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- To develop theoretical and methodological foundations of Architecture, Planning and Design,
- To discuss the role of architects, planners and designers today and in the future,

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Effects of Expo Fairs on Urban Development as the Event Legacy and Their Sustainability: Comparison of Expo Lisbon and Expo Antalya Cases

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İkbal Erbaş**

Abstract

In terms of the development and progress of cities, it is necessary to make investments and arrangements before large-scale events, to introduce the cultures and characteristics of the cities during the event process, and to plan their use after the event to ensure spatial sustainability. The aim of this study is to evaluate the urban development effects of Expo fair areas and their contribution to spatial sustainability in terms of being an event legacy. Within the scope of the study, content analysis was realized between the Expo fair held in Lisbon in 1998 and the Expo fair held in Antalya in 2016, and the event legacies they left to the cities were compared. Research results reveal that Expo Lisbon was a tool in terms of urban development and spatial sustainability, while Expo Antalya was a purpose. The study underlines the necessity of planning the spatial uses during and after the fair, associating the fair area with the city, and sustaining social life and economic employment in order to transform the Expo areas into an investment and space that will be effective in the long-term for the cities. The study is limited to the urban and spatial sustainability of Expo Lisbon and Antalya areas. It is recommended to carry out studies that include different Expo areas and socio-economic sustainability in the future. This study provides important contributions to the field of science and practice in terms of presenting the effects of Expo fairs on urban development and sustainability relations through the examination of Lisbon and Antalya examples. In addition, the comparison of the two Expo cases is aimed to guide the countries and cities that will host large-scale events in the future.

Keywords:
Event legacy, Expo Antalya, Expo Lisbon, sustainability, urban development

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INTRODUCTION

Large-scale events are organized around the world in order to appeal to large audiences on an international scale and to increase interaction, communication and sharing among communities. Large-scale events contribute to the cities, and some of these contributions are the investments made during the preparation process, the economic activity that occurred during the event, the promotion of cultural features and the arrangement of qualified spaces. World fairs and Expos are one of the prestigious international events known worldwide, as they have been going on for many years and make lasting effects and structures on the host cities (Polat, 2019).

National and international fairs, which continue for centuries with different purposes and methods, are cultural and economic sharing spaces that revitalize the economic and social structure of cities. As Pinto (2018) states, after the national fairs in which industrial and technology products were introduced and exhibited in Europe at the end of the 18th century and the beginning of the 19th century, the first international Expo was organized at the Crystal Palace in London in 1851. It was realized under the name of "Great Exhibition of Industrial Artifacts of All Nations". In addition to industrial products, different exhibition goods such as handmade, natural products and works of art were included in this fair. After London, Expo fairs were organized in different cities such as Paris, Vienna, Philadelphia, Barcelona, Brussels, Milan and San Francisco. All the international fairs held since then have been an educational and developing environment where countries share their cultures, scientific and technological studies they have developed, their understanding of art and many other elements.

Expo fairs offer important opportunities for investing in cities, developing and promoting them. In this sense, the "Bureau International des Expositions" (BIE) was established in 1928 to be responsible for the organization of international fairs with the participation of 31 countries. Headquartered in Paris, BIE is responsible for organizing and supervising all non-commercial international exhibitions (Expo) lasting more than three weeks. BIE organizes four types of exhibitions: World Fairs, Special Fairs, Horticulture Fairs (Botanical Fair) and Milan Fair. The World's Fair under a universal theme in every five years, a Special Fair with a special theme between the two World Exhibitions, and the Milan Fair with the theme of decorative arts and architecture in every three years since 1993. On the other hand, Horticultural Fairs have been organized since 1960 after the candidacy of countries and cities, as a result of the cooperation between BIE and the International Association of Horticultural Producers (AIPH) (Polat, 2019). The purpose of BIE is to determine the host country at the fairs, organize the event, ensure that the host country and all exhibitors comply with the BIE agreement and Expo rules, and constantly improve the quality of the fairs (BIE, 2021). Currently, 170 countries are members of BIE, and these fairs are important in terms of both countries

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sharing their own values and following the developments in other countries.

Each Expo, with its own theme, is a large-scale event that reflects the characteristics of the period and the host country, provides international communication and interaction, promotes awareness, development and change, while bringing innovation to the host city (Polat, 2019). Countries hosting the fairs are responsible for developing the necessary infrastructure for the realization of the event, arranging the event area, and making the necessary spatial arrangements for the anticipated visitors. Realizing all these require the expenditure of high budgets. Investments and regulations made considering the needs of the event can affect the city positively or negatively in terms of the quality of their effects. Erturan Topgül (2019) defines these effects with the concept of "event legacy" created by the event in the city and its residents. The legacy of the event has direct effects such as spatial/physical, economic and social-cultural as well as indirect effects such as image, branding and urban recognition. Policies, culture, social structure and economic power that dominate the city have a decisive role in the legacy of activity. In this sense, each host country shapes its event legacy and determines whether the sustainability of event venues is ensured or not.

Architecturally, the structures built for Expo affect the image of the cities, and symbolic and/or monumental structures are designed in the city. Crystal Palace in London and Eiffel Tower in Paris are touristic and historical focal points brought to the city after the fairs. As Polat (2019) stated, 51 million people visited the fair, which was held in Brussels in 1958 with the theme of "Democratic Demand for Peace" and the iconic "Atomium" was built for this fair. "Space Needle" was designed at the fair organized in Seattle in 1962, and this structure still maintains its feature of being an interesting design today. Vasco da Gama Bridge, built for Lisbon Fair, is one of the structures that make up the city's image. In addition to the cultural and architectural structures gained through these fairs, it should not be forgotten that local and foreign tourists who come to visit the fair spend time in the city and experience the culture and life of the city (Dirsehan, 2019). In this sense, it is important that the fair should be planned in a way that interacts with the urban space and the citizens, its location is determined to have easy access, it hosts cultural events and contributes to tourism.

As Erturan Topgül (2019) states, with the competitive environment created by globalization, interest in international large-scale events has increased to make new investments and developments in cities. Expo fairs, which are at the forefront of large-scale events, are effective in investing in cities and becoming the focus of touristic interest, while providing improvements in the physical structure of the city through infrastructure investments and spatial arrangements. At the same time, with the increasing awareness regarding sustainability, the highlight is placed on emphasizing sustainability both in the spatial planning of the Expos and in the content of the themes. In this sense, the sustainability of

Expo organizations depends on some criteria and processes. These processes can be defined as the organization preparation process, establishment and implementation of the organization area, management and functioning of the organization, and post-organization management (Karahan et al., 2021). The priority of urban development and spatial sustainability in planning, implementation, operation and management processes provides many benefits to the city and its citizens in the short, medium and long terms (Batuhan, 2020). In this sense, it is important to plan and implement large-scale events in line with sustainability goals, both for the organizers and funders of the event, and for the host cities.

METHODOLOGY

In this study, a content analysis was realized about the planning, event and post-event stages of the Lisbon Expo Fair, which was held in 1998 with the theme of a special fair, and the Antalya Expo Fair, which was held with the theme of the botanical fair in 2016. Content analysis is defined as categorizing all kinds of verbal and written data in a way that meets the purpose of the research, summarizing, measuring and interpreting the data (Arık, 1992, as cited in Böke, 2017). In the content analysis, the information obtained as a result of scientific researches, organization websites and field trips was examined with a systematic methodology.

Turkey has participated in many events since London Expo in 1851, yet became a member of BIE in 2004 and experienced its first Expo hosting in Antalya in 2016. Portugal has been a member of the BIE since 1932 and hosted the specially themed Expo in 1998 (BIE, 2021). The aim of this study is to evaluate the urban development effects of the Expo fair areas and their contribution to spatial sustainability in terms of being an event legacy. For this purpose, within the scope of the study, the Expo fairs, which were organized in Lisbon and Antalya were compared in terms of the event legacy they left to the city. In the light of the analysis and comparison of the information obtained from the two fair fields in question, inferences have been made so that the investments and plans to be made in the city through the Expo fairs will be effective in the long term. Within the scope of this study, it is aimed that the information obtained from the comparison of the two Expo fairs will be a guide for the countries and cities that will host large-scale events in the future.

EXPO LISBON

Special Fairs within the scope of Expo are international events aimed at finding solutions to specific humanity problems. Although it is similar to World Expos in terms of the content of its theme, these fairs are smaller in scale and remain open for about 3 months (Batuhan, 2020). 143 countries, 14 international organizations participated in the special themed Expo fair, which lasted for about 4 months between May 22 and September 30, 1998 in Lisbon, the capital of Portugal, and 10.128.204 people visited the fair (BIE, 2021).

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500 years after Vasco da Gama's discovery of Portugal on his way to India in 1498, the idea of celebrating this discovery on an international platform shaped the main theme of the Expo (Kantürer, 2016). The theme of "Oceans, a heritage for the future" determined at the fair, aims to reflect Portugal's relationship with the sea and its national identity, while emphasizing raising awareness of the sea and oceans, ensuring the nature-human relationship and sustainability (Pinto, 2018). Since the year of 1998 was determined as the "International Year of the Ocean" according to the United Nations declaration, the theme of the event was also related to the current issues of the period (BIE, 2021). During the planning process of the fair, training programs related to this theme were also given in schools. Between 1994-1998, a national environmental education program was developed under the name of "love of the ocean", and "sea clubs" were established where scientific, artistic and sports activities were carried out. Scientific meetings and conferences were held during the fair, and after the fair, three different books were published about the theme of Expo Lisbon (Pinto, 2018). While planning the fair, training programs, conferences and publications aiming to raise awareness were organized beyond creating a physical sightseeing area within the determined land.

In line with the perspectives and political attitudes of the countries, in some countries, if a city is selected as a host for the fair, the fair is included in the strategic development plan of the city and is planned as a part of the urban development (Polat, 2019). As can be seen in studies in the literature (Kantürer, 2016; Erturan Topgül, 2019), the Expo Lisbon has been a remarkable project as it aims to create a new city center as a result of extensive studies and dual-functional design planning. As for Aelbrecht (2014), the majority of the fair fields is generally abandoned after the fair, and the part that is not abandoned is left as it is without being developed with large debts. The fact that these areas, for which serious budgets are spent and provide an economic and international potential to the host country, are not active during the event and cannot be integrated into the city afterward, harm the city's economy and land in the long run. However, Expo Lisbon, which was realized as a Special Fair in 1998, has been a different and remarkable positive example in terms of the event legacy with its planning process, methods, results, and what it has brought to the city after the event.

Effects of Expo Lisbon on Urban Development

According to Carrière and Demazière (2002), in the Lisbon Metropolitan Area Plan of 1990, it was emphasized that Lisbon should be a world city, and it was stated that there was a need for a comprehensive urban transformation study. This decision was also approved in the 1992 Strategic Plan and an application was made to BIE for the Expo this year. On the edge of the Tagus River to the east of Lisbon, 5 kilometers long and 0,6 kilometers wide, rectangular shaped, nonfunctional industrial area has been designated as the Expo field (Fernandes et al., 1998) (Figure1).

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Figure 1. Expo Lisbon field map (BIE, 2021).

The planning of re-functioning the area that is valuable with its location to become the second center of the city is closely related to urban policies. The aim of the re-functioning of the existing industrial buildings in the region and the planning that will be effective in the long term and after the Expo fair in the urban space were effective in the BIE's selection of Lisbon as the host country for the 1998 Expo (Aelbrecht, 2014).

When the location of the Expo Lisbon in the city is examined, it is seen that the fair field is 10 kilometers away from the city center and 3 kilometers away from the city's international airport. In addition to the existing railway and highway connecting the area to the city, the transportation network has been expanded with new metro and tram lines within the scope of the Expo project (Aelbrecht, 2014). The metro line has been developed and connected to the city center with 7 new stations, including the airport and Expo stops (Kantürer, 2016). The fact that the Expo area is located by the river, close to the city center and the airport and has sufficient and diverse transportation networks, has been effective in making the region easier to reach during the fair, as well as being preferred for living and spending time after the fair. In this sense, the importance of paying attention to the fact that the choice of location in the Expo fields is preferable both in terms of tourism and for the life of the citizens after the fair is clearly seen in the example of Expo Lisbon.

To realize the Expo Lisbon project, a private company named "Park Expo'98" with access to public capital was established. This company was tasked with designing, developing, constructing and dismantling the exhibit, as well as purchasing, developing and selling land throughout the region. While the completion of the Expo area in 1998 was the priority for the works carried out by the company, the comprehensive transformation project outside the fair field was allowed to be completed by 2010 (Carrière & Demazière, 2002).

Abandoned urban areas have the potential to become a second city center with renovation and transformation works. In this sense, the redevelopment of the abandoned industrial port area and the creation of the second city center emerged as two basic strategies for determining the location of Expo Lisbon (Carrière & Demazière, 2002). After the location was determined, a systematic planning process was initiated with a team of many architects and experts, led by architect Luis Vassalo

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Rosa. The fair area was named "Park of Nations" by the project team (Figure 2). As stated by Aelbrecht (2014), the strategies developed under the leadership of Vassalo Rosa were discussed under the headings of planning, design, development, management and finance. During the planning phase, it was aimed to make the area a center, create a mixed-use area, an economic base and develop the infrastructure for during and after the Expo fair. In the design phase, the structures were designed to be dual-functional with temporary and permanent spatial features to enable the structures built for the exhibition to be reused after the exhibition. In temporary spaces, flexible usage areas are generally created in modular structures. In permanent buildings, importance and priority was given to their use with their new function after the fair. The Park Expo organization was authorized for development and management, and it is planned to sell the spaces in the fair to the private sector or investors after the event for the financial model.

Figure 2. Left: Park of Nations; Right: Expo Lisbon fair field (Park of Nations, 2021).

Within the scope of the project, new structures such as the Ocean Pavilion, the Portuguese Pavilion, a 600 mooring capacity marina and the panoramic Vasco da Gama tower were built for the event, and the landscape project was realized for 5 kilometers along the river. For transportation, Vasco da Gama Bridge, which is one of the longest bridges in Europe with a length of 17 kilometers, Gare de Orient Train Station and Park of Nations cable car have been implemented (BIE, 2021; Erturan Topgül, 2019; Kantürer, 2016) (Figure 3).

Figure 3. Left: Vasco da Gama Bridge (URL 1); Right: Gare de Orient Train Station, (URL 2).

Around the Expo field, which has an area of 50 hectares, different usage areas that will contribute to urban development such as 330 hectares of residential areas, shopping center, hospital, education, sports and entertainment areas were planned. Social housing built in Olivias and Chelas neighborhoods around the Expo area, where the low-income group generally lives, has become one of the largest mass housing

projects in the country (Erturan Topgül, 2019). All these practices realized with the construction of the fair cause the question of "is it a big international event in a city or an urban redevelopment process that includes an exhibition" (Matias Ferreira, 1997, as cited in Carrière & Demazière, 2002). For Lisbon, it is possible to say that urban arrangements that will contribute to the city in the long term have been realized through the Expo event. In this arrangement, the Expo area was not only evaluated with its own borders, but also the areas adjacent to the event border were designed together to be used both during and after the event. This approach made a significant contribution to the Lisbon Expo's main goal of creating a second city center.

Spatial Sustainability at Expo Lisbon

According to Vassalo Rosa (1998), the leading architect of the Expo Lisbon fair, the city should be considered as a limited sustainable environmental resource. For this reason, studies such as recycling and re-functioning in urban space should be prioritized. Expo fair has been a tool for the urban development and renewal of Lisbon, and the spaces that can always be used have been left to the city as an event legacy, with the flexibility and continuity built between temporary-permanent spaces. Transforming the event legacy into permanent effects can bring much more to the city than the fair will. It is possible to say that the investments and projects made for Lisbon, rather than the event itself, provide permanent changes and contributions to the city in the long run, and these contributions and changes are also sustainable.

The old oil refinery tower that existed before in the area was re-functionalized as the central boulevard and the entrance gate to the fair (Vassalo Rosa, 1998). The new structures built within the scope of the fair were turned into a part of the urban space with their secondary functions after the fair. The Ocean Pavilion was converted into a large aquarium named "Oceanarium", the Utopia Pavilion was transformed into a venue called "Meo Arena" where cultural activities such as concerts and exhibitions are held, the exhibition pavilions were converted into the "Lisbon International Fair Hall", the main entrance structure was transformed into Vasco da Gama Shopping Center and brought to the city with new uses. (Erturan Topgül, 2019) (Figure 4). The Oceanarium was one of the first large aquariums in Europe with the size of four olympic swimming pools housing more than 500 creatures (BIE, 2021).

Figure 4. Left: Oceanarium (URL 3); Right: Meo Arena, (URL 4).

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The most important reasons why Expo Lisbon fair is still an active and livable area today are that the buildings in the fair area were brought to the city with different functions and the housing areas around it were arranged. The study of Aelbrecht (2014) demonstrated the success of the fair and urban renewal in Lisbon with numbers and stated that there are 1247 million square meters of residential area, 626 million offices, 190 million commercial areas and 19 thousand people living in the region.

In addition to the spatial contributions of the Expo to the city, it is also necessary to mention the techniques applied in terms of energy use and the benefits it provides. As Fernandes et al. (1998) stated, one of the objectives of the project is to realize low-energy and environmentally friendly urban renewal while planning the event venue. To achieve this, tests were carried out to reduce the amount of energy use and microclimate indoors and outdoors on a 3D model, considering the dimensions of the land, the heights and shapes of the buildings, the width of the streets, and the placement of the trees. In addition to the tests, the use of energy in infrastructure applications and transportation networks was also considered. As a result, despite the dense use in the Expo area, approximately 50% less energy is used than any equivalent size and density area in Lisbon.

In addition to all these positive developments, there are also some negative views about the Expo Lisbon project. According to these views, while the fair and the new settlement area were planned, the old settlement area in the vicinity was ignored, and the railway, which is a threshold/border, strengthened the spatial and social separation of these two areas. Although social housing was built in these neighborhoods later, it is necessary to facilitate the adaptation of the people living there economically and socially to the city. Although it was developed together with the areas adjacent to the borders of the Expo field, the social dimension was ignored in the arrangements. In this sense, while creating a new development area in the city, planning in a way that will improve its environment in every aspect is an important issue to ensure holistic development in cities.

In short, with the strategies developed during the planning phase of Expo Lisbon, the port area with abandoned warehouses and barracks was brought to the city and turned into a focal point for international events. Since it is an actively used urban space after the fair, it has become the second city center of Lisbon. As a result, the example of Expo Lisbon, about which there are positive and negative opinions, is an important example in terms of showing what large-scale events with serious budgets and intense efforts can bring to the city and its citizens.

EXPO ANTALYA

The studies carried out for Antalya to host the 2016 Horticultural Fair were started in 2008 (Batuhan, 2020). After Turkey became a member of AIPH, became candidate for the Horticulture Expo, which would be held in the A1 category in 2016. Antalya's hosting application was accepted in

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2010 and the fair field was approved by AIPH in 2011. Antalya Governorship has prepared a directive for the organization and management of Expo 2016 Antalya, and in line with the directive, the Expo Assembly and the Expo Executive Board, which included different actors such as deputies, mayors, non-governmental organizations, associations and foundations were established (Kantürer, 2016; Karahan et al., 2021). As Karahan et al. (2021) stated, Expo 2016 Antalya Law No. 6358 was enacted in 2012, and with this law, decisions regarding the planning and management of the organization were specified. In 2013, the Expo 2016 Antalya Agency was established to ensure the execution of the preparations by determining the procedures and principles related to the exhibition with the regulation numbered 28641, and construction works were started in the Expo area. All preparations for the Expo were carried out by the Ministry of Agriculture and Forestry and Expo 2016 Antalya Agency under the Presidency of the Republic of Turkey.

As Çelik and Aslantaş (2018) stated, Horticulture Expo (Botanical Expo) emerged in order to revive the fields of agriculture, horticulture and landscape architecture, to encourage and develop innovations in these fields. Horticultural Expo, organized in Antalya in 2016, was a type of fair in the A1 category, whose application was made 2-6 years ago, with a minimum exhibition area of 50 hectares and an exhibition duration of 3-6 months (Polat, 2019). The Expo fair held in Antalya was an international event where organizer and participant countries present their local cultures with their own gardens, with the aim of addressing the measures and solutions to environmental problems such as the extinction of plant species, global warming, desertification, and depletion of natural resources, and contributing to the future in the field of environment and sustainability (Hür, 2019). For this purpose, the theme of the Expo fair was “Flowers and Children”, since the target audience of the event was young people and children, and the slogan of the fair was determined as “Green the Future” in relation to the sub-themes of history, biodiversity, sustainability and green cities. Within the scope of the theme, cultural programs, activities, workshops for children and educational activities, seminars, meetings, panels, special organizations organized by international participants, and national day celebrations were held throughout the event (Batuhan, 2020).

In connection with the theme of Expo Antalya, the opening ceremony was organized on April 23, National Sovereignty and Children’s Day, and the fair continued until October 30, 2016. It was foreseen that 5 million foreign and 3 million domestic tourists would come to the event (Kantürer, 2016); however, a total of 4,693,571 people, 71% domestic and 29% foreign, visited the fair (Batuhan, 2020; BIE, 2021).

Effects of Expo Antalya on Urban Development

The land chosen for Expo Antalya is an area of 112 hectares, within the borders of Solak Village of Aksu district, between Aksu and Tehnelli Streams, belonging to the Western Mediterranean Agricultural Research

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Institute (Kantürer, 2016). The Western Mediterranean Agricultural Research Institute (Batı Akdeniz Tarımsal Araştırma Enstitüsü - BATEM) was established in Aksu in 1934 under the name of "Hot Climate Plants Station" in connection with the rural economic development plan of the Early Republican Period (Çetin, 2012) to conduct research on agriculture, develop agriculture and garden, and inform the owners. Since 1934, different studies have been carried out in the institution and it has undergone name changes. Today, BATEM, which is affiliated with the Agricultural Research and Policy Directorate of the Ministry of Food, Agriculture and Livestock, was formed as a result of the uniting of 5 research institutions (Mediterranean Agricultural Research Institute, Biological Control Research Institute, Citrus Research Institute, Greenhouse Research Institute and Regional Cotton Research Institute) working in different areas of plant production in Antalya at different times (T.R. Ministry of Agriculture and Forestry, Western Mediterranean Agricultural Research Institute).

According to the statement of Mehdi Eker, former Minister of Food, Agriculture and Forestry, it was decided to demolish 96 of 103 buildings with historical value belonging to BATEM in the Expo area, and the future of the remaining 7 buildings was left uncertain. Apart from these demolitions, it has been stated that, within the scope of the construction of the Expo area, infrastructure works, environmental and road arrangements, new botanical studies would be carried out in addition to the existing plant and tree species in the area for the flood and overflow hazard that may arise from the Aksu Stream (Arkitera, 2013). In relation to spatial and economic sustainability, instead of improving and re-functioning the existing buildings in the region, the method of demolishing cultural heritage structures and constructing new buildings with high costs was preferred. The construction of the Expo area, infrastructure and transportation works in and around the area and the event were completed with a budget of 1.8 billion TL (Batuhan, 2020).

When the site plan of the Expo fair is examined, a total of 665.562 square meters of green space, an artificial lake of 71.200 square meters (Hür, 2019; Kantürer, 2016), two bridges over the artificial lake, and Children's Island in the middle of the lake where activities were held with children were inserted (Figure 5). Various activity areas such as the big amphitheater, small amphitheater, Expo Greenhouse, Children's Science and Technology Center, Congress Center, Ottoman Garden, Agriculture and Biodiversity Museum, Mosaic Culture Areas, Seven Region Houses were located around the lake. Related to the theme, about one-third of the area has gardens organized by countries, districts, institutions and universities.

According to Batuhan (2020), the objectives of Expo 2016 Antalya were to increase the quality of life with more green spaces and new investments in the city's infrastructure, create new job opportunities and employment, support and promote ecotourism in Antalya. In line with these goals, 656.562 square meters of green space has been brought to

the city, the tram line has been added to the city's transportation, road and stream arrangements and improvements have been made, and employment created for Antalya residents in both activity areas and businesses throughout the event. However, after the fair, urban employment was adversely affected due to the return of the personnel working in public institutions to their previous duties, the termination of the employment contracts of the employees within the Expo General Secretariat on 31.12.2016 (Batuhan, 2020), and the closure of the businesses in the area.

Figure 5. Expo Antalya field map (T.R. Ministry of Agriculture and Forestry Expo2016 Antalya).

The Expo area is 22 kilometers away from Antalya city center and 11 kilometers away from the airport. In order to facilitate access from the city center to the fair field, a 16-stop tram line with a station was built both at the airport and the Expo area, and in addition to the tram, transportation was provided by private vehicles, tour buses, municipal buses and taxis throughout the event. After the fair, the Expo area lost its potential to be a place where tourists and Antalya residents stop by and spend time, as it is far from both the city center and tourism areas. Since Expo Antalya is far from the city center and there are no residential and service areas around it, it could not integrate with the urban space and become a part of the urban development. While one reason for this problem is the location, another reason is the lack of arrangements to improve the region during the planning process of the fair.

After Expo Antalya was closed on October 30, 2016, the privatization works of the area were started and it was stated that these works would be completed by December 31, 2022 (Batuhan, 2020). Since June 2018, the entrance to the Expo area has been made free of charge, but there has been no planning for the future and use of the exhibition area. In this sense, while the fair field remains uncertain in urban planning and development, it becomes physically neglected and loses its social and cultural attraction.

Spatial Sustainability at Expo Antalya

Although the Expo Antalya event is over, the entrance of visitors to the area continues. The main entrance gate of Expo Antalya was designed

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with inspiration from the leaves of the peony flower, which was the symbol of the fair. At the entrance square, visitors are welcomed by the 100,7 meter-long Expo Tower, inspired by the Hadrianus Gate, the symbol of Antalya, and palm trees (T.R. Ministry of Agriculture and Forestry Expo2016 Antalya). The design of the tower, which was intended to be the symbolic structure of the fair, was determined as a result of a competition held by the Chamber of Architects (Kantürer, 2016). The viewing terrace of the tower offers the opportunity to watch the Expo area and its surroundings 360 degrees (Figure 6). The restaurant on the lower floor of the viewing terrace in the tower served during the event, but it was closed after the fair. However, it would have been possible for the restaurant to be operated by the public or private sector after the fair, making the area the center of attraction and making a positive contribution to the revival of tourism and employment.

Figure 6. Left: Fair entrance gate, kiosks, and Expo Tower; Right: View of the area from the Expo Tower (Personal Archive, January 2022).

The congress center was designed as a venue where national and international events can be realized with its 3-storey structure and a total capacity of 6500 people. The Grand Amphitheater with a capacity of 3200 people was planned for events such as national day celebrations, concerts and shows and was actively used throughout the fair. In the middle of the Expo Lake and on the Children's Island, which was planned in a central location in relation to the theme of the fair, educational, entertaining activities and workshops that appeal to children were held throughout the fair. The Seven Region Houses (Konya House, Antalya House, Bodrum House, Diyarbakir House, Erzurum House, İstanbul House and Trabzon House) reflect the architectural features of the seven geographical regions of Turkey served as restaurants throughout the fair and the food cultures of those regions were introduced in these houses. In this direction, the structures built for the fair, the other structures and green areas transferred to the fair area by the participating countries, institutions and organizations have the potential to serve in many fields, primarily culture, art, education and sports (Karahan et al., 2021). Nevertheless, when the current conditions and uses of the Expo area and these structures are examined, it is seen that the structures are left closed or empty due to political uncertainties and lack of planning (Figure 7).

Figure 7. Left: Inside the Children's Island; Right: Seven Region Houses that are forbidden to enter (Personal Archive, January 2022).

The area allocated for the national garden exhibitions of 54 countries participating in the organization was divided into 86 parcels, and each country arranged its own gardens with semi-open and closed space designs and pavilions in relation to the theme (Hür, 2019). After the Expo, the country gardens and the maintenance of the gardens were transferred to the Republic of Turkey (Karahan et al., 2021). Apart from 54 country gardens and other gardens, the Mosaic Culture Plant Sculptures, which were created with 108 plant sculptures in 10 different areas, were designed to provide information about planting types in different geographies in history. Today, while the privatization processes continue, it is observed that both the general landscaping in the area, and the country gardens and Mosaic Culture Sculptures are not adequately maintained, the information and regulations about the country gardens are disappearing, and the green area is left neglected (Figure 8).

Figure 8. Left: Country Garden in the neglected state; Right: Mosaic Culture Plant Sculptures' current situation (Personal Archive, January 2022).

After 2016, "Let's Meet in the Blue" event for children in 2019, and other events such as "GastroAntalya 2021", "Ironman 2021 bike track", "1st International Tourism Gastronomy and Hospitality Summit" were organized at the Expo Antalya area (T.R. Ministry of Agriculture and Forestry Expo2016 Antalya). However, when the indoor and outdoor potentials of the area are evaluated, the scope and quality of these events are quite limited and insufficient for the Expo field. In this sense, these activities have not made it possible to ensure both spatial and socio-cultural sustainability. Regarding sustainability, it is seen that the landscape areas are not adequately maintained and most of the indoor activity areas are closed and left idle (Figure 9). Today, the activities that can be done in the area of 112 hectares are very limited. There is a kiosk in the area for needs such as food and drink, a walking area, a tower to

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watch the area, and a cine-vision show is active in a hall of the 7.500 square meter Agriculture and Biodiversity Museum, which is now called the Time Tunnel. These limited activities cannot provide the desired contribution to the spatial sustainability of the area.

Figure 9. Left: Closed ticket offices; Right: Neglected fair field and direction signs (Personal Archive, January 2022).

In the last 5 years, few events have been organized in the Expo area, the gardens have been neglected, and most of the buildings and restaurants have been closed. The fair field, which was built with high cost, creates the impression of being abandoned and neglected when visited today. Projects for which high budgets are spent during construction, but which are not efficient in terms of the economic situation and use, and cannot show the desired performance are called "White Elephant" (Erturan Topgül, 2019). These projects not only cause spatial and economic damage, but also negatively affect the sustainability of urban life. In this sense, it is necessary to carry out the maintenance and arrangements, to produce solutions that will activate the area under the leadership of a management unit, and to evaluate the potentials of the area so that the Expo Antalya area, which has a history of 5 years, does not turn into a White Elephant in terms of event heritage. Also, considering the size of the area and the number of personnel employed during the active period, it was not possible for the personnel to continue their employment after the Expo. In this context, it is clearly seen that Expo Antalya, which also aims to increase employment in the region, has not been successful in this target.

DISCUSSION AND CONCLUSION

International events that offer investment and development opportunities to cities need to be carefully evaluated and planned. In order for international events to provide the cities with spatial, social and economic opportunities that will be effective and productive in the long term, multi-dimensional planning should be done with different actors and experts. It is also an important issue that international events and fairs, which are realized by spending high budgets, are considered a tool or purpose for the development of the city. This study, which aims to compare Expo Lisbon and Antalya in terms of their effects on urban development and spatial sustainability, reveals that Expo Lisbon is used as a tool for the development of the city, whereas Expo Antalya consists of only a purpose (Table 1).

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Table 1. Similarities and Differences of Expo Lisbon and Expo Antalya Fairs

Similarities	Differences	
	Expo Lisbon	Expo Antalya
They are large-scale events organized within BIE.	The event area is planned as the second center in the city.	The event area is far from the city center and does not interact with it.
During the event, they were visited by local and foreign visitors.	Pre-existing buildings in the event area have been re-functionalized.	Pre-existing buildings in the event area were demolished.
During the event, social and cultural activities were organized, and the use of green and open space was encouraged.	After the event, the use of the area was continued with spatial and functional changes.	After the event, most of the event spaces were closed, the gardens were neglected, and visitors decreased.
Production and consumption were provided during the event period.	After the event, economic activity and employment continued.	After the event, economic activity and employment disappeared.
Vasco da Gama Bridge at Expo Lisbon and Expo Tower at Expo Antalya were designed as symbolic structures.	Vasco da Gama bridge was brought to the city as a structure that provides transportation within the city.	Service areas such as the restaurant in the Expo Tower were closed after the event. The tower is visited only to watch the area.

Firstly, when evaluated in terms of its contribution to urban development, it is seen that the Expo Lisbon was used as a large-scale event, a tool to attract attention in the international arena, create a second city center and provide investment resources for them, in order to transform the urban space. In this context, Expo Lisbon was planned to support urban renewal and integrated within the city. In this respect, even though the Expo Lisbon event has been completed, it still continues to be a living part of the city today. On the other hand, Expo Antalya is a region with great potential for both local and foreign tourists and Antalya residents, due to its large green area, tower, businesses in the tower and Seven Region Houses, and various activity areas for children and adults. However, it is seen that these potentials could not be evaluated after the fair and the area was left idle. In this sense, it can be interpreted that while the fair was being planned, it was not evaluated within the city's development plan, it was planned as a short-term event and it contradicted the sustainability criterion in the sub-theme of the fair. All these negative aspects reveal the inadequacy of the contribution of Expo Antalya to urban development.

Secondly, when evaluated in terms of spatial sustainability, the permanent event legacies of the Expo fair to the city of Lisbon are the construction of the fair in the re-functioning of an abandoned area, the consideration of natural environmental factors, the development of the fair area with its surroundings, the structures that provide dual-functional flexible uses and spaces. These are important indicators that Expo Lisbon provides spatial sustainability. All these contributions are important guides in terms of ensuring sustainability in the process of adapting cities to changing technology and living conditions. On the other hand, it is possible to say that the Expo Antalya area has been left to its

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own disrepair today due to the lack of a management plan before and after the organization. Due to the lack of adequate promotions both during and after the fair, the area could not turn into a touristic and socio-cultural attraction center. For all these reasons, the spatial sustainability of the area after the event could not be achieved.

In addition to these determinations, when the effects of the event legacy of the fair on employment are evaluated, it is seen that the employment created during the Expo fair in Lisbon was continued with the active use after the event, while the employment created during the fair in Antalya could not be sustained after the event. This is another factor that negatively affects both urban development and economic and spatial sustainability. In addition, another issue that should be emphasized is that the field should be a part of urban development in the process of determining the location of such large-scale activity areas. This can only be possible by choosing the area that is easily accessible by different means of transportation within the city and located close to the touristic routes.

In the next period, in order to prevent the Expo Antalya fair field from turning into an abandoned area and to transform its existing potentials into an event legacy, a management unit should be established, necessary maintenance and arrangements should be done in the buildings and green areas, promotions should be made in order for Antalya to be considered within the scope of tourism activities. Also, international scientific, cultural, sports and entertainment activities should be organized and arranged as a recreation area for the citizens to spend time with their children in the city. Making these improvements and arrangements will enable the exhibition area to contribute to the city spatially, socially and economically, and will make urban development and sustainability possible.

The most important contribution of this study to the field of application is that it shows that urban development and spatial sustainability should be taken into account by public policies, local governments and practitioners before the realization of large-scale organizations by providing a comparison of two different activities that were carried out at different times and whose effects on the city can be seen today. The information obtained from the comparison of the two Expo fairs is expected to be a guide for the countries and cities that will host large-scale events in the future. In this context, international events with high-cost investments in order to organize the urban space, improve the conditions of the people living in the city economically, spatially and socially, and develop tourism activities should be planned by the actors of the process with not temporary but permanent aspects, and the sustainability and continuity of the positive effects of the fair should be ensured. In order to achieve this, governments, public institutions, local administrations, private sector and different actors that will contribute, should carry out collective studies in the planning, implementation and operation processes by informing the citizens and receiving their

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support. As a result of the study, in line with the information obtained from the comparison of the two Expo fairs, it is recommended that the countries and cities that will host large-scale events in the future, carefully determine the location of the event area, design the event and post-event uses in the planning process, and determine the legacy of the event in a way that will contribute to urban development and sustainability.

The most important contribution of the study to the field of science is that it provides a basis for scientific research on the determination of urban and spatial sustainability criteria in the conduct of fairs and all similar organizations within the scope of large-scale events. The study provides an important contribution to the literature in terms of presenting the effects of Expo fairs on urban development and sustainability relations. In this context, it is recommended that the scientific research to be carried out in the future can focus on the determination of sustainability criteria in large-scale activity areas, which will improve the field of science. The study is limited to the urban and spatial sustainability of Expo Lisbon and Antalya areas. It is recommended to carry out studies that include different Expo areas and socio-economic sustainability in the future.

REFERENCES

Aelbrecht, P. S. (2014). A World Fair for the Future: A Study of the Legacy of the Expo'98 Urban Model. In L. Hollengreen, C. Pearce, R. Rouse, & B. Schweizer (Eds.), *Meet Me at the Fair: A World's Fair Reader* (pp. 485-501).

Arık, A. (1992). *Psikolojide Bilimsel Yöntem*. İstanbul: İstanbul Üniversitesi Basımevi.

Arkitera. (2013). Antalya Numune Çiftliği'ndeki Binalar Yıkıldı. (online) (accessed 21 January 2022). Available at: https://www.arkitera.com/haber/antalya-numune-ciftligindeki-binalar-yikildi/

Batuhan, T. (2020). Antalya'nın EXPO 2016 Tecrübesi ve Organizasyon Mirasının Değerlendirilmesi. *İstanbul Gelişim Üniversitesi Sosyal Bilimler Dergisi*, *7*(2), 281-298. https://doi.org/10.17336/igusbd.656499

Böke, Kaan (Ed.). (2017). *Sosyal Bilimlerde Araştırma Yöntemleri* (5th ed.), İstanbul: Alfa Yayınları.

Bureau International des Expositions. (2021). Who we are. (online) (accessed 28 December 2021). Available at: https://www.bie-paris.org/site/en/who-we-are

Bureau International des Expositions. (2021). Expo 1998 Lisbon. (online) (accessed 28 December 2021). Available at: https://www.bie-paris.org/site/en/1998-lisbon

Bureau International des Expositions. (2021). Expo 2016 Antalya. (online) (accessed 20 January 2022). Available at: https://www.bie-paris.org/site/en/2016-antalya

Carrière, J. P., & Demazière, C. (2002). Urban planning and flagship development projects: Lessons from EXPO 98, Lisbon. *Planning practice and research*, *17*(1), 69-79. https://doi.org/10.1080/02697450220125096

DOI: 10.15320/ICONARP.2022.191

Çelik, F., & Aslantaş, F. (2018). GELECEK NESİLLER İÇİN YEŞİL BİR DÜNYA: EXPO 2016 ANTALYA. *Uluslararası Sosyal Araştırmalar Dergisi*, *11*(56), 1056-1070. http://dx.doi.org/10.17719/jisr.20185639071

Çetin, S. (2012). Bir Erken Cumhuriyet Dönemi Tarımsal İşletmesi: Antalya Sıcak İklim Nebatları Teksir ve Islah İstasyonu. *Mimarlık, 367*. http://www.mimarlikdergisi.com/index.cfm?sayfa=mimarlik&DergiSayi=381&RecID=3000

Dirsehan, T. (2019). Fuar Organizasyonlarının Makro Düzeyde Sağladığı Ekonomik Katkıların İncelenmesi. In M. Sümersan Köktürk, & E. Çobanoğlu (Eds.), *Pazarlama Düşüncesiyle Sürdürülebilir Fuarcılık ve İstihdam* (p.99-109). Sokak Yayın Grubu.

Erturan Topgül, A. (2019). Mega Etkinlik Olarak Fuarların Kentlerdeki Mirası: Lizbon Expo 98 Fuarı Üzerinden Bir Okuma. In M. Sümersan Köktürk, & E. Çobanoğlu (Eds.), *Pazarlama Düşüncesiyle Sürdürülebilir Fuarcılık ve İstihdam* (p.245-261). Sokak Yayın Grubu.

Fernandes, E. D. O., De Almeida, F., & Cardoso, P. (1998). Energy and environment at EXPO'98 Lisbon. In E. Maldonado, & S. Yannas (Eds.), *Environmentally Friendly Cities, Proceedings of Plea 98* (p.7-12). James & James Science Publishers. https://doi.org/10.4324/9781315073712

Hür, S. (2019). *Mimarlıkta Expo Kavramı Ekoloji Temalı Expolar Üzerine Bir Karşılaştırma* (Master dissertation, İstanbul Kültür University). https://hdl.handle.net/11413/5382

Kantürer, E. (2016). *Büyük Ölçekli Uluslararası Etkinliklerin Kentlerin Pazarlanması Bağlamında Değerlendirilmesi: Antalya 2016 Botanik Expo Örneği* (Master dissertation, İstanbul Teknik University). https://acikbilim.yok.gov.tr/handle/20.500.12812/636860

Karahan, F., Özgeriş, M., Demircan, N., Sezen, I., & Karahan, A. (2021). Türkiye'nin Dünya Fuarı Deneyimi: Expo 2016 Antalya Üzerine Bir İnceleme. *Journal of Humanities and Tourism Research*, *11*(2), 304-319. DOI: 10.14230/johut1000

Park of Nations. (online) (accessed 27 December 2021). Available at: https://www.parkofnations.com

Pinto, B. (2018). 1998, celebrating oceans in Lisbon Expo '98: World exhibitions and science communication. *Public Understanding of Science*, *27*(4), 490-494. https://doi.org/10.1177/0963662517743375

Polat, M. (2019). EXPO VE TÜRKİYE. *International Journal of Business Economics and Management Perspectives, 3*(1), 28-39.

T.R. Ministry of Agriculture and Forestry, Directorate of Western Mediterranean Agricultural Research Institute. Tarihçe. (online) (accessed 21 January 2022). Available at: https://arastirma.tarimorman.gov.tr/batem/Menu/52/Tarihce

T.R. Ministry of Agriculture and Forestry Expo2016 Antalya. (online) (accessed 20 January 2022). Available at: https://expo.tarimorman.gov.tr

URL 1. Vasco da Gama Bridge. Available at: https://stringfixer.com/tr/Vasco_da_Gama_Bridge

URL 2. Gare de Orient Train Station. Available at: https://commons.wikimedia.org/wiki/File:Gare_do_Oriente_0540.jpg

URL 3. Oceanarium. Available at: https://acquarioincasa.it/en/Lisbon-Oceanarium-Submerged-Forest/

URL 4. Meo Arena. Available at: https://tr.m.wikipedia.org/wiki/Dosya:Pavilhão_Atlântico_Meo_Arena_-_Helder_Palma.jpg

Vassalo Rosa, L. (1998). The urban planning development for EXPO'98. In E. Maldonado, & S. Yannas (Eds.), *Environmentally Friendly Cities, Proceedings of*

Plea 98 (p.3-6). James & James Science Publishers. https://doi.org/10.4324/9781315073712

Resume

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Determining People's Design Priorities for Neighbourhood Units: A Study in Liverpool, Merseyside

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Abstract

Local planning authorities and developers aim at designing and regenerating neighbourhoods in which people want to live. However, this aim is difficult to achieve if participation is conducted poorly. As a result, people may live in places that are created according to the ideas of designers and the priorities of market conditions and not according to their own. Therefore, determining people's preferences is essential for livable and sustainable neighbourhood design. This paper introduces and tests a method for determining people's design preferences, namely an Analytic Hierarchy Process (AHP) methodology. The method is based on making pairwise comparisons of key design principles and structural factors of neighbourhood units. The testing was conducted in Liverpool city centre. Here, it was established that participants' priorities in neighbourhood design are safety, affordable housing and accessibility, respectively. Also, participants prefer to live in non-gated detached and semi-detached housing communities. This article offers an empirical contribution to the participatory neighbourhood planning literature.

Keywords:
Neighbourhood planning, design principles, participatory planning, AHP, Liverpool

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INTRODUCTION

For the past 30 years, under the influence of neoliberalism[1], market mechanisms have become a key factor in the process of determining public policies (Şengül, 2009; Taşan-Kok, 2012). The neoliberal approach implies that cities can develop by opening up to the world and become competitive in global markets. Neoliberal policies also play an essential role in forming urban space (Baeten, 2012a). In this process, urban policies tend to be driven by an entrepreneurial governance mechanism in which public and private institutions cooperate (Punter, 2007; Taşan-Kok, 2012; Roy, 2015). To compete with other cities and attract investors, administrators facilitate the formation of capital-oriented spaces through urban design or urban transformation projects (Punter, 2007). This capital-oriented approach has become the primary determinant shaping today's urban area.

The influence of capital on urban space also causes living spaces to be subject to capital-oriented planning. Housing projects produced to meet the demands of investors can lead to people's needs and priorities being ignored (Al-Kodmany, 2000; Tezcan & Penbecioğlu, 2010; Baeten, 2012a; Roy, 2015). It is challenging to design livable and sustainable neighbourhood units if human expectations are not understood and included in the design process. In this context, a primary question to be answered in this paper is how to determine the priorities of people regarding housing and living environments in which they wish to live. Planning neighbourhoods with a participatory approach can lead to balancing capital-oriented demands.

The method we introduce allows the handling of technical issues related to neighbourhood planning at a level that can be understood by the public. It also provides for a systematic evaluation of participants' ideas. Neighbourhood residents are provided with a means to express themselves during decision-making.

Collected data were analysed using the Analytical Hierarchy Process (AHP) method, and the findings of people's priorities were determined. Subsequently, determinations were made regarding sustainable and livable neighbourhood planning. The study, which provides a participatory method for residents to express their priorities regarding their neighbourhoods, contributes to the participatory planning literature.

NEIGHBOURHOOD PLANNING

The neighbourhood concept from a planning perspective has been widely used in different contexts since its introduction into the urban literature by Perry and Mumford (Perry, 1929; Mumford, 1954; Banerjee & Baer, 2013). Although the 'neighbourhood' is defined from a range of perspectives by different researchers, it is impossible to explain all dimensions in a single sentence because it contains many elements conceptually. For this reason, there are different definitions regarding the neighbourhood concept, spatially, socially and politically. In general, the

[1] Neoliberalism is a market-oriented economic structuring model that denies or interferes with state intervention in the local economy. Neoliberalism advocates that the state should act as a provider and regulator of necessary public services (Harvey, 2007; Taşan-Kok, 2012).

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neighbourhood is the essential element of the city where social relations are established and people's living environments defined (Wheeler, 2013; Zheng, Shen, Song, Sun, & Hong, 2017). The neighbourhood is defined as the living space where people live, where they establish relationships with each other, meet their basic needs, and constitute housing and its immediate surroundings. In this sense, the neighbourhood does not only provides housing but is the urban unit where social relations are established, and cultural and economic activities carried out (Madanipour, 2001; Barton, Grant, & Guise, 2006; Talen, 2019). Because the neighbourhood is a subjective term, the spatial size of a neighbourhood is based on local conditions and people's perceptions. For some people, the neighbourhood can be a cluster consisting of a house and its immediate surroundings, while for others, it means a large area with certain boundaries formed by hundreds of houses (Wheeler, 2013; Park & Rogers, 2015; Galster, 2019).

In addition to facilitating spatial organisation, neighbourhoods serve as a means of social organisation where interaction between residents is believed to be based on shared values and interests. (Wargent & Talen, 2021). Neighbourhoods are units where neighbours know each other, help each other, and form a community with a common understanding. The community having a sense of belonging to the neighbourhood and the formation of social capital in neighbourhoods enable people to take care of their living environment (Mumford, 1954; Wargent & Talen, 2021). Thus, residents become a political force to protect and develop their neighbourhoods (Park & Rogers, 2015).

Neighbourhood planning is the ideal scale to create a human-oriented livable environment and ensure sustainable urban development (Wheeler, 2013; Sharifi, 2016; Sharifi & Murayama, 2014) because neighbourhood planning and design affect people's daily lives, environment, opportunities, and relationships with other people. Different cultures have different approaches to neighbourhood design (Sharifi, 2016; Banerjee & Baer, 2013). Since the end of the 19th century, many approaches to neighbourhood planning have been developed (Barton, Grant, & Guise, 2006; Wheeler, 2013; Mehaffy, 2015; Wargent & Talen, 2021). Examining the literature on planning and design approaches since Ebenezer Howard’s Garden City Movement, it is found that the Neighborhood Unit, Modernism, Neo-traditional (New Urbanism) Eco-urbanism approaches are the main approaches. These approaches are aimed at making neighbourhoods livable. In the 1950s, most cities consisted of suburbs connected with urban sprawl, especially in the US. This sprawl caused problems in the city centre by inducing commercial areas' deterioration and housing stock reductions. In addition, sprawl in cities has led to unresolved problems such as weakening relations between regions, poverty, inequality, crime, social segregation, social instability, traffic congestion and pollution. In the 1980s, urban planning and design movements based on the concept of sustainability emerged as a solution to problems which are experienced

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in cities and have adverse effects on the natural and social structure. In this context, neo-traditional approaches have come to the fore that shape urban space based on concepts such as being participatory, compact, people-oriented, livable, sustainable, and smart (Schubert, 2014; Sharifi, 2016).

Since our paper aims to determine the design priorities of people's living spaces, participation is introduced first. Key design principles of neo-traditional approaches aiming to create sustainable and liveable neighbourhood units are presented. The main reason for determining neo-traditional approaches as a reference is that they are contemporary approaches, focusing on the production of human-scale living spaces, reflecting sustainability and liveability principles. Generally speaking, urban planning policies in the UK have been inspired by key principles of neo-traditional approaches such as sustainability, compact and mixed development, walkability, and reuse of brownfield sites (ODPM, UK, 2005; Punter, 2007; Jones & Evans, 2008; Lombardi, Porter, Barber, & Rogers, 2011).

Participation

Participation is a basic principle of sustainability. A simple definition is that people affected by a decision take part in the decision-making process and can express their ideas. In a neoliberal system, urban development decisions are generally made by private, public or voluntary sector organisations (Barton, Grant, & Guise, 2006). On the other hand, neighbourhood planning allows communities to have a say in developing and shaping their living environment.

Living environments that meet people's expectations increase life quality and well-being (Banerjee & Baer, 2013). Therefore, local planning authorities, developers and urban designers should consider people's needs and expectations regarding what kind of environment they want to live in. Public participation in the decision-making process ensures that transparent, inclusive and fair decisions are made (Brown & Chin, 2013). Participation allows people to empathise with each other and critically review their thoughts (Ataöv, 2007; Lombardi, Porter, Barber, & Rogers, 2011; Medved, 2017). People participating in the decision-making process feel part of society and are able to accept decisions taken better. Thus, participation contributes to the development of the sense of community and the formation of social capital.

The Localism Act, passed in the UK in 2021, allows people to participate in the decision-making process in neighbourhood planning and shape the environment in which people live (DEFRA, 2013; Parker, Lynn, & Wargent, 2015; Wargent & Parker, 2018). Although there is criticism in that the primary purpose of the Localism Act is to simply facilitate economic growth (Parker, 2015), the Localism Act allows residents to participate in neighbourhood planning. Also, the act defines the neighbourhood as a political identity and has given communities a set of rights during the neighbourhood planning process (Bradley, 2015).

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Public participation in the decision-making process has many different meanings and different levels of implementation regarding the role of the public in the process. Arnstein (1969) and Bruns (2003) defined different levels of participation in the decision-making process according to the degree of competence given to the public by the government (Arnstein, 1969; Bruns, 2003; Archon, 2006; Ananda, 2007). Similarly, The International Association for Public Participation (IAP, 2014) defines the Public Participation Spectrum used internationally. This spectrum reveals the role of the public in participation processes at five levels. The spectrum starts with the 'informing' level where the public has the least impact on the decision-making process. At this level, it is stated that the administration should provide objective public information on public problems, alternatives and solutions. The consult level follows the inform level. Management listens to people's interests and requests, and the relevant data is reflected objectively in the decision-making process. The third level of the spectrum is the 'involve' level. At this level, it is envisaged that administrators and the public work together to understand the public's concerns and expectations in the decision-making process. The fourth level is the collaboration level. At this level, the public works together with management in the decision-making process, including developing alternatives and determining preferred solutions. At the collaborate level, the public's views, requests, and suggestions are included in the decisions to the highest possible extent. The empower level is the level at which people are the most effective in decisions. At the empower level, governments delegate the final decision-making authority to the public and implement decisions (National Research Council, 2008). The International Association for Public Participation claims that all participation levels expressed in the spectrum are legitimate and that any of them can be applied depending on the objectives of the decision-making process (IAP, 2014).

In this study, a participation method was applied in which technical issues were discussed at a level the public could understand, and the participants' ideas were systematically evaluated. The public's expectations were determined by a survey-based method in which a participant was able to understand and assess the complex and technical dimensions of planning. Thus, it aims to create a democratic process by forming the public's participation at the involve level in the decision-making process. Besides, the method can also be used at the collaboration level to develop alternatives and identify preferred solutions.

Key neighbourhood design principles

Neo-traditional approaches emphasise the need to organise urban space sustainably and improve the quality of life of people while preserving the natural environment (El Din, Shalaby, Farouh, & Elariane, 2013). Neo-traditional design principles include creating sustainable, compact and mixed-use, accessible and walkable places (Nasar, 2003; Stangl & Guinn, 2011; Rahnama, Roshani, Hassani, & Hossienpour, 2012;

Sharifi, 2016; EPA, 2018). Sustainability has emerged as a key principle at times of rapid economic and population growth globally. The contemporary definition of sustainable development comes from the Brundtland Report, *"development that meets today's needs without compromising the ability to meet the needs of future generations"* (World Commission on Environment and Development & Brundtland, 1987; Kleinhans, 2006). Sustainability is about improving the life quality without destroying the resources future generations will need. This means addressing social, economic and environmental dimensions together (Köken, 2017; Karakurt Tosun, 2017). Public participation is a key principle of sustainable development. It can create a sense of community and positively impact social capital (Lombardi, Porter, Barber, & Rogers, 2011; Medved, 2017). Key sustainable design principles of neighbourhood units are briefly explained below.

Compact and mixed-use development

Compact (dense) and mixed-use neighbourhoods can reduce urban sprawl and lead to more efficient use of urban spaces. The density provided by compact design can increase urban area vitality and contribute to sustainability, preventing urban sprawl. People can meet their daily needs within walking distance (American Planning Association, 2007; Wheeler, 2013; Sharifi, 2016). In other words, the compact and mixed-use urban form aims to create high accessibility residential areas and reduce vehicle dependence (DETR & CABE, 2000; Luederitz, Lang, & Wehrden, 2013; Blundell, 2014).

Socio-cultural environment

Residential areas offer spaces where people interact with neighbours, potentially creating a sense of community. High-quality spaces such as open spaces, green spaces and children's playgrounds support the development of relationships between people and the creation of safe environments (Brower, 2017; Transit Oriented Development, 2018). Moreover, a strong neighbourly culture can contribute to the development of social capital. In societies with high social capital, public spaces are cleaner, people are open-minded, and the streets are safer (Kleinhans, 2006).

Proximity

Residential areas need to be close to other urban facilities for human-scale and sustainable neighbourhood development. In this context, daily needs reflected in public facilities, commercial spaces, green spaces and public transportation stations should be within walking or cycling distance (10 minutes) for residents (Morris, 2011; DEFRA, 2013; Wheeler, 2013; Blundell, 2014; Talen & Koschinsky, 2014; Sharifi, 2016; New Urbanism, 2018). Compact and relatively mixed-use neighbourhoods reduce vehicle dependency and increase accessibility. Thus, people can build healthier societies.

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Safety

Sustainable neighbourhoods should meet basic physical and social needs as well as making people feel secure and safe (Talen & Koschinsky, 2013). Walking routes between residential areas and other uses, such as schools, parks and employment areas, should be designed to be safe, compelling, and encouraging (DETR & CABE, 2000; Habitat, 2014; Design Council & Cabe, 2016; Transit Oriented Development, 2018). Making residential areas safe and increasing their viability leads to people being in their neighbourhood more frequently (Smart Growth America, 2018). Living in a safe residential area allows people to develop social relationships and capital (Rahnama, Roshani, Hassani, & Hossienpour, 2012; Luederitz, Lang, & Wehrden, 2013).

Accessibility

For sustainable neighbourhood development, creating high accessibility for residential areas is essential. Therefore, neighbourhood units should be designed within walking distance of daily needs, such as workplaces, public institutions, schools, parks, and public transportation stops. In addition, to increase accessibility among urban land uses, the order of priority should be walkability and cyclability, public transport and, in the end, private vehicle transport. The main objective is therefore to create neighbourhood units that have easily walkable and cyclable road and green systems, strong public transport systems and a well-connected street network (Talen & Koschinsky, 2013; Sınmaz, 2013; Koschinsky & Talen, 2015; New Urbanism, 2018; The Congress for the New Urbanism, 2018; Transit Oriented Development, 2018).

Structure of neighbourhood units

The structure of neighbourhoods, such as neighbourhood patterns, secure access, and different housing types significantly impact people feeling secure and enabling social interaction (Monfared, Hashemnejad, & Yazdanfar, 2015). Pedestrian-friendly streets and living spaces should be established with various housing styles or types in neighbourhoods. Supplying various housing types in a wide price range strengthens personal and social ties that are the foundation of a peaceful society by enabling everyday interaction of people of different ages, ethnicities and income levels (Talen, 2010; Morris, 2011; Köken, 2017; Medved, 2017; New Urbanism, 2018; The Congress for the New Urbanism, 2018; Transit Oriented Development, 2018). Diversifying housing options gives everyone more choices about where they want to live. Also, housing in commercial areas can keep neighbourhoods alive day and night. The main objective is to prevent spatial segregation and urban sprawl (Smart Growth America, 2018).

Affordability

One of the basic design principles for neighbourhood units is that housing should be supplied for people of various income levels, such as

middle and low-income families (Punter, 2007; Talen, 2010; DEFRA, 2013; Habitat, 2014). In addition, providing a balanced distribution of affordable housing within a city in a manner compatible with work areas contributes to the increase of economic activity and supports social equality in cities (Morris, 2011; Koschinsky & Talen, 2015; Design Council & Cabe, 2016; New Urbanism, 2018).

Character

This is about the need to reflect on a city's identity in the design of residential means, preserving and maintaining cultural values regarding creating distinctive places (Wheeler, 2013; Luederitz, Lang, & Wehrden, 2013; Design Council & Cabe, 2016). In order to strengthen identity and character, distinctive place characters can be produced, using buildings that reflect the local culture and have a clearly identifiable character (DETR & CABE, 2000; Punter, 2007). Neighbourhood units that create a sense of place and that are integrated with the landscape on a human scale are perceived as livable (Medved, 2017).

The design principles described above affect each other and can increase sustainability and liveability overall. However, the effects of design principles on sustainability and quality of life may vary depending on the specific socio-cultural contexts. For example, transferring people's priorities to the design of neighbourhood units contributes to the long-term living of people in the same region and social capital formation in the area where they live.

LIVERPOOL'S HOUSING POLICIES IN THE NEOLIBERAL ERA

Liverpool is a metropolitan borough on Merseyside, situated on the River Mersey's eastern side, and its population was 494800 people in 2018 (Liverpool City Council, 2019d) (Figure 1). The reason for selecting Liverpool as a case study is that it attracts some substantial international investment. In this context, Liverpool city council provides investment incentives. In addition, the council also supports and guides the development of the housing sector (Liverpool City Council, 2019a; Liverpool City Council, 2019b). The incentives provided by the council have led to many urban designs and urban transformation projects being produced in various areas of the city.

Upon a perceived inability of the welfare state to respond to social demands, since the beginning of the 1980s, neoliberal ideology advocating the reduction of the role of the state in the housing economy first manifested itself in the UK and the USA (Özdinç, 2007; Allmendinger & Haughton, 2012). In this context, cities have become the places where the effects of neoliberal policies can be best observed (Baeten, 2012a). This is because city managers facilitate the production of capital-focused urban design and urban transformation projects, which are often supported by international capital.

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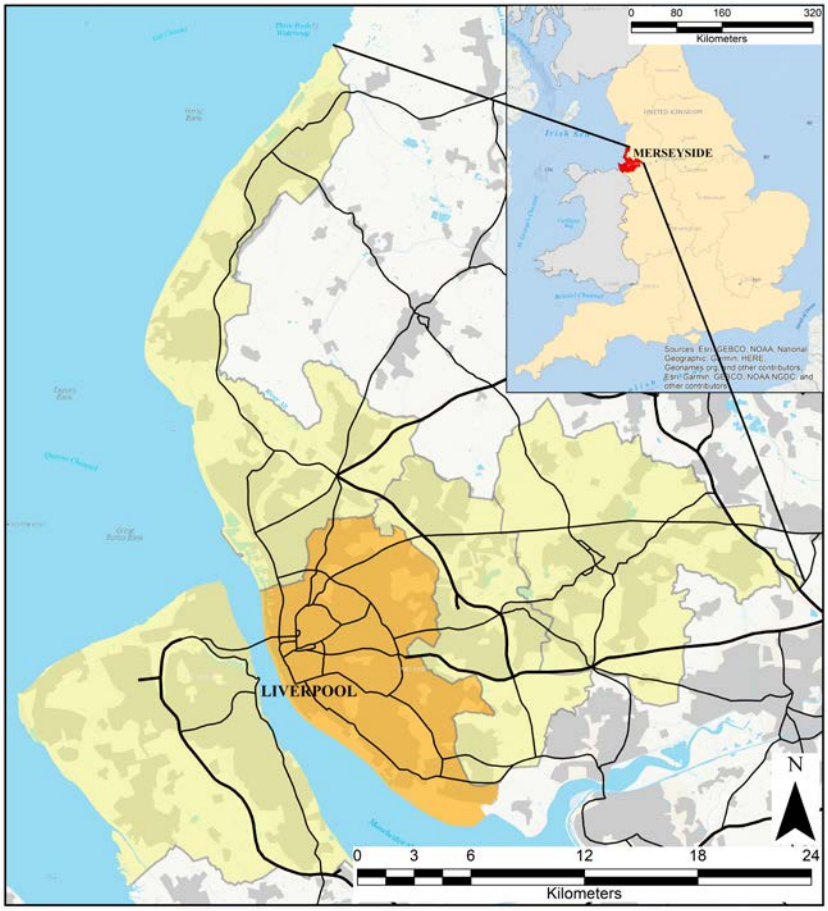

Figure 1. Location of Liverpool Districts (visualised by the authors)

In the UK, planning reforms, such as neighbourhood planning, framed by the Localism Act 2011, are neo-liberal arrangements created to facilitate economic growth (Allmendinger & Haughton, 2012; Bradley, 2015; Parker, 2015; Brookfield, 2017). Moreover, flexible strategic spatial planning has facilitated urban design projects in line with neo-liberal market conditions (Taşan-Kok, 2012). Today, large-scale urban design and transformation projects produced under public-private partnerships[2] shape the urban space (Jones & Ward, 2002; Parker, Street, & Wargent, 2018). While London competes with global cities such as New York and Tokyo as an international financial business centre (Jones & Evans, 2008), Liverpool competes with other regional cities. Liverpool City Council is seeking to attract investors to the city by highlighting the advantages of its waterfront, historical values, scientific infrastructure and economic potential. In this context, the city council seeks investment partners by using their legal powers to facilitate investment through incentives[3] such as financial support, recruitment services, property incentives and land/property acquisition assistance (Liverpool City Council, 2019a; Liverpool City Council, 2019b). Following investment opportunities and services offered to investors by Liverpool City Council, Liverpool's city centre and its surrounding areas have changed dramatically with many large-scale design and renovation projects, especially in the riverside and dockland areas of Liverpool. Today, many

[2] Partnerships produce urban projects by completing each other in terms of knowledge, experience and management under the leadership of public institutions, semi-independent public institutions and private companies. These partners perform functions such as land provision, land development, creation of resources for the project, coordination between interest groups, completion of legal processes, and public support for projects (Taşan-Kok, 2012). Partnerships are formed by a contract called an urban development agreement (Jones & Evans, 2008).

[3] Liverpool City Council offers "Liverpool in London" incentive that gives investors the privileges of owning a business in a London location without the cost of owning an address in London (Liverpool City Council, 2019a).

projects in and around the city centre continue to shape the urban space of Liverpool.

Apart from large-scale projects, Liverpool City Council has two essential tools to direct the development of the housing sector. The first one is a housing company called Foundations, and the other is a partnership called Liverpool Housing Partnership (Liverpool City Council, 2019c). Foundations housing company aims to control and shape the housing market and provide people with quality and affordable housing (Liverpool City Council, 2019c). In 2015, Liverpool City Council formed a partnership called The Liverpool Housing Partnership with Redrow Homes, Liverpool Mutual Homes and Willmott Dixon, private and social housing sector representatives. The main purpose of the partnership is to meet the need for affordable homes in Liverpool. The Liverpool Housing Partnership aims to build 1500 new homes and make 1000 derelict homes usable again within five years (Liverpool Housing Partnership, 2019).

Neoliberal urbanisation is attractive mainly in terms of obtaining investment and associated with this employment. Ultimately it can lead to regeneration. However, concessions on the development of the city, facilitation of investment and branding can lead to neglecting concepts such as social justice, sustainability and quality of life (Baeten, 2012b). Thus, cities begin to be filled with structures that resemble each other that result from neoliberal urbanisation dynamics. To produce livable housing areas, the original structure of the place, people's priorities and basic design principles should be considered. In this context, the following section details the key design principles for sustainable and livable neighbourhood units.

METHODOLOGY

People's design priorities regarding their neighbourhood units are established in this paper using the analytical framework of an analytic hierarchy process (AHP). The AHP is a widely accepted methodology for decision-making (Bhushan ve Rai 2007). The AHP method was developed by Thomas Saaty in the late 1970s and is a multi-criteria decision support model based on mathematical principles. It allows people to include both, objective and subjective factors in the decision process and makes pairwise comparisons between criteria using the eigenvalue approach (Saaty R. , 1987; Saaty T. , 1989; Saaty T. , 1990; Filipović, 2007; Saaty T. , 2008; Mu & Pereyra-Rojas, 2017). The reason why the AHP method was used here is the method's ability to quickly reveal how critical or dominant criteria are relative to each other, in line with the pairwise comparisons made by the participants regarding the criteria.

AHP consists of steps such as defining the aim, determining the decision hierarchy, creating binary comparison matrices, calculating the factors' relative weights, and making the final decision (Bhushan & Rai, 2007; Filipović, 2007; de FSM Russo & Camanho, 2015). In this study, AHP's ability to prioritise criteria was used. In this context, participants

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were asked to make pairwise comparisons of the basic design criteria, neighbourhood patterns, secure access types and housing types in terms of living spaces. When comparing two factors, to standardise factor sets, the values defined by Saaty (between 1 and 9, Table 1) were used. A value shows how important a factor is. For example, suppose the participant thinks that a criterion has absolute importance compared with others when comparing the two criteria. In that case, they must give 9 points to the criteria of absolute priority in the comparison.

On the other hand, if a participant thinks that two factors are equally important, they give 1 for the comparison value. In this framework, in the pairwise comparison of factors, a score interval of 1 to 9 is used (Table 1). In group decisions, these values can be determined jointly in a questionnaire, interview or a meeting (Saaty T., 2008; Saaty & Vargas, 2012). Here, group decisions regarding each pairwise comparison were obtained by taking the geometric mean of the paired comparisons of the participants.

Table 1. Quantitative values for pairwise comparison

Pairwise comparison value definitions	Value
A and B are equally important	1
A is somewhat more important than B	3
A is much more important than B	5
A is very much more important than B	7
A is absolutely more important than B	9
Intermediate values for comparison	2,4,6,8

The pairwise comparison values were collected in a matrix, and the priorities of the design principles were calculated using the normalisation method. Thus, for participants, the relative priorities of the key design principles, neighbourhood patterns, secure access types and housing types for the neighbourhood units set out in the theoretical part of the study were determined using AHP's analytical infrastructure.

A survey prepared by the AHP method was used as the data collection technique. The survey aimed to determine the priorities of the participants regarding the design of neighbourhood units. In this context, the survey was conducted with 271 participants randomly selected over the age of 16 in Liverpool.

The survey consists of four parts in general. In the first part of the survey, participants were asked to compare the key design principles of the neighbourhood units (see above); compact and mixed-use development, socio-cultural environment, proximity, safety, accessibility, the structure of neighbourhood units, affordability and character. In the second part, a pairwise comparison of neighbourhood patterns of neighbourhood units is made. Neighbourhood patterns relate to the structure of neighbourhood units, such as street network pattern and cluster pattern (cul-de-sac). In the following sections of the survey, participants were asked to determine their priorities regarding secure

access types and housing types. In this context, secure access types were grouped as private (gated community) and public. The housing types were grouped as detached houses, semi-detached houses, bungalows, terraced houses and apartments/flats. Finally, participants made pairwise comparisons for each factor according to the priority values proposed by Saaty (Saaty T. , 2008).

The pairwise comparison data obtained from the survey were first transferred to a spreadsheet designed in MS Excel. Then, to obtain a single group decision from the participants' answers, the geometric mean of the pairwise comparison values given by the participants for each factor was taken (Saaty T. , 2008; Saaty & Vargas, 2012). Thus, a score reflecting the group decision was calculated for each factor. In the following stage, the pairwise comparisons were analysed with the AHP method, and the priority values of the factors were determined.

RESULTS

The neighbourhood design principles defined above increase sustainability and livability. However, an important question arising is whether they are compatible with the priorities of participants. In this context, 271 Liverpool residents from different age groups were asked about their neighbourhood design priorities. A single group decision was obtained by analysing the answers of the participants with the AHP method. First, the priorities of all participants regarding their living areas were transformed into a single group decision by taking the geometric mean. Then, results were obtained by analysing this single group decision with the AHP method. Participants' responses were analysed using the Super Decisions program, decision support software that implements the AHP. Paired comparison matrices obtained from the survey results were loaded into the Program, and the consistency rates of the comparisons and the priority order of the factor for each group were determined.

Table 2. The pairwise comparison matrix of key neighbourhood design principles

	Compact and mixed-use development	Socio-cultural environment	Proximity	Safety	Accessibility	Structure of Neighbourhood Units	Affordable	Character
Compact and mixed-use development	1	1/3	1/4	1/6	1/4	1/2	1/5	1/3
Socio-cultural environment	3	1	1	1/4	1/2	1	1/3	1
Proximity	4	1	1	1/3	1/2	1	1/3	1
Safety	6	4	3	1	2	3	1	3
Accessibility	4	2	2	1/2	1	2	1/2	2
Structure of Neighbourhood Units	2	1	1	1/3	1/2	1	1/3	1
Affordable	5	3	3	1	2	3	1	3
Character	3	1	1	1/3	1/2	1	1/3	1

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Table 2 shows the results of the paired comparisons. Based on Table 2, the percentage ranking of participants' priorities regarding design principles is established (Figure 2). According to Figure 2, the most important neighbourhood design principle for the participants is safety (25.30%). Furthermore, and according to the participants, the second most important design principle is affordability (23.90%), with the third being accessibility (14.60%). Among the design principles, the lowest value, with 3.40%, belongs to the principle of compact and mixed-use development. These values show the common judgment of all participants according to the AHP results. However, priorities may change for different social groups. This is discussed later.

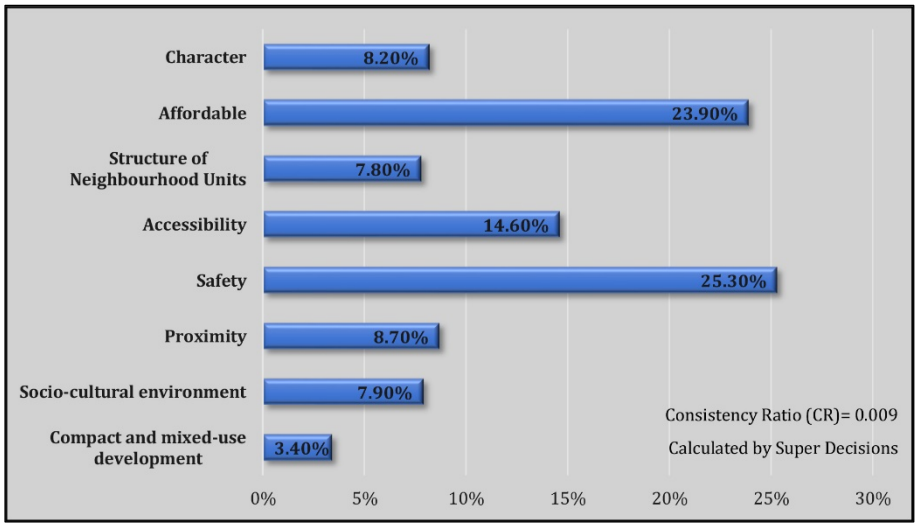

Figure 2. Participants' priorities regarding key neighbourhood design principles)

Survey results established that street network pattern and cluster pattern (cul-de-sac) shapes were equally important for participants. However, as seen in Table 3 and Figure 4, the participants did not highlight any of these patterns.

Table 3. The pairwise comparison matrix of neighbourhood patterns

	Street Network Pattern	Cluster Pattern
Street Network Pattern	1	1
Cluster Pattern	1	1

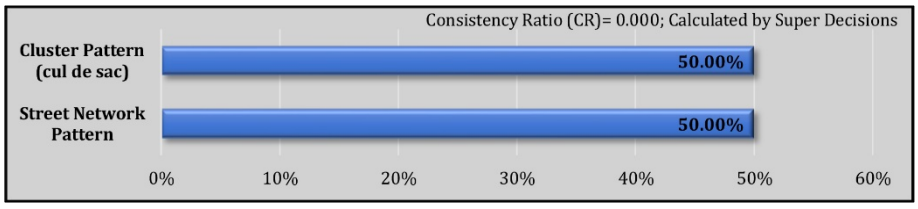

Figure 3. Participants' priorities regarding neighbourhood patterns

Findings suggest that participants want to live in the public structure twice as much as the gated community (private) in the neighbourhood unit (Table 4). Figure 4 shows the priority order of people's access to the

housing area by secure access types. Figure 4 shows that 66.60% of participants prefer a public structure.

