branches of art and design, including furniture. The term futurism continues to be used even today to refer to "that which relates to the future".

In 2021, Aegean Exporters' Associations organized a furniture design competition under the name of the game-changing design competition. The competition was organized in two categories as Student and Professional. The theme of the competition was determined as "futuristic work area furniture", starting from the origin of the Covid-19 Outbreak experienced all over the world. The futuristic term used here by the competition organizing committee is not actually the futurism movement that emerged at the beginning of the 20th century. The aim of the competition was to design innovative workspace furniture of the future, and this goal was called “futuristic workspace furniture”.

Especially the 1960s were the years when the effects of the futurism movement began to be seen in furniture designs. A number of cultural and scientific developments in the world have triggered this. With the launch of the USSR's unmanned space flight program Sputnik in 1957, the world's dream of space became a reality. American President John F. Kennedy stated that the future is in space and America started to compete with Russia in space exploration. At that time, the dream that humanity would one day walk on the moon meant that life on earth would also change. Crochet (1999) stated that these developments changed the design trends once again, and the organic

design that surrounded the 1940s took a new path and the spaces resembled space stations and spaceships.

In the 60s the movement towards the new popular culture advanced. A group of British architects, including Michael Webb, Peter Cook, Dennis Crompton and Ron Herron, founded the 'Archigram' design group. They were primarily interested in architectural projects for futuristic cities and megastructures that were not planned to be realized. Archigram's projects represented extreme examples of the landscape furniture idea (Landscape Furniture) illustrated in the glossy magazines of the 60s. Furniture pieces in wavy free forms, usually no more than upholstered polyurethane furniture, were randomly placed in the interior so that people could move freely among them. (Sparke, 1986). The furniture in the living space design called "living 1990", which they designed in 1967, looks like it came out of the spaceships in science fiction movies.

Another example of the future living space fiction is the “Central Living Block” designed by Joe Colombo. While this living space design exhibits the vision of the modern apartment of the future, the furniture in the project was designed within the framework of this fiction.

Investments in space studies have increased society's interest in space with the effect of the mass media. In these years, space and furniture designs were made with the concept of space age, and many companies used the concept of space age in furniture advertisements (Canoğlu, 2012).

The Tulip chair designed by Eero Saarinen is supported by a molded fiberglass shell seating surface with a latex foam cushion on a plastic-coated cast aluminum base. With its organic lines, the chair reflected the futuristic style and the science-fiction style that would be felt more in the 60s. The Tulip chair was used in the televised science fiction series Star-Trek and became famous in popular culture. (Design Museum, 2009). The theme of

space is also dominant in the advertisement poster prepared by Knoll company for Tulip Chair. This theme was supported by the clothes and accessories of the model in the poster.

Another space-themed interior fiction belongs to the 2001 A Space Odyssey Movie. The Djinn chair designed by Olivier Mourgue was used in the design of the Hilton Hotel set in space, which was fictionalized for the movie '2001: A Space Odyssey' directed by Stanley Kubrick.

Yılmaz Zenger is also a name who has designs in futuristic furniture lines with the composite materials and sculptural forms he uses. Yılmaz Zenger is among the leading furniture designers in Turkey. Zenger has produced solutions for the future by using the developing possibilities of computer technologies, new materials and technologies in his designs (Canoğlu, 2012).

Zenger especially emphasizes that in the design line that can be described as futuristic furniture, it is not actually dependent on a design trend or fashion. While he defines design in life, he associates his designs with the future. He designs by constructing the future requirements of the user. While giving importance to the user's needs in his designs, Zenger aims to get to know the user and their lifestyle in the best way, and aims to provide solutions not only for the current life style of the user, but also for the future lifestyle of the user, in the furniture designed by knowing the user.

“To make the user comfortable, or rather, to renew his lifestyle, or rather to learn to read it first. Reading the customer, that is, taking a photo of the customer. Then notice how he's progressing. You want to shoot that development further, that is, the form that the customer will take in the future, the way of life, the way of life he will gain. So, if you aim for this day, the furniture will be outdated by the time it goes through the change. However, if you do something about its future, if you define it, if you create your solution

for its future, then it means that it will use that furniture for many more years in the future." (Y. Zenger, personal communication, November 29, 2011)

Figure 1. Furniture designed by Yılmaz Zenger
Reference: Canoğlu, 2011

As a result of the creation of an important market by the youth with the influence of the Youth movements of the 1960s, the high-tech furniture style, which is easily obtained but modern, was born for this market. Sparke (1986, p. 101) defines High-Tech furniture as a futuristic style that differs sharply from the formal features of previous years, but is also cheap and modern. In those years, the concept of high technology was different from today. Based mostly on industrial production systems and materials associated with heavy industry such as steel frame, stamped metal and rubber flooring, High-Tech furniture has imitated rationally designed industrial equipment and is often sold disassembled (Fiell, 1991).

While the first effects of environmental movements in furniture started in the 1970s, rapidly developing technologies and access to these technologies became the main factors shaping furniture design in the following years within the framework of the future concepts.

2.BASIC CONCEPTS OF FURNITURE IN DESIGN FOR THE FUTURE

Digital technologies and smart applications have become a part of our living spaces as they are much more economical and easily accessible. With the introduction of these applications, which make our lives easier, into our living spaces, it is seen that furniture designs are shaped in this direction. It is thought that these applications will increase by diversifying and will be one of the basic facts that guide future furniture designs.

Another concept that makes life easier with digital technologies is smart designs. Although this concept is mostly associated with technology, every design that offers smart solutions can be evaluated within this scope. It is predicted that smart furniture, which adapts easily to rapidly changing living conditions and meets the needs of the user intelligently, will maintain its importance in the future. Based on the furniture exhibited in Imm Cologne Fair in 2020; In the future, it can be said that scalable (adaptable to different room sizes), variable and versatile affordable system furniture and compact individual products will continue to influence (Maricic, 2020).

While digital technologies, smart applications and smart furniture continue to shape our lives rapidly, an important issue for designers is the future existence of the world, which is struggling with problems such as global warming, decreasing resources, migration, climate change and drought. These conditions have made sustainable design one of the main subjects of furniture, as in all design disciplines. The importance of sustainable possibilities in both design, materials and production will continue in the future, and researches and new applications on this subject will also guide furniture design.

In this part of the study, the basic concepts of furniture in design for the future are examined with various examples within the framework of digital technologies and smart applications, smart design and sustainability.

2.1.Digital Technologies and Smart Applications

From the beginning, high technology has a great place in future fictions in design. Technological developments will inevitably continue to exist in all areas of our lives. One of them is undoubtedly high-tech furniture. Furniture with integrated digital systems is strengthening its place in our lives day by day.

The internet of things, a concept that has emerged in recent years, has also found a place in the field of furniture design. “Internet of Things”, abbreviated as IoT, is a technology that enables objects used in daily life to exchange data with other objects and to be in full synchronization with each other. IoT is an ecosystem of smart applications and services that make people's lives easier and raise their living standards (Gündüz et al. 2018). According to the National Intelligence Council (2008), by 2025 the vast majority of everyday life objects will have their own internet connections. These objects include furniture.

Smart lock systems produced by a company called Onlock, which works on IoT based lock systems, can lock and unlock cabinets, drawers or office furniture with the remote-control method. This system, which is controlled by a mobile application, finds a solution to the problem of carrying or losing a key. The key can be shared with more than one person via the mobile application. The application can easily access who has access to the drawer or cabinet by keeping the records of the people with whom the key is shared and who are using the lock. In addition, it provides instant notification by sending

a notification to the mobile phone every time the key shared with someone else is used. (Onlock, 2020)

Digital systems integrated into homes or furniture can be accessed by all segments of the society, such as the elderly, children or disabled, and can play an important role in reintegrating them into society. Diseases or risks can be detected by analyzing the data collected from the devices integrated into the furniture. By using these devices, heart rate, blood pressure, body temperature, glucose level can be measured and thus the physical and even emotional states of the patients can be monitored remotely.

Digital systems are looking for possibilities to make daily life more reliable and healthier. Axia smart active application developed by BMA ergonomics is one of them Through this system, which is integrated into the company's Axia 2.0 collection of office chairs, the chairs begin to communicate interactively with the user, in addition to their ergonomic structure suitable for working. This system analyzes the sitting positions of the user and gives warnings to the user to encourage them to sit in the correct and healthy position. For example, it reminds them to take a break during long working hours or gives information about healthy working habits (BMA Ergonomics, 2017).

Digital technologies should not be considered as a system that is integrated into the design only after the product is finished. These technologies actually have an important place in the process from the design to the production and usage. In furniture production computer technologies and developing digital production technologies make the production of complex forms much easier than previous years. This provides a great freedom to the designers.

Digital technologies bring great convenience in usage and marketing. For example, companies have started to apply these technologies in their marketing strategies to attract potential customers (Vection Technologies,

2022). Virtual reality (VR), augmented reality (AR), and mixed reality (MR) are used to create realistic furniture and home decor simulations that can be experienced before making a purchase. These systems provide users with a realistic and interactive environment between furniture and interior by activating the senses of sight, hearing and touch.