Table 4. The pairwise comparison matrix of secure access types

	Gated Community (Private)	Public Structure
Gated Community (Private)	1	1/2
Public Structure	2	1

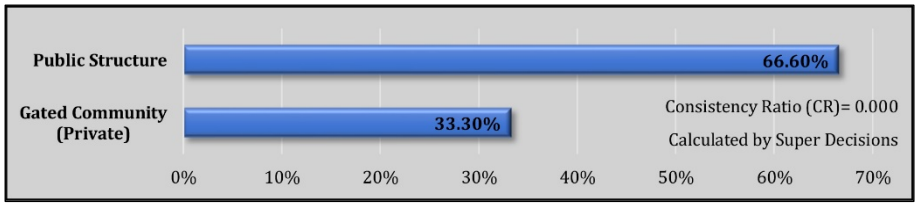

Figure 4. Participants' priorities regarding secure access types

Finally, the last issue is participants' priorities in terms of housing types. The pairwise comparison values for the housing types of the participants are shown in Table 5. When Figure 5 produced from Table 5 is examined, it is seen that participants attach importance to the detached housing type two times more than all other housing types. Figure 5 also shows that the detached housing type is the most important housing type for participants, with a value of 32.60%. This is followed by the semi-detached housing type with a value of 23.20% for the participants. The proportions of other housing types are bungalows 18.20%, terraced houses 15.90% and apartments 9.90%, respectively. These values show that participants preferred option was apartments least.

Table 5. The pairwise comparison matrix of housing types

	Detached	Semi-detached	Bungalows	Terraced	Apartments/Flats
Detached	1	2	2	2	2
Semi-detached	1/2	1	1	2	3
Bungalows	1/2	1	1	1	2
Terraced	1/2	1/2	1	1	2
Apartments/Flats	1/2	1/3	1/2	1/2	1

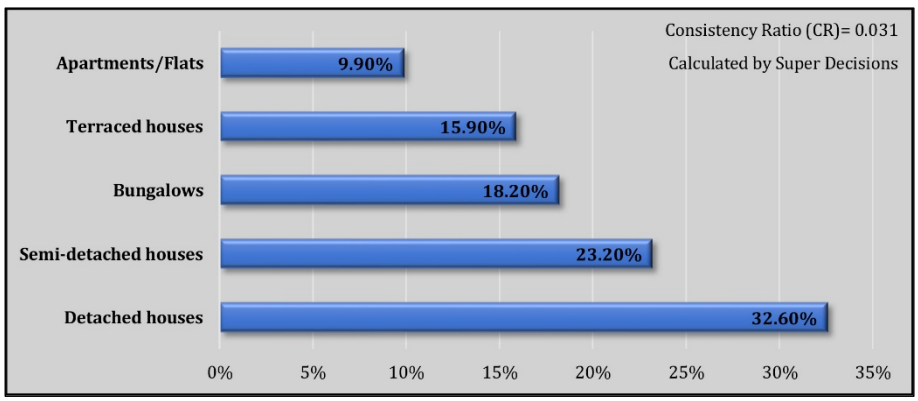

Figure 5. Participants' priorities regarding housing types

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The results reflect judgments of randomly selected participants living in Liverpool. The consistency ratio of all paired comparison decision matrices is less than 0.10. This means that the pairwise comparison decision matrices are consistent. However, priorities of different social groups, such as families, students or older people, may differ. This, however, was not examined.

DISCUSSION

Firstly, we asked the participants to compare eight neighbourhood unit design criteria according to their priorities. Participants considered that safety is the most important design principle. Affordable homes and accessibility follow. Safety and security have been significant elements that have shaped people's living spaces throughout history (Tekkanat & Türkmen, 2018). Jane Jacobs (1961) emphasised this and stated that people should feel safe and secure in a well-designed urban space or street (Jacobs, 1961). In this context, it is not surprising that participants cite safety as the main priority of neighbourhood design with 25.3%. Creating a sustainable society and designing sustainable urban spaces are of great importance in creating safe living spaces. For this reason, the expert's guidance and the decisions taken in public meetings are significant in terms of what kind of understanding of security can be provided in living areas. For building a sustainable society, living spaces should be designed where a street is at the forefront instead of designing gated communities that are physically close but disconnected from the city centre. Living spaces should be designed for various activities, such as playing, sitting, chatting, resting and eating, where people can interact with each other. Windows, doors, and showcases directly faced/associated with the street allows people to keep an eye on the public space and feel safer. In addition, increasing the visibility of public spaces is essential. The coexistence of social facilities in a neighbourhood and the use of these facilities by different socio-economic groups as well as mixed housing types in residential areas enhance people's sense of ownership of space. This creates a sense of community, and people can feel more secure.

The key design principle that participants consider important after security is that a house is affordable. Having a home is a fundamental necessity, so affordable housing is essential. Liverpool has an advantage in this regard because Liverpool Council has two tools for delivering affordable housing. One is that the city council owns the housing company Foundations, and the other is that the city council is part of the partnership called The Liverpool Housing Partnership. On this basis, Liverpool City Council aims to produce affordable housing for people with various income levels, predominantly middle and low-income families. Besides, there is a connection between the accessibility principle, which is the third priority of the participants for the design of residential areas and the affordable housing principle. By creating accessible/walkable neighbourhoods, people can quickly reach their

daily needs and public transportation. Thus, people can meet their daily needs in a short time and at less cost. For this reason, mixed-use and pedestrian/transit-oriented accessible neighbourhoods increase the quality of life of people with low income and contribute to social equality.

The case study showed that participants attach equal importance to living in the street texture and cluster fabric in terms of neighbourhood patterns. The main reason for this appears to be that the traditional British residential building is street-oriented. When designing neighbourhoods in line with the participants' priorities, preferring a high connectivity street network and short-range cul-de-sac will contribute to creating a more accessible neighbourhood unit. Although the participants did not choose a specific side, very long cul-de-sacs should be avoided for living areas with high accessibility. In addition, a pedestrian and public transportation-oriented transportation system should be designed in living spaces.

Although the participants specified safety as the key design principle for a neighbourhood unit, they preferred the public street structure two times more than the gated community (private) in terms of secure access types of housing. The main reason for this is most likely the traditional British housing culture and stock. No doubt, different social groups may have other preferences. Still, the fact that the participants, by and large, do not want gated communities is critical in creating a sustainable society in neighbourhood life.

Our findings show that detached and semi-detached housing types are top in the priority assessment of the participants regarding all housing types. This indicates that people do not prefer high-rise apartments. However, and in the context of globalisation processes, this development dominated by high-rise buildings has increased in recent years. The findings show that participants want to live in detached and semi-detached housing as much as possible. However, this type of housing causes urban sprawl as they require more space. Urban sprawl is not sustainable, though, from the point of view of efficient provision of public transport and some other services. Also, cities are under pressure from increasingly dense and high-rise construction, with managers' preferences and demands of investors. In designing sustainable and livable urban spaces, adopting a participatory planning approach is essential to balance the abovementioned situations. Therefore, it is necessary to engage in dialogue with people to explain the consequences of their choice and to establish a balance between potentially incompatible people's priorities. A better balance can potentially be achieved by using various housing types together in the design process. This will lead to both social integration and the design of more secure and affordable housing areas (Raco, 2007).

Our results reflect the common views of the participants. In this context, it should be noted that the results will vary for different cultures and social groups. In addition, all of the design criteria discussed within the scope of the study are important. The primary purpose is to

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understand which criteria people see as more important for their living spaces and ensure the design process is carried out within the priorities framework.

CONCLUSION

In the early 1980s, neoliberal policies were adopted to further economic growth in the United Kingdom. Then large-scale urban projects were produced in many British cities. In this context, the Liverpool city administration has attempted to attract investors to the city by providing various incentives. In order to understand how people want to live, it is important to determine their design priorities, especially in the housing production process. By transferring people's priorities to housing and neighbourhood design, urban design or urban transformation, projects are prevented from being shaped according solely to investors' demands. This situation enables the formation of more sustainable and high-quality neighbourhood units.

This paper revealed design priorities for neighbourhood units of people living in Liverpool using the AHP methodology. Although all neighbourhood design principles outlined in the theoretical section are essential, our results show that people give more importance to some design criteria. Furthermore, people's priorities regarding their living environment were transferred to the neighbourhood design process. The methodology presented in this paper allows neighbourhood design projects to be produced with more participatory processes. Therefore, the study contributes to the participatory planning approach in urban studies.

Participatory planning is about people's priorities and needs and that these need to find their way into the design process. In this context, participatory planning aims to produce projects that reflect these needs and priorities. The public is included in the planning and design process, and the public's support is obtained. Obtaining public support leads to a reduction of objections in the plan production process and speeds up processes. Thus, the legitimacy of the projects to be produced increases. In this direction, determining people's priorities in deciding the policies that will direct the neighbourhood design projects will prevent the production of purely market-oriented urban design projects.

Participants' priorities regarding their living spaces were determined thanks to the method applied. However, it should be noted that the participatory planning approach is not to fulfil all participants' wishes. In this context, planning and design decisions should be produced through participation meetings where all stakeholders affected by a decision can express their views and experts who will explain to residents/potential residents the consequences of their choices.

The recent coronavirus pandemic has caused significant changes in people's attitudes and behaviours. In this context, studies on the impact of the pandemic on people's perspectives on housing and living spaces will guide the design of more sustainable and livable neighbourhoods.

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REFERENCES

Al-Kodmany, K. (2000). Using web-based technologies and geographic information systems in community planning. Journal of Urban Technology, 7(1), 1-30.

Allmendinger, P., & Haughton, G. (2012). Post-political spatial planning in England: a crisis of consensus? Transactions of the Institute of British Geographers, 37(1), 89-103.

American Planning Association. (2007). Planning and urban design standards. (F. R. Steiner, & K. Butler, Dü) New Jersey: John Wiley & Sons.

Ananda, J. (2007). Implementing participatory decision making in forest planning. Environmental Management, 534-544.

Archon, F. (2006). Varieties of participation in complex governance. Public administration review, 66-75.

Arnstein, S. (1969). A ladder of citizen participation. Journal of the American Institute of planners, 35, 216-224.

Ataöv, A. (2007). Democracy to become reality: Participatory planning through action research. Habitat international, 31, 333-344.

Baeten, G. (2012a). Normalising Neoliberal Planning: The Case of Malmö, Sweden. T. Taşan-Kok, & G. Baeten içinde, Contradictions of Neoliberal (s. 21-42). Dordrecht: Springer.

Baeten, G. (2012b). Neoliberal Planning: Does It Really Exist? T. Taşan-Kok, & G. Baeten içinde, Contradictions of Neoliberal Planning (s. 205-211). Dordrecht: Springer.

Banerjee, T., & Baer, W. C. (2013). Beyond the neighborhood unit: Residential environments and public policy. New York: Springer Science & Business Media.

Barton, H., Grant, M., & Guise, R. (2006). Shaping neighbourhoods: for local health and global sustainability. London: Routledge.

Bhushan, N., & Rai, K. (2007). Strategic decision making: applying the analytic hierarchy process. London: Springer.

Blundell, C. (2014). How would you deliver a new Garden City which is visionary, economically viable, and popular?

Bradley, Q. (2015). The political identities of neighbourhood planning in England. Space and Polity, 19(2), 97-109.

Brookfield, K. (2017). Getting involved in plan-making: Participation in neighbourhood planning in England. Environment and Planning C: Politics and Space, 35(3), 397-416.

Brower, S. (2017). Neighbors and neighborhoods: Elements of successful community design. London and New York: Routledge.

Brown, G., & Chin, S. Y. (2013). Assessing the Effectiveness of Public Participation in Neighbourhood Planning. Planning Practice and Research, 28(5), 563-588.

Bruns, B. (2003). Water tenure reform: Developing an extended ladder of participation. Politics of the commons: Articulating development and strengthening local practices. Chiang Mai: RCSD Conference.

DOI: 10.15320/ICONARP.2022.192

de FSM Russo, R., & Camanho, R. (2015). Criteria in AHP: a systematic review of literature. Procedia Computer Science, 1123-1132.

DEFRA. (2013). Neighbourhood Planning. London: Department for Environment, Food & Rural Affairs. www.gov.uk/defra

Design Council & Cabe. (2016). Design in Neighbourhood Planning. My Community. 05 05, 2019 tarihinde https://neighbourhoodplanning.org/wp-content/uploads/Design-in-Neighbourhood-Planning_FINAL220216-1.pdf

DETR, & CABE. (2000). By design, Urban design in the planning system: towards better practice. London: Department of the Environment, Transport and the Regions and Commission for Architecture and the Built Environment.

El Din, H., Shalaby, A., Farouh, H., & Elariane, S. (2013). Principles of urban quality of life for a neighborhood. HBRC Journal, 9(1), 86-92.

EPA. (2018, 06 01). About Smart Growth. United States Environmental Protection Agency: https://www.epa.gov/smartgrowth/about-smart-growth#smartgrowth

Filipović, M. (2007). The analytic hierarchy process as a support for decision making. Spatium, 44-59.

Galster, G. C. (2019). Making our neighborhoods, making our selves. Chicago: University of Chicago Press.

Habitat, U. (2014). A new strategy of sustainable neighbourhood planning: Five principles. Nairobi, Kenya: United Nations Human Settlements Programme.

Harvey, D. (2007). A brief history of neoliberalism. New York: Oxford University Press.

IAP. (2014, 10 10). IAP2 Spectrum of Public Participation. 10 10, 2018 tarihinde International Association of Public Participation : https://cdn.ymaws.com/www.iap2.org/resource/resmgr/foundations_course/IAP2_P2_Spectrum_FINAL.pdf

Jacobs, J. (1961). The Death and Life of Great American Cities. London: Jonathon Cope.

Jones, M., & Ward, K. (2002). Excavating the logic of British urban policy: Neoliberalism as the "crisis of crisis–management". Antipode, 34(3), 473-494.

Jones, P., & Evans, J. (2008). Urban regeneration in the UK: Theory and Practice. Sage.

Karakurt Tosun, E. (2017). Sürdürülebilirlik Bağlamında Ekolojik Kent Söylemi. Abant İzzet Baysal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 1-21.

Kleinhans, R. (2006). Residents' social capital after neighbourhood transformation. V. Gruis, H. Visscher, & R. Johannes içinde, Sustainable neighbourhood transformation (s. 67-92). Amsterdam: IOS Press.

Koschinsky, J., & Talen, E. (2015). Affordable housing and walkable neighborhoods: A national urban analysis. Cityscape, 17(2), 13-56.

Köken, K. (2017). Sürdürülebilir Kentsel Tasarım Kriterleri Açısından Kentsel Dönüşüm Projelerinin İncelenmesi. Ankara: İller Bankası Anonim Şirketi.

Liverpool City Council. (2019a, 07 21). Why Invest in Liverpool? Regenerating Liverpool: http://regeneratingliverpool.com/why-invest-in-liverpool/

Liverpool City Council. (2019b). Liverpool's Investment Opportunities March 2019 Prospectus. Liverpool: Mayor of Liverpool. 07 21, 2019 tarihinde www.regeneratingliverpool.com

Liverpool City Council. (2019c, 07 21). Housing. Regenerating Liverpool: http://regeneratingliverpool.com/housing/

Liverpool City Council. (2019d, 07 30). Population. liverpool.gov.uk: https://liverpool.gov.uk/council/key-statistics-and-data/data/population/

Liverpool Housing Partnership. (2019, 07 21). Home. Liverpool Housing Partnership: http://liverpoolhousingpartnership.co.uk/

Lombardi, R. D., Porter, L., Barber, A., & Rogers, C. D. (2011). Conceptualising sustainability in UK urban regeneration: a discursive formation. Urban Studies, 48(2), 273-296.

Luederitz, C., Lang, D., & Wehrden, H. (2013). A systematic review of guiding principles for sustainable urban neighborhood development. Landscape and Urban Planning, 118, 40-52.

Madanipour, A. (2001). How relevant is 'planning by neighbourhoods' today? Town Planning Review, 72(2), 171-193.

Medved, P. (2017). Leading sustainable neighbourhoods in Europe: Exploring the key principles and processes. Urbani izziv, 28(1), 107-121.

Mehaffy, M. W. (2015). The "neighborhood unit" on trial: a case study in the impacts of urban morphology. Journal of Urbanism: International Research on Placemaking and Urban Sustainability, 8(2), 199-217.

Monfared, N., Hashemnejad, H., & Yazdanfar, S. (2015). Design principles in sustainable local community with security and socialisation approach (Case study: Chizar). Procedia-Social and Behavioral Sciences, 62-70.

Morris, E. (2011). Down with Eco-towns! Up with Eco-communities. Or Is There a Need for Model Eco-towns? A Review of the 2009-2010 Eco-town Proposals in Britain. Eco City Planning-Policies, Practice and Design, 113-130.

Mu, E., & Pereyra-Rojas, M. (2017). Practical Decision Making An Introduction to the Analytic Hierarchy Process (AHP) Using Super Decisions v2. Pittsburgh: Springer.

Mumford, L. (1954). The neighborhood and the neighborhood unit. The Town Planning Review, 24(4), 256-270.

Nasar, J. (2003). Does neotraditional development build community? Journal of Planning Education and Research, 23(1), 58-68.

National Research Council. (2008). Public participation in environmental assessment and decision making. (T. Dietz, & P. Stern, Dü) Washington: National Academies Press.

New Urbanism. (2018, 05 15). Principle of New Urbanism. New Urbanism: http://www.newurbanism.org/newurbanism/principles.html

ODPM, UK. (2005). Planning Policy Statement 1: delivering sustainable development. London: Office of the Deputy Prime Minister, UK.

Özdinç, H. K. (2007). Neoliberal politikalar ve bölge yönetimi sorunu: Türkiye deneyimi. Ankara: Basılmamış Doktora Tezi, Ankara Üniversitesi SBE.

Park, Y., & Rogers, G. O. (2015). Neighborhood planning theory, guidelines, and research: Can area, population, and boundary guide conceptual framing? Journal of Planning Literature, 30(1), 18-36.

Parker, G. (2015). The Take-up of Neighbourhood Planning in England 2011-2015. Reading: Real Estate and Planning, University of Reading.

Parker, G., Lynn, T., & Wargent, M. (2015). Sticking to the script? The co-production of neighbourhood planning in England. Town Planning Review, 86(5), 519-536.

Parker, G., Street, E., & Wargent, M. (2018). The Rise of the Private Sector in Fragmentary Planning in England. Planning Theory & Practice, 19(5), 734-750.

Perry, C. A. (1929). The Neighborhood Unit: A Scheme of Arrangement for the Family-Life Community Regional Plan of New York and Its Environs (Cilt 3). New York: Routledge.

DOI: 10.15320/ICONARP.2022.192

Punter, J. (2007). Developing urban design as public policy: Best practice principles for design review and development management. Journal of Urban Design, 12(2), 167-202.

Raco, M. (2007). Securing sustainable communities: citizenship, safety and sustainability in the new urban planning. European Urban and Regional Studies, 14(4), 305-320.

Rahnama, M., Roshani, P., Hassani, A., & Hossienpour, S. (2012). Use principles of new urbanism approach in designing sustainable urban spaces. International Journal of Applied Science and Technology, 2(7), 195-203.

Roy, P. (2015). Collaborative planning–A neoliberal strategy? A study of the Atlanta BeltLine. Cities, 43, 59-68.

Saaty, R. (1987). The analytic hierarchy process—what it is and how it is used. Mathematical modelling, 161-176.

Saaty, T. (1989). Group decision making and the AHP. T. Saaty içinde, The Analytic Hierarchy Process (s. 59-67). Berlin: Springer.

Saaty, T. (1990). How to make a decision: the analytic hierarchy process. European journal of operational research, 48(1), 9-26.

Saaty, T. (2008). Decision Making With The Analytic Hierarchy Process. International Journal of Services Sciences, 1(1), 83-98.

Saaty, T., & Vargas, L. (2012). Models, methods, concepts & applications of the analytic hierarchy process. London: Springer Science & Business Media.

Schubert, D. (2014). Transatlantic Crossings of Planning Ideas: The Neighborhood Unit in the USA, UK, and Germany. E. Weitz, & J. Zipes içinde, Transnationalism and the German City (s. 141-158). New York: Palgrave Macmillan.

Sharifi, A. (2016). From Garden City to Eco-urbanism: The quest for sustainable neighborhood development. Sustainable Cities and Society, 1-16.

Sharifi, A., & Murayama, A. (2014). Neighborhood sustainability assessment in action: Cross-evaluation of three assessment systems and their cases from the US, the UK, and Japan. Building and Environment, 72, 243-258.

Sınmaz, S. (2013). Yeni Gelişen Planlama Yaklaşımları Çerçevesinde Akıllı Yerleşme Kavramı ve Temel İlkeleri. Megaron, 76-86.

Smart Growth America. (2018, 05 06). What is smart growth? Smart Growth America: https://smartgrowthamerica.org/our-vision/what-is-smart-growth/

Stangl, P., & Guinn, J. (2011). Neighborhood design, connectivity assessment and obstruction. Urban Design International, 16(4), 285-296.

Surveymonkey. (2019, 06 12). Survey Sample Size. SurveyMonkey: https://tr.surveymonkey.com/mp/sample-size/

Şengül, H. T. (2009). Kentsel Çelişki ve Siyaset: Kapitalist kentleşme süreçlerinin eleştirisi. Ankara: İmge Kitabevi.

Talen, E. (2010). Affordability in new urbanist development: Principle, practice, and strategy. Journal of Urban Affairs, 32(4), 489-510.

Talen, E. (2019). Neighborhood. New York: Oxford University Press.

Talen, E., & Koschinsky, J. (2013). The walkable neighborhood: A literature review. International Journal of Sustainable Land Use and Urban Planning, 1(1), 42-63.

Talen, E., & Koschinsky, J. (2014). Compact, Walkable, Diverse Neighborhoods:Assessing Effects on Residents. Housing Policy Debate, 24(4), 717-750.

Taşan-Kok, T. (2012). Introduction: Contradictions of Neoliberal Urban Planning. T. Taşan-Kok, & G. Baeten içinde, Contradictions of Neoliberal (s. 1-19). Dordrecht: Springer.

Tekkanat, S. S., & Türkmen, S. N. (2018). Tarih boyunca kent formlarının biçimlenişi üzerine bir inceleme. Aksaray Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 10(4), 107-124.

Tezcan, M., & Penbecioğlu, M. (2010). Neoliberal Kentleşme Süreci ve Kıyı Kentlerinde Mutenalaştırma; İzmir Alaçatı Üzerine Bir Araştırma. Kentleri Korumak/Savunmak (s. 6-8). Antalya: TMMOB Şehir Plancıları Odası Dokuzuncu Türkiye Şehircilik Kongresi.

The Congress for the New Urbanism. (2018, 05 15). What is New Urbanism? 06 01, 2018 tarihinde The Congress for the New Urbanism (CNU): https://www.cnu.org/sites/default/files/charter_in_turkish.pdf

Transit Oriented Development. (2018, 05 05). Home. Transit Oriented Development Institue: http://www.tod.org/

Wargent, M., & Parker, G. (2018). Re-imagining neighbourhood governance: the future of neighbourhood planning in England. Town Planning Review, 89(4), 379-402.

Wargent, M., & Talen, E. (2021). Rethinking neighbourhoods. Town Planning Review, 92(1), 89-95.

Wheeler, S. (2013). Planning for sustainability: creating livable, equitable and ecological communities. London: Routledge.

World Commission on Environment and Development, & Brundtland, G. (1987). Presentation of the Report of the World Commission on Environment and Development to UNEP's 14th Governing Council Session... Nairobi, Kenya: World Commission on Environment and Development.

Zheng, H. W., Shen, G. Q., Song, Y., Sun, B., & Hong, J. (2017). Neighborhood sustainability in urban renewal: An assessment framework. Environment and Planning B: Urban Analytics and City Science, 44(5), 903-924.

Resume

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Effects of Visual Environment on Students' Adjustment to Stress

Sevgi Yılmaz*

Abstract

The impact of stress on visual landscape perception was assessed in a photo-based survey. The survey was first performed when the student participants were expected to be stressed just prior to an important examination. The same students were asked to respond to the same questionnaire a month after the examination when they were expected to have a lower level of stress. Then respondents answered some daily activities, personal study habits, and feelings before an exam. They also provided ratings of how much a selection of environmental factors generally influence their ability to study and their academic success. In the main perceptual survey reactions to a selection of 22 landscape scenes photos were reported by ratings (1–5) of the extent to which each of six emotions was associated with each scene. Differences in emotions ratings for the represented landscapes during high-stress and low-stress periods were analyzed by multiple comparison and Pearson correlational methods using the SPSS 17.00 package. Stress tests confirmed higher stress in the first versus second survey and perceptual ratings showed significant statistical differences in emotion ratings between landscape scenes, as well as both main effects and interactions between high stress and low stress conditions. Scene ratings for each emotion were strongly positively correlated between high stress and lower stress conditions. At the same time, respondents generally gave slightly higher ratings for positive emotions -excited, relaxing, happiness-when in the high stress condition and moderately higher ratings for negative emotions -stressed, irritating, scary-, compared to their ratings when tested later under lower stress conditions. This study indicated that stress conditions affect perception, and stressed conditions gave higher emotionality overall than the unstressed condition. In general, in both stressed and unstressed conditions, the students gave the highest scores (>3.4) to convenience and the lowest score (<2) to scary. The main limitations of this study are the large number of environmental factors that influence people's perception. The strongest determiner of emotion ratings was the landscape scenes themselves. Inspection of outliers in the scatter plots and multiple comparisons articulating higher order interactions with stress conditions revealed clear differences in the patterns of emotions ratings, especially for scenes representing water surfaces, open green spaces, and seasonal plant scenes.

Keywords:
Stress, visual quality, environmental psychology, psychological restoration

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INTRODUCTION

The rapid growth of population in urban centers during the last decade has resulted in creating cities with a lot of concrete buildings and little greenery. Such developments negatively affect city dwellers. They feel psychological pressure during their daily lives. To overcome these difficulties and to relax a little, they visit recreational areas, shopping centers, and small parks existing in the cities (Ulrich 1999; Parsons and Daniel 2002; Grahn and Stigsdotter 2003; Velarde et al 2007; Hartig et al., 2014, WHO 2016; Byrne et al., 2016; Jahani et al., 2021).

Under current living conditions, especially the COVID-19 pandemic conditions, people spend most of their time building their environments. This might start creating psychological situations for them. People now live in isolated living spaces without much exposure to the natural environment. Research by Zube et al. (1975) indicated that natural landscapes reduced stress. Moreover, it is suggested that natural landscapes are superior to artificial landscaping. The existence of natural elements in the buildings improves the quality of the scenery (Real et al., 2000; Cerwén et al., 2016; Vert et al., 2020; Jahani et al., 2021; Ha et al., 2022). Also, the aesthetic environment positively affects a human to boost morale (Carlson 2010). Attempts have been made to define landscaping since the beginning of the 1990s. It is more than just what is seen or perceived. In other words, landscaping includes all areas that humans live in how they perceive scenery and their psychological make up at the time. The evaluation of participants in landscape visual quality assessment studies is a widely used and accepted method based on image presentation (Clay and Daniel, 2000; de Val et al., 2006; Özhanci et al. 2014; Devlin et al., 2014; Wang et al., 2021).

Since the European Landscaping Agreement views landscaping as "the key for individual and societal wellness". The World Health Organization (WHO) defines health as "not only the lack of diseases or injuries, but a complete status of physical, mental, and social wellness." The belief that natural factors reduce stress and help the sick can be found in the design of many great ancient cities in Iran, China, and Greece (Velarde et al., 2007).

The literature review conducted reveals that there is a great deal of scholarly research on visual quality. However, a limited number of studies investigate the relationship between visual quality perception and stress level. Finding whether stress affects people's perceptions of the visual environment will guide future landscape projects. Understanding where stressed people find themselves more comfortable will be helpful to landscape planners. As well known, stress affects the performance of students. Thus, removing factors that increase stress and planning educational environments to help with this will be very important in assisting the students in succeeding (Thompson 2011; Beil and Hanes 2013; Tyrväinen et al., 2014; Gidlow et al. 2016).

Stress is difficult to define, but almost everybody frequently faces this psychological condition (Gadzella, 1991; Devlin et al., 2014). Lazarus and

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Folkman (1984) argue that it is the body's physiology or psychological extreme response to stimuli caused by external or internal factors that the individual perceives as threatening or harmful. Thus, it is not the individual or a particular event that causes the stress. The interaction of the person with a specific event and how s/he interprets it is the case that causes stress (Ulrich et al., 1991; Folkman and Moskowitz 2004; Hartig and Staats 2006; Barton and Pretty 2010; Tyrväinen et al., 2014; Nasar and Bokharaei, 2017).

Perrine and Lisle (1995) suggest that the new living conditions of university students and the resulting adjustment problems as the source of stress. When investigating the sources of stress for university students, Şahin (1998) focused on their long-term worries, the daily pressures they face, and the sadness they suffer in personal life. Folkman and Lazarus (1980) provide two main ways of fighting stress. First, one can focus on problem-solving where s/he directly acts on the problem and collects the necessary information to eliminate the problem that causes the stress. Second, s/he can try to control or eliminate the negative feelings that cause stress. Billings and Moos (1981) proposed a three-factor conceptualization of coping with stress. These included active cognitive, active behavioral, and avoidance approaches in a dynamic cognitive system that may consider several alternatives and focus on the positive options. The active behavioral process tries to find more about the problem by talking to friends and resorting to other information sources while the avoidance approach wants to focus on other things such as sports, eating, and the like so that s/he does not have to think about the problem. Stress conditions may get affected by gender. The stress conditions and levels show a gender variation or not have been the subject of many academic studies. Although many studies have indicated that females face more stress than males on average, the results are not conclusive (Cohen et al. 1983). In one such study conducted with university students, perceived stress did not show a variation among genders (Pedrelli et al., 2008). However, other studies show that perceived stress was higher for females (Hogan et al. 2002; Gentry et al. 2007). Yet, in another reflection of the university students investigating the relationship between eating habits, perceived stress, and depression in Germany, Bulgaria, and Poland, the researchers concluded that the perceived stress was higher for the females (Mikolajczyk et al. 2008). In another study in Sweden, the effects of landscape gardening on stress were investigated by Adevi and Lieberg 2012. The conclusion was that gardening could ease anxiety and benefit mental health (Hawkins et al. 2011; 2013; Cerwén et al., 2016).

Although the quality of landscaping can be measured easily in many ways independent of humans, it is also a fact that human interaction and perceptions play a role in the assessment. These perceptions can be characterized and measured in some ways (Palmer and Hoffman, 2001). Evaluation of landscape quality has become an essential component of

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regional planning and management and hence continues to be active research (Daniel and Meitner, 2001).

Many researchers have investigated this topic from some angles, including studies in urban and rural settings, natural and artificial landscaping, and various landscaping elements and parameters. Many researchers, interested in assessing the visual quality of landscaping, have used photographs of different scenes to obtain respondent input (Dearden 1984; Habron 1998; Bergen et al. 1995; Clay and Daniel 2000; de Val et al. 2006; Howley 2011; Thompson 2011; Özhanci et al. 2014). How humans evaluate and why is an essential interest area in environmental psychology. Researchers have developed various analytical and interpretative models (Hartig and Staats 2006). Studies on healthy environments typically point to the role of natural elements in reducing or curing stress (Parsons et al. 1998; Hartig and Staats 2006; Hartig et al. 2014; Bringslimark et al. 2009; Nordh et al. 2011; Roe et al. 2013). Hartig et al. (2003) have compared natural and rural environments by obtaining psychophysical measurements through repetitive blood pressure measurements in assessing stress reduction. The researchers have observed that respondents sitting in a room with a view had faster blood pressure reduction than other respondents seated in a room without an argument. Similarly, walks in nature provided more stress reduction than walks in urban environments. Moreover, nature walks have resulted in long-lasting stress reduction and anger reduction. Hartig and Staats (2006) studied university student subjects in two different periods, morning hours when students were less tired and afternoon hours when the students were more tired. The students preferred to walk in a wooded area over walking in the city center in both periods. The preference of the more tired students showed a stronger inclination in choosing to walk in the woods. They believed that the wooded area had a stronger refreshing and healing characteristic.

In academic studies, different methods are used to understand and describe the concepts in visual perception. For example; In Brisbane, Australia, digital media and image-sharing platforms such as Instagram have been used to determine which elements in pictures the population associates with happiness in the urban environment by showing photographs (Pringle and Guaralda, 2018). In a study conducted by Yamashita (2002) in Japan, they asked adults and children to take pictures in an area with a river view. Then, they analyzed the water perception of adults and children according to the photographic images taken. The relationship between green spaces and stress in urban areas was analyzed by showing 24 photographs of trees, flowers, birds, and water surfaces (Wang et al., 2019).

The following questions guide this research: * What is the effect does stress and unstress have on visual quality? *Which is the relationship between environmental psychology and stress? *What is the effect of visual perception on emotions in case of stress and unstress. *Which

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landscape features are stronger in the coexistence of stress-unstress and emotion?

Landscape architectures have considerable responsibility in planning and creating environments that enable people to live comfortably and less stressed. This study aims to determine what types of landscapes relax people when they are stressed. This is very important for the improvement of urban design.

RESEARCH METHODS

The effect of stress on visual perception was tried to be determined with photographs. It was explicitly preferred to use photographs because the "human brain constitutes cognitive models for various conditions and events to be able to adapt to the environment and lead a life based on experiences. Photographs seen in the information guide books and postcards are attractive points for citizens and visitors of the cities" (Bostancı and Oral, 2017). The selection of photographs taken by the researcher was by Prof. Dr. Terry Daniel (Emeritus Professor of Psychology and Renewable Natural Resources, University of Arizona). Full color photos were used by the author as a proxy for real landscapes. All photographs were taken on different dates. Previously, we interviewed this expert by e-mail, and the things which we should do about the visual perception of this study were informed. Accordingly, we requested similar photographs with the same photographic frame in the designed research. Images of natural, artificial, and cultural areas affecting the landscape design were preferred. In addition, we preferred the use of natural, artificial areas, crowded, quiet regions, urban and rural landscapes only in the environmental perception of students under exam stress. Mountains, lakes, sea, and forests were preferred for natural areas. In the water surface photograph, a natural still water surface is preferred. Other photographs have been selected as belonging to cultural-artificial places. It aims to transfer the obtained results to the physical plan decisions and guide the landscape design. The 22 landscape photos used in this study and the visual quality questions were prepared using a representation and rating scale judgment method (Daniel and Meitner 2001; Özhanci et al. 2014; Jiang et al. 2014; Polat and Akay, 2015; Wang et al., 2021). Using two different photos for the similar landscape character was due to increased perception and recovery memory. The 22 landscape scenes (Figure 1) are briefly described below:

In order to determine the stress status of the students, a stress test was conducted first. The stress test was repeated before each questionnaire application. The stress-related questions were related to the 14-question stress questionnaire developed by Cohen and Williamson in 1988. This instrument was translated into Turkish by Professor Zuhal Baltas, and together with Ercument, Yerlikaya has used it for a survey in 2006 (Baltas-Baltas 1997). Data for the stress assessment were used to calculate stress indices for each respondent at

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the time of the first session, just prior to taking an exam, and one month later when all exams had been completed.

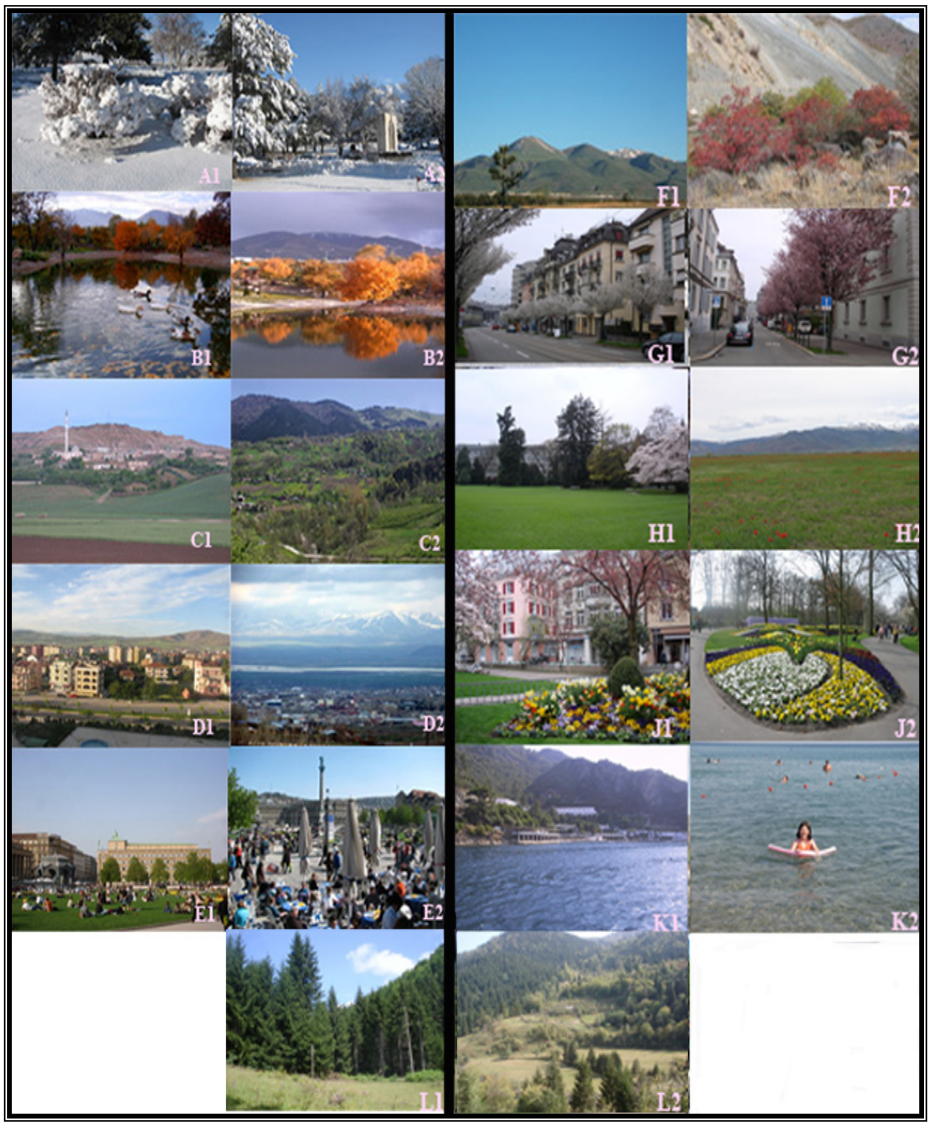

Figure 1. Photos used in visual quality assessment, paired by landscape type

I performed the study in two stages. In the first stage, we asked questions to measure the stress level. In the second stage, without allowing any time, the questions were asked about respondents' characteristics and visual quality perceptions and assessed by some short questions on the reasons affecting them. The respondent sample for this study consists of 34 voluntary Landscape Architecture senior students. As these students entered the classroom to take a difficult final exam, they were first administered a survey that lasted about 45 minutes. The students then went on to take the final exam. The second stage was carried out with the same 34 students. The same students who were preparing for the graduation event without the stress of the exam were collected. The students were seated in several row approximately two

meters in front of the screen. They were informed about the procedure and read through the instructions. I and our assistant chatted with them.

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Afterward, the questionnaire showing the same visuals was applied again.

Statistical analysis: Stress and unstress visual perceptions of 34 students were analyzed. The SPSS 17.00 statistical program was used for all data analyses. Perceptual ratings were analyzed using appropriate T-tests with subsequent multiple comparison procedures, Duncan's multiple comparison tests and Pearson Correlation Analysis. The Pearson analysis method can analyze linear correlation factors better. When studying the environmental factors of ammunition storage, Pearson correlation analysis can be used to find out the environmental factors which have significant linear correlation with ammunition reliability. In statistics, the Pearson correlation coefficient is used to measure the linear correlation between two variables. The closer the absolute value of the coefficient to 0 means that the linear correlation between the two variables is smaller, and the closer the absolute value of the coefficient to 1 means the higher the linear correlation between the two variables (Yang et al., 2021).

Different methods are used in visual quality analysis. Studies on visual perception with the internet include the opinions of many people. Researchers could do more surveys by traveling or with the internet. Also, colored printouts on paper can be shown to people (Polat and Akay, 2015; Bostancı and Oral, 2017; Wang et al., 2021). However, this method was chosen as it would be difficult to find a similar group as its reliability would be questionable. Comparing the answers of the same group will give more accurate results (Professor Terry C. Daniel).

Personal Characteristics of the Respondents

The sample consisted of Landscape Architecture senior students. All have been exposed to visual quality surveys of different objectives in the past. Thus, they have had no problems following instructions during this study. All participating students were in the 23-24 years age category. None had a physical handicap. Of the total respondents 34, 24 were females and 10 were males. The students in the sample relied on their families for financial support. Almost 50 percent of the respondents were satisfied with the allowance they received from the family, and more than 50 percent indicated that their families were financially sound.

Stress and Visual Perception Survey

Two survey instruments were used to determine the role of stress on visual perception. The first one was used to assess the stress level of the respondents. The questionnaire was initially prepared by Cohen (Cohen and Williamson 1988) and contained a 14-item scale with five Likert scale positions. This scale was translated into Turkish and was used for a survey by Baltas-Baltas (1997). After the questionnaire application, the students who experienced stress were interviewed again. It was stated that these students had problems in graduation.

The second questionnaire had three sections. The first section had 13 questions and focused on respondent demographics and other characteristics. The second section included six environmental factors that influence concentration on studies and other daily tasks. Finally, the last area focused on visual perceptions. It contained 22 photographs, two from each of 11 different types of locations, including sea, lake, urban, city center, winter, mountain and rural dwellings, city roads with trees, open green areas, seasonal flowers, and wooded areas. Photographs representing each type of location were selected with input from several knowledgeable people in this area. These 22 photographs were grouped based on landscape characteristics and projected randomly to the respondent sample as they participated in the survey. Respondents independently rated each scene on six dimensions (exciting, relaxing, happiness, stressful, irritating, and frightening) as each picture was presented using a 5-point scale (1-5). Color can be considered a determinant that affects the quality of the environment. For this reason, the color criterion was added to the study. It can have a high impact on visitors' emotions. Colors not only affect human activities but also affecting the description of a place status, psychologically (Babakhani2017). Different hues can elicit various feelings in people, and they are a significant component in the design of spaces. Therefore, in order to optimize the use of color and create responsive urban environments, it seems that it is important to know the features of the colors. Unconscious and careless use of color, as well as a lack of awareness of the effects of color on people, can result in spaces that are not responsive to people's needs, whereas the correct use of colors in urban spaces creates a sense of vivacity and calmness in citizens and improves their sense of place (Khalili, 2019).

The survey was completed first, just before a difficult final exam in June 2010. When the senior students from the department of landscape architecture entered the classroom to take the final exam, they were told to take a couple of surveys before the exam. Before starting the study, information about the surveys was given, and the procedure was described.

First, the “stress index” instrument was distributed to the students for their response. After collecting these forms, the second questionnaire was distributed immediately. Then, all 22 photographs representing the 11 landscape types were projected on the screen for preview. After that, the pictures were shown in a paired format (such as two lake scenes together, then two city scenes, etc.). The total time to complete the survey was 45 minutes. Three professionals organized the survey. One managed the projector, the second controlled the time (max 1 minute for each pair), and the third distributed the forms. One final question (which was not on the questionnaire) was asked for the group to respond. They were asked to note which landscape types among the 11 pairs made them feel relaxed/most liked and more stressed/least liked.

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The same procedure was followed to get responses from 34 students in the exact location about a month after the first survey. One difference, however, was that the students were not under the specific stress of an impending exam. Since the students were asked to write down their names in the survey instruments (the students were promised confidentiality), they could pair and compare their responses under the first (stress) test and second conditions.

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RESULTS AND DISCUSSION

Questionnaires with 34 students were analyzed. The effect of stress on visual perception was investigated. It is very important for planners and landscape designers since we understand that stress levels are effective on visual perception. The visual characteristics of landscape elements influence cognition and then affect cognitive preference. The analysis results of the surveys are given below.

Exam Stress, Daily Activities, and Environmental Factors

The majority of the students reported that they prefer to study one day before an exam (58.8 %), while only a tiny proportion reported studying continuously (17.6 %). When asked how they generally feel just before an examination (5-category scale extending from "always feel comfortable" to "always feel stressed"), 64.7% indicated that they sometimes or always feel stressed and worried (41.2% and 23.5%, respectively) while 23.5% reported that they sometimes or always felt comfortable (17.6% and 5.9%, respectively). Only 11.8% reported that they were unaffected by the anticipation of examinations.

The results from the second section of the questionnaire indicated that a typical student in the group watches at most one hour of television (29.4 %) and spends an hour on the Internet (29.4 %) in a day. S/he also studies for 1 hour (29.4 %) and reads a book for one hour (44.1 %) a day. Most of the students came from middle-income or higher-income families and

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reported being pretty happy with their allowances. These figures may indicate that the students are unstressed on a typical day. These observations are consistent with the higher stress scores for the students on the first test (prior to the exam) versus the second test (1 month later, with no impending exam).

The respondents were asked to rank the importance of out-of-school activities. The results indicated that the use of the Internet received the top ranking in their lives (2.82 mean rating), followed by studying (2.16), watching television (1.82), and reading books/magazines (1.33).

A large majority of the students (68 %) of the students indicated that their academic success is very much affected (38.2 %) or somewhat affected (29.4 %) by environmental factors. Only 2.9 percent indicated that they were not affected by the environment. They also indicated in response to the more general question that the physical attributes of their study area (noisy, small, cold, hot) affect their performance (71.7 %). Respondents reported that when they are studying, they are affected by the view that they are facing (29.4 % reported being affected "very much" and 52 % affected "somewhat" by their view. Only 2.9 % reported not being affected by the view when studying (Figure 2). 41.2 % indicated that they sometimes feel stressed and worried when we asked how they felt before the examination, while 5.9 % always felt comfortable (Table 1).

Perceptual Assessment

Relationships among the six emotion scales used to rate the 22 scenes just before a final exam (Stressed condition), and after all, exams had been concluded (Unstressed condition) were assessed using correlations (Table 2). Correlations among the scales were generally very high, with absolute values ranging from a low of 0.75 to a high of 0.97.

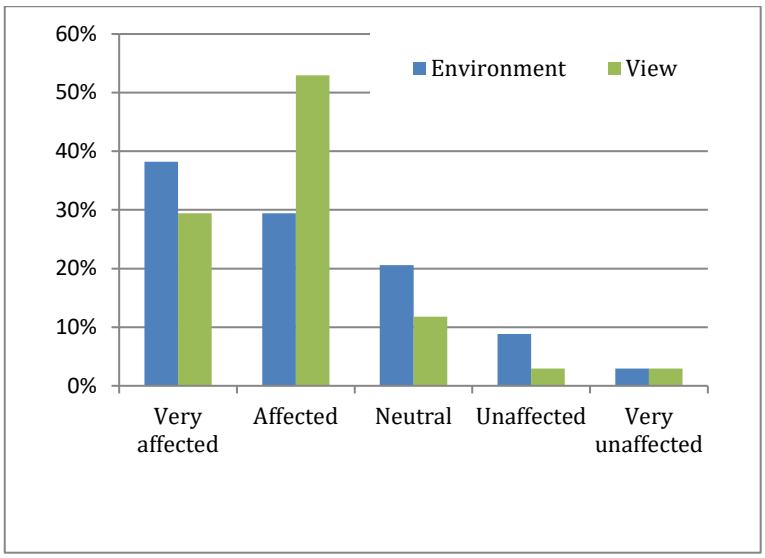

Figure 2. Reported effects of environment and views on student's academic performance

Of course, the correlations between positive (exciting, relaxing, happiness) and negative (stressed, irritating, frightening) scales are all

negative but still high in absolute terms. Most of the between-scale correlations are close to +/- 0.90, with the negative correlations consistently indicating the difference between negative and positive emotions.

Table 1. Psychological Status of the Students before Examinations

	Frequency	Percent
always feel comfortable	2	5.9
sometimes feel comfortable	6	17.6
not effect	4	11.8
sometimes stressed and worried	14	41.2
always stressed and worried	8	23.5
Total	34	100.0

Correlations between ratings under Stressed X Unstressed conditions for each emotion scale were also very high, as shown in Table 3.

Table 2. Inter-correlations among the six emotion scales as rated for the 22 scenes under Stressed (top panel) and Unstressed (bottom panel) conditions.

Stressed	***Exciting***	***Relaxing***	***Happiness***	***Stressful***	***Irritating***	***Frightening***
Exciting	0.89	0.76	0.86	-0.79	-0.88	-0.88
Relaxing		0.78	0.95	-0.79	-0.86	-0.82
Happiness			0.85	-0.85	-0.92	-0.74
Stressful				-0.90	-0.90	-0.85
Irritating					0.94	0.77
Frightening						0.85
Unstressed	Exciting	Relaxing	Happiness	Stressful	Irritating	Frightening
Exciting	0.85	0.77	0.83	-0.75	-0.83	-0.85
Relaxing		0.91	0.94	-0.81	-0.89	-0.76
Happiness			0.94	-0.93	-0.97	-0.81
Stressful				-0.87	-0.91	-0.85
Irritating					0.95	0.80
Frightening						0.85

Table 3. Correlations between Stressed and Unstressed conditions for each of the 6 emotion scales.

	Exciting	***Relaxing***	***Happiness***	***Stressful***	***Irritating***	***Frightening***
r (SxUns)	**0.91**	**0.93**	**0.96**	**0.91**	**0.96**	**0.92**

The pearson correlation analysis overall indicates that the ratings of the 22 scenes can primarily be distinguished between "positive" emotions and "negative" emotions. By far, the most significant determiner of emotion ratings was the scenes themselves. Some differences between Stressed and Unstressed conditions for specific scenes and emotion scales were observed by closely examining the relevant scatter plots. Appropriate T-tests also identified significant higher-order interaction effects, suggesting differences in stress conditions. The mean ratings for each scene (organized by the 11

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landscape scene types) are presented in Table 4 for both (Stressed) and (Unstressed) conditions.

Table 4. Emotion ratings for the 22 scenes representing 11 landscape types under Stressed (pre-exam, upper mean in each cell) and Unstressed (post-exams, lower mean) conditions.

Landscape scene Type		Pictures		Colorful	Exciting	Relaxing	*Happiness*	Stressful	Irritating	Frightening	Correlation Scene 1x2
Winter scene	A1		**Stressed**	2.15	2.45	2.26	2.44	3.09	3.15	2.56	
			Unstressed	2.21	2.70	2.58	2.45	2.88	3.12	2.59	
	A2		**Stressed**	2.27	2.36	2.36	2.79	2.82	3.12	2.50	.865
			Unstressed	2.41	2.85	2.88	2.67	2.62	2.85	2.41	.551
Lake Scene	B1		**Stressed**	3.88	3.85	3.79	4.09	1.88	1.66	1.88	
			Unstressed	3.59	3.38	4.26	3.79	1.67	1.48	1.50	
	B2		**Stressed**	4.18	3.88	4.65	4.27	1.85	1.58	1.65	.980
			Unstressed	3.85	3.85	4.41	3.97	1.48	1.32	1.33	.995
Rural/Village scene	C1		**Stressed**	1.59	1.75	1.67	1.67	3.24	3.71	3.29	
			Unstressed	1.29	1.44	1.33	1.30	3.82	4.35	3.29	
	C2		**Stressed**	3.12	2.94	3.53	3.18	2.52	2.30	2.28	-.925
			Unstressed	3.29	2.85	3.53	3.03	2.18	2.06	1.82	-.893
Urban scene	D1		**Stressed**	2.94	2.52	2.61	2.41	3.12	3.06	2.39	
			Unstressed	2.85	1.91	2.27	2.18	2.76	2.94	2.24	
	D2		**Stressed**	2.88	2.75	2.85	2.88	2.94	2.61	2.30	.352
			Unstressed	2.74	2.71	2.85	2.38	2.35	2.67	2.24	.082
City cent			**Stressed**	4.00	3.82	3.85	4.00	2.36	2.09	1.66	

	E1		**Unstressed**	4.01	3.68	3.91	3.59	2.18	1.91	1.45	
	E2		**Stressed**	3.48	3.16	2.73	2.97	3.03	2.97	2.06	.620
			Unstressed	3.15	2.79	2.42	2.79	3.33	3.12	2.09	.122
Mountain scene	**F1**		**Stressed**	2.88	2.6	4.50	2.85	2.34	2.28	2.61	
			Unstressed	2.41	2.91	3.62	2.88	2.00	1.97	2.00	
	F2		**Stressed**	3.21	2.66	2.39	2.36	2.61	2.79	2.85	-.395
			Unstressed	3.50	2.84	2.74	2.59	2.53	2.59	2.44	.177
Street with trees	**G1**		**Stressed**	2.91	2.91	3.18	2.85	2.74	2.47	2.06	
			Unstressed	2.91	2.82	3.24	3.00	2.70	2.44	2.09	
	G2		**Stressed**	3.59	3.09	3.39	3.12	2.24	2.26	2.06	.834
			Unstressed	3.76	3.38	3.65	3.29	2.42	2.21	1.79	.910
Large green areas	**H1**		**Stressed**	3.97	3.47	4.38	3.79	1.36	1.33	1.25	
			Unstressed	4.15	3.71	4.47	4.00	1.91	1.52	1.69	
	H2		**Stressed**	3.09	2.94	3.76	3.21	1.79	2.18	2.24	.955
			Unstressed	3.44	3.09	3.97	3.51	2.26	1.88	1.85	.955
Seasonal plants	**J1**		**Stressed**	4.65	3.85	3.89	3.88	1.58	1.63	1.22	
			Unstressed	4.62	3.88	3.94	4.06	1.94	1.66	1.34	
	J2		**Stressed**	4.53	4.06	4.00	3.88	3.30	1.81	1.34	.995
			Unstressed	4.65	3.76	4.03	3.65	1.61	1.47	1.28	.995
Sea [illegible]	**K1**		**Stressed**	4.06	4.50	4.62	4.47	1.56	1.56	1.50	

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			**Unstressed**	3.94	4.15	4.65	4.44	1.64	1.52	1.61	
	K2		**Stressed**	3.76	3.94	3.71	3.97	2.03	1.91	1.88	.991
			Unstressed	3.44	3.41	3.85	4.03	1.73	2.00	1.61	.984
Forest area	**L1**		**Stressed**	3.59	3.62	3.56	3.36	2.29	2.24	2.50	
			Unstressed	3.41	3.68	3.74	3.29	2.12	1.85	2.58	
	L2		**Stressed**	2.91	3.24	3.21	2.82	2.15	2.29	2.39	.957
			Unstressed	3.09	3.03	3.41	2.85	2.36	2.42	2.61	.937
Mean ($\overline{X}$)			**Stressed**	**3.35**	**3.19**	**3.40**	**3.23**	**2.32**	**2.30**	**2.11**	
Mean ($\overline{X}$)			**Unstressed**	**3.29**	**3.11**	**3.43**	**3.14**	**2.23**	**2.25**	**1.98**	
Landscape Type		**Scene**		**Colorful**	**Exciting**	**Relaxing**	***Happiness***	**Stressful**	**Irritating**	**Frightening**	**Correlation Scene 1x2**

The mean scores for each emotion scale aggregated over the 22 scenes, shown across the bottom of the table above for Stressed and Unstressed conditions, are depicted in the graph in Figure 3 below. The positive emotions, exciting, relaxing, and happiness, we have all given mean ratings more significant than 3.0 under both stress conditions and negative emotions. Stressful, Irritating and frightening all received mean ratings lower than 2.50 under both stress conditions. The substantial similarity in the pattern of ratings for Stressed and Unstressed conditions is evident in Figure 3.

T-tests and Duncan's multiple comparison tests were used to assess the effects of stress conditions on emotional ratings of the landscape scenes.

The results indicated that the students under stress rated higher positive emotion scales for photos that included water surfaces, open green urban areas, and seasonal flowering plants. However, the negative emotions were more dominant against the other photos. The statistical results indicated that stress significantly affected landscape ratings as the main effect (M Stressed = 3.24; M Unstressed = 3.82, $p<0.01$). Duncan's multiple comparison test also indicated that positive emotions had higher scores, but negative emotions had lower scores (Table 5, 6, and 7). These results are a bit complicated because the Stress condition, with few exceptions, gave higher ratings on all emotion scales, whether positive or

negative, suggesting that stressed conditions experienced higher emotionality overall compared to the unstressed condition. Two-way interactions indicated a significant relationship between stressed versus un-stressed conditions and scenes. Also, it is understood that there is an essential relation between scenes and emotional changes in both conditions. The quad interaction proved to be insignificant.

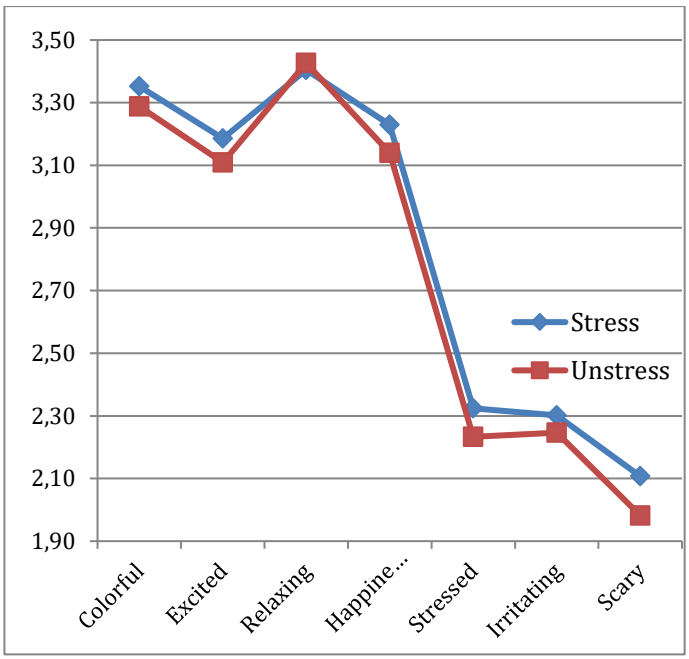

Figure 3. The mean scores were given to the photos under stressed and unstressed conditions

A Paired Samples Test was performed to determine the differences due to the students' stress level according to the different landscape scenes. Students' attitudes towards the same photograph were measured at two different times in which students were more and less stressed. Scenes displaying significant differences are listed in the table below. According to the analysis results concerning the scenes listed in table 4, students demonstrate different attitudes towards some emotions depending on their stress level. For example, the sense of relaxation depended on the stress level of repliers for the A2 photograph ($p < 0.05$); relaxation ratings were significantly lower when the responders were stressed (Table 5).

On the other hand, a sense of happiness, stress, and irritation depended on the stress level of repliers for the C1 photograph ($p < 0.05$). When the respondents are stressed, the sense of happiness is significantly decreased, and stressfulness and irritation are significantly increased. Also, students' sense of excitement displays significant differences at ($p<0,05$) for the K1 and K2 scenes. It was seen that when respondents were stressed, the sense of excitement significantly decreased. The mean differences, stressed minus unstressed, for each respondent per scene per emotion scale make up the numerator for the reported t values. The great majority of the comparisons are consistent with stressed conditions giving higher ratings than unstressed for almost

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all emotion scales, except for C1, which shows a pattern of the stressed condition giving lower ratings (3.42 for stressed and 3.82 for unstressed conditions). The magnitude of differences between stressed and unstressed conditions for other landscape scenes are evident in Table 5. In general, ratings for the negative emotion scales were substantially lower than for the positive emotion scales overall scenes tested. According to the results of the analyses, it can be said that when the students were stressed, their positive attitudes decreased while the negative ones increased.

Table 5. Significant differences in students' attitudes towards scenes: stressed minus unstressed.

Landscape Scene Type (LST)	t	df	Sign (2-tailed)	Mean Square	
				Unstress	Stress
A2 (LST)					
Relaxing	2.126	31	.042	2.8824	2.2941
C1 (LST)					
Happiness	2.431	32	0.021	1.6667	1.3030
Stressful	-2.458	33	0.019	3.2353	3.8235
Irritating	-2.427	33	0.021	3.7059	4.3529
D1 (LST)					
Exciting	3.304	32	0.002	2.7500	2.7188
D2 (LST)					
Happiness	2.153	32	0.039	2.8824	2.3824
Stressful	2.291	32	0.029	2.3333	2.9394
Irritating	2.810	32	0.008	1.9091	2.6061
E1 (LST)					
Happiness	2.508	33	0.017	4.000	3.5882
E2 (LST)					
Exciting	2.368	31	0.024	2.6252	2.9053
F1 (LST)					
Colorful	3.668	33	0.001	2.4118	2.8824
Frightening	2.899	31	0.007	1.9355	2.6129
H1 (LST)					
Stressful	2.408	32	0.022	1.3636	1.9091
Frightening	2.308	31	0.028	1.2500	1.6875
H2 (LST)					
Exciting	2.908	32	0.044	3.4412	3.0882
J1 (LST)					
Stressful	2.171	32	0.037	1.5758	1.9394
J2 (LST)					
Irritating	2.156	31	0.039	1.3438	1.4688
K1 (LST)					
Exciting	2.425	33	0.021	4.5000	4.1471
K2 (LST)					
Exciting	2.547	33	0.016	3.9412	3.4118

Table 6. Duncan multiple comparisons showing significantly different subsets of landscape types based on emotion ratings averaged over stress conditions and emotion scales

Landscape type	N	Subset			
		1	2	3	4
Rural /Village Landscape type	937	2.60d			
Winter	941	2.62d			
Urban	935	2.62d			
Mountain	932	2.67d			
Street with trees	941		2.81c		
Large green areas	945		2.87bc	2.87bc	
Forest area	940		2.88bc	2.88bc	
City center with large squares	935			2.96ab	2.96ab
Lake	937				2.99a
Seasonal plants	940				3.02a
Sea	939				3.06a
Sig.		.146	.152	.061	.083

Table 7. Duncan multiple comparisons distinguishing different subsets of emotion scales based on ratings averaged over scenes/landscape types and stress conditions.

Emotions Perceptions	N	Subset				
		1	2	3	4	5
Scary	1457	2.05e				
Irritating	1466		2.29d			
Stressed	1471		2.32d			
Excited	1476			3.17c		
Happiness	1482			3.20c		
Colorful	1487				3.33b	
Relaxing	1483					3.41a
Sig.		1.000	.339	.384	1.000	1.000

Pearson Correlation Analysis

Scatter plots and associated regression equations relating Stressed x Unstressed conditions over the 22 scenes for each emotion scale are shown in Figure 4. Overall the two stress conditions largely agreed in their ratings on each scale. There were some deviations from this pattern for some scales where some individual scenes did show up as outliers. These deviations were captured in the factor analysis and reflected in the factor loadings for specific scene x emotion scale combinations. Displays the values of the X-Axis independent variable and the Y-Axis dependent variable. The coefficient of determination (R2) are close to 1, which shows that the correlation is statistically significant, and the model performed perfectly.

The results indicated that the students gave an even lower perception of the negative photos with scary stress. In both cases, stressed or unstressed, the students scored higher than 3.4 for convenience perception. On the other hand, it was obtained that the students gave

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lower perception for the landscape photos with good visual perception and worse for the landscape photos with wrong visual perception when they were under stress. As a matter of fact, this situation was also stated in different studies (Maas et al. 2006; Mitchell and Popham 2007; Barton and Pretty 2010; Roe et al. 2013; Xue et al., 2017).

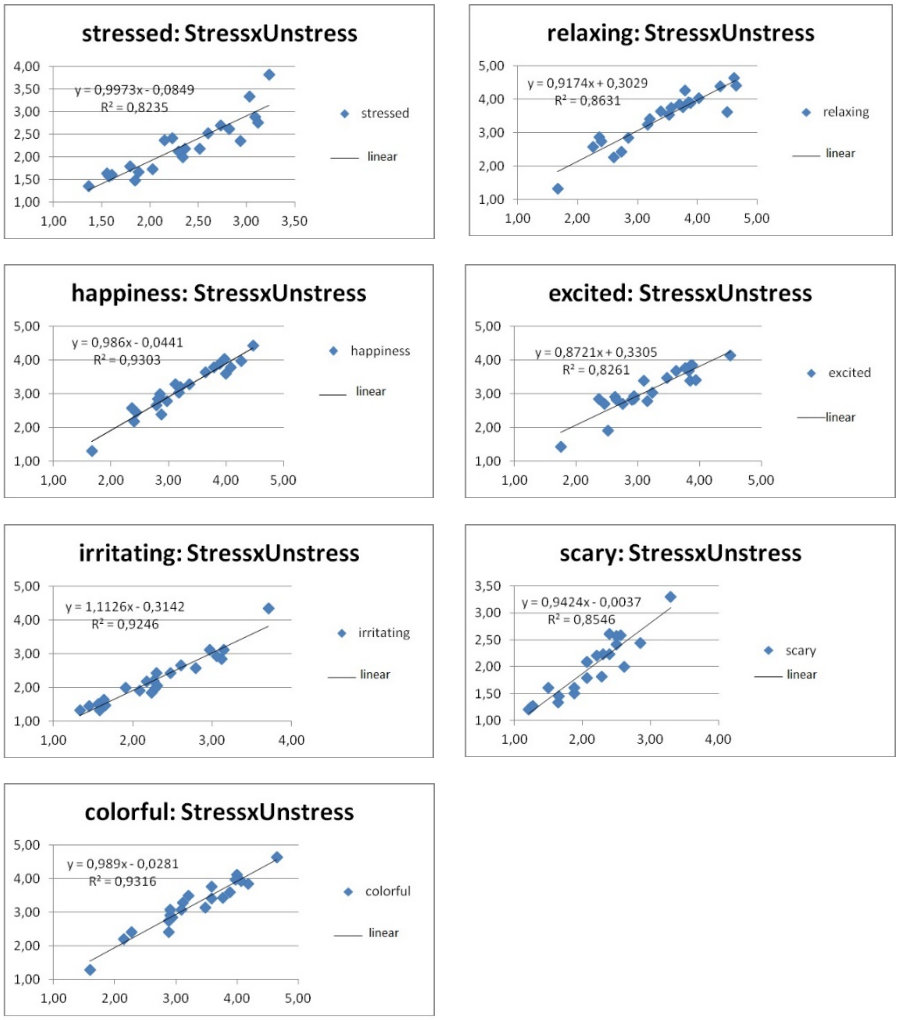

Figure 4. Scatter plots and the regression equations for correlations between rating under stressed and unstressed conditions

The respondents indicated that they did not like the primitive rural photograph before the exam. Their dislike for this picture increased after the exam. The sea and lake photographs were among the best-liked photographs (Perhaps this is because of the craving of the young population for the sea and the beaches). In visual quality evaluation, it has been stated that it always makes a positive contribution to water-related studies. Understanding these aspects of people's perception of the on-water landscape facilitates the management and development of water tourism in cities and improves urban planning and management (Cao et al., 2021; Li et al., 2021).

A rural village photograph (C1) was chosen as disturbing with a score of 4.35. Students rated the mountain landscape photo without trees (F1) as frightening (Table 5). The findings of this study's link between significant impact factors and visual quality scores are consistent with

those of prior studies.: the visual quality of the environment is reduced by unforested mountain structures and harsh village landscapes. (Saeedi and Dabbagh, 2021). Also, in this study, students' sense of excitement displays significant differences at ($p<0,05$) for the sea and lake scenes. It was seen that when respondents were stressed, the sense of excitement significantly decreased. For other natural mountain landscape scenes, the size of the differences between stressed and unstressed conditions was found to be statistically significant ($p<0,05$). Human factors could be predictors of the sense of safety; people with deeper connections to nature may be expected to feel safer (Xue et al., 2017; Li et al., 2021). It was determined that forest areas representing natural areas were ineffective. L1 and L2 forest photograph were insignificant in the stress level of the respondents ($p < 0.05$). Whereas, in terms of psychological effects, visiting forests has been found to contribute to mitigating psychological symptoms, such as anxiety, tension, nervousness, and fatigue, and improving mood states and cognitive function (Korpela et al., 2017). This may be because the selected photos are dark. A more impressive photo should have been chosen. The light of the photo is important in visual end environmental perception (Nasar and Bokharaei, 2017).

Students rated the photograph of seasonal plants (J1-J2) with the highest score above 4.5 in both stressed and unstressed states (Table 4). This was the photo with the most colorful flowers among the pictures. In the survey, it was seen that they are affected by the color. Therefore, it could be said that colors have a combination of visual and biological functions on human and these effects should be considered in cities where humans live. Most of existing literature demonstrates that natural elements are a powerful and positive predictor of aesthetic quality. For example, trees or flowers are considered to be one of the most important landscape elements and attract people's attention (Nordh and Østby, 2013; Khalili, 2019; Saeedi and Dabbagh, 2021; Wang et al., 2021).

While the students were stressed, they gave the highest score of 4.35 to large green areas (H1) as a relaxing effect in visual quality evaluation. The results indicated that perceived large grass richness is positively associated with negative mood states. In line with these findings, many studies had confirmed that the relaxation effect can also be achieved by exposure to large green areas. Like urban green spaces, the presence of grass in the landscape has been widely thought to have a restorative effect. It is a widely held view that urban green space which can contribute to the mental health of urban residents, but the link between the landscape composition (Vert et al., 2020; Ha et al., 2022).

Points awarded to natural field photos are affected by the stress (Table 4). In the analysis results, the design with the living comfort of humans and natural arrangements reduces stress since the people gave the highest scores to the lake, vast green areas, and forest photos. Thus, similar results were obtained from the studies made in this field. Landscape, gardens, open space areas, color, music, and plant areas

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decrease the pressure on inhabitants in urban places. There are many studies about the decreasing effects of natural places on stress. These places are beneficial for all age groups relieving stresses (Kaplan and Kaplan 1989; Ulrich, 2001; Xue et al., 2017). There is an essential need for landscape design to reduce people's pressure and urban stress. Natural landscape photos affect human physiology (Parsons and Daniel 2002). The artificial atmosphere in urban areas harms human physiology. Enough attention should be given to determining and reducing these adverse effects. For instance, in Millennium Park (Chicago, USA), a collection of natural plants exists and modern design. People in this area get a positive perception because of neutrality. So this is an example where landscape design affects human physiology. As an example, settings including trees, grass, and open spaces are stated in the literature as the solution to reducing physiological stress (Hartig et al. 2003; Ulrich et al. 1991; Van den Berg et al. 2007; Beil and Hanes 2013; Jiang et al. 2014; Wang et al., 2021).

The results of the pearson correlation analysis showed that stressed students rated higher positive emotion scales for photographs that included water surfaces (0.985), light green urban areas (0.955), and seasonal flowering plants (0.955). As a matter of fact, in the analyses made with visual photographs, it has been determined that the brightly colored flowers used in the green areas in urban spaces affect people more positively (Hoyle et al. 2017; Wang, et al., 2019). Visual quality assessments of photos showed that natural components such as grass, trees and bushes were predictors of restoration likelihood. Similarly, the photograph with grass, trees and flowers received the highest score in the visual assessment (Nordh and Østby, 2013).

During the about 20 years of teaching, the researchers observed that the students working on landscape projects had performed better when they worked in "good" classrooms with windows, appropriate design desks and chairs, and proper lighting. The reverse was true for students who worked in "bad" classrooms, usually in basements with low ceilings and inappropriate lighting. This might be another indication that people are affected by the environment. Thus, landscape architects should consider human expectations and analyze them well. Thus, they can minimize the undesirable potential impact at a later time.

CONCLUSION

As a result, it has been shown that stressful conditions affect perception and stressful conditions generally give higher emotionality than non-stressed ones. In general, in both conditions, students gave the highest scores as a convenience and the lowest score as frightening. Overall, it was concluded that when students are under stress, they have a superficial perception of the photographs. However, when they are relaxed, they perceive the pictures in more detail and study them more.

The t-test and Duncan's multiple comparison test results indicated that stress affected visual perception. Therefore, every type of design in

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urban areas should be analyzed more in-depth. The water surfaces, seasonal flowering plants, and vast areas within urban areas which are comfortable and happy places and encourage positive emotions in people should be increased. Mainly it should be considered in University campuses intensively used by the students. When the students are under stress, they perceive the visual quality of the picture as low. They identify the pictures as giving bad feelings worse than usual. These types of scenery should be considered to reduce the impact of stress to adopt landscape preferences and the perceptions of all concerned and to aid decision-making in landscape planning. Campus administrators, landscape architects, and planners should pay their efforts to stress improvement and emotional convenience when planning or renovating campus landscape.