2.2. Smart Design

The concept of intelligent design may not be just about digital and high-tech components. In addition to high technology in furniture designs, furniture called modular or smart design has a wide usage area, especially when its effects on productivity are evaluated. Changing living and working conditions have important effects on this need.

When the new generation projects are examined, it is predicted that furniture with flexible usage possibilities such as adjustable tables or furniture that can change and transform according to different functions will continue to be included in the design concepts of the future. “Baitasi House of the Future” designed by Dot Architects is a smart home project in Beijing/China, designed out of the concept of the living space of the future. The main starting point of the project is the blurring of the boundaries of working life and daily life. When the furniture of the smart house is examined, it is seen that it is shaped within the framework of the use of mobile and fixed furniture together. The different usage possibilities of these mobile and fixed furniture offer four different layouts to solve different usage scenarios. According to the user's expectations, the house can be transformed from a living space into a bedroom or an office. Along with these movable modules that transform the layout of the house, other household appliances and lighting in the house are controlled by a smart television. Compared to various projects classified as futuristic, this minimal house may seem non-futuristic at first glance, but with

its unassuming appearance and user-adaptive structure, it contains clues to the future of Beijing city (ArchDaily,2017).

Another example of smart furniture is the clock table designed by Yeg Design Studio. This design aims to find solutions for eating, drinking and working functions together. Yeg design studio describes this furniture as the hybrid working and eating station of the future. While the hybrid station provides self-power wirelessly by converting food waste into energy, it can also work with wired electrical energy when needed. When the working part of the station is not needed, this part is slid closed and turned into a flat bench. When the panel is closed, only the "Power" icon and energy level are visible. Defined heating and cooling areas are touch-controlled. With the Clock application on the phone, energy production information and statistics about the panel are obtained. Production rankings occur among friends in the social network established in the application. This multifunctional desk is designed for flexible living spaces and won an award in the 2019 Furnitur design competition. (Yeg, 2020)

2.3. Sustainability

In design, the idea of searching for a more perfect life often lies in the background of future fictions. Smart homes and products also need to be sensitive to the environment and society.

Future design ideas may also relate to the not-too-distant future. The limited predictability of the future phenomenon ensures that the design of the future is based on imaginary situations. However, it is very important to analyze the possible future extensions of the problems that exist today, as well as to think about imaginary worlds in future design fictions. Today's problems such as global warming, refugee problems, wars, famine, drought, climate change and global epidemic have made disaster scenarios inevitable for the future.

For the future world shaped around these scenarios, some of the problems that designers sought answers to have developed in this direction. In other words, design in recent years has been unavoidably faced with a question many of us never thought we would have to ask: How do you design for the future when the future you are designing for will not exist? (Saval, 2021).

All these problems have led designers to think about solutions for the sustainability of the existence of the world and humanity. Where "Designs for Different Futures" feels high-tech in imagination, Julia Watson (2019) in her book Lo-TEK imagines that knowledge of how to survive in the future is already embedded in low-energy, often ancient practices (Saval, 2021).

Today, many furniture designers are working on new and at the same time sustainable design possibilities using traditional methods and materials. Rattatan Stool, designed by Wiktoria Szawiel, reinterpreted the natural and sustainable rattan material with a contemporary form, out of its usual, traditional use. Rattan is a plant that grows in the tropical forests of Asia. Due to its easily bendable structure, it is traditionally used with knitting technique in furniture designs. In her design, Szawiel made an experiment on the uses of this material other than the knitting technique we are accustomed to seeing, based on the easily bendable structure of the traditional rattan material. These designs open the way to explore the potential of use for the future by making inquiries with the traditional one within the framework of today's possibilities.

Studies on materials and production methods in furniture design for the future are becoming increasingly important. Issues such as the limitation of material possibilities and the harm of production technologies to the environment have resulted in the intensification of these studies within the framework of sustainability. Wood, which is a renewable material that is easy to transform, is a material used extensively in furniture production. Many wooden furniture used in furniture production are coated with chemical materials to be resistant

to water and environmental effects. These chemicals make it difficult for wood to recycle in nature. In the future, eco-friendly coating possibilities for wood materials have been started to be researched and experiments related to this have begun.

Another view about wood that is thought to become widespread in the future is bio-facture applications. Bio-facture is a technique that uses biological organisms to develop new materials (Maganga, 2022). A project by designer Sebastian Cox and researcher Ninela Ivanova used a blend of biological organisms and wood. In their collection called Mycelium+Tımber, designers made lighting and stool designs by combining waste wood and a kind of mushroom plant. Design researcher Ivanova (2017) highlights the importance of holistic thinking and shared incentives behind combining mycelium cork and wood to create beautiful pieces of furniture and household items that push the boundaries of design thinking around future biobased materials and processes.

Another way to draw inspiration from the traditional for the sustainable use of limited resources is to explore the reuse possibilities of materials or products. Concepts such as Do it yourself, Recycle, and Reuse, which have become widespread as individual trends, especially through social media, are gaining importance within the framework of sustainability in furniture design. The main purpose of these concepts is to search for new usage and design alternatives by giving life to a product or material that has expired. These designs, which are generally produced by hand, have environmentally friendly production conditions.

In the furniture design course at Eskişehir Technical University, Department of Interior Design, Students evaluate old furniture or waste furniture pieces and conduct research on reuse possibilities. The furniture produced at the end

of the project was exhibited at Eskişehir Furniture Fair in 2021 and attracted great attention.

Figure 1. Furniture made with old furniture and waste furniture pieces. Eskişehir Furniture Fair
Reference: Canoğlu, 2021

CONCLUSION

The idea of "design for the future" should not be understood as purely imaginary projects that are deeply rooted in digital technology. The world has experienced this situation during the global epidemic, high-tech smart buildings have turned into unusable places, and people are in search of places with gardens close to the ground where they can interact with the world again, or places that can be ventilated through windows instead of air conditioners and ventilation. In this context, it should not be ignored that future fictions, in which technological applications will inevitably take place, may bring a return and a return to the essence. For this reason, it is not possible for a world that designers build on a future fiction that is not inspired by the past.

Today, furniture design in future fiction is different from designs based on amorphous forms or space-themed designs created within the framework of futuristic movements. In addition to the search for new materials and forms, future usage scenarios and solutions for the real needs of users continue to be important in furniture design.

Beyond being a luxury object, it is also very important to design and use smart applications integrated into furniture within the framework of actual needs. In this context, usage needs should be analyzed and evaluated together with the future vision. At this point, the unpredictable nature of the future once again emphasizes the importance of imagination for designers.

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CHAPTER XI

SUSTAINABILITY, UTOPIA AND URBAN

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INTRODUCTION

The rapid population growth that started with the Industrial Revolution brought along some problems. In order to accommodate the increasing population, new settlements were formed, and with the increase in the population rate, these settlements grew gradually and rapidly. Thus, the first examples of cities began to take their place on the stage of history. The advancement of technology has affected the production and consumption patterns, causing cities to develop more and receive immigration. According to World Bank data, as of 2021, 57% of the world's population lives in urban areas. This rate is 77% in Turkey (Anonymous, 2022).

The rapid and uncontrolled development and growth of cities has also caused some environmental problems. In order to solve the problems in cities where infrastructure is insufficient and exposed to unplanned development, the idea of using the concept of sustainability in urban development, as in all areas of life, has gained importance.

SUSTAINABILITY AND SUSTAINABLE URBAN

Although the concept of sustainability was included in the World Nature Charter document prepared by IUCN (World Union for Conservation of Nature) in 1982, it gained importance especially with the Brundtland Report published in 1987. The World Nature Charter states that "the ecosystem, organisms, land, sea and atmosphere resources that people benefit from should be managed in a way that can achieve optimum sustainability, but this should be done in a way that does not endanger the integrity of ecosystems and species" (Tosun, 2009). In the Brundtland Report, sustainability is defined as “meeting the needs of today in a healthy and balanced way, taking into account the needs of future generations”.

Sustainability can be briefly defined as “transferring all kinds of relations and interactions between nature and society to the future by taking into account the rights of future generations, ensuring the continuity of ecosystems, providing life support to each element that creates these relations and interactions and protecting them” (Altuntaş, 2012). Sustainability, as a multidimensional concept, is the expression of uninterruptedness in every field and at every level.

Urbanization movements that developed simultaneously with the Industrial Revolution changed cities physically, socially, culturally and economically. Changing lifestyles, management structure, capital power, population growth, migrations, economic conditions have caused the differentiation of living spaces in cities over time. Today, more than half of the world's population lives in cities. This situation has caused cities to be counted as one of the starting points of environmental problems. Physical activities carried out to transform natural areas into urban areas are dragging humanity towards disasters that cannot be recycled. In addition, urbanization results such as the use of approximately 70% of the world's energy, the production of more than 80% of greenhouse gas emissions, the ongoing lifestyle and consumption habits, the destruction of nature and natural assets, dispossession, fragmentation, the formation of urban rent and the increase in crimes. These problems have been the driving force in the emergence of the sustainable city concept (Altuntaş, 2012).