In the analysis results, the design with the living comfort of humans and natural arrangements reduces stress since the people gave the highest scores to the lake, vast green areas, and forest photos. This study indicated that landscape architectures should consider water surfaces, colorful plants, and open green areas in design to reduce stress on people in intensive urban and high-pressure areas.

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REFERENCES

Adevi, A. A., & Lieberg, M. (2012). Stress rehabilitation through garden therapy: A caregiver perspective on factors considered most essential to the recovery process. *Urban forestry & urban greening*, *11*(1), 51-58.

Baltas-Baltas, Education. (1997). Counseling Center. Team Building and Development Seminar Manual Book. *Character Color*: İstanbul.

Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental science & technology*, *44*(10), 3947-3955.

Babakhani, R. (2017). Color and light in architecture and its effects on spirits of space users in a psychological view. *Journal of Architectural Engineering Technology*, *6*(1).

Beil, K., & Hanes, D. (2013). The influence of urban natural and built environments on physiological and psychological measures of stress—A pilot

DOI: 10.15320/ICONARP.2022.193

study. *International journal of environmental research and public health*, *10*(4), 1250-1267.

Bergen, S. D., Ulbricht, C. A., Fridley, J. L., & Ganter, M. A. (1995). The validity of computer-generated graphic images of forest landscape. *Journal of Environmental Psychology*, *15*(2), 135-146.

Billings, A. G., & Moos, R. H. (1981). The role of coping responses and social resources in attenuating the stress of life events. *Journal of behavioral medicine*, *4*(2), 139-157.

Bringslimark, T., Hartig, T., & Patil, G. G. (2009). The psychological benefits of indoor plants: A critical review of the experimental literature. *Journal of Environmental Psychology*, *29*(4), 422-433.

Bostancı, S. H., & Oral, M. (2017). Experimental approach on the cognitive perception of historical urban skyline. *ICONARP International Journal of Architecture and Planning*, *5*, 45-59.

Byrne, J., Sipe, N., & Searle, G. (2010). Green around the gills? The challenge of density for urban greenspace planning in SEQ. *Australian Planner*, *47*(3), 162-177.

Carlson, A. (2010). Contemporary environmental aesthetics and the requirements of environmentalism. *Environmental Values*, *19*(3), 289-314.

Cao, J., Wang, J., Wu, X., Ding, C., Wang, W., & Wang, H. (2020). Post‐evaluation of urban river open space landscape restoration: a case study of the eastern part of the Inner Qinhuai River in Nanjing. *Journal Of Nanjıng Forestry Unıversıty*, *44*(3), 195.

Cerwén, G., Pedersen, E., & Pálsdóttir, A. M. (2016). The role of soundscape in nature-based rehabilitation: A patient perspective. *International journal of environmental research and public health*, *13*(12), 1229.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of health and social behavior*, 385-396.

Cohen, S. (1988). Perceived stress in a probability sample of the United States.

Clay, G. R., & Daniel, T. C. (2000). Scenic landscape assessment: the effects of land management jurisdiction on public perception of scenic beauty. *Landscape and urban planning*, *49*(1-2), 1-13.

Daniel, T. C., & Meitner, M. M. (2001). Representational validity of landscape visualizations: the effects of graphical realism on perceived scenic beauty of forest vistas. *Journal of environmental psychology*, *21*(1), 61-72.

Dearden, P. (1984). Factors influencing landscape preferences: an empirical investigation. *Landscape planning*, *11*(4), 293-306.

Devlin, A. S., Nasar, J. L., & Cubukcu, E. (2014). Students' impressions of psychotherapists' offices: cross-cultural comparisons. *Environment and Behavior*, *46*(8), 946-971.

Folkman, S., & Tedlie, J. (2004). Coping: Pitfalls and promise. *Annual review of psychology*, *55*, 745.

Folkman, S., & Lazarus, R. S. (1980). An analysis of coping in a middle-aged community sample. *Journal of health and social behavior*, 219-239.

de Val, G. D. L. F., Atauri, J. A., & de Lucio, J. V. (2006). Relationship between landscape visual attributes and spatial pattern indices: A test study in Mediterranean-climate landscapes. *Landscape and urban planning*, *77*(4), 393-407.

Gadzella, BM., (1991). Student-life Stress Inventory. *Commerce*. TX: Copyright.

Grahn, P., & Stigsdotter, U. A. (2003). Landscape planning and stress. *Urban forestry & urban greening*, *2*(1), 1-18.

Gentry, L. A., Chung, J. J., Aung, N., Keller, S., Heinrich, K. M., & Maddock, J. E. (2007). Gender differences in stress and coping among adults living in Hawaii. *Californian journal of health promotion*, *5*(2), 89-102.

Gidlow, C. J., Jones, M. V., Hurst, G., Masterson, D., Clark-Carter, D., Tarvainen, M. P., ... & Nieuwenhuijsen, M. (2016). Where to put your best foot forward: Psycho-physiological responses to walking in natural and urban environments. *Journal of environmental psychology*, *45*, 22-29.

Ha, J., Kim, H. J., & With, K. A. (2022). Urban green space alone is not enough: A landscape analysis linking the spatial distribution of urban green space to mental health in the city of Chicago. *Landscape and Urban Planning*, *218*, 104309.

Habron, D. (1998). Visual perception of wild land in Scotland. *Landscape and urban planning*, *42*(1), 45-56.

Hartig, T., & Staats, H. (2006). The need for psychological restoration as a determinant of environmental preferences. *Journal of environmental psychology*, *26*(3), 215-226.

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Gärling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of environmental psychology*, *23*(2), 109-123.

Hartig, T., Mitchell, R., De Vries, S., & Frumkin, H. (2014). Nature and health. *Annual review of public health*, *35*, 207-228.

Hawkins, J. L., Mercer, J., Thirlaway, K. J., & Clayton, D. A. (2013). "Doing" gardening and "being" at the allotment site: Exploring the benefits of allotment gardening for stress reduction and healthy aging. *Ecopsychology*, *5*(2), 110-125.

Hawkins, J. L., Thirlaway, K. J., Backx, K., & Clayton, D. A. (2011). Allotment gardening and other leisure activities for stress reduction and healthy aging. *HortTechnology*, *21*(5), 577-585.

Hoyle, H., Hitchmough, J., & Jorgensen, A. (2017). All about the 'wow factor'? The relationships between aesthetics, restorative effect and perceived biodiversity in designed urban planting. *Landscape and urban planning*, *164*, 109-123.

Hogan, J. M., Carlson, J. G., & Dua, J. (2002). Stressors and stress reactions among university personnel. *International Journal of stress management*, *9*(4), 289-310.

Howley, P. (2011). Landscape aesthetics: Assessing the general publics' preferences towards rural landscapes. *Ecological Economics*, *72*, 161-169.

Jahani, A., Allahverdi, S., Saffariha, M., Alitavoli, A., & Ghiyasi, S. (2022). Environmental modeling of landscape aesthetic value in natural urban parks using artificial neural network technique. *Modeling Earth Systems and Environment*, *8*(1), 163-172.

Jiang, B., Chang, C. Y., & Sullivan, W. C. (2014). A dose of nature: Tree cover, stress reduction, and gender differences. *Landscape and Urban Planning*, *132*, 26-36.

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge university press.

Khalili, R. (2019). The role of color in sense of place. Tajrish and Hassan Abad Squares, Tehran.

Korpela, K., Savonen, E. M., Anttila, S., Pasanen, T., & Ratcliffe, E. (2017). Enhancing wellbeing with psychological tasks along forest trails. *Urban Forestry & Urban Greening*, *26*, 25-30.

DOI: 10.15320/ICONARP.2022.193

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Li, X., Zhang, Y., Li, D., Xu, Y., & Brown, R. D. (2022). Ameliorating cold stress in a hot climate: Effect of Winter Storm Uri on residents of subsidized housing neighborhoods. *Building and Environment*, *209*, 108646.

Li, X., Li, L., Wang, X., Lin, Q., Wu, D., Dong, Y., & Han, S. (2021). Visual quality evaluation model of an urban river landscape based on random forest. *Ecological Indicators*, *133*, 108381.

Maas, J., Verheij, R. A., Groenewegen, P. P., De Vries, S., & Spreeuwenberg, P. (2006). Green space, urbanity, and health: how strong is the relation?. *Journal of epidemiology & community health*, *60*(7), 587-592.

Mitchell, R., & Popham, F. (2007). Greenspace, urbanity and health: relationships in England. *Journal of Epidemiology & Community Health*, *61*(8), 681-683.

Mikolajczyk, R. T., Maxwell, A. E., Naydenova, V., Meier, S., & El Ansari, W. (2008). Depressive symptoms and perceived burdens related to being a student: Survey in three European countries. *Clinical Practice and Epidemiology in Mental Health*, *4*(1), 1-9.

Nasar, J.L.,&Bokharaei,S. (2017). Lighting modes and their effects on impressions of public squares. *Journal of Environmental Psychology*, *49*, 96-105.

Nordh, H., & Østby, K. (2013). Pocket parks for people–A study of park design and use. *Urban forestry & urban greening*, *12*(1), 12-17.

Nordh, H., Alalouch, C., & Hartig, T. (2011). Assessing restorative components of small urban parks using conjoint methodology. *Urban forestry & urban greening*, *10*(2), 95-103.

Özhanci, E., Yilmaz, H., & Yilmaz, S. (2014). Safety perceptions of different plant designs in pedestrian and car streets. *Urban design international*, *19*(4), 303-310.

Palmer, J. F., & Hoffman, R. E. (2001). Rating reliability and representation validity in scenic landscape assessments. *Landscape and urban planning*, *54*(1-4), 149-161.

Parsons, R., Tassinary, L. G., Ulrich, R. S., Hebl, M. R., & Grossman-Alexander, M. (1998). The view from the road: Implications for stress recovery and immunization. *Journal of environmental psychology*, *18*(2), 113-140.

Parsons, R., & Daniel, T. C. (2002). Good looking: in defense of scenic landscape aesthetics. *Landscape and Urban Planning*, *60*(1), 43-56.

Pedrelli, P., Feldman, G. C., Vorono, S., Fava, M., & Petersen, T. (2008). Dysfunctional attitudes and perceived stress predict depressive symptoms severity following antidepressant treatment in patients with chronic depression. *Psychiatry Research*, *161*(3), 302-308.

Perrine, R. M., Lisle, J., & Tucker, D. L. (1995). Effects of a syllabus offer of help, student age, and class size on college students' willingness to seek support from faculty. *The Journal of Experimental Education*, *64*(1), 41-52.

Polat, A. T., & Akay, A. (2015). Relationships between the visual preferences of urban recreation area users and various landscape design elements. *Urban Forestry & Urban Greening*, *14*(3), 573-582.

Roe, J. J., Thompson, C. W., Aspinall, P. A., Brewer, M. J., Duff, E. I., Miller, D., ... & Clow, A. (2013). Green space and stress: evidence from cortisol measures in deprived urban communities. *International journal of environmental research and public health*, *10*(9), 4086-4103.

Real, E., Arce, C., & Sabucedo, J. M. (2000). Classification of landscapes using quantitative and categorical data, and prediction of their scenic beauty in north-western Spain. *Journal of environmental psychology*, *20*(4), 355-373.

Pringle, S., & Guaralda, M. (2018). Images of urban happiness: A pilot study in the self-representation of happiness in urban spaces. *The International Journal of the Image*, *8*(4), 97-122.

Saeedi, I., & Dabbagh, E. (2021). Modeling the relationships between hardscape color and user satisfaction in urban parks. *Environment, Development and Sustainability*, *23*(4), 6535-6552.

Şahin, N.H., (1998). A positive approach to coping with stress. *Turkish Psychological Association publications*. Ankara.

Thompson, C. W. (2011). Linking landscape and health: The recurring theme. *Landscape and urban planning*, *99*(3-4), 187-195.

Tyrväinen, L., Ojala, A., Korpela, K., Lanki, T., Tsunetsugu, Y., & Kagawa, T. (2014).Theinfluenceofurbangreen environments on stress relief measures: A field experiment. *Journal of environmental psychology*, *38*, 1-9.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of environmental psychology*, *11*(3), 201-230.

Ulrich, R.S. (1999). Effects of gardens on health outcomes: Theory and research. In: Healing gardens: *Therapeutic benefits and design recommendations (Eds. Cooper Marcus C &Barnes M)*: 27–86. John Wiley & Sons, New York

Ulrich, R. S. (2001). Effects of healthcare environmental design on medical outcomes. In *Design and Health: Proceedings of the Second International Conference on Health and Design. Stockholm, Sweden: Svensk Byggtjanst* (Vol. 49, p. 59).

WHO,(2016). World Health Organization | Urban Population Growth. http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/.

Xue, F., Gou, Z., & Lau, S. (2017). The green open space development model and associated use behaviors in dense urban settings: Lessons from Hong Kong and Singapore. *Urban Design International*, *22*(4), 287-302.

Van den Berg, A. E., Hartig, T., & Staats, H. (2007). Preference for nature in urbanized societies: Stress, restoration, and the pursuit of sustainability. *Journal of social issues*, *63*(1), 79-96.

Velarde, M. D., Fry, G., & Tveit, M. (2007). Health effects of viewing landscapes–Landscape types in environmental psychology. *Urban forestry & urban greening*, *6*(4), 199-212.

Vert, C., Gascon, M., Ranzani, O., Márquez, S., Triguero-Mas, M., Carrasco-Turigas, G., ... & Nieuwenhuijsen, M. (2020). Physical and mental health effects of repeated short walks in a blue space environment: A randomised crossover study. *Environmental Research*, *188*, 109812.

Wang, R., Zhao, J., Meitner, M. J., Hu, Y., & Xu, X. (2019). Characteristics of urban green spaces in relation to aesthetic preference and stress recovery. *Urban Forestry & Urban Greening*, *41*, 6-13.

Wang, R., Jiang, W., & Lu, T. (2021). Landscape characteristics of university campus in relation to aesthetic quality and recreational preference. *Urban Forestry & Urban Greening*, *66*, 127389.

Yamashita, S. (2002). Perception and evaluation of water in landscape: use of Photo-Projective Method to compare child and adult residents' perceptions of a Japanese river environment. *Landscape and Urban Planning*, *62*(1), 3-17.

Yang, Q., Kang, Q., Huang, Q., Cui, Z., Bai, Y., & Wei, H. (2021, June). Linear correlation analysis of ammunition storage environment based on Pearson correlation analysis. In *Journal of Physics: Conference Series* (Vol. 1948, No. 1, p. 012064). IOP Publishing.

DOI: 10.15320/ICONARP.2022.193

Zube, E. H., Pitt, D. G., & Anderson, T. W. (1975). Perception and prediction of scenic resource values of the Northeast: Values, perceptions and resources. In *Landscape assessment: Values, perceptions and resources* (pp. 151-167). Dowden, Hutchinson and Ross.

Resume

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The Role of the Senses in Children's Perception of Space

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Abstract

While we humans exist in space through our bodies, we experience it via all our senses and build up an integrated knowledge of the world in our memories. However, children's conception of the world differs from adults due to their developmental stages. This study aims to examine human-space interaction with a new approach to reveal the effects of sensory stimuli on children's perception and memory of space. The case study was conducted in a theme park that offers various sensory stimuli with particularly designed spaces and activities. For the behavioral data, the spatial preferences of the participants (33 children, age 10) were recorded during the tour, and for the memory data participants were asked to draw pictures (cognitive maps) afterwards. The data sets were redefined by the main sensory stimuli offered by the spatial units (spatial data), and the number of stimulus experiences and the number of stimulus recalls were analyzed comparatively. Contrary to popular belief, the results show that (1) all of the senses take part in perception depending on the existing stimuli in the space, vision does not have any precedence; (2) the functioning of the senses during an experience changes depending on how much stimulus they are exposed to and how much the body participates in the perception process; (3) kinesthetic stimuli come to the fore as the best stored stimuli in memory, whereas the taste stimuli remain in the background as the least remembered ones. The case study group was limited, the subjective aspects of perception, and the age and gender differences that may exist are ignored. With the inclusion of age and gender factors precisely, this methodology could reveal promising alternatives for design methods and guide the production of all types of architectural spaces, including the children's spaces. This study proposes an original perspective that regards both the physical and social components of the space as the source of perception; and it attempts to make up for a deficiency by regarding the children who are mostly neglected in other studies, yet are active users of the space.

Keywords:
Children, cognitive map, memory, multi-sensory perception, perception of space

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INTRODUCTION

Human beings exist in space. During this existence, our bodies are tools for establishing a relationship of physical and sensory integrity with the environment (Merleau-Ponty, 1964), and our experience is the foundation of the reciprocally ongoing human-space interaction. In this context, human senses are one of the main means of interaction. They are the bodily functions that provide people with cognitive data about the experienced environment and internal or external situations, i.e., the information needed to understand the world, life, and to survive as active social beings (Ingold, 2011; Üstündağ, 2011; Kranowitz, 2014).

The perception and learning processes via the senses never actualize through a single sensual modality; many senses such as vision, hearing, touch, smell, and balance work together (Gibson, 1950). In the perception of space, the physiological qualities of the body and its movement in space shape a holistic perception with the addition of the information of physical components of that space, its participants and their activities. For instance, disabled, pregnant or child participants interact with different components of an environment through their experiences depending on their bodies, their cognitive characteristics, and their physical and social needs. At the end of their subjective evaluation of the collected information from those differing sources, a unique spatial memory that belongs only to the perceiving individual is built.

Among the former studies related to the perception of space, it is a fact that the diversity of human senses, which is the most important factor in the relationship between the perceptual integrity of the space and experience, is mostly ignored. The findings of psychological studies cannot be evaluated on a spatial scale because of their limitations of research scale, contents, and participant groups (Marks, 1978; Van der Stoep et al., 2017), whereas architectural and environmental perception theories are mostly limited to the visual qualities of space (Eco, 1980; Jencks, 1980; Rapoport, 1990, Venturi & Brown, 2004; Aytem, 2005; Ertürk, 1984, Asar, 2013). Still, the increase in the number of studies investigating the role of different types of senses in the perception of spaces after 2000 shows that the deficiencies in this area have been noticed (Howes, 1991; Classen, 1993; Pink, 2009; Ingold, 2011; Pink & Howes, 2010; Henshaw, 2013; Hamlacıbaşı, 2019; Seçkin, 2010; Öktem Erkartal & Ökem, 2015; Öztürk & Durmuş Öztürk, 2020).

The main perceptual patterns emerge in childhood. During this period the ongoing physical, cognitive, and emotional development processes affect both the experience and the relationship with space and differentiate children's spatial perception from adults. This fact makes the questions of how the sensory factors work in child-space interaction and how the senses work in a child's perception process essential topics for research. However, children who are also part of an active group using space remain a partly neglected subject in former research. There are a couple of studies that have questioned the effects of different types

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of spaces (educational, play, social, etc.) on the spatial behavior, perception and learning of children (Day & Midbjer, 2007; Moore & Young, 1978; Olds, 1987), and there are some original studies that focus on spatial perception of children (Çanakçıoğlu, 2011; Baksi, 2018; Koç, 2012; Çermikli Buluklu, 2015; Köksüzer, 2013; Yılmaz, 2005), but unfortunately the studies that focus the role of senses in children's perception of space are very few (Başoğlu, 2002; Temel, 2015; Dilmaç, 2018).

Within this framework, this study aims to examine human-space interaction with a new approach and reveal the effects of sensory stimuli on children's perception and memory of space. In the first part of the study, the theories of perception, sense, and memory are discussed within the framework of spatial perception and child perception, and then the field study, findings, and general evaluations are presented.

LITERATURE REVIEW

Perceiving the World

In the actuality of living in and perceiving the world, the human body is at the center of everything (Merleau-Ponty, 1964). While man exists in the body in motion, there is a constant relationship between the entire body, its movements, and the information sources of the environment. As active information seekers, the senses constantly collect stimuli from the environment and the mind creates a cognition of the world. There is a perception-action cycle here; action is taken after perception, new stimuli are encountered while in action, and the learning process is continued by distinguishing these stimuli (Gibson, 1977). In this process, only the stimuli that exceed certain perceptual thresholds (absolute threshold and difference threshold) are perceived and then transferred to memory through "bottom-up processing". In the end, only the selected information is stored; and is repeatedly reconstructed in every reuse in the course of life (Goldstein, 2013).

Each sense has an optimal usefulness in different circumstances and its own unique subjective impressions that must not be disrupted by the integrative process (Stein and Stanford, 2008). However, if the senses operate collectively, they have the ability to increase the potentiality to detect and identify environmental data, and if they combine their individual sources of information they reveal the nature of the whole experience (Stein and Stanford, 2008). In fact, the senses always coexist and work simultaneously. The nervous system always integrates (or binds) cues from different senses to form a perception of a unitary experience (Stein and Stanford, 2008). This synthesis of the sensual information modifies our perceptions, influences our reactions, and continuously shapes our view of the world (Wallace, 2004).

Furthermore, the senses train each other by continuing to both work by themselves and by communicating their knowledge to each other (Smith, 2005). The mutually shared information is revived in future experiences that take place later; therefore, when an object is perceived

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by vision, its smell, taste, texture, and possible movements are remembered at the same time (Smith, 2005).

Just as each sense is unique, every individual's perception is unique, too. During perception, the coded information is changed in line with additional information, and it becomes subjective depending on the individual's identity, past, and the retrospective information in his memory (Goldstein, 2013; Cüceloğlu, 2006). According to Rapoport (1977) this subjective aspect of perception in which the individual makes sense with his/her feelings and values is auto-centric (self-centered), whereas the objective aspect of perception, which consists of stimuli and sources, is allocentric (others-centered).

The Beginning of Perception; Senses

In 1969, Gibson classified the senses as the visual, auditory, taste-smell, basic direction-finding, and tactile systems, whereas in 1999, Steiner asserted that there are at least twelve senses (touch, sense of life, sense of self-movement, balance, smell, taste, vision, sense of temperature, hearing, language sense, conceptual sense, ego-sense). In the last 50 years, different classifications that include from 6 to 12 components have been developed with the articulation of subcategories of touch (temperature, coldness, pain), organic senses, and muscular senses (balance, muscle) (Kahvecioğlu, 1998). Today, seven senses appear to be the basic senses included in most of the current classifications: vision, hearing, smell, touch, taste, balance, and muscle. Among these, vision, and hearing, which are named as distant or primary senses, are differentiated with their high patterning and organizational qualities, their intense use in daily life, and their ability to collect information from sources that are distant from the body (Özak, 2008, Koyuncuğlu, 2017). The sense of smell also detects stimuli at a certain distance from the body and is considered among the distant senses, still it is secondary. Taste, touch, muscle, and balance on the other hand, are secondary and close senses that sense stimuli within the limits of the body (Koyuncuğlu, 2017).

The sense of vision is the transmission of the wavelength perceived as light to the brain through the eye (Kahvecioğlu, 1998). Vision is more complex than the other senses, due to the eye's adaptability to light, color sense, and ability to perceive details (sharpness). It provides information on external features such as color, shape, size, illumination, texture, and the instant perception of a wide area at a glance. Vision allows other objects to be partially included in our perception in our peripheral vision while our attention wanders at a certain point (Ungar, 2000). Therefore, vision is critical for the perception of space, which has a three-dimensional physical existence. Changes in the temperature and lightness-darkness values of the colors used in the building elements of vision create different psychological effects or emotions on participants (Heuser, 1976, Martel, 1995), and the color preferences of children may change depending on age (Friedling, 1974).

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Hearing occurs when sound waves formed by compression and relaxation of air molecules stimulate the recipient cells in the ear (Cüceloğlu, 2006). In the subjective experience of several sounds, the very small interaural time difference between the two ears enables the individual to detect direction, distance, and movement (Marks, 1978), and every sound source is heard in its particular position (Darwin, 2007.; Besides, hearing can perceive specific changes in space that cannot be perceived by the other senses and can transfer information of events outside the field of view to the consciousness (Gellen, 2010; Blesser & Salter, 2007). These features enable the perception of the size, shape, openings, furnishings, and material of the space through sound waves reflected from the objects. Spaces themselves produce noise with equipment such as plumbing, light bulbs, curtains, air-conditioners, etc. Sounds from outside or the neighboring spaces contribute to the perception of space, and all these auditory stimuli may construct a unique acoustic character for each space.

Smell is a form of chemical perception which occurs when gas molecules in the atmosphere stimulate cells on a membrane in the nose (Kahvecioğlu, 1998). Smell's direct connection to the amygdala (limbic system) strengthens its relationship with memory and mood (Bogdashina, 2003), and causes scents to trigger some long forgotten memories. Scents increase the salience of objects and convey information that helps us to understand the essence of things, to classify them and to realize how we relate to them (Day & Midbjer, 2007; Degel et al., 2001). Throughout the experience, the elements of the space and the smells that exist there form an interface between space and human (Gezer, 2012), they provide information about the environment by adding meaning to the perception through association (Henshaw, 2013), and they affect people's (pleasant-unpleasant) judgments about the environment. Furthermore, scents have very strong effects on the remembering of spaces (Rodaway, 1994), even though they are not related to design, production and the physical-formal existence of the space.

Taste is another kind of chemical perception formed by the stimulation of receptors located at the tip, the sides and back of the tongue, partially in the cheeks, upper palate, and larynx (Bogdashina, 2003; Koyuncuoğlu, 2017). Taste works together with smell, and accompanying scents may cause losses and changes in the perception of taste (Cüceloğlu, 2006). Perceived tastes vary in every individual according to genetics, past experiences and information. The sense of taste is also recorded in the mind during some experiences and is associated with the experienced space, and it can gain a place in the memory by keeping the memory of that space alive at the level of consciousness (Gezer, 2012). Therefore, taste is regarded as a sense linked with spatial memory only in special situations.

The sense of touch emerges with the stimulation of the cells in the inner skin while an object exerts pressure on or contacts the skin

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(Kahvecioğlu, 1998). In touch, five different receptors (pressure, touch, pain, heat and cold) enable the perception of different texture characteristics of an object, such as hardness, roughness, sharpness, stickiness, dryness, and the senses of hot/cold and pain/soreness (Kahvecioğlu, 1998; Bogdashina, 2003). Besides, touch plays an important role in defining the qualities of objects such as weight and shape, especially by working together with the kinesthetic senses. While visual and auditory stimuli intertwined in space are continuously imposed on individuals, the perception of tactile stimuli is always relatively limited and under the strict control of the individual (Marinetti, 2009). With the sense of touch, hands become the main means of experience due to the high density of nerve cells in the fingertips; they arouse more sensation/emotion than the eyes and make tactile experiences more important for the perception of presence. While experiencing the space, the body's contact with certain points in space or the activities of the hands in line with certain intentions are the mediators; and when a space is evaluated through touch, every kind of texture and the hard/soft, rigid/flexible, plain/rough qualities of its components become tools that define the 'tactile identity' of a place (Day & Midbjer, 2007).

The sense of balance (vestibular sense) is a type of sensation that perceives stimuli through the semicircular canals and two otolith organs in the ear. It works together with the senses of vision and kinesthetics from infancy and provides information about the body's position, posture, resistance to gravity, balance, and security feelings (Url-1). Perception processes work according to the position of the head and the movement of the body, and collect information on the direction, speed, and intensity of the body's movements (Kahvecioğlu, 1998).

The kinesthetic sense (muscle sense) perceives stimuli from cells located in the muscles, joints, skin, and tendons (Kahvecioğlu, 1998). Basic kinesthetic perceptions are the position and movement of the body, the movements of the body parts relative to each other and the muscle force and effort (Proske & Gandevia 2009; Taylor, 2013). Kinesthetic perceptions enable one to decide how much the body will move or when to stop in combination with the perception of external resistances faced by contraction, relaxation, elongation, withdrawal, and tension in the muscles and skin (Kahvecioğlu, 1998; Taylor, 2013). The combination of kinesthetic and balance senses (which is also known as the proprioception sense) enables us to perceive gravity, movement, and the body's position (Kahvecioğlu, 1998); and with the inclusion of touch, the weight, tension, stiffness, softness, and looseness of objects could be perceived. Furthermore, the combination of vision, touch and balance with kinesthetic signals may enable us to perceive ergonomic relations between humans and space or the existing potential for movement.

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Perception and Memory

The stimuli offered by an environment depend on the quality and quantity of each of the physical components, as well as the ongoing experience and its participants; each of them is a part of a whole. Still, experience is the foundation of the relationship between humans and the environment. While human memory codes and stores the information acquired through an experience, a basic understanding of that environment is formed in the mind and the experience becomes the basis that defines memory as well (Tarçın Turgay, 2018). In perception, the physical reality of the space and the individual's sense organs form a spiral structure, all parts of that reality are perceived simultaneously through the senses (Özak, 2008), and subsequently are evaluated subjectively through memory (Figure 1).

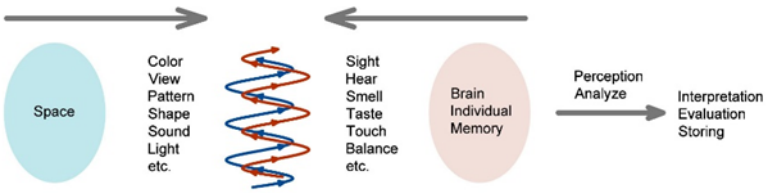

Figure 1. The sensation phase of space (Özak, 2008; s.76)

Human memory, in which the perception is actualized, is considered to have three components: sensory memory, short-term memory, and long-term memory (Figure 2). Sensory memory (SM) is the starting point of human-environment interaction. Perception begins when SM starts collecting sensory data (Kahvecioğlu, 1998) (Figure 3). In this process, a large number of sensory data that exceed the "absolute threshold", the lower limit of the creatures' sensitivity to a stimulus, are stored simultaneously; but this storage is limited to seconds and most of the data is lost rapidly. Therefore, the role of SM in perception is limited to procedures such as "collecting information to be processed", "keeping the information for a while as the previous process continues" and "filling the gaps between intermittent stimuli" (Goldstein, 2013, p.224).

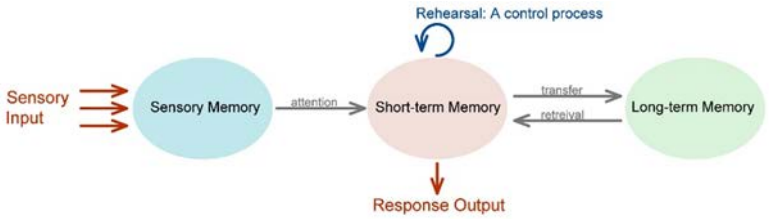

Figure 2. Flow diagram for Atkinson and Shiffrin's (1968) model of memory (Goldstein, 2013, s.217)

Short-term memory (STM), on the other hand, is a system that encodes, processes and stores information for a short time. In the Working Memory Model, Baddeley indicates that STM has four basic components (Figure 4). Among these, (1) the Phonological Loop System stores and operates verbal and auditory information, (2) the Visuospatial Sketch Pad System stores and operates visual and spatial information, (3) the Episodic Buffer, combines and stores the information from the first two components by associating them with the

information existing in long-term memory, and (4) the Central Executive acts as a center performing complex cognitive processes (such as attention, regulating and combining information) (Goldstein, 2013; Baddeley, 2000).

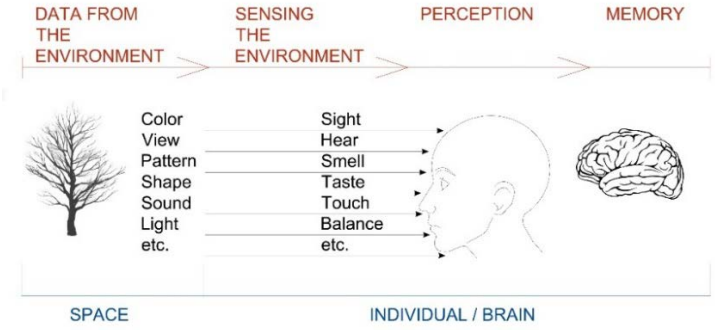

Figure 3. Interaction Process of Sensory Memory and Environment

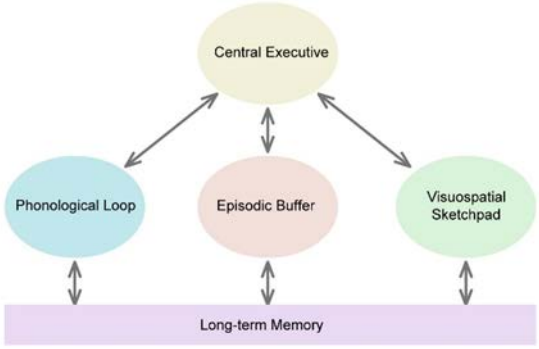

Figure 4. Baddeley's Working Memory Model (Goldstein, 2013, s.247)

The Long-Term Memory (LTM) is a system that processes and stores the information received from STM for a long time (Figure 5). The Implicit Memory (non-declarative memory) component of the LTM processes and stores information about the activities that the body continues automatically without conscious recall, time perception, or individual awareness. Explicit Memory (declarative memory), on the other hand, is a fast-working system that establishes connections between different stimuli, that stores and consciously brings together the information of close and distant memories, and that enables one to learn something at once (Nelson & Fivush, 2004). Within Episodic Memory, Explicit Memory comprises personal experiences that involve time and space information, while Semantic Memory comprises information based on facts and works as the storage of general information of the world (Goldstein, 2013). In this context, "remembering" is the conscious and successful recall from Episodic Memory, and "forgetting" is an error in the recall process. In both cases, many factors can be effected and in some unsuccessful processes, recalled information might be transformed, blocked, or replaced with misleading information (Smith & Kosslyn, 2014).

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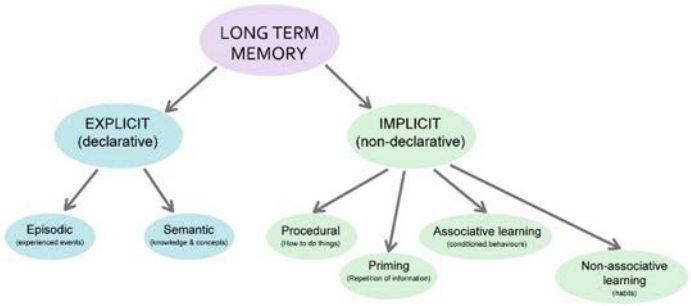

Figure 5. The Schema of Long-Term Memory (Smith & Kosslyn, 2014; p.194)

When the operation of the memory is viewed from the perspective of the senses, it is possible to say that the information is collected by the SM, transferred to the STM, and finally encoded in Episodic or Semantic Memory within the LTM, depending on whether it is personal or not. Within the framework of current memory theories (and many other related theories), this process is considered to be limited to the perception of visual and auditory stimuli, due to the critical position of STM and its accepted model that excludes the non-primary senses. However, depending on the quality of the experience, it is known that information belonging to other senses, such as scent, can be clearly recalled and has strong effects on remembering a whole experience (Koyuncuoğlu, 2017; Chu and Downes; 2000). Therefore, to reveal the effects of both separate and relative activities of the non-primary senses on perception, it is important to look at the sensory-memory relationships outside the perspective of conventional memory models.

Space as The Object of Perception

During the experience of space, all the senses actively provide data to the memory system from the beginning to the end (Özak, 2008). The conceptualization of the environmental character is a complex multi-sensory fusion of innumerable factors which are integrally grasped at once as an overall atmosphere, feeling or mood (Pallasmaa, 2014a). For instance, a museum visit exceeds the perception of mere visual stimuli and turns into an experience that comprises "the visitor's body movements, sensory experiences, associations, recollections and imaginations", and as a result of the embodied nature of this experience the exhibited works become a part of the visitors who experience them (Pallasmaa, 2014b, 241).

In the 1970's, psychologists discussed whether this multi-sensory perception of space is a "single psychological representation containing visual, proprioceptive, kinesthetic, tactile, and auditory information" or a perceptual integrity that emerged because of the coordinated work of different psychological representations of more than one modality, which resembles a single psychological representation (Marks, 1978). In the 2000's, it was accepted that the sensory data collected from a space came together at a point of perception by being coded into a common frame of reference, "a set of axes that describes the location of an object" (Van der Stoep et al., 2017; Cohen and Andersen, 2004, p.463).

According to this view, spatial information obtained from a sense is transformed into the dominant frame of reference in a particular region of the brain which is related to the eventual motor act. These reference frame transformations enable individuals to compare spatial information from different senses.

Since the 1970's, the questions of how the senses work together, how they affect each other and which one is dominant in perception have been important for psychologists (Aronson & Rosenbloom, 1971; Auerbach & Sperling, 1974; Pick et. al., 1969; Morell, 1972; O'Connor & Hermelin, 1972; Van der Stoep et al., 2017; Spence & Van der Stoep, 2020; Bedford, 2007). Nevertheless, the limitations of their research in scale, content, and participants make it difficult to evaluate their findings in the context of phenomenological integrity and upper scale of the space. Similarly, some anthropological researchers focus on the sensory perception of space (Davis, 2017; Howes, 1991; Classen, 1993, Henshaw, 2013; Hamlacıbaşı, 2019) and emphasize the multi-sensory nature of experience (Pink, 2009; Ingold, 2011). However, they mostly only deal with the sense of smell.

Also, in architectural theories, there are many studies using concepts such as sense, perception, and spatial perception of space. The architectural theories popular in the 1980s, investigated the meanings attributed by the research participants to the visual features and structural components of the buildings (Hershberger, 1980; Hershberger & Cass, 1974; Venturi & Brown, 2004); and analyzed the relations between mind and space through semiotic models (Eco, 1980; Jencks, 1980; Rapoport, 1990). These theories were elaborated partly using some particular research in the 2000's in Turkey, which argued again the effects of the visual properties (color, shape, texture, size, surface, edge, opacity) of the structural components and the effects of the visual-spatial characteristics (configuration and number of spatial units) on perception (Aytem, 2005; Ertürk, 1984, Asar, 2013; Çermikli Buluklu, 2015; Koç, 2012; Tarçın Turgay et al, 2015). Also in the same period, the multiple effects of the senses on the perception of space were investigated through studies examining the integrated effect of touch and vision on material perception (Seçkin, 2010), the effectiveness of different sensory stimuli (hearing, smelling, tasting, and touching) through experiencing (Erkan Yazıcı & Çakıcı Alp, 2017); how the sense of touch can be brought forward against the sense of vision (Öktem Erkartal & Ökem, 2015) and how the spaces' perception and comfort could be enhanced (Türk & Midilli Sarı, 2020). These studies mostly neglected multi-sensory functioning due to external reasons such as the inadequacy of measurement-evaluation methods (Öktem Erkartal & Ökem, 2015), the limitations on the spatial scale of research and the dominance of certain theories. Still, the increase in the number of studies on the senses indicates that the weight of the sense of vision or smell in related research will gradually decrease and a multi-sensory perspective will become prevalent.

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The Child-Space Relationship Through Perception

Children's perception of space is mostly evaluated within the framework of the developmental theories of Piaget, Inhalder and Szeminska (1960; 1964). The notion of phantasy act includes attention, remembering, symbolizing, planning, reasoning, problem-solving and creating (Berk, 2013); while in the context of spatial perception and spatial computing, it includes causation, judgment, and recall (Hart & Moore, 1973).

According to Piaget (2004) there are four cognitive stages during the development process of a child. Around the ages of 0-2, the child is in the sensory-motor stage and conceptualizes his environment in ways that are consistent with his senses and movements and thinks through his actions. Between the ages of 2-7, the relationship of a child with place depends on instantaneous conditions; a certain situation is perceived at a certain time, and the child has not developed a sense of integrity yet. In the concrete operational stage between the ages of 7-12 children can process information systematically and logically when confronted with concrete information, but abstract information can be processed by systematically addressing it only between the ages of 12-18 (Tunçok Sarıberberoğlu, 2018).

In this developmental process, perception of the world is always a multi-sensory event that includes the use of every sense and the whole body. Seeing something brings the desire to touch, taste, smell, shake, throw or hit that thing. This combined working causes both a difficulty in processing the simultaneous sensory stimuli (Day & Midbjer, 2007), and gives priority to senses in cognitive processes and makes them one of the main determinants of childhood. The information received from the environment is transformed into behavior by the senses and instant emotions rather than logic (Day & Midbjer, 2007). Children move on from perception to conception and from feeling to meaning by experiencing rich stimuli with their senses. This multidimensional perception also makes the conceptualization of things multidimensional and clears the way for creative thinking.

In this context, the perception of space operates by distinguishing different forms of sense rather than associating different sensory stimuli (Gibson, 1969). This dependency on the senses starts to decrease as the child strengthens his/her sense of self by separating himself/herself from the place between the ages of 3-5, and between the ages of 4-7 he/she begins to perceive places as tools that can be transformed and used for a purpose. Afterwards, development of abstract thinking skills helps the child to perceive that the environmental changes depending on his/her perspective (Tunçok Sarıberberoğlu, 2018), and he/she starts to build a sense of space which is not only perceived by the senses and the body but also conceptualized with rules and related information (Day &Midjer, 2007). Still, the holistic and systematic idea of space is formed towards puberty, after the age of 12 and the skills of imagining,

designing, and producing spaces develop over time (Day & Midbjer, 2007).

Research on child-space interaction through the senses mostly focuses on child specific environments such as open playgrounds, educational facilities, pediatric clinics, classrooms and investigates the importance of specific environments (Moore and Young, 1978), the effects of physical qualities of spaces and visual stimuli (color and lighting) on perception (Day and Midjber, 2007; Al-Alwan and Al-Kahidi, 2009; Temel, 2015; Aral et al., 2011) and the effects of color on likes, preference and psychology (Başoğlu, 2002; Dilmaç, 2018). In this framework, there is also a group of studies instrumentalizing cognitive maps to investigate children's perception of space. Cognitive maps are defined as a psychological procedure that deciphers the processes of coding, storing, and recalling of the experienced spaces in the mind (Downs ve Stea, 1973), and transforms it to data that can be evaluated. In some significant research the effects of architectural parameters (Çakır, 1997), movement/ behavior (Hume et al., 2005) or culture (Gillespie, 2010) on perception and the effects of different socio-economic characteristics (Yılmaz, 2005), spatial experience (Tarçın Turgay et al., 2015) or spatial configuration (Köksüzer, 2013) on memory; or children's satisfaction and sense of belonging about places (Baksi, 2018) were investigated through cognitive maps.

In the scope of the above-mentioned studies, the sense of vision was still regarded as a dominant factor in the perception of space. However, the theories of child and environment interaction indicate that the whole body takes part in the child's relationship with space and none of the senses can be ignored in this context. Besides, the ongoing cognitive development of children and the long-term dependence of their thoughts on sensual information cause them to be constantly under the influence of the environment they live in, both physically and psycho-socially (Gür & Zorlu, 2002); and it is also possible that their perceptual patterns are still emerging simultaneously (Wallace, 2004). These characteristics of childhood puts them in a partly passive position toward the environmental effects and differentiates their spatial perception, experience, and spatial memory from adults (Tunçok Sarıberberoğlu, 2018). Still, children remain a neglected group of participants in current space perception research, and their different situation in human-space interaction need further discussion.

In the light of these findings, for this paper, a field study was conducted to investigate the multiple effects of the senses on the spatial experience, perception and memory processes of children.

CASE STUDY ENVIRONMENT

The field study searched for the effects of sensory stimuli in a space on children's spatial behavior and memory. A total of 33 students (10 years old), 14 boys and 19 girls, studying in the 4th grade of Çayırova-Guzeltepe Primary School participated in the study. Before the data

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collection phase, signed consent forms were obtained from the parents and the entire study was carried out with the knowledge of the school administration and under the supervision of the class teacher.

The setting of the field study was a theme park (Kidzania Istanbul) that offers the experience of different adult professions in a child scale environment. This fictional setting presents an interesting, remarkable environment that is quite different from daily life, both with its physical characteristics and the activities taking place in it (Figure 6). The theme park can be visited alone or accompanied by a parent. The total visiting time is limited to four hours and is controlled with an electronic wristband. Each participant waits in line for the profession they want to experience, if there is high demand. For this reason, the number of spaces experienced by each participant varied depending on their preferences and the demand during that day.

Figure 6. Theme Park spaces (Url-2)

Each spatial unit is furnished with specific appliances, equipment, costumes, and decors. Also, there is at least one adult who gives directions on how to experience a specific profession. The entire theme park is equipped with distinctive and intense stimuli regarding all the senses and each spatial unit predominantly presents specific stimuli to its participants through its physical qualities and activities. For example, in the Perfume House where children create and bottle their own scent mixtures, smell stimuli are dominant. On the other hand, vision, balance, and kinesthetic senses are dominant in Window Wiping and Construction Site activities in which the children walk on a scaffold with safety ropes. In the Chips Factory, Chocolate Factory and Pizza Shop, which offer activities for food production, children are exposed to smell and taste stimuli more than the others. And, in the Disco and Secret Agent Centers, besides visual and kinesthetic senses, the sense of hearing is stimulated more than the others (Figure 7).

Figure 7. Theme Park activities (Url-2)

In the Theme Park, the performed activity and its space are integrated with each other. While children perform a specific task with various kinds of bodily participation, the physical qualities of the space are perceived simultaneously. Therefore, the spatial perception process takes place through a holistic experience with more than one sense stimulated at the same time.

RESEARCH METHODOLOGY

The case study includes three different data sets that are defined by sensory stimulus types; one of which belongs to the space (spatial data), and the other two belong to the participants (behavior and memory data).

Spatial Data

The spatial data focuses on the stimuli offered by the spaces. Through a preliminary review of the park, it was observed that (1) the visual and auditory stimuli are primarily presented by the architectural components in each spatial unit, and that (2) smell, touch (fine motor activities) and kinesthetic (fine and gross motor activities) stimuli have an effect on the perception of space depending on the contents of the activities. Only in five spatial units (Window Film Application, Construction Site, Disco, Earthquake Simulation Center and Stadium), in which there is a minimum height requirement of 120cm and the sense of balance is dominant (along with kinesthetic sense). Above all, the number and type of sensory stimuli differs for each spatial unit, and six different stimuli (hearing, taste, smell, touch and kinesthetic) came to the forefront throughout the entire theme park.

In the spatial data analysis, the primary stimuli that the participants are exposed to, or obligated to experience in each spatial unit (inside the unit and during their activity) were identified. For instance, children are intensely exposed to touch, vision and auditory stimuli at the Aviation Academy in which they sit down and participate in a flight simulation. In contrast, they are exposed to hearing, vision and kinesthetic stimuli in the Secret Agent Center when performing climbing, jumping and running activities under bright lights and sound effects, whereas they are exposed to tactile, smell and taste stimuli in preparing and cooking activities (such as Chocolate Factory, Chips Factory and Pizza Shop).

In this context, the nominal values (available/non-available) of each of the six sensory stimuli are defined by determining if they are presented as the primary stimulus in a spatial unit or not. By defining

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the type, number, and distribution of the primary stimuli in each space, each spatial unit's sensory character is revealed. This characteristic data constituted the basis of the field study and was used as a tool for redefining the participant data through the senses.

The sum of the nominal values of one stimulus is the maximum number of times that stimulus can be experienced by a participant in the theme park, i.e., "the number of potential experiences". The sum of the number of potential experiences of all stimuli is the maximum number of sensory stimuli that can be experienced by a participant in the theme park, i.e., "the number of potential experiences in the theme park" (Figure 8).

Behavioral Data

The behavioral data was obtained from the forms on which participants wrote down the places they visited during the tour. The number of visits to each spatial unit was calculated by how many participants wrote it on the forms and was regarded as "the number of experiences" value of each spatial unit (Figure 8).

$$\textbf{number of stimulus experiences} = \sum_{n=43} \textit{nominal value of the stimulus x number of experiences of the spatial unit}$$

$$\textbf{total number of stimuli experiences} = \sum_{n=6} \textit{number of stimulus experiences}$$

$$\textbf{number of stimulus recalls} = \sum_{n=43} \textit{nominal value of the stimulus x number of recalls of the spatial unit}$$

$$\textbf{total number of stimuli recalls} = \sum_{n=6} \textit{number of stimulus recalls}$$

Figure 8. Data Analysis Formulas

Memory Data

The memory data was obtained from the drawings (cognitive maps) which participants drew in a classroom environment two days after the tour (Figure 9). Participants were asked to "draw what they remember about the tour" in approximately 35 minutes. At the end of the period, students were allowed to write down the names of places which could not be drawn in the session on the back of the drawing. Using these drawings, the number of representations of each space in cognitive maps was calculated and regarded as "the number of recalls" value for each spatial unit.

The number of experiences and the number of recalls of each spatial unit were considered as factors. By multiplying the nominal values of sensory stimuli in a unit with the number of experiences of that unit, the "number of stimulus experiences" for a spatial unit was obtained. Similarly, by multiplying the nominal values of sensory stimuli in a unit with the number of recalls of that unit, the "number of stimulus recalls" for a spatial unit was obtained. For each stimulus, the "total number of stimulus experiences" is calculated by adding up a stimulus's number of

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experiences, and the "total number of stimulus recalls" is calculated by adding up a stimulus's number of recalls.

Figure 9. Cognitive Map Drawings

For example, if six children visited a spatial unit that presented only a visual stimulus as the primary stimulus, it was accepted that the visual stimulus was experienced six times in the context of that unit, and the number of stimulus experiences was six. Accordingly, the sum of the number of visits (number of experience values) of the spatial units whose primary stimulus is vision gave the total number of visual experiences.

At the end of the study, the distributions and changes in these numerical values were compared, and participants' (1) number of experiences and number of recalls of spaces, (2) exposure to different sensory stimuli during their experience of spaces and (3) their recall of the sensory stimuli after their experience were evaluated.

DATA & FINDINGS

During the field study, 43 spatial units were available to be visited in the theme park. According to the data, only 34 of these spatial units were visited, and nine spatial units were not by any of the participants. While the most visited spatial units were Perfume House and Cargo Distribution Center; nine spatial units (ER, Hamburger Shop, Culinary School, Dentist, Ice Cream Factory, Photo Lab, Police Station and Biscuit Factory) were visited only by one participant (Figure 10).

The cognitive data shows that some units (Fashion House, Grand Bazaar and Emergency Service) were remembered and drawn rather than visited, and some units were not remembered although they were visited. These differences could be seen as demonstrating that some spaces could not be visited by children even though they wanted to and that some spaces did not satisfy the children through the experience and so were not retained in memory (Figure 10). Overall, the relationship between visiting and remembering spaces is tested through the Pearson Correlation and the result shows a positive and significant relationship (r=0.9) between experiencing a space and recalling it afterwards, in other words, the spatial experience and spatial memory.

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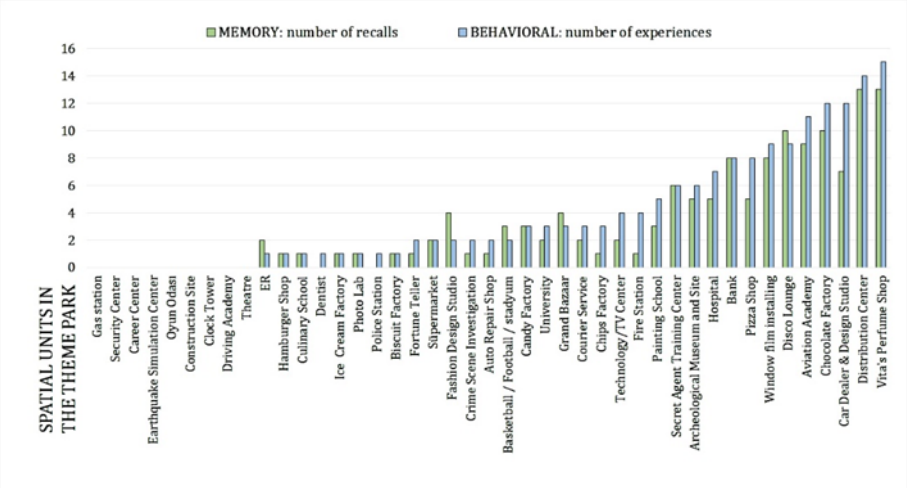

Figure 10. The participant data. The number of recalls and the number of experiences of the spatial units.

According to the spatial data that shows the number of potential experiences of sensory stimuli in the park, vision (24) and touch (23) are the most presented stimuli, while smell (9), taste (8) and hearing (7) are the least presented ones, and kinesthetic stimuli have a value (18) in the middle of these two groups (Table 1). This distribution shows that the sensory character of the theme park consists primarily of vision, touch and kinesthetic stimuli. In other words, in the process of experiencing the theme park, the participants tended to use their vision, touch and kinesthetic senses more significantly, rather than smell, taste and hearing. This finding is different from the preliminary review of the park which suggested that visual and auditory stimuli are the primary stimuli presented by the architectural components, and the others are secondary ones that depend on the contents of the activities. This difference indicates that kinesthetic activities become significant parts of perception if the participants go beyond being an observer and participate in the activities that take place in the park. Still, the other three stimuli (smell, taste, and hearing) which are encountered within the scope of the experience (general ambient, noise, etc.) or at the end of the experience (food served at the end of the activity, etc.) remain at the background of the process.

Among the 34 places visited within the scope of the study, the total number of spatial units children experienced was 165, the total number of places they recalled was 136, and the difference was 29. Accordingly, children did not remember the 29 places they had experienced and approximately one of every five places (18%) was forgotten. Similarly, the total number of stimuli experienced by the children was 359, the total number of stimuli they recalled was 278, and the difference was 81. The fact that 81 stimuli were not remembered even though they were experienced shows that one of every five stimuli (%22) was forgotten (Table 1).

Table 1. The spatial and participant data regarding sensory stimuli

		STIMULUS TYPE						
		HEARING	VISION	SMELL	TASTE	TOUCH	KINESTHETIC	TOTAL
the number of potential experiences	number	7	24	9	8	23	18	89
	order	6	1	4	5	2	3	
number of stimulus experiences	number	32	98	45	30	96	58	359
	order	5	1	4	6	2	3	
number of stimulus recalls	number	27	81	36	3	75	56	278
	order	5	1	4	6	2	3	

Regardless of the numerical values, the ranking values of stimuli were the same as the number of stimulus experiences, the number of stimulus recalls and the potential number of experiences (Table 1). In other words, vision and tactile stimuli were the most imposed, most experienced and most recalled stimuli of the study, whereas taste stimuli were the least imposed, least experienced and least recalled. However, the changes between the numerical values show that the differences between smell, hearing and taste were variable. The number of potential experiences and the number of stimulus experiences of taste and hearing differ by only 1-2 values (7 and 8; 30 and 32). On the other hand, the difference between the number of experiences and the number of recalls for taste (30 and 3) is much bigger than the difference for hearing (32 and 27). This indicates that whereas taste stimuli were largely forgotten after the experience, this was not the case for hearing stimuli.

In order to better interpret these contrasts and reveal to what extent stimuli were forgotten, the differences between the number of experiences and the number of recalls were evaluated (Table 2, Figure 11). The findings show that;

- The values of the number of experiences and the number of recalls of kinesthetic stimuli were almost the same, all children who experienced kinesthetic stimuli remembered these activities and drew them on their cognitive map.
- The difference value of the auditory stimulus is only 5, and the difference value of the visual stimulus is 17. These difference values show that 15% of the experienced auditory stimuli and 17% of the visual stimuli were forgotten.
- The difference value of the smell stimulus is only 11, and the difference value of the tactile stimulus is 21. These difference values show that 24% of the olfactory stimuli and 21% of the tactile stimuli were forgotten.
- The difference between the number of experiences and the number of recalls of kinesthetic stimuli is 27. This difference is the biggest

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one in the study and shows that 90% of the taste experiences were forgotten.

- Finally, whether the sensory character of a space affects participants' visiting choices or their recall of spatial units could not be tested because of the incompatible data for correlation (the number of primary stimuli in the spatial units varies between 1 and 3, while the number of experiences and number of recalls varies between 0 and 15).

Table 2. The difference between the number of stimulus experiences and the number of stimulus recalls

	STIMULUS TYPE					
	HEARING	VISION	SMELL	TASTE	TOUCH	KINESTHETIC
number of stimulus experiences	32	98	45	30	96	58
number of stimulus recalls	27	81	36	3	75	56
difference value: number of stimulus experiences - number of stimulus recalls	5	17	11	27	21	2
difference value / number of experiences	15%	17%	24%	90%	21%	3%

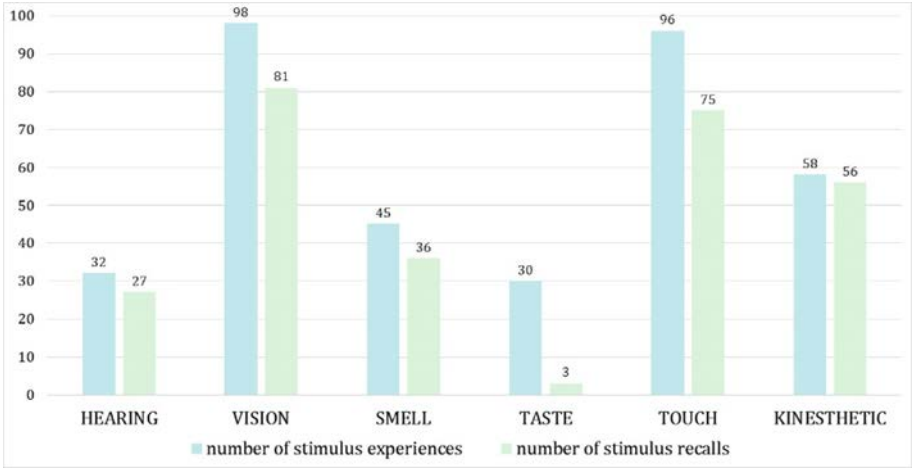

Figure 11. The change between the number of stimulus experiences and the number of stimulus recalls

EVALUATION

This study investigated spatial perception and memory in the context of the child-space relationship via environmental stimuli by examining the experience and recall processes of children who experienced a specific environment, a theme park.

Until very recently, vision and hearing were accepted as the two primary senses in both cognitive and environmental perception theories (Goldstein, 2013; Baddeley, 2000). Along with that, most of the theories reviewing space perception, especially the ones that discuss architectural spaces, agreed that visual stimuli take first place in perception (Jencks, 1980; Venturi & Brown, 2004; Asar, 2013). Today,

even though much recent research in several fields reveals that perception is always a multisensory process, its multi-component mechanism is still an area that is unclear (Wallace, 2004). It is possible that this ambiguity leads many researchers to continue to work in the known, safe field of vision and touch (Öktem Erkartal & Ökem, 2015; Seçkin, 2010) or the visual-spatial characteristics of space (Aytem, 2005; Koç, 2012). This study, on the other hand, aims to go beyond these limits by proposing a new method that examines the multi-sensory perception of an architectural space by accepting the human experience as an integral part of the environment.

The findings of the study show that the most common stimuli in the field are the sense of vision, touch, kinesthetic, smell, hearing and taste in that order. This ranking is also coherent with visiting and recalling the spaces on a cognitive map. Therefore, it can be stated that the potential stimuli offered by the place were effectively and consistently transferred to the participants throughout the experience. Furthermore, those perceived sensual data were also effectively and consistently transferred to memory, and no stimulus comes to the fore as being unlikely to be recalled. First of all, this finding confirms that perception is always a multisensory process. Secondly, contrary to the general consensus, this finding shows that visual stimuli are not always prioritized in the perception of architectural space and visual and auditory stimuli cannot be considered as the main sources of perception in the functioning of memory. Most importantly, this demonstrates that the type and number of perceived stimuli are related to how much they are present in the space to be experienced; and the type and number of recalled stimuli are related to how much they are experienced. This is compatible with the fact that all parts of an environment, the space, the participants and the ongoing experience are perceived and conceptualized simultaneously (Özak, 2008). The efficiency of the senses in this context may vary depending on the qualities of the space and the participant that undergoes the experience. Still, the experience remains the main ground of perception and therefore of remembering a space.

Another finding of the study was that the changes between the numbers of experienced and recalled stimuli showed that the experiences that included kinesthetic stimuli were the most remembered with respect to hearing, seeing, touching, smelling, and taste stimuli (in that order). In the theme park, kinesthetic stimuli were experienced through gross motor activities that children participated in with their whole bodies. In contrast, tactile stimuli were experienced only within the framework of fine motor activities using the hands and taste stimuli were experienced only for a moment at the end of the activity. This difference shows that the perceived stimulus was remembered if it was experienced via the whole body for a long period, and was not remembered when the experience was shortened and the bodily interaction area became more specific. These findings indicate

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that the active participation of the body in an experience, together with the related senses, positively affects the perception and recall of the space enclosing that experience. Here, the body appears to be at the center of this perception process. There is a constant relationship between the body's actions and the information sources of the environment, as Merlau-Ponty (1964) stated, and the physiological qualities of the body and its movement in space defines both the perception and memory of that space.

Finally, the most significant change was seen between the experience and recall values of the sense of taste. Almost all the taste experiences were forgotten. Even though taste is defined as a "close sense" along with touch, muscle and balance, it is kept in the background in the perception processes in this context. This indicates that hearing and other stimuli are stored in memory more efficiently than taste in the framework of perception of space. It is known that taste sense can be included in spatial memory if it is associated with the experienced space, and support the memory of space at the level of consciousness (Gezer, 2012); but this requires some specific conditions that bring the sense of taste to the forefront during the experience, which was not shown in our case.

CONCLUSION

We live in a multisensory world in which we are constantly bombarded with information conveyed via the different sensory modalities, and our brains are continuously synthesizing this commixture of sensory information into an adaptive and coherent wholeness to reveal the nature of our experiences (Wallace, 2004; Stein and Stanford, 2008). This process sometimes resembles reasoning or problem solving (Goldstein, 2013), and the individual's experience of space is like a ball of knowledge that is constantly fragmented, reassembled, and transformed in the mind. This is much more complicated for children, as they are much more dependent on their bodies and senses during their development to learn and understand the world that they are growing up in.

Experience is both the ground and the act of interaction with the world, and it defines how a space is perceived with all the senses, how it becomes a part of us and what that space will mean for us afterwards. Therefore, the space should not be regarded as an object, but a process ((Ökem & Öktem Erkartal, 2015), that involves both its physical components, its participants and the experience that is ongoing there. In this study, the concept of space is reconsidered from this perspective, and it has been expanded to include the activities carried out by the participants during their experience of a space. In addition, the cognitive data of the research was derived from the sensory characteristics of this particular concept of space.

Our results regarding the child-space relationship show that different sensory stimuli have various roles in and effects on perception and

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recall of spaces. First, together with vision, all the senses are included in the perception of space, depending on the type and quantity of stimuli presented in the space. Second, the recall of perceived stimuli may change depending on the rate and time of the participation of the body in the experience. And third, some stimuli, taste in our case, may remain in the background in the process of transferring the perceived information to spatial memory. On the other hand, the gender and age differences were ignored and could not be discussed by necessity.

The findings of the study indicate that the perception of space has a multi-sensory structure, which is strongly defined by the characteristics of space and how much its participants, children in our case, bodily participate in the activities that take place in that space. Moreover, the study itself reveals that paying regard to the role of experience enables us to evaluate human-space interaction with a broader perspective and that multisensory research models offer the potential to analyze the perception of space more effectively.

At the present time, many challenging questions regarding the function of the senses in perception of space still remain unanswered. New innovative and holistic research methods that additionally question the human factors and subjective aspects of perception would definitely exceed the limitations of existing theories, and further cross-disciplinary research between behavioral and neuro-cognitive fields would provide a much broader perspective. And eventually, the obtained answers shall lead to alternative design methods that will guide the production of all types of architectural spaces, along with the specific children's spaces like in our case.

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REFERENCES

Al-Alwan, H. A. & Al-Khalidi, W. H. A. (2009). Visual Perception of Interior Spaces in Paediatric Hospitals. Journal of Engineering, 15(3, 704-744.

Aral, N., Ayhan Bütün, A., Gümüş, D., Zeytinli, Ö. & Arslan, T. (2011). A Study on the Visual Perception of Children attending the First Grade of Elementary Schools, International Journal of Learning, Vol. 17, Issue 11, 215-225.

Aronson, E., & Rosenbloom, S. (1971). Space perception in early infancy: Perception within a common auditory-visual space. Science, 272, 1161-1163.

Asar, H. (2013). Mimari Mekân Okumasında Algısal Deneyim Analizinin Bir Yöntem Yardımıyla İrdelenmesi, Yüksek Lisans Tezi, Eskişehir Osmangazi Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, Eskişehir.

Auerbach, C. & Sperling, P. (1974). A Common Auditory-Visual Space: Evidence for Its Reality, Perception and Psychophysics, 26, 129-135.

Aytem, N. M. (2005). Mimari Mekanda Renk, Form ve Doku Değişkenlerinin Algılanması, Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.

DOI: 10.15320/ICONARP.2022.194

Baddeley A. D. (2000). The Episodic Buffer: A New Component of Working Memory?,. Trends in Cognitive Sciences, 417–423.
Baksi, S. (2018). Çocukların Mekan Algısının Yaşam Çevresi Üzerinden İncelenmesi, Yüksek Lisans Tezi, Selçuk Üniversitesi – Hacettepe Üniversitesi, Sosyal Bilimler Enstitüsü, İç Mimarlık ve Çevre Tasarımı Anabilim Dalı, Konya.
Başoğlu, Z. A. (2002). Comparative Study on Color Preferences of Children for their School Environment: Two Private Schools in Ankara, Yüksek Lisans Tezi, Bilkent Üniversitesi, Güzel Sanatlar Enstitüsü, Ankara.
Bedford, F. L. (2007). Can a space-perception conflict be solved with three sense modalities?. Perception, 36(4), 508-515.
Berk, E. L. (2013). Çocuk Gelişimi, (A. Dönmez, çev.). Ankara: İmge Yayınevi.
Blesser, B. & Salter, L. R. (2007). Spaces Speak, Are You Listening? Experiencing Aural Architecture. MIT press.
Bogdashina, O. (2003). Sensory Perceptual Issues in Autism and Asperger Syndrome: Different Sensory Experiences-Different Perceptual Worlds. New York: Jessica Kingsley Publishers.
Chu S. & Downes J. J. (2000). Long live Proust: the odour-cued autobiographical memory bump. Cognition, 75(2), B41-B50.
Classen, C. (1993). Worlds of Sense: Exploring the Senses in History and Across Cultures. London: Routledge.
Cohen Y. E & Andersen R. A. (2004). Multisensory Representations of Space in the Posterior Parietal Cortex, pp.463-479, In G. Calvert, C. Spence, B.E. Stein (Eds.) The Handbook of Multisensory Processes. The MIT Press, Cambridge.
Cüceloğlu D. (2006). İnsan ve Davranışı. İstanbul: Remzi Kitabevi.
Çakır, H. (1997). Çocukların Algılamasında Etkili Olan Mimari Parametrelerin Belirlenmesi, Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.
Çanakçıoğlu, N. G. (2011). İstanbul'da Farklı Sosyal Grupların Yerleştiği Çevrelerde Yaşayan Çocukların Algısal Süreçlerinin Bilişsel Haritalar Yöntemiyle İrdelenmesi, Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.
Çermikli Buluklu, Y. (2015). Çocuğun Konut Algısının Sözel ve Görsel Temsiller Üzerinden Değerlendirilmesi, Yüksek Lisans Tezi, Dokuz Eylül Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İzmir.
Darwin, C. J. (2007). Spatial hearing and perceiving sources, pp. 215-232. In Yost, W. A., Fay, R. R., & Popper, A. N. (Eds.) Auditory Perception of Sound Sources. Springer, Boston, MA.
Davis, L. N. (2017). Sensorial Urbanism and Smellscapes: Documenting and Exhibiting İstanbul's Cultural Heritage, Doctoral Dissertation, Koç University, Archaeology and History of Art, İstanbul.
Day, C. & Midbjer, A. (2007). Environment and Children. London: Routledge.
Degel J., Piper, D. & Köster E. P. (2001). Implicit learning and implicit memory for odors: the influence of odor identification and retention time, Chemical Senses, 26, 3, 267–280.
Dilmaç, E. S. (2018). Anaokulu Sınıf Mekanlarında Rengin Çocuk Psikolojisine Etkisi, Yüksek Lisans Tezi, Maltepe Üniversitesi, Fen Bilimleri Enstitüsü, İç Mimarlık Ana Bilim Dalı, İstanbul.
Downs, R. M. & Stea, D. (1973). Cognitive Maps and Spatial Behaviour: Process and Products, pp. 312-317. In M. Dodge, R. Kitchin, C. Perkins (Eds.) The Map Reader: Theories of Mapping Practice and Cartographic Representation. West Sussex, UK: Wiley & Blackwell.
Eco, U. (1980). Function and sign: the semiotics of architecture, pp. 11-70. In G. Broadbent, R. Bunt, C. Jenks (Eds.) Signs, Symbols and Architecture. New York: Wiley.
Erkan Yazıcı, Y. & Çakıcı Alp, N. (2017). Duyuların Mekânsal Deneyimleri Şekillendirmesi: Sagrada Familia Kilisesi. SDÜ ART-E, Mayıs/Haziran, Cilt 10, Sayı.19, 55.

Ertürk, S. (1984). Mimari Mekanın Algılanması Üzerine Deneysel Bir Çalışma, Doktora Tezi, Karadeniz Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, Trabzon.
Friedling, H. (1974). Farbe im Raum. Angewandte Farbenpsychologiearbe, München: Callwey.
Gellen, K. (2010). Hearing spaces: Architecture and Acoustic Experience in Modernist German Literature. Modernism/Modernity, 17(4), 799-818.
Gezer, H. (2012). Mekânı Kavrama Sürecinde Algılama Bileşenleri. İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi, Sayı: 21, 1-10.
Gibson, E. J. (1950). The Perception of the Visual World. Oxford: Houghton Mifflin.
Gibson, E. J. (1969). Principles of Perceptual Learning and Development. New York: Appleton-Century-Crofts.
Gibson, E. J. (1977). How perception really develops: A view from outside the network, pp.157-173. In D. LaBerge, SJ Samuels (Eds.) Basic Processes in Reading. NJ: Erlbaum.
Gillespie, C. A. (2010). How Culture Constructs Our Sense of Neighborhood: Mental Maps and Children's Perceptions of Place. Journal of Geography, 109:1, 18-29.
Goldstein, B. (2013). Bilişsel Psikoloji (O. Gündüz, çev.). İstanbul: Kaknüs Yayınları.
Gür, Ş. & Zorlu, T. (2002). Çocuk Mekanları. İstanbul: Yapı-Endüstri Merkezi Yayınları.
Hamlacıbaşı, F. Ü. (2019). Duyusal Mekan Olarak Kapalıçarşı: Uz Alanı ve Mekan Pratikleri, Doktora Tezi, Yeditepe Üniversitesi, Sosyal Bilimler Enstitüsü, Antropoloji Bölümü, İstanbul.
Hart, R. A. & Moore G. (1973). The Development of Spatial Cognition: A Review, pp. 246-288. In R. Downs and D. Stea (Eds.) Image and Environment: Cognitive Mapping and Spatial Behavior. Chicago: Aldine Publishing Company.
Henshaw, V. (2013). Urban Smellscapes: Understanding and designing city smell environments. London: Routledge.
Hershberger, R. G. (1980). A study of meaning and architecture, pp.21-41. In G. Broadbent, R. Bunt, T. Llorens (Eds.) Meaning and Behavior in the Built Environment. London: John Wiley and Sons.
Hershberger, R. G. & Cass, R. C. (1974). Predicting user responses to buildings, pp.195-211. In J. Nasar (Eds.) Environmental Aesthetics. Theory, Research, and Application. Cambridge: Cambridge University Press.
Heuser, K. (1976). Inenarchitektur Und Raumgestaltung, Berlin: Bauverlag.
Howes, D. (1991). The Varieties of Sensory Experience: A Sourcebook in the Anthropology of the Senses. Toronto: University of Toronto Press.
Hume, C., Salmon, J. & Ball, K. (2005). Children's perceptions of their home and neighborhood environments, and their association with objectively measured physical activity: a qualitative and quantitative study. Health Education Research, 20(1), 1-13.
Ingold, T. (2011). Reply to David Howes. Social Anthropology, 19, 3, 323-327.
Jencks, C. (1980). The architectural sign, pp.71-118. In G. Broadbent, R. Bunt, C. Jenks (Eds.) Signs, Symbols and Architecture. New York: Wiley.
Kahvecioğlu, H. (1998). Mimarlıkta İmaj: Mekansal İmajın Oluşumu ve Yapısı Üzerine Bir Model, Doktora Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, İstanbul.
King, P. (2008). Memory and Exile: Time and Place in Tarkovsky's Mirror. Housing, Theory & Society, 25 (1), 66–78.
Koç, B. (2012). Çocuklar İçin Tasarlanan Mekanlarda Bilişsel Sınırlar, Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.
Koyuncuoğlu, B. (2017). Anasınıfına Devam Eden Dört Beş Yaş Çocukların Yaratıcı Düşünme Becerilerine Duyu Eğitim Programının Etkililiğinin İncelenmesi, Doktora Tezi, Hacettepe Üniversitesi, Çocuk Gelişimi ve Eğitimi Programı, Ankara.

DOI: 10.15320/ICONARP.2022.194

Köksüzer, G. (2013). Çocuğun Algısında Okul Öncesi Eğitim Merkezlerinin Mekansal Dizim (Space Syntax) Yöntemiyle İrdelenmesi, Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.

Kranowitz, C. S. (2014). Senkronize Olamayan Çocuk - Duyu Bütünleme Bozukluğunu Anlayabilme ve Onunla Başa Çıkabilme. İstanbul: Pepino.

Marinetti, F. N. (2009). Dokunsalcılığın Manifestosu. Dosya 17, Mimarlar Odası Ankara Şubesi, s.51-54.

Martel, C. (1995). Ben Enerjiyim. İstanbul: Arion Yayınevi.

Marks, L. E. (1978). Chapter 2: The Doctrine of Equivalent Information, pp. 11-48. In Lawrence E. Marks (Eds.) The Unity of the Senses. Cambridge: Academic Press.

Merleau-Ponty, M. (1964). Sense and Non-Sense. USA: Northwestern University Press.

Moore, R. & Young, D. (1978). Childhood outdoors: Toward a social ecology of the landscape, pp.83-130. In Irwin Altman, Joachim F. Wohlwill (Eds.) Children and the Environment. Boston: Springer.

Morrell, F. (1972). Visual system's view of acoustic space. Nature, 238, 44-46.

Nelson, K. & Fivush, R. (2004). The emergence of autobiographical memory: a social cultural developmental theory. Psychological Review, 111(2), 486.

O'Connor, N. & Hermelin, B. (1972). Seeing and hearing in space and time. Perception and Psychophysics, 22, 46-48.

Olds, A. R. (1987). Designing settings for infants and toddlers, pp. 117-138. In Carol Simon Weinstein & Thomas G. David (Eds.) Spaces for Children. Boston: Springer.

O'Neill, D. K. & Chong, S. (2001). Preschool children's difficulty understanding the types of information obtained through the five senses. Child Development, 72(3), 803- 815.

Öktem Erkartal, P. & Ökem, H. S. (2015). The Phenomenon of Touch in Architectural Design and A Field Study For Haptic Mapping. Megaron, 10(1): 92-111.

Özak, N. (2008). Bellek ve Mimarlık İlişkisi Kalıcı Bellekte Mekansal Öğeler, Doktora Tezi, İstanbul Teknik Üniversitesi, Fen bilimleri Enstitüsü, İstanbul.

Öztürk, A. & Durmuş Öztürk S. (2020). The Brand and Sensation Relation as a Spatial Tracking in Shopping Malls. ICONARP International Journal of Architecture and Planning, Cilt.8, Sayı:1, 821-844.

Pallasmaa, J. (2014a). Space, place and atmosphere. Emotion and peripherical perception in architectural experience. Lebenswelt: Aesthetics and Philosophy of Experience, 4, 230–245.

Pallasmaa, J. (2014b). Museum as an embodied experience, pp. 239-250. In N. Levent, Alvaro P. (Eds.) The multisensory museum: Cross-disciplinary perspectives on touch, sound, smell, memory, and space. USA: Rowman & Littlefield.

Piaget, J. (1964). Cognitive development in children: Piaget. Journal of Research in Science Teaching, 2(3), 176-186.

Piaget, J., Inhelder, B. & Szeminska, A. (1960). Child's Conception of Geometry (Vol. 81). London: Routledge.

Piaget, J. (2004). Çocukta Zihinsel Gelişim. (H. Portakal, çev.). Cem Yayınevi.

Pick, H. L., Jr., Warren, D. H. & Hay, J. C. (1969). Sensory conflict in judgments of spatial direction. Perception and Psychophysics, 6, 203-205.

Pink, S. (2009). Doing Sensory Ethnography. London: SAGE Publications.

Pink S., Howes, D. (2010). The Future of Sensory Anthropology/the Anthropology of the Senses. Social Anthropology ,18, 3, 331-340.

Proske, U. & Gandevia, S. C. (2009). The kinaesthetic senses. The Journal of Physiology, 587(17), 4139-4146.

Rapoport, A. (1977). Human Aspect of Urban Form: Toward a Man Environment Approach to Urban Form and Design. Oxford: Pergamon Press.

Rapoport, A. (1990). The Meaning of the Built Environment: A Nonverbal Communication Approach. Arizona: University of Arizona Press.

Rodaway, P. (1994). Sensuous Geographies: Body, Sense and Place. London: Routledge.
Seçkin, N. P. (2010). Mimaride Malzeme Algısı: Dokunsal ve Görsel-Dokunsal Deneyimlerin Değerlendirilmesi, Doktora tezi, MSGSÜ Fen Bilimleri Enstitüsü. İstanbul.
Smith, E. E. & Kosslyn, S.M. (2014). Bilişsel Psikoloji Zihin ve Beyin (M. Şahin, çev.). Ankara: Nobel Akademik Yayıncılık.
Smith, L. B. (2005). Cognition as a dynamic system: Principles from embodiment. Developmental Review, 25(3-4), 278-298.
Spence, C., Lee, J. & Van der Stoep, N. (2020). Responding to sounds from unseen locations: crossmodal attentional orienting in response to sounds presented from the rear. European Journal of Neuroscience, 51(5), 1137-1150.
Stein, B. E. & Stanford, T. R. (2008). Multisensory integration: current issues from the perspective of the single neuron. Nature Reviews Neuroscience, 9(4), 255-266.
Tarçın Turgay, Z., Çanakçıoğlu N. G., Tunçok Sarıberberoğlu, M. (2015). How Does a Child Act in a Theme Park? Searching The Role of Space Syntax in a Child's Cognitive Schema. Proceedings of the Tenth International Space Syntax Symposium, London, UK: UCL, 13-17 July 2015, England.
Tarçın Turgay, Z. (2018). Mekansal Belleğin Ortaöğretim Binaları Bağlamında İrdelenmesi, Doktora Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, İstanbul.
Taylor, J. L. (2013). Kinesthetic Inputs, pp. 931-964. In Pfaff D.W. (Eds.) Neuroscience in the 21st Century. New York: Springer.
Temel, H. (2015). Çocuk Poliklinikleri Bekleme Mekanlarında Çocuk Psikolojisine Uygun Renk ve Işık Kullanımı ve Örnekler Üzerinde Analizi, Doktora Tezi, MSGSÜ, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.
Tunçok Sarıberberoğlu, M., (2018). Eğitim Binalarında Mekansal Davranışın Dizimsel (Sentaktik) İrdelenmesi, Doktora Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.
Türk, S. & Midilli Sarı, R. (2020). Eğitim Yapısı Tasarımını Duyular Üzerinden (Yeniden) Düşünmek. Sanat ve Tasarım Dergisi, 719-750.
Ungar, S. (2000). Cognitive Mapping Without Visual Experience, pp.1-16. In Kitchin, R. & Freundschuh, S. (Eds.) Cognitive Mapping: Past Present and Future. London: Routledge.
Üstündağ, T. (2011). Yaratıcılığa Yolculuk. Ankara: Pegem Akademi.
Venturi, R. & Brown, D. S. (2004). Architecture as Signs and Systems. Cambridge: Belknap Press.
Van der Stoep, N., Postma, A. & Nijboer, T. C. W. (2017). Multisensory perception and the coding of space, pp.123–158. In A. Postma & I. J. M. van der Ham (Eds.) Neuropsychology of space: Spatial functions of the human brain. Cambridge: Elsevier Academic Press.
Wallace, M. T. (2004). The Development of Multisensory Integration, pp.625-642. In Calvert, G., Spence, C., & Stein, B. E. (Eds.) The handbook of Multisensory Processes. MIT press.
Yılmaz, Ç. N. (2005). Tarlabaşı'nda Yaşayan Çocukların Çevresel Algı Süreçlerinin Bilişsel Haritalar Yöntemiyle İrdelenmesi, Doktora Tezi, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, İstanbul.
Url-1: https://www.ncbi.nlm.nih.gov/books/NBK279394/
Url-2: https://istanbul.kidzania.com/tr-tr

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Visual Accessibility and Inclusive Wayfinding Design in Hospital Environment in Nigeria

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Abstract

Visual accessibility refers to the legibility and intelligibility of space cues that most contribute to the searching and use of information from the environment for wayfinding in hospitals. Because of building complexity and expansions over time, there is a lack of visual clarity to navigate and access the most desired destinations in the hospital. However, the inaccessibility of space by many unfamiliar users of any age, gender, or disability resulted in disorientation, uncertainty, stress, frustration, getting lost, and missed medical appointments. The purpose of this study is to investigate the impact and barriers of visual accessibility on wayfinding in hospital buildings. Mixed-method approach combined quantitative and qualitative measures for the study area with focus on General Outpatients Departments (GOPD). A simple random sampling technique was used to select 98 participants. 24 respondents were selected for interview, while GOPD hospital buildings were observed for data elicitation. The main findings show that some of the circulation spaces were crowded with patients, and that most destinations within the GOPD were not visible from the main entrance. In addition, indistinctive nodes act as barriers, rendering some buildings inaccessible during navigation. It also revealed that signage, unit building entrances, and lighting were legible and properly positioned, enhancing space accessibility during wayfinding. The main limitations of this study are the absence of physically challenged people and the elderly in the research process, as well as cultural and linguistic differences. The implications are that designers should make simplified building layout more legible to the wide group of users such that core sections are visible and interlinked with high traffic flow pathways in the hospital for inclusive wayfinding. This study suggested solutions to the problems of visual accessibility in the hospital could improve all users' inclusive wayfinding, increase satisfaction, confidence, reduce confusion during direction-finding in the hospital.

Keywords:
Barriers, hospital environment, impact, inclusive wayfinding, visual accessibility

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INTRODUCTION

The difficulty of easily locating desired destinations in a hospital is exacerbated by the building's complexity and evolving spaces (Ahmed et al., 2020). Hospitals typically grow and expand in response to increased demand for services, necessitating the addition of new buildings and extensive route changes. Due to the renamed and disordered systems of linked corridors and entrances that results from the expansion of the hospital, consequently confuses new users which affects successful wayfinding (Brunyé et al., 2018). Furthermore, hospitals must accommodate a wide range of user requests and emotional states, as well as address a wide range of physical and cognitive abilities (Mollerup, 2009). Complex building layouts typically provide very limited visual access from the main entrance to some target locations, which impedes the user's orientation within the buildings (Hughes et al., 2015; Kamal et al., 2010). Impediments to orientation hamper wayfinding, resulting in uncertainty, anxiety, stress, and frustration (Martins & de Melo, 2014). As a result, the level of optical admittance to building layout is a significant variable in the hospital environment for effective legibility of buildings and circulations for efficient wayfinding (Baskaya et al., 2004).

Successful wayfinding requires knowing the origin, the best route to take to reach the intended destination, recognizing the destination, and being able to retrace the route out of the premises (Vaez et al., 2016). Getting to the destination easily is currently a problem for new users at the University of Abuja Teaching Hospital (UATH), Gwagwalada-Abuja due to the expansion of buildings, which creates complication in cognitive and visual understanding of finding a target (Ahmed et al., 2018). Consequently, imprecise visual access from start to destination and lack of pathway intelligibility may obstruct movement and decision making for effective wayfinding (Kamal et al., 2010). Despite the convenience of various guides such as signage, maps, and directories in the hospital, uninformed patients and those with language barriers have difficulty accessing the facilities (Verghote et al., 2019). As a result, all users, including those that experience disability such as the elderly with difficulty in movement, uninformed and language barrier users who cannot read signs, all require access to navigate hospital environment.

Hospital designs are expected to meet the growing needs of diverse users by being inclusive and accessible in addressing the needs of a wide range of physical, language, cognitive, and sensory, aptitudes, and desires of the users (Morag et al., 2016). Aside from language, other aspects of inclusive wayfinding design considerations include social and cultural background, which ensure effective wayfinding to many groups of potential users (Passini, 1992). These inclusive wayfinding characteristics give meaning to wayfinding systems and the cues provided in the hospital. Visual access, though intricate to accomplish in a multifaceted layout, has been shown by researchers to be a significant factor that eases one's spatial orientation and influences new users'

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wayfinding behavior more than available signage (Baskaya et al., 2004; Belir & Onder, 2013; Carpman et al., 1985; Sadek, 2015). Previous research looked into the effects of visual access and the capacity of available information on the legibility of an environment. Kuipers (1978) investigated the use of optical sanity in navigation, whereas Turner and Penn (2002) investigated the relationship between visual field and human behavior in the wayfinding procedure.

These previous studies hypothesized that an increased scale of intersection between the optical arena of a starting point and the intended landmark might aid users in developing the necessary spatial knowledge for wayfinding tasks. This implies that clear visual access and prominent landmarks are important factors in effective wayfinding (Ahmed *et al.,* 2020). According to Shokouhi (2003), a high degree of global integration, such as the configuration of landmarks and pathways, influences the legibility of the built environment. However, there have been few studies on the factors that act as roadblocks to wayfinding, particularly the lack of understanding of accessibility in the hospital setting.

This research evaluated the barriers to accessibility and their impact on the inclusive wayfinding design of hospital buildings. It focused on able-bodied individuals who were not impaired, but were hampered by the experience of difficulty due to the level of information available in the hospital setting. It is argued in this context that wayfinding cues should be inclusive and accessible to all users. The study's significance is to advance understanding of accessibility and inclusive wayfinding design in order to improve all users' access, increase satisfaction, and reduce confusion during hospital direction-finding as espoused by Morag et al. (2016). Consequently, the paucity of research on accessibility problems in hospital wayfinding necessitates the study.

PERCEPTION AND COGNITION OF WAYFINDING

Wayfinding is an exceptionally perplexing intellectual task that contains various instruments (spatial recollections and signs) and systems (route looking and course following) utilised successively or all the while(Andresen et al., 2016) . Direction-finding in hospital involves perception and cognition of cues afforded by the environment. When addressing a wayfinding task, individuals obtain environmental cues through observation (perception) and utilise spatial recollections (cognitive map) accumulated from past visits, summed up data, signs, maps, and navigational frameworks. Perception is the visual comprehension of a situation with limited information, while cognition is the intellectual understanding of a situation with additional data processing and varying levels of psychological activity (Cubukcu, 2003; Verghote et al., 2019).

The discovery of one's path in a location is a task that requires decision making by first sketching out a plan of action for where to go (Sadek, 2015). This is followed by decision execution, which

encompasses navigating to the correct position and information processing, which involves comprehending the acuity of the setting (Curl, 2018). All of these processes are accomplished through the psychological perception and cognition of the user, which results in wayfinding behavior (Kang et al., 2017). Thus, a comprehensive wayfinding system aids the wayfinder's decision-making process and provides equipment designed for spatial orientation and cognitive mapping.

Perception and cognition are both required to develop spatial knowledge of a built environment in order to maintain orientation and make the best route choice to efficiently access and reach a destination (Andresen et al., 2016; Kamal et al., 2010). The concept of accessibility refers to the ease of access to destinations by all people in a timely manner and is related to the relationship between people, mobility, and the built environment (Curl, 2018). Inaccessibility occurs when a person wishes to use a hospital's services but is unable to do so due to difficulty or an obstacle encountered in reaching the desired destinations (Creem-Regehr et al., 2021). Furthermore, the effective accessibility of the hospital environment increases opportunities for improved mobility as well as social and economic autonomy (Kang et al., 2017). Inaccessible space, on the other hand, may cause patients to experience a disability situation if the hospital environment does not provide the conditions required for appropriate accessibility (Brunyé et al., 2018; Montello, 2014). This inaccessibility in hospital wayfinding has the unintended consequences of uncertainty, stress, and becoming disoriented. Therefore, the design of wayfinding systems and spaces is expected to be organized in such a way that it effectively communicates to all groups of users by raising awareness of inclusive design and universal access.

As a result, most users should be guided from their starting point to their final destination by recognising and spotting places with distinguishing landmarks, zoning of spaces, connecting and arranging spaces using architectural and graphic means(Morag et al., 2016) . As such, the setting of the hospital is expected to emphasize on distinctiveness and structure towards aiding the reading of space and formation of image in the perceiver's memory to facilitate interpretation of 'place legibility.

Inclusive Wayfinding Design Strategies

The strategy for an inclusive wayfinding system includes recognising and marking spaces, categorising spaces, and connecting and systematizing spaces using architectural and graphic techniques (Curl, 2018). It should account for and effectively communicate with large groups of people with varying sensory abilities, cerebral capacities, literacy levels, languages, and physical statures (Verghote et al., 2019). The criteria for inclusive wayfinding design as stated by Vaez et al.

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(2016) include equitable and flexible use of facilities by all. The design should be made simple with instinctive exploits regardless of the user's experience, familiarity, and language proficiency. It should ensure competent and contented use with the least amount of effort. It can be surmised that inclusive wayfinding design guidelines ensure that objects and supports are accessible to all people without distinction, and reducing the barriers to free circulation.

Scholars have identified some factors that are significant variables for the assessment of visual access in public spaces such as the accessibility of hospital settings for wayfinding. Differentiation, visual access, and layout complexity are three major spatial attributes that influence orientation and wayfinding, according to Montello and Sas (2006). Furthermore, Colfelt (2012) investigated accessibility in public spaces, with a focus on wayfinding in Danish hospitals. The study's findings revealed that spatial knowledge is acquired when there are a few distinct and visible choice points from a long distance. However, Colfelt (2012) did not adequately facilitate users' general understanding of the wayfinding design that eases accessibility. The issue with building accessibility prevented users from taking the best routes to targeted locations in hospitals. Hughes et al. (2015) discovered hospital site size, security concerns, and signage constraints as wayfinding barriers.

Hunter (2010) also investigated accessibility and universal design in architectural wayfinding for various building types, classifying wayfinding obstacles as exterior or interior. However, the urgency required in hospitals to access facilities in emergency situations necessitates additional research into the barriers that hinder accessibility in wayfinding (Morag et al., 2016). Similarly, (Carpman & Grant, 2003) states that wayfinding impediments include lack of distinguishing space, connecting walkways at sharp angles. However, little is known about the amount of information provided in the setting that allows all users, regardless of their abilities, to easily access and navigate the hospital environment. Thus, there is a need for this research to further the understanding of accessibility and inclusive wayfinding design.

METHODOLOGY

The study is situated at the University of Abuja Teaching Hospital (UATH) as depicted in Figures 1 and 2 showing the site layout as well as the marked out study units. The General Outpatient Departments (GOPDs), a radiology unit, a theatre, a laboratory, wards, and the National Health Insurance Scheme (NHIS) Complex were all part of the delineated area. The NHIS building contains a pharmacy. The variables evaluated include circulation patterns, corridor intersections, clarity of visual access, and building floor plans in terms of configuration. Furthermore, the variables were used to assess the

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factors that obstruct successful wayfinding and the impact of such obstructions to Inclusive wayfinding in the hospital.

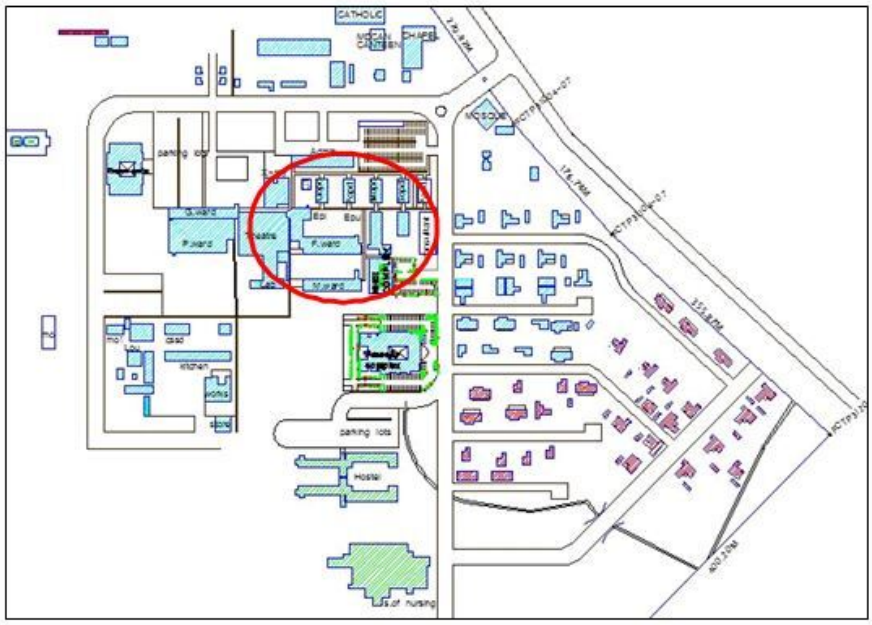

Figure 1. The layout of University of Abuja Teaching Hospital (Ahmed et al., 2018)

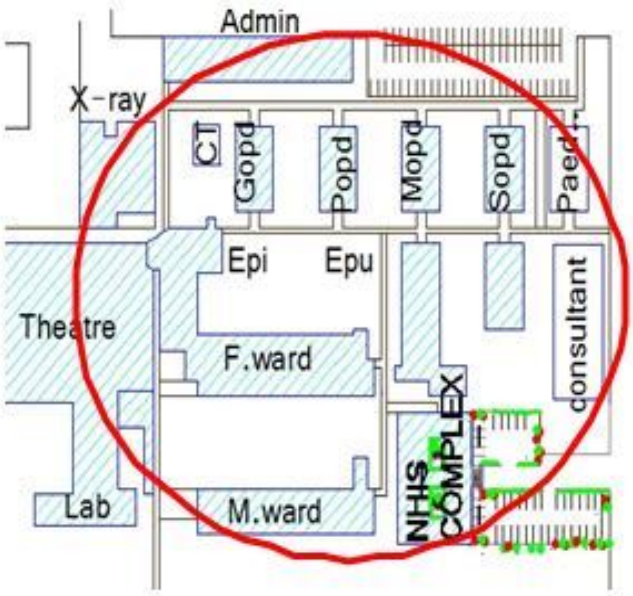

Figure 2. The study area within the University of Abuja Teaching Hospital (Ahmed et al., 2018)

Method of Data Collection

Data collection for the research entailed the use of the survey questionnaire and semi-structured interviews as research instruments, thus, a mixed method approach was used via a concurrent strategy. The average number of daily outpatients for the (GOPD) obtained from the hospital's medical information unit was 131, which serves as the population. For the survey, a simple random sampling technique was used, while for the interview, a purposive sampling technique was employed. Bartlett et al. (2001) states that that Cochran's formula in equation (i) for categorical data should assume a 95% confidence level

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and a 5% sampling error, which was used to compute the sample size as follows:

$n_{0 =(}t)\ 2^*\ (p)\ (q)\ /\ n_0\ (d)^2$..... (i)

Where t = the value of the chosen alpha in each tail = 1.96; d = the acceptable limit of error, alpha degree =.05. As a result, $n_0 = (1.96)^{2*}(.5)\ (.5)\ /\ (.05)^2 = 384$. As a result, Cochran's correctional formula for sample size used in equation (ii) was:

$n_1 = n_0\ /\ (1+n_0\ /$ population) ..... (ii)

Where population size = 131 and n_0 = basic return sample size according to Cochran's formula = 384. Since n_1 is the sample size we want to find, $n_1 =384\ /\ (1+384/131) = 98$.

Consequently, a sample size of 98 (49 male, 49 female) was employed for the survey questionnaire. Furthermore, the sample size for the interview was found based on theoretical data saturation, which is the position where further interview provides no fresh data (Singh & Masuku, 2014). Therefore, saturation was achieved at 24 interviews which were used as the sample size for the study. Previous research suggested that the sample size threshold of 10-15 interviews is adequate for theoretical data saturation for qualitative interview (Morse, 2000).

Procedure for data collection

The UATH's Ethical Research Committee granted permission for the research. Furthermore, prior to the start of data collection, the participants gave their verbal informed consent. While the patients were waiting for consultation in the hospital, the survey questionnaire was administered on the spot by the recruited research assistants. In addition, the interviews and building observations were conducted at different times.

Also, the variables utilised in the instruments were modified from preceding researches on hospital wayfinding (Ahmed et al., 2020; Colfelt, 2012; Morag et al., 2016; Vaez et al., 2016; Verghote et al., 2019) To obtain the frequencies and percentages of the opinion poll, the inquiries were assessed using a 4-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree). This is because Joshi et al. (2015) stated that the 4-point Likert scale could be used to make an imposed decision of measure to avoid unresponsive choices such as 'neutral' or indecision. In addition, the 24 respondents were interviewed at the GOPDs. The conversation was undertaken in English language, however, the research assistant sometimes interpreted in local languages for those not fluent in English language. The consent of each respondent was sought to record the interview and each lasted approximately 30 minutes. The protocol for the interviews also included notification of the audio recording to the participants. However, some respondents declined participation because they were not emotionally stable for the interview.

Data Analyses

The data collected in this study were both quantitative and qualitative in nature. In analysing the quantitative data statistical tools were used, while content analysis was used for the qualitative data. The survey questionnaire data was descriptively analysed to elicit perception for the questionnaire survey, using a 4-point Likert's-scale (1 = Strongly Disagree to 4 = Strongly Agree) to get frequencies, and percentages. The 4-point Likert's-scale was used to generate an enforced choice of measure to avoid unresponsive option such as 'neutral' (Neither Agree nor Disagree) as affirmed by (Joshi et al., 2015). For better interpretation, the weighted score (WS) and weighted mean value (WMV) for each item were obtained and ranked based on the mean values. Similarly, the interview transcripts were transcribed and content analysed.

The recurring themes were identified from the texts through coding and creation of categories. Thereafter, there was the emergence of respondents' wayfinding knowledge. This followed Miles et al. (2014) which affirmed that the frequency of similar categories could be counted to determine the number of recurrences to evade replication and to highlight commonalities. Transcripts of interviews were used to analyze the impact and barriers of visual accessibility on wayfinding in hospital buildings. Data from tape-recorded interviews was transcribed verbatim, and nonverbal cues were noted. The transcript was divided into sense parts, and reduced sense components were summarized and labeled with ciphers. The various ciphers were compared in terms of their differences and similarities, and then classified into sub-groups and groups that constituted the obvious content.

The transcripts revealed recurring themes that represented a wide range of respondents' wayfinding experiences. In the form of a framework matrix, these themes were used in the content analysis. Similar concepts were merged and counted in the second column based on the number of times they appeared. The data mapping and interpretation were completed by identifying the core concept. According to Gale, Heath, Cameron, (Gale et al., 2013) mapping entails establishing relationships between groups in order to discover associations. The information was described and explained in terms of the implicit and explicit meanings of the data in the interpretative steps. In the content analysis, a matrix table (framework method) was used to manage the large data set obtained, allowing for a holistic and descriptive synopsis of the entire data set. Subsequently, the interpretation focuses on the connections between disparate parts of the summarized information, with the goal of drawing descriptive or explanatory conclusions. Furthermore, peer debriefing was used by allowing seminar researchers to read through analysed data to increase credibility in the qualitative research as stated by Nguyen (2008). This was done to ensure openness, sensitivity, and insight throughout the entire data collection and analysis process.

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RESULTS AND DISCUSSION

Survey Data

There were 98 respondents in UATH of which half were male (50%) and the other half (50%) were female. Similarly, almost half of the respondents (48%) were aged between 20 to 34 years that were classified as youth, 49% were aged between 35 to 55 years categorised as middle aged, and the remaining 3% were above 55 years which was classified as elderly (senior citizens). For the educational status, 30% had secondary education, 47% were graduates, while 21% of the respondents had primary education, and 2% had no formal education. Furthermore, over half of the respondents (60%) could speak English language while the other 40% of the respondents speak other languages.

Table 1 shows the results of the survey questionnaire, including the weighted sum (WS) as response scores for each item, the weighted mean value (WMV), the ranking, and the degree of agreement in the interpretation. The architectural features used in the wayfinding process were the factors considered in the survey questionnaire. Table 1 shows that the most critical variables that enhance visual accessibility of wayfinding success in the hospital are signage, building entrance identification, and well-lit up circulation space, ranked first, second, and third, respectively.

Table 1. Users' responses on architectural factor for wayfinding in UATH, Abuja (Researcher's work, 2018)

Item	WS	WMV	Ranking	Interpretation
A11: Designed signage system makes destination easy to identify	104	3.10	1st	Agree
A1: Easy identification of building entrance	102	3.04	2nd	Agree
A8: Lighting up circulation space play a vital role in wayfinding	99	2.95	3rd	Agree
A4: Legible pathway identification	95	2.85	4th	Agree
A2: Floor plan arrangement was difficult to understand (building layout)	94	2.82	5th	Agree
A3: Easy direction finding in circulation space	94	2.82	5th	Agree
A6: Too many patients around circulation space disturb wayfinding (Crowdedness)	93	2.78	7th	Agree
A9: Visible environmental picture	92	2.77	8th	Agree
A12: See direct from entrance to important building and destination	89	2.74	9th	Agree
A5: Easy identification of stairways	89	2.74	9th	Agree
A10: Corridor intersection (nodes) makes wayfinding difficult	88	2.72	11th	Agree
A7: Map was used to find direction	86	2.70	12th	Agree

*WS (Weighted Sum); WMV (Weighted Mean Value)

This implies that the signage was clear and legible in terms of text and symbols provided where users needed the information to find their way to destinations in the hospitals. Consequently, signage influences ease of wayfinding and reduces wayfinding errors, such as incorrect turns and backtracking, supporting the findings of Michael O'Neill (1991) and Potter (2017) (2017). This implies that the hospital

provided adequate signs and landmarks at decision points, reducing the complexity of route directions.

There was clear visual access from the building entrance and was easily identified, which ranked as the second most important influential variable in the hospital's wayfinding success. This was due to the fact that the majority (76%) of respondents agreed with the statement that the building entrance was visible and easily accessible for wayfinding. This lends credence to the findings that visual access influences spatial legibility and has the potential to reduce uncertainty and stress during wayfinding (Montello, 2014; Verghote et al., 2019) The implication is that prominent landmarks such as signs, artwork, and visible main staircases from the main entrance area can help wayfinders identify and access navigation options available during wayfinding.

The third variable influencing the ease of wayfinding in the hospital was the use of lighting in the circulation space. This was because the circulation spaces were adequately lighted, with an open courtyard for natural lighting, allowing users to clearly see signs and cues while navigating (See Figure 2). This implies that lighting improves visibility for navigation. Similarly, the majority of respondents (71.3%) ranked legible pathway as the fourth influential variable influencing ease of wayfinding. This implies that there were distinguishable signs and landmarks at decision points, reducing the complexity of route directions and facilitating accessibility.

Furthermore, the hospital's building layout complexity (5th), crowdedness (7th), and mental image (8th) rankings show that the attributes impede successful wayfinding. This means that the vast majority of patients (71%) were unable to understand the functional spaces of the building layout. Consequently, the hospital environment was far too complicated for effective wayfinding.

Crowding around the circulation space was a barrier to hospital wayfinding by the majority of respondents (70%), while 69.5 percent were unable to form a cognitive map of the setting. The visual clarity of the users to see from the building entrance to the desired destination within the buildings was ranked ninth, and as such, was ineffective for hospital wayfinding (See Table 1). This implies that users' wayfinding behavior through the building entrance to the desired destination was influenced by visual access. Stairways, nodes, and maps in circulation space, on the other hand, were ranked as the 9th, 10th, and 11th influential attributes to wayfinding, respectively. This implies that respondents found stairways, nodes, and maps difficult to perceive in situations where there were no directional signs to identify and improve correct route knowledge to the preferred destination.

Interview Data

The impact of the building's entrance on wayfinding

The GOPD patients and their family members who were interviewed included 12 males and 12 females ranging in age from 25 to 55 years.

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Two (2) had graduate degrees (Masters and PhD), twelve (12) had first degrees or diplomas, five (5) had secondary school education, three (3) had primary education, and two (2) had no formal education. Fifteen (15) of the respondents had never been to the hospital, while nine (9) had been there twice. The respondents were asked about the impact of building entrances on wayfinding in terms of accessibility and visibility. Table 2 summarizes the findings and the emerging core theme.

Table 2. Influence of Building entrance on wayfinding (Researcher's work, 2018)

Identifying themes	Indexing: coding and merging similar issues	Charting: Data abstraction and summary	Mapping and Interpretation
Theme: Building entrance (A) Help to direct me to destination (**2**) (B) Makes wayfinding easy (**3**) (C) Good and centrally located for easy access (**4**) (D) Easily noticed (**4**) (E) Centrally placed for easy accessibility (**2**) (F) GOPD entrance was not distinctive (**3**) (G) Confuses emergency entrance with NHIS/OPD entrance (**3**) (H) Difficult to notice (**2**) (I) Confusing entrances (**1**)	(A – B) Help to direct me to destination / makes wayfinding easy (**5**)* (C -E) Good/ Centrally located for easy access (**10**)* (F -I) GOPD entrance was not distinctive; Difficult to notice; Confusing entrances (**9**)*	(A – E) = (**15**)* (R1, R4) (F - I) = (**9**)*	The main trend was that the building entrance was user-friendly, thus, easily accessible. **Core concept:** Easy accessibility

*The bold numbers indicate the frequency of count of concepts;

As shown in Table 2, the majority of respondents (15 out of 24) stated that the building entrance was user-friendly and thus easily accessible. This is supported, for example, by the following quotes from respondents: "*the entrance of the building is centrally located for easy accessibility, so, it really helped me to find my destination*." (R4); "*I easily noticed the building entrance location and helped to direct me to my destination in the hospital*" (R1). These assertions could be attributed to the parking lot's proximity to the entrances.

However, some pedestrians (9) were perplexed by the entrances because they mistook the emergency section for the GOPD sections. This implies that the location of the building's entrance for each section should have been more visible and marked to facilitate access to various locations within the hospitals. Furthermore, a well-designed layout should provide users embarking on wayfinding with a clear visual understanding of the building configuration, including the easy access to the main entrance.

Recognising building layout in hospital wayfinding

The respondents were asked how they understand the hospital's building layout that enabled finding direction to the desired destination. The respondents' narrations and experiences were considered,

analyzed, and interpreted (See Table 3). The alphabets in capital letters represent the coding of themes, while the numbers represent the number of themes that appeared in all of the responses.

Table 3. Opinion on building arrangement (Author's field work, 2018)

Identifying themes	Indexing: coding and merging similar issues	Charting: Data abstraction and summary	Mapping and Interpretation
Theme: Building layout (A) Simple to understand (**3**)* (B) Complex layout and stressful (**2**)* (C) Difficult to understand (**7**) (D) Confusing layout (**3**)* (E) Layout was very easy to understand (**3**)* (F) Very easy to access (**2**)* (G) Very big and complex; one can get lost (**2**)* (H) Simple layout (**2**)*	(A, E, F, & H) Simple to understand ; Simple layout; Very easy to understand / Very easy to access (**10**)* (B,C,D,&G) Complex layout and stressful; confusing layout /difficult to understand (**14**)*	Layout was simple to understand : A, E, F, (**10**)* (R2, R12) Complex to understand, confusing and stressful B, C, D, & G = (**14**)* (R3, R7)	Majority of the respondent agreed that the building layout was complex to understand, confusing and stressful. **Core concept:** Building layout was **complex** and **stressful** to navigate

* Bold numbers were count of recurring themes

The majority of respondents (14) stated that the building layout was complex and stressful to navigate, making accessibility and wayfinding in the hospital difficult to understand (See Table 3). This finding was supported by the following quotes from the respondents: ''the building arrangement was complex to understand" (R3); ''Hospital buildings were complex and stressful to navigate" (R7). This suggests that the majority of users found it difficult to reach their destinations, which impedes wayfinding in hospitals. This implies that the conceptual composition of hospital building layout should be simple to understand to ease successful wayfinding.

Key features used in hospital navigation

The important features (landmarks) that were accessible cues and used in hospital wayfinding were asked of the respondents. Table 4 shows the analysis of their responses as well as the emergence of the core concept.

Table 4 reveals that the majority (15) of the respondents agreed that signage were a prominent feature in hospital that enhances accessibility and wayfinding. The quotes from some of the respondents support the claim which states as follows: For example, ''the important features that aid my movement in the hospital were signs and symbols'' (R1); ''Pictographs and signpost on the wall and the door post'' (R14). This implies that the signage was legible and used as landmarks. However, some patients identified ATM stand (5) while trees, flowers, overhead tank and distinctive buildings account for 2 each as landmarks which assisted users to identify and access their destinations.

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Table 4. Important features in wayfinding (Researcher's Field Work, 2018)

Theoretical framework: Identifying themes	Indexing: coding and merging similar issues	Charting: Data abstraction and summary	Mapping and Interpretation
Theme: Landmarks (A) Signs and symbols (**9**) (B) Overhead tank and parking lot (**2**) (C) Use trees as landmark (**2**) (D) ATM stand (**2**) (E) signage & Signpost (**6**) (F) stairways (**1**) (G) Unique height and design of the buildings (**2**)	(A & E) Signs and symbols ; signage = (**15**)* (B &D) ATM stand, overhead tank and parking lot (**4**)* (C) Use trees as landmark (**2**)* (F) stairways (**1**)* (G) Unique height and design of the buildings (**2**)*	(A) Signage (**15**)* (R1, R14) (B) ATM stand, overhead tank and parking lots (**4**)* (C) Trees and flowers (**2**)* (R2, R7) (G) Unique height and design of the buildings (**2**)*	The major landmarks used were signage. **Core concept:** Signage

* Bold numbers were count of recurring themes

Influence of lighting on wayfinding

Table 5 shows the emerging themes and concepts from the transcript of responses from the participants when the question was raised on the influence of lighting on wayfinding. The emerging similar themes were merged in column three of the table.

The main trend of opinion in Table 5 reveals that all the respondents agreed that lighting enhance accessibility and visibility in hospital wayfinding as it illuminates pathways and improve ease to identify destinations. The quotes from some of the respondents support the findings as follows: ''the lighting in the circulation space brightens up the corridor so I was able to access the destination without stress'' (R2); ''the lighting was helpful and aids my visibility to the destination'' (R12). This implies that that hospital designs should provide both natural and artificial lighting to illuminate the pathways for accessibility and effective wayfinding.

Table 5. Influence of lighting on wayfinding (Researcher's work, 2018)

Theoretical framework: Identifying themes	Indexing: coding and merging similar issues	Charting: Data abstraction and summary	Mapping and Interpretation
Theme: Lighting (A) All pathways are well lighted (**3**)* (B) Adequate lighting aid me to see the writings on the walls and doors ; easy access to destinations (**3**)* (C) Lighting helps me to see sign post better (**8**)* (D) Lighting was very okay; Lighting brightens the corridor (**5**)* (E) Help enhance visibility (**3**)* (F) Lighting ease movement (**2**)*	(A - D) All pathways are sufficiently lighted; helps me to see sign post better (**17**)* (E - F) Help enhance visibility; ease movement; brightens the corridor (**7**)*	A -D = (**17**)* E - G = (**7**)* (R2, R12) (A –G) Sufficient lighting at pathways and enhance visibility = (**24**)*	The main trend was that pathways were sufficiently lighted and enhances visibility to destinations. **Core concept:** Lighting enhance visibility and accessibility

* Bold numbers were count of recurring themes.

Wayfinding barriers in the hospitals

The participants were asked about the wayfinding barriers encountered in the hospitals. The responses were analysed as shown in Table 6.

Table 6. Wayfinding barriers (Researcher's work, 2018)

Identifying themes	Indexing: coding and merging similar issues	Charting: Data abstraction / summary	Mapping and Interpretation
Theme: Wayfinding barriers (A) Far distance to walk (**1**); (B) complexity of buildings (**2**) (C) Some confusing Signs and symbols (**1**) (D) Distance (**1**) and too many stairs causes confusion (**1**) (E) Similarity of building colours confuses users (**1**) (F) Many junctions and turns (**2**) (G) Crowd in the hallway (**5**)	(A & D) Far distance to walk; (B) complexity of buildings (**4**)* (C) Some confusing Signs and symbols (**1**) (D) Confusing stair cases (**2**) (E) Many junctions and turns (nodes) (**2**) (F) Crowd in the hallway (**5**)*	A & D = (**4**)* B = (**1**)* C = (**2**)* E = (**2**)* F = (**5**)* (R3, R9)	Crowdedness in the hallway was the main barrier in the hospital followed by the building layout complexity. **Core concept:** Crowdedness and building layout complexity

* Bold numbers were count of recurring themes; Capital letters indicate coding

The main perception in Table 6 illustrates that crowdedness and building layout complexity accounted for 5 and 4 of the respondents respectively which agreed that the attributes constitute barriers to accessibility in hospital wayfinding. It is to be noted that 24 respondents were interviewed. The combine effect of the attributes on accessibility and wayfinding is 15 of the respondents. The quotes from some of the respondents that support the claims are as follows: ''there are many people in the hallways and at the corridors at peak periods which makes the hospital crowded and causes confusion in finding destinations'' (R3); ''the heavy human traffic in the corridor cause obstruction to movement on busy days'' (R9); the building layout was very complex and confusing (R7). These attributes are considered as hidden barriers because they are intangible objects, which made wayfinding inaccessible and inadequate for all users' navigation. Furthermore, confusing junctions and staircases constitutes 2 each as substantiated by the following quotes: "staircase and junctions (nodes) in the hospital caused confusion in accessing destinations" (R6). This suggests that designs should consider sufficient corridor widths and hallways in hospitals. Also, sufficient seats should be provided in the waiting areas to avoid people hanging around the walkways in the hospital, particularly at emergency section.

Summary of Findings

Both the quantitative and qualitative findings corroborate that signage was used as the main landmark at decision points, thus, facilitates accessibility in hospital wayfinding. This result confirms the findings of other researchers that both directional and destination signage at decision points positively improve wayfinding (Michael O'Neill, 1991; Tzeng & Huang, 2009; Verghote et al., 2019) . This implies that textual, pictographs, tactile and audible signage are major and important landmarks for wayfinding. This also indicates that signage should be translated into local languages for better understanding by major group of users to ensure accessibility and inclusive wayfinding in the hospital.

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The result of other research in wayfinding asserted that clear visual access in hospital building entrance was capable of reducing uncertainty and stress during wayfinding (Montello, 2014). This proposes that the hospital building entrance should be conspicuous, visible and accessible to all users for successful wayfinding. Similarly, the qualitative research outcome substantiates the quantitative finding that lighting enhanced accessibility and visibility of patients in hospital pathways during wayfinding. Accordingly, the study of Hidayetoglu et al. (2012) found that the rise in the illumination of space absolutely correlates with optimistic perception and accessibility of space during wayfinding. This implies that visibility is a function of building layout; as such hospital design should ensure greater visibility to most destination zones.

Furthermore, crowdedness and difficulty in forming the cognitive map of building layout create barriers to accessibility and wayfinding in hospital. Similarly, Dogu and Erkip (2000) found crowding in pathways to have impacted on individual's aptitude to recollect a building and its position. Likewise, it is argued that a crowded environment suggests complexity and could offer a lot of visual distortion, causing difficulty in giving concentration to suitable wayfinding data in the hospital (Verghote et al., 2019). This supports the findings that crowd control is significant in hospital wayfinding design (Hughes et al., 2015).

CONCLUSIONS AND RECOMMENDATIONS

The complexity of the building layout results in lack of accessibility and wayfinding difficulty which causes uncertainty, stress, frustration, and getting lost in hospital. This research set out to assess the impact of visual accessibility and barriers of wayfinding in hospital buildings. The major findings of the research indicate that well placed signage recognisable entrances, and adequate illumination of circulation spaces do enhance accessibility of spaces during wayfinding. In addition, crowdedness in the circulation spaces, invisibility of most destinations from the main entrance, and indistinctive nodes constitutes barriers that impede effective wayfinding. These imply that the main building zones and signage should be conspicuous and accessible to all users; adequate pathway width and proper segregation of waiting areas should be created for crowd control, and building layout be made simple to understand in hospital design.

This research is significant to the understanding of accessibility and inclusive wayfinding design to improve all users' access, increase satisfaction, reduce confusion and confidence during hospital wayfinding. It is to be noted that inclusive wayfinding design refers to providing sufficient wayfinding information that allows diverse people to efficiently use their capabilities in discovery routes to the desired destinations. The policy implications are that designers should make building layout more legible through simplified design such that core departments are visible and interlinked with high traffic flow pathways in the hospital. Also, the study recommends that decision points should

be made distinctive with markers (landmarks) to improve imageability and readability of the hospital environment. Finally, policy makers and designers should ensure the utmost independent wayfinding to the extensive group of users beyond physical and sensory accessibility for a successful inclusive wayfinding system.

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REFERENCES

Ahmed, S., Muhammad, I. B., Isa, A. A., & Sani, M. A. (2020). Influence of Spatial Layout on Wayfinding Behaviour in Hospital Environment in Nigeria. *Journal of Art, Architecture and Built Environment* , *3*(1), 26-44.

Ahmed, S., Olagunju, R. E., Zubairu, S. N., & Akande, O. K. (2018). Architectural Design Layout and its Implication for Wayfinding in Abuja Hospital Environment. *Environmental Technology & Science Journal*, *9*(2), 55-47.

Andresen, E., Zinke, R., Hofinger, G., Chraibi, M., & Seyfried, A. (2016, October 17-24). *The impact of perception and wayfinding on pedestrian movements.* Proceedings of the 8th International Conference on Pedestrian and Evacuation Dynamics (PED2016), Hefei, China.

Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *InformationTechnology, Learning and Performance Journal*, *19*(1), 43-50.

Baskaya, A., Wilson, C., & Özcan, Y. Z. (2004). Wayfinding in an unfamiliar environment: Different spatial settings of two polyclinics. *journal of Environment & Behavior*, *36*(6), 839-867. https://doi.org/10.1177/0013916504265445

Belir, O., & Onder, D. E. (2013). *Accessibility in Public Spaces: Spatial legibility for visually impaired people.* Proceedings of the Ninth International Space Syntax Symposium Edited by Kim, YO, Park, HT and Seo, KW,

Brunyé, T. T., Gardony, A. L., Holmes, A., & Taylor, H. A. (2018). Spatial decision dynamics during wayfinding: Intersections prompt the decision-making process. *Journal of Cognitive Research Principle and Implications*, *3*(1), 1-19.

Carpman, J., & Grant, M. (2003). *Wayfinding: A broad View*. John Wiley & Sons.

Carpman, J. R., Grant, M. A., & Simmons, D. A. (1985). Hospital design and wayfinding: A video simulation study. *Environment & Behavior Journal*, *17*(3), 296-314.

Colfelt, S. (2012). *Designing Inclusive Spaces: Wayfinding in Hospital Complexes* Denmark University]. https://adk.elservierpure.com/files/.../

Creem-Regehr, S. H., Barhorst-Cates, E. M., Tarampi, M. R., Rand, K. M., & Legge, G. E. (2021). How can basic research on spatial cognition enhance the visual accessibility of architecture for people with low vision? *Cognitive Research: Principles Implications*, *6*(1), 1-18. https://doi.org/10.1183/s41235-020-00265-y

Cubukcu, E. (2003). *Investigating wayfinding using virtual environments* The Ohio State University]. https//www.facweb.knowlton.ohio.state.edu/jnas…

DOI: 10.15320/ICONARP.2022.195

Curl, A. (2018). The importance of understanding perceptions of accessibility when addressing transport equity. *Journal of Transport & Land Use*, *11*(1), 1147-1162.

Dogu, U., & Erkip, F. (2000). Spatial Factors Affecting Wayfinding and Orientation A Case Study in a Shopping Mall. *Environment and Behavior*, *32*(6), 731-755.

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC medical research methodology*, *13*(1), 1-8.

Hidayetoglu, M. L., Yildirim, K., & Akalin, A. (2012). The effects of color and light on indoor wayfinding and the evaluation of the perceived environment. *journal of environmental psychology*, *32*(1), 50-58. https://doi.org/dx.doi.org/10.1016/j.jenvp.2011.09.001.

Hughes, N., Pinchin, J., Brown, M., & Shaw, D. (2015). *Navigating in large hospitals.* 6th International Conference on Indoor Positioning and Indoor Navigation (IPIN), Alberta, Canada.

Hunter, S. (2010). Architectural wayfinding. *Centre for Inclusive Design Environmental Access. School of Architecture Planning. University of Buffalo*, *1*, 1-8. http://Udeworld.com/dissemination/publications/47-wayfinding-

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British Journal of Applied Science and Technology*, *7*(4), 396-403.

Kamal, A., Doganer, S., Ruvuna, J., Flores, J., Hernandez, E., & Nishimoto, T. (2010). Wayfinding and Accessibility in the San Antonio Riverwalk: A Model for Urban Design Education. *ArchNet-IJAR: International Journal of Architectural Research*, *4*(2/3), 391-406.

Kang, Y., Fukahori, K., Kubota, Y., & Gunawardena, G. M. W. L. (2017). A study on spatial legibility of street network around railway station. *Journal of JSCE*, *5*(1), 87-100.

Kuipers, B. (1978). Modeling spatial knowledge. *Cognitive science*, *2*(2), 129-153.

Martins, L. B., & de Melo, H. F. V. (2014). *Wayfinding in hospital: A case study*. International Conference of Design, User Experience, and Usability, Springer,Cham.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage Publication, Inc.

Mollerup, P. (2009). Wayshowing in the hospital. *Australasian Medical Journal*, *1*(10), 112-114.

Montello, D., & Sas, S. (2006). Human Factors of Wayfinding in Navigation. In W. Karwowski (Ed.), *International Encyclopedia of Ergonomics and Human Factors-3 Volume Set* (pp. 2051-2056). CRC Press.

Montello, D. R. (2014). Spatial cognition and architectural space: Research perspectives. *Architectural Design*, *84*(5), 74-79.

Morag, I., Heylighen, A., & Pintelon, L. (2016). Evaluating the inclusivity of hospital wayfinding systems for people with diverse needs and abilities. *Journal of health services research and policy*, *21*(4), 243-248.

Morse, J. M. (2000). Determining sample size. *Qualitative Health Research Journal*, *10*(1), 3-5.

Nguyen, T. (2008). The Sage encyclopedia of qualitative research methods. In L. M. Given (Ed.). Sage publications. http://dx.doi.org/10.4135/9781412963909.n312.

O'Neill, M. (1991). A biologically based model of spatial cognition and wayfinding. *Journal of Environmental Psychology*, *11*(4), 299-320.

O'Neill, M. (1991). Effects of signage and floor plan configuration on wayfinding accuracy. *Environment and Behavior*, *23*(5), 553-574.

Passini, R. (1992). *Wayfinding: People, signs, and architecture*. McGraw-Hill Ryerson Limited.

Potter, J. S. (2017). *Best Practices for wayfinding in a hospital setting* University of Oregon]. https;//pdfs.semanticscholar.org

Sadek, A. H. (2015). *A comprehensive approach to facilitate wayfinding in healthcare facilities*. Proceedings of the 3rd European Conference on Design4Health, Sheffield, UK,

Shokouhi, M. (2003). *The Role of Visual Clues and Pathways Configuration in Legibility of Cities.* Proceedings 4th International Space Syntax Symposium, London.

Singh, A. S., & Masuku, M. B. (2014). Sampling techniques & determination of sample size in applied statistics research: An overview. *International Journal of economics, commerce and management*, *2*(11), 1-22.

Turner, A., & Penn, A. (2002). Encoding natural movement as an agent-based system: an investigation into human pedestrian behaviour in the built environment. *Environment and Planning B: planning and design*, *29*(4), 473-490.

Tzeng, S.-Y., & Huang, J.-S. (2009). Spatial forms and signage in wayfinding decision points for hospital outpatient services. *Journal of Asian Architecture and Building Engineering*, *8*(2), 453-460.

Vaez, S., Burke, M., & Alizadeh, T. (2016). *Urban form and wayfinding: Review of cognitive and spatial knowledge for individuals' navigation*. Australasian Transport Research Forum (ATRF), 38th, 2016, Melbourne, Victoria, Australia,

Verghote, A., Al-Haddad, S., Goodrum, P., & Van Emelen, S. (2019). The effects of information format and spatial cognition on individual wayfinding performance. *Buildings*, *9*(2), 29.

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Research Article

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Evaluating Fear of Crime in the City from Ecological Perspective: A Study on Female University Students in Turkey

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Abstract

Today, fear in urban areas is rapidly expanding its domain. Disadvantaged sections of the city feel the fear of crime more prominently because of their vulnerability. Among these segments, female university students are the subject of this study. The insecure feelings of female students who frequently use urban public spaces, live in less isolated environments than other parts of society and have to ride on public transportation at late hours, reduce their quality of life and add to their existing problems. In particular, it can be expressed that environmental and design related factors affect female students' fear of crime. The ecological approach based on this subject constitutes the starting point of this study. In this context, the study aims to analyze female university students' fear of crime from the ecological perspective. Within the scope of the study, a quantitative standardized questionnaire technique was used as a data collection tool for the above-mentioned purposes. According to the findings; female students feel a distinct fear of various crimes in Turkey as they do in every country in the world. In particular, sexual assault is the leading crime. Female students who are continuing their education in Turkish cities are inadequate in the context of integration with the city where they live and establishing neighborly relations. This leads to an increase in their level of unease. However, students feel unsafe in their daily life practices due to urban planning problems, irregularities and physical disorganizations. The value of this research, which is carried out with the idea that there is a significant deficiency in the field especially in terms of urban studies, is to be a leading survey in Turkey. In addition, the study is one of rare studies dealing with female university students' fear of crime from an ecological perspective.

Keywords:
Ecological perspective, fear of crime, female university students, Turkish cities

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INTRODUCTION: FEAR OF CRIME AND SPACE

Fear of crime is, in its most general definition, 'the fear of being a victim of a crime'. Although it varies according to the personal characteristics of individuals such as age, gender, physical strength, education, a significant number of individuals living in society feel fear of crime at least for a certain period of their life and to a certain extent. Fear of crime can lead to anxiety, insecurity, discontent, dissatisfaction, alienation, physiological and physical problems (Miceli et al., 2004). However, the individuals carry fear of crime not only for themselves but also for their inner circles and families. For example, women, who experience the fear of crime the most, feel the fear more for their children. (Ünal Reşitoğlu, 2017: 145).

Another aspect of the fear of crime, which is essentially an individual and psychological concept, is the fear of crime from a social point of view. Fear of crime (Warr, 1995:296) is qualified as a 'social problem' and is claimed -through the most predominant public opinion about the fear of crime- that the existence of socialization, based on fear and insecurity, drives fear of crime away of being personal and shapes social thought and living (Kul, 2012: 27).

However, some conceptual differences regarding fear of crime should be briefly included here. Descriptions regarding the fear of crime identify and differentiates 3 factors of fear of crime; perceptual, emotional and behavioral and suggest that these factor forms fear of crime. The perceptual dimension of fear includes the logical thinking process in which perceptions of risk occur, while the emotional dimension emphasizes the emotions associated with fear, and the behavioral dimension emphasizes the physical responses given when faced with a criminal act (Franklin et al., 2008: 205). In other words, the perceptual dimension is called perceived risk, the emotional dimension is called fear of crime, and the behavioral dimension is called constrained behavior. The individual who perceived the risk may not necessarily always feels the fear even though gets anxious. However fear gives individuals physical reactions such as throbbing and supplies adrenaline that supports the individuals with courage in their war against fear. However, this difference is often overlooked in studies, and researchers claim that although they measure the perception of risk of individuals, they persistently measure fear of crime (Öztürk et al., 2016: 1491).

With all the differences considered, the concept of 'perceived risk' is substituted by 'fear of crime' in this study. This is because it is aimed at accessing statistical data that will be used to take a general picture of the current situation, rather than measuring the behavioral, psychological, or physical responses mentioned in quantitative research for measuring perception.

A significant part of the literature on fear of crime tends to explain the problem in the context of the physical environment in which people live their lives. The most well-known of these is the ecological approach,

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which treats the city as an organism that affects and gets affected by people. The ecological approach analyzes the impact of space on fear of crime by associating irregularities in the space with social problems.

Studies that interpret the fear of crime through gender variability often take the subject in the context of individual approaches such as vulnerability and victimization. There is a widespread belief that women in disadvantaged social sectors –with the influence of gender perception– feel the fear of crime more than men because of their physical and emotional vulnerability.

In this study, women's fears of crime are analyzed from an ecological perspective. For this purpose, data obtained from survey research carried out in the Turkish universe of female students studying in universities were based. The study focuses on how female students' perceptions of safety are affected in the context of spatial characteristics in the cities where they study.

ECOLOGICAL PERSPECTIVE /THE DISORDER PERSPECTIVE

When the literature on fear of crime is examined, it is seen that there are approaches that address the fear of crime in an individual and social context. Individual approaches evaluate the subject in a more psychological dimension and analyze it based on factors such as the person being subjected to crime, vulnerability or high risk of exposure to crime. However, approaches that address the fear of crime from a social perspective tend to explain the issue in the context of the physical and social environment in which people live their lives. From here; it is seen that fear of crime is addressed through approaches such as 'urban organizational disorder', 'social disorganization', 'broken windows theory' and 'the community concern perspective' (Sipahi, 2016: 37).

The ecological theory, which is the focus of the aforementioned approaches, focuses on the idea that environmental factors shape the behavior of the individual, based on the fact that the tendency towards crime is high in cities (Oktik, 2013: 17-19). Thus, the fear of crime and crime is shaped by the influence of environmental factors. In this context, the social disorganization perspective focuses on the heterogeneous structure of the city, urban slum areas and the effects of variables such as social mobility and industrialization on crime, directly or indirectly. According to this approach, places with social and/or physical disorders such as rapid or distorted urbanization, poverty, darkness, derelict buildings, graffities, vandalism create a more favorable environment for people prone to crime than other parts of the city. This has the potential to create a frightening or threatening atmosphere on people who are resident in or in and out of these places (Skogan & Maxfileld, 1981; Skogan, 1987; Ferraro & La Grange, 1992). Such places in the city are perceived as 'risky areas', especially for women. Examples include dark underpasses, secluded places, empty parking spaces, crowded places (Colquhoun, 2004).

As you can see, spatial factors that influence or trigger crime also cause the emergence of fear of crime in cities or the increase in the severity of the fear. In light of the narratives, it is possible to list the spatial factors affecting the fear of crime in the urban area as follows and interpret them in the context of women (Ayhan & Çubukçu, 2007; Unsal, 2015: 34-38; Sipahi, 2016: 41-44):

- Population Density: Regional population densities can be the cause of psychological problems (stress, noise, etc.) caused by crowds, as well as problems such as lack of social spaces and wear of social control mechanisms. This can increase crime trends and fear of crime. Crowds are particularly unsettling for women. Since many women think that crowds provide a favorable environment for many crimes, especially sexual harassment, they can develop restrictive behaviors, such as avoiding being in crowded environments.
- Spatial size and positioning of the city: Factors such as the residential areas, area width, and dispersed settlements of the city can cause internal security weaknesses, which affect the degree of fear of crime. In cities with this type of settlement plan, population density decreases. It is possible to state that seclusion is one of the determinants of fear of crime, as opposed to the perception of risk caused by crowding. For women, especially at night, secluded places are unsettling places.
- Problems with urban design: It is inevitable that there will be regions shaped by social and economic differences, especially in cities that are not planned properly and do not have a premeditated design against migration. These differences can lead to problems such as marginalization and exclusion for the people living in that area, and as a result, their tendency towards crime. For example, ghettos made up of migrants isolate these groups from the city and can make them feel like undesirable elements. These neighborhoods are becoming 'uncanny' places for the people living in different parts of the city, especially women who prefer to stay away from these places.
- The lack of lighting: The lack of lighting as a result of urban design can increase the likelihood that these areas will become environments suitable for crime at night, as well as triggering fear of crime. Due to the lack of lighting elements, women feel a distinct perception of risk not only in ghetto areas but also in some other urban areas (such as underpasses, public toilets, car parks, dark streets).
- Presence of unused and non-functional areas: These areas are areas where there is little or even no control in the city. In such areas, city dwellers feel unsafe because there are no security guards, cameras, or CCTV systems. This leads to increased fear of crime and crime.
- Presence of Vacant Housing Units: Vacant housing can harbor crimes ranging from drug use to kidnappings and hiding. Similarly, streets and neighborhoods with the majority of abandoned, derelict buildings, urban slum areas, eventually become crime scenes. As a

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natural consequence of this, there is a serious perception of insecurity or even fear about these neighborhoods. For a significant number of individuals living in the city, especially women, these places are frightening.

- Presence of Parking Spaces: Parks and gardens that do not have adequate security personnel can be considered areas where crime is easy. Especially at night, in terms of being a place to stay for the homeless, street thugs, addicts etc., such places can become perceived as safe during the day and completely unsafe at night. In this case, the fear of crime will vary not spatially but temporally. Especially women's perception of "something might happen" in such areas drives them away from such areas at late times. Therefore, women tend not to go to these areas or to go accompanied by a man with the influence of gender perception.
- Traffic Jams: People who are stressed in everyday life are more prone to committing crimes in busy traffic environments. Traffic congestion can be cited as causing increased tension in people and the emergence of criminal incidents. This stress factor can also be articulated from time to time for fear of crime, especially women are more likely to be harassed by road hogs, which can lead to different forms of stress being added to stress levels caused by traffic jams.
- Crowded Public Transport: Excessive passenger numbers of public transport due to the insufficient number of vehicles in urban transportation can significantly increase stress. In addition, congestion in vehicles, pickpocketing, sexual harassment, etc.it increases the rate of crime, and as a result, anxiety about these crimes can develop in individuals (especially women).
- Street Regulations: Streets and avenues that are not properly placed in urban planning can become crime places, especially at night, which can cause unease among the people of the city. Especially in uneven, nooks and crannies that are not sufficiently illuminated, women experience anxiety.
- Presence of Security Guards: Especially in large cities, the lack of adequate security guards for the protection of non-urban areas is seen as a reason to increase the crime rate. However, police patrolling gives some a sense of confidence, while others have an effect that increases their fear of crime.
- Barriers such as Wall/Fence/Iron Bars/Window Locks/Window Grids: Barriers such as walls, fences and iron bars used in urban spaces can be seen as preventive measures for crime, on the other hand, they also can be used for protection against people who attempts crime. Moreover, since such measures are taken as a result of people's fear of crime, they can reduce the level of fear of individuals, but also make these places more attractive to criminals.
- Alarm Systems and Cameras: Burglar alarm systems and cameras, which are used as a deterrent against theft, are considered tools that prevent crime from occurring. Therefore, these systems,

which are installed as a security measure, also have an effect that reduces the fear of crime due to the sense of safety it gives. However, since cameras also create a sense of surveillance, it can also negatively affect some people's sense of security.

- Seating Time/Stable Structure in One Place: The fact that the people of the city are long-term residents will also increase the number of people who know each other, it will prevent the formation of crime. Therefore, living in the city for a long time brings with it the strengthening of urbanization and a sense of urban belonging. Since the regularity of the neighborhood and the presence of neighborhood relations mean social control, crime rates in such places are thought to decrease in parallel with the fear of crime. Being especially recognizable, while recognizing its neighbors is a supportive element of security, on the other hand, it can cause some kind of neighborhood pressure, especially where gender perception is strong.

On the other hand, the physical appearance, nature, and cleanliness of a city adversely affect the fear of crime. Because the beautiful appearance of the environment increases the sense of trust in people – even if it is misleading (Kul, 2012: 39-40).

At this point, it is appropriate to include the famous Broken Windows Theory. Inspired by a social experiment by Zumbardo in 1969, this theory was put forward by Wilson and Kelling (1982); based on the idea that the slightest element of disorder that exists in a region will lead to the development of a perception that the area is criminally dangerous (Özaşçılar, 2015: 332). The theory suggests that broken window in one place leads to violence in those who are in that region. This theory states that continuous urban maintenance and control are required, and that disorder of neglect will feed the formation of crime and fear of crime (Ünsal, 2015: 47-48).

SURVEY

Purpose and Importance of Research

Today, fear in urban areas is rapidly expanding its domain. Disadvantaged sections of the city feel the fear of crime more prominently because they are vulnerable. Among these groups, female university students often experience a distinct fear of crime due to living away from their families, economic difficulties, limited life experiences, physical disadvantages, and teaching them fear from birth. The insecure feelings of female students who frequently use urban public spaces, live in less isolated environments than other parts of society and have to ride on public transportation at late hours, reduce their quality of life and add to their existing problems.

Efforts to identify the criminal fears of this group in Turkey are still in their infancy. Most of the studies are limited to students of a single city or university. The subject of this research, which is carried out with the idea that there is a significant deficiency in the field especially in terms of urban science studies, is the female students of the university.

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Data Collection Tool, Universe and Sampling of Research

In studies related to fear of crime, qualitative inquiry method based on in-depth interview technique or quantitative inquiry method based on survey is preferred. While these methods have limitations in determining fear of crime, the increased interest in the subject is a con. However, it should be noted that both conceptualization and measurement of fear of crime are problematic (Taylor & Hale, 1986: 166).

The scale often used in fear of crime studies is Kennet F.Ferraro's The Fear of Crime (1995: 35-38) is the scale of fear of crime. On this scale, various questions were designed to determine the socio-demographic characteristics of the participants, the risk of exposure to crime, the degree of fear, the state of victimization, the characteristics of the environment experienced, the perception of safety for the neighborhood, the near environment, and neighborly relations. It is seen that the Ferraro scale is used in standardized questionnaires used for survey studies in Turkey. In this study, the same scale was used, in addition, questions were added to determine the perceptions of the students from an ecological perspective, the place, security personnel, and situations that will help to address the issue. In addition, the questionnaire was shaped in line with the author's observations on the subject and the feedbacks in the pilot studies with the female students.

Within the scope of the study, a quantitative standardized questionnaire technique was used as a data collection tool for the above-mentioned purposes. SPSS statistical package program was used to prepare the questionnaire, determine the universe and sampling, implement the survey and analyze the data in order to achieve the research objective. The findings, the main starting point of the study, and the findings and interpretations obtained from the literature review on the subject were tested in the Turkish universe.

The universe of the survey is made up of female students studying at universities in Turkey. According to the Classification of Statistical Regional Units of Turkey (NUTS), the provinces in 26 different regions in Level 2 were categorized and the cities where the most female university students were studying were determined by scanning the statistics of Council of Higher Education.1 After this determination, the number of interviews to be held in the cities designated as examples of these university cities was determined by layer according to the number of students in the provinces. In line with the sample plan determined, the survey research was carried out between 1 December 2018 and 1 January 2019 by face-to-face interviews with 2002 participants aged 18 and over, determined by the random sampling method that is undergoing university education (associate degree, bachelor's, master's, doctorate) in the cities (78 districts in total) where sampling is included.

[1] The number of female students is obtained from https://istatistik.yok.gov.tr/.
[2] Cities (respectively by IBF Level 2 regions) and the number of participants interviewed: İstanbul (644), Edirne (36), Çanakkale (40), İzmir (140), Denizli (48), Kütahya (44), Bursa (60), Kocaeli (60), Ankara (268), Konya (106), Antalya (54), Adana (42), Kahraman Maraş (26), Kırıkkale (24), Kayseri (52), Karabük (34), Kastamonu (22), Samsun (46), Trabzon (52), Erzurum (58), Kars (20), Malatya (34), Van (20), Gaziantep (46), Şanlı Urfa (16) and Mardin (8).

Results

Demographics

The majority of the sample group consists of undergraduate students (85%), and the proportion of associate students is 13% and the proportion of graduate students is 1%. The age range of the participants is 18-24 years. 98% of the students are single and 88% do not work in any job. Only 2% of students stated that they were working full-time jobs, and about 1% of respondents said they worked part-time.

Urban Life Experience and Relations with City-dwellers

The ecological approach suggests that the environment is an important factor in the direction of crime. Environmental and social disorganization is also an important factor in shaping crime and fear. For this reason, where the sample group lives, why they prefer the city where they study and their relationship with their neighborhoods or surroundings has been questioned.

A significant number of the sample group stated that they lived in the dormitory (46%) and with their family (32%), and the number of people staying at home was about 10%. The proportion of those who stay in an apartment or alone (around 4%) is low. As you can see, a large proportion of students study away from their parents.

A significant number of students stated that they preferred the city where they studied at for reasons such as 'good university education' (37%) or 'exam score is enough to win that department' (31%). A large proportion of the sample group (63%) stated that they had lived in the city where they had been studying for 1-5 years. These ratios show us that education characteristics are preferred over the social or spatial characteristics of the city. Again, these rates show that a significant number of students are in the process of adapting to the cities where the universities are located.

In fact, being integrated with the city, being recognized in the neighborhood, provides a significant advantage in terms of security and security perception in places where social control is strong. However, social control also brings a certain degree of neighborhood pressure. Therefore, recognition, which is perceived as positive in terms of safety, can be perceived negatively for students. Therefore, it is possible for many students to perceive the city where they are studying as a freedom area and prefer to spend time with 'people like themselves rather than integrate with the residents. For example, this preference is evident in the choice of location. Students are reluctant to settle in areas where there are no students, and the presence of other students is also an important factor in choosing places for students (Rugg et al. 2002). On the other hand, students' stay in the place is decisive when it comes to the inability of students and other residents to establish relationships that will ensure social integrity. Students are often "temporary settlers" who leave the neighborhood when their academic life ends (Hubbard, 2008). This temporariness of students prevents the establishment of

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long-lasting relationships with both families and the neighborhood (Kenyon, 1997, Duke & Williams, 2009; Tuncer & Islam, 2017). This sometimes negatively affects the safety of the students and causes them to be subjected to crime or to be afraid.

In other words, apart from the places where the students live, (for example; house, dormitory, etc.) the locations, town, neighborhood, and neighborhood relations in which these living spaces are located also have positive/negative effects on security perceptions. Physical and behavioral situations such as the clean and orderly appearance of the neighborhood, the residents staying away from fights, noise and taunts, good neighborly relations, people knowing each other a little, helping a person who needs help, causes positive effects on the sense of safety.

Two excerpts from a quantitative survey carried out by Tuncer and Islam (2017: 309) in the case of Konya in 2016 (one from a resident and the other from a student) are included here to summarize the subject:

"Students live here in isolation. Naturally, social values, cultural values are not prevalent, relatively, there is not even a bit of neighborhood pressure that's supposed to be. There's no audit, there's no suppressor, there's no uncle in the neighborhood who says, look, if you do wrong here, it's like this..." (Student)

"Drugs don't use to be sold in our neighborhood, but now they're being sold very easily. In the past, when something like this happened, there were brothers waiting around the corner, they wouldn't allow it." (Resident)

However, psychological situations such as trusting people while living a life apart from home, being able to find a helping hand to be held when they are in trouble, being in an environment that will protect and save them, knowing that they are not "stray", the social structure with strong social control and solidarity networks not only increases the sense of security but also significantly prevents the fear of crime. Therefore, participants were asked questions about the neighborhood and neighborhood relations in which they sat in the focus of the perception of trust.

First of all, the status of the sample group knowing their neighbors where they live has been questioned. It was found that it was more common for students not to know their neighbors and not to relate to them. Again, the extent to which the students trusted the people they lived in was questioned and there was a significant distrust of the people around them. A high proportion of respondents (49%) answered "neither trust nor trust". On the other hand, the high likelihood of exploitation of these people with high vulnerability rates is also decisive in the perception of insecurity feeling. However, a significant proportion of the sample group (about 60%) thinks that surrounding people will intervene when an incident that disrupts public order happens. This finding is positive because, although female students do not know the neighborhood, it reveals that they have a strong perception that people will take action when it comes to safety.

Spatial Factors Affecting Fear of Crime in Urban Areas

It was stated in the previous parts of the study that the ecological perspective focuses on spatial factors affecting the fear of crime in the urban area. In this part of the study, data obtained from the options presented in the questions or questions asked to measure the perceptions of insecurity of students through an ecological approach are analyzed.

1. Impact of dense and sparse population on fear of crime

As noted earlier in the study, many women feel a risk of being verbally and physically abused or subjected to other crimes in crowded places (Colquhoun, 2004). On the other hand, in the process of planning and decomposing the city, security gaps arise due to the fact that some places are open to very few settlers, especially at some hours, or urban fringe, which creates a distinct unease for the women.

In the interviews, it was found that secluded places were one of the factors that most affected the fear of crime. Students were most agitated in 'secluded places' (65%). However, it has not been observed that the crowd makes students nervous to a certain extent, if not too much. 17% of female students said they experienced anxiety in 'crowded' places. In this case, however, it was found that the secluded places made the female university students more nervous. Again, among the answers to a question about 'What measures do you take against the crimes that you are afraid of being exposed to in this city?', 8% said 'I don't go to very crowded places, compared to 41% who said 'I don't go to secluded places'.

2. Impact of urban design problems on fear of crime

i. Ghettos, crime neighborhoods and fear of crime

One of the most mentioned subjects of the ecological approach is the migration problem. Issues such as migrant choice of location and adaptation issues are discussed within the framework of this approach. Ethnic factors were also added to socio-spatial segregation in Turkish cities, which were on the agenda with planning problems, and migrant ghettos were formed. The aforementioned neighborhoods also turn into crime places from time to time due to exclusion and economic limitations. These places, which are perceived as 'spook' places for many women, are places where they prefer to stay away.

On the other hand, regarding whether there is any link between ethnicity and fear of crime, Wiltz stated in his 1982 article, that ethnic groups have high levels of fear of crime, but when gender and age variables come into play, this fear becomes even more pronounced.