The three main objectives of the idea of creating a sustainable city are given below (Yazar, 2009):

- Overcoming the problem of increasing the quality of life of people living in cities, in their relations with the city, in the use of the common areas of the city and in the procurement of public services.

- Strengthening the ability of the city to maintain its existence as a settlement
- The necessity of questioning the existing production and consumption patterns in the use of the city's environmental values above their carrying capacity and in the transformation of resources.

Physical and socio-cultural requirements are at the forefront of various features that must be present in the formation processes of sustainable cities. Physical requirements are the requirements that ensure the positive development of the city, which is claimed to consist of a cultural system, cultural heritage and cultural life, together with its components. Socio-cultural requirements, on the other hand, express the indispensable conditions for the formation of a sustainability culture, which is necessary for the physical sustainability of the city. In addition, the common points aimed at creating sustainable cities are as follows (Çahantimur and Yıldız, 2008):

- Ecological Features (High quality of life, optimum density, mixed-function living spaces, strong public transportation and pedestrian traffic, minimum natural assets and energy use, optimum carrying capacity)
- Social Features (Effective and strong local government, equal opportunity, intense social interaction)
- Cultural Characteristics (Cultural continuity, strong sense of belonging / commitment / urbanity, vibrant and living city center)

United Nations member states have set 17 interrelated sustainable development goals that are aimed to be achieved by the end of 2030. One of them is the goal of “Sustainable Cities and Communities”. The 10 targets set for this purpose are listed as follows (United Nations, 2022):

1. By 2030, ensure everyone has access to adequate, safe and affordable housing and basic services, and improve “slums”
2. By 2030, ensure that everyone has access to safe, affordable, accessible and sustainable transport systems by improving road

safety, in particular by improving the public transport system, with particular attention to the needs of people in vulnerable situations, women, children, the disabled and the elderly.

3. By 2030, strengthen capacity to develop inclusive and sustainable urbanization in all countries and to plan and manage participatory, integrated and sustainable human settlements
4. Increasing efforts to protect and preserve the world's cultural and natural heritage
5. By 2030, significantly reduce the direct economic losses associated with global gross domestic product due to disasters, including water-related disasters, and significantly reduce deaths and the number of people affected, based on protecting the poor and vulnerable people
6. By 2030, reduce the negative per capita environmental impacts of cities by paying particular attention to air quality and municipal waste management and other waste management
7. By 2030, ensure universal access to safe, inclusive and accessible green spaces and public spaces, in particular women, children, the elderly and persons with disabilities
8. Promoting positive economic, social and environmental linkages between urban, peri-urban and rural areas by strengthening national and regional development planning
9. By 2020, significantly increase the number of cities and human settlements adopting and implementing integrated policies and plans for inclusion, resource efficiency, climate change adaptation and disaster resilience and developing and implementing an integrated disaster risk management at all levels in line with the Sendai Disaster Risk Reduction Framework Action Plan 2015-2030
10. Supporting least developed countries to build sustainable and durable buildings using local materials through financial and technical assistance

The examples of sustainable cities in the world are increasing day by day. Examples of these are the Swedish city of Gothenburg, parts of Amsterdam and Vienna, Bristol City, and Canadian cities. However, increasing the number of these examples has now become a necessity.

A sustainable city is defined as a city that avoids the irreversible destruction of natural values as a result of its use beyond its carrying capacity and that adopts a development style that meets the needs of current generations as well as future generations (Bayram, 2001).

Since the emergence of the concept of sustainability, many terms and ideas have started to form the lexicon of the cities of the future. Different institutions/organizations and interest groups regarding the ideal city of the future have tried to express cities in terms that reflect their own perspectives and understandings. The popularity of individual terms and the meanings attributed to them have received varying degrees of attention over time among academia, business, politics, and civil society. Moir et al. (2014) identified the most widely used urban terminology in their study (Table 1) (Pınarcıoğlu and Kanbak, 2020).

Table 1. Terminology of Cities (Source: Moir et al., 2014; Pınarcıoğlu and Kanbak, 2020)

Environmental	**Social**	**Economic**	**Administrative**
Garden Cities	Participating Cities	Entrepreneurial Cities	Managed Cities
Sustainable Cities	Walkable Cities	Competitive Cities	Intelligent Cities
Eco Cities	Integrated Cities	Productive Cities	Productive Cities
Green Cities	Inclusive Cities	Innovative Cities	Efficient Cities
Compact Cities	Only Cities	Business Friendly Cities	Well-Managed Cities
Smart Cities	Open Cities	Global Cities	Smart Cities
Resilient Cities	Livable Cities	Resilient Cities	Future Cities

Within the urban terminology expressed in Table 1, there are also some concepts that can be described as utopian urban ideas.

UTOPIA

As a derived word, "utopia" first appeared as a term of Greek origin in the literary work "De Optima Reipublicae Statu Deque Nova Insula Utopia" written by English writer and thinker Thomas More in 1516. More used the term "utopia" as a "place without", deriving from the Greek roots "u" meaning "non-existent" and "topos" meaning "place". The term "utopos", which gave its name to More's work, inspired many intellectual movements in later processes (Yüksel, 2012; Şimşek, 2019). The word “utopos” describes an island standing between reality and the imaginary plane. Krishan Kumar (2005), on the other hand, defines utopia as both a nowhere (outopia) and a good place (eutopia). Kumar stated that living in a world that is not possible, but where one aspires to be, reflects the essence of utopia (Yüksel, 2012).

The earth has witnessed tremendous transformations that have taken place in the last few centuries, creating shocking effects incomparable with the developments in previous periods. These processes of change and transformation, which we try to understand and make sense of through a wide conceptual spectrum from the Enlightenment to the scientific revolution, from the industrial revolution to modernity and the accompanying postmodernity, penetrate deeply into every field in which human beings exist. Undoubtedly, cities also get their share from the effects of this process (Olgun, 2010).

URBAN UTOPIAS

Urban utopias, that is, people's dreams, hopes and expectations about cities are almost as old as the first cities. In this sense, at the beginning, it is necessary to accept that there is some utopia in the essence of every city. Lewis Mumford claimed that “the first utopia is the city itself” (Kumar, 2005).

According to Fishman (1982), utopian urban projects such as Ebenezer Howard's garden city project in the 1890s emerged as a natural consequence of the inability of the current reality to respond to current urban problems. In this case, human beings, who cannot stay away from thinking and dreaming of the future while living in the present, especially imaginary urban thinkers, have created utopias that are alternative to the "present", functional, perfect, universal, radical and even a panacea due to the discomfort or discontentment felt by the changes in the existing built environment and social structure (Çöteli, 2018).

In utopias, the city is important in terms of being the place where ideal life, ideal society, and ideal management take place. In utopias, the view of the city was separated from each other in different periods. Those who see utopias as a tool for the improvement of people have accepted that the ideal form of the city shapes the society and social structure and idealizes them as well. In some periods, it has been accepted that the ideal society creates its own ideal space (Yüksel, 2012).

While utopia proposals were associated with both Nazism and Communism in the 19th century, the meaning of utopia was equated with unreal, naive and impractical in the 20th century as a result of the sharp distinction between real, scientific and utopian (Mannheim, 1985; Hughes, 2000; Milojevic, 2003; Çöteli, 2018).

From a different perspective, according to Erdem (2005), utopias suggest alternative lifestyles based on the characteristics of the periods in which they were produced. The designer creates a positive vision that will flourish in an uncertain date or place, based on the fact that the order he is in is a problematic one. Situations such as war, poverty and class struggle that already exist in the world we live in are not included in this positive vision.

On the contrary, all utopias refer to a happy society where justice and equality prevail (Şimşek, 2019).

Utopias have been shaped according to the social, environmental and economic context in each period they emerged. These propositions, which are an effort to change the ongoing order, absolutely need a physical space, and therefore the urban scale becomes the unchanging ideal environment of utopias. The fact that the city is presented as a factor that shapes the hoped-for life in utopian narratives stems from its holistic fiction that can organize social life (Şensoy ve Özaslan, 2018).

The beginning of the concept of utopia is based on Homer. Homer describes an island where there is no work and no wars, and where festivals are celebrated in abundance and constantly. This is followed by Plato's Republic (Arslan, 2006). Plato's Republic is outside the literary structure in terms of form. It would be more correct to accept this work as a philosophically based utopia (Olgun, 2010). Plato, who is seen as the owner of the first written utopia and deeply influenced the modern utopia literature, described the ideal city as well as the ideal state. Emphasizing that the city is the basis of his propositions, Plato built his utopia, the "State", as city-centered. In fact, the main reason for addressing the urban phenomenon in utopia is the belief that an ideal society and life can exist on an urban scale. For this reason, utopia seeks the ideal not somewhere outside the city, but in the very center of the city, in the living part (Sekman, 2017; Şimşek, 2019).

Although utopias are usually based on Plato, Usta (2005) states that utopias have a history of five thousand years in his work called Ancient Age Utopias. Utopia, which set off from Sumer, Egypt, and Greece, went to Rome, China, and India, and after a pause, spread to the Middle East and Europe again. Five thousand years ago, the Sumerians spoke of a "very ancient age" when humanity was not yet sinful and knew abundance and peace (Yüksel, 2012).