In the case of Turkey, places where different ethnic groups such as Syrians, Romans and Alawites live intensively (ghettos) which are perceived as 'unsafe' for urbanites. Especially in the planning, design and urban transformation issues of the city administrations, the

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inability of these groups to produce permanent solutions to the problems of settlement and adaptation leads to the perception of these places as 'crime neighborhoods' from the outside. As a matter of fact, these are the findings of the survey researches. In Sipahi's 2016 fear of crime survey in Turkish cities, 10% of women living in Turkish cities stated that they experienced anxiety in places where ethnically diverse people lived. It was observed that female university students gave the same answer at a higher rate. About a fifth (18%) of students expressed unease in these places. On the other hand, there is a distinct (39%) dissatisfaction among students regarding the services for rehabilitating and re-cooperation of crime neighborhoods into the city.

A similar question is: "Is there any place or neighborhood in your city that you don't want to go to?". In addition, they were asked to specify the place/neighborhood in question. 42% of the sample group stated that there were places that they are afraid to go to in their city. Although separate locations are specified for each province due to the scope of the study, the most frequently mentioned places are; Gazi Neighborhood and Sultanbeyli in İstanbul, Sincan and Çin Çin in Ankara, Levent and Tepecik districts in İzmir. Participants, who stated that they did not want to go to certain neighborhoods in question, were asked why.

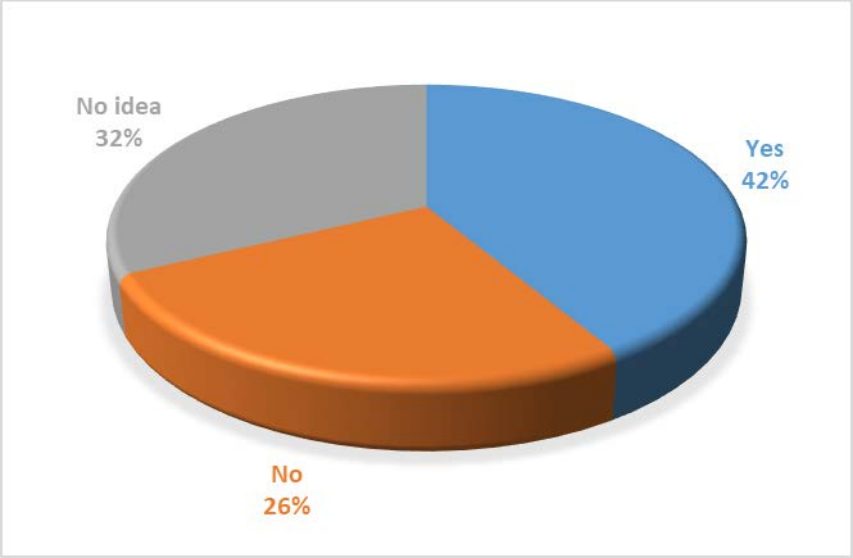

Chart 1. Avoiding going to certain neighborhoods of the city

Table 1. Why the sample group avoids going to certain neighbourhoods of the city

Reason to Avoid Going	Number	%
I'm afraid of being physically assaulted	391	20,4
I'm afraid of being sexually assaulted	380	19,9
I'm afraid of being mugged	371	19,4
I don't know why, but they always freak me out	306	16,0
I'm afraid of theft	282	14,7
I'm afraid of being conned	151	7,9
Other	33	1,7
Total	1914	100,0

As shown in Table 1, 1914 people answered the question, about a fifth of whom said they avoided going to that neighborhood because they were afraid of being physically (20%) or sexually assaulted (19%) or subjected to extortion (19%). In this case, where the sample group avoids going – in the criminal areas of the city – there is a sense of fear of crimes against both property and individuals.

Crime is likely everywhere, not just in so-called crime neighborhoods or urban depression areas. However, as expressed in the approaches of physical disorder or the theory of broken windows, some situations (such as the presence of broken windows) can be inciting crime.

ii. Lighting and safety-oriented designs and fear of crime

Another dimension of urban design that affects safety comes from lighting and safety-oriented designs. Lighting, especially in the evening, is a factor that prevents crime from being committed. Among the most important problems that hinder women's freedom to go out late and cause them to be afraid is the lack of safety and lighting systems. Apart from the neighborhoods associated with crime, women also experience a distinct sense of insecurity or even fear due to planning and design problems in urban public spaces such as underpasses, public toilets, car parks and streets.

A significant part of the sample group feels unsafe (37%) at the point of going out at night. The proportion of people who say 'neither safe nor unsafe' (40%) is also quite high. Female students who use public transportation at night, walking the streets, using other urban public spaces such as underpasses and overpasses experience various difficulties due to the fear they feel. Various questions have been asked to measure students' perceptions of safety in the aforementioned urban public spaces.

The first of these questions is the question to measure the degree of satisfaction of some spatial regulations related to urban security. Four elements related to the design have been identified and they have been asked to evaluate their adequacy. The answers given are formulated with a five-way Likert scale.

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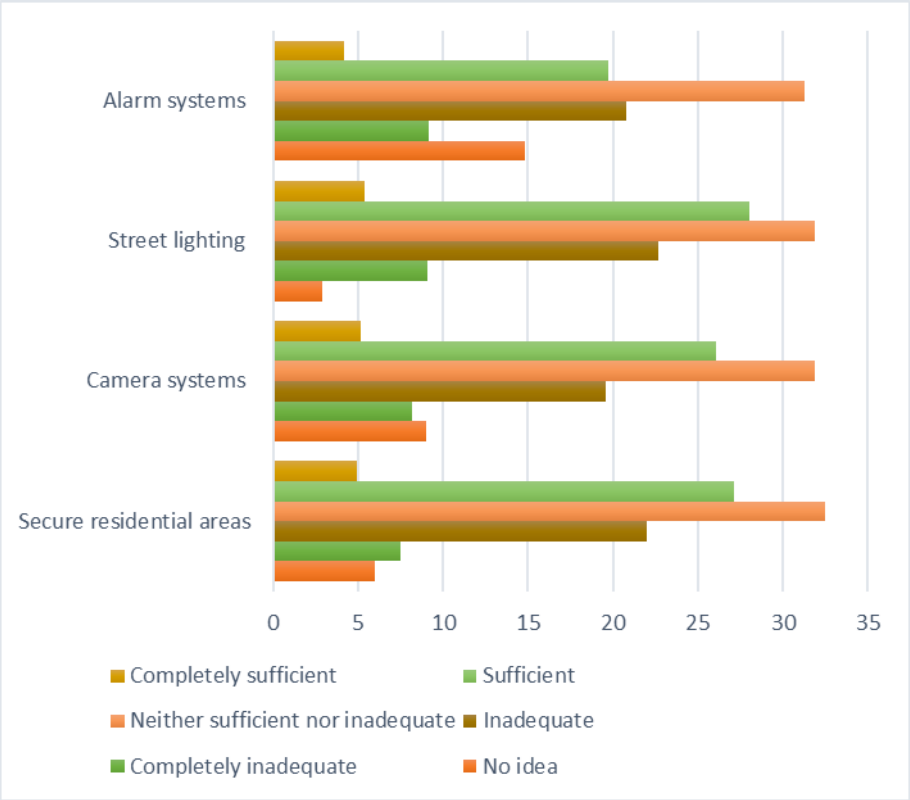

Chart 2. Adequacy/inadequacy of security-related design elements

Although it varies according to the city in which they live, it is seen that 33% of the students think that street lighting is sufficient. The proportion of those who find camera systems adequate (31%) is close to this. Again, when the chart is examined, it is seen that the most obvious answer in the context of different applications is "neither sufficient nor inadequate". Approximately one in three participants in the sample group gave this answer.

When Chart 2 is evaluated in general, it is seen that the students are significantly differentiated, those who find the spatial arrangements for security 'sufficient', those who consider them 'inadequate', and those who answer 'neither adequate nor inadequate'. In this context, it can be stated that there is an ambiguity about the adequacy of the services and that students tend to think that not enough measures have been taken against crime.

The perception of risk of exposure to crime undoubtedly varies according to urban spaces. In an attempt to determine which places the participants generally consider risky, the question was asked, "Where do you think your risk of being exposed to a crime is high?"

Eighteen different urban locations were specified and the participants were given the opportunity to answer multiple questions for the question. According to Table 2, which was created in line with the answers given, the urban areas deemed to be the riskiest by the students were stated as public transport with 705 people, and the neighborhoods where Romans live intensively with 685 people. Again, streets and streets (628 people) and neighborhoods where migrants live intensively (609 people) have been mentioned as urban spaces where

students feel uneasy from time to time. Traffic lights with cameras and alarm systems and stores are indicated as the places with the least anxiety.

Table 2. Urban areas with high risk of exposure to crime

Urban Area	*Number*	*%*
Public transportation	705	35,2
Roman-intensive neighborhoods	685	34,2
Street-Avenue	618	30,9
Immigrant-intensive neighborhoods	609	30,4
Overpasses/Underpasses	461	23,0
Parks	441	22,0
Passenger terminals	390	19,5
Stops	307	15,3
Public toilets	257	12,8
Bank fronts	249	12,4
City center	207	10,3
Parking lots	204	10,2
Stations	203	10,1
Neighborhood markets	198	9,9
Place of living	136	6,8
Shopping malls	107	5,3
Store or shop	71	3,5
Traffic lights	60	3,0

Streets are one of the most used public spaces in cities. Therefore, the negative perception of the safety of the streets is mainly meaningful in terms of showing the dimensions reached by the perception of risk regarding Turkish cities. In particular, it is possible to perceive the streets, avenues, and public transportation that female students often use, as 'unsafe'.

iii. Fear of crime in urban transportation

One of the situations that significantly affect students' perceptions of insecurity in urban transportation. Although they generally choose a place close to the school, it becomes difficult to find a place close to the school as the cities grow. Similarly, situations such as those who study with their families or the limitation of housing facilities for students in the city provide the basis for students to have difficulties with transportation. In everyday life practices, students are often involved in the transportation process for their various activities. At this point, the question "is urban transportation perceived as safe by students?" comes to mind. This basic question has been answered through various sub-questions.

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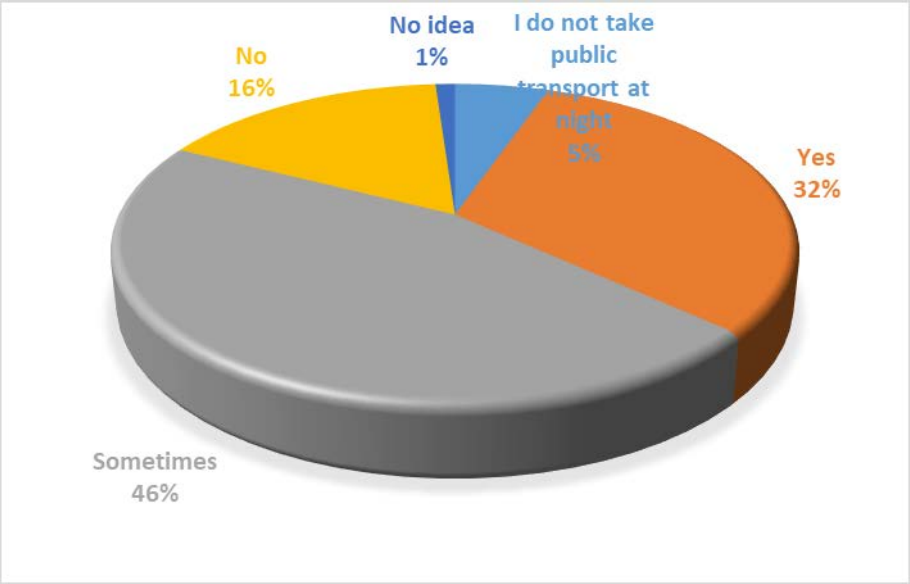

Chart 3. State of unease when boarding public transportation during night/evening hours

As seen in the Chart 3, 45% of the participants answered "sometimes" and 31% answered "yes". These rates show that three out of four female students do not find it safe to take public transport at night/evening. 5% of the participants stated that they never used public transportation during the night/evening hours.

As it is known, the most commonly used means of transportation used by students are public transport such as buses, trams, subways, buses, and ferries. Female university students experience various difficulties during the use of these vehicles and are harassed from time to time. In particular, the sexual assault and murder of Özgecan Arslan by the driver of the public transport in 2015 have significantly affected the perceptions of insecurity of all students in this regard.

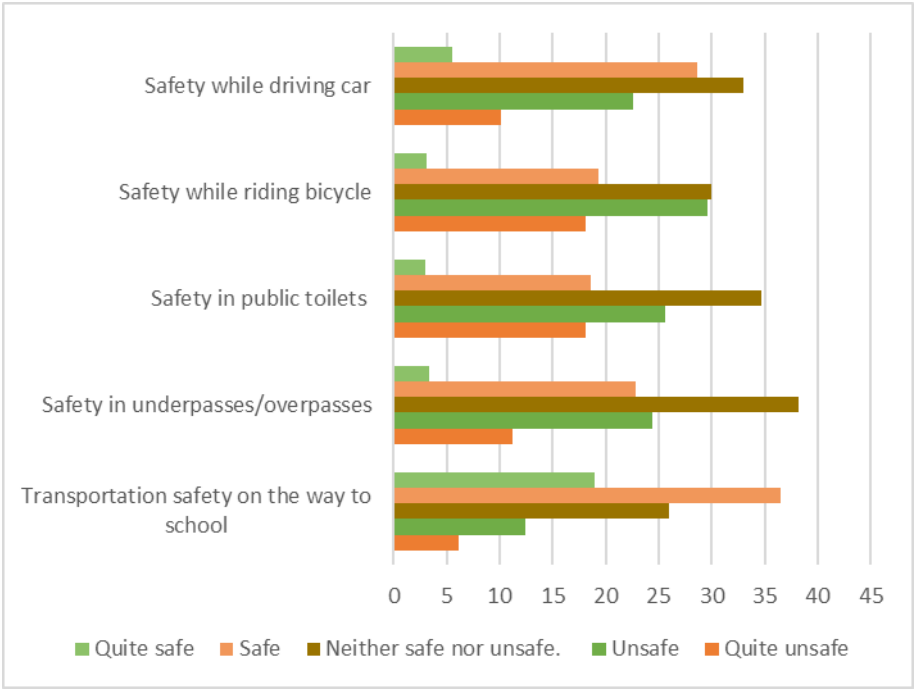

Chart 4. Urban transportation safety perception

A low percentage of participants (16%) in the sample group stated that they were driving a car. As shown in Chart 4, a significant number of them (34%) stated that they felt safe while driving, while approximately one percent (33%) responded neither safe nor unsafe. However, 32% of respondents said it was unsafe.

There are aspects of driving that negatively/positively affect safety during access and parking in addition to driving in traffic. Especially in the context of the perspective of physical disorder, closed car parks can become unsettling places for women when they do not appear clean and tidy or are dark. Therefore, participants who were driving were asked if they heard anxiety when they parked their car in a closed parking lot.

Of the 376 participants who drove, 37% said they did not feel uneasy in closed car parks and 46% said they felt uneasy at times. There is also a significant number of participants (17%) who do not express opinions. These rates show that closed car parks are not perceived as safe enough by students driving cars. The especially dark, secluded, and neglected appearance of the car parks increases this state of unease.

To measure the safety perceptions of the participants in the context of transportation by bicycle, which is one of the urban transportation vehicles; to the participants who stated to be using a total of 1268 bicycles; "Do you feel safe enough in traffic (when cycling) if you are cycling?" A significant proportion of participants (47%) stated that they found cycling unsafe in urban transportation and 30% of students answered neither safe nor unsafe. It seems that although cycling is a common means of transportation among students, students feel distinctly unsafe about cycling due to the lack of adequate bike paths in cities and the danger of cycling in traffic. In addition to these physical inadequacies, it is often expressed that they have a fear of being harassed and blocked while cycling.

It is seen that a significant number of respondents (35%) do not find the underpasses and overpasses safe, compared to 38% who say they are neither safe nor unsafe. Only 26% of respondents consider these locations safe. Simple security measures can ensure the security of these areas.

Another important point about transportation is the question of whether students feel safe on the way to school in the city where they are studying. Transportation safety of students who have to travel the same way five days a week is an issue that university administrations, municipalities, and the state are responsible for. A significant number of students (55%) stated that it is safe to reach the school. Although this may seem gratifying, the fact that half of the students do not feel safe enough on the way they travel during their access to the school highlights an important need for the relevant administrations to reconsider their responsibilities.

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2. Fear of crime and the impact of ecological factors

With the scale created to determine the levels of criminal fear of female university students seventeen different types of crimes that they are likely to encounter in everyday life were identified, and their anxiety levels related to these crimes or how afraid they were of these crimes were determined. With the help of this scale, an index of fear of crime has been determined. When determining the index, the average values of the responses of female university students regarding the types of crimes specified on the scale were included in the calculation.

Table 3. Sample group's fear of crime index

Crimes	Average	Participation Level
Being sexually assaulted	4,47	89,4
Being physically assaulted	4,27	85,4
Being attacked by a terrorist	4,21	84,2
Being attacked with a gun	4,18	83,6
Being mugged/snatched	4,14	82,9
To be kidnapped	4,12	82,4
Burglars entering the house/where they live	4,09	81,8
To be murdered	3,95	79,0
Damage to the house/place where it lives	3,81	76,2
Being verbally assaulted/verbally abused	3,78	75,6
Being scammed by fraudsters	3,74	74,8
Car theft	3,73	74,6
Being threatened/insulted	3,67	73,4
Getting caught in the middle of an incident at school	3,31	66,2
Theft of any belongings at school	3,30	66,0
Being pressured by some group/students at school	3,12	62,5
Fear of Crime Index	3,86	77,3

Note: The crimes in Table 3 are listed according to the level of overall participation. Average values were calculated by giving 1 point for 'I'm not afraid at all' on the scale, 2 for 'I'm not afraid', 3 for 'I'm a bit afraid', 4 for "I'm afraid", and 5 points for 'I'm so afraid.

In line with the answers given, the students' fear of crime index was determined as an average score of 3.86. When the index is taken into account, it is seen that the level of fear is close to the answer 'I am afraid' (when considered 4). This tells us that there is a widespread fear of crime among female university students.

The crime that the sample group fears most exposure to is sexual assault. This crime is followed by physical assault and fear of terrorism. This ranking was determined in the same order in the study of Sipahi and Şengün (2017: 16) in the Bayburt sample. The fear of crime index was 3.84 in the study. Fear of being sexually assaulted being the lead fear is a finding that is expected because it is the crime that women fear the most to be exposed. This fear overshadows their grievances against other crimes (shadow of sexual assault) but also increases their reaction to other types of crimes (Warr, 1984; Ferraro, 1995; 1996). In fact, the fears of female university students about other crimes such as physical assault and abduction are an extension of the fear of being sexually assaulted, and another act of crime brings with it the risk of sexual harassment.

A wide range of individual, social and cultural factors influence the criminal fears of female students. However, since this study deals with the issue from the perspective of social disorder, only findings related to ecological factors are included. Participants were asked to evaluate the

effects of 7 different ecological factors on fear of crime and the question was formulated on the five-way Likert scale.

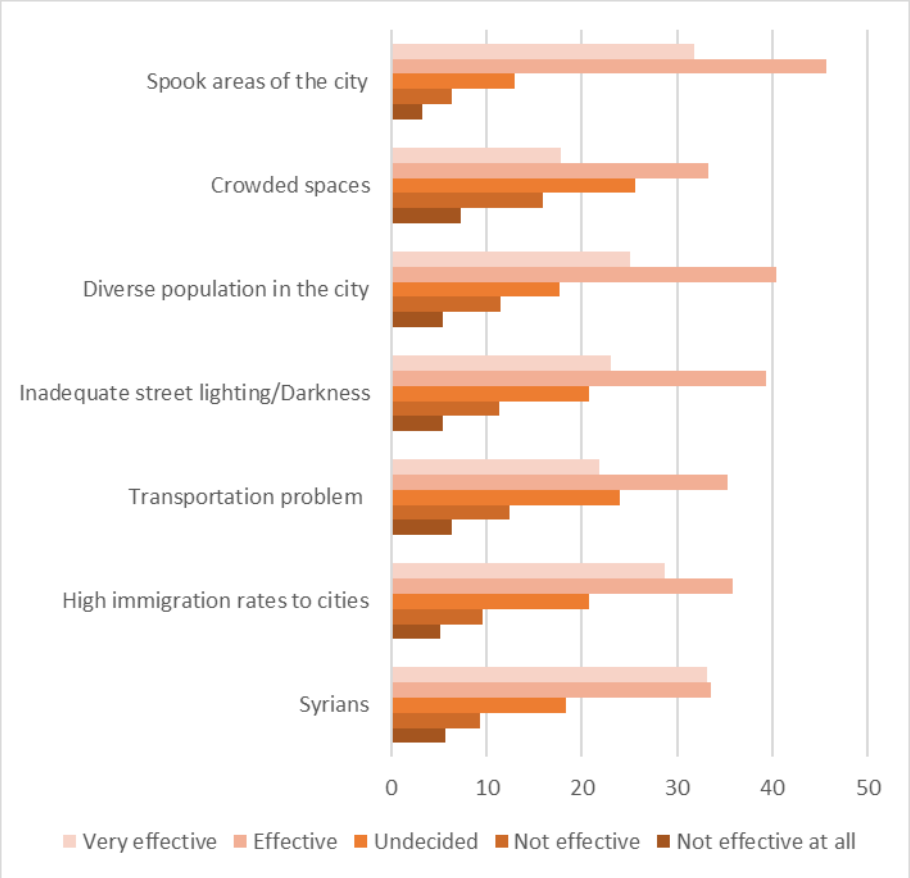

Chart 5. Ecological factors influencing fear of crime

As seen in Chart 5, the answers are rated from the "Not effective at all" option to the "very effective" option (from 1 to 5). Accordingly, scores ranging from 3.12 to 4.01 were obtained. This shows how effective the factors expressed in the question are for the sample group. Accordingly, the most influential ecological factor on the fear of crime is "spook areas of the city" with a value of 3.96. Intensifying the urban safety debate, similarities are observed in the findings of the survey research carried out by Çelik and Mirza (2021:13) at Selçuk University Campus, a current study on the fears of university students. The study highlights that a significant proportion of female students feel a distinct fear of crime within the campus area and, regardless of gender variability, students are uneasy in the crowd (19%) and in neglected/rundown places (17%).

EVALUATION AND CONCLUSION

According to ecological theory, which emphasizes the relationship of the physical and social environment with crime, social and spatial disorders also shape the fear of crime. Indeed, the safety of the place is associated with the perception of whether it is safe or not. Therefore, design and measures to make spaces safe in reducing the fear of crime, which is a social phenomenon, are becoming more and more important

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every day. In order to take these steps towards fear of crime and to make cities safer areas, factors that affect the fear of crime in society should be determined.

In this study, the effects of the disorder factor on fear of crime and risk perception based on ecological perspective were analyzed on female students at the university, who constituted one of the most vulnerable parts of the city. The findings of the study coincided with studies on female students studying in different cities such as Istanbul, Konya and Bayburt in Turkey.

It can be stated that female students, a large proportion of whom are studying away from their parents, perceive the city they are studying as an area of freedom and do not strive to integrate with the city because they live in that city for a (temporary) period. The situation is similar in terms of the neighborhood in which they live. However, the integration with the city or the neighborhood relations established with the neighborhood has positive/negative effects on the security perceptions of the students as well as the clean and tidy appearance of the neighborhood.

In the study, spatial factors affecting the fear of crime in the urban area were discussed in the context of demographics and design. It was found that the places that most unsettled the students were secluded places and those female students were noticeably agitated in places where different ethnic groups lived intensively.

It has been observed that female students experience a distinct unease about some subjects related to spatial design. Students feel insecure in urban public spaces such as underpasses and streets, and in urban transportation vehicles, especially at night. However, it has been observed that there is no firm opinion on the adequacy/inadequacy of spatial regulations regarding security.

Female students feel a distinct fear of various crimes in Turkey as they do in every country in the world. In particular, sexual assault is the leading crime. This type of crime, which is much more feared than other crimes, is considered an extension of other crimes, so it is the nightmare of the students.

In summary, female students who are continuing their education in Turkish cities are inadequate in the context of integration with the city where they live and establishing neighborly relations. This leads to an increase in their level of unease. However, students feel unsafe in their daily life practices due to urban planning problems and disorganizations and have to resort but the restrictive measures such as not going out at night and not wandering in secluded places.

Their fear makes it difficult for students to focus on their quality of life, work efficiency, and learning. Therefore, it is important that psychological, social, economic and physical studies are carried out in a coordinated manner to reduce their fear of crime. Diversifying and increasing design-related activities such as security lighting, cameras, well-maintained and clean public spaces are among the steps to be

taken to overcome the fear of crime. Afterward, it should be studied to find solutions to problems such as migrant neighborhoods, crime nests, and students' adaptation to the city in the context of socio-psychological approaches. There is no doubt that this second phase requires the implementation of long-term, multi-actor, visionary and strong urban policies. On the other hand, increasing female visibility through the safening of urban public spaces is one of the most effective issues in reducing fear of crime and will make the most positive contribution to the sense of security of female university students.

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REFERENCES

Ayhan, I. & Çubukçu, K. M. (2007). Suç ve kent ilişkisine ampirik bakış: literatür taraması, Süleyman Demirel University Journal of Institute of Social Sciences, 3 (5), 30-55.

Colquhoun I. (2004). Design out crime. Oxford, UK: Architectural Press.

Çelik F. & Mirza, E. (2020). Fear of crime of students regarding Selçuk University, Alaeddin Keykubad Campus, Inonu University Journal of Art and Design, 10 (22), 1-21.

Duke Williams, O. (2009). The geographies of student migration in the UK. Environment and Planning A, 41(8), 1826–1848.

Ferraro, K. F. (1995). Fear of crime: Interpreting victimization risk. Albany: State University of New York Press.

Ferraro, K. F. (1996). Women's fear of victimization: Shadow of sexual assault?, Social Forces, 75 (2), 667-690.

Ferraro, K. (1995). The fear of crime: Interpreting victimization risk, New York State Unv. of New York Press.

Ferraro, K. F. & La Grange, R. (1987). The measurement of fear of crime. Sociological Inquiry, 57, 70-101.

Franklin, T.W., Franklin, C.A. & Fearn, N. E. (2008). A multilevel analysis of the vulnerability, disorder and social integration models of fear of crime. Social Justice Research, 21 (2), 204-227.

Hubbard, P. (2008). Regulating the social impacts of studentification: a loughborough case study. Environment and Planning A, 40(2), 323– 341.

Kenyon, E. L. (1997). Seasonal sub-communities: The impact of student households on residential communities. The British Journal of Sociology, 48 (2), 286-301.

Kul, M. (2013). Suçtan Daha Büyük Suç Korkusu. Istanbul: Yeniyüzyıl.

Miceli, R., Roccato, M. & Rosato, R. (2004). Fear of crime in Italy: Spread and determinants, Environment and Behavior, 36 (6), 776-789.

Oktik, N. (2013). Sosyal sapma ve suçun sosyolojisine kuramsal yaklaşimlar. G. Önkal & Ö. Sarı(Ed.), Suçun Sosyolojisi Cezanın Felsefesi (3-44), Ankara: Nobel.

DOI: 10.15320/ICONARP.2022.196

Özaşçılar, M. (2015). Suç Korkusu ve yakın çevre düzensizliği ilişkisi: Kırık cam teorisi. Solak and Ö. Solak (Ed.), Gündelik Hayat Sosyolojisi Açısından Suç ve Suç Korkusu (329-347), Ankara: HEGEM.

Öztürk, M., Kocacık, F. & Gönültaş M. B. (2016). Suç korkusu ve risk algisinin toplumsal cinsiyet açisindan incelenmesi. International Journal of Human Sciences, 13(1), 1488-1502.

Rugg, J., Rhodes, D. & Jones, A. (2002). Studying a niche market: UK students and the private rented sector. Housing Studies, 17(2), 289–303.

Sipahi, E. B. & Şengün, H. (2017). Üniversiteli kız öğrencilerin suç korkularının "mağduriyet" perspektifinden analizi: Bayburt örneğinde bir araştırma. Toplum ve Demokrasi, 11(24), 57-80.

Sipahi, E. B., (2016). Suç Korkusu, Konya: Çizgi.

Skogan, W.G. (1987). The Impact of victimization on fear. Crime and Deliquency, 33(1),135-154.

Skogan, W.G. & M. G. Maxfield (1980). Coping with Crime: Victimization, Fear, and Crime in Three American Cities (Reactions to Crime Porjects), Document No.: 85506, Illinois: Northwestern Unv. Cebter for Urban Affairs.

Taylor, H. B. & M. Hale (1986). Testing Alternative Models of Fear of Crime, Journal of Criminal Law and Criminology, 77(1), 151-189.

Tuncer, T. & Islam, T. (2017). Studentification as a new form of gentrification: Changing neighborhood dynamics in bosna hersek neighborhood (Konya). Planlama, 27(3), 303-313.

Ünal Reşitoğlu, H. (2017). Kadınlar, mağdurluk ve suç korkusu. Toplum ve Demokrasi, 11(24), 37-56.

Ünsal, T. (2015). Kentleşme ve suç ilişkisi: Çocuk suçlular üzerine bir araştırma. Unpublished Dissertation. Ankara. Turgut Özal Unv. Institute of Social Sciences.

Warr, M. (1984). Fear of victimization: Why are women and the elderly more afraid? Social Science Quarterly, 65, 681–702.

Warr, M. (1985). Fear of rape among urban women. Social Problems. 32(3), 238-250.

Wilson, J. Q. & Kelling, G. L., (1982). Broken windows: The police and neighborhood safety, The Atlantic Monthly, March.

Wiltz, C. J. (1982). Fear of crime, criminal victimization and elderly blacks, Phylon, 43 (4) (4th Qtr.), 283-294.

Resume

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Research Article

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Career Barriers of Women Architects in the Construction Sector

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Abstract

It has been determined that the existing studies in the literature about women architects have remained in the background or ignored in the historical process, there are barriers they have encountered in the sector, their visibility in the sector is low and they have left the profession of architecture over time. However, it has been observed that it has not been investigated whether the career barriers that female architects encounter differ according to their career stages. The aim of this research is to fill the knowledge gap identified in this field in the literature and to reveal the career barriers faced by women architects.

Quantitative research method was used in this study and data were collected by questionnaire method.

It has been understood that the glass ceiling and sexist attitudes, which are among the career barriers of female architects, differ according to career stages. The limitations of the research are that the participation of the participants in the research is based on voluntariness, contacting people through online platforms due to Covid 19, the research is carried out in a limited time frame and the opinions of the participants are limited to the questions in the measurement tools.

Within the construction industry, women architects face career barriers throughout their careers. Ensuring that more women architects take part in the construction sector will be an important step in reducing or eliminating such barriers. However, making individual efforts to prevent these barriers faced by female architects during their careers will not produce a real solution.

The research is considered important in that it has not been investigated whether the career barriers found to be faced by female architects differ according to career stages and in this context, this study is the first of its kind.

Keywords:
Career barriers, male-dominated structure of the construction industry, women architects.

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INTRODUCTION

It is an undeniable fact that men are dominant in architecture and construction activities both in the world and in our country. In the historical process, it has taken a long time for women architects to take an active role in the architectural profession. Today, it is observed that the demand of female students for architectural education has increased. At the same time, male and female architects who graduated from architecture schools have reached a mixed structure. However, the number of female architects graduating from architecture schools and the number of female architects appearing in the construction industry do not progress in a direct proportion. It is possible to associate this situation with the male-dominated structure of the construction sector in the literature. On the other hand, it is stated that female architects take a break from their career processes, leave their careers or encounter a series of barriers in their career processes.

The construction sector is known as a sector that demands intensive work and has a structure that makes people uninterested or unwilling with its stressful environment (Bennett et al., 1999, Fielden et al., 2000, Ling & Poh, 2004, Bilbo et al., 2014). In the literature, it is mentioned that women face this situation more and the construction industry is more resistant to women's entry into the industry. (Agapiou, 2002; Ling & Poh, 2004; Denissen & Saguy, 2014). Because the male-dominated image drawn by the construction industry makes tolerance to negative working conditions and masculine behaviors normal. This perception reduces women's interest in the sector (Agapiou, 2002, Ling & Poh, 2004, Denissen & Saguy, 2014).

Despite the negative image drawn by the industry, it is seen that the participation of female architects in architectural education in Turkey has increased and they graduated successfully. However, when we look at the records of the Chamber of Architects, it is stated that the number of graduated female architects and the number of female architects registered to Türkiye Mimarlar Odası do not match (Dostoğlu & Erkaslan, 2010). This contradiction is also encountered in the records of architectural organizations abroad. Due to the traditionally male-dominated structure of the construction industry and its culturally biased perspective, the view is that the industry is a more challenging field for women than for men (Fowler & Wilson, 2004; Gregory, 2006; ONS, 2009; Fielden, 2010; Architects' Council of Europe, 2018). In line with this information, the main purpose of this research is to reveal the career barriers faced by female architects in the construction sector, to collect these obstacles in a single source and to understand whether these career barriers differ according to career stages. In the literature research, career barriers faced by female architects in the construction sector were obtained from different sources. There are a number of qualitative and quantitative studies on these career barriers. With the information obtained, scales for career barriers were created and a survey was conducted with female architects. Thus, career barriers are included in a

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single source and the exposure of women architects to these barriers has been re-examined. In addition, this study differs from other studies on female architects in that it investigates the exposure of female architects at different career stages to career barriers. Although there are many studies on the career barriers of female architects abroad, studies in Turkey are almost non-existent.

Female Architects in The Male-Dominated Field

Societies define the person who should hold the architectural power in terms of their deep-rooted roles as those who have the power to govern. In the traditional structure, the strong and strong-willed person was accepted as a man (Grimes, 2007), while women were integrated with the concepts of mother and wife in the society, and this situation was reflected in the architectural profession by limiting the duties of female architects to residential architecture (Wright, 1997). Even when women started to take part in the architectural profession, they were not recognized as real architects (Grimes, 2007). The debate over whether women architects are architects or not was reflected in an article in the magazine called 'American Architect and Building News' (Wright, 1997).

Looking at the historical background, women have not been recognized in the history of architecture, mostly because they contribute to the built environment (Grimes, 2007). Women architects are also given little place in historiography (Grimes, 2007, Stratigakos, 2016, Sarıçelik, 2017, Alvarez & Gomez, 2017). Moreover, female architects do not appear in the historical record, they often remain in secondary status in the offices of their male colleagues, lose their individuality and are overshadowed by well-known male colleagues (Grimes, 2007). Thus, there are few documents about women architects in historiography. It is possible to list the reasons for this situation as the fact that the works of female architects do not survive or that these works cannot be preserved, and that female architects work under the body of competent male architects (Stratigakos, 2016).

From a current perspective, the construction industry continues to resist the entry of women into the construction industry with its traditionally rooted structure and a perspective based on cultural prejudices (Grimes, 2007). Because the construction industry, with its male-dominated image and brute force, draws an image that requires tolerance against unfavorable working conditions and rude speech. It is this image of the construction industry that renders women indifferent to the industry (Agapiou, 2002; Ling & Poh, 2004; Denissen & Saguy, 2014). According to a study conducted by Fielden et al. (2001), the construction industry has a male-dominated, macho image (Fielden et al., 2001). The construction industry is portrayed as a macho culture characterized by gendered colloquialism and conflicts, crises and conflicts that can be frightening for women working in the industry (Fielden et al., 2010). Due to this image of the construction industry and masculine approaches in

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recruitment, women will not want to stay in the construction industry after graduation due to the difficulties of working in a male-dominated environment (Dainty et al., 2000, Hamel, 2009, Mavriplis et al., 2010, Kurtuluş & Tomaskovic-Devey, 2012). For example, although nearly half of the number of students graduating from architecture programs in the United States are women, 13% of the number of registered architects in the organization are women, and the construction industry, which is more abrasive for women, is still male-dominated (Gregory, 2006; ONS, 2009; Fielden, 2010; Architects). ' Council of Europe, 2018).

It is known that there are a significant number of barriers to women's participation in the construction industry and their taking up positions in the hierarchy of an organization (Amaratunga et al., 2006). When the management cadres of the companies in the construction sector are examined, it is seen that with the presence of these barriers, women are much less in the management positions than men (Woosnam, 2007; Fairs, 2017).

Working Conditions of Women Architects

In studies focusing on women's careers, it has been seen that the barriers women face throughout their business life are considered important in terms of their career processes. There are also a number of barriers to the entry of women who want to take part in the construction industry (Dainty et al., 2000; Amaratunga et al., 2006; Powell et al., 2006; Thurairajah, 2007; Fielden et al., 2010; Fernando et al. , 2014; Secatore & Young, 2016). These barriers are the image of the construction industry (Gale, 1994; Fielden et al., 2000; Fielden et al., 2001), career knowledge (Gale, 1994; Fielden et al., 2000; Agaipou, 2002), the culture and work environment of the construction industry. (Bennett et al., 1999; Dainty et al., 2000, Fielden et al., 2000), family (Fielden et al., 2000, Lingard & Francis, 2004), attitudes in recruitment (Fielden et al., 2000, Fielden et al., 2001) in the literature.

The construction industry is prejudiced against female workers (Amaratunga, 2006) and attitudes and behaviors in the construction industry are not woman-friendly (Afolobi et al., 2018). While male managers in the construction industry mostly hinder the recruitment of women and exhibit sexist attitudes in the recruitment of women (Dainty et al., 2001), on the contrary, some female architects are recruited to the organization they work for because of their gender and when they realize this situation, they leave the organization. (Dainty et al., 2001). In the construction industry, women are misjudged about their capacities when compared to their male counterparts (Chun et al., 2009). These misconceptions; The project was based on issues such as minimal recognition at the sites (Menches & Abraham, 2007), lack of role models/mentors (Yates, 2001), slow career development (English & LeJeune, 2012) (Afolabi et al., 2019). In the male-dominated construction industry, gender is an important factor in affecting job performance for both women and men (Denisen, 2006; Duke et al., 2013). However,

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women in the construction industry historically; they are more likely than men to enter the sector, difficult working conditions, barriers to promotion, and dismissal (Berik & Bilginsoy 2006, Paap, 2006; Saucedo & Morales, 2010, Duke et al., 2013). In addition, in studies conducted, women state that they are concerned about the gender-based discrimination they encounter in the construction industry, unequal wage tariffs, and issues that affect their career progress, such as the management of work-family responsibilities (Loosemore & Waters 2004; Worrall et al., 2010; Watts, 2012; Worrall, 2012). ; Sang & Powell, 2012). Although women's employment in the construction sector is not new, they continue to experience the same barriers as women before them (Denisse, 2006; Aydın & Erbil, 2019).

In the male-dominated structure of the construction sector in terms of social roles, it is accepted that women are employed in offices instead of construction sites (Enshassi et al., 2008). According to the construction sector, the job skills of women working at construction sites are secondary when compared to their gender (Paap, 2006). On the other hand, men express masculine discourses to honor their work. Women stated that they felt powerless in the construction industry because of these situations and practices (Saucedo & Morales, 2010). Women are not satisfied with their professional life. This situation leads women away from the production areas where men in the construction industry work intensively and to office environments (Dostoğlu & Erkaslan 2010).

Career Barriers of Women Architects

There are many studies on women architects. Studies have generally focused on the historical background (Adams & Tancred, 2000) or why women leave the profession (Anthony, 2001; De Graff-Johnson et al., 2003) (Caven, 2004). In this research, which was conducted to examine the career barriers of female architects, many studies involving female architects were examined. These studies include different sub-topics such as the entry of women into the architectural profession, the reflection of the female body in design, and the problems women face in the architectural profession. The scope of the study is on the career barriers of female architects. In the context of this scope, the barriers identified in the studies on women architects are included in Table 1 (Table 1).

Based on the studies, women architects are exposed to wage inequality, male-dominated structure, inflexible working hours, sexist attitudes, glass ceilings, *family-career balance* career barriers (Aydın 2021).

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Table 1. Career barriers detected in the study

Career Problems Identified in the Study		Wage Inequalities	Working hours	Glass Ceilings	Male-Dominated Structure	Family Career Balance	Sexist Attitudes
Person doing the work	**Name of the Study**						
Agapiou, A. 2002.	Perceptions of gender roles and attitudes toward work among male and female operatives in the Scottish construction industry. Construction Management & Economics, 20(8): 697-705.				+		+
Amaratunga, D., Richard, H. 2006.	Construction industry and women: A review of the barriers. In Proceedings of the 3rd International SCRI Research Symposium, Delft University, Netherlands.			+	+	+	+
Fowler, B., Wilson, F. 2004.	Women Architects and Their Discontents. Sociology, 38(1): 101-119				+	+	
De Graft-Johnson ve et al. 2003.	Why do women leave architecture? RIBA/University of West of England Research Project. London, RIBA.	+	+	+	+	+	+
De Madariaga, I., S. 2010.	Women in architecture: the Spanish case, Urban Research & Practice, 3(2): 203-218.	+					+
Fielden, S., Davidson, M., Gale, A., Davey, C. 2010.	Women in construction: the untapped resource. Construction Management and Economics, 18(1): 2-9.				+	+	
Norma Isabel Figueroa Rubero 2008.	The masculine construction of the profession and women architects in practice in Puerto Rico, from 1960 to 1979				+		+
Gözde Yenipazarlı. 2006.	Türk İnşaat Sektöründe Liderlik Davranışları Üzerine Bir Araştırma. Yüksek Lisans Tezi, İTÜ Fen Bilimleri Enstitüsü, Mimarlık Anabilim Dalı, İstanbul.			+	+		
Grimes, S. E. 2007.	Women in the studios of men: Gender, architectural practice, and the careers of Sophia Hayden Bennett and Marion Mahony Griffin, 1870–1960. Ph.D Thesis, Faculty of the Graduate School, Saint Louis University Missouri, America.			+	+		+
Gürcanlı ve et al. 2018.	Şantiyelerde Çalışan Teknik Elemanların Çalışma Koşulları Üzerine Bir Alan Çalışması. Çalışma ve Toplum, 59(4).	+			+		+

Current Research on Women Architects

When the studies are examined; Although there are many studies in the world that include the obstacles that women architects face in their professional careers, there are few studies on women architects in Turkey. Table 2 includes some of the prominent studies in the literature, which will help to identify the career barriers mentioned in this study, related to female architects in the literature review.

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Table 2. Researches on women architects in Turkey and in the world

Sharon E. Grimes 2007	'Women face a number of different obstacles when they want to enter the profession of architecture. After receiving architectural education, many women can gain a place in the sector by being associated with a male colleague or through their spouses. It becomes impossible for them to have a sustainable career because they have limited workspaces.'
Amaratunga ve et al. 2006	'Women choosing careers in non-traditional sectors such as the construction industry face many barriers to enter and stay in their chosen industry. It is the male-dominated structure of the construction sector that reveals this situation in the construction sector. This structure drives women away from the construction industry.'
Navarro-Astor ve et al. 2017	'When the studies on women in the construction sector are examined; In most studies, multi-role conflict and the need to balance personal life with work is an almost exclusively female problem. In the face of such problems and responsibilities, women feel compelled to take a career break.'
Merve Sarıçelik 2017	'The architectural profession has a male-dominated environment. Although women took part in the profession, they could not find a place in architectural historiography. In this direction, it is possible to talk about the existence of an unequal and prejudiced historiography in architecture and art.'
Nadiye Akyüz 2017	'The positions of female architects in the offices of which they are partners are not determined professionally, but rather based on their gender. Women architects in partnership with co-family or male colleagues; has adopted in-office roles such as project design and project follow-up.'
Gürcanlı ve et al. 2018	'While factors such as the inconvenience of working hours of male and female technical staff, lack of holidays, workload, imbalances in work life, and the uncertainty of job responsibilities are the stress factors of the work environment, gender discrimination is added to these factors for women.'

MATERIAL AND METHOD

The sample of the study consists of female architects in Turkey. An online survey study was prepared to collect data. The survey was conducted through 'online surveys', a web-based internet service, and by creating a survey-specific web address (https://www.onlineanketler.com/s/kadinmimar). The web address was sent to potential participants via e-mail. Between 23.03.2019-03.11.2020, 268 female architects participated in the survey.

The questionnaire created to collect data consists of 4 parts. These sections were collected under the headings of demographic characteristics (section 1), career barriers (section 2), women architects' perceptions of the structure of the construction industry (section 3), and suggestions of women architects on the structure of the construction

industry. The aim of the problems in the first section, which includes demographic characteristics, is to collect data on features such as the age of female architects, the number of children, the type of institution and sector they work, and their position in the institution. The second part of the questionnaire consists of questions about career barriers. This section consists of 6 different career barriers determined for female architects. The contents of these sections and questions are as in Table 3.

Table 3. Classification of survey questions on career barriers

CAREER BARRIERS	CONTENT OF THE SURVEY QUESTIONS
Wage Inequality	– Remuneration of men and women for the same work – Transparency of the wage issue – The factor of gender in determining wages
Working hours	– Flexibility of working hours – Relationship between intensity of working hours and family-career balance
Male-Dominated Structure	– Structure of the construction industry – Gender factor in task distribution – Perspectives on women architects in the construction industry
Sexist Attitudes	– Impact of women-specific conditions – Marital status – The effect of gender on professional life
Glass ceiling	– Barriers placed by men that prevent women from progressing in the profession
Family-Career Balance	– Factors in balancing family and work life

In the third part of the survey, there are questions created to determine the perceptions that the construction industry is more challenging for women architects and full of barriers for women, according to their career stages. The fourth part of the questionnaire includes questions about the issues that they think should change in the structure of the construction industry for the professional careers of female architects. Survey questions were prepared in 5-point Likert type in order to collect data on career barriers (section 2), possible perceptions of female architects about the construction industry (section 3), suggestions of women architects on the structure of the construction industry (section 4). The options, score ranges and evaluation criteria for the answers to the items in the prepared questionnaire are as in Table 4.

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Table 4. Scale and score ranges and evaluation criteria in the questionnaire (Tantekin Çelik & Laptalı Oral 2013).

Options	Likert scale	Ranges	Evaluation Criteria
Absolutely agree	5	4.20-5.00	very high level
I agree	4	3.40-.4.19	high level
Undecided	3	2.60-3.39	medium-level
I do not agree	2	1.80-2.59	at a low level
I strongly disagree	1	1.00-.1.79	very little

SPSS 22 package program was used for the entry and statistical analysis of the data collected by the questionnaire. Descriptive analysis, reliability analysis and Kruskal Wallis test were performed for the study.

FINDINGS OF THE RESEARCH

Performing Reliability Analysis

The Cronbach Alpha (α) value for the scale reliability of the questionnaire created for data collection was calculated as 0.875. According to this value, the scale was found to be highly reliable. Cronbach Alpha (α) values for the sub-dimensions of the scale are as in Table 5.

Table 5. Reliability values for scale sub-dimensions

Career Barriers	Variable	Confidence value (α)
Wage Inequality	5	0,633
Working hours	3	0,751
Male-Dominated Structure	6	0,710
Sexist Attitudes	10	0,666
Glass ceiling	7	0,645
Family-Career Balance	5	0,652

Career barriers sub-dimensions and perceptions scales were determined as 'highly reliable' and recommendations scale as 'highly reliable'.

Profile Of Female Architects Surveyed

The majority of the female architects surveyed are in the early career stage. The percentages of female architects are close to each other in terms of marital status. The majority (81.7%) of the female architects participating in the survey are in the private sector. In terms of management experience, it was determined that 64.9% of the female

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architects who participated in the survey did not have management experience. There are equal numbers of female architects with managerial experience in senior and second-level management levels. 49.6% of female architects work between 41-50 hours per week (Table 6).

Table 6: Profile of female architects participating in the study

		Frequency	Percent
Distribution by age	Early career stage	167	62
	mid career phase	62	23
	late career stage	37	14
	non-career	2	1
Marital status	The married	131	48,9
	Single	137	51,1
Professional experience years	2-5 years	111	41,4
	5-10 years	60	22,4
	10-15 years	28	10,4
	15-20 years	33	12,3
	20-30 years	29	10,8
	30+ years	7	2,6
Sectors they work	Public	49	18,3
	Special	219	81,7
Management status	Yes	94	35,1
	No	174	64,9
Management levels	Second Management Level	40	43
	Third Management Level	13	14
	Senior Manager	40	43
Weekly working hours	< 20 hours	9	3,4
	21-30 hours	15	5,6
	31-40 hours	68	25,4
	41-50 hours	133	49,6
	51-60 hours	33	12,3
	60> hours	10	3,7

Findings on Career Barriers

The findings of the survey conducted with women architects are given in Table 7. According to the arithmetic averages of wage inequality ($\bar{X}$= 3,5694), inflexible working hours ($\bar{X}$= 3.9366), male-dominated structure ($\bar{X}$= 3,5840) and family career balance scales, female architects stated that they were exposed to these career barriers at a high level. According to the arithmetic averages of the sexist attitudes ($\bar{X}$= 2.9586) and glass ceilings ($\bar{X}$= 3.3417) scales, female architects stated that they were exposed to these career barriers at a moderate level (Table 7).

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Table 7. Findings on career barriers

		Arithmetic mean ($\bar{X}$)	Scale Average ($\bar{X}$)
Wage Inequality	For the same job, female architects work for lower wages than their male counterparts.	3,765	3,5694
	There is transparency about wages in working environments in the construction industry.	3,243	
	There is equality in terms of remuneration for male and female architects in recruitment.	3,243	
	A continuous increase in performance is expected in the business environment, but a specific wage increase is not recommended.	4,093	
	If I were a male architect, I think that I would be paid more for the work I do now.	3,101	
Working hours	Inflexible working hours make it difficult for women architects to balance their work and family lives.	4,019	3,9366
	The absence of part-time work in the construction industry makes it difficult for women architects to stay in the industry.	3,892	
	Freelancing (opening an office, outsourcing, etc.) is more attractive for female architects due to inflexible working hours.	3,899	
Male-Dominated Structure	In terms of enforcement power, the construction industry has a male-dominated structure.	3,877	3,5840
	In numerical terms, the structure of the construction industry is male-dominated.	4,116	
	The distribution of duties in the construction sector is determined based on gender.	3,713	
	In the construction industry; The network of crony relations between men isolates women architects in the business environment.	3,757	
	There are elements supporting female architects in the construction industry.	2,817	
	The construction industry accepts the visibility and effectiveness of women architects in the industry.	3,142	
	Women architects' unique situations such as motherhood, pregnancy and menstruation create a negative situation in their employment and business life.	3,836	2,9586

Sexist Attitudes	Marriage and fatherhood of male architects creates a negative situation in their employment and business life.	2,209	
	I often come across the phrase 'male architect' in job postings.	3,127	
	There are no specialized areas such as WCs for female architects in the construction site.	3,657	
	Since I am a woman, I have to do cleaning and tea service etc. at my workplace. I am expected to take charge of the subjects.	3,198	
	I encounter/hear about harassment against my female colleagues.	3,500	
	In the company I work for, women are given priority in matters such as promotion and wage increase.	2,328	
	In the company I work for, men are given priority in matters such as promotion and wage increase.	2,642	
	Being a woman has helped me recruit and advance my career.	2,343	
	I have been discriminated against on the basis of gender by a female colleague.	2,746	
Glass ceiling	It is more difficult for female architects to be promoted in the profession than male architects.	3,336	3,3417
	The advancement of female architects in the profession is limited compared to male architects.	3,377	
	The male-dominated structure of the industry makes senior promotions inaccessible for female architects.	3,373	
	In the construction sector, managers are generally men.	3,828	
	Promotion conditions are equivalent for male and female architects.	2,974	
	Women architects need to make more efforts in order to be in the upper levels in the construction industry.	3,660	
	In terms of career development, male and female architects have the same opportunity.	2,791	
Family-Career	Having children of female architects negatively affects their careers.	3,937	3,7530
	Women architects are supported to return to business life after having children.	3,306	

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	There is a lack of female architect role-models balancing career and family life in the construction industry.	3,903	
	Having children does not offer an advantage for female architects in their working environment in the construction industry.	3,832	
	Working conditions in the construction industry are made in a more challenging environment for female architects.	3,787	

Wage Inequality

According to the data of the wage inequality career barrier scale, female architects state that they work for lower wages than their male counterparts. He is moderately involved in the transparency of remuneration in the work environment and gender equality in recruitment. He stated that there was no wage increase against the expectation of performance increase in the business environment. Participating female architects think that if they were male architects, they would work for higher wages.

Inflexible Working Hours

According to the data of the career barrier scale of inflexible working hours; inflexible working hours, for female architects make it difficult for female architects to balance their work and family lives. The absence of part-time working hours in the construction industry pushes women architects away from the construction industry. For female architects, freelance work is more attractive due to the flexibility of working hours.

Male-Dominated Structure

According to the data of the inflexible working hours career barrier scale, female architects think that the construction industry is male-dominated in terms of sanction power and numerically. He thinks that assignments in the construction sector are based on gender and that they are isolated in the relations between men in business relations. Women architects agree at a moderate level that there are no supporting elements for women architects in the construction industry and that the construction industry accepts the competence of women architects.

Sexist Attitudes

According to the data of the gendered attitudes career barrier scale, female architects state that women-specific situations create a negative situation in their employment and business life, while male architects state that marriage and having children do not create a negative situation. Women architects are often faced with the phrase "male architect" when hiring, they experience gender-based discrimination by their fellows, tea

service in the workplace, cleaning, etc. They also stated that they participated in the subjects of undertaking the subjects at a moderate level. Women architects think that there are no areas specific to women in working environments such as construction sites. Female architects stated that they faced harassment against their colleagues. Women architects did not agree that women are given priority in matters such as promotion and wages for women in the institutions they work in, but they expressed the same situation for men at a moderate level. Women architects stated that they do not agree with the fact that being a woman is an advantage in recruitment.

Glass Ceilings

According to the data of the glass ceilings career barrier scale, it is more difficult for female architects to get promoted in the profession compared to male architects, the male-dominated structure of the industry makes top-level promotions inaccessible for female architects, the promotion conditions are equivalent for female and male architects, and female and male architects are more likely to be promoted in terms of career development. moderately participates in the subjects for which they have the same opportunity. He stated that their advancement in the profession is limited compared to male architects. Female architects think that the managers in the construction industry are generally male architects. Women architects think that they need to make more efforts to be in the upper levels of the construction industry.

Family-Career Balance

According to the data of the Family-Career Balance Career Barrier Scale, female architects state that having children negatively affects their careers and having children does not offer an advantage for female architects in their working environment. She is moderately involved in being supported in returning to work after having a child. Women architects stated that there is a lack of female role-models in the construction industry, and the working conditions are made in a more challenging environment for female architects.

Determination of Career Barriers by Career Stages

Career stages of the participants were determined in order to determine career barriers according to career stages.

Table 8. Career stages of female architects surveyed

Career Stages	Frekans		Percent (%)
Early Career Stage (22-34)	167		62
Mid Career Stage (35-50)	63		24
Late Career Stage (50-65)	36		13
65+	2		1
Total	268		100

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62% (167 people) of the surveyed female architects are in the early career stage (22-35 years old), 24% (63 people) are in the mid-career stage (35-50), 13% (36 people) are in the late career stage (Table 8).

Table 9. Career barriers of surveyed women architects according to career stages

		N	average	sd	X2	p
Wage Inequality	Early Career Stage (22-34)	167	127,46	2	2,866	0,239
	Mid Career Stage (35-50)	62	142,04			
	Late Career Stage (50-65)	37	146,46			
Working Hours	Early Career Stage (22-34)	167	136,43	2	5,083	0,079
	Mid Career Stage (35-50)	62	140,97			
	Late Career Stage (50-65)	37	107,74			
Male-Dominated Structure	Early Career Stage (22-34)	167	137,93	2	4,217	0,121
	Mid Career Stage (35-50)	62	135,83			
	Late Career Stage (50-65)	37	109,59			
Sexist Attitudes	Early Career Stage (22-34)	167	129,16	2	6,029	0,049
	Mid Career Stage (35-50)	62	128,04			
	Late Career Stage (50-65)	37	162,23			
Glass ceiling	Early Career Stage (22-34)	167	120,67	2	12,842	0,002
	Mid Career Stage (35-50)	62	152,11			
	Late Career Stage (50-65)	37	160,22			
Male-Dominated Structure	Early Career Stage (22-34)	167	137,42	2	4,483	0,106
	Mid Career Stage (35-50)	62	137,69			
	Late Career Stage (50-65)	37	108,78			

In the study, the career barriers of female architects to create significant differences for female architects at different career stages were examined. In the results of the hypothesis test, there were no significant differences in terms of different career stages for career barriers coded as wage inequality, inflexible working hours, male-dominated structure and inability to establish a family-career balance. It has been concluded that there are significant differences for female architects in different career stages for career barriers coded as gendered attitudes and glass ceilings. While these career barriers are seen more in advanced career stages, it has been determined that they are less common in early career stages. In terms of glass ceilings career barrier, it is possible to associate this result with more encounters with glass

ceilings, as female architects have a higher chance of catching managerial positions in later career stages. Sexist attitudes examine career barriers, wage and promotion increases, and motherhood. Again, since these situations are seen more in advanced career stages, it makes it possible for female architects in advanced career stages to encounter more gendered attitudes (Table 9).

COMPARISON OF FINDINGS

Comparison of the findings with similar studies according to the data obtained as a result of the study is as in figure 1.

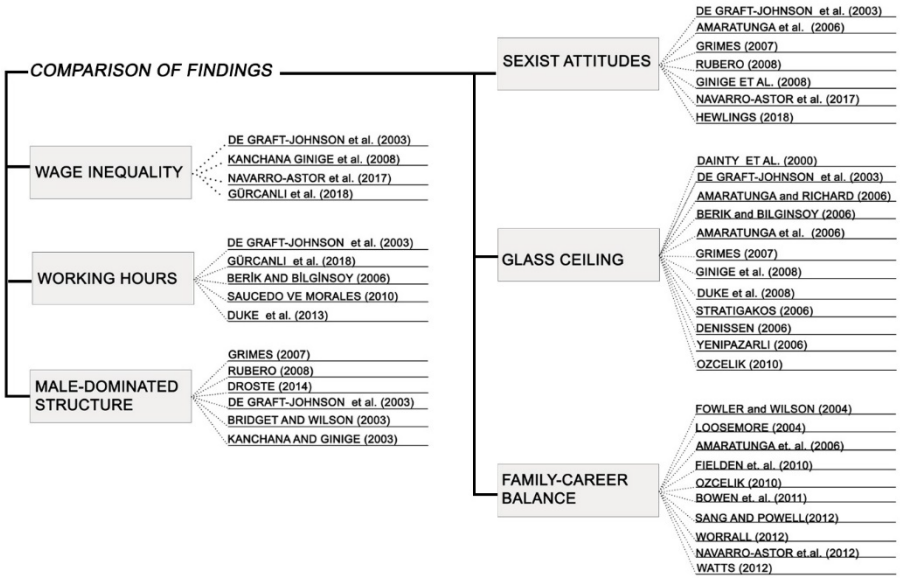

Figure 1. Comparison of the findings

RESULT

According to the results obtained in the research, female architects stated that they were exposed to career barriers coded as wage inequality, inflexible working hours, male-dominated structure and family career balance at a high level, and that they were exposed to career barriers from gendered attitudes and glass ceilings at a moderate level. It has been observed that wage inequality arises as a result of career barriers, the fact that male and female architects receive different wages for the same work and there is no equality in terms of remuneration. Inflexible working hours emerge due to the general structure of the construction industry. The male-dominated structure stems from the traditional structure of the construction industry. It has been determined that the male-dominated career barrier has emerged as a result of the fact that men dominate the sector more numerically and in terms of authority, the distribution of duties is determined based on gender, and the visibility of female architects in the sector is low. It has been observed that the family-career balance is a result of the attitude that women architects face in their business life on having children.

It has been concluded that there is no differentiation according to career stages in the career barriers of wage inequality, inflexible working hours, male-dominated structure and inability to establish a family-

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career balance. Female architects at different career stages are similarly exposed to these career barriers. However, it was concluded that career barriers such as sexist attitudes and glass ceiling barriers have significant differences for female architects at different career stages. According to the research, it is possible to say that female architects in the late career phase are most affected by the glass ceilings and sexist attitudes, which are career barriers, followed by female architects in the middle and early career phases. In terms of glass ceiling career barrier, it is possible to say that female architects have a higher chance of catching managerial positions in advanced career stages, and accordingly, female architects in advanced career stages are more likely to encounter glass ceilings. Sexist attitudes examine career barriers, wage and promotion increases, and motherhood. Again, since these situations are seen more in advanced career stages, it makes it possible for female architects in advanced career stages to encounter sexist attitudes more.

Within the construction industry, women architects face career barriers throughout their careers. Ensuring that more women architects take part in the construction sector will be an important step in reducing or eliminating such barriers. This will contribute to the efforts to increase women's employment, as well as to the country's economy by ensuring the continuity of people who have received vocational training in business life. However, making individual efforts to prevent these barriers faced by female architects during their careers will not produce a real solution. Instead, both the Chamber of Architects and the private sector should develop some measures together and raise awareness in order to overcome these barriers. Because such structural problems can be solved by collective action, not individual solutions. In order to ensure equal pay distributions, wages should be determined according to the nature of the job, not individuals. According to these determined fees, the Chamber of Architects should follow the fees paid by the companies/institutions to their members. Inflexible working hours, instead of limiting working hours in companies/institutions, working times can be stretched by completing weekly working hours or completing the given job. Certain criteria that do not include gender on the basis of companies/institutions can be applied in recruitment and promotion. In line with these criteria, recruitment or promotion can be made. Fair attitudes in recruitment and promotion will facilitate the placement of female architects in the sector and will positively affect the male-dominated structure of the construction sector. Child care units can be established in companies/institutions to provide a balance between family and career. It is of great importance that the measures taken are supervised by professional organizations in order to ensure that every measure to be taken is permanent and its continuity. In order to eliminate the ingrained perceptions of women about the structure of the construction industry, and to enable women architects to take a place in

the construction industry with equal opportunities with male architects, faculties of architecture can be informed about these issues.

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REFERENCES

Adams, A., & Tancred, P. (2000). Designing Women. University of Toronto Press.

Afolabi, A. O., Oyeyipo, O., Ojelabi, R., A., & Tunji-Olayeni, P., F. (2019). Balancing the female identity in the construction industry. Journal of Construction in Developing Countries, 24(2), 83-104.

Agapiou, A. (2002). Perceptions of gender roles and attitudes toward work among male and female operatives in the Scottish construction industry. Construction Management & Economics, 20(8), 697-705.

Akyüz N. (2017). Serbest mimarlık pratiğinde kadın mimarların görünürlüğü; Trabzon örneği. [Master's thesis, Karadeniz Technical University]. KTÜ Akademik Veri Yönetim Sistemi. https://avesis.ktu.edu.tr/yonetilen-tez/d670376e-592d-40f2-aeae-8712dd315ab8/serbest-mimarlik-pratiginde-kadin-mimarlarin-gorunurlugu-trabzon-ornegi

Álvarez, E., & Gómez, C. (2017). The Invisible Women: How female architects were erased from history. Architectural Review. https://www.architectural-review.com/essays/the-invisible-women-how-female-architects-were-erased-from-history (Erişim Tarihi: 11.02.2021)

Amaratunga, D., Richard, H., Shanmugam, M., Lee, A., J., & Gayani, E. (2006, April 3-4). Construction industry and women: a review of the barriers. [Paper presentation]. In: 3rd International SCRI Research Symposium, Delft University, Netherlands.

Anthony, K. (2001). Designing for diversity: gender, race, and ethnicity in the architectural profession. University of Illinois Press.

Architects' Council of Europe (2018). The Architectural Profession in Europe 2018 ACE Sector Study. https://www.acecae.eu/fileadmin/New_Upload/7._Publications/Sector_Study/2018/2018__ACE_ Report_EN_FN_1_OK.pdf

Aydın, M., Erbil, Y. (2019, March 7-8). İnşaat sektöründe kadın mimarların yeri üzerine bir inceleme [Paper presentation]. International Conference on Contemporary Women's Studies (IWSC), İstanbul. http://www.iws-c.net/publication_folder/iwsc/iwsc2019pb.pdf

Aydın, M. 2021. Kadın Mimarların Kariyer Engellerinin İncelenmesi. [Master's thesis, Bursa Uludag University].

Barthorpe, S., Duncan, R., & Miller, C. (2000). The pluralistic facets of culture and its impact on construction. Property management, 18: 335–351.

Bennet, J. F., Davidson, M. J., & Gale, A. W. (1999). Women in construction: A comparative investigation into the expectations and experiences of female and male construction undergraduates and employees. Women in Management Review, 14(7), 273-291. https://doi.org/10.1108/09649429910291122.

DOI: 10.15320/ICONARP.2022.197

Berik, G., Bilginsoy C., (2006). Still a Wedge in the Door: Women Training for the Construction Trades in the USA. International Journal of Manpower, 27(4),321-341.

Bilbo, D., Bigelow, B.F., Rybkowski, Z., & Kamranzadeh, A. (2014). Effects of family-related factors on female project managers' salaries in the construction industry in the US. International Journal of Construction Education and Research, 10(4), 255-267.

Caven, V. (2004). Constructing a career: women architects at work. Career Development International,9(5),518-531. https://doi.org/10.1108/13620430410550763

Chun, B. L., Arditi, D., & Balci, G. (2009). Women in construction management. CMAA eJournal, 1-15.

Dainty, A., R., J., Bagilhole, B.M., & Neale, R. H. (2000). A grounded theory of women's career under-achievement in large UK construction companies. Construction Management and Economics, 18(2), 239-250.

Dainty, A., R., J., Bagilhole, B., M., & Neale, R., H. (2001). Male and Female perspectives on equality measures for the UK construction sector. Women in Management Review, 16(6):297-304.

Dainty, A., R., J., & Lingard, H. (2006). Indirect discrimination in construction organizations and the impact on women's careers. Journal of management in engineering, 22:108–118.

De Graft-Johnson, A., Manley, S., & Greed, C. (2003). Why do women leave architecture? RIBA/University of West of England Research Project. London, RIBA.

De Madariaga, I., S. (2010). Women in architecture: the Spanish case, Urban Research & Practice, 3(2), 203-218.

Denissen, A., M., & Saguy A., C. (2014). Gendered homophobia and the contradictions of workplace discrimination for women in the building trades. Gender & Society, 28(3), 381-403.

Droste, C. 2014. Women architects in West and East Berlin 1949-1969: reconstructing the difference: a contribution to Berlin building history and knowledge about women architects' conditions of professionalization [Doctoral thesis, Westminister University]. WestminsterResearch.https://westminsterresearch.westminster.ac.uk/item/98w5z/women-architects-in-west-and-east-berlin-1949-1969-reconstructing-the-difference-a-contribution-to-berlin-building-history-and-knowledge-about-women-architects-conditions-of-professionalization

Dostoğlu, N., & Erdoğdu Erkarslan, Ö. (2010). Türkiye'de Kadın Mimarların Statüsü Üzerine Niceliksel Analiz. Cinsiyet ve Mimarlık, Dosya 19, 22-26.

Duke, M., R., Luke, B., Carol, B. C., & Genevieve, M., A. (2013). Like Swallowing a Butcher Knife: Layoffs, Masculinity, and Couple Conflict in the United States Construction Industry. Human Organization, 72(4),293-301.

Ellison, L. (2001). Senior management in chartered surveying: where are the women? Women in Management Review, 16(6), 264–78.

English, J., & Le Jeune, K. (2012). Do professional women and tradeswomen in the South African construction industry share common employment barriers despite progressive government legislation? Journal of Professional Issues in Engineering Education and Practice, 138(2), 145-52.

Enshassi A., Ihsen S., & Al Hallaq K. (2008). The perception of women engineers in the construction industry in Palestine. European Journal of Engineering Education, 33(1), 13-20.

Evetts, J. (1994). Women and career in engineering: continuity and change in the organization. Work, Employment and Society, 8(1), 101-12.

Fairs, M., (2017). Survey of top architecture firms reveals "quite shocking" lack of gender diversity at senior levels. Dezeen. https://www.dezeen.com/2017/11/16/survey-leading-architecture-firms-reveals-shocking-lack-gender-diversity-senior-levels/

Fernando, G.N., Amaratunga, D., & Haigh, R., (2014). The career advancement of the professional women in the UK construction industry. Journal of engineering, design and technology, 12, 53–70.

Fielden, S., L., Davidson, M., J., Gale, A., & Davey, C. L. (2000). Women in construction: the untapped resource. Construction Management & Economics, 18(1), 113-121.

Fielden, S. L., Davidson, M. J., Gale, A., & Davey, C. L. (2001). Women, equality and construction. Journal of Management Development, 20(4), 293-304.

Fielden, S., L., Davidson, M., J., Gale, A., W., & Davey, C. (2010). Women in construction: the untapped resource. Construction Management and Economics, 18(1), 2-9.

Fowler, B., & Wilson, F. (2004). Women Architects and Their Discontents. Sociology, 38(1), 101-119.

Gale, A., W. (1994). Women in non-traditional occupations: the construction industry. Women in Management Review, 9(2), 3- 14.

Gregory, A. (2006). Identifying obstacles to professional achievement affecting women in architecture, and to determine the causes of high attrition rates in South Carolina. [Unpublished Master Thesis]. Clemson University.

Grimes, S. E. (2007). Women in the studios of men: Gender, architectural practice, and the careers of Sophia Hayden Bennett and Marion Mahony Griffin, 1870–1960 [Doctoral thesis, Saint Louis University]. WorldCat.https://www.worldcat.org/title/women-in-the-studios-of-men-gender-architectural-practice-and-the-careers-of-sophia-hayden-bennett-and-marion-mahony-griffin-1870-1960/oclc/513719114

Gürcanlı, G. E., Akboğa Kale, Ö., & Artan, D. (2018). Şantiyelerde çalışan teknik elemanların çalışma koşulları üzerine bir alan çalışması. Çalışma ve Toplum, 59(4).

Hamel, S., A. (2009). Exit, voice, and sensemaking following psychological contract violations: women's responses to career advancement barriers. Journal of business communication, 46, 234–261.

Kurtuluş, F., A., & Tomaskovic-Devey, D. (2012). Do female top managers help women to advance? A panel study using EEO-1 records. The Annals of the American Academy of Political and Social Science, 639(1), 173-197.

Ling, F., Y., Y., & Poh, Y., P. (2004). Encouraging more female quantity surveying graduates to enter the construction industry in Singapore. Women in Management Review., 19(8), 431–436.

Lingard, H., & Francis, V. (2004). The work-life experiences of office and site-based employees in the Australian construction industry. Construction Management and Economics, 22(9), 991-1002.

Loosemore, M., & Waters, T. (2004). Gender differences in occupational stress among professionals in the construction industry. Journal of management in engineering, 20, 126–132.

Mavriplis. C., Heller, R., Beil, C., Dam, K., Yassinskaya, N., Shaw, M., & Sorensen, C. (2010). Mind the gap: women in STEM career breaks. Journal of technology management & innovation, 5(1), 140–152.

DOI: 10.15320/ICONARP.2022.197

Menches, C., L., & Abraham, D., M. (2007). Women in Construction - Tapping the untapped resource to meet future demands. Journal of Construction Engineering and Management, 133(9), 701-707.

Navarro-Astor E., Román-Onsalo M., & Infante-Perea M. (2017). Women's career development in the construction industry across 15 years: main barriers. Journal of Engineering, Design and Technology, 15(2),199-221.

ONS (Office of National Statistics) (2009). Construction Statistics Annual 2008, http://www.statistics.gov.uk/downloads/theme_commerce/CSA_2008_final.pdf

Paap, K. 2006. Working Construction: Why White Working-Class Men Put Themselves and the Labor Movement in Harm's Way. Cornell University Press. https://doi.org/10.1177/1097184X07302289

Powell, A., Bagilhole, B., M., & Dainty, A., R., J. (2006). The Problem of Women's Assimilation into UK Engineering Cultures: Can Critical Mass Work? Equal Opportunities International, 25(8), 688-699.

Sang, K. & Powell, A. (2012). Equality, diversity, inclusion and work-life balance in construction. A. Dainty & M. Loosemore, (Eds.), Human resource management in construction. (pp. 163-196). Lincoln Repository. http://doi.org/10.4324/9780203842478

Sarıçelik, M. (2017). Architecture in the role of women and the early republic period in architecture culture construction women relationship. [Master's thesis, Dokuz Eylül University].

Tez Arşivi. https://tezarsivi.com/mimarlik-kulturunun-olusumunda-kadinin-rolu-ve-erken-cumhuriyet-doneminde-mimarlikkadin-iliskisi

Saucedo, L., & Morales, M., C. (2010). Masculinities Narratives and Latino Immigrant Workers: A Case Study of the Las Vegas Residential Construction Trades. Harvard Journal of Law and Gender, 33(2), 625-659.

Secatore, C., & Scott-Young, C. (2016). Attracting and retaining young Professional women in the construction industry. N. Singhaputtangkul (Ed.) Proceedings of the 40th Australasian Universities Building Education Association Conference, 6-8 July 2016, Cairns, Australia. https://espace.library.uq.edu.au/data/UQ_396629/UQ396629_frontmatter.pdf?Expires=1620211825&Key-Pair-Id=APKAJKNBJ4MJBJNC6NLQ&Signature=W8K-n-q4v~ngqxj3De8E6Bk~XkmRqrwHt7lhB7iWh177aokQKF3JcN~3zJBzs5r~goFtiqgO4ub58mcmOLlvgOggruZs1ti5t4y2MkMc3myqwQRl0hMs~gnB7O-uyLOzDe859gExNFT4TG0Me3E9Onow23SdNp2bVfYb875aP6O8ZwEep~jn9muwVrzu3ZKUBWomxdJjzEz-iH0-DLwmhNucLTt~wUGW7vMbgCrqA-p8wvO4WgGQ10UVnCxs8Er4~OIimM1UJUkZ1USOwwgYiKgK1d0Scp~cE9G7kRF3hzZy5tbDMdZT2EsYWqed9M4SFxLF-AQ4V~eiRMjZ0S2S8w__

Stratigakos, D. (2016). Unforgetting Women Architects: From the Pritzker to Wikipedia Places Journal https://wcwahistory.wordpress.com/

Tantekin Çelik, G., & Laptalı Oral, E. (2013). Türk inşaat sektörü çalışanlarının kişilik özelliklerinin, örgütsel bağlılık ve iş tatmini ile ilişkisi. Çukurova Üniversitesi Mühendislik-Mimarlık Fakültesi Dergisi, 28(2), 15-26.

Thurairajah, N., Amaratunga, D., & Haigh, R. (2007). Confronting barriers to women in leadership positions: A study on construction industry. R. Amaratunga (Ed.), 7th International Postgraduate Conference in the Built and Human Environment, Salford Quays, UK. http://usir.salford.ac.uk/id/eprint/10004/

Yates, J., K. (2001). Retention of non-traditional engineering and construction professionals. Journal of Management in Engineering, 17(1), 41-48.

Yenipazarlı, G. (2006). Türk inşaat sektöründe liderlik davranışları üzerine bir araştırma. [Master's thesis, Istanbul Technical University]. Polen İTÜ. https://polen.itu.edu.tr/xmlui/handle/11527/8280

Watts, J. H. (2012). Women working in construction management roles: is it worth it? Global journal of management science and technology, 1, 38–44.

Woosnam, M. D. (2007). Journey to leadership: women administrators in architecture. Ph.D. Thesis, Clemson University South Carolina, ABD.

Worrall, L., Harris, K., Stewart, R., Thomas, A., & McDermott, P., (2010). Barriers to women in the UK construction industry. Engineering, Construction and Architectural Management, 17, 268–281.

Wright, G. (1997). On the fringe of the profession: Women in American architecture. In S. Kostof (Eds), The Architect: Chapters In The History Of The Profession (280-308). Oxford University Press.

Resume

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Architects' Reactions to COVID-19 Pandemic with Evidence from Their Social Media Accounts

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Abstract

The crisis caused by the covid-19 pandemic is being experienced by consecutive waves of effects, and more is expected until it settles down. The restrictions forced many of us to stay indoors, work remotely and communicate online, as much as possible. Although the advances in ICT were increasing online communication and remote work practice, a change in such a scale was not something expected this abruptly. Besides, the change did not stay limited to the work environment and blurred the line between private lives and the business environment. Social Networking Service (SNS) use increased exponentially both for business and social needs. This sudden change triggered by the pandemic not only challenged the way we work and communicate but also many questions about the future of the built environment emerged. This study attempts to identify the similarities and differences between reactions of a group of Turkish and international architects during the first wave of the COVID-19 pandemic, by using the data retrieved from their corporate SNS accounts. A mix of qualitative and quantitative methodology is adopted for content analysis of Instagram (IG) accounts. There are significant differences between architects' social network use and their expressed reactions to the pandemic. These differences are both between the Turkish and international architect groups, but also between the group members. Similar studies with different groups of architects, regions and the use of different SNSs should be repeated to compare the results and implications. One of the main contributions of this article is that, it tries to draw attention towards the role of SNSs for the architects to develop a professional identity in digital mediums and administer it within the company's management strategy. Research on architects' professional social media use and its implications on their management strategy and corporate practice seem quite scarce. The knowledge gap in this area is promising for further research.

Keywords:
AEC industry, architecture office, content analysis, instagram, social networking service

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INTRODUCTION

Although crises caused by political and economic conflicts are more common and suggest a model for future ones, the extent of the crisis triggered by the coronavirus disease of 2019 (COVID-19) in the first weeks of 2020 was unexpected for most of the world. On the 11th of March 2020, the World Health Organization assessed the case as a pandemic depending on its alarming levels of spread and severity, calling for precautions (WHO, 2020). The unexpected interruption to people's mobility and imposed restrictions brought many industries to a standstill. Inevitably, architecture, engineering, and construction (AEC) industry also took its share. While construction sites struggled to stay operational, the majority of technical offices preferred to send their staff home and asked them to work remotely. Almost suddenly, people woke up into a new world where any kind of physical contact with 'other' people became almost offensive and our isolated homes became the only possible place that we can eat, sleep, work, and if possible socialize in a digital way. The work environment unavoidably shifted into digital mediums, forcing their limits.

Institutions of the AEC industry are discussing guidelines to overcome the present and predicted difficulties of the future. However, it seems that we have just started to understand the repercussions of the crisis caused by the COVID-19 coronavirus pandemic, and we are trying to predict how our daily lives and businesses will change in the near future yet. Discussions over the future of public spaces, public services buildings and office buildings are hot topics of debate, as well as the future of the architectural education. Moreover, a recent study shows that effects of economic crisis can be more destructive for architects (Nassereddine et al., 2021). While construction markets rise and fall about 10% in response to major economic crisis, this fluctuation can be up to 50% for architects (Mirza, 2020).

Architecture is a profession deeply interested in society and human behaviour. This interest tackles with any kind of change whether it is referring to a developmental or a destructive one. Moreover, strategic responses to a crisis is important for a firm to survive and there can be positive effects of the crisis in the field of innovation (Rodrigues et al., 2021). This exquisite shifts towards the information and communications technology (ICT) can also create opportunities and threats.

It is not just the usual ways of business communication and office programs that are considered to keep the business world operational during the COVID-19 crisis. Online meetings became a daily routine even for people who never practiced them before. Social networking service (SNS) platforms increased their presence in business communication to reach clients with ease and practicality (Bursztynsky, 2020), enabled by the smart phones with dedicated social networking applications. Smart phones became ubiquitous devices of our daily lives that are even becoming a standard for public services. And, although

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they are mostly privately owned devices, due to their practicality they became an inseparable office equipment for businesses including the AEC industry. SNSs that enable instant messaging and live group video conferencing increased their popularity that are well suited to the isolation period.

Facebook, Instagram (IG), Pinterest, and LinkedIn are among the most popular SNSs in the architecture world and IG became one of the 'most important new tool for architects' in the last couple of years especially for design oriented professionals and businesses by the advantage of its visuals based interface (Abdallah, 2020). IG is a unique social network of its time, which is the first SNS that was 'born mobile' (Miles, 2014). Use of IG among the architects and architectural offices are also booming, not just on using its social aspects but also using it as a tool for improving their business (Lee, 2014). Moreover it is not limited to tech-savvy new generations that are using ICT innovations since their birth but it is already part of some renowned senior architects. Architect Norman Foster of London based Foster+Partners architecture office have started a personal as well as a corporate IG account in 2017, at age 82. He is being pointed out to be one of the best Instagrammers of the architecture world (Furman, 2019).

ICT technologies have implemented a revolutionary infrastructure into the human civilization, such that it seems somewhat impossible to think our future apart from it. New media technologies built over them are changing the way we communicate and do our businesses with an increasing pace. While our smart-phones are becoming an inseparable part of our bodies like a limb, just as (McLuhan, 1964) predicted, social media is becoming an inseparable part of corporate identity (Devereux et al., 2017). On the other hand, the concept of social media is literally young and its implications are yet to be further discussed. But it is becoming more apparent each day that, what social media changed so far seems to be only "a scratch on the surface of what is coming and what is possible" (Aral et al., 2013). All the professions should be aware of the opportunities presented by the advances in the ICT technologies, such as social media (Stonor, 2019). Taking these into consideration, it seems like SNSs are becoming an integral part of our lives, not just for leisure, or business, but also for manifesting a digital identity. In the business of architecture, the digital identity of an architect can easily get intertwined with his corporate identity. SNSs can be considered as a practical way for architects to express and discuss opinions about the predicted change and future implications that will affect the society and the profession. In this framework, SNSs create strategic value throughout the organization and become a tool for developing next generation of ideas (Arora & Predmore, 2013). Therefore, examining architects' IG practice as a business activity, appears to be worth examining.

The main research interest for this paper is to identify the first reactions of the architects against the COVID-19 pandemic, using their

IG activities. According to the tackled research interest, three research questions of qualitative and quantitative units of analysis are set as follows:

Q1: How was the performance of architects/architecture offices' Instagram accounts? (Quantitative & Qualitative implications)

Q2: Did Architects respond to the COVID-19 pandemic by their Instagram posts? (Quantitative implications)

Q3: How did the architects react to the pandemic? (Qualitative implications)

METHODOLOGY, SCOPE AND LIMITATIONS

This research is in a retrospective-documentary form, with descriptive analysis, trying to identify reactions of architects against the COVID-19 pandemic in the first wave of the crisis, using their social media traffic, in particular IG posts. This methodology is adapted to provide a summary of the available evidence and the critical analysis of the subject. In order to be legitimate, this kind of methodology needs to be transparent in data collection (Hadengue et al., 2017) and should involve a descriptive summary (Rodrigues et al., 2021).

A similar methodology is used by Ilter (2020), to make comparison between seven global and seven Turkey-based architecture firms. However, findings of mentioned research is limited as the short list of IG accounts are a mix of personal and corporate accounts, number of media uploads are taken from a third-party web site, and qualitative analysis of uploaded media is not detailed.

Using a parallel methodology, this research increases the number of companies compared to 10 each, and only corporate accounts are taken into account which introduces eight new international and four new Turkey-based firms. Media uploads are examined using relevant IG accounts, performance analysis are double-checked using two different dedicated web sites, hashtags are scanned, a more in-depth qualitative analysis is accomplished, and correlation analysis is used for possible relationships, which is expected to give more accurate and seminal results.

Content Analysis

Content analysis is a research method for analysing the content of various documents, such as visual and verbal data (Harwood & Garry, 2003), not necessarily from an author's or user's perspective (Krippendorff, 2004). It is often used to decide the occurrence of certain words, themes or concepts within the data provided. This method can be used to quantify the presence, meaning and relationship of such words, themes or concepts. As a distinction from many other social sciences research methods, content analysis does not require data collection directly from people. It uses data from recorded information in forms of text, media, or other articles. In this context, content analysis

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method is selected for analysing the digital media content of corporate IG accounts.

Codes of the content analysis are formed using the keywords that are reminiscent to the COVID-19 pandemic crisis. These codes included direct references to the pandemic such as 'COVID-19' or 'corona' and varied through more contextual indicators such as 'stay safe and healthy' or 'difficult times'. Starting with a quantitative analysis, the frequency of these codes' presence are recorded. After that, a qualitative search for the stress caused by this global crisis that may be skipped by these pre-determined codes are looked for. Text and visuals are checked for possible implicit or explicit ties relative to the research questions. Findings of this qualitative search that are indicating an implicit relation to the research theme are also added as 'other' to the table of codes.

In order to maintain a more in-depth performance metrics analysis of the architects/architecture offices, two professional websites, dedicated to making statistical analysis for social networking sites, 'socialblade.com' and 'popster.com' are employed. A descriptive analysis of the selected digital media content is presented following theseanalysis.

Time Frame

In order to set a time frame for analysing the reactions of the architects, the period between the last week of February 2020 and the first week of June 2020, covering roughly 70 calendar days on average is chosen. This period is regarded as the first wave of the pandemic by many, although it is not scientifically sound until the pandemic is officially over (Zhang et al., 2021). However, the disturbing consequences of the contagion has been spread to the Africa, Europe and Americas in late February. In the following months, we saw restrictions and lockdowns, causing tremor globally. Although each country did have its own scheme and dates, in early June 2020 most of the European countries, as well as Turkey, started to ease the taken measures considering the predictions (Dzien et al., 2020) that pandemic will slow down in the summer months. Regarding this relatively turbulent period of the fight against the virus and representing the first wave of shock and despair ending with the ease of restrictions and lockdowns for many countries in the northern hemisphere, this period is considered appropriate for the research.

Sample Selection

While selecting the set of architects, it is found useful to set two groups of architects and make comparisons between these groups. 10 Architecture companies that are based in Turkey are selected based on the architect associations' data depending on their social media practice, retrieved from a research regarding social media use as an innovative tool for strategic brand management. These Turkey-based companies are Autoban, Avcı Architects, Bahadır Kul Architects, Çinici Architects,

EAA-Emre Arolat Architecture, ERA Architects, Erginoğlu & Çalışlar Architects, GAD Architecture, Tabanlıoğlu, and Toner Architecture. Although the research showed more social media activities for some other companies, they are eliminated due to the lack of their IG accounts, or insufficient data for the assessed period.

On the international side, an international business magazine's short list 'The 10 most innovative architecture companies of 2021' is considered as the starting point for selecting the architects (Fast Company, 2021). The 10 architecture companies suggested by the web site are studied to reach their official IG accounts and make the necessary analysis over them. However, no trace of an IG account could be found for 3 of the 10 companies and 2 company's accounts did not provide the needed analysis for the decided time-frame because of their personal to corporate account status change was too recent. The 5 remaining companies from the Fast Company list is as follows: Mass Design Group, Studio Gang, Diller Scofidio + Renfro, SGA Architecture, and Gensler. As the list of international companies fell short of the intended number of 10 companies, another list, Archdaily's 'These Are the World's Most Innovative Architecture Firms' is referred (Grozdanic, 2016). A total of 10 companies to conduct the research is formed by adding BIG, Shop Architects, Perkins & Will, NBBJ and HOK to this list.

The separation between the firms depends on their home country only, and naming these groups is referencing the Engineering News Record (ENR) magazine. ENR releases annual lists ranking firms of the AEC industry, such as the Top 225 International Design Firms, and provide valuable data for researchers (Lu, 2014). As a US based magazine, ENR lists the firms based outside the US as 'International'. Regarding this separation, this research groups the firms as 'Turkey-based' and 'International', where the international group represents the firms that are based outside Turkey. In their business environment many Turkey-based firms have offices and active projects outside their homeland. Likewise, many of the international firms have offices outside their homeland, and have operations in Turkey.

Restrictions

Due to the research variables selected for this study, this research has many limitations. The architects selected for this research are innovative firms considered by either a magazine as stated above or a research on the social media use of architects. However, these specifications do not necessarily point out a high performance in innovating or successful social media usage as a management strategy of the firm. Besides all these peculiarities are quite time dependent, especially when the social media activities are addressed. So, a different sample selection, a different period and other social media networks may put forward different results. Moreover, other stakeholders of AEC, such as engineering firms, professional institutions like chambers, associations, non-governmental organizations, AEC industry related

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blogs, would all add-up to this discussion from different perspectives, and using a larger sample size will improve the statistical significance of the results.

Separating the corporate accounts of the firms, with the personal ones of the leading architects can be difficult for some of the businesses. Some of the architects/offices have side accounts besides their official business accounts that even have more followers than the business account. For an example, the IG account 'Zaha Hadid Architecture' has 1.1 million followers, where the official business account 'Zaha Hadid Design' has roughly 111.000 followers. Only the business accounts are deemed for this research to avoid any confusion.

The performance of individual IG accounts can be measured in different ways. The first measures and the most easily accessible ones are the number of the followers of the account, number of the accounts being followed by and number of media uploads (posts) shared by the users. However, these numbers are not enough to predict the performance of an account if the research focuses on a relevant period or some other basic comparisons between the account and that particular social networking population. Quantitative analysis made for the first research question of this research depends on the data taken from the social media analysis web sites 'socialblade.com' and 'popsters.com'. Moreover, as the content analysis of the IG accounts are made past the research period, possible posts and stories deleted by the users or the time setting, as well as links removed are being excluded from this research. Social media is a relatively new-established research area and the social networking platforms that are being explored are in a constant change of popularity. IG is selected as a preferred social networking platform frequently used by designers at the time of the research. However, other social networks in combination with different architecture offices may propose a distinct perspective.

ARCHITECTS' REACTIONS OVER THE SOCIAL NETWORKS

Performance of Architects/Architecture Offices on Instagram

For the first research question, a mixed way of analysis that has both quantitative and qualitative implications is used. In order to find quantitative answers to "Q1: How is the performance of architects/architecture offices' IG accounts" and interpret the findings, the selected social media analysis web sites are utilized. IG performance analysis summary of the selected architects'/architecture offices' IG accounts are shown on Table 1. The architects are sorted according to their media uploads during the period selected for the research. As the data retrieved from socialblade.com is weekly, there is a slight shift in start and end dates of the period analysed by this certain web site. Due to this shift, the period analysed is between February 24-29th to June 6-7th, and acknowledged as reliable. The start of this period cover the phase when the outbreak turned into a pandemic and restrictions as well as lock-downs took place all over the world. The end date complies

with the ease of these restrictions mostly for EU and surrounding countries as stated in the methodology part. On the popsters.com side, the period is more certain and accepted as February 24th to June 7th.

Depending on this period, 'social grade', 'number of followers' and 'number of following' are taken from socialblade.com, and 'number of uploads', total likes', and 'total comments' are taken from 'popsters.com'. The metrics shown on the table include the overall numbers of posts shared by the account, total number of followers, and number of accounts followed by the account as basic indicators. Average likes and average comments are means of the responses for the shared content and provide data for the 'social grade rank' that is calculated by the socialblade.com in comparison with other similar accounts. These variables are also used to calculate 'engagement rates' by both analysis web sites, but they are excluded on Table-1.

The number of posts, number of followers and number of followed at the end of February are shown on Table-1 to reveal any meaningful changes that happened during the period of the pandemic restrictions. The architects are sorted according to their media uploads during the selected period. First three Turkey-based architects' media uploads are significantly higher above the average of both groups while Gensler is the top uploader with a slight difference with the top 3 Turkey-based architects. Emre Arolat Architecture's IG account is the only B- rated architecture office between the Turkey-based group as all the others are rated C+. Between the international architects, the only company that has C+ social media grade is SGA Architecture while all the others are graded as either B- or B. Table 1 provides numbers to assess the social media performance of these two groups.

Apart from the differences of account grades assigned by the Socialblade.com, the international group reaches an average of 94k followers at the end of the selected period, while in the Turkey-based group this number is around 15,5k. The percentage of increasing follower numbers are also different for international and Turkey-based groups. In this period, the international architects increase their followers by %7,92 while the Turkey-based architects' followers increase by %4,58. Similarly the mean value of accounts that international architects follow is 512 while Turkey-based ones is 340. In both groups, there are a few architects who loose followers or decreased the number of followed accounts in this period. The difference between number of followers also reflect from the number of responses. While the international group receives 1633 likes and 17,2 comments on average, the Turkey-based group has 345 likes and 3,2 comments. With these numbers, both groups have the same value of comments per follower by %0,02. However, Turkey-based architects have a greater value of likes per follower than the international ones, with values of %2,22 and %1,74 respectively. Table-1 does not show significant relations between these variables. However, while the international architects' data do not show a relationship between the number of

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uploaded posts and the increase in their follower numbers, Turkey-based architects' number of posts and the increasing number of followers show a significant relationship in this period, when a Pearson's Correlation test is conducted ($r(10) = .903$, $p < .001$).

Table 1. Instagram Performance Summary of International and Turkey-based Architects'/Architecture offices'

		Home Country	Social Grade	Uploads	Followers		diff.	Following		diff.	Likes (Total)	Avg. Likes.	Comm. (Total)	Avg. Comm.
					F 24-29	] 6-7		F 24-29	] 6-7					
	INTERNATIONAL													
1	Gensler	@gensler_design	USA	B	66	112.905	124.830	11.925	255	280	25	97.992	1.484,73	879	13,32
2	Studio Gang	@studiogang	USA	B-	38	67.823	73.084	5.261	312	345	33	47.416	1.247,79	419	11,03
3	NBBJ	@nbbjdesign	USA	B-	32	9.022	12.385	3.363	676	737	61	8.358	261,19	118	3,69
4	Perkins & Will	@perkinswill	USA	B-	31	59.924	64.835	4.911	341	338	-3	25.980	838,06	218	7,03
5	HOK	@hoknetwork	USA	B-	21	25.686	27.773	2.087	959	968	9	6.920	329,52	84	4,00
6	Mass Design Group	@massdesigngroup	RWA	B-	19	15.439	17.675	2.236	186	234	48	7.898	415,68	85	4,47
7	BIG - Bjarke Ingels Grp	@big_builds	DK	B	15	404.765	439.985	35.220	251	255	4	129.635	8.642,33	869	57,93
8	Diller Scofodio+Renfro	@diller_scofidio_renfro	USA	B	6	66.080	70.073	3.993	177	180	3	7.775	1.295,83	64	10,67
9	SGA Architects	@sgaarch	GB	C+	4	1.180	1.251	71	874	864	-10	264	66,00	7	1,75
10	Shop Architects	@shoparchitects	USA	B	1	108.773	108.758	-15	921	922	1	1.758	1.758,00	59	59,00
	TURKEY-BASED														
1	EAA-Emre Arolat Arch.	@eaa_emrearolatarchitecture	TR	B-	63	45.987	48.295	2.308	225	229	4	34.770	551,90	202	3,21
2	GAD Architecture	@gadarchitecture	TR	C+	62	12.265	14.292	2.027	965	970	5	18.356	296,06	330	5,32
3	Autoban	@autoban212	TR	C+	62	22.670	23.723	1.053	849	894	45	22.013	355,05	190	3,06
5	Bahadır Kul Architects	@bkarc	TR	C+	11	7747	7964	217	194	137	-57	2.767	251,55	24	2,18
8	Avcı Architects	@avciarchitects	TR	C+	9	4712	4880	168	123	125	2	1.597	177,44	13	1,44
6	Tabanlioğlu Architects	@tabanliogluarchitects	TR	C+	3	17.902	18.381	479	167	167	0	2.285	761,67	23	7,67
4	Erginoglu&Calislar Arch	@ecarchitects	TR	C+	2	10.970	11.532	562	2	2	0	1.055	527,50	2	1,00
7	Cinici Architects	@ciniciarchitects	TR	C+	1	9.842	9.934	92	342	340	-2	507	507,00	8	8,00
9	Era Architects	@era_architects	TR	C+	0	11609	11491	-118	110	144	34	0	0,00	0	0,00
10	Toner Architects	@tonerarchitects	TR	C+	0	4.934	4.960	26	368	391	23	0	0,00	0	0,00

F 24-29: February 24-29th
] 6-7: June 6-7th

Finally, Table-1 shows the number of posts uploaded in the selected period for each architect group. Total number of posts sent by the international architects is 233, while the Turkey-based ones have 213. That makes a difference of around %10 between the groups. However, while there are 3 companies that have a single digit number of posts in the international group, 6 of the Turkey-based architects have a number of posts below 10, and 2 of the Turkey-based ones do not have any uploads during this period. The number of total posts have a more homogeneous distribution for the international architects while %88 of the posts belong to only 3 Turkey-based architects. A more in depth analysis is needed to identify if these architects, who are in a way social media leaders of their scale, have responded to the pandemic during the crisis period or not.

Traces of response to the pandemic by Instagram Accounts

Architecture extends beyond designing spaces and also shape the lives of people in different ways. The second research question of the study tackled with the idea that architects would have been reacting for the unexpected and traumatic setting created by the pandemic. In order to examine the 'Q2: Did Architects respond to the COVID-19 pandemic by their Instagram posts?' both group of architects' IG posts during the period of late February to early June are observed according to the content analysis framework formed. Keywords selected for this framework are checked in the descriptions on the visuals, including hashtags related to these keywords. Video clips are checked for its content as well as the 'stories'. Results of this scan is shown on Table 2. The numbers given in Table-2 shows different number of reactions expressed by the architecture offices. These responses bring us to our third research question: 'Q3: How did the architects react to the pandemic?'. Analysis of all these items are separated into three parts below, according to these items.

Analysis of the Instagram Posts

The dates of the architecture firms' first IG posts about the COVID-19 pandemic can be seen in Table-2. According to these dates, the first evidence of the pandemic can be seen at NBBJ's March 9th post. All the international architects have shared at least one post regarding the health crisis, and between the firms who responded, the latest first response belongs to SGA Architects on May 7th. HOK and Shop Architects have first response dates on April 10th and 4th. The first response dates are aggregating between mid to late March 2020 despite different home countries and the Turkey-based firms' first response dates also fit in these dates too. However, two of the Turkey-based architects did not share anything on IG during the research period and three of the Turkey-based firms did not mention the crisis despite they shared other posts. Despite the similarities between companies with different home country origins, some posts remind us the different

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situation of China, where the pandemic started and spread to the globe. International firms that have China offices, like Perkins & Will or Gensler have IG posts mentioning their China offices are back to work. The dates of these posts, as early as 29th of April, give clues that the pandemic has a different progress in China.

Table 2. Shared documents by the architects and traces of pandemic with keywords for the period of late February to early June 2020.

	INTERNATIONAL FIRMS		First Related Post	Posts Total	**Total evidence**	Posts related	Stories attached	Link attached	Hashtags	**Used Keywords**	covid-19/corona pdm.	stayhome	social distancing	faceshield / visor	mask	lockdown	quarantine	crisis	difficult/challenging times	remote working	stay safe&healthy	other	office return, new normal
							--- evidence exp. ---				---------- keywords expanded ----------												
1	Gensler	@gensler_design	6.03.2020	66	**56**	41	15		47	**55**	32		4	1	1	1		5	1	4		6	
3	Studio Gang	@studiogang	29.03.2020	38	**8**	7		1	2	**13**	5	1	1		1			1	2	1	1		
2	NBBJ	@nbbjdesign	9.03.2020	32	**86**	7	79		2	**8**	2	1	1						1	1	1	1	office return,
4	Perkins & Will	@perkinswill	19.03.2020	31	**13**	9	4		2	**15**	7		3						1	2		2	frontlines, office return
5	HOK	@hoknetwork	10.04.2020	21	**8**	8			11	**13**	5				1					1		6	covid stories, #covidimpact, work must go on, frontlines, return to work
6	Mass Design Group	@massdesigngroup	25.03.2020	19	**39**	10	28	1	16	**16**	9		2						2			3	frontlines',#architecturecanheal, response guide
7	BIG - Bjarke Ingels Grp.	@big_builds	31.03.2020	15	**2**	1	1		1	**2**		1		1									
8	Diller Scofodio+Renfro	@diller_scofidio_renfro	20.03.2020	6	**3**	**3**			6	**6**		3										3	#washyourhands
9	SGA Architects	@sgaarch	7.05.2020	4	**1**	1			1	**2**	1											1	office return
10	Shop Architects	@shoparchitects	4.04.2020	1	**1**	1			1	**1**				1									
				233	**217**				89	**131**	**61**	**6**	**11**	**3**	**3**	**1**	**0**	**6**	**7**	**9**	**2**	**22**	
	TURKEY-BASED FIRMS																						
1	EAA-Emre Arolat Arch.	@eaa_emrearolatarchitecture	20.03.2020	63	**5**	5			3	**9**	4				1					2	1	1	sanitizer
2	GAD Architecture	@gadarchitecture	26.03.2020	62	**8**	8			4	**19**	9						2	5			2	1	missed construction sites, post covid
3	Autoban	@autoban212	20.03.2020	62	**1**	1			0	**2**		1								1			
4	Bahadir Kul Architects	@bkarc	-	11	**0**				0	**0**													
5	Avci Architects	@avciarchitects	16.03.2020	9	**4**	4			5	**6**	3	1								1		1	office return
6	Tabanlioğlu Architects	@tabanliogluarchitects	18.03.2020	3	**1**	1			0	**4**	1		1							1	1		
6	Erginoglu&Calislar Arch.	@ecarchitects	-	2	**0**				0	**0**													
7	Cinici Architects	@iniciarchitects	-	1	**0**				0	**0**													
9	Era Architects	@era_architects	-	0	**0**				0	**0**													
10	Toner Architects	@tonerarchitects	-	0	**0**				0	**0**													
				213	**19**				12	**40**	**17**	**2**	**1**	**0**	**1**	**0**	**2**	**5**	**0**	**4**	**5**	**3**	

International and Turkey-based architecture firms listed in Table-2, are sorted according to the number of posts they have made during the

research period in groups. However, the pandemic response frequency in their posts' content is not exactly in line with the their activity performance. On the international architects side, Gensler is the most active firm with 66 posts in total, and they have 41 posts related to the pandemic which also makes the largest number of COVID-19 related posts. However, second most active firm Studio Gang with 38 posts do have only 7 related posts, which makes the firm fifth in number of COVID related posts. Instead, Mass Design Group, which is the sixth most active firm with 19 total posts, have 10 related posts about the crisis and takes the second place on this kind of sorting, followed by Perkins&Will, and HOK by 9 and 8 related posts respectively. Regarding the total posting activities in the selected period, third most active firm NBBJ with 32 total posts, have 7 COVID related posts. In the group of international architecture firms, all firms have a related post in their IG accounts.

In order to analyse these posts, certain keywords are selected to understand their usage frequencies. Selected keywords and the frequency they are used by the firms can be seen in Table-2. Between these keywords, 'COVID-19/COVID pandemic' derivatives are used 61 times and take the lead. Next, 'social distancing' is used 10 times, and 'remote working' 8 times, which makes these keywords second and third most used keywords respectively. Other than these specific ones, firms have used others that are not being repeated by most of the others. These keywords are coded as: 'office return/return to work', 'new normal', 'vaccine', 'frontlines', 'COVID stories', 'COVID impact', 'work must go on', 'architecture can heal', 'response guide', and 'wash your hands'.

When the content of the international group's posts are analysed, these items regarded as evidence are mostly related to the architects' proposals to re-thinking the project types of their practice according to the COVID-19 measures taken, as well as proposals for the post-pandemic era. Being the most active and responsive to the pandemic firm, Gensler has many proposals about workplace, school, healthcare, retail, hospitality, urban space transformations during and post-COVID era. Perkins & Will have proposals about healthcare buildings, hospitality industry and workplace return in their posts. The topic of their first post on March 19th is striking: "Design has the power to strengthen the spirit of the community". One of their posts is about a mobile COVID test lab prototype, while another post is about 'at home learning tips'. Mass Design Group and HOK also share their healthcare and wellbeing project experiences in connection with the COVID crisis. Diller Scofodio+Renfro has some hygiene related design posts. SGA is referring to 'return to work' in their only post during this specific period. Meanwhile, BIG, Shop Architects, HOK, and Gensler have posts showing their contribution to the healthcare workers by producing 3D printed face shield components. Studiogang's posts tackle with the popular expression 'social distancing' which is frequently used as a

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single most powerful measure to avoid the virus. These messages underline the importance of being social for the human kind and proposing the message should be 'physical distance' instead of being socially distant. Within their post, dating March 20th, they mention the pandemic by these words: "…staying safe and healthy through this challenging and uncertain time".

In the Turkey-based group, the earliest response came from Avcı Architects on March 16th. Tabanlıoğlu Architects' announcement of their office closure and home office transformation dates on March 18th. This post is Tabanlıoğlu Architects' only related post through their IG account aside a link attached to their bio that gives more information about this shift. On the Turkey-based side, three firms are conveying most of the posts in the researched period with a total of 187 posts. These firms are EAA, GAD, and Autoban. However, these firms only have 5, 8, and 1 posts regarding the pandemic, respectively. Avcı Architects have 4 posts, and as mentioned, Tabanlıoğlu have only 1 post about the global health crisis. Although Bahadır Kul Architects, Erginoğlu&Çalışlar, and Çinici Architects have posts in the researched period, they do not mention anything about the crisis and its consequences. No traces about the pandemic have been found in Toner, and Era Architects IG accounts.

When the used keywords are analysed, 'COVID-19/COVID pandemic' or similar steps forward with 17 times, followed by the key words 'crisis' and 'stay safe/healthy' that are used 5 times each. There are also a few uncommon keywords used is the Turkey-based group. These are 'sanitizer', 'missed construction sites', post-COVID', and 'office return'. On the content side, first pandemic related posts of GAD, Tabanlıoğlu, Avcı Architects, and EAA are announcements about their office closures. EAA repeats a similar set of posts about their international office closures in the following weeks. Autoban mentions that they work from home. Their indirect remark, 'site visits are halted' is repeated by GAD with the words 'missed construction sites'. Only Avcı Architects and GAD mention about their projects related to the COVID-19 crisis. These two firms dwell on their residential projects with inner courtyards, and facilities for quarantined residents. The most active Turkey-based architecture firm between the Turkey-based group, GAD has 4 significant posts about an online discussion series of "COVID Crisis and Education" that put forward the need for a new perspective for architecture education in the post-COVID era.

Hashtags (#) added to IG posts are powerful markers to reach other users who are interested in specific topics but not especially the sharing account itself, forming a social bookmarking system (Ibba et al., 2015). The posts are checked to find out the used hashtags. Gensler, Mass Design Group and HOK are the first three firms using hashtags effectively. Their posts have 47, 16 and 11 associated hashtags respectively. While all international architecture firms have used at least one hashtag about the issue, only three Turkey-based architecture firms

have related hashtags. Avcı Architects have used 5, GAD have 4, and EAA have 3 hashtags in this period related to the crisis.

The hashtags and their frequency of occurrence are shown in Table-3. In a total number of 100 hashtags used, the most frequently used ones are covid19/covid-19 and corona/coronavirus. These combinations are not separated from each other because of their eminent synonymity. These two keyword groups have a frequency of 38 and 29 respectively. Third most used hashtag is 'stayhome' with a frequency of 5. The fourth and the following hashtags' frequencies range between 4 and 1. Hashtags 'socialdistancing, 'returntowork', and 'workingfromhome/homeoffice', are all used 4 times. Meanwhile, Gensler Design is the most frequent hashtag user of the both architecture company groups with 47 hashtags. Mass Design Group follows with 16 and Diller Scofidio+Renfro with 11 hashtags.

Table 3. Used Hashtags and the user frequency

	covid19 /covid-19	corona / coronavirus	stayhome	socialdistancing	returntowork	workingfromhome / homeoffice	pandemic / pandemic2020	washyourhands	remotework / workingremotely	covidstories	3dfaceshield	covidinsights	covidimpact	healthcareheroes	TOTAL
Gensler_design	22	20				3			2						47
MASS Design Group	7	5		4											16
HOK Network	5	1			1					2			1	1	11
Diller Scofidio + Renfro			3					3							6
Avcı Architects		1	1				3								5
GAD Architecture	1	1			1	1									4
EAA-Emre Arolat Arch.	1	1							1						3
Perkins&Will					1							1			2
Studio Gang	2														2
SGA					1										1
SHoP											1				1
BIG - Bjarke Ingels Group											1				1
NBBJ Design			1												1
Autoban															0
Bahadır Kul Architects															0
Tabanlıoğlu Architects															0
Erginoglu&Calislar Arch.															0
Cinici Architects															0
Era Architects															0
Toner Architects															0
TOTAL	38	29	5	4	4	4	3	3	3	2	2	1	1	1	100

In the Turkey-based architects group, Avcı Architects have 5, GAD Architecture have 4, and EAA-Emre Arolat Architecture have 3 hashtags used related to the pandemic in the specified period analysed. Despite their relatively high number of posts, some of the architecture companies did not use hashtags much frequently. For example, NBBJ has only 1 pandemic related hashtags despite their 32 posts and a total of 81 other evidence items. Similarly in the Turkey-based group, Autoban has 62 posts without any related hashtags.

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Analysis of the Attached Stories and Links in Bio

In the social networking app IG, there are other tools users can prefer for sharing, apart from the posts. One of these alternative sharing types is called IG stories. IG stories are vertically formatted full screen videos or images. They appear on the screen with a 15 second limit for every item uploaded as a story. Rather than appearing in the news feed, these items are shown in a separate line on top of the application interface and disappear in 24 hours. However, the user may prefer to keep them by 'highlighting', which keeps them pinned to the user's profile until they choose to delete them. This way, users can keep different clusters of stories for different likes and reasons under each highlight topic created. While preparing these stories, users can add stickers on top of the images or videos. These stickers may indicate many information, such as text, location, hashtag, poll, quizzes etc., or mention another IG user. Some of the features like polls and quizzes are stories specific, as they cannot be placed on regular posts. Therefore, these additional information over the stories are also worth analysing with the shared story itself. However, as stated under the restrictions section, stories which are not highlighted or deleted by the user are exclusive of this research.

When the architecture firms accounts are analysed for pandemic related items, no highlighted stories have been found in the Turkey-based architects side. However, on the international architects side, there are five companies who have highlighted stories that are related to the global health crisis. Between these firms, NBBJ has 79 highlighted stories that clearly outperform any other firm in the number of either posts, stories or information bounded by links. 54 of these stories are highlighted under the topic of 'COVID-19 response' in NBBJ's account and accommodate various reactions. Some 25 more highlighted stories are under 'ideas' topic. Stories under this part are questioning the new workspace necessities and real estate strategies needed for the post-pandemic era. While these topics are existing also in the 'COVID-19 response part, they also tackle with modular construction for rapid healthcare response, conversion of public buildings such as dorms into healthcare units, safer inner navigation ideas for the hospital buildings, and showing their solidarity and contribution by 3D printing and assembling face shields for healthcare workers. All the highlighted stories have links attached over them providing third-party information for further details. Another firm using highlighted stories effectively is Mass Design Group. In comparison to their 19 posts, they have 28 stories attached to their profile page. Here, all their related stories are put together under the topic of COVID-19. Story topics discuss urban design, healthcare and office architecture, natural ventilation, and design hacks. There is also a panel announcement for 'design emergency', which captures the role of architecture in fighting a pandemic, and makes a bold statement: "All architectural decisions have social and political implications…".

The other 3 international architects that also used highlighted stories are Gensler with 15, Perkins&Will with 4, and BIG with 1 stories. Gensler's highlighted stories are on a 'work from home' survey. The point they emphasize is, that most of the office workers in the US want to return to the office and they discuss the possible strategies. Perkins&Will use the term 'physical distancing' instead of 'social', and point out discussions on office return, K12 schools and personal needs. Both companies have links on their stories, leading towards third party information sources. Meanwhile, BIG has a single highlighted story dated 1st of April, telling 'stay home!'.

IG users can also share links in the profile for more detailed information about an issue to focus on. But like the stories, their existence are subject to change by the users when desired and mostly used for directing the users to their company related web sites. Similar to the use of highlighted stories for expressing ideas about the global health crisis, no related links could been found in the profiles of Turkey-based architecture firms. Evidence from the international group is quite scarce too. Only Mass Design Group and Studio Gang's accounts showed evidence for attached links dedicated to the pandemic.

The link attached to Studio Gang's profile invites people to an annual mask design activity, this time dedicated to the COVID-19 pandemic. Beside these links still present, some posts and stories of both groups of architects also mention links in their bio, such as Studio Gang's May 14th post pointing out "Architecture, Hope, & COVID-19" link which was not available at the time of this research.

DISCUSSION

This research started with three main questions to identify the reactions of the architects during the lockdown period. Answers for the first research question are looked for in the performance assessment of the two selected group of architects in a certain timeframe. For the second and third research questions, we looked for the architects' reactions towards the COVID-19 pandemic in their official IG accounts. The content analysis of the IG posts show that, architects showed different reactions against the period of lockdown. Apart from their origin or IG performance in general, some of the architects shared implications on the unexpected effects of the pandemic in their IG accounts, while the others did not respond. When they did, in most cases it started with the announcement of their office closure, and work-from-home arrangements (@gensler_design, @perkinswill, @hoknetwork, @big_builds, @studiogang, @avciarchitects, @tabanlıoğlu, @gadarchitecture). Further, some of them reflected their concerns (@studiogang, @gadarchitecture) and some of them tried to motivate their followers to monitor the guidance being made by the authorities (@big_builds, @diller_scofidio_renfro, @autoban212, @tabanlıoğlu) or showing solidarity with the health care providers. Some of the architects showed their support for the efforts to provide supplies such as

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producing face shields (@gensler_design, @shoparchitects, @big_builds). While 5 of the Turkey-based architects did not respond to the crisis in their IG accounts (@bkarc, @era_architects, @ecarchitects, @ciniciarchitects, @tonerarchitects), all the international architects did. In this unresponsive group, @tonerarchitects and @era_architects did not share any posts. @ciniciarchitects had only one, and @ecarchitects had two posts during the lockdown period which may be associated with the absence of their response to the crisis. However, @bkarc shared 10 posts during the researched period but did not give any clue about the pandemic or the crisis caused by the pandemic. The distribution of the found evidence in numbers, for each group is shown in Figure 1.

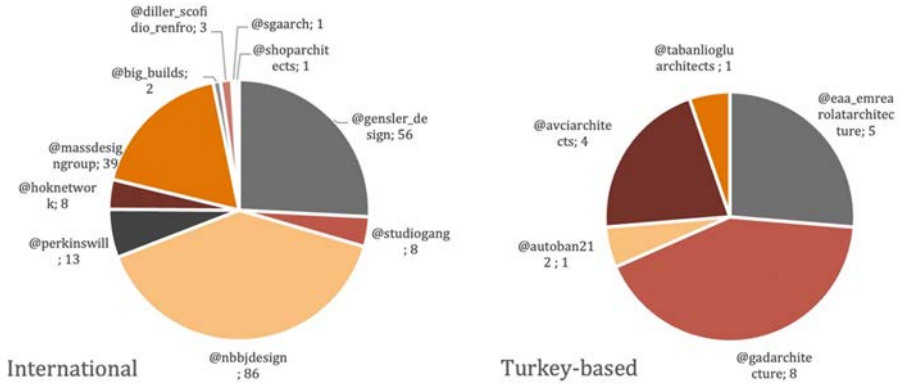

Figure 1. Evidence revealed for Turkey-based and international architecture firms.

One of the significant discussions captured by this study is the one that is put forward by Studio Gang (@studiogang). Is 'social distance' the correct expression to identify the needed distance between individuals to avoid the infectious particles, or is it the 'physical distance' that we are looking for? Likewise, Perkins&Will also use the term 'physical distancing' instead of the widely used one. This gripping viewpoint has a considerable amount of startling connections with the discussion of architecture and built environment. Another discussion is about the future of architectural education. Global Architectural Development (@gadarchitecture) is promoting the discussion on this hot debate adding the uncertainties of the post-COVID era. The sudden and compulsory shift towards the digital mediums in this lockdown period created an inevitable leap for the online education efforts. Moreover, it seems we will be facing more online education challenges in the near future and the distinct characteristics of the architectural design education will escalate the pressure on this already hot debate.

Detected between the IG activities of the architects, there are some outright statements that pose direct evidence for the discussion of this research. Perkins & Will, shared a post on March 19th with a striking topic: "Design has the power to strengthen the spirit of the community". On March 20th, Studio Gang shared a post with the phrase" …challenging and uncertain time" and the '#ArchitectureCanHeal' hashtag. Mass Design used phrases like "All architectural decisions have

social and political implications…" and "the role of architecture in fighting a pandemic" in their stories. Although these statements are not directly related to the COVID-19 pandemic itself, they are powerful messages that encapsulate the confident attitude, that architecture has the power to tackle with many social, political or environmental problems. Without any doubt, these statements were directed to the crisis we are still facing during the year 2021.

All the posts, stories and links in IG profiles can be removed whenever the user wants to. Mistakes or misunderstandings can be removed that way. Although it is not so common for corporate accounts, such a modification is detected during the analysis are made. One of the international companies, who had a very early response to the COVID-19 crisis with a phrase like "… expectations for a vaccine…", removed this part of the text months later. Although that phrase is now disappeared into the vastness of internet, this single occasion give hints about the importance and consequences of the shared content which can still be sensitive for some, even after a relatively long time.

CONCLUSION

Although it is a relatively new digital medium, this research shows that, architects seem to make an effort to gain ground in the digital mediums such as IG. The international architects group have more followers resulting higher interaction outcomes such as comment and likes. As the number of followers in total increase like a snowball in SNS world, the followers of the international architects are soaring more significantly during the period of pandemic compared to the followers of the Turkey-based architects. This difference may be linked to the scale of the architecture firms and rather low presence of the Turkey-based firms in global markets, compared to their existence in their homeland, despite their increasing efforts. In that sense SNSs seem to be the right platform to reach the globe. However, the results show that, IG presence of some of the Turkey-based architects are lagging behind their international counterparts. Also, they seem less intended for commenting on daily issues. Nevertheless, the performance of the Turkey-based group is not the same for all the architects just as the international group. EAA-Emre Arolat Architecture (@eaa_emrearolatarchitecture) seems quite close to the international group in most performance measures. Again, that can also be associated with the increasing presence of the firm in global markets with their latest works.

The results of the research show that, the confident attitude towards architecture as a solution towards the global problems can be traced through the architecture firms' IG accounts analysed according to their activities during the specified period, which can be regarded as the first wave of the COVID-19 pandemic. Although there are firms who did not reflect their reactions, traces of evidence show that architects are using SNS's not only for promoting their business but also to express their

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ideas about global issues in the context of architecture and more. Solidarity with the healthcare workers, suggestions for changing work environments, home-office arrangements, emphasized need for natural ventilation, and wellbeing concepts, strategies and predictions for different project types during and the post-pandemic era, concerns for the future of architecture education are some of the topics that reflect architects' SNS activities.

As we are entering the third decade of the 21st century, SNSs are becoming ubiquitous and occupy more in our personal and business lives. On the other hand, SNSs are persistently evolving to attract more attention of the users onto them, and the amount of user interaction is constantly increasing. In our swiftly digitalizing daily lives, architects are also trying to create a digital identity for their business and manage their communication strategies. The increasing presence and activities of architects and architecture companies in SNSs support this tendency. And ironically, we are more into our social networks in the days of so-called 'social distancing', as the world is trying to heal it's wounds caused by an unexpected pandemic.

The reliability of the digital outputs of the SNSs are limited to some extent and open to manipulation, which also adds up to the many limitations of this research. However, it becomes evident that, SNS use in AEC industry is worth considering from many aspects, and the publicly available data is quite promising. Today, strategic management, communication management, creating a corporate and brand identity are all under the impact of social networks. The research on this interaction is quite scarce, which makes it encouraging for further research.

REFERENCES

Abdallah, C. (2020). The Most Important New Tool for Architects: Instagram. Archdaily.Com. https://www.archdaily.com/900637/the-most-important-new-tool-for-architects-instagram/

Aral, S., Dellarocas, C., & Godes, D. (2013). Social media and business transformation: A Framework for research. Information Systems Research, 24(1), 3–13. https://doi.org/10.1287/isre.1120.0470

Arora, P., & Predmore, C. E. (2013). Social Media as a Strategic Tool: Going Beyond the Obvious. Advanced Series in Management, 11, 115–127. https://doi.org/10.1108/S1877-6361(2013)0000011010

Bursztynsky, J. (2020). Zoom's massive surge in new users is increasing costs, but the focus is on keeping video calls reliable. CNBC. https://www.cnbc.com/2020/04/14/zooms-new-users-increasing-costs-focus-is-keeping-the-platform-free.html

Devereux, L., Melewar, T. C., & Foroudi, P. (2017). International Studies of Management & Organization Corporate Identity and Social Media: Existence and Extension of the Organization. https://doi.org/10.1080/00208825.2017.1256161

Dzien, A., Dzien-Bischinger, C., Lechleitner, M., Winner, H., & Weiss, G. (2020). Will the COVID-19 pandemic slow down in the Northern hemisphere by the

onset of summer? An epidemiological hypothesis. Infection, 48(4), 627–629. https://doi.org/10.1007/S15010-020-01460-1

Fast Company. (2021, March). The ten most innovative urban development companies of 2021. Fast Company Business Magazine. https://www.fastcompany.com/90600111/architecture-most-innovative-companies-2021

Furman, A. N. (2019). The Social Media Monster: Dangers and Thrills Only Partially Glimpsed. Architectural Design, 89(6), 80–87. https://doi.org/10.1002/ad.2506

Grozdanic, L. (October, 2016). These Are the World's Most Innovative Architecture Firms. https://www.archdaily.com/798252/these-are-the-worlds-most-innovative-architecture-firms.

Hadengue, M., de Marcellis-Warin, N., & Warin, T. (2017). Reverse innovation: a systematic literature review. International Journal of Emerging Markets, 12(2), 142–182. https://doi.org/10.1108/IJOEM-12-2015-0272

Harwood, T. G., & Garry, T. (2003). Overview of Content Anlaysis. The Marketing Review.

Ibba, S., Orrù, M., Eros Pani, F., & Porru, S. (2015). Hashtag of Instagram: From Folksonomy to Complex Network. 7th International Conference on Knowledge Engineering and Ontology Development, 279–284. https://doi.org/10.5220/0005613502790284

Ilter, A. T. (2020). From social networking to social distance: How did architects react to the pandemic? Evidence from social media accounts. 6th International Project and Construction Management Conference (e-IPCMC 2020), 916–925. https://www.researchgate.net/publication/346018100_From_social_networking_to_social_distance_How_did_architects_react_to_the_pandemic_-Evidence_from_social_media_accounts

Krippendorff, K. (2004). Content Analysis: An Introduction to its Methodology (2nd ed.). SAGE Publications Inc.

Lee, I. (2014). Social Media for Business Model Improvement. In Integrating Social Media into Business Practice, Applications, Management, and Models (pp. 276–289). https://doi.org/10.4018/978-1-4666-6182-0.ch014

Lu, W. (2014). Reliability of Engineering News-Record international construction data. Construction Management and Economics, 32(10), 968–982. https://doi.org/10.1080/01446193.2014.919403

McLuhan, M. (1964). Understanding media : the extensions of man. New York : McGraw-Hill, 1964.

Miles, J. G. (2014). Instagram Power - Build Your Brand and Reach More Customers with the Power of Pictures. In McGraw-Hill.

Mirza, A. (2020). Architects workload lessons from past recessions. RIBA Journal.

Nassereddine, H., Seo, K. W., Rybkowski, Z. K., Schranz, C., & Urban, H. (2021). Propositions for a Resilient , Post-COVID-19 Future for the AEC Industry. Frontiers in Built Environment, 7. https://doi.org/https://doi.org/10.3389/fbuil.2021.687021

Rodrigues, M., Franco, M., Sousa, N., Silva, R., & Kyriakopoulos, L. (2021). Reviewing COVID-19 Literature on Business Management: What It Portends for Future Research? Sustainability, 13(5995). https://doi.org/10.3390/su13115995

DOI: 10.15320/ICONARP.2022.198

Stonor, T. (2019). Measuring Intensity – Describing and Analysing the "Urban Buzz." ICONARP International Journal of Architecture and Planning, 7(0), 240–248. https://doi.org/10.15320/ICONARP.2019.87

WHO. (2020). Director-General's Media Briefing on Covid-19. World Health Organization Director-General's Media Briefing on Covid-19 - 11 March 2020. https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

Zhang, S. X., Marioli, F. A., & Gao, R. (2021). A Second Wave? What Do People Mean By COVID Waves? – A Working Definition of Epidemic Waves. MedRxiv, 2021.02.21.21252147. https://doi.org/10.1101/2021.02.21.21252147

Resume

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Investigation of the Effects of Different Types of Traditional Timber Load-Bearing Systems Used in Turkey on Building Behaviour

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Abstract

Recently historic timber structures in Turkey are unfortunately not given the value they deserve. Although timber structures are unique symbols of our cultural heritage, they are forgotten for natural and human reasons. On the other hand, when traditional timber structures standing today to repairs and / or reinforcements and restorations are examined, it is seen that timber elements according to the knowledge and skill of construction foreman are constructed with different types of structural systems. This matter reveals that choosing the right timber structural system is very important. This study the effects of their behaviour of traditional timber structural systems of different types widely used in the construction of timber structures in Turkey were comparatively examined. With this purpose, teen different structural system models with the Sta-stell program of the timber-framed (with Çatkı) Safran mansion which is widely used in Turkey were created and the findings were compared with each other by carried out structural analyses. The findings obtained reveal that buttresses are important in meeting, distributing and transferring the loads acting on the structural system, especially earthquake loads, to the foundation and the displacement distributions in the storey levels of the buttressed building models are less. In addition, the findings obtained show that buttresses that increase the lateral rigidity of timber structures increase the performance of the structure in question and reduce the internal forces of the structural elements. Turkey's widely used timber structural systems (in accordance with the Safran mansion architecture, which received the best restored mansion award) were modelled and analysed. The results presented are aimed to design recommendations and better understanding of the behaviour of different timber structural systems in today's architectural practice.

Keywords:
Buttress, timber structures, timber structure design, timber structural systems

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INTRODUCTION

Historical buildings, which are an important reflection of our cultural heritage, form a link between past civilizations and today. Through these structures, it is possible to understand and interpret civilization. These structures, which are forgotten for many social, cultural and economic reasons, are sometimes protected by the state and sometimes by the private sector and / or individuals. For this reason, protecting of these structures and transferring them to the future generations have a great importance like other historical buildings (Gürsoy et al. 2009). However, many of historical timber structures in Turkey, unfortunately, do not see the value it deserves. Timber structures, which are unique symbols of cultural heritage, have been suffered many damages due to natural and human reasons. Therefore, the protection of timber structures is very important for their permanence. In other words, to periodically repair these unique cultural values and to protect them by developing appropriate rescue projects are necessary.

There are many factors that cause the timber structures to be damaged over time. These may be factors due to the physical, chemical and biological structures of timber, as well as factors caused by people and natural disasters (Örmecioğlu et al. 2013, Saatci & Gürsoy 2019). These factors negatively affect the current situation at the point of inheritance to the future of timber structures. For this reason, to know the problems of timber structures and to take necessary measures against these problems are very important. It is possible to increase the resistance of timber structures by making connection calculations according to the load effects that affect the structure, by considering wind and earthquake effects and particularly the structural system arrangement. On the other hand, it is necessary to make static calculations that include engineering knowledge as well as architectural aesthetics. In addition, it is necessary to obey the current standards and provisions of the regulations in the protection of timber structures and to provide update the standards and/or regulations regarding timber structures depending technological developments and to develop on structural analysis programs.

In studies made on the protection of timber structures; it is necessary to consider along with design, the sizing and combination details calculations. It is necessary to consider statically the negative effects of natural and human damage factors that occur or may occur in historic timber structures on the structural system of the building in question in the restoration studies be carried out. Thus, not only the formalistically restoration of the old will be provided toward preservation of the timber structure, but also by creating durable, useful, and developable structures will be provided to stay standing up longer.

It is possible to classify literature research on timber structures under generally those headings; studies on earthquake behaviours of timber structures (Bayülke 2001, Ahunbay & Aksoy 2005, Doğangün et al. 2006, Cakir et al. 2016), studies examining protection of materials used in timber structures, their physical and mechanical properties and studies examining on resisting capacity of timber structural systems (Çobancaoğlu 2003, Yaman 2007). In addition to; Cruz et al. (2015) have given information's on the criteria to be used in the assessment of structural timber structures in heritage buildings. Wang et al. (2018) have reviewed and contrasted potential sources of biodegradation that exist for traditional wood construction with those in mass timber

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construction and have identified methods for limiting the degradation risk. Cura & Eyüpgiller (2019) urban space analyses made through field surveys to document the present situation in Şile Balibey district, identify the problems, assess the potentials and recommendations developed to reveal these potentials. Koca (2019) focused on the evaluation of Şirince according to sustainable construction principles and suggested some interventions to increase the sustainability. Aloisio et al. (2020) assessed the fragility functions and behaviour factors of cross-laminated timber (CLT) structures. With this purpose the Aloisio et al. derived from the assembly of single CLT wall panels, the structures of which are characterized by different configurations. Gündoğdu & Birer (2021) revealed the relationships between vernacular traditional houses of Mersin and ecological architecture and suggested as a guide and reference for architects to design and construct in a way that they do not harm the natural environment and ecological balance by learning from vernacular architecture.

By adhering to the Safran Konak architecture in Safranbolu Bağlar-Köyiçi Square chosen as an example in this study, behaviours against all load effects including the earthquake by creating different models of timber structural system applied in Turkey are examined comparatively. In addition, the effects of buttresses, which are widely used in timber structures, on the dynamic behaviours of the structure are investigated.

TIMBER STRUCTURE STRUCTURAL SYSTEMS USED IN TURKEY

Timber structures are generally made of stone (masonry) material up to the basement storey and/or subbasement elevation of the structure according to the topographic structure of the land. This part of the structure made using stone material is mostly used as warehouse, coalbunker and the entrance is provided from outside. A structural system constructing of timber material is established on the wall built with stone material. Timber structural system elements consist of timber posts, beams, buttresses and connecting elements. After the timber base groundsill beams are placed corner posts are placed on them, intermediate posts and buttresses are placed between them. In addition, in accordance with the architectural project door and window gaps are left and short beams called “kuşak” are placed on required points at the lower and upper parts of doors and windows for the purpose of strengthen the structure to. The timber posts lengths are generally up to the storey height and for to carrying the load of the upper flooring are placed on the groundsill beams of the upper floor to timber posts headpiece.

Timber structures are classified in different ways in terms of architecture and structural systems. Because different structural systems have been applied depending on the material existing in timber structures, the knowledge and skill of the master, the climatic conditions of the region and the economic power of the owner. Depending on the structural system elements applied on the walls of a timber structure and the working styles of these elements under load effects, it is possible to classify the timber structures as follows (see Figure 1). There are timber structures creating from the timber logs, panels, and the frame in Turkey. In order words, there are different types of timber structure structural systems in Turkey.

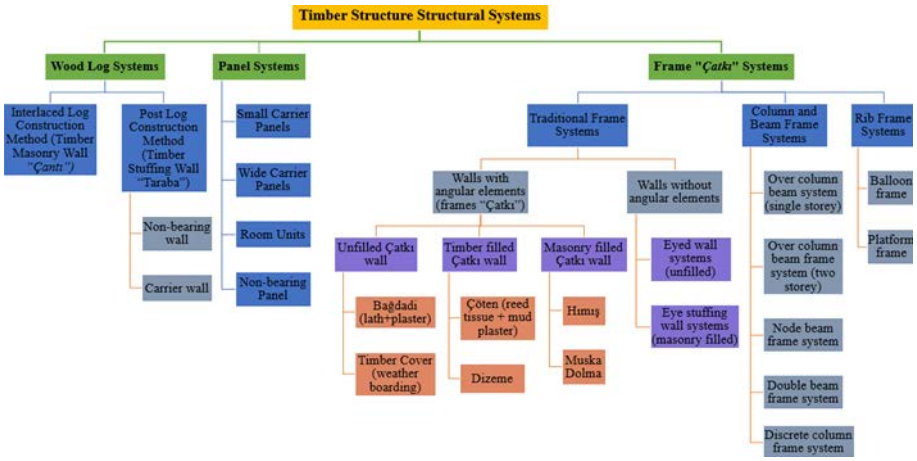

Figure 1. Structural systems and wall shapes of timber structures.

Timber Structures Created to the Structural System from Timber Logs

Such structural systems are encounter on areas where abundant of generally mountainous and forest areas in the Western Black Sea, Bolu and Gerede regions. These systems are also expressed to as block (masonry) timber structures. In their construction two different construction methods are applied impending interlaced and columned.

Interlaced log construction method (timber masonry wall "Çantı")

This system is the most applied construction method in timber masonry structures. These are systems where billets or planks are prepared in advance and are made with the technique of throat overlapping according to the number order (see Figure. 2). In these systems, it is not possible to increase the number of storey due to overweight of the structure. In these, from upper logs to lower logs is transferred vertical load. These structures, which are called square and rectangular planned serender, nayla and paska, which are generally used for warehouse, cellar, purposes, are made with an interlaced logs system. Timber posts placed on the flat large stones transfer the load as a concentrated to the ground (see Figure 3).

Post log construction method (timber stuffing wall "Taraba")

It is a wall system created by passing through the grooves opened in the posts placed to the corners of the structure and between them. In these systems 2,5~6 cm thick and 30~40 cm wide planks and logs are intertwining horizontally and/or vertically. Intermediate posts are used to leave space on the wall surface (see Figure 4).

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a) Systems created from logs (Başkan 2008)

b) Systems created from logs (Arun 2009)

Figure 2. Timber masonry wall technique *"Çantı"*

a) Serender structure example (Başkan, 2008) b) Schematic representation of a Serender structure (Güneş, 2014)

Figure 3. Various views from timber Serender structure.

Figure 4. Example of timber stuffing wall *"Taraba"* (Arun, 2012).

Timber Structures Created from Structural System Panels

These systems are generally preferred for offices and for the construction of single storey school buildings. Timber panel elements consist of single or two-wall artificial timber plate panels. The constructions of the exterior wall panels with the construction of the floor panels are similar. The dimensions of the exterior wall panels are selected according to the timber plate sizes.

Timber Structures Created from Structural System Frames

Timber structural systems are the systems the loads affecting the structure are met by posts, beams, purlins, base and diagonal elements and these loads are ensuring the transferred to the foundation of the structure. Considering these structural systems to be applicable, evaluated as the most preferred type of timber structure in Turkey.

The main structural system, which consists of the posts, angular and horizontal elements that form the structural skeleton in traditional timber framed systems, is called the frame (see Figure 5). In these structural systems to increase the strength corner and central posts are supported with angular elements (diagonal elements). These diagonals different forms are placed in a X, V, Λ shape. There is not any rule in the size and location of the diagonals. However, in case of short diagonal elements are placed it can create large shear forces.

Figure 5. Timber frame *"çatkı"* example in Bilecik Osmaneli (Güneş, 2014).

Walls with angular elements (frames "Çatkı")

The gaps between the elements that make up the frame system are sometimes left empty and sometimes filled with timber, adobe, brick, or stone material. In these systems, patterns are created with filling materials such as sometimes brick or stone in the inner and outer parts of the outer walls therefore have this system also possible to come across unplastered timber structures with this system. Also, angular elements (diagonal) elements used on the outer walls of the timber structures that are applied to the frame act as a cross shear wall in the said structure. The walls where the frame is applied consist of two parts namely filling and structural skeleton. Different Çatkı techniques are used according to styles of infilling of the gaps between the posts and the technique used in the creation of the system.

Unfilled Çatkı wall

The gaps between the horizontal, vertical and angular elements that make up the structural system are the walls formed by not filling them using any filling material. These are divided into two as Bağdadi and timber cover, too.

a) Bağdadi (lath + plaster)

The plaster the made over laths which are frequently intervals nailing over the frames (Çatkı) is called the bağdadi plaster. The gaps between the walls during the plastering of the front and back parts of the walls are

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ventilated with the entrance-exit holes. In this way, hot-cold air insulation is provided. Bağdadi plaster is made with thick or thin laths (see Figure 6). After they are covered with wire grid (Rabitz wire) between the laths placed they are plastered. In the 1970 Gediz earthquake, he emphasized that the bağdadi timber structures behaved better than according to hımış timber structures and that the damages were less (Doğangün et al. 2005).

b) Timber cover (weather boarding)

It is a type of wall created by nailing timber veneer boards over the structural system elements. These timber covers are nailed overlapped or straight. This system which is constructed on the purpose of the discharge of rainwater that overlaps and hits the surface is called as weather boarding. There are examples of timber structures made with the bağdadi and weather boarding technique (see Figure 7).

Figure 6. Examples of timber structures made with the Bağdadi technique.

Figure 7. Examples of timber structures made with bagdadi and weather boarding technique (Güneş, 2014).

Timber filled Çatkı wall

The gaps between the horizontal, vertical and angular elements that make up the structural system are the walls formed by filling them timber filling material. These are divided into two as çöten and dizeme depending on the type of material used and the application method.

a) Çöten (reed tissue + mud plaster)

The gaps between the çatkı elements the walls formed by horizontally knitting with thin branches with a thickness of 2~3 cm is called çöten. These are generally applied in the West and Central Black Sea Region. The gaps between çöten are filled by plastering from the externally and internally (see Figure 8).

b) Dizeme

The walls formed by placing horizontally and vertically under-treated timber pieces into the gaps between the frame elements are called dizeme. There are as well as plaster and non-plastered samples between the pieces of timber (see Figure 9). However, if the timber pieces are thick

in case of it is difficult to hold plaster. To keep the plaster to be applied better there are also examples where laths are nailed like the bağdadi technique (Doğangün et al. 2005). This case, stiffness of structures therefore makes a significant contribution to the resistance during an earthquake (Köylü 2008). Since these timber elements (dizeme) join the frame elements with nails, they work on tensile and pressure in earthquakes.

a) unplastered b) plastered

Figure 8. Example of timber structure made with *çöten* wall and this technique (Güneş 2014).

a) unplastered b) plastered

Figure 9. Examples of timber structures made with the dizeme technique (Güneş, 2014).

Masonry filled Çatkı (frame) wall

The gaps between the horizontal, vertical and angular elements that make up the structural system are the walls formed by filling them masonry filling material. These are divided into two parts as hımış and muska dolma according to the frequency of use on the wall surfaces of vertical elements.

a) Hımış

The walls formed by placing masonry filling materials (such as brick, adobe, briquette etc.) of the gaps between the çatkı elements are called hımış (see Figure 10). This system is the most applied timber construction system in Anatolia. Masonry filling materials placed in the voids differ from according to the climate and properties of the region where the structure is located. These applied filling materials are interlaced in the form of vertical, horizontal, cross and herringbone. The filling materials, which are passed into each other in the form of herringbone, rain waters flowing from the joints cause less damage to the timber elements than others (see Figure 11).

b) Muska dolma

Timber structure posts (40~60 cm apart) are divided into sections with angular timber elements inclined approximately 45˚ and are the walls formed by placing the masonry filling material between the gaps occur in this way. As can be seen from the figure, since the connections

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between the posts are oblique, triangular shaped spaces are formed on the facade. These triangles formed are called muska dolma because these triangles resemble the muska shape. Due to the difficulty of filling the gaps in the shape of a triangle with block stones because generally it is filled with small stones in the streams. In addition, these stones can be plastered painting with lime and a specific appearance can be achieved (see Figure 12). Although there is no need for buttresses in the amulet filled system, it is seen that corner connections are supported with buttresses in some timber structures (see Fig. 13). In addition, angular timber elements secondary buttresses can be found in these structures supported by buttresses and integrity is provided in the facades.

Figure 10. Example of hımış-walled timber structure (Güneş, 2014).

Figure 11. Example of herringbone brick filled wall (Güneş, 2014).

a) unplastered b) plastered

Figure 12. Examples of muska dolma wall in timber structures (Güneş 2014).

Figure 13. View of a timber structure supported by buttresses to corner posts (Güneş, 2014).

Walls without angular elements

Wall systems without angular elements are mostly applied in regions where earthquake hazard is short. In these systems, timber carriers are created by placing them horizontally and vertically. It is seen that the gaps in the frame created in this way as will be left blank seen that it is filled with plaster. On the other hand, timber structures without angular elements do not performing well under the effect of horizontal loads such as earthquake and wind.

Eyed wall systems (unfilled)

These wall systems are created by connecting horizontal timber sash between the posts placed frequent. Since between as the posts are supported flat with horizontal bonding timber kuşak, eye to eye partitions is formed on the structure facade. For this reason, these wall systems are named as eyed systems (Başkan, 2008). Since only vertical and horizontal elements are used in these systems, there are examples in which posts in the corners are supported with buttresses as the resistance against horizontal load effects such as wind and earthquake are weak (see Figure 14).

Eye stuffing wall systems (masonry filled)

These wall systems are formed by filling the gaps masonry filling materials formed by connecting the frequently placed posts with horizontal bonding timber (see Figure 15). In these, smaller cross sections are used by reducing the post spacing as in eyed wall systems. The reason for this is to keep the against effects that may come from

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outside in place the masonry materials. These wall systems are mostly encountered in the Eastern Black Sea region, and these are mostly made without using nails.

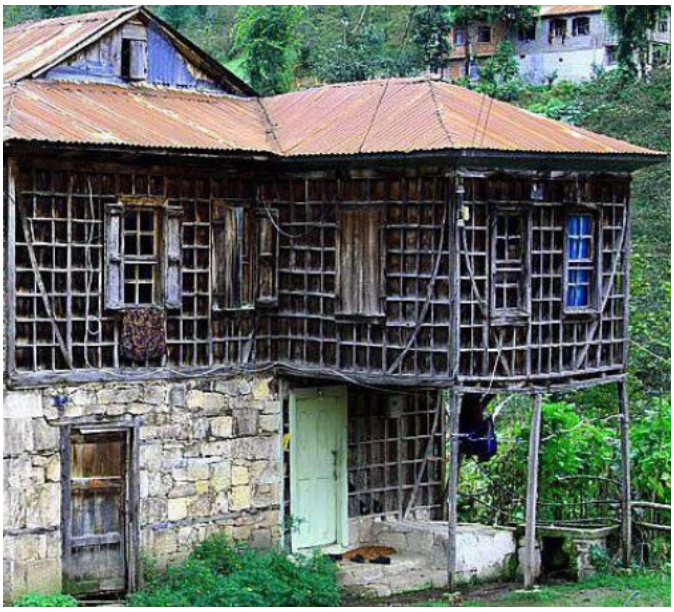

Figure 14. A view of the buttresses placed in the corners in the timber system with eyed (Güneş 2014).

Figure 15. Example of timber structure with eye stuffing wall system (Tunçkol, 2012).

NUMERICAL APPLICATIONS

For the numerical applications of this study Safran Mansion (former name Bağlar Mansion) located in Köyiçi Square in Safranbolu district of Karabük, which was built 150 years ago with timber frame Çatkı technique, was chosen. The exterior of the pavilion is without plaster (see Figure 16). The restoration of Bağlar Pavilion was started in 2010 and it was put into service in hotel concept as Safran Mansion in 2012 concept. Safran Mansion, which was built in the style of last period Ottoman Mansion received the "Best Restored Mansion Award" in 2015.

Modelling of the Mansion with Sta-Steel Structural Analysis Program

This sample which was chosen firstly in this study was modelled with the help of the mansion's structural systems (model-1) Sta-Steel program (Sta-Steel 2019). Then with timber frames (with the Çatkı) widely used in Turkey the same mansion's ten different structural systems models have been created and the findings obtained by performing structural

analyses were compared with each other (Saatci 2020). The views of Safran Mansion which are the subject of the numerical applications of this study, from different facades are given in Figure 17.

Figure 16. A view from facade of Bağlar Mansion.

a) front facade b) rear facade c) left facade d) right facade

Figure 17. Views from different sides of Safran Mansion.

Table 1. Other design parameters of Safran Mansion according to TBER

Ground Movement Level (DD)	DD3
Ductility coefficients (R_x and R_y)	4
Resistance excess coefficients (D_x and D_y)	2
Modal analysis *min* load rate (β)	0,90
Earthquake load additional eccentricity (e)	0,05
Building location longitude	32,669
Building location latitude	41,264
Short period map spectral acceleration coefficient (S_s)	0,237
Map spectral acceleration coefficient for a 1s period (S_1)	0,08
Short period design spectral acceleration coefficient (S_{ds})	0,308
Design spectral acceleration coefficient for a 1s period (S_{ds1})	0,12
Soil bearing capacity (kN/m^2)	210
Soil bedding coefficient (kN/m^3)	10000
Snow load (kN/m^2)	0,75
Building height (m)	10 m
young's modulus of the wooden material (kN/m^2)	1x10^7
Shear modulus of wooden material (kN/m^2)	500000
Thermal expansion coefficient of the wood material	5x10^{-6}
Unit weight of wood material (kN/m^3)	4

Today in force Turkey into Building Earthquake Regulation according to (TBER, 2019) due to the fact that Safran Mansion is a social residence, it is building usage class (BKS) 3, building importance factor (I) 1,0 and live load mass participation coefficient 0,3 is considered to be. According to TBER, the horizontal design spectrum corner periods for the building

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coordinate were calculated as TA=0,078 s, TB=0,39 s and TL=6 s. In addition, depending on the building usage class and building design spectral acceleration coefficient, the earthquake design class (EDC) was taken as 4. On the other hand, it is assumed that the for the location of the structure in question local ground class ZC according to TBER and the wind load affect 0,96 kN/m2 the building facades. Other design parameters considered in the structural analyses of Safran Mansion are summarized in Table 1.

Timber Çatkı layout in Safran mansion

Wall details of timber structures consist of differences in the arrangement of bar elements. The Çatkı wall arrangement for one storey of the timber structure consists of three parts as shown in Figure 18. Bottom wooden truss: it forms the part between the middle wooden truss and the floor covering, and in this section, there are bracings, main and intermediate posts. Medium wooden truss: it forms the part between the lower wooden truss and the upper wooden truss, there are intermediate posts and bonding, and the door and / or window gaps are usually left in this part. The upper wooden truss is the part between the middle truss and the top of the ground floor wall. In these, there are bracings, main and intermediate posts as in the lower wooden truss.