Facts such as the days when people lived in abundance and happiness in Greece until the first century AD, an egalitarian order where women came to power and no private property, a communal order made up of artisans and peasants and soldiers, and an equal society were the subject of literary and other Works (Yüksel, 2012).

Ancient utopias first appear in legends and myths, and then find their place in literary works. While the works speak of an equal society where all people live in prosperity, abundance and abundance, they are actually a reaction to the negativities/problems of the period in which they emerged (Yüksel, 2012).

Sekman (2017) analyzed urban utopias by dividing them into four periods. These are Renaissance Utopias, Enlightenment Utopias, 19th Century Utopias and 20th Century Utopias.

Renaissance Utopias

According to Alsaç (1978), ideas and views on changing the environment were first put forward through designs during the Renaissance period. The architectural products of the Renaissance period are mostly within the framework of urban design, in this respect, the history of architecture and urbanism is called "ideal urban designs of the Renaissance period". The first of these designs was developed by Antonio di Pieto Averlino, who became famous under the name of Filarete in Italy, in the work called “Trattato d'architetura”, which was written between 1460 and 1465. In this work, Filarete presents ideas for an ideal city, which he named "Sforzinda" in honor of Francesso Sforza. The plan of the city is in the form of an eight-pointed star formed by two squares positioned diagonally on top of each other(Şimşek, 2019) (Figure 1).

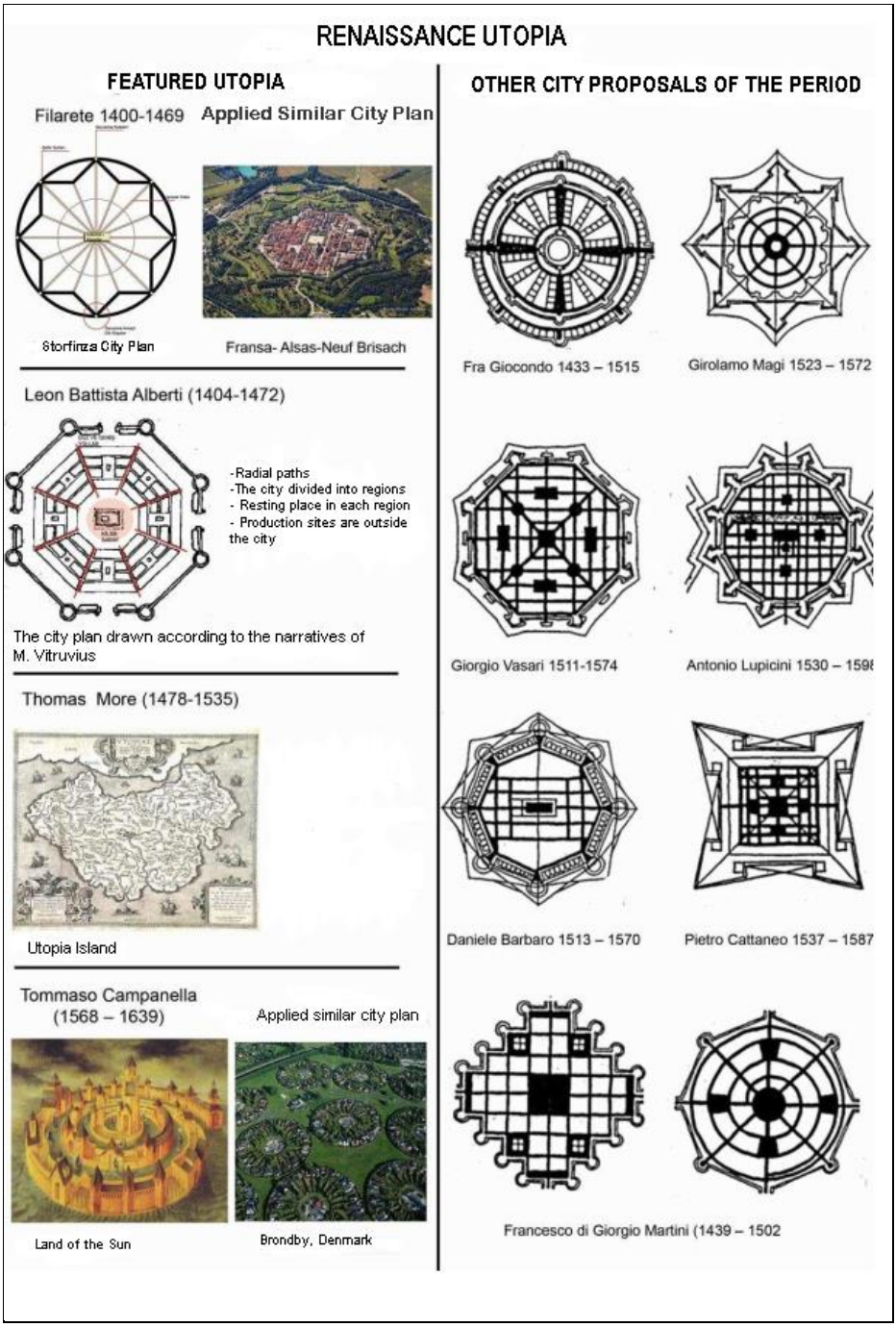

Figure 1. Renaissance Period Utopias
Source: Sekman, 2017

While talking about utopian designs in Italy during the Renaissance period, it is necessary to mention Campanella's "City of the Sun" (Alsaç, 1978). Tomasso Campanella published his work City of the Sun in 1623. The City of the Sun was built on a hill rising from the middle of a wide plain. The diameter of the city reaches 3500–5000 meters. The city is divided into seven rings with a common center, and each of these rings bears one of the names of the seven planets (Şimşek, 2019).

In the process from the past to the present, utopia has found a place for itself in every period. When examined periodically, the value given to human beings in the Renaissance Period led people to research what kind of society they should live in. Due to the structure of the Middle Ages that limited individual freedoms, unrest in society increased. In such an environment, systems of individual freedom, social justice and equality emerged. As a result, studies suggesting a utopian social order have been carried out. In fact, the idea of arranging the environment in which people live has existed in all ages. But it first became a design in the Renaissance Period. In this period, the designs of Filarete, Leon Battista, Thomas More, and Tommaso Campanella can be shown as good examples of ideal urban designs (Sekman, 2017).

Enlightenment Utopias

The period called the Age of Reason or the Age of Enlightenment is a period that defines the transition of Western civilization to the modern age between 1650-1800. It is a period in which the mind is tried to be dominated. The foundations of the Enlightenment were laid in the Renaissance Period. The discoveries in this period expanded the human world and made it a focal point. But in this period, unlike other ages, the mind came to the fore. The fact that the Age of Enlightenment was an age that gave priority to the mind caused a different period in urban designs as well. Science and technology gave birth to modern thought and more monumental buildings came to the

fore. With the decrease in the effectiveness of the church, the castle and churches were removed from the focus of urban planning. The designs of Etienne Louis Boullee and Claude Nicolas Ledoux, prominent designers of the Age of Enlightenment, are striking examples of this period (Sekman, 2017) (Figure 2).

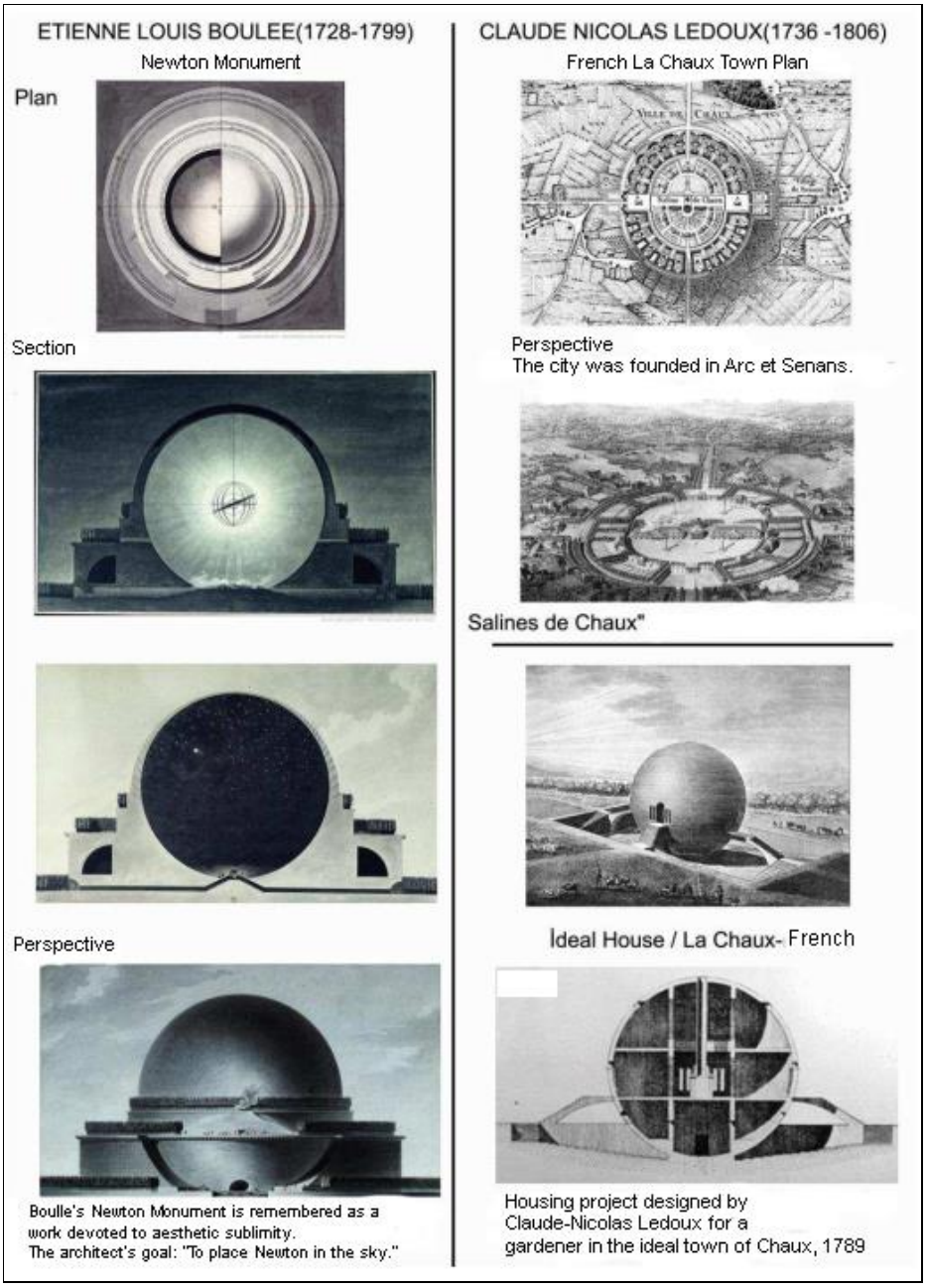

Figure 2. Enlightenment Utopias
Source: Sekman, 2017

19th Century Utopias

By the 19th century, the idea of an orderly city was moved away from utopias. Fishman (2002) states that in the first half of the 19th century, major European cities demolished their historical walls and fortifications, expanding at a reckless pace towards the surrounding countryside, losing the proper structure of a healthy organism (Yüksel, 2012).

As a result, utopians in this period criticize the negative effects of the industrial revolution such as overpopulation, unhealthy conditions and inequality in the cities and searched for a new social and urban fiction. In this period, the gap between the city and nature has widened, and cities have become both uninhabitable and far from nature. Sarcey et al. (2003) states that the utopias of this period have two different faces, on the one hand passionate about technical infrastructures such as urban lighting, sewers, metro, and on the other hand, yearning for the Middle Ages and its monuments (Yüksel, 2012).

In the 19th century, Robert Owen in England, Saint Simon, Charles Fourier and Andre Godin in France are defined as social utopians. What they have in common in their utopias is a humanistic approach. They are trying to bring an economic order. They want to establish an ideal city where people do not have financial worries and where everyone can live happily. At this point, they are similar to Thomas More's utopia. They want to provide ideal urban approaches with communal housing (Sekman, 2017) (Figure 3).

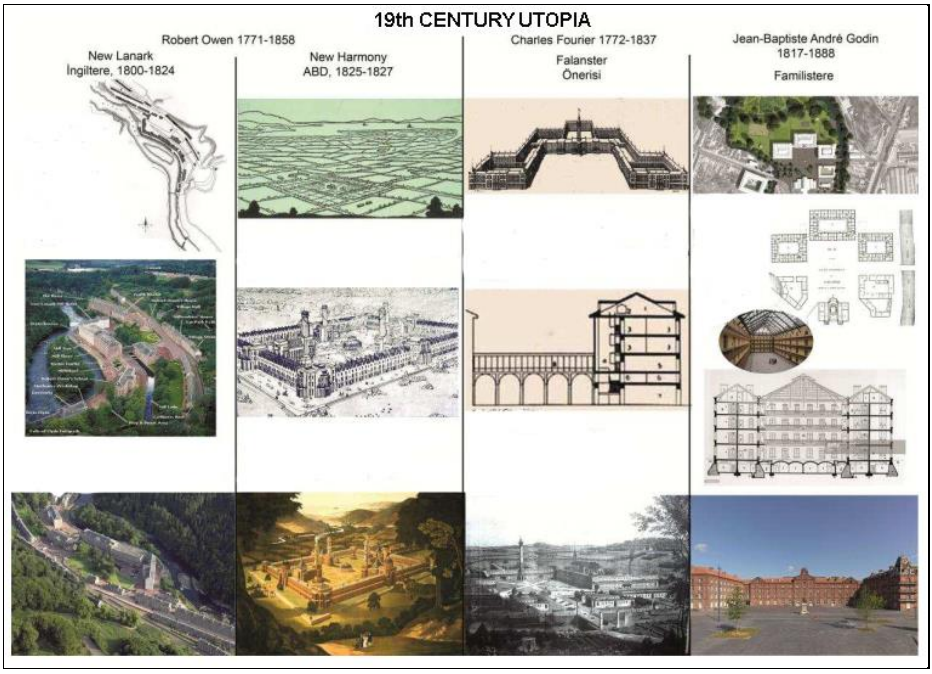

Figure 3. Utopias of the 19th Century
Source: Sekman, 2017

20th Century Utopias

Ideal city designs and practices in the 19th century were fed by ideological approaches and remained limited to utopian thoughts and practices. After the Industrial Revolution, migration from rural to urban areas accelerated with the mechanization process, the urban population increased and the urban environment was negatively affected by this increase. When 20th century urban designs are evaluated, it is seen that the concept of utopia has gained intensity. In this period, the change experienced with industrialization led architects and planners to new searches. With the negativities brought by mechanization, the city's moving away from the livable environment and the start of escaping from the cities have caused the concept of the ideal city to be questioned (Sekman, 2017).

The garden-city utopia, put forward by the English-born Ebenezer Howard in his 1898 work Tomorrow: A Peaceful Path to Real Reform, will remain on the agenda for many years, and will be a city model that will be tried not only in England but also in other countries. Howard designed a new city in Garden City that combines the advantages of the countryside such as the beauty of nature, clean air, sun, water, low rent with the advantages of the city such as social opportunity and high wages (Yüksel, 2012) (Figure 4).

French-born Charles-Edouard Jeanneret, better known as Le Corbusier, was one of the pioneers of the Modernism Movement. The Contemporary City (1922), which he designed after the First World War, considering big cities such as Paris, is almost a prediction of today's cities. Le Corbusier reflects the future of industrial society and technological development in his ideal city of three million inhabitants. With the Contemporary City, Le Corbusier has designed a design that brings solutions to the problems of sprawl, vehicle dependency, industrial damage to the physical environment and security issues. Le Corbusier's Contemporary City is based on the idea that "a big city should have skyscrapers at its center" (Yüksel, 2012).

Apart from the problems that emerged as a result of the Industrial Revolution, the housing problem arose in Soviet Russia due to the revolution and civil wars. A striking utopian understanding was displayed with the ideas produced in Soviet Modernism between 1920-1930. In this period, dystopias criticizing the concept of utopia began to question the livability of urban space. With this differentiated utopia understanding, the functional process in the first half of the 20th century was left to the structural process in the 1960s. In this period, communities that believe that high technology can solve all the problems of society, such as Archigram and Japanese Metabolists, are at the forefront. In other words, the technological utopia is in the foreground (Sekman, 2017).

According to Yüksel (2012), the emergence of ecological utopia as a design did not happen all of a sudden, but took place step by step. The principles used in ecological designs have developed in a fragmented way over time. To summarize briefly, one of the first principles was introduced by Howard's Garden City movement. Howard talks about controlling the size of the city and protecting nature in the Garden City. In the 1940s, Frank Lloyd Wright spoke of the use of local building materials and the design in accordance with the Genius Loci, while the Swedish Ralph Erskine spoke of south orientation, façade planting/greening, planting on the north façade. In the 1960s, he added to the ecological design process by using principles such as the use of renewable energy, the use of local materials, recycling and energy saving, with applications in the USA and Europe. In the 1970s, Bengt Warne added to the ecological design process by using principles such as not harming and even improving the nature with housing, use of rain water and gray water, evaluation of organic waste, use of heated air in the house, and evaluation of soil temperature. The process, which started by applying one or more of the ecological principles in single houses, has expanded to a housing unit, neighborhood, and city scale over time.