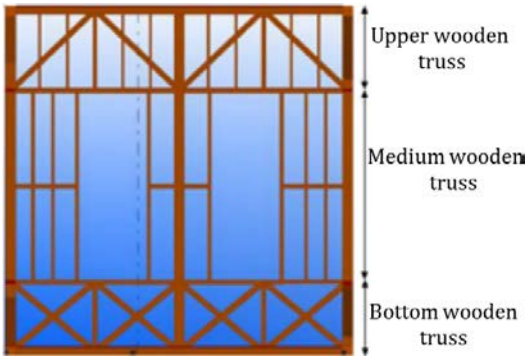

Figure 18. Çatkı wall layout for one storey of the timber structure (Kaplan 2013).

The Safran mansion creating of different models with Sta-Steel program

Creating the current status (model 1) of Safran mansion

The three-dimensional and different facades structural system views of the model created for the structural analysis of the current state of Safran mansion (model 1) with the Sta-Steel program are given in Figure 19. As seen this Figure, the ground storey height of the Safran mansion is 2,79 m. The dimensions of the timber elements used in the created of the structure models in question are given in Table 2.

Here, it would be useful to note that h in Table 2 indicates is the wooden truss height, b is the wooden truss width and n is the number of wooden trusses.

It would be useful to note here that the posts, buttresses, intermediate beams, and sash are modelled in accordance with the architectural projects of the mansion in question. In addition, it will be appropriate to state that the angular elements supporting the posts are called buttresses, and the angular elements that do not support are called bracing members.

Table 2. Dimensions of wooden elements used in Safran mansion

Wooden elements		cm	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9	model 10
Upper wooden truss	Upper flange	h	100	100	100	100	100	100	100	100	100	100
		b	100	100	100	100	100	100	100	100	100	100
		n	12	12	12	12	12	12	12	12	12	12
	Bottom flange	h	320	320	320	320	320	320	320	320	320	320
		b	150	150	150	150	150	150	150	150	150	150
		n	12	12	12	12	12	12	12	12	12	12
	Intermediate posts	h	50	50	50	50	50	50	50	50	100	50
		b	100	100	100	100	100	100	100	100	100	100
		n	300	303	303	303	103	350	303	303	114	303
	Medium struts	h	150	150	150	150	150	150	150	150	150	150
		b	150	150	150	150	150	150	150	150	150	150
		n	30	30	30	30	30	30	30	30	30	30
	Cross elements	h	150	-	150	150	150	150	150	-	50	150
		b	150	-	150	150	150	150	150	-	100	150
		n	49	-	98	98	49	318	49	-	840	98
Medium wooden truss	Wooden sashes	h	100	-	100	100	-	100	100	30	-	-
		b	100	-	100	100	-	100	100	100	-	-
		n	156	-	27	57	-	77	115	1272	-	-
	Bottom flange	h	320	320	320	320	320	320	320	320	320	320
		b	150	150	150	150	150	150	150	150	150	150
		n	12	12	12	12	12	12	12	12	12	12
	Intermediate posts	h	50	50	50	50	50	50	50	50	100	50
		b	100	100	100	100	100	100	100	100	100	100
		n	300	303	303	303	103	103	303	303	114	303
	Medium struts	h	150	150	150	150	150	150	150	150	150	150
		b	150	150	150	150	150	150	150	150	150	150
		n	30	30	30	30	30	30	30	30	30	30
	Cross elements	h	150	-	150	150	150	150	150	-	50	150
		b	150	-	150	150	150	150	150	-	100	150
		n	15	-	98	98	49	318	49	-	840	98
Bottom wooden truss	Upper flange	h	320	320	320	320	320	320	320	320	320	320
		b	150	150	150	150	150	150	150	150	150	150
		n	12	12	12	12	12	12	12	12	12	12
	Bottom flange	h	270	270	270	270	270	270	270	270	270	270
		b	180	180	180	180	180	180	180	180	180	180
		n	12	12	12	12	12	12	12	12	12	12
	Intermediate posts	h	50	50	50	50	50	50	50	50	100	50
		b	100	100	100	100	100	100	100	100	100	100
		n	300	303	303	303	103	103	303	303	114	303
	Medium struts	h	150	150	150	150	150	150	150	150	150	150
		b	150	150	150	150	150	150	150	150	150	150
		n	30	30	30	30	30	30	30	30	30	30
	Cross elements	h	150	-	150	150	150	150	150	-	50	150
		b	150	-	150	150	150	150	150	-	100	150
		n	15	-	98	98	49	318	49	-	840	98

Creating of model 2

The Safran Mansion buttress-free, intermediate-posted and sashless model (model 2) related three dimensional and different fronts structural system views are given in Figure 20. Intermediate posts in these figures were created by using 5x10 cm timber elements with 30 cm intervals.

Creating of model 3

In the Safran Mansion on the model (model 3) created by using intermediate post and sashes where the buttresses used are supported with cross elements the three-dimensional and different fronts structural system views are given in Figure 21. Intermediate post in these figures was created using 5x10 cm timber elements with 30 cm intervals. Also, in this model the sashes pass through the lower parts of the windows.

Creating of model 4

In the Safran Mansion on the model (model 4) created by using intermediate posts, intermediate beams and sashes where the buttresses are supported with cross elements the three-dimensional and different

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fronts structural system views are given in Figure 22. Intermediate posts seen in these figures are created using 5x10 cm timber elements with 30 cm intervals.

Creating of model 5

In the Safran Mansion on the model (model 5) created by using intermediate posts and buttresses the three-dimensional and different fronts structural system views are given in Figure 23.

Creating of model 6

In the Safran Mansion on the model (model 6) created by using crossmembers, intermediate posts, intermediate beams and sashes the three-dimensional and different fronts structural system views are given in Figure 24.

Creating of model 7

In the Safran Mansion on the model (model 7) created by using buttresses, intermediate posts, intermediate beams and sashes the three-dimensional and different fronts structural system views are given in Figure 25. It will be appropriate to state that the intermediate posts shown in the figures are created with 5x10 cm timber elements at 30 cm intervals.

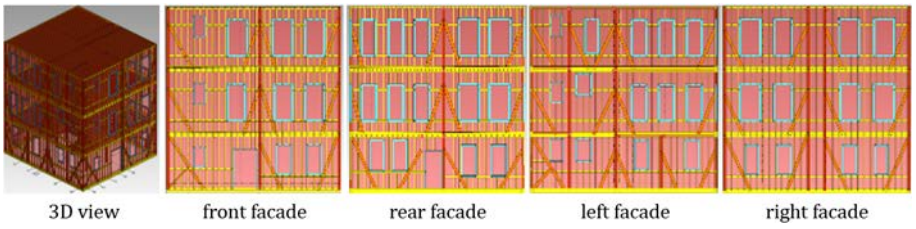

Figure 19. Views from three-dimensional and structural system on different fronts of created model (model 1) of Safran Mansion's.

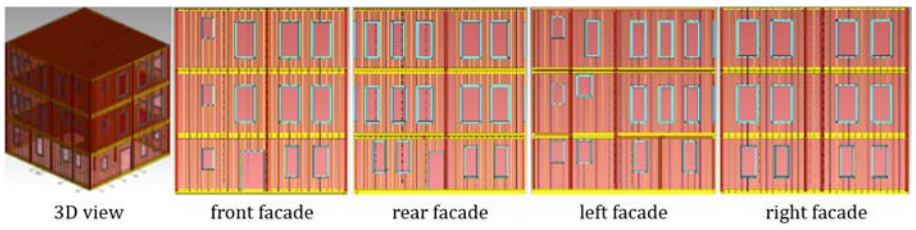

Figure 20. Views from three-dimensional and structural system on different fronts of created model (model 2) with different çatkı system of Safran Mansion's.

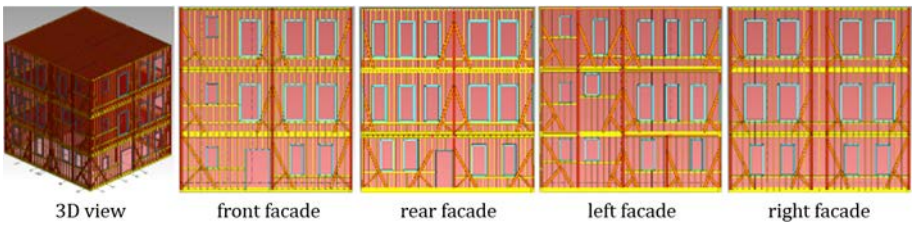

Figure 21. Views from three-dimensional and structural system on different fronts of created model (model 3) with different çatkı system of Safran Mansion's.

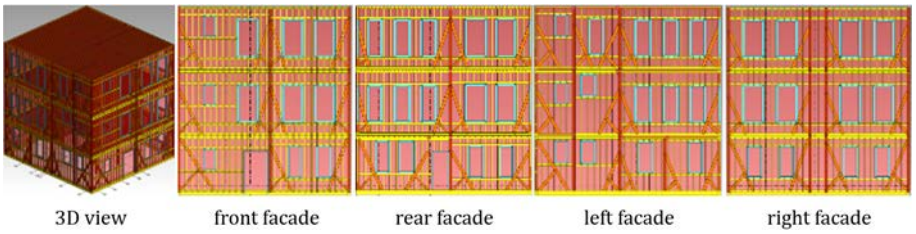

Figure 22. Views from three-dimensional and structural system on different fronts of created model (model 4) with different çatkı system of Safran Mansion's.

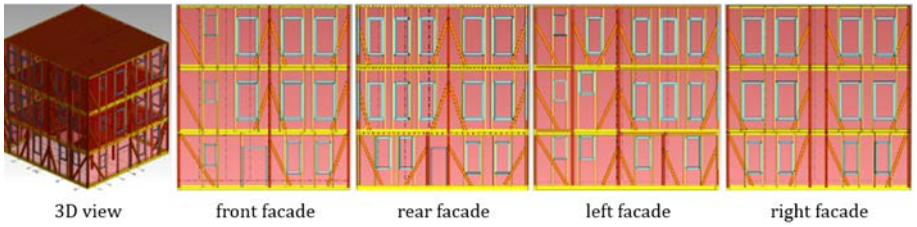

Figure 23. Views from three-dimensional and structural system on different fronts of created model (model 5) with different çatkı system of Safran Mansion's.

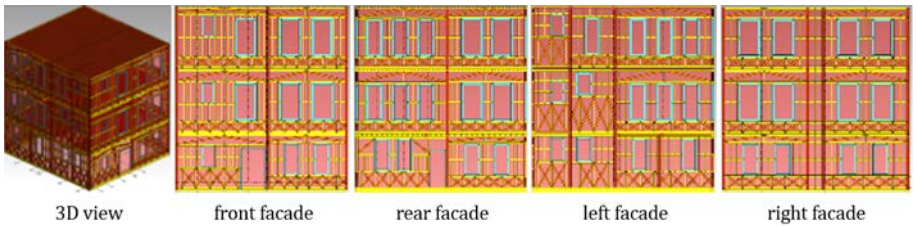

Figure 24. Views from three-dimensional and structural system on different fronts of created model (model 6) with different çatkı system of Safran Mansion's.

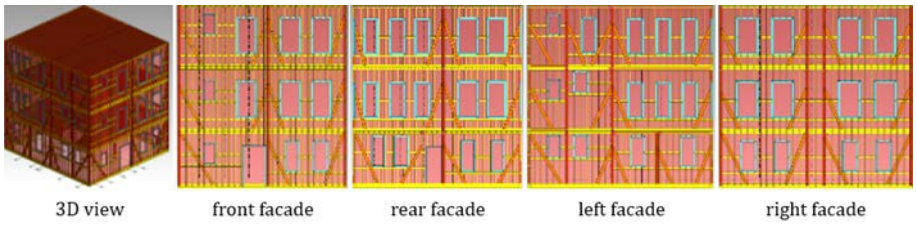

Figure 25. Views from three-dimensional and structural system on different fronts of created model (model 7) with different çatkı system of Safran Mansion's.

Creating of model 8

In the Safran Mansion on the model (model 8) created by using intermediate posts and intermediate beams the three-dimensional and different fronts structural system views are given in Figure 26. Intermediate posts in these figures were created using 5x10 cm timber elements with 30 cm intervals.

Creating of model 9

In the Safran Mansion on the model (model 9) created by using crossmembers and intermediate posts the three-dimensional and different fronts structural system views are given in Figure 27. Intermediate posts seen in these figures were created using 10x10 cm timber elements with 70 cm intervals.

Creating of model 10

Safran Mansion on the model (model 10) created by using intermediate posts and where the buttresses are supported with cross elements the three-dimensional and different fronts structural system views are given in Figure 28. Intermediate posts in these figures were created using 5x10 cm timber elements with 30 cm intervals.

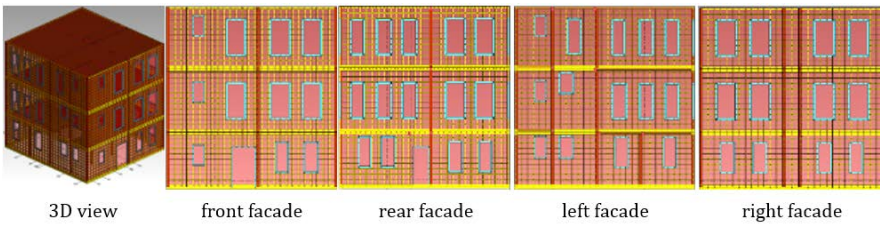

Figure 26. Views from three-dimensional and structural system on different fronts of created model (model 8) with different çatkı system of Safran Mansion's.

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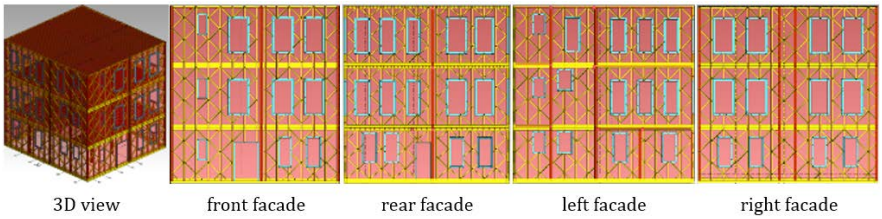

Figure 27. Views from three-dimensional and structural system on different fronts of created model (model 9) with different çatkı system of Safran Mansion's.

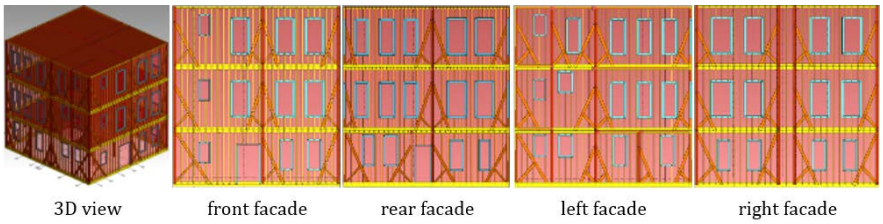

Figure 28. Views from three-dimensional and structural system on different fronts of created model (model 10) with different çatkı system of Safran Mansion's.

Determination of nodal point for comparing displacement values of Safran mansion models

In this study aimed to compare the performance of different *Çatkı* systems currently used in Turkey. To obtain the maximum displacement values of the Safran Mansion models selected for the numerical applications of the study carried out for this purpose, and the internal force in the posts in the middle of the 2nd and ground storey therefore, to compare with each other, the nodal point and timber structural element shown in Figure 29 are selected.

FINDINGS OBTAINED AND DISCUSSIONS FROM STRUCTURAL ANALYSES OF MODELS

The Safran mansion considered in this study, views of inadequate structural elements as a result of structural analyses performed for different models of formed according to the timber *Çatkı* system applied in Turkey are given in Figure 30. In all building models taken into consideration from these figures, it is seen that according to the building architecture especially the 2nd storey ceiling slab beams are inadequate. In addition, it is seen that insufficient elements in the ground storey ceiling beams of the other building models, except model 1. Accordingly, considering 2nd storey ceiling slab the insufficient beam deflexion the best behaviour is model 5 and model 9, while the worst behaviour against it is model 6. Model 1 shows the best behaviour when considering the ground floor ceiling beams. This matter reveals that the timber *Çatkı* systems used significantly affect the behaviour of the building.

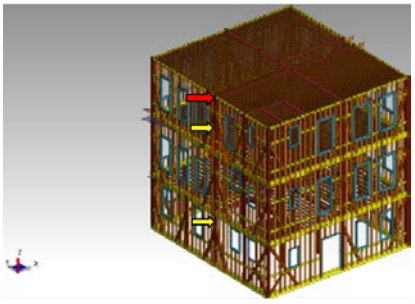

Figure 29. The nodal point selected to compare the findings obtained.

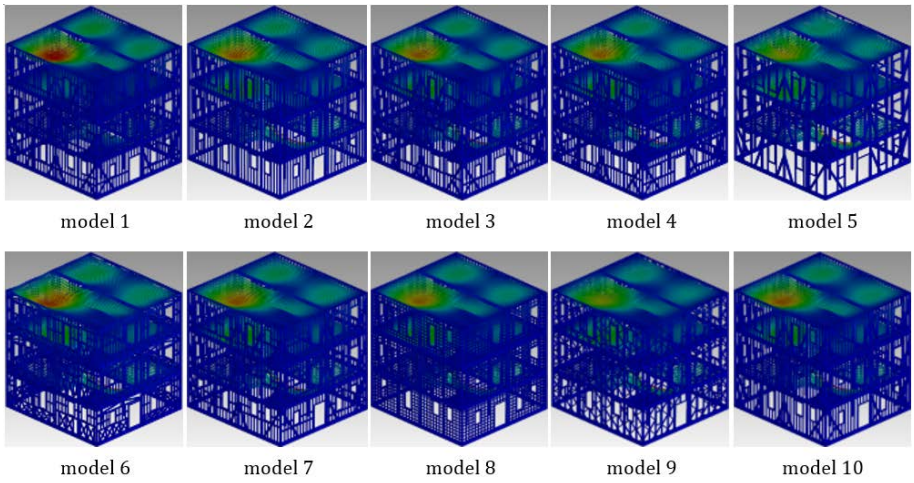

Figure 30. Views from the insufficient structural elements for vertical loads of the models.

Within the scope of this study the 1. natural vibration periods obtained from the structural analyses performed according to the mode superposition method of the building models created according to the different timber frame systems considered are given in Table 3. It can be seen from this table that the periods values obtained from model 5 for the first 3 modes are larger than the period values obtained from models considered. In contrast, the period values obtained from model 8 for the first 3 modes take the smallest value. This situation reveals the contribution of intermediate beams.

The Safran mansion, the displacement views of the structural elements for the earthquake effect in the x direction as a result of the structural analyses of different building models formed according to Çatkı systems that applied in Turkey are given in Figure 31. In addition, the displacement values for the earthquake effect in the x and y directions of the nodal point selected as a result of the structural analyses of the building models are given in Table 4. It is seen that maximum displacements occur at the same points in all building models considered from these tables and figures. Also, the largest displacement value in the x direction for the earthquake effect in the x direction from Table 4 is seen from model 6 and the largest displacement in the y direction is seen from model 5. For the earthquake effect in the y direction the largest displacement value in the x direction is seen from model 7 and the largest displacement value in the y direction is seen from model 2. These findings show that the buttresses and intermediate beams provide positive affect structure behaviour and timber Çatkı systems significantly affect the behaviour of the structure in question.

Table 3. 1st natural vibration period values according to the first three modes of building models

Natural vibration periods (s)	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9	model 10
1st mode	0,6310	0,5331	0,6611	0,6145	0,6785	0,6616	0,6554	0,4432	0,4594	0,5169
2nd mode	0,4882	0,4667	0,5173	0,4718	0,5268	0,5494	0,5022	0,3795	0,4046	0,4050
3rd mode	0,2918	0,3183	0,3177	0,3078	0,3206	0,3372	0,3138	0,2329	0,3542	0,2754

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Table 4. Maximum displacement values of node point selected for earthquake effect in the x and y directions

Displacement values (cm)	Earthquake direction		model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9	model 10
	x direction	δ_x	0,8701	0,5809	1,0549	0,9331	1,0792	1,0795	0,9708	0,8069	1,0341	0,7904
		δ_y	0,0365	0,0295	0,0487	0,0419	0,0488	0,0399	0,0389	0,0183	0	0,0113
	y direction	δ_x	0,2572	0,1062	0,2647	0,2620	0,2611	0,2160	0,2751	0,1336	0,1675	0,1956
		δ_y	0,2107	0,2624	0,2216	0,1594	0,2424	0,2476	0,1838	0,1192	0,0266	0,0771

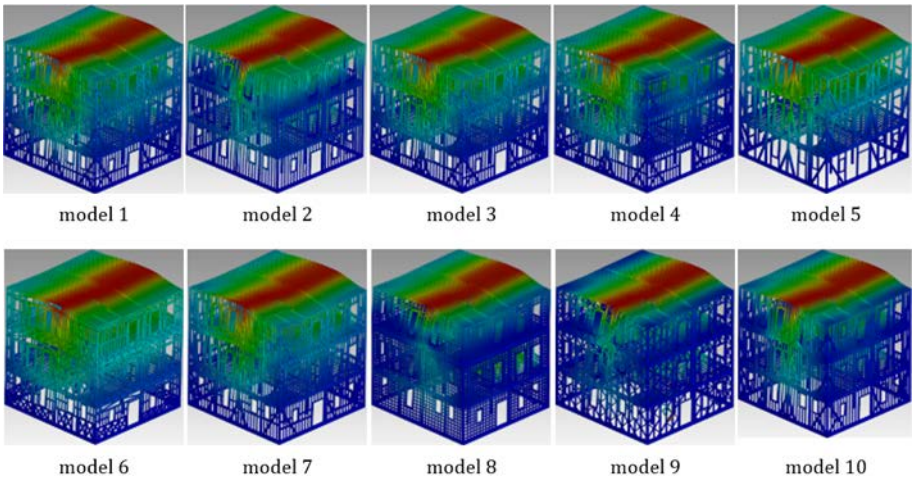

Figure 31. Displacement views of structural elements in the x direction under earthquake effect of models.

Within the scope of this study, the maximum base shear force values obtained in the x and y directions from the structural analyses carried out with the methods of mode superposition and equivalent earthquake load by the help of the Sta-Steel program of the models created according to different *Çatkı* systems are given in Table 5 and Figure 32. The base shear force values obtained by the equivalent earthquake load method (EELM) in both the x direction and y direction from this figure and table are larger than the base shear force values obtained by the mode superposition method (MSM). In addition, according to the equivalent earthquake load method from Figure 32 and Table 5, it is seen that the maximum base shear force value obtained from in both x direction and y direction model 9 is large. in spite of that, according to the mode superposition method, it is seen that the maximum base shear force value obtained from the model 2 in the x direction and the maximum base shear force value obtained from the model 8 in the y direction is large. These findings obtained from structural analyses show that timber *Çatkı* systems that do not have buttresses are exposed to greater shear forces and that these therefore that the models in question will be exposed to larger earthquake loads. This situation clearly reveals the importance of the timber frame systems of the buttresses in terms of earthquake performance.

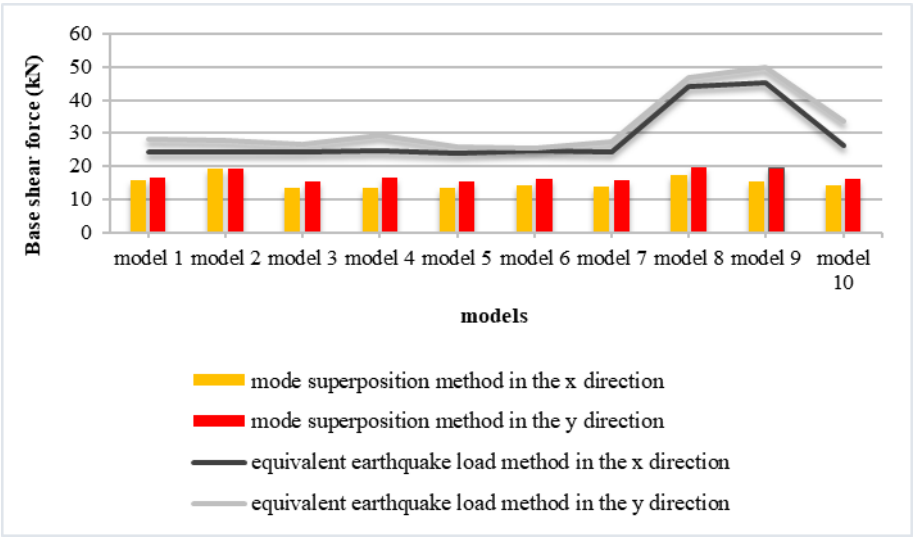

Figure 32. Variations of in the maximum shear force values obtained in the x and y directions of the building models created according to different timber *Çatkı* systems.

Table 5. Maximum shear force values of building models created according to different timber *Çatkı* systems

			model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9	model 10
Maximum base shear force values (kN)	Earthquake in the x direction	mode superposition method	15,76	19,17	13,43	13,35	13,39	14,43	13,97	17,34	15,51	14,22
		equivalent earthquake load method	24,44	24,39	24,36	24,55	23,91	24,72	24,34	44,22	45,44	26,28
	Earthquake in the y direction	mode superposition method	16,61	19,41	15,42	16,53	15,37	16,2	15,77	19,71	19,30	16,2
		equivalent earthquake load method	28,35	27,86	26,75	29,56	25,71	25,56	27,53	46,94	49,75	33,54

The overturning moment, moment against overturning, safety coefficient and damping ratio values obtained in the x and y directions of the earthquake effect from the structural analyses of the building models created according to the different timber frame systems considered in this study are given in Table 6. From this table, lowest safety coefficient value according to the overturning moment-the moment against overturning in both the x and the y direction and are obtained from model 1. Also, it is seen from this table that the lowest damping rate value is obtained from model 1. In addition to, it is seen that all the building models are sufficiently safe.

The maximum displacement and effective interstory drift distributions obtained along the structure height (at storey levels) of the structural elements (posts) selected under the effect of earthquake from the structural analyses of the Safran mansion models created according to the different timber frame systems are given in Figure 33 and Figure 34, respectively. These figures are seen that the maximum displacement and effective interstory drift distributions at the storey levels of the building models with buttress and diagonal member are different from models the wall without buttress. As seen in Figure 33, the displacement values at the storey levels obtained from model 6 are larger than the other building models that are considered. It can be seen from Figure 34 that the values of effective interstory drift distributions in the storey levels obtained from models the wall without buttress are that it differs considerably compared to models with buttresses. In addition, it is seen

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that the difference between the effective interstory drift values at the storey levels (especially at the 2nd and 3rd storey levels) in models the wall without buttress is large. These findings obtained reveal that the structure models with buttress will perform well especially in the earthquake effect.

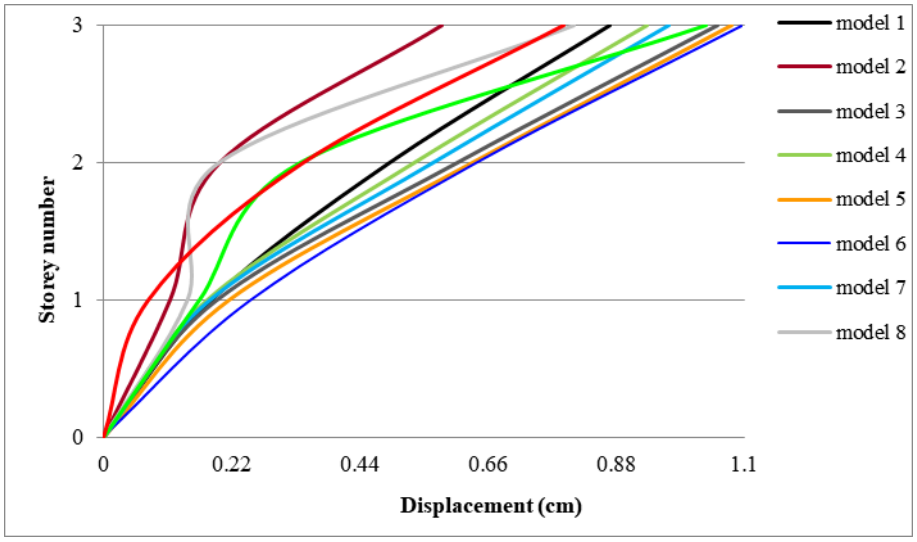

Figure 33. Maximum displacement values at the storey levels of the structural elements (posts) selected in the earthquake effect of the building models created according to different timber *Çatkı* systems.

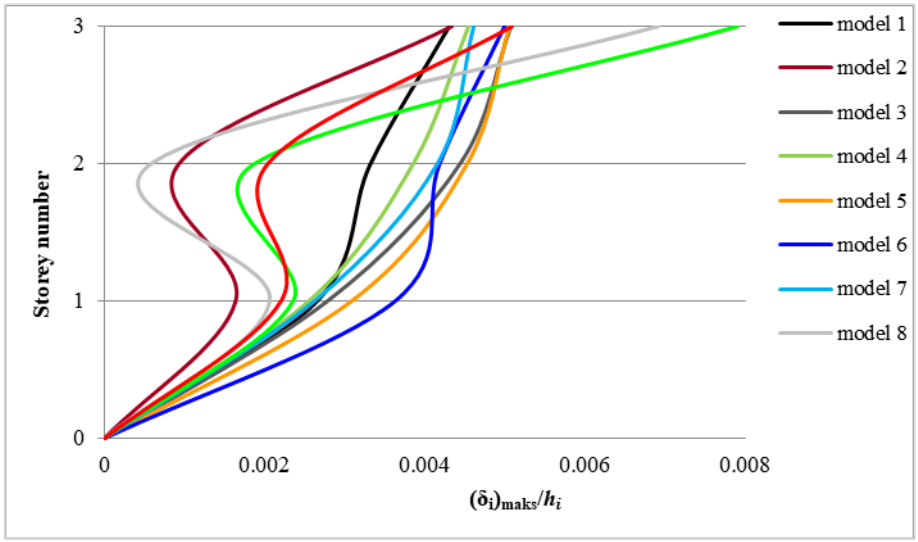

Figure 34. Effective interstory drift values at the storey levels of the structural elements (posts) selected in the earthquake effect of the building models created according to different timber *Çatkı* systems.

Table 6. The overturning moment, moment against overturning, safety coefficient and damping ratio values of the building models created according to different timber Çatkı systems

	earthquake direction	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9	model 10
Overturning moment (kNm)	X	289,3	29,141	271,77	96,536	275,23	268,37	292,94	63,544	89,62	52,708
	Y	322,33	37,077	253,87	94,45	249,02	227	287,58	61,85	75,49	60,982
Moment against overturning (kNm)	X	5209,5	5107	5318,4	5331,2	5263,3	5403,3	5319,7	5328,9	5327	5237,1
	Y	5668,5	5469,1	5701	5728,2	5631,3	5825,4	5707,7	5700,7	5703,3	5614,6
Safety coefficient	X	18,01	175,25	19,569	55,225	19,123	20,134	18,16	83,862	59,44	99,359
	Y	17,586	147,51	22,456	60,647	22,614	25,663	19,847	92,169	75,55	92,069
Damping ratio (ζ)		13,618	120,07	17,112	55,225	16,204	15,233	16	83,862	59,44	92,069

CONCLUSIONS AND RECOMMENDATIONS

In this study, the effects to the structure behaviour of different timber frame (Çatkı) systems that are widely used in the construction of timber

structures in Turkey are comparatively examined. The main conclusions and recommendations obtained from the structural analyses carried out within this scope are summarized below.

- The largest displacement values in the x and y directions of the selected nodal point for the x direction of the earthquake effect are obtained from model 6 and model 5, respectively. By contrast with the largest displacement values in the x and y directions of the nodal point selected for the y direction of the earthquake effect are obtained from model 7 and model 2, respectively.
- Base shear force values obtained by the equivalent earthquake load method are larger than those obtained by the mode superposition method in both the x direction and y direction. With the equivalent seismic load method, the maximum base shear force value both in the x and y direction is obtained from model 9. By contrast with it is seen that the maximum base shear force value with the mode superposition method is obtained from model 9 both in the x and y direction. This result obtained shows that the timber Çatkı systems with buttresses are exposed to smaller shear forces. Therefore, the models in question will be better particularly earthquake performances.
- The safety coefficient value obtained from model 1 according to the overturning moment and the moment against overturning is smaller than the other building models considered in this study. This result obtained reveals that model 1 is more unsafe than other building models considered in this respect.
- The damping ratio value obtained from model 1 from the structural analyses performed is smaller than the other building models considered. This result shows that the horizontal stiffness of model 1 is less than the other models considered.
- The displacement distributions of building models that do not have buttresses are more complicated than the building models with buttress. In addition, the maximum displacement values at storey levels are obtained from model 6. This situation shows that the buttresses that increase the lateral stiffness of the building are very important in terms of building performance.
- At the selected top nodal point (2nd storey) in the x direction the maximum displacement value obtained from model 6 24,07% larger than model 1 and in the y direction, the maximum displacement value obtained from model 2 is 24.54% larger than model 1.
- The difference between the effective interstory drifts value especially at the 2nd and 3rd storey levels in the models without buttress is large. This result reveals that buttress building models will behave better in other words, it will perform better.
- When considering the findings of this study, the timber structures that will be built in earthquake zones in Turkey the use of buttresses in terms of safety and performance is recommended.

ACKNOWLEDGEMENTS/NOTES

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REFERENCES

Ahunbay, Z. & Aksoy, D. (2005). Behaviour of Turkish traditional timber framed houses against earthquakes, İTÜ Journal/A Architecture, Planning, Design, 4(1), 47-58. (in Turkish)

Aloisio, A., Alaggio, R. & Fragiacomo, M. (2020). Fragility functions and behavior factors estimation of multi-story cross-laminated timber structures characterized by an energy dependent hysteretic model, Earthquake Spectra, 1-26. http://doi:10.1177/8755293020936696

Arun, G. (2009). Traditional timber constructions in Turkey, Proceedings of the International Symposium on Timber Structures from Antiquity to Present, 25-27 June, İstanbul, Turkey, 113-124.

Arun, G. (2012). Evolution of timber constructions in Turkey, iaSU2012-2nd International Conference on Archi-Cultural Translations Through the Silk Road, , 14-16 July, Nishinomiya, Japan, 225-230.

Başkan, S. (2008). Traditional houses in the Eastern Black Sea Region, Erdem Dergisi, 52, 41-90. (in Turkish)

Bayülke, N. (2001). Timber structures and earthquakes, Turkey Engineering News, 414(4), 14-20. (in Turkish)

Cakir, F., Ergen, Y.B., Uysal, H. & Dogangun, A. (2016). Influence of modified intended use on the seismic behavior of historical hımıs structures, Earthquakes and Structures, 10(4), 893-911. http://dx.doi.org/10.12989/eas.2016.10.4.893.

Cruz, H., Yeomans, D., Tsakanika, E., Macchioni, N., Jorissen, A., Touza, M., Mannucci, M. & Lourenço, P. B. (2015). Guidelines for on-site assessment of historic timber structures, International Journal of Architectural Heritage, 9, 277-289. http://doi:10.1080/15583058.2013.774070

Cura, B. A. & Eyüpgiller, K. K. (2019). Urban conservation proposal: the case of Şile Balibey district, ICONARP International Journal of Architecture & Planning, 7(2), 352-384. http://doi:10.15320/ICONARP.2019.90

Çobancaoğlu, T. (2003). An evaluation for grouping by examined of the traditional wooden houses construction systems in Turkey, Tasarım+Kuram Journal, 2(3), 27-42. (in Turkish)

Doğangün, A., Livaoğlu, R., Tuluk, Ö. İ. & Acar, R. (2005). Earthquake performances of traditional wooden buildings, Earthquake Symposium, 23-25 March, Kocaeli, Turkey, 797-799.

Doğangün, A., Tuluk, Ö. İ., Livaoğlu, R. & Acar, R. (2006). Traditional wooden buildings and their damages during earthquakes in Turkey, Engineering Failure Analysis, 13(6), 981-996. https://doi:10.1016/j.engfailanal.2005.04.011.

Gündoğdu, E. & Birer, E. (2021). Evaluation of ecological design principles in traditional houses in Mersin, ICONARP International Journal of Architecture and Planning, 9(1), 25-52. https://doi:10.15320/ICONARP.2021.149

Güneş, M. E. (2014). Investigation of construction system of vernacular timber structures: Safranbolu case, M.Sc. Thesis, Yıldız Technical University, İstanbul.

Gürsoy, Ş., Turcan, Y. & Şık, K. (2009). Comparison of designs according to different codes under earthquake loads of wooden structures, Sakarya International Symposium of Earthquake Engineering "The Learning Outcomes of Marmara Earthquake in the First Decade", 1-3 October, Kocaeli, Turkey, 8-18. (in Turkish)

Kaplan, B. (2013). Seismic analysis of traditional Ottoman timber mansion and reinforcement techniques, M.Sc. Thesis, İstanbul Technical University, İstanbul.

Koca, G. (2019). Evaluation of traditional Şirince houses according to sustainable construction principles, ICONARP International Journal of Architecture & Planning, 7(1), 30-49. https://doi:10.15320/ICONARP.2019.65

Köylü, A. (2008). Analysis of traditional structures under lateral loads, M.Sc. Thesis, Osmangazi University, Eskişehir.

Örmecioğlu, H.T., Er Akan, A. & Uçar, A. (2013). The effects of environmental factors on vernacular construction systems: the case of Anatolia, The Journal of Akdeniz Sanat, 6(11), 269-279. (in Turkish)
Saatci, M. (2020). Comparative investigation of the effects of structure behavior of traditional timber structural systems in different type used in Turkey, M.Sc. Thesis, Karabük University, Karabük.
Saatci, M. & Gürsoy, Ş. (2019). An evaluation on the causes of damage and protection of wooden structures, International Science and Engineering Applications Symposium on Hazards 2019, 25-27 September, Karabük, Turkey, 80-90. (in Turkish)
Sta-Steel, (2019), Structural analysis for steel structure, ver.1.3.0.3. www.sta4.net/steeldefault.aspx
TBER. (2019). Turkey Building Earthquake Regulation, Disaster and Emergency Management Presidency, Ankara, Turkey.
Tunçkol, P. (2012). Constructing the log structure and researching the advanced manufacturing method, M.Sc. Thesis, Yıldız Technical University, İstanbul.
Wang, J. Y., Stirling, R., Morris, P. I., Taylor, A., Lloyd, J., Kirker, G., Lebow, S., Mankowski, M. E., Barnes, H. M. & Morrell, J. J. (2018). Durability of mass timber structures: a review of the biological risks, Wood and Fiber Science, 50(Special Issue), 110-127. https://doi.org/10.22382/wfs-2018-045.
Yaman, F. Z. (2007). Long term performance of elements in traditional wooden buildings-a case study in Zeytinlik District in Giresun, M.Sc. Thesis, İstanbul Technical University, İstanbul.

Resume

Merve Saatci received her M.Sc in civil engineering from Karabük University. She has been studying on timber structures and earthquake resistant design. Merve Saatci was worked as a Civil Engineer in the First Dost Building Inspection Ltd. company.

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Cultural Perception Performance Assessment of Adaptively Reused Heritage Buildings: Kilis Eski Hamam Case Study

Esra İslamoğlu*
Tülay Karadayı Yenice**

Abstract

Adaptive reuse of the built heritage can often result in damage to heritage values both during the adaptation and reuse processes -in many cases it can bear on building performance and user satisfaction. Post-occupancy evaluation (POE) is a well-known method of assessing building performance, and previous studies demonstrated the practicality of employing POE in reused heritage building assessment. Yet, POE's contribution to heritage conservation has not been comprehensively explored. This paper presents the findings of an indicative POE of a hammam building adapted into a restaurant as a case study.

The case study building was evaluated through a series of walk-throughs, photographs, documentation, and a user survey. The POE has pointed to damage and authenticity loss in the building by reuse based on established conservation principles concerning intangible heritage values and cultural perception, resulting in a series of recommendations to prevent future deterioration and improve the performance of the building. A key observation is that data from the user survey do not coincide with the findings based on internationally acknowledged principles of conservation practice, which indicates that heritage awareness still has not been gained by the wider society. Hence, this study concludes that more research is required to examine the use of POEs in addressing heritage conservation issues and suggests a greater understanding of the role of POE surveys for a more valuable insight into user feedback. It also provides designers and decision-makers with matters to be taken in account regarding the preservation of authenticity when executing an adaptive reuse project for a heritage building.

Keywords:
Adaptive reuse, heritage buildings, cultural heritage, post-occupancy evaluation, building assessment

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INTRODUCTION

In modern conservation theory and practice, adaptive reuse is regarded as a critical strategy towards heritage building conservation (Plevoets and Van Cleempoel, 2012). This international trend has made conservation by adaptive reuse among the priority topics of conservation theory (Mazlum, 2014) – the theory that relates to intangible aspects of heritage conservation, produced in the last couple of decades (Viñas, 2002). Subsequently, it has been acknowledged not only by the governments or academics but also by a large part of society that retrofitting old buildings for new uses provides economic, ecological, and most importantly, socio-cultural benefits. Yet as a specialized form of refurbishment, adaptive reuse poses significant challenges for designers (Langston and Shen, 2007). The primary concern in this approach is giving the building its new function without damaging values that make it a built heritage; while also taking present-day conditions and requirements into account. The most outstanding adaptive reuse projects are those that honour and preserve a building's heritage significance and add a contemporary layer that presents value for the future (Bullen and Love, 2011). Thus, adaptive reuse projects require moderate alteration, a high level of creativity, and diligence. However, they often involve poor design decisions and practices. Heritage buildings may be damaged in many ways both during the adaptation and reuse processes, bearing on the building performance, as well as user satisfaction.

Previous studies have demonstrated (Günçe and Mısırlısoy, 2019; Yung and Chan, 2013; Mundo-Hernandez et al., 2015; Yaldız and Asatekin, 2016) that reused heritage buildings can be evaluated through the post-occupancy evaluation (POE) method. POE studies can be conducted to ensure preservation without damage to a building's original characteristics while retaining the expected sociocultural, ecological and economic benefits of adaptive reuse; as POEs provide more than just feedback and solutions for the assessed building and develop design guidelines for future projects. Despite identified benefits, more studies are needed to address how POEs are to be implemented in reused built heritage to ensure their contribution to heritage conservation.

This paper presents the POE of a hammam building adapted into a restaurant from Turkey's southeastern Kilis province. The 16th-century hammam not only bears witness to the Turkish bath culture but also demonstrates a past community life, socio-cultural activities, religious rituals and architecture of the region. The case study examines whether the reuse project is justifiable by following established conservation principles and evaluates the building's performance regarding cultural perception elements. Moreover, it questions the reliability of user feedback in adapted heritage building evaluation. This research also gives a literature overview of the cultural perception context of heritage conservation and aims to contribute to evaluation studies in adapted heritage buildings.

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METHODOLOGY

This study adopts both quantitative and qualitative research methods. It is generally trusted to adopt a variety of techniques as part of the POE process. The questionnaire, the standards of which are derived from the relevant literature, examines the values to evaluate the heritage site by the users. However, most POE studies have relied heavily on user feedback only, and some studies have shown that the results can sometimes be distorted. Hence, POEs based on user or resident feedback alone are insufficient in assessing building performance (Deuble and de Dear, 2014). For this reason, this study also attempts to figure out whether there are any significant differences between the users' opinions and our findings based on international heritage conservation criteria. Accordingly, the study illustrates the widely accepted established conservation principles and philosophy concerning cultural perception, to begin with. Subsequently, the building was evaluated through inspections/walk-throughs to investigate elements, systems, and fittings through observation, photographing, and interviews with the personnel. The collected data were subjected to qualitative analyses based on the conservation criteria.

A commonly used POE method, walkthroughs are an informal meeting, a tour around the entire building and its immediate surroundings intended to identify issues that may require urgent attention by facilities managers; or those that need more investigation. In such an examination, areas or elements in critical situations are identified through signs of deterioration or misfits between the elements in the building (Hassanain et al. 2010).

Design of Survey

Data for this research was also collected from a random sample of 95 users using an online survey. The sample reached was assumed to represent the goers of Eski Hamam Restaurant who are assumed to have understood the questions correctly and answered truthfully. The survey consisted of 20 questions in two parts. Part A contained questions about the respondents' background. Part B contained the evaluation of the cultural perception performance of the Eski Hamam Restaurant. Questions in Part B were measured by means of a 5-point Likert-type scale, ranging from 1 ('strongly disagree') to 5 being ('strongly agree'). Considering the calculation of the interval width of the scale with the formula "array width/number of groups to be made" (Tekin, 2002), the arithmetic mean ranges that are taken as a basis for the evaluation of the research findings; 1.00-1.80; "Strongly disagree", 1.81-2.60; "Disagree", 2.61-3.40; "Partially agree", 3.41- 4.20; "Agree" and 4.21-5.00; is "Strongly agree". Since the scores on the scale are between 1 and 5, it is accepted that the perceived level of the cultural values of the Eski Hamam increases as the scores approach 5.00 and decreases as they approach 1.00.

LITERATURE REVIEW

Conservation in architecture refers to continuous protection, restoration, maintenance, and monitoring work to carry cultural heritage to the future (Ahunbay, 2019). Hasol's Dictionary of Architecture (2016) defines conservation as "taking necessary precautions for preservation, repair, and maintenance for buildings, natural values or city parts bearing historical or artistic value to survive." Taking an old building/site and reusing it for a function other than that it was designed for, is termed adaptive reuse (Shipley et al., 2006). It is an effective strategy to encourage the preservation of architectural heritage (Bacon, 2001) and can be defined as the process that adapts heritage structures, which have become unusable with their current function, to new uses while preserving their unique features. With this method, the life span of the building can be expanded by protecting the entire or most of the building system, including the building envelope and even interior materials. The approach of preserving historical buildings by using them with new functions includes a series of precautions and implementations to be taken before the buildings are reduced to trivial objects or ruins. The approach of preserving historical buildings by using them with new functions includes a series of precautions and implementations to be taken before the buildings are reduced to trivial objects or ruins. Adaptive reuse is not a modern phenomenon (Stone, 2019), yet it was not established as a theory and practice before the 1970s (Plevoets, 2014). Previously, adaptive reuse was more about providing a new use to an existing building for its time-saving and labour-saving benefits (Velthuis and Spennemann, 2007). In modern conservation, however, adaptive reuse is a tool for preserving the value and meaning of cultural heritage, sustaining the built environment, and the genius loci, or spirit of place (Dogan, 2019). The built heritage can also hold value for telling a story, being a symbol of events, conveying knowledge, evoking past experiences, old traditions, beliefs, namely, a source of cultural value (De Medici et al., 2019).

Post-occupancy Evaluation

Throughout history, the purpose of a building has primarily been to safeguard people and their belongings from environmental factors; in modern times, however, a lot more is expected from buildings. Owners invest in more advanced buildings that are sustainable, convenient, adaptable, energy-efficient, and economical to build and maintain; meet the needs of their customers, improve work productivity, profit, and image. Users demand buildings that are practical, comfortable, secure, and harmless to their well-being. Building performance is a building's capability to fulfil these expectations (Council, 2001).

Post-occupancy evaluation (POE) is a pursuit in exploring how a building performs, along with if and how adequately it responds to expectations and how content its users are with the designed

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environment (Vischer, 2001). The Royal Institute of British Architects' Research Steering Group defines POE as "a systematic study of buildings in use to provide architects with information about the performance of their designs and building owners and users with guidelines to achieve the best out of what they already have" (RIBA, 1991). Various methods exist for assessing buildings during the planning, design, construction, and occupancy stages. However, they generally focus on technical performance, operation, or shape/beauty, not the perspective of occupant needs and goals. The method of POE is different from other types of evaluations in various ways. For instance, a POE focuses on the needs, activities, and ambitions of the people and organizations using a building, in addition to maintenance, building operations, and design concerns. Moreover, POEs are known for examining both successes and failures of a building's performance (Preiser, 2001), generating suggestions to improve its performance (feedback), and collecting information that will lead the way for future designs (feedforward) (Preiser et al., 1988). The data collected from a POE done for a specific building can be employed for comparing the performance elements of similar structures (Hassanain et al., 2016).

The study of a building after occupation requires a complex, highly developed system involving many examinations. These should include thermal comfort, visual comfort, building functioning, human well-being and function, and, lastly, psychological comfort, for all of these matters will determine energy usage and user satisfaction. The techniques applied are both quantitative and qualitative and may be divided into three general categories based on the data examined and evaluated:

- measurements, observations, experiments;
- surveys, group studies, investigations, task performance analyses;
- document analysis and on-site inspections (Meir et al., 2009).

When the term POE was coined, the three widely accepted categories of performance criteria were technical, functional, and relational. Later, this formation was deemed inadequate in various aspects (Preiser and Nasar, 2008). As early POE studies were usually predominantly based on users' views, the increasing building complexity of our day requires a more comprehensive approach (Sanni-Anibire et al., 2016).

Cultural Perception Performance

Adaptation of heritage buildings demands an insight into their identity and values (ICOMOS, 1994), and one of the main issues surrounding adaptive reuse is how to preserve the heritage value of a building undergoing this type of change. Broadly speaking, heritage values refer to the meanings and importance associated with heritage. The perception of what they are has changed over time, with considerable differences of understanding between one country and another. These values have been a crucial factor in the legitimation of heritage protection and management. Today, it is widely accepted that heritage values have

tangible and intangible dimensions which are intertwined and cannot be arbitrarily separated (Mezzino, 2017). Intangible values are socio-cultural, functional (as documentation of past human activity), associative/symbolic, political, spiritual/religious, memory, authenticity, rarity, and identity values associated with the significance of the building; whereas tangible values are aesthetic/artistic, architectural, technical, historical and age values of a building's material substance (Madran, 2006).

The sophistication of an adapted heritage building with its tangible and intangible values requires a more comprehensive approach beyond technical, functional and relational performance assessment. Thus, another category of performance criteria was introduced to study the state of intangible values post-occupancy: cultural perception. It largely relies on observer comments as heritage can rarely hold its values if not perceived as cultural heritage by society (Dogan, 2019). Moreover, it examines if the heritage building is maintained adequately concerning its intangible values. Cultural perception performance criteria are derived primarily from the notion of authenticity and its implications, for it is considered an important indicator of success in reuse projects. Authenticity embodies distinct features and qualities. Therefore, a heritage building's authenticity can be measured based on different elements, and each is exclusively a representation of it (Yazdani Mehr and Wilkinson, 2020).

Authenticity has been a predominant evaluation criterion in modern conservation (Plevoets & Van Cleempoel, 2019) and a values-based approach to conservation and heritage management has been broadly recognized today. However, the boundaries of authenticity are not explicit, and the requirement of modern materials and technology in conservation induces even more diverse perspectives on authenticity (Orbasli, 2017). In a generally acknowledged description by the UNESCO World Heritage (2019), eight main elements contribute to the authenticity of a heritage place: (1) form and design; (2) use and function; (3) location and setting; (4) traditions, techniques, and management system; (5) materials and substance; (6) language, and other forms of intangible heritage; (7) spirit and feeling; (8) other internal and external factors. Article 13 of The Nara Document underlines that authenticity perceptions may be associated with a large variety of sources of knowledge. It is further noted: “The use of these sources permits the elaboration of the specific artistic, historical, social, and scientific dimensions of the cultural heritage being examined.”

In an attempt to develop assessment standards for intangible values, Yaldız and Asatekin (2016) created a set of questions; upon which our user survey is designed and developed:

- Is the heritage building's original function evident with its symbolic value?
- Is the new use of the heritage building recognized by society?

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- Does the reuse highlight the heritage building's architectural, historical, and artistic values?
- Are the heritage building's authenticity, cultural, and socioeconomic values preserved?
- Does the reuse give a new vision to the heritage building?
- Is the heritage building's brand-new vision harmonious with the sociocultural structure of the region?

CASE STUDY BUILDING: ESKI HAMAM

Eski Hamam is a 16th-century bathhouse (hammam) located in Kilis, Turkey. The hammam is the largest in the city and is considered a genuine example of hammam design from the Classical period of Ottoman architecture. It is also one of the oldest and most sophisticated surviving historical structures in the city and of the very few adapted for a new purpose. Its character, transmitted to us via its fabric, has survived relatively intact despite being abandoned for a lengthy period during the 20th century. This abandonment caused significant deterioration in its structure. The hammam was eventually restored in 2014 and adapted to become “Eski Hamam Restaurant”.

Eski Hamam is a rectangular-shaped building (Fig. 1a) accessible through one main gate on the northern façade (Fig. 1b). The backyard is accessible from the southwest of the surrounding courtyard through a wooden door. The hammam was a "single bath", with men and women having separate bathing times; rather than separate entrances and chambers. The typological characteristics of Eski Hamam can be recognized from the outside, as each main space is in different dimensions in height and width (Fig. 2). The main sections of soğukluk (frigidarium), ılıklık (tepidarium), and sıcaklık (caldarium) are linearly lined up from north to south. Each space is identified in fig. 3: The entrance, taşlık (1), leads to the soğukluk (2) with the central fountain, the ılıklık (4) with the aralık (3) that includes the toilet, the sıcaklık (5), the furnace, and the water tank (6, 7).

Figure 1.
a) Location of Eski Hamam in Kilis
b) Northern Façade
(Photos by first author)

The *soğukluk* is a square-shaped and domed chamber. Equipped on each side with benches and niches arranged around a central fountain, its setting aimed to maintain the centrality of the compositional forming of the space. The *ılıklık* is the medium-temperature room, directly connected with the toilet and the *mikveh* (bath used for ritual immersion in Judaism). The sıcaklık, the heart of the *hammam*, is connected to the

water tank and the furnace, with smaller rooms for the steam bath (the *halvets*) located over it. There is an octagonal-shaped platform where customers could lie down to relax or get a massage, called *göbektaşı,* at the centre of the *sıcaklık*.

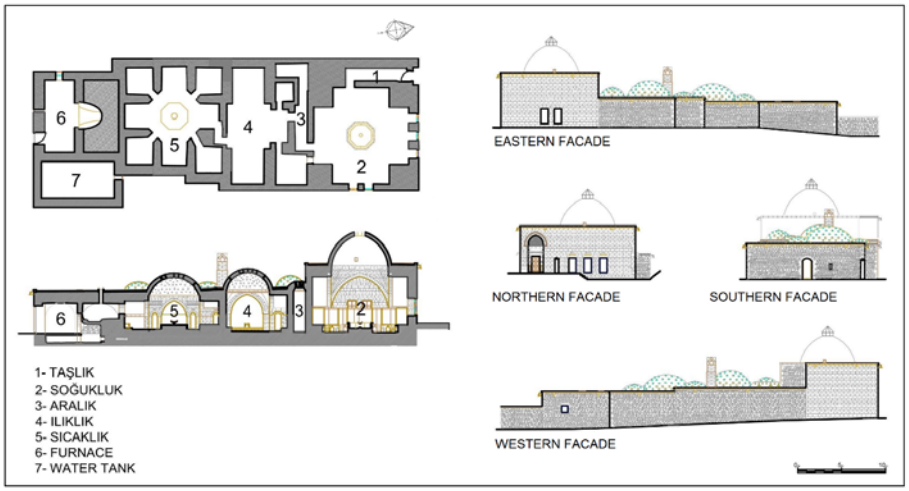

Figure 2. The architectural survey of the Eski Hamam. Plan, section, and elevations.
(Source: Bebekoglu, 2005)

The hammam structure is ashlar masonry. Its internal and external walls were built with matching ashlar blocks of 25-30 cm. The building interior and the façades are remarkably plain; the main gate on the northern façade is the only decorated element. Eski Hamam was, and still is, situated in a central area of Kilis surrounded by mosques and near a synagogue and a marketplace, so it serviced a great number of locals, both men and women; which suggests that it is a significant element of the city's collective memory.

FINDINGS OF THE STUDY

According to internationally accepted conservation principles, it is appropriate to attribute new functions to heritage buildings, which are no longer practical to use with their original functions. However, it is recommended to assign functions that do not require serious alterations in the spatial setup of the building, which is arguably the most important factor in the determination of a new function (Altınoluk, 1998). Article 5 of The Venice Charter (1964) emphasizes conserving heritage by using them for some socially beneficial purpose. However desirable it may be, it must not change the building's plan or decoration. Hence, adjustments demanded by a new function may be allowed only within due limits. Similarly, Article 7.2 of The Burra Charter (2013) states: "A place should have a compatible use."

Hammams have exclusive spatial layouts and equipment, and for that reason, their adaptation to reuse by preserving these features is considered quite challenging by some scholars (Ahunbay, 2019). Nevertheless, the particular challenges of adapting a hammam can be addressed after careful analysis and interpretation pre-construction.

Changes in the spatial layout indicate a lack of consideration in the heritage significance before the adaptation process of Eski Hamam. The

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heart of a restaurant, the kitchen and service area, for instance, could not be sorted within the building; hence, a prefabricated structure was erected in the front garden that is inappropriate in terms of building materials and functional efficiency. It goes against established principles of new additions to heritage buildings: they should have harmonious integration with the whole and not devalue the heritage building and its settings (Mısırlısoy, 2017).

In achieving the new design requirement, extensive alterations were required: each space except the toilet had to be given a new function. The furnace, formerly connected to sıcaklık by a small window, was organized as an office after the removal of this original window. The intact Jewish bath (mikveh) in ılıklık, as evidence of past ethnic and religious diversity, is now used as storage. Heritage elements in the iwans and halvets, such as the traditional hammam benches and washbasins were all removed to make space for dinner tables, a practice that goes against the principle of reversibility in conservation. A common understanding of reversibility is 1) to return objects to the condition just before treatment and 2) select treatments whose benefits far outweigh the losses they cause (Smith, 1988). These practices also violate Article 8 of the Venice Charter: “Items of sculpture, painting or decoration which form an integral part of a monument may only be removed from it if this is the sole means of ensuring their preservation.” In this respect, the right design decisions were solely not dividing the main spaces of the hammam and retaining them as single large spaces and preserving the raised floors of soğukluk. Such practices raise the question of whether the new purpose is appropriate for the heritage building. Adaptation solutions and additions to Eski Hamam are summarized as follows:

- Changes in the Building Layout: Since the restaurant use demands were not compatible with the former hammam use, extensive changes were required in the spatial setup (Table 1).
- Updating of Building Systems: Modern electrical, mechanical, lighting, air conditioning and plumbing systems were installed.
- Changes in the Façades: The window glasses were tinted in various colours, LED wall washer fixtures were employed to illuminate the façade, and a sizable nameplate is placed on the roof on the front façade.

Changes in the Immediate Surroundings: An additional building was erected in the front garden to provide space for the kitchen and service area. The backyard was designed as a cafe, with a large door added to its entry. A children's playground was built adjacent to the outer wall on the west façade; a seating area was arranged in the side garden with a polycarbonate porch roof over it.

Article 1.2 of the Burra Charter states that "cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places, and related objects." Article 8 declares the conservation of a historical area involves visual arrangements, and for this, it is necessary to retain the "appropriate setting" in that area. It

includes preserving spiritual and other cultural relationships that add to the cultural significance of the place (Australian ICOMOS Burra Charter, 2013). It is thought that the setting described here implies an indoor and outdoor atmosphere.

Table 1. Changes in the case study building's spatial configuration

Original Function		New Function	Description of Intervention
1 - *Taşlık*		Entrance	The *taşlık*, entrance of the hammam, remains the main entrance to the building.
2 - *Soğukluk*	a) Iwan	Dining Area	The *soğukluk*, which is the largest part of the hammam, is arranged as a waiting and dining area.
	b) Rest Area	Waiting Area	
3 - *Aralık*	c) Toilet	Toilet	The *aralık* section is organized as the toilet. *Mikveh* (bath used for the purpose of ritual immersion of Judaism) is arranged as a storage.
	d) *Mikveh*	Storage	
4 - *Ilıklık*	e) Iwan	Dining Area	The *ılıklık* (tepidarium) is a small, medium temperature transitional room between the cold *soğukluk* (frigidarium) and hot *sıcaklık* (caldarium). Its iwans are arranged as dining areas and the circulation space retains its function.
	f) Circulation Space	Circulation Space	
5 - *Sıcaklık*	g) *Göbek taşı*	Circulation Space	In the *sıcaklık* where washing takes place, iwans and *halvets* (secluded areas where people wash privately) are arranged as dining areas, while *göbek taşı* (the central platform raised above the heating source) and its surroundings function as circulation areas.
	h) Iwan	Dining and Service Areas	
	i) *Halvet*	Dining Area	
6 - Furnace		Office	Furnace (the *külhan*), the place used for heating the water, is arranged as an office.
7 - Water Tank		Office	The water tank is arranged as an office for re-use.

Light is one of the key elements that create atmosphere, and lighting is a serious design challenge in heritage buildings where the atmosphere of the space conveys many meanings. Building materials, such as stone wood, brick, marble, lead, copper, and tile form the natural colour compositions of old cities, neighbourhoods, and buildings. The natural colours of stones, its main building materials, are dominant in Eski Hamam. The introduced lighting design of Eski Hamam Restaurant goes against the authentic atmosphere of the building with its red, blue, green, etc., coloured lights, as well as dyed window tints.

Reversibility in conservation also implies avoiding the use of elements that may become so immovable that their subsequent removal will threaten the object (Smith, 1988). In Eski Hamam's refurbishment, sufficient care was not taken when installing the modern lighting elements, air conditioning systems, energy and signal cables, and mounting equipment in a systematic manner not to damage the structure, which also resulted in an aesthetically non-pleasing look. In particular, the oversized chandelier in *sıcaklık* might pose a threat to the building in the future.

The interior design, finishings and furniture play a crucial role in the perception of space (Altan, 2015). Rugs, carpets, seating elements, decorative objects, and many other random items of various colours dispersedly placed in the Eski Hamam have created a gaudy environment lacking identity and authenticity. In the small chambers (*halvets*) of

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sıcaklık, for instance, the dark furniture at varying heights made the spaces cumbersome (Fig. 3).

Figure 3.
a) Sıcaklık
b) Ilıklık
c) A private room of soğukluk
(Source: by the first author, 2020)

The variances of colour and form that disrupt the aesthetic integrity indicate that a thorough intangible values analysis was not undertaken pre-refurbishment. The authentic atmosphere of the Eski Hamam was damaged by the adaptation process; the original characteristics of the walls, ceilings, and floors can be vaguely noticed due to poor design decisions and applications.

Conversations with restaurant workers revealed that customers refer to the building as both the "Eski Hamam" and the "hammam restaurant". Also revealed by the walkthrough, quite limited information about Eski Hamam's history or the local hammam culture is conveyed, aside from the brief statements on a sign on the northern façade.

Subsequently, data obtained through the walkthrough were analyzed based on internationally accepted standards of conservation practice, and the adaptation of the building in terms of selected performance criteria was evaluated as "favourable" "partially favourable" "partially unfavourable" or "unfavourable" (Table 2).

A questionnaire was applied in the study to obtain the opinions of the users. The majority of respondents were female (57,9%), between 25 and 44 years of age (54,7%), and had a Bachelor's degree (55,7%). The mean responses and the rate of users' satisfaction for cultural perception elements of performance are presented in Table 3, and discussed as follows:

More than half of the users "strongly agree" that they still refer to the building as "Eski Hamam", want to show the building to their guests visiting the city, and regard the building as easily perceived in its environment and well-known by the people of Kilis. Nearly 50% stated that they prefer to go to Eski Hamam Restaurant because it is a historic building; its new use makes the building viable, leaving it empty would have been an economic loss, it has been important for the city from the past to present and still contributes to the promotion of Kilis with its new function. Also, the majority disagree with the statement that its reuse as a restaurant made people forget about its original use.

Analyzed according to the X variable; the following measures are above ≥3.40: Users still refer to the building as "Eski Hamam", they like to take their guests there, the building is well-known by the people of Kilis

Table 2. Assessment of Eski Hamam according to cultural perception criteria

Assessment Criteria	Status	Brief Explanation
1- Is the authenticity of the heritage building preserved in adaptation and reuse processes?	Unfavourable	Loss of authenticity due to overall damage caused by major changes in the spatial organization; removal of heritage objects; the use of unsuitable furniture, fixtures and fittings; poor colour selection; construction of an incompatible additional building in terms of mass, materials, and colour, etc.
2- Is the heritage building known for both its original and new function?	Favourable	Largely owing to its name "Eski Hammam Restaurant", the building is known as both a hammam and a restaurant by users.
3- Does the heritage building retain its heritage values and symbolic meaning, despite its new function?	Partially favourable	No loss of symbolic meaning as the original function is not forgotten by the people. However, most intangible values that make the Eski Hamam a heritage building are not preserved due to poor design decisions.
4- Has cultural sustainability been achieved through reuse?	Partially favourable	No longer offering a bathing experience, the heritage building still serves as a meeting place where people socialize, as it did in its original function. Yet, very limited information about Eski Hamam's tangible and intangible values is depicted in and around the building.

and is outstanding in its surroundings, its use as a restaurant makes the building livable, they prefer to go to the Eski Hamam Restaurant because it is a historical building, leaving it empty would have been an economic loss, it has been important for the city from the past to the present, and it still contributes to the promotion of Kilis with its new function. They disagree with the statement that its use as a restaurant made them forget about its former, original function. The value of referring to the building as the "Eski Hamam" and not "Eski Hamam Restaurant" is 4.07 (Table 3), which demonstrates that the historical significance of the building is still in the minds of the city's residents. Overall, the results of the survey demonstrate the users view the Eski Hamam Restaurant as favourable.

Cronbach's alpha (α) was used in this study to show the reliability of the results. α should be at least 0.7 for a scale to be deemed reliable (Nunnally, 1978). In this study, α is 0.735, which means that there is a satisfactory agreement among the respondents.

The walkthrough tour and conservation principles indicated damage to the building's original characteristics and authenticity. Yet, the average response of the cultural elements of performance shows that users are satisfied with the reuse of the building. This finding is addressed in the discussion section. Recommendations offered by this indicative POE study are as follows:

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Table 3. Responses from users, their mean values, and standard deviations to survey questions. The answer choices for the items in the scale are 5 = Strongly Agree, 4 = Agree, 3 = Partially Agree, 2 = Disagree, and 1 = Strongly Disagree

Statements	Likert Scale					Variables	
	1	2	3	4	5	X	S
I refer to the building as "Eski Hamam" not "Eski Hamam Restaurant".	8,4%	6,3%	5,3%	29,5%	50,5%	4,07	1,25
Eski Hamam is among the buildings known and deemed important by the people of Kilis.	0%	3,2%	21,1%	20%	55,8%	4,28	0,90
Eski Hamam is a building we want to show our guests who visit Kilis.	0%	12,6%	13,7%	20%	53,7%	4,14	1,08
Eski Hamam is a distinct and prominent building in its surroundings.	4,2%	8,4%	9,5%	25,3%	52,6%	4,13	1,15
Its reuse as a restaurant made Eski Hamam a viable environment.	6,3%	7,4%	13,7%	29,5%	43,2%	3,95	1,20
I prefer to go to the Eski Hamam Restaurant because it is a historical building.	5,3%	9,5%	11,6%	28,4%	45,3%	3,98	1,19
Leaving Eski Hamam abandoned would have been an economic loss.	7,4%	8,4%	16,8%	21,1%	46,3%	3,90	1,28
The use of Eski Hamam as a restaurant made us forget that its original function was a bathhouse.	27,4%	29,5%	22,1%	12,6%	8,4%	2,45	1,25
Eski Hamam has been important for Kilis from past to present.	1,1%	4,2%	21,1%	29,5%	44,2%	4,11	0,95
The re-use of Eski Hamam as a restaurant contributes to the promotion of Kilis.	7,4%	5,3%	21,1%	20%	46,3%	3,92	1,24

- not using the *mikveh* as storage, since it was used for the religious bathing rituals of the Jewish community (Figure 4a)
- representing information about the hammam and local hammam culture in the building and its vicinity
- removal of all coloured lighting in the interior and exterior of the building and handing the lighting design over to lighting specialists
- renewal and reorganization of inappropriate fittings and furniture in all spaces (Figure 4b)
- removal of the large name sign installed on the roof of the building as it is incompatible with the building in terms of size and aesthetics
- removal of the children's playground attached to the western wall of the building (Figure 4c)
- using techniques and materials only known to be technically and aesthetically compatible with the building fabric.

Figure 4.
a) Mikveh
b) Sıcaklık
c) Western Façade
(Source: by the first author, 2020)

DISCUSSION OF RESULTS

The research has highlighted some critical questions concerning the assessment of adapted heritage buildings. Firstly, it exposed a contradiction in users' opinions to conclusions based on established conservation criteria about the reused heritage building. It seems that *authenticity*, defined by English Heritage (2008) as "those characteristics that most truthfully reflect and embody the cultural heritage values of a place", has a relative and subjective nature. This finding is in accordance with several other authors (Jokilehto, 2008; Labadi, 2010) who stress that the concept of authenticity can easily be distorted as there are different opinions and concepts associated with it. Since most design decisions and practices in Eski Hamam are against the established principles of heritage conversation, as explored in the previous section, our conclusion was that Eski Hamam Restaurant is an unsuccessful reuse project, and its reuse damages the building. However, the data obtained from the questionnaire did not support this conclusion. As seen from the responses, many of the erroneous applications that were expected to set off a reaction went unnoticed by the users. Low public awareness of heritage may be the reason for this controversy. That reasoning is in line with those of other scholars, who identified that intangible functions of heritage are nonexistent for most people (Viñas, 2002). Users' positive attitude towards Eski Hamam Restaurant could also be explained by the plausibility that people enjoy heritage buildings without putting careful thought into architectural design and prioritise their overall experience over the preservation of heritage values. Admittedly, people feel a stronger bond with their local surroundings through heritage (Bullen and Love, 2011), and it strengthens a sense of social well-being (Taçon and Baker, 2019). Taha (2013) remarked that people are emotionally attached to their cultural heritage, to which the built environment adds considerably, and many people desire to observe obsolete or inaccessible buildings (Rushton et al., 2018). Another matter to take into account is a lack of alternatives: there are very few adapted heritage buildings in Kilis, which makes Eski Hamam unique in some way.

CONCLUSIONS AND RECOMMENDATIONS

In this research, an indicative post-occupancy evaluation was conducted for a historic hammam adapted into a restaurant located in Turkey's southeastern Kilis Province. Previously described, Eski Hamam has many heritage values for still preserving its design and application techniques from the 16th century, its fabric, setting, function, relations, meanings, and associated objects. The POE has pointed to damage and authenticity loss in the building by reuse, resulting in the development of a series of recommendations to prevent future deterioration and to improve the cultural perception performance of the building.

This study indicates that conservation awareness still has not been gained by the wider society, based on the controversial data from the user survey. User perception is one of the main challenges in preserving

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intangible heritage values. Many activities hold the potential of raising awareness among users or residents of built heritage:

- giving heritage awards to successful reuse projects of national and regional nature
- organising heritage events, festivals, campaigns and training workshops
- building student councils for promoting heritage conservation in schools
- using social media for community engagement in the reuse and management of heritage buildings.

Often, as observed in Eski Hamam, information about the heritage building is very limited or nonexistent, which contributes to the loss of intangible values. Given this finding, ways to represent information about a heritage building to cover its historical research are specified. Crucial data that should be depicted in and around heritage buildings are (1) date of construction, information about the architect and contractor, (2) the building's original use, significant changes in the building or its use, (3) significant historic events related to the building, (4) the building's relationship to the neighbourhood and society. Additional architectural documentation may also be represented, including descriptions, photographs and maps. Adopting the newest technology and using innovative solutions, such as augmented and virtual reality, mobile apps, QR codes, and many other interactive technologies, will enhance user involvement with the heritage building. The age of digital transformation certainly requires decision-makers to recognise the importance of interactive technologies in preserving heritage values.

Regarding POEs in adapted heritage buildings, this study suggests rethinking the role of POE surveys and a more promising insight and integration of user feedback. Single/multiple POE case studies of similar projects may be conducted with different approaches to the involvement of users to improve the process of POEs in heritage buildings and generate crucial guiding data. This study also advises that POE studies should be building-specific with the proper customisation of the assessment criteria when dealing with adapted heritage buildings. The recommendations would offer insights for other countries facing conservation issues, particularly those with a long way to go in raising awareness of cultural heritage.

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REFERENCES

Ahunbay, Z. (2019). Kültür Mirasını Koruma İlke ve Teknikleri. Yem Yayın.
Altan, İ. (2015). Mimarlıkta Mekân Kavramı. Ofis 2005 Yayınevi.
Altınoluk, Ü. (1998). Binaların Yeniden Kullanımı. Yem Yayın.

Architects' Council of Europe Leeuwarden Declaration: Adaptive Re-Use of the Built Heritage: Preserving and Enhancing the Values of Our Built Heritage for Future Generations. Available online: https://www.ace-cae.eu/uploads/tx_jidocumentsview/LEEUWARDEN_STATEMENT_FINAL_EN-NEW.pdf (accessed on 20 February 2022).

Bacon, K. (2001). The adaptive re-use of heritage buildings. [Master's Thesis, University of Calgary]. http://dx.doi.org/10.11575/PRISM/19336

Bebekoğlu, S. (2005). Drawings of Eski Hamam Restoration Project.