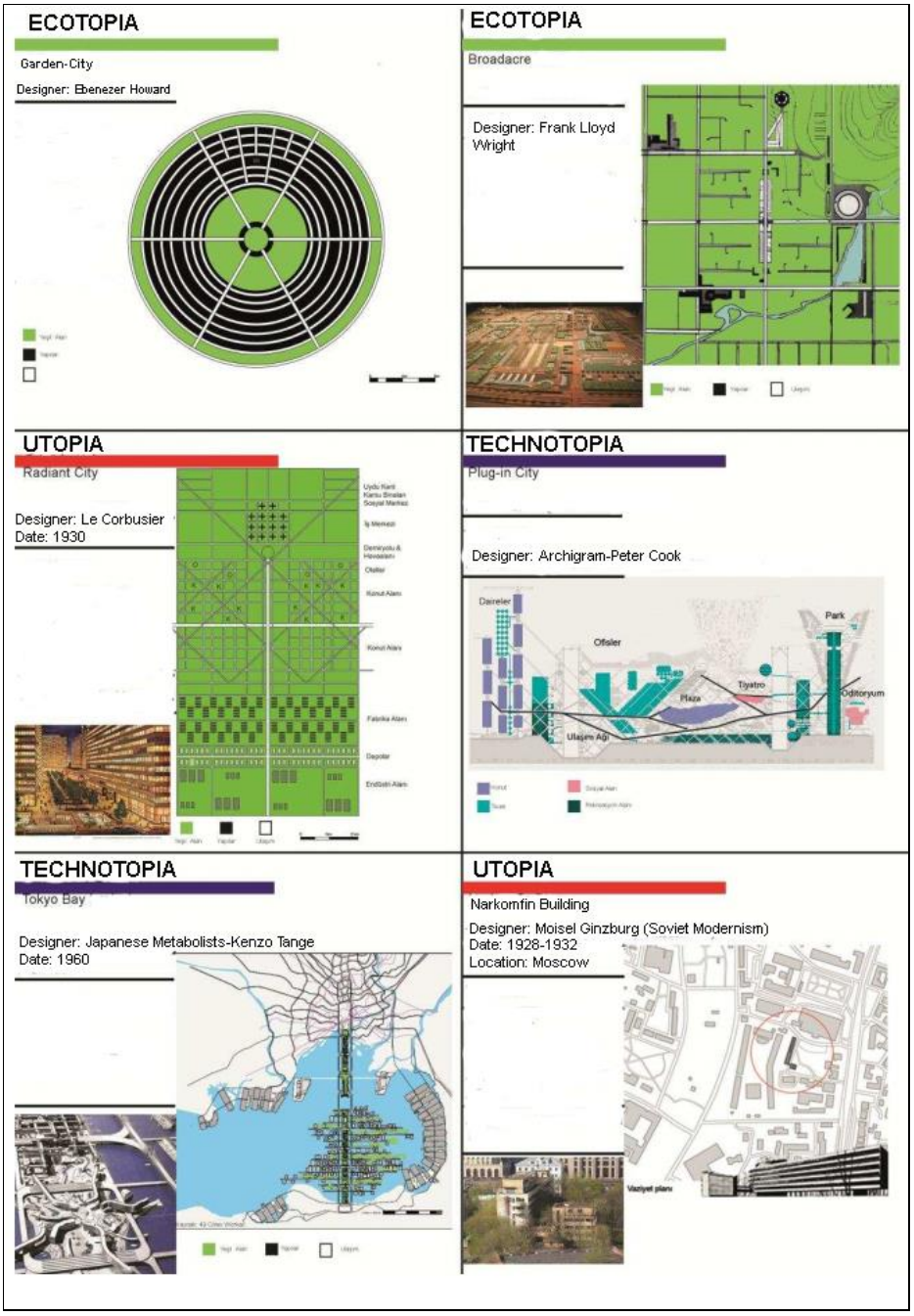

Figure 4. 20th Century Utopias
Source: Sekman, 2017

CONCLUSION

Considering the changing lifestyles, changing social structure, needs, expectations, etc., it is an inevitable fact that sustainability is found in all areas of life. From individuals to societies, there are decisions that must be taken at every stage, activities that must be done, and goals that must be achieved. Considering that more than half of the world lives in cities, sustainability and sustainable cities have become a necessity.

Although utopia is a phenomenon dating back to ancient times, it expresses the dreams that people wish to come true. Just like Frank Lloyd Wright's idea of skyscrapers, the utopias of time can be crucial stepping stones in building the realities of the future. Because both cities in utopias and sustainable urban forms seek solutions to global, social and physical problems instead of trying to represent the universal order.

Both sustainable cities and utopian ideas about urban development are very important for people to lead a better and quality life and to achieve an ideal life. But more important than that is the sense of respect and protection for the world and its resources, which is formed on the basis of these phenomena.

As a part of the earth, human beings must live in harmony with other living things and must protect natural resources in order to continue their existence. Sustainable and utopian city ideas are guiding for the realization of this.

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CHAPTER XII

URBAN LIFE AND URBAN SPACE IN THE INTERACTION OF UNIVERSE AND METAVERSE

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INTRODUCTION

In the near future, a new driver that has an influence on daily urban life which is broadly influenced by geographical, social, and cultural aspects may emerge: Metaverse (i.e., beyond the reality or universe). This technology, which combines the physical and digital worlds and is typically associated with the use of virtual reality (VR), augmented reality (AR), and blockchain can affect daily travel of people directly and the way of land use indirectly (Dionisia et al., 2013). It can change the regulations on spatial planning and add a new dimension to governance although it is still no more than an ambitious but utopian idea.

We have already experienced that people might act collectively regardless of the space with the rise of social networks. In addition, we went through a pandemic period that showed it is not always possible to experience leisure activities, gather, and organize in a physical space. The fame of social networks and social media has grown even more during the COVID-19 pandemic (González-Padilla, 2020), which means that especially young urban dwellers exist in both the physical and digital worlds. This may be an opportunity rather than a threat: Shirky (2011) argues that social media revitalizes the public sphere and increases the ability to undertake collective action. So, what does metaverse, as the utopian synergy between the physical and digital world (Dzelme, 2022), promise for urban space in the construction of Society 5.0?

Urban planning may need to reconsider its priorities since urban life, which combines built and natural environments, may need to interact with the virtual world. This paradigm shift can both reveal inequalities in urban space and make a positive contribution to quality of life and environmental sustainability. The aim of this paper is to discuss the implications of metaverse on the field of urban planning, in particular (re)thinking about

urban life and space, with a perspective of universe-metaverse interaction. The paper is primarily intended to address the following research questions. What can the interaction of metaverse and universe bring to urban life and space? And how can metaverse contribute to cities? The paper reviews the literature on the possible effects of metaverse on urban space and deals with the topic through four different aspects: Work and education, leisure and retail activities, property investment, and ecological environment. Introducing metaverse platforms under development, the opportunities they can offer for urban planning are being evaluated for a better interpretation of the experience of universe-metaverse interaction.

1. What is Metaverse?

The idea of metaverse was first introduced in Neal Stephenson's 1992 science fiction book named Snow Crash, which was influenced by Vernor Vinge's novella True Names. In Snow Crash, the hacker Hiro Protagonist –as a main character– travels between dystopian Los Angeles and a virtual world known as the Metaverse (Stephenson, 1993). The metaverse in Stephenson's cyberpunk novel is represented as a metropolis where people interact and communicate with each other and intelligent agents in an immersive three-dimensional (3D) virtual world which is accessed via VR goggles (Stephenson, 1993). In this virtual urban environment, there are spatial and building-scale permits managed by the Global Multimedia Protocol Group, as in the cities we live in. You can purchase clothing or weapons for games with digital currency and you can virtually travel places in the metaverse.

About three decades later, Stephensons's metaverse inspired tech giants like Meta, Google, Microsoft, Samsung, etc., either by using this vision in their own technologies (e.g., Google Maps) or trying to bring this artificial universe fiction into reality (e.g., Reality Labs). However, we owe the popularity of the

term to the rebranding of Facebook as Meta in October 2021, as can be seen in the diagram in Figure 1 representing Google Trends data on “metaverse”.

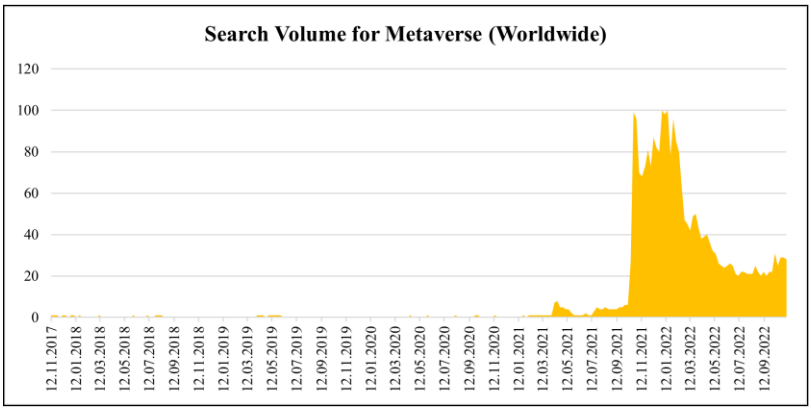

Figure 1. Worldwide Search Volume for the Term “Metaverse” on Google in the Last 5 Years (Google Trends, 2022).

The term Metaverse is “the post-reality universe, a perpetual and persistent multi-user environment merging physical reality with digital virtuality”, according to Mystakidis (2022: p.486). Mystakidis (2022: p.487) expounded metaverses as “technologies that enable multisensory interactions with virtual environments, digital objects and people”, meaning that users –as avatars– will be able to communicate with other users through digital representations of themselves in these worlds. Kim (2022: p.141) defines the term metaverse as “a three-dimensional virtual world inhabited by avatars of real people”. Lee et al. (2021: p.1) described metaverse as “a virtual environment blending physical and digital, facilitated by the convergence between the internet and web technologies, and extended reality (XR)”.

Metaverse can be seen as the experience interface of Web3, the next web. The term Web3 that has a place in the published literature is coined by Ethereum cofounder Gavin Wood (Wood, 2018). To better understanding of the Web3, we need to take a closer look at the Web2 by paraphrasing the White Paper of Lamina1 –a company cofounded by Neal Stephenson, creator of the term,

bridging the spatial/metaverse world with the crypto world (Lamina1, 2022: p.6):

"*Web2 introduced a period of rapid innovation and unprecedented access to entertainment, information and goods on a global scale... Consumer behavior, recorded on centralized company servers, offered constant, privileged insight into how to monetize human emotion and attention… Web3 envisions a better world through the thoughtful redesigning of our online lives, instituting stronger advocacy for our interests, our freedom and our rights*."

In Web3, users got the power over their data and identity, unlike Web2. Non-fungible tokens (NFT), cryptocurrency, and blockchain are tools that create the property of users (Gadekallu et al., 2022). Besides, according to Google Trends searches, the top two keywords searched worldwide along with the metaverse are NFT and real estate (Google Trends, 2022). Therefore, to create or establish a metaverse platform –not "the" metaverse platform as it has various variations–, we need these tools and maybe some more (such as social media, digital commerce, digital assets, etc., as detailed in Figure 2) in addition to VR, AR, or XR. Metaverse uses these elements as part of its ecosystem, while enabling users to interact with the Web.

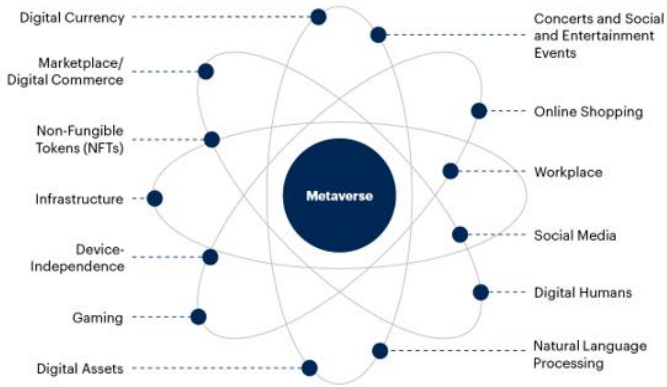

Figure 2. Elements of a Metaverse (Gartner, 2022a).

In the universal literature, it is seen that the metaverse is associated with Society 5.0 (Suzuki et al., 2020; Yao et al., 2022). Society 5.0 refers to a super smart society that merges physical and digital spaces. The main purpose is to process large volumes of data collected from the real world by computers and use this information as a solution to real-world problems (Deguchi et al., 2020). The metaverse appears to be the ideal platform on which the concept of Society 5.0 can be applied, considering the digital revolutions it brought by guiding attitudes in the virtual world. So, is the society ready for this?

According to a prediction by the Gartner Inc. technology research firm, 25% of people will spend at least one hour a day in the metaverse for work, shopping, education, social activities, and entertainment by 2026 (Gartner Inc., 2022b). The fact that the Z generation spends more time in the digital world such as video games and social media and their escapist tendencies due to economic challenges are an important reason to give a chance to the metaverse in the long run (Wood, 2013; Oh et al., 2023). On the other hand, physical features that are rejected or filtered in the real world can push people into virtual environments. These trends show that the metaverse will gradually take its place in our lives, even though it has not yet reached the expected widespread user mass. Therefore, it is beneficial to consider the metaverse vision while seeking solutions to existing urban and social problems and while dreaming of an ideal urban plan.

2. The Metaverse as an Urban Utopia: Implications on Urban Life and Urban Space

In the present and the future, urbanists plan and define utopian scenarios to make cities more livable. The common purpose of many examples such as Ebenezer Howard’s Garden City, Frank Lloyd Wright’s vision of Broadacre City, Tony Garnier’s Cité Industrielle design, and/or Le Corbusier’s Contemporary City arises from the desire to bring an ideal order in response

to physical and social problems (Duman-Yüksel, 2012). Unlike them, today we no longer have to confine ourselves to a single scenario while imagining a perfect world. Should this mean setting aside the universe and dreaming of a new ideal order beyond physical reality? If so, wouldn't the metaverse utopia become the dystopia of the universe we live in?

These questions lead us to examine the effects of the steps taken so far regarding the metaverse on urban life and urban space. Metaverse is known as a collective virtual shared platform, so, being collective without needing any physical space can change the value attributed to the space. There may be less mobility in urban space due to virtual meetings, training, leisure activities, and/or shopping. Considering that real estate is a scarce resource in the physical world, a new opportunity may arise for investment property. It is possible to examine the issue in four contexts: Work and education, leisure and retail activities, property investment, and ecological environment.

2.1 Work and Education

While traveling has been a part of daily life for the last 50 years, COVID-19, which started in 2020, suddenly interrupted mobility routines (Hayrullahoğlu and Varol, 2022). As a result of the pandemic, urban dwellers principally questioned if they truly needed to change their location to meet all their needs. Human mobility reorganized; co-locating home and work and/or school became the new reality. The use of digital tools has become widespread, especially in work (if doing it remotely makes sense) and education, to reduce disruption of daily life.

Today, we can choose a venue for a meeting anywhere on the planet thanks to virtual meetings, which means a prospect of a less mobile future. This vision naturally sparked the establishment of metaverse platforms to provide an interactive remote work environment. An advanced scenario in the report

"Cities and the Metaverse" of the National League of Cities (NLC) makes it easy to picture the working environment in any metaverse (NLC, 2022: p.17):

"Jackie, a planner in the city's Planning and Urban Development Department, has been tasked by their boss to identify the potential impact of sea-level rise on the city's beachfront properties and businesses. Using the city's digital twin, Jackie creates a 3D model of the city to explore different climate scenarios through a virtual reality headset based on the latest Intergovernmental Panel on Climate Change sea-level rise projections. Jackie invites their colleague Yui, an engineer in the Public Works Department, to join them in the metaverse. Jackie and Yui are able to walk around together, create a list of neighborhoods most at risk from rising sea levels, and make accompanying notes for both Jackie and Yui to discuss with colleagues in their respective departments. After exploring how different sea-level rise projections will impact properties and businesses, Jackie invites their boss to present options for further research into strategies to mitigate potential risks to beachfront neighborhoods."

But what parts of this scenario have been accomplished so far?

According to Ammar (2022), on-the-job training and remote learning could be advanced by the developing metaverse as a new method of transferring knowledge. The fact that learning by doing experience improves the learning process is an important reason for using VR technologies in simulations. This method provides feedback on the impact of both job training and primary education. Bank of America, for example, is a pioneer in its industry, launching VR training in nearly 4,300 financial centers nationwide, enabling employees to practice and simulate customer interactions through a virtual environment (Bank of America, 2021). It should be noted that 97% of the participants in the pilot study, which involved 400 employees, reported

feeling more comfortable when performing their tasks (Bank of America, 2021).

Metaverse could be a way to offer disadvantaged people employment opportunities or accessible services inside the house. Or spatial access inequities could be eliminated by assigning new functional roles to regions, where unemployment is spatially concentrated, –only if accessible and inclusive platforms are developed. During the pandemic, PricewaterhouseCoopers (PwC) built a platform called "Virtual Park" to use in student recruitment (PwC, 2021). An interactive, COVID-safe platform where students from different countries can learn about the culture, opportunities, and values of PwC. Virtual spaces were designed for students to interact with each other and representatives of PwC through the avatars they created. Parks, auditoriums expo halls, and skill session areas designed for group interaction (Figure 3). More than 12,400 people used the platform at 56 recruitment events, according to PwC (2021). Beyond adding an interaction dimension to remote work and education or being more productive, advanced technologies quasi-metaverse can provide an opportunity to resolve social inequalities arising from spatial barriers, –apart from requiring costly equipment.

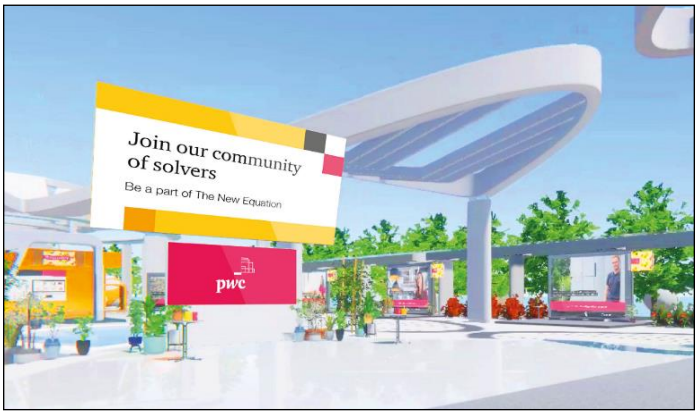

Figure 3. Image from PwC's Virtual Park (PwC, 2022).

According to Meta (2022), metaverse office spaces do not coincide with the hierarchy of corporate culture. Each employee can access all places, including the CEO's room, regardless of their position in the hierarchy. Could the taboos destroyed by this revolutionary suggestion cause society to reconsider the tools it uses to make its voice heard in urban space? In fact, reaching out to public authorities in metaverse can strengthen active participation in urban management decisions.

The closest local government to achieving this goal is the Seoul Metropolitan Government. The city of Seoul, South Korea, is the first global city to offer virtual public services on metaverse. The Seoul Metropolitan Government began the Seoul Metaverse pilot service for citizens' feedback on 9 May 2022. In the beta testing version, users will be able to visit the lobby and the mayor's office as an avatar, interact with other users, and even submit petitions at the virtual Seoul City Hall (Figure 4) (Seoul Metropolitan Government, 2022). Seoul Metropolitan Government aspires to create a standard metaverse environment by 2026 for all municipal services, including tourism, education, and the economy.

Figure 4. Images from the Seoul Metaverse Platform (Seoul Metropolitan Government, 2022).

2.2 Leisure and Retail Activities

Digital world experiences such as games, social media, and rising e-commerce already occupy a large part of our free time today (Kozyreva et al.,

2020). Metaverse aims to take this experience to the third dimension. Events that could not be held in the physical place due to restrictions were moved to virtual platforms fulfill social needs during the pandemic (Oh et al., 2023). This trend has diversified the leisure and retail activities to be done in metaverse.

Decentraland, one of the most popular metaverse platforms, held a four-day virtual concert event with 50,000 virtual attendees in October 2021 (Decentraland, 2022a). According to J.P. Morgen (2022), virtual concerts have the potential to be more profitable than physical concerts that deal with barriers such as capacity and parking. In March 2022, the Metaverse Fashion Week event occurred, again in Decentraland. Some major retail companies have already launched retail spaces in the metaverse. Instead of opening stores in every city, it can be tempting to establish a global center in the metaverse that can serve millions of customers (J.P. Morgen, 2022).

Metaverse is already used to advertise local tourism and banks. In the Seoul Metaverse, historic landmarks are being introduced as virtual tourist zones. It is said that the traditional festivals will be held both live in the Seoul Metaverse to introduce the South Korea culture to more people (Seoul Metropolitan Government, 2022).

According to a recent study in South Korea, young people's social presence in the metaverse enables them to participate in constructive interactions with other users in the virtual environment, which also decreased their loneliness (Oh et al., 2023). We should not underestimate how quickly the next generation will adapt to using this new playground as a place to spend their free time. Therefore, the number of visitors of art galleries, museums, cinemas, casinos, restaurants, fashion boutiques, and many urban attractions can be on the decline.

2.3 Property Investment

The metaverse vision can lead to the emergence of a new digital economy, and virtual property investments are one of them. Metaverse assets are NFTs that are bought and sold online with cryptocurrency. Its technology is based on an open blockchain, which differentiates it from existing gaming platforms such as World of Warcraft, Roblox, Fortnite, etc. Blockchain technology enables metaverses to have their own cryptocurrencies and, naturally, financial systems (Nakavachara and Saengchote, 2022). Therefore, as trust in digital economy tools increases, the use of metaverse in daily life will also become widespread.

The creation of a more accessible virtual economy with new products and services in metaverse can produce benefits for users and business owners. Users can buy land in the metaverse in anticipation of generating revenue stream on the interactive experiences such as organizing art activities or reselling it in secondary markets at a higher price (Nakavachara and Saengchote, 2022). For example, LAND is an NFT that indicates ownership of virtual real estate in "The Sandbox" ecosystem –one of the most popular metaverse on the Ethereum blockchain with a market capitalization of $915 million (Nakavachara and Saengchote, 2022). Another popular metaverse platform, Decentraland, sells estates and parcels on its marketplace (Figure 5) and has a market capitalization of $845 million. Like mimicking the real world, the price of land is influenced by attributes such as having a main road frontage, proximity to the center of the Decentraland and the experience it provides.

Metaverse property may draw more interest as property investment in the real world becomes a hassle due to legal procedures, taxes, and middlemen. On the other hand, discussions of "digital gentrification" have already begun.

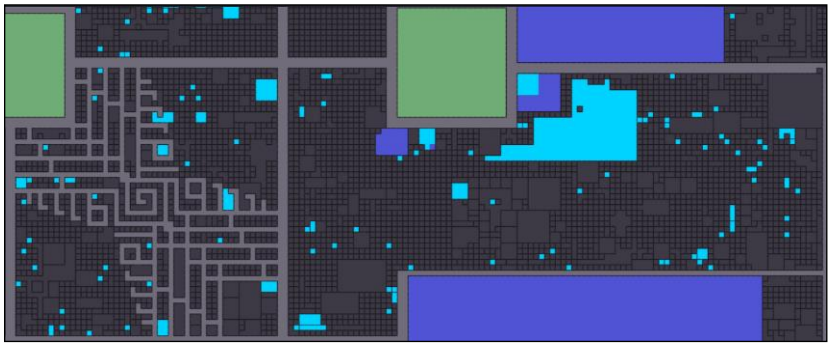

Figure 5. An Image Showing a part of Decentraland Lands in Marketplace (Blue ones are on sale) (Decentraland, 2022b)

2.4 Ecological Environment

Thanks to the rising metaverse, we can reduce the need for office space and/or we can reduce the demand for domestic or international mobility. By carrying leisure activities onto virtual platforms, we may need fewer places for mass events such as fairs, exhibitions, and seminars. In this case, we can predict that the time spent in residences will increase. The intertwining of the virtual and real worlds can also reduce the need for large residential areas. So overall, it looks like our physical space requirements may decrease. The positive side of this change is the decrease in land consumption. Financial resources, on the other hand, can be used on problems with a higher priority (Oh et al., 2023). The population density in megacities is anticipated to decrease with the use of metaverse in work life, hence encouraging metaverse applications in daily activities could be beneficial for the sustainability of cities (Choi, 2022).

However, the large amount of data storage needed to construct the metaverse may conflict with sustainability objectives. High use of non-renewable energy, waste production, and CO2 emissions are the main barriers to sustainable metaverse applications (Venture Beat, 2022). Besides, as the experimental metaverse integrates with daily life, more land and digital infrastructure will be needed for the computer servers it works on which

brings about economic and ecological resource consumption. Expanding server farms perhaps requires considering a new land use classification.

CONCLUDING REMARKS

Metaverse, as a world with its own currency and rules, is still an experimental technology. There are many details that need to be worked on both conceptually and practically. It can be a utopia escaping a dystopian world, as in Snow Crash, or it can be used interactively with the universe and offer useful solutions to the urban problems of today and the future.

We have entered an advanced digitalization process triggered by the COVID-19 pandemic. Developments such as blockchain, cryptocurrencies, NFTs, and the seek for a decentralized internet continue to evolve metaverse to offer experiences that make daily life easier or fun. The main idea was “an embodied internet can provide great advantages for collaboration and creativity”.

The fields of application so far give clues about the possible impact of the metaverse on urban life and space. Primarily, the use of the metaverse in business and education improves the hybrid working model. Interactive training on metaverse platforms makes a positive contribution to the learning process. There may be hope for those who cannot receive adequate education due to spatial barriers. Considering that working environments are already becoming more flexible and liquid (Richter S. and Richter A., 2020), metaverse may also be a suitable working environment for digital nomads working remotely using telecommunication technologies (Reichenberger, 2018). The use of metaverse by local governments can encourage and increase participation in solving urban problems. It is possible to carry out many activities such as concerts, museum visits, fairs, and art galleries on the metaverse platform, which can reduce the urban area requirement. Virtual

property investments can lower interest in real-world property. But ultimately, high use of non-renewable energy, waste production, and CO2 emissions can threaten environmental sustainability.

All these scenarios or events have fed and continue to feed the immobility and non-space discussions. Today, space is no longer just a concrete concept. Virtual meetings, for instance, eliminate the restrictions of distance and reduce our dependency on intraurban transportation. In other words, instead of saying that the physical world will be replaced by the digital world, we can say that there will be a hybrid world. Being in the universe while experiencing metaverse is a contradiction, thus these two worlds should be considered together with hybrid solutions. People cannot possibly meet all their social needs with virtual tools from where they reside. Moreover, experiencing the city only virtually renders existing investments ineffective.

Since planning is the construction of the future, it is important that planners think and act in sync with tech giants. It is beneficial to find common ground with those who dream of creating these digital worlds. The planning approach of today indicates that smart cities are trying to achieve this with the use of big data and advanced technology. Therefore, the metaverse should not be seen as a frightening future construction that keeps human and space apart, but as an opportunity that offers the necessary infrastructure and vision to build the cities of Society 5.0.

This paper attempted to provide insight into how urban spaces, where human interactions are seen, will be structured in the face of metaverse applications. Rather than offering answers, it was intended to ask thought-provoking questions and encourage critical thinking.

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