Bullen, P. and Love, P. (2011). Adaptive re-use of heritage buildings. Structural Survey, Vol. 29, No. 5, 411-421.

De Medici S, De Toro P, Nocca F. (2020). Cultural Heritage and Sustainable Development: Impact Assessment of Two Adaptive Reuse Projects in Siracusa, Sicily. Sustainability, 12(1):311.

Deuble, M. P., de Dear, R. J. (2014). Is it hot in here or is it just me? Validating the post occupancy evaluation. Intelligent Buildings International, 6:2, 112-134, DOI: 10.1080/17508975.2014.883299

Dogan, H.A. (2019). Assessment of the perception of cultural heritage as an adaptive re-use and sustainable development strategy: Case study of Kaunas, Lithuania. Journal of Cultural Heritage and Sustainable Development, Vol. 9, No: 3, 430-443.

English Heritage (2008). Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment. English Heritage.

Günçe, K., Mısırlısoy, D. (2019). Assessment of Adaptive Reuse Practices Through User Experiences: Traditional Houses in the Walled City of Nicosia. Sustainability, 11, no 2: 540.

Hadjri, K., Crozier, C. (2009). Post-occupancy evaluation: Purpose, benefits and barriers. Facilities, 27, 21–33.

Hasol, D. (2016). Ansiklopedik Mimarlık Sözlüğü. Yem Yayın.

Hassanain, M.A., Mathar, H. and Aker, A., (2016). Post-occupancy evaluation of a university student cafeteria. Architectural Engineering and Design Management, 12(1), 67–77.

Hassanain, M. A., Sedky, A., Adamu, Z. A., and Saif, A. W. (2010). A framework for quality evaluation of university housing facilities. Journal of Building Appraisal, 5(3), 213–221.

ICOMOS (2008), "Quebec declaration of the preservation of the spirit of place", 16th General Assembly of ICOMOS, Quebec, available at: https://www.icomos.org/quebec2008.

Jokilehto, J. (2008), "Aesthetics in the world heritage context", in Values and Criteria in Heritage Conservation, Polistampa, pp. 1000-1010.

Labadi, S. (2010). "World Heritage, Authenticity and Post-Authenticity." In Heritage and Globalisation, edited by S. Labadi and C. Long, 66–84. Oxford: Routledge

Langston, C., Shen, L. (2007). Application of the adaptive reuse potential model in Hong Kong: A case study of Lui Seng Chun. International Journal of Strategic Property Management, 11:4, 193-207, DOI: 10.1080/1648715X.2007.9637569

Madran, E. (2006). Modern Mimarlık Ürünlerinin Belgelenmesi ve Korunması Süreci için Bazı Notlar. Mimarlık, 332, 20-22.

Mazlum, D. (2014). Koruma Kuramının Mimari Rekonstrüksiyona Bakışı. Mimarlık. 380, 72-77.

DOI: 10.15320/ICONARP.2022.200

Meir I.A., Garb Y., Cicelsky A. (2009). Post-occupancy evaluation: an inevitable step towards sustainability. Advances In Building Energy Research, Volume 3, 189–220.

Mezzino, D. (2017). Cultural Built Heritage's Tangible and Intangible Dimensions and Digitalization Challenges. [Doctoral Dissertation, Carleton University]. https://doi.org/10.22215/ETD/2017-12183

Mısırlısoy, G. (2017). New Designs in Historic Context: Starchitecture vs Architectural Conservation Principles. Civil Engineering and Architecture, 5(6), 207-214.

Mundo-Hernández, J., Valerdi-Nochebuena, M.C., Sosa-Oliver, J. (2015). Post-occupancy Evaluation of a Restored Industrial Building: A Contemporary Art and Design Gallery in Mexico. Frontiers of Architectural Research, Volume 4, Issue 4, 330-340.

Nunnally, J. (1978). Psychometric Theory. McGraw-Hill, New York, NY.

Orbaşlı, A. (2017). Conservation Theory in the Twenty-First Century: Slow Evolution or a Paradigm Shift? Journal of Architectural Conservation, 23 (3), 157–170. https://doi.org/10.1080/13556207.2017.1368187

Pintossi, N., Ikiz Kaya, D., & Pereira Roders, A. (2021). Assessing Cultural Heritage Adaptive Reuse Practices: Multi-Scale Challenges and Solutions in Rijeka. Sustainability, 13(7), 3603. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su13073603.

Plevoets, B. (2014). Retail-reuse: an interior view on adaptive reuse of buildings. [Doctoral Dissertation, Hasselt University].

Plevoets, B., & Sowińska-Heim, J. (2018). Community initiatives as a catalyst for regeneration of heritage sites: Vernacular transformation and its influence on the formal adaptive reuse practice. Cities, 78, 128–139. https://doi.org/10.1016/J.CITIES.2018.02.007

Plevoets, B. & Cleempoel, K. (2012, March 28-29). Adaptive Reuse as a Strategy towards Conservation of Cultural Heritage: A Survey of 19th and 20th Century Theories. 1-6. RIE International Conference, Ravensbourne.

Plevoets, B., & Van Cleempoel, K. (2019). Adaptive Reuse of the Built Heritage: Concepts and Cases of an Emerging Discipline. Routledge.

Preiser, W.F.E. (2001). Feedback, feedforward and control: post-occupancy evaluation to the rescue. Building Research & Information, 29:6, 456-459.

Preiser, W.F.E., Nasar, J. (2008). Assessing Building Performance: Its Evolution from Post-occupancy Evaluation. International Journal of Architecture Research, Volume 2, Issue 1, 84-99.

RIBA. (1991), A research report for the architectural profession. In Duffy, F.W. (Ed.), Architectural Knowledge: The Idea of a Profession, E. & F.N. Spon, London.

Rushton, H., Silcock, D., Rogers, J., Schnabel M.A. (2018, June 13-15). The Tangible and Intangible: Interpreting Modern Architectural Heritage in Virtual Realities. [Paper presentation]. Tangible - Intangible Heritage(s) Design, Social and Cultural Critiques On The Past, Present And The Future, London.

Sanni-Anibire, M.O., Hassanain, M., & Al-Hammad, A. (2016). Post-Occupancy Evaluation of Housing Facilities: Overview and Summary of Methods. Journal of Performance of Constructed Facilities, 30. http://dx.doi.org/10.1061/(ASCE)CF.1943-5509.0000868

Shipley, R., Utz, S. and Parsons, M. (2006). Does adaptive reuse pay? A study of the business of building renovation in Ontario, Canada. International Journal of Heritage Studies, Vol. 12 No. 6, 505-520. http://dx.doi.org/10.1080/13527250600940181

Smith, R. D. (1988). Reversibility: A Questionable Philosophy. Restaurator, Vol. 9, no. 4, 199-207. https://doi.org/10.1515/rest.1988.9.4.199

Stone, S. (2019). UnDoing Buildings: Adaptive Reuse and Cultural Memory. Routledge.

Taçon, P.S., Baker, S.J.H. (2019). New and emerging challenges to heritage and well-being. Critical Review, 2(2), 1300-1315. https://doi.org/10.3390/heritage2020084

Taha, S. (2013). Attachment to Abandoned Heritage: The Case of Suakin, Sudan, Azania: Archaeological Research in Africa, 48:4, 550-551, https://doi.org/10.1080/0067270X.2013.827851

Tekin, H. (2002). Eğitimde Ölçme ve Değerlendirme. Yargı Yayıncılık, Ankara.

The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013.

The Venice Charter: International Charter for the Conservation and Restoration of Monuments and Sites, Adopted by the IInd International Congress of Architects and Technicians of Historic Monuments, Venice, 1964.

The UNESCO World Heritage, G. (2019). Operational Guidelines for the Implementation of the World Heritage Convention, Paris, available at: https://whc.unesco.org/en/guidelines

Velthuis, K. & Spennemann D. H. R. (2007). The Future of Defunct Religious Buildings: Dutch Approaches to Their Adaptive Re-use. Cultural Trends, 16:1, 43-66, https://doi.org/10.1080/09548960601106979

Viñas, S.M. (2002). Contemporary theory of conservation. Studies in Conservation, 47:sup1, 25-34, https://doi.org/10.1179/sic.2002.47.Supplement-1.25

Vischer, J. (2001). Post-Occupancy Evaluation: A Multifaceted Tool for Building Improvement, In Stanley, L. (Ed.), Learning from our Buildings: A State-of-the practice Summary of Post-occupancy Evaluation, National Academy Press, Washington, DC, 23-34.

Yaldız, E., Asatekin N.G. (2016). Anıtsal Yapıların Yeniden Kullanımında Kullanıcılar Üzerinden Kültürel Algı Performansı Değerlendirmeleri; Sivas Buruciye Medresesi Örneği. Megaron, Vol. 11, 3, 333-343. https://dx.doi.org/10.5505/megaron.2016.66487

Yazdani Mehr, S., Wilkinson, S. (2020). The importance of place and authenticity in adaptive reuse of heritage buildings, International Journal of Building Pathology and Adaptation, Vol. 38 No. 5, 689-701. https://doi.org/10.1108/IJBPA-01-2020-0005

Yung, E., Chan E.H.W. (2013). Evaluation for the conservation of historic buildings: Differences between the laymen, professionals and policy makers. Facilities, Vol. 31 Issue 11/12, 542-564. http://dx.doi.org/10.1108/F-03-2012-0023

Resume

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Architectural Distinctiveness of the 15th Century Ottoman Tombs in Skopje: Learning from the Recent Archeological Excavation

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Abstract

Grave structures are architectural works reflecting the cultural accumulation, continuity and political power of societies. In addition, graveyards or necropolises and grave structures themselves, have an important contribution in shaping urban forms of cities. This article aims to evaluate the impact of crypted tombs (*mezar odalı türbe*), originating from the Kurgan culture of the Turks, in shaping the urban morphology of Skopje, as a Turkish city during the 15th century. Crypted tombs, which are very few in the Balkan geography, are a type of tombs mostly built during the Seljuk and Early Ottoman periods. The rich architectural forms and local aesthetic qualities of tombs have attracted a lot of research attention. As a result, tomb typology was defined by classifying the tombs according to the architectural peculiarities such as plan, volume shape, roofing system and applied materials. For the purpose of this paper, available sources were examined and the typology for six crypted tombs of Skopje was prepared. In addition, the archive documents describing the immediate surroundings of the tombs were examined, and the confusion of information about the tombs was clarified.

After the definitions and typology of the tombs were determined, the locations of these tombs in the city of Skopje were defined, confirming the urban development approach applied since the Early Ottoman period.

This paper relies on the results of Archaeological Excavation and Research Project of the Pasha Yiğit Bey Tomb, which was done under the auspices of the Şarık TARA, in Skopje, during which three crypted tombs were found beside the previously known ones.

In this study, the tombs unearthed as a result of archaeological excavations are defined in the context of the 15th century Early Ottoman city structure. The crypted tombs found in Skopje are discussed for the first time in this study.

Keywords:
Skopje, architectural heritage, early Ottoman architecture, crypted tomb

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INTRODUCTION

Located in the centre of the Balkan peninsula, Skopje is an important centre located in the middle of Vardar and Morava rivers valley spreading from north to south. Reaching the Thessaloniki and the Aegean Sea in the south and the Panon basin via Nis-Belgrade in the north, this axis is one of the oldest and important south-north connections of the European continent.

Founded under the name of "Scupi" during the Illyrian period in the 5th century B.C., the city has been the capital of the Serbian Kingdom for 110 years from 1282 until the First Battle of Kosovo in 1389. (Deroko, 1971, s. 4). Skopje was conquered by the Ottoman Empire at the end of the 14th century, and since the 15th century became important logistic and military center of the Ottoman Empire in the west (Şabanoviç, 1959). The first commander of Skopje *uçbey* was Saruhanlı Pasha Yiğit Bey (1391-1414). After his death, he was succedded by his adopted son İshak Bey (1414-1439). Afterward, Isa Bey (1439-1464), was appointed as the last commandor of Skopje. During this period, İsa Bey served also as the Governor of Bosnian Sancak (İnbaşı, 1995, s. 16). With the conquest of Bosnia, the region became the centre of the Ottoman aristocracy, and officers of Skopje played an important role in the raids to the east, west and north (Curcic, 2010, s. 755).

According to İnbaşı (1995) between the years 1455-1569, a very dense Turkish population has been settled in Skopje since 1455 and constantly increased until the last period. Inbasi also stated that in 1455, 23 of 31 neighborhoods were inhabited by Muslims, while approximately a century later, in 1569, this ratio was 57 of 67 neighbourhoods to be distinguished as Muslim(İnbaşı, 1995, s. 42).

Further on, the establishment and development of settlements and cities in the Ottoman Empire was followed by neighbourhoods that grew around religious, social, commercial and educational facilities established through foundations - *waqf* (Özcan, 1991, s. 6).

However, the most important of these are religious buildings. Currently, 21 (12%) of 174 mosques; 2 (5%) of 39 *tekkes* (sufi lodge) and 9 (36%) of the 25 *turbes* (tombs) are still standing in Skopje. In addition to these, the *namazgâh* built has not survived to the present day (Table 1). In total, from 239 religious buildings, only 39 (13%) survived until today, (İbrahimgil A. , 2018, s. 94).

Among built structures grave structures played important role in reflecting the cultural accumulation, continuity and political power of societies. The subject of this research is newly discovered tombs with crypt sections in Skopje as a result of recent archaeological excavations. The richness of the architectural work of turbe in Skopje is one more confirmed by the detailed study of revealed crypted tombs. However, the idea of preserving heritage is not every time properly embraced, due to many disputes arouse around the historical facts which also affects the proper reading of urban history.

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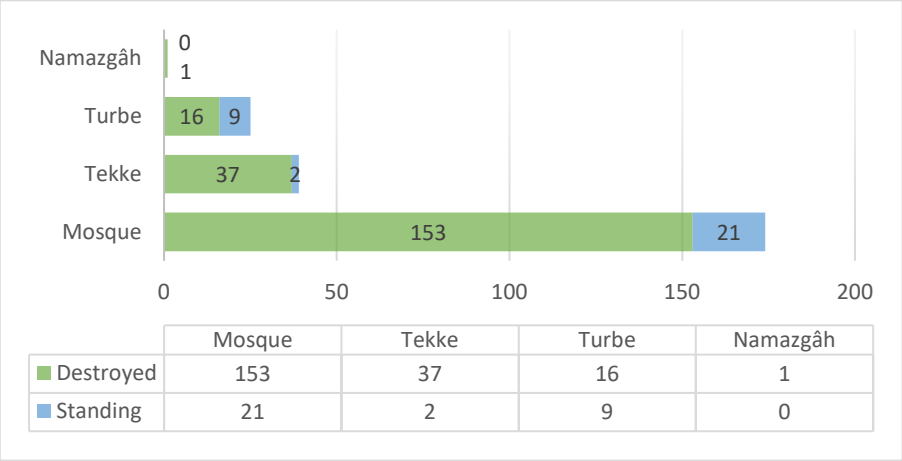
Table 1. The current state of religious buildings in Skopje (2020)



	Mosque	Tekke	Turbe	Namazgâh
Destroyed	153	37	16	1
Standing	21	2	9	0

In this paper crypted tombs of Skopje were reconsidered in particular naming, dates, description and comparative studies in the light to the new information revealed. The purpose of conducting this study is to create resources for researchers from architecture and different disciplines by re-evaluating the new findings. Within the scope of the study is the tomb with underground chambers reflecting the same cultural continuity in Skopje, which was shaped by the influence of Paşa Yiğit Bey and his family in about 100 years, what was documented from written sources and examined in terms of location and architectural formation. Other tombs in Skopje were not included in the study.

METHODOLOGY

The fact that the tombs have many local aesthetic qualities has trigered many researches on this subject what has resulted in rich bibliography. Among these valuable contributions done by O. Arık's *Erken Devir Anadolu-Türk Mimarisinde Turbe Biçimleri (1969), H. Önkal's Anadolu Selçuklu Turbeleri (1996), O.C. Tuncer's Anadolu Kümbetleri (1986)* have been studied. On the other hand, extensive research on the city of Skopje has been conducted in order to understand the local effects on the subject. Regarding Skopje, work of G. Elezovich (1933), S. Asım (2004), K. Balabanov (1980), L.K. Bogoyeviç (2011) focuse on the general Ottoman legacy in Skopje, while M.Z. İbrahimgil (2001) examined the mausoleum structures in North Macedonia. In addition to these, Stefanovska and Kozelj (2012) have been consulted as well as regarding the development of the city, individuals and events related to Skopje.

Tombs (*Turbes*)

Turbe or tomb structures are architectural work usually built as a sort of mauselum for nobles or royalties. The root of this tradition in Turkish societies can be traced to the in pre-Islamic Turkish societies *Kurgans (burial mounds)* were made for purpose of burring. With the conversion

of the Turks to the religion of Islam the tradition on burring has radically changed afterward depending on the belief of Islam.

In Islamic architecture, mausoleums were first seen in the Abbasid period and gained a monumental dimension during the Karahanlı, Gazneli and Seljuk period (Yetkin, 1984, s. 71). The tombs, which were built in the name of political, religious, scientific, military, etc. important personalities, have gained a rich architectural form with local influences in Anatolia and in the Balkans after a very short time (Arık, 1967, s. 58). Its examples in Central Asia have square, rectangular, circular and polygonal plans and were built using different top covers (Koshenova, 2019, s. 525). In the examples in Crimea, it is more similar in plan type and size (Dişli, 2014, s. 183). The tomb structures in the cemeteries or, in the cemeteries which are set within the mosque courtyards, are mostly located at a central point as structures that strengthen the belief in the afterlife from religious point of view.

Tombs (*Turbes*) Of Skopje

The oldest known tomb in Skopje was the gravestone of Meddah Baba (death 1426) in the courtyard of the Pasha Yiğit Mosque in the bazaar and the tomb of Pasha Yiğit from the same area, whose archive photograph only survives. Apart from these two works, within the complex built by Sultan II. Murat in 1436 there is partially destroyed tomb of İshak Bey (death 1444) which is considered to be among the oldest works in Skopje (Bogoyeviç, 2011, s. 44). However, information about the tombs built during the 15th century in Skopje is mostly a repetition of Elezovich's article *"Turski Spomenici u Skoplju" (1933)*.

In 2013, within the scope of the Research Project of the Tombs of the of Paşa Yiğit and İshak Bey, archaeological studies were conducted for those tombs. Before the archaeological studies were carried out, the area was bought by Mr. Şarık Tara and donated to Çayır Municipality. Within the scope of the archaeological excavations at the depth of 250cm crypt section of the tomb was found which remained standing until 1963. In addition, the wall of the holy spring (healing water) reservoir mentioned in the documents was found. Thereupon, the archaeological excavation was expended and it was understood that the place considered as the water reservoir was a second squared tomb with crypt section. During the archaeological excavation, different parts of wall were found between these two tombs and the archaeological excavation was expanded in the direction of a third tomb. Thus, a third tomb with squared chamber was found, slightly larger than the second tomb. While naming this structure, which does not have any traces like a tombstone, documents and sources were researched again. This third tomb unearthed in the excavation is one of the early period tombs with crypt sections called *"Akıt"*1 in Anatolia, which are frequently applied in Ahlat (Van, Turkey) Seljuk

1 It is a tomb style that the tomb which has the crypt section but there hasn't superstructure on the ground. All the grave structure is underground. It means final point in Kyrgyz language.

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Cemeteries. These types of tombs generally have a simple foundation consisting of a square plan and a single crypt section partially buried in the ground, without a monumental tomb body at the top, but the substructure ends in a pyramidal shape (Karamağaralı, 1992). However, there are not any precise information about the body and the covering system of the two tombs, except the Pasha Yiğit Tomb. It is the first time in the Balkans that grave of *"Akıt"* style tomb was found.In other excavation drillings carried out in the field, the foundation traces of the lodges and madrasa structures were also brought to light. Along with excavation work on these structures' documents from the state archives in Turkey and Macedonia have also reveiled new information.

In previous studies on tombs in Skopje, the general mistake was in mixing the two individuals of Pasha Yiğit Bey and Meddah Baba which perhaps occurred following the old photo of Pasha Yiğit Bey Complex from before 1963 where the tomb and Meddah Baba tombstone are located. As a result of extensive resource research on the tombs, the classification of tombs in Skopje has been made in terms of the volumes period in which they were built, the plan type, the superstructure building material, the tomb chamber top cover, the entrance of the tomb chamber and the overall dimensions (Table 2).

Table 2. Typology of Tombs in Skopje according to the architectural forms

Date of construction	Plan Outline type	Crypt section Top Cover	Crypt section Entrance Side	Superstructure Arch. Form.	Superstructure Material	Tomb Dim.	Seating Part[2]
1st half of XIV.	Square	Dome	North	Akıt Type	Cut stone	Width	One
2nd half of XIV.			South		Brick	Length	
1st half of XV.	Hexagon	Cross vault	East	Baldachin	Stone and Brick Row	Height	Two
2nd half of XV.			West				

Turbe of Yahşi Bey (Six Pillar), 1402

The Six Pillars Tomb, located in the Tophane neighbourhood to the east of the Skopje Castle, was named due to its architectural form created by the six pillars. While there is no exact information about the construction date of the tomb, Balabanov (1980) associated the tomb with Yahşi Bey, the commander of the Ottoman army cavalry in the early 15th century, whereas Bogojeviç (1964) and Tomovski (1958) defined the construction date of the tomb as 1690 (İbrahimgil M. Z., 2001). Bogojevic explained that is must be closed to the year 1690 when Austrian Army confront Turkish-Tatar Army (Bogoyeviç, 2011, s. 224). However, the difference between the architectural form of the building

2 It is the frame that covers the crypted section underground. Mostly the opening area took a place in this oturtmalık (seat) part.

and the period of construction weakens this statement (Figure 1).

Based on Balabanov's approach, Yahsi Bey was the eldest son of Kara Timurtas Pasha, who was one of the first important figures during the establishment of the Ottoman Empire. Yahsi Bey captured Nis and Prevadi in the raids he made with his troop (Apak, 2002, s. 189). Yahsi Bey, known as the conqueror of Nis (in 1836), was killed in the Ankara war in 1402 (Süreyya, 1996, s. 1667). His father, who was killed in the same war, was buried in Bursa, while there is no information that his children were also buried next to him.

Yahsi Bey went to Rumelia with a large cavalry unit from Anatolia and commanded the conquests between Vardar and the Danube for nearly 30 years. It is possible that Yahşi Bey was buried in Skopje, the center of his fellowship, instead of Nis, which was ruled by the Serbian despot at that time. In addition, the fact that 10 villages from 22 villages were named in the name of Sûbaşı Yahşi Bey in the tax registers (tahrir defteri) dated from 1444. However, there is no a foundation certificate issued in the name of Yahşi Bey in Skopje, and it shows that Yahşi Bey who was mentioned in the registration book was not alive, but his name was kept alive. In summary, the view that Balabanov put forward by associating the tomb with Yahşi Bey is not certain, but has been accepted as more appropriate in terms of the historical course and architectural style.

Figure 1. Tomb of Yahşi Bey (Six Pillars) before the 1963 Earthquake (Bogoyeviç, 2011, s. 225) and its appearances after the earthquake (2001, 2018)

The tomb is a six-pillars structure made of cut stone, on one side of which is placed on a 275cm hexagonal base. These six pillars are connected by semicircular arches and metal tensioners. The arched sections rising on the pillars are built in three rows of bricks and a row of cut stones. The top of the tomb in baldachin style is covered with a dome. A symbolic stone sarcophagus was placed on the floor of the tomb (Figure 2). The entrance to the crypt section of the tomb is in the form of a small window facing south. There are two levels of seating section surrounding the crypt section. The lower seating level is made of rubble stone, and the upper seating level with the entrance window is made of cut stone. The crypt section is covered with a barrel vault made of bricks. The tomb has the characteristics of the 15th century in terms of decoration. It is a simple ornamentation style that reflects the period when the arch stones were pulled inwards from the facade besides the stone-brick masonry. It

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was largely destroyed in the 1963 earthquake. Only two pillars of the building, have survived to the present day. Moreover, it has been subject to some unconscious interventions over time. The bases were plastered with a thick layer of lime. In the seating section, there is a large amount of molten wax traces and soot covering a large area on the surface around the burial chamber window.

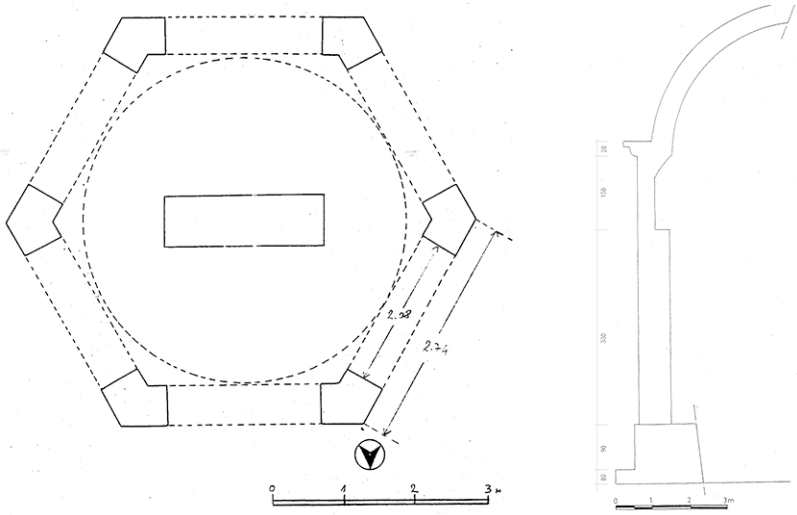

Figure 2. Survey drawings of Yahşi Bey (Six Pillars) Tomb (1960, Bogojeviç Archive)

Turbe of Hoca Salahuddin, XV. Early Century

The documents related to Skopje for the third uncovered tomb after the archaeological excavation were examined. In the records of Paşa Yiğit Bey Masjid dated from 1469, the name Hodja Salahuddin was found. According to the document in the Macedonian State Archive (Državen Arhiv Na Republika Severna Makedonija), "Pasha Yiğit Bey Masjid was located in Skopje between the Isa Bey foundation shops in the Tuz Pazarı area and between the Hoca Salahuddin cemetery and the main road"3. In the vakıfnâme, the area where the cemetery is located is described between the Yiğit Bey Mosque, Mustafa bin İshak Bey house, İsa Bey foundation shops, the Ferraş Doğan property and the main road. Uroşevic, who first mentioned this name in academic sources, accepted Hodja Salahuddin as Harajcı Salahuddin (Uroşeviç, 1961, s. 233).Considering that there were 47 Muslim and 61 non-Muslim households in the Haraccı Salahuddin District in 1841, Bogojevic claimed that Harajcı Salahuddin Bey was a person in charge of collecting taxes from non-Muslims on behalf of the Ottoman State in Skopje.(Bogoyeviç, 2011, s. 175). All this information confirmed that Hodja Selahaddin, who is mentioned in the endowment dated 1469, is not the same person as the Harajcı Selahaddin claimed by Uroşevic.

Also, it is interesting to mentioned the title of *"Hodja"* that was associated to the Hodja Salahuddin.There is an understanding that the Turks regard as an important principle raising administrators and

[3] Vakıfname:17, YB-021-VKF-0017-19-24; Date: H.1 Safer 874 / M. 10 August 1469

express them as *"rutbetu'l-ilmi ale'r-ruteb"* (the rank of science is above all ranks). Every ruler was definitely mentioned with an *âlim* (scholar), e.g. in the 15th century, among the Ottoman Sultans, Emir Sultan was adjective for Sultan Yıldırım Beyazid and Hacı Bayram Veli for Sultan Murat II, Akşemsettin for Fatih Sultan Mehmet, Kemalpashazade for Yavuz Sultan Selim. Therefore, Pasha Yiğit Bey cannot be considered independent of this understanding. It is understood that Hodja Salahuddin, was a person whom the conqueror of Skopje Pasha Yiğit Bey highly valued since he named the cemetery which started from the Pasha Yiğit Bey Complex and spread over a wide area, after his name. In the light of all the information, it can be said that Paşa Yiğit Bey, who conquered Skopje, was a valuable scholar and even his teacher who raised him. Although the cemetery was named by Hodja Salahuddinthe fact that he did not have any property arranged in his name by him shows that this person's dignity is not directly based on a military or political power. Considering the respect shown to scholars by the ruling class of the Turks, Pasha Yiğit Bey had built the tomb of a scholar, who was probably his teacher, in the area that will be a cemetery, in the courtyard of the complex, and the cemetery's name is much more likely to be mentioned by this name. While this area where the Pasha Yiğit Bey Kulliye is located is described in the documents, the name of the cemetery is always referred to as Hodja Salahuddin Cemetery besides the names of the neighborhoods that have survived until today (Figure 3).

In term of architectural peculiarities and builings materials, it is visible that on the foundation of the square planned tomb made of rubble stone, there is a base part made of three rows of bricks and one row of cut stone. There is no trace of any architectural element on the base of the superstructure. In this respect, it resembles akıt style tombs. Inside the pedestal there is a cross vaulted crypted section. Material losses were detected on the top cover of the tomb chamber made of brick. After the restoration, the missing parts were completed and the structure was reinforced with steel carriers from the inside. The entrance to the crypt section is through a small opening in the south-west facade.

Figure 3. The discovery of Hodja Salahuddin Tomb and the emerging tomb structure

Turbe of Pasha Yiğit Bey, 1414

Timurtaş Pasha, Evrenos and Pasha Yigit Beys, one of the important raider beys of the Ottoman Empire, acted as fighter (raider beys) in different geographies of the Balkans. Among them, Pasha Yiğit Bey conquered Skopje in 1392 after the First Kosovo Pitched Battle at 1389 (Şabanoviç, 1959, s. 280). He has chosen Skopje as the centre for the

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operations to be carried out in Bosnia and Serbia as the Ucbeyi (İnalcık, 2018, s. 119). The oldest record about Pasha Yiğit Bey is found in the Vakif General Directorate in Ankara (VGMA)'s in Gazi İshak Bey Vakıfnâme from 1445.4 While describing the properties of the foundation in the document, the phrase "with the main road on both sides, the Pasha Yiğit Bey Foundation on one side and the Old Han (Sulu Han), which is limited to the Serava River on one side, and with 24 shops adjacent to it" is used. Masjid, imaret, madrasah and school buildings were listed among the buildings included in the Paşa Yiğit Bey Foundation in the detailed tax registers numbered 12 belonging to the period between 1452 and 1455. In addition, according to the document related to Paşa Yiğit Bey Masjid in the Macedonian State Archive dated from 1469, the mosque is described as "Isa Bey foundation shops in Tuz Pazari area, between Hoca Salahuddin cemetery and the main road."

Pasha Yiğit Bey complex was destroyed by the time (Bogoyeviç, 2011, s. 168). From documents, it is understood that the place where Pasha Yiğit Bey built his *kulliye* was surrounded by Hoca Salahuddin cemetery, and this cemetery remained in the bazaar with the addition of structures such as a han and hammam (public bath). The tomb of Paşa Yiğit Bey and a few other tombstones have survived to the present day.

Paşa Yiğit Bey *turbe* has a hexagonal plan, 250 cm on one side. The tomb in baldachin style has a dome sitting on a raised drum section. Pillars, made entirely of bricks, are connected by semi-circular arches. The seating part of the tomb is made of three rows of bricks and a row of cut stone. The dome of the crypt section raised in the seating part is made of bricks. The entrance to the burial chamber is in the form of a small opening in the eastern façade (Figure 4). The fact that the stone is used only in the seating part of the tomb, and the superstructure is completely made of brick, makes this structure distinguished from other of the same period. Besides, the stone arches were pulled inwards from the façade (Figure 5, Figure 6, Figure 7, Figure 8). It was completely destroyed in the 1963 earthquake. The tombstone, which was found before the archaeological excavation, was added after the earthquake.

Turbe of Meddah Baba, 1426

Meddah Baba is among the veteran dervishes who participated in the conquest of Skopje. After the conquest of Skopje in 1392, he built his lodge next to the Pasha Yiğit Bey Complex. However, since it is located next to the mosques of Pasha Yiğit, all these structures were called *"Meddah Baba mosque, school and madrasa"*. This confusion was evident in the endowment of Havva Hanım (Kaleşi & Mehmedovski, 1958, s. 6)

[4] VGMA Df. 632, Sf. 424, sıra:194; Tarih: H. 1 Zilkade 848 / M. 9 Şubat 1445

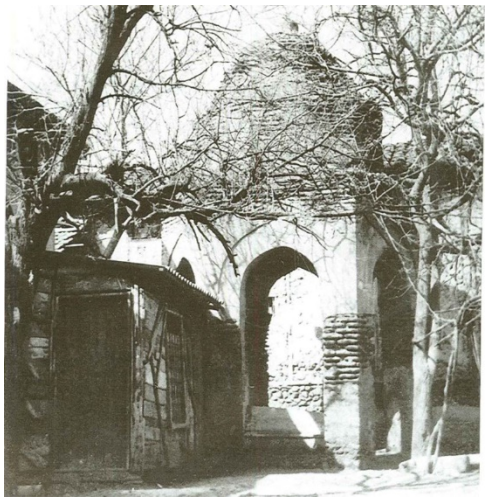

Figure 4. General view of the Paşa Yiğit Bey Tomb before the 1963 Earthquake (Bogoyeviç, 2011, s.172)

Figure 5. Turbe of Paşa Yiğit Bey archaeological excavation (2014)

as well as of Şafizade Seyyid Sâdi Efendi bin Ahmed dated from 1719 and the endowments of Ramiz Bey bin Hasan Bey from the Hüdâverdi District from1900.

Talking about the Meddah Baba Tekke, Evliya Çelebi mentioned "There was 'healing water' or 'Meddah Baba water' next to the Meddah Baba grave (mezar) in Skopje. It is the most visited dervish lodge, as both Muslim and Christian people believe that this water is healing." (Çelebi, 1979, s. 285). As stated it was believed that water was healing by the presence of Meddah Baba and the structures to be called this name The fact that Evliya Çelebi did not mention the tomb but mentioned a respected mezar (grave) in his statement strengthens the argument that this tomb structure is a akıt type tomb.

Salih Asım clarified this situation in his work named *"Üsküp Tarihi ve Civarı" (1932)* Asım named Pasha Yiğit Bey as the builder of Meddah Baba Mosque and described the Meddah Baba Tekke, which was in ruins next

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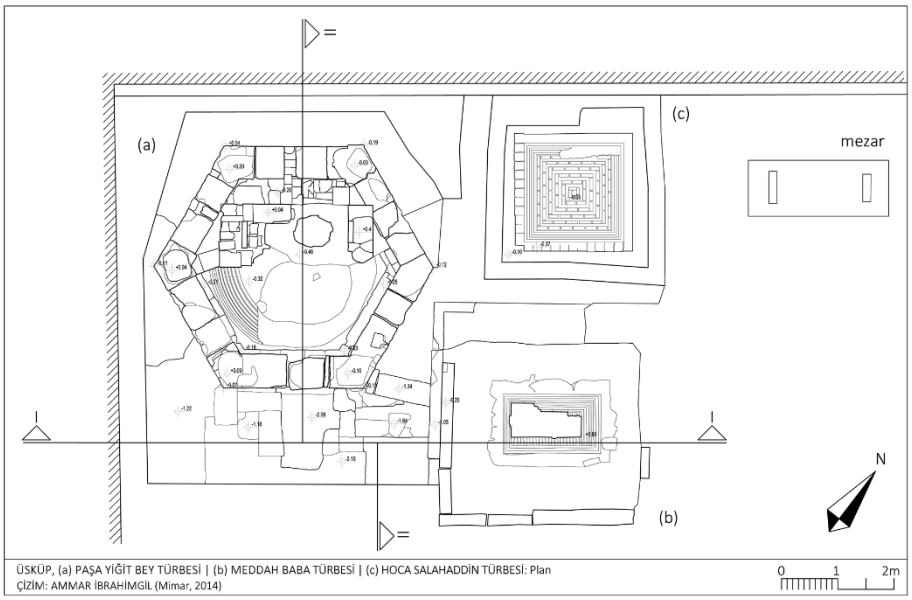

Figure 6. Tomb foundations found in the archaeological excavation

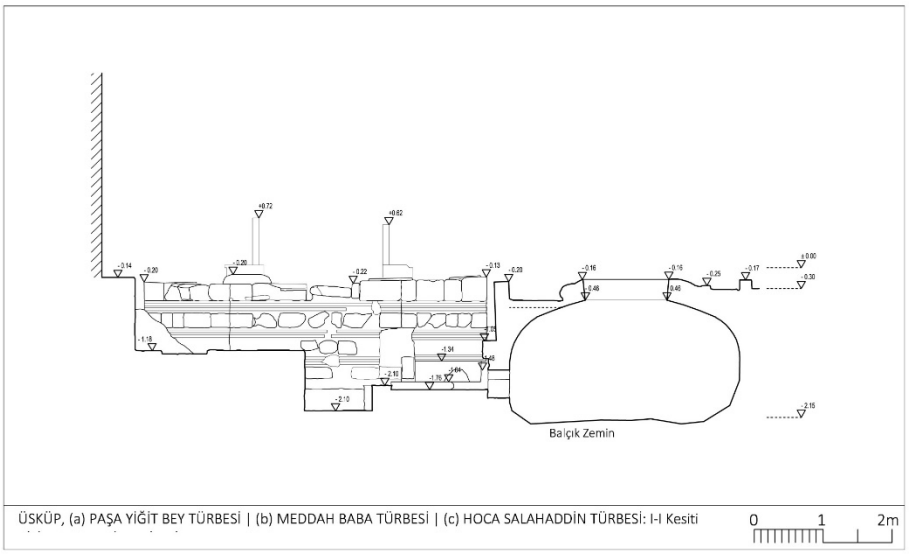

Figure 7. Archaeological Excavation Site Section I-I

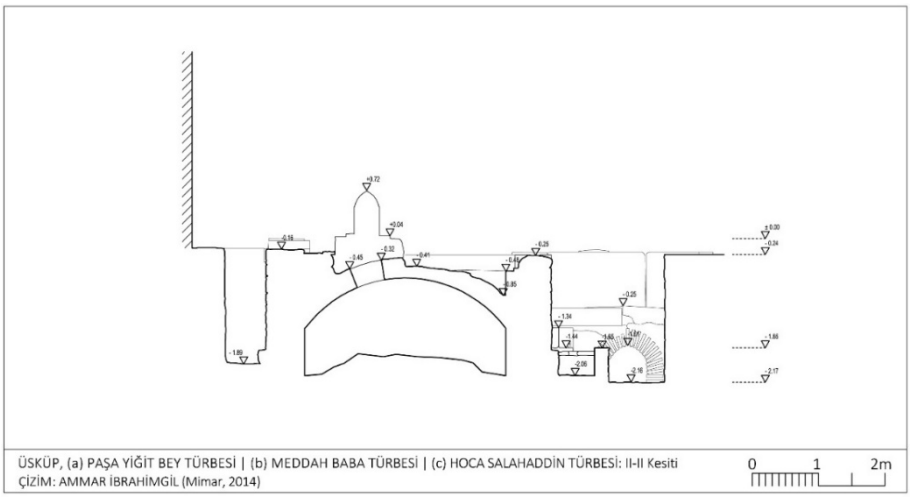

Figure 8. Archaeological Excavation Site Section II-II

to this mosque as a school (Asım, 2004, s. 21). On the other hand, Ekrem Hakkı Ayverdi mentioned separately as Meddah Baba Mosque and School and Pasha Yiğit Mahallesi Masjid, based on foundation records (Ayverdi, 1981, s. 247).

Due to the demolition of the buildings during the World War II and the problem of the rescuing earthquake victims after the 1963 earthquake, who were temporarily placed in Hoca Salahuddin Cemetery, no detailed research could have been done on this subject. In this case, until the archaeological excavations in 2013, only one headstone inscription from Meddah Baba survived. The modern Turkish version of the inscription, which is decorated with a large wheel of fortune motif on its upper side, is as follows: *"Hüve'l-hallâku'l-bâkî / El-merhum el-mağfur / Fatih Üsküp eş-şeyh / Meddah Baba ruhiçun / El-Fatiha / sene 830 (M.1426)" (Figure 9)*. The title of "sheikh" in the inscription and the mention of the Meddah Baba Tekke by Evliya Çelebi in the description of the region confirms that the person was a sheikh (head) of tekke. In addition, taking the name "Baba" over time, the hook wheel of fortune motif and the mention of Skopje as the conqueror on the tombstone indicate that the person was veteran, one of the Bektashi dervishes associated with janissaries.

Figure 9. Meddah Baba Tomb archaeological excavation and consolidation works

Documents and sources were re-examined in order to fully define this newly discovered structure. According to the available sources, Skopje was developed around the Serava creek after the big earthquake in 1518 and after the 1963 earthquake, the Sereva creek was completely covered (Stefanovska & Kozelj, 2012, s. 94).

Since (Sereva) creek passes very close to the cemetery, water filled the burial chamber, and the effect of the Bektashi lodge, the belief that the water in the crypta chamber is healing has become widespread. In time, it was forgotten that this area was in the crypt and it was accepted as a holy spring.

In the light of all this information, it is possible to conclude that the lodge structure next to the tomb was built in the name of its founding sheikh who participated in the conquest. The tomb was built very similar to Hoca Salahuddin turbe and in a square plan of 220 cm. After the foundation was made with brick material up to the crypt section, large regular cut stone blocks were used for the ground level. The grave chamber has a cross-vaulted covering. After the archaeological excavation, it was covered with a transparent protective cover made of steel and glass.

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Turbe of Hacı İshak Bey, 1439

Gazi İshak Bey (1414-1439) is the son of Paşa Yiğit Bey, the conqueror of Skopje, and the brother of Turhan Bey. Gazi İshak Bey became Skopje *uçbey* when his father passed away. During the period of Gazi İshak Bey, the Skopje *uçbeylik* (border principality), acting in a special status in the Balkans, adopted a joint administration with the Serbian and Bosnian principalities (Pepiç, 2002, s. 133). İshak Bey, as a *uçbey* of Skopje, entered Bosnia with a great force upon the request of Hrovje Vukçiç and defeated them especially in the struggles with the Hungarians, thus weakening the Hungarian influence that lasted for decades (Çoroviç, 1940, s. 413). Having strengthened his influence in Bosnia, İshak Bey turned to the Serbian lands after 1425 and supported the Serbian nobles who agreed with him with a similar policy. He participated in the siege of Belgrade during the operation launched by Sultan Murad II (1421-1444) against the Hungarians in 1438 (Efendi, 1999, s. 197). İshak Bey conquered Semendire and remained here as the sanjak beg, and his son Isa Bey was brought to the Skopje frontier / uçbeylik. İshak Bey, until his death in 1444, directed the raids and conquests in the territory of Serbia. With the 1444 Edirne-Segedin Treaty, Semendire was left to Curac Branković (Pepiç, 2002, s. 61).

The most definite record of İshak Bey is the Arabic inscription of the mosque he built, dated from 1438, Modern Turkish writing of the inscription is as follows *"El-imaratu'ş-şerifetu binahu fi eyyami devleti Sultan / Murad bin Mehmed Han esere emru'l-hayr İshak / Beg bin Paşa Yiğit Beg fi sene isneyn ve erbain ve semane mie / Fi sene 842" (M.1438/39)*. The imaret in its inscription is a part of a large complex such as İshak Bey Mosque, which is now known as *Alaca* Mosque, a madrasah that has not survived, the double bath, Kapan and Sulu *han*. In a sense, this shows that İshak Bey was important figure in the shaping Skopje during the Ottoman period and the original establishment of the Skopje Bazaar.

Regarding the tomb of İshak Bey, Evliya Çelebi used the statement *"There is a grave of Gazi İshak Bey in front of the Hünkar Mosque"* in Skopje (Çelebi, 1979, s. 293). In addition, in the plan drawing of Sultan Murad II Mosque (Skopje) dated 1711, the tomb structure near the mosque is stated as the *"Tomb of the late Gazi Hacı İshak Bey"* (Stojanovski, 1981, s. 218). According to Bogojevic's research, the tomb was damaged during the severe earthquake in Skopje in 1555 and the Austrian occupation and remained neglected afterwards. The last surviving pieces were destroyed by the 1963 earthquake (Bogoyeviç, 2011, s. 219). In 2013, with the initiative of the late Şarık TARA, the Chairman of the Board of ENKA Holding, efforts were initiated to revive the tomb again in memory of his beloved mother, *"Yaşar Beg Kumbaracı's daughter Mahmure Hanım"*, one of the well-established families of Skopje.

Before the archaeological excavation, the tomb structure consisted of only foundation remains and an unnamed tomb in a cemetery located between Sultan Murad II and Isa Bey Mosque. The foundation walls of the tomb structure are made of fine cut blocks and have a hexagonal plan. The

stones are tied together with lead clamps in both directions, longitudinally and transversely (Figure 10). The ground of the tomb is covered with stone stones of 70x100cm size, and only some of these stones have survived to the present day. The sarcophagus, which has survived the least damage until today, is made of two blocks of stones that complement each other (Figure 11). The entrance to the crypta of the building is on the southeast side and is covered with an iron railing. Vents were made to coincide with the middle of the hexagonal body walls of the crypt section (except the north wall adjacent to the surrounding tombs).

Figure 10. The archaeological excavation and crypted section conservation.

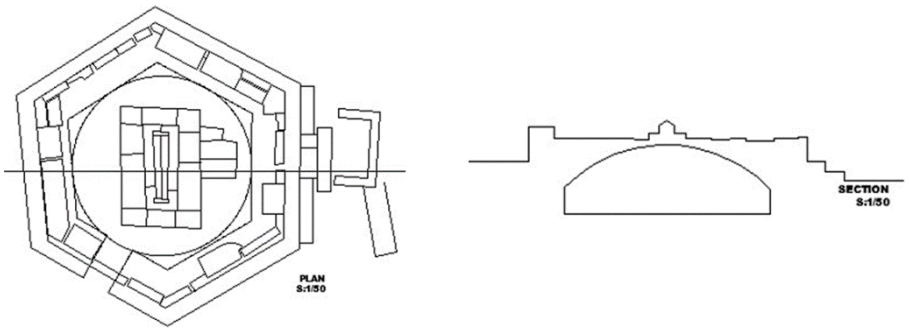

Figure 11. Ishak Bey Tomb survey drawing (ENKA)

During the archaeological excavations the large crypt section of the tomb was entered. The burial room dome is fully exposed inside and outside. Cracks and slips in the domed, shifts in the cut stones forming the body walls outside. Missing parts were identified as the most important structural problems in the building. In addition, it was understood that the roots of the plants covering the ground of the tomb completely damaged the mortar and brick of the dome of the crypt section. Besides to these structural problems, due to the fact that the building blocks are open to atmospheric effects for a long time, there is evidence of increased porosity. Also, ruptures, melting, cracking are visible as a consequence of the frost cycle.The structure was also exposed to fires and vandalism.

By removing the floor of the tomb, the dome of the grave chamber was reinforced from outside and inside, and a drainage line was created around it. The reconstruction dimensions of the building were

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determined with comparative examples, and a reconstruction project was prepared for the tomb and the cemetery where it is located (Figure 12). The tomb was reconstructed from reinforced concrete and covered with stone.

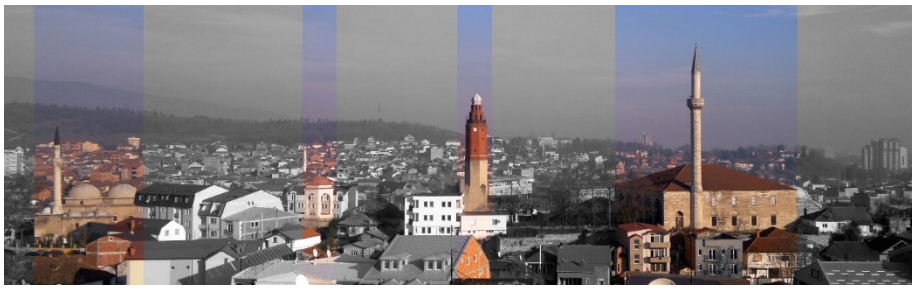

Figure 12. With the encouragement of the late Şarık TARA, İshak Bey Tomb was restored to Skopje's silhouette.

Turbe of Kralj Kizi (Katerina, King's Daughter), End of XV. Century

The Interregnum Period (1402-1413), when the political authority was weakened by the conflicts between Musa Çelebi, Emir Süleyman and Çelebi Mehmet at the beginning of the 15th century, was overcome with the support of the uçbegs in the Balkans. After the Ankara War (1402), it acted with the policy of gaining power by taking the uçbegs / fronts under the protection of the nobles in Serbia and Bosnia (Kiprovska, 2004, s. 56). In this period full of political turmoil in the Balkans, the Vatican had a serious impact, especially on Bosnia (Filipoviç N. , 1965, s. 363). Finally, in 1463, under the command of Fatih Sultan Mehmet, the Ottoman army, captured Bosnia, and executed the Bosnian King Stjepan Tomoseviç in the city of Kljuç. During this war, Queen Catherine fled to Rome, and her young children were sent to the Ottoman palace (Hammer, 1979, s. 196).

According to Elezoviç, this mausoleum, known as the Turbe of the King's Daughter (Kraljeve Kćeri or Kralj K'zi) in Skopje, was built for daughter of Queen Catherine and King Stjepan Tomaš. She was convereted to Islam after she was taken to the Ottoman palace with her brother (Elezoviç, 1939, s. 50). This claim, which was controversial until recently, became more evident with the researches on the Bosnian Queen Catherine.

The Venetian historian Donado D'Lezze, in his work Historia Turchesca (1910), mentions a son and a daughter taken captive in the will of Queen Catherine of Rome written in 1478. In addition, it was stated that the children kept in the palace converted to Islam after their uncle, Prince of Herzegovina, Ahmet Bey Hersekzade (Prince Stjepan Hercegovac), came to Istanbul.(Şkrijelj, 2017, s. 147). Thereupon, her brother Sigismund was named İshak Kraloğlu and appointed as the Governor / Sancakbeg of Karasu, and Princess Catherine was adopted by the fellow of Skopje and conqueror of Bosnia, Isa Bey bin İshak Bey. Her tomb known as the King's Daughter, was associated and maintained by the dervishes of Sersem Ali Baba Tekke with the position of Sarı Saltuk Dede in Bosnia.

The tomb is located within the borders of the present-day name Gazi Baba Muslim cemetery. Archaeological excavations were initiated and

reconstructed with the initiative of the Ministry of Culture of Bosnia and Herzegovina in 2014 regarding the tomb that was destroyed in the earthquake of 1963 (Figure 13). The square planned tomb was built in baldachin style. The dome of the tomb, supported by a cross-vault, resting on a four-block stone base, is covered with tiles. While the foundations of the tomb to the ground and the four pillars carrying the dome are made of cut stone, pointed arches, arch cheeks and dome are made of brick. In addition, metal tensioners are placed between the arch openings (Figure 14).

Figure 13. General view of the King's Daughter Mausoleum before the 1963 Earthquake and its view after the earthquake (Bogojevic Archive) and after the restoration (Şkrijelj, 2017, s. 150)

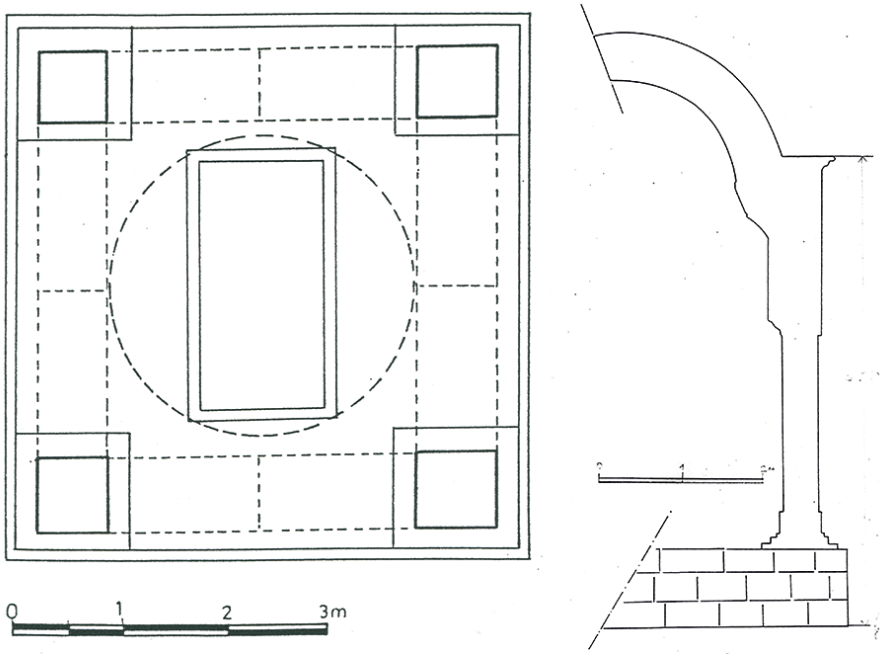

Figure 14. King's Daughter Tomb survey drawings (1960, Bogojeviç Archive)

EVALUATION AND DISCUSSION

In essence, the restoration project includes, as Feilden and Jokilehto mentioned a wide-ranging arrangement of intervention tools that are tasked with preserving the emotional, cultural and use value of the building, preventing deterioration (Feilden & Jokilehto, 1993) (Jokilehto, 2011, s. 62). This is related to verifying and recording the technical information and memories about the work as much as possible. However, in the post-Ottoman Balkan geography, mutual sensitivities emerged over the symbols of identities. In this sense, Ottoman artefacts representing a historical period were also handled according to this identity perception, rather than understanding them as a common cultural heritage of entire humanity.

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The locations of these tombs and cemeteries, which date back to the early Ottoman period, give clues to the urban structure of the city. Accordingly, there is a direct relationship between the bazaar and the cemetery in Ottoman cities. In addition to the formation of the castle, mosque and bazaar districts that are said for Ottoman cities, cemeteries are part of the urban pattern. It was used as a transition area between the bazaar and residential areas and as a reserve area for public buildings to be built in the future. The large cemetery covering a wide area between the Sultan Murat II Complex, where the İshak Bey Tomb is located, and the İsa Bey Complex, formed the eastern border of the bazaar until the 1900s. Yahşi Bey Tomb is located in the westernmost part of the area determined as a cemetery in the first settlement of the Ottoman Empire. On the other hand, there was never any construction in the Gazi Baba Cemetery area, which was designated as a martyrdom after the conquest of the city. Martyrdoms were used as the general cemetery of the city (Figure 15). Another area used as a martyrdom in the city is Haydar Kadı Cemetery. Today, there is the US Embassy in this area, which was not built until recently. Before the building was built in the region, the tombs were moved to another place according to Islamic methods.

When we consider the crypted tombs in Skopje within the framework of cultural continuity, in Anatolia and its near geography, the part of the tomb, crypta, funeral or mummy in the terminology of the mausoleum, was more common in the east of Azerbaijan and Anatolia geography, where the Central Asian influence was strong, and was applied until the late period. The effect of this architectural formation was felt in the west of Anatolia dominated by the Ottoman Empire and in the Balkans, albeit by decreasing until the early 1500s (Tuncer, 1986, s. 384). On the other hand, it can be said that four of the tombs with crypted section in Skopje, which is the subject of this study, are of the type of tombs, which are described as baldachin or open *turbe*, and two of them are of *akıt* type, although it is not certain. Very few of the baldachin-type mausoleums in Anatolian samples have crypt sections. In addition, while in the first examples the crypt section was a more prominent place in the upper structure, it became smaller over time and transformed into a space that can be accessed by a narrow passage opening from the outside.

In Bursa, the first capital of the Ottoman Empire and where there are many dynastic tombs, there is no dynastic mausoleum with a crypt section except the Yeşil Tomb (1421) where Çelebi Mehmet is buried (Önkal, 1992, s. 19). The Mausoleum of Midwife Gülbahar Hatun (XV. Century), the midwife of Fatih Sultan Mehmet, is similar to the mausoleums built in Skopje in terms of its grave room, square plan, architectural formation and material.

Six tombs with crypt sections in Skopje are dated to the 15th century. The seated parts (oturtmalık) of the crypted section of these tombs are

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Figure 15. 15th-century buildings in Skopje

shorter and smaller than the examples in Anatolia. The grave rooms of the square planned tombs are covered with cross vaults. Except for the King's Daughter Tomb, the seating parts surrounding the top of thecrypted section are made of two parts in all tombs. In Yahşi Bey (Six Pillars) Tomb; In Hodja Salahuddin Turbe, rubble stone for the lower seat and brick for the upper seat; In the Meddah Baba Turbe, the lower seat is made of brick, the upper seat is cut stone; In the Pasha Yiğit Bey Turbe, rubble stone for the lower seat, one row of cut stone for the upper seat, and an alternative wall type with 3 rows of bricks; In the İshak Bey Tomb, both seats are made of cut stone. In the King's Daughter (Katerina) Tomb, there is a single seat made of cut stone. Although the entrances to the crypt section were generally made on the east side, the terrain conditions and the situation of the neighbouring buildings were more determinant in this (Table 3).

In terms of architectural form, the superstructure of the tombs is square and hexagonal Four mausoleums were built in baldachin style. While there is a square pedestal in the King's Daughter Tomb, in the tombs of Paşa Yiğit Bey, İshak Bey and Yahşi Bey (Six Pillars), cut stones placed in a hexagonal corner are used. No definite trace was found regarding the superstructure of Hoca Salahuddin and Meddah Baba Tombs, and it was evaluated from historical information that it was a akıt type tomb structure. In terms of material, the tomb of Pasha Yiğit Bey is entirely made of brick, and İshak Bey's Tomb is entirely made of cut stone. The feet of the Yahşi Bey (Six Pillars) Tomb are made of cut stone, the arch is made of one row of stones and three rows of bricks. In the King's Daughter Tomb, the feet are cut stone, but the arch is built only with bricks.

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Table 1. Architectural typology table of tombs with crypted in Skopje

		Yahşi Bey (Six Pillars) Turbe	Hoca Salahuddin Turbe	Meddah Baba Turbe	Paşa Yiğit Bey Turbe	İshak Bey Turbe	King Daughter Turbe
Date of construction	XV. cen. Ist quarter	■	■	■	■		
	XV. cen. IInd quarter					■	
	XV. cen. IIIrd quarter						
	XV. cen. IVth quarter						■
Plan Outline type	Square		■	■			■
	Hexagon	■			■	■	
Crypt section Top Cover	Dome	■			■	■	
	Cross Vault		■	■			■
Crypt section Entrence Side	North						
	South				■		
	East	■	■			■	■
	West			■			
Superstructur Arch. Form.	*Akıt* Type		■	■			
	Baldachin Type	■			■	■	■
Superstructur Material	Cut Stone					■	
	Brick				■		
	Stone-Brick	■					■
Tomb Dimensions	Width	275cm	250cm	230cm	260cm	420cm	470cm
	Length	275cm	250cm	230cm	260cm	420cm	470cm
	Height	850cm	-	-	820cm	1280cm	720cm
Seating Part	One		■				■
	Two	■		■	■	■	

In final, further steps on preserving and properly presenting valuable remains, such as in the case of crypted tombs of Skopje, is of high importance, in line with the internationally accepted doctrine as stated already in 1964 by the Venice charter of ICOMOS. *"The sites of monuments must be the object of special care in order to safeguard their integrity and ensure that they are cleared and presented in a seemly manner…"* (ICOMOS, 1964). Further on, regarding archaeological heritage Charter For The Protection And Management Of The Archaeological Heritage in Lausanne (ICOMOS, 1990) states that some elements of the archaeological heritage are components of architectural structures and in such cases must be protected in accordance with the criteria for Conservation and Restoration of Monuments and Sites.

Figure 16. Before and after the project area

CONCLUSION

In Skopje, Turkish public institutions and organizations such as Turkish Cooperation and Coordination Agency (TIKA), Directorate General of Foundations (VGM), Presidency of Religious Affairs (DIB), some metropolitan and district municipalities and ENKA foundation restored a total of 15 monuments. Monumental structures to be restored are determined according to certain criteria that are deemed worthy of protection.

Evaluation of the Pasha Yiğit Bey Tomb archaeological excavation, restoration and restoration project, all together contributed to prevent further illegal construction in the historical environment. An area has been transformed into a social and cultural environment and restored to its historical texture. On the building scale, the reconstruction of the Pasha Yiğit Bey Tomb, which was destroyed in 1963, was carried out and two previously unknown tomb structures were unearthed. In addition, the foundation of the madrasah structure mentioned in the documents was also found. After the consolidation of the tombs that emerged, they were covered with glass and protected as they are.

As a result, differences are observed in tombs with burial room in Skopje in terms of material, top cover, decoration and size comparing to the Anatolian samples. Over time, the height of the seating part (*oturtmalık*) of the crypt section was reduced, and most of the crypt section remained under the ground. stone and brick were used as building materials in the tombs, adobe was not used. It is seen that the dimensions of the tomb are generally small. In terms of decoration, there are no rich decorations found in the tombs from the first period. Following development of the tomb architecture, the structure of the tomb shrinks, the use of materials varies according to the geography, and some of the simple decorations were applied.

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Along with the rich aesthetic reflections of the regional influences in the mausoleums design also the pronounced integration of the founder with the region is visible. Furthermore, two unearthed flow-style mausoleums as a result of archaeological excavations point to the common cultural accumulation from the Turanian geography (Central Asia).

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REFERENCES

Aktepe, M. M. (1953). XIV. ve XV. Asırlarda Rumeli'nin Türkler Tarafından İskânına Dair. Türkiyat Mecmuası, 299-312.

Altuğ, U. (2011). Erken On Beşinci Asır Osmanlı Balkanlar'ında Tımar Sisteminin Tatbikinde Coğrafi Koşulların Tesiri. ADAM Akademi(1), 29-44.

Apak, A. (2002). Osmanlı Devleti'nin Kuruluş Döneminde Bursalı Bir Vezir Ailesi: Kara Timurtaşoğulları. Marife Dini Araştırmalar, Bahar / 2(1), 181-196.

Arık, M. O. (1967). Erken Devir Anadolu Türk Mimarisinde Turbe Biçimleri. Anadolu, XI, 57-100.

Asım, S. (2004). Üsküp Tarihi ve Civarı. İstanbul: Rumeli Araştırmaları Merkezi Yayınları.

Ayverdi, E. H. (1981). Avrupa'da Osmanlı Mimari Eserleri (Vol. III). İstanbul: İstanbul Fetih Cemiyeti.

Bogoyeviç, L. K. (2011). Üsküp'te Osmanlı Mimari Eserleri. İstanbul: ENKA.

Bozdoğan, M., Çakır, H., & Özkan, S. (2006). Edirne Turbelerinin Mekânsal Analizi. Trakya University Journal of Science, 7(1), 23-31.

Curcic, S. (2010). Architecture in the Balkans. Princeton: Princeton University.

Çelebi, E. (1979). Seyahatname. (H. Šabanović, Ed.) Sarajevo, Ministerstvo za Kultura.

Çoroviç, V. (1940). Historija Bosne. Druştveni i Istoriski Spisi, CXXIX(53).

Deroko, A. (1971). Средњове, Кобни Град Скопје. Београд: Српска Академија Наука и Уметности.

Dişli, G. (2014). Muslim tombs in Crimea: a typological analysis. Journal of Architectural Conservation, 182-197.

Efendi, H. S. (1999). Tacüt-Tevarih. (İ. Parmaksızoğlu, Ed.) Ankara: KTB.

Elezoviç, G. (1933). Turski Spomenici u Skoplju. GSND(1).

Elezoviç, G. (1939). Kralj Kizi. Bratstvo(XX), 48-64.

Feilden, B. M., & Jokilehto, J. (1993). Management Guidelines for World Cultural Heritage Sites. Rome: ICCROM

Filipoviç, E. O. (2011). Grob Bosanske Princeze Katerine u Skoplju. Posebna Izdanja, II, 1-4.

Filipoviç, N. (1965). Osvrt na Polozaj Bosanskog Seljstva u Prvoj Deceniji Uspostavljanja Osmanske Vlasti u Bosni (Vol. 3). Sarajevo: Radovi Filozofskog Fakulteta u Sarajevu.

Hammer, J. v. (1979). Historija Osmanskog Carstva (Vol. I). Zagreb.

ICOMOS, (1964). International Charter For The Conservation And Restoration Of Monuments And Sites (The Venice Charter 1964), IInd International Congress of Architects and Technicians of Historic Monuments, Venice, Article 14.

ICOMOS, (1990). Charter for The Protection and Management of the Archaeological Heritage, International Committee for the Management of Archaeological Heritage (ICAHM) and 9th General Assembly, Lausanne.

İbrahimgil, A. (2018). Makedonya Üsküp'ün Tarihi Kent Dokusunun İncelenmesi ve Koruma Önerisi. Ankara: Gazi Üniversitesi Fen Bil. Enst. Mimarlık ABD.

İbrahimgil, M. Z. (2001). Makedonya'da Turbe Yapıları ve Türk Sanatındaki Yeri. In M. Kiel, N. Landman, & H. Theunissen (Ed.), Proceedings of the 11th International Congress of Turkish Art. IV, pp. 1-30. Utrecht: EJOS.

İnalcık, H. (2018). The Ottoman Empire. İstanbul: Kronik Kitap.

İnbaşı, M. (1995). Osmanlı İdaresinde Üsküb Kazâsı (1455-1569). Erzurum: Atatürk Üniversitesi Sos. Bil. Ens. (Doktora Tezi).

Jokilehto, J. (2011). World heritage: Observations on decisions related to cultural heritage. Journal of Cultural Heritage Management and Sustainable Development, 61-74.

Kaleşi, H., & Mehmedovski, M. (1958). Tri Vakufnami Na Kaçanikli Mehmed Paşa. Skopje.

Karamağaralı, B. (1992). Ahlat Mezar Taşları. Ankara: Türk Tarih Kurumu.

Kemal, Y. (2017). Çocukluğum, Gençliğim, Siyasi ve Edebi Hâtıralarım (7. baskı ed.). İstanbul: İstanbul Fetih Cemiyeti.

Kiel, M. (2007). Niş. İslâm Anslikopedisi, pp. 147-149.

Kiprovska, M. (2004). The Military Organization of The Akincis In Ottoman Rumelia. Ankara: Bilkent University Dept. of History.

Koshenova, G. (2019). Kazakistan, Kızılorda ili Türk-İslam yapıları (10.yy.-20.yy. başı). Ankara: Gazi Üniversitesi Sos. Bil. Enst. Doktora Tezi.

Önkal, H. (1992). Osmanlı Hanedan Turbeleri (Vol. 22). Ankara: KTB.

Özcan, T. (1991). Osmanlı İmaret Sisteminin İktisadi İşleyişi. İstanbul: Marmara Üniversitesi Sos. Bil. Ens. (Yüksek Lisans Tezi).

Pepiç, A. (2002). Üsküp Beyi İshakoğlu İsa Beyin Osmanlı Hakimiyerinin Kosova, Sancak ve Bosna Topraklarına Girmesindeki Rol ve Önemi (1439-1469). Ankara: Ankara Üniversitesi Sos. Bil. Ens. (Yüksek Lisans Tezi).

Stefanovska, J., & Kozelj, J. (2012). Urban planning and transitional development issues: The case of Skopje, Macedonia. Urbani izziv(23).

Stojanovski, A. (1981). Novi Podataci za Skopje po Pozarot vo 1689 Godina. Skopje.

Süreyya, M. (1996). Sicil-i Osmanî. (S. A. Kayraman, & N. Akbayar, Eds.) Ankara: Tarih Vakfı.

Şabanoviç, H. (1959). Bosanski Paşaluk. Sarajevo: Naučno Društvo NR Bosne i Hercegovine.

Şkrijelj, R. (2017). Makedonya'daki Boşnakların En Eski Anıtı: Kral Kızı Turbesi. Osmanlı Mirası Araştırmaları Dergisi, 4(10), 141-155.

Topdemir, R. (2013). Balkan Tarihi Karşısında Yahya Kemal Beyatlı'nın Şiiri. IJLET, 72-80.

Tuncer, O. C. (1986). Anadolu Kümbetleri (Vol. II). Ankara: Güven Matbaası.

Uroşeviç, A. (1961). Proslost Muratovog Turbeta na Kosovu. Glasnik Muzeja Kosova i Metohija, 1.

Uzunçarşılı, İ. H. (1982). Osmanlı Tarihi (Vol. I). Ankara: KTB.

Yetkin, S. K. (1984). İslam Ülkelerinde Sanat. İstanbul: Cem Yayınları.

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Silent Witnesses of the Sacred Region: Findings and Evaluations About Ottoman Period Non-Muslim Places of Worship in Trabzon-Hamsiköy

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Abstract

Trabzon-Değirmendere Valley is the third holy place for the Orthodox after Jerusalem and Hagion Oros (the Holy mountain). This study intends, through a field work, to trace and document the places of worship built by non-Muslims in Hamsiköy Valley, which is a branch of Değirmendere Valley that had the densest non-Muslim population, not included in the current literature or not made subject to comprehensive determinations and analyses. On-site determination and documentation studies were carried out in the study by tracing down the Non-Muslim places of worship situated in Hamsiköy Valley. Coordinates of these buildings were established, measurements were conducted whether the building/remnant was existing, schematic plans were drawn and photographs were taken. Inventory forms were generated in accordance with the information obtained. The building/remnants were processed on maps and their locations/positions were documented and their interrelations and the topography of the area was exhibited. A total number of 47 non-Muslim worship places were identified in Hamsiköy Valley in the current literature. Only 14 of these 47 buildings were located during the land study and 19 more buildings that could not be matched with the 47 buildings in the literature were identified during the field work. Hamsiköy Valley which is a branch of Değirmendere Valley, extending from the center of Maçka to Zigana in the south defines the spatial boundaries of the research. While the beginning of the period in question commences with conquest of Trabzon by the Ottoman, the temporal boundary of the study is drawn by the 19th century when extensive rights were granted to non-Muslims and then Turkish-Greek population exchange that took in 1923. This study was conducted for tracing down the places of worship built by non-Muslims in the past in Hamsiköy Valley in Trabzon. These non-Muslim buildings, for which there is not enough information about their current situation despite references in the literature, were identified on site, their coordinates were determined, their sketches were drawn, photographed and taken into inventory.

Keywords:
Değirmendere valley, Hamsiköy valley, non-muslim places of worship, Trabzon

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INTRODUCTION

Anatolia is an important geographical area settled on the fertile lands of the East and the West where individuals from different religious and ethnic backgrounds could establish a society, adopt the most appropriate solutions for their time and develop architectural works within that context. Situated on these lands, the Eastern Black Sea Region has drawn the attention of many civilizations throughout history with its geographical and geopolitical location. As such, the region has accumulated traces of ancient civilizations and become a focal point for observing physical changes that occurred between one and then next.

The Eastern Black Sea Region has the quality of being a central region surrounded by the Black Sea in the north, Eastern Anatolia in the south, the Caucasus in the northeast and Central Anatolia in the southwest. The region exhibits a distinct geographical structure with its mountain ranges forming its natural boundaries and valleys extending perpendicular to the sea constituting the only connecting axis between the midlands and the coast. Although the valleys which generally extend through the mountains perpendicularly are the most natural paths to reach the midlands, there is almost no possibility to pass between the valleys. Therefore, the valleys which establish boundaries between settlements also act as a barrier between them, in terms of socio-cultural and ethnic structure, besides constituting a physical linkage and being restrictive. These geographical conditions constitute the main factor for many settlements on the Eastern Black Sea coastline in terms of their history. The natural structure that is not fit for settlement had influence on the fact that the settlements were squeezed into the narrow coastline or the regions where the valleys meet the sea, and the transportation restrictions had influence on the fact that they were squeezed in the bays that are natural harbors (Tuluk, 2016).

Presence of Değirmendere Valley, which is located adjacent to the province of Trabzon and has been suitable for linking the coastline to the midlands since the early times of the region's history, is important in the area due to its topographical structure (Figure 1). Değirmendere Valley, which can be considered as the "entrance gate of Trabzon Province" has been in communication with Anatolia, Middle East, Far East and the Caucasus continuously throughout history with its mountain passes and trade routes unlike other valley systems that are isolated within themselves as a consequence of the geography of the Eastern Black Sea region (Bryer & Winfield, 1985). Because of its strategic location, despite the geographical factors in question, while it created isolated living spaces for people who want to be out of sight interestingly. It also became one of the popular settlements for certain communities that wanted to benefit from the advantages of being located on an active transit path for the trade routes (Tuluk, 2010).

This valley is found on the most important roads reaching to Trabzon, the capital city of the Komnenos Dynasty, and accommodates the empire's largest population. As the third holiest place for the

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Orthodox after Jerusalem and Hagion Oros (the Holy mountain) (Ayar, 2017), the valley accommodates the Meryemana (Sümela), Vazelon and Kuştul monasteries and the most renowned samples of these cultural/historical artifacts. However, having hosted communities of various ethnic and religious backgrounds, as well as cultures, throughout its history, the valley accommodates many architectural works besides its monasteries that do not attract attention, but these continue to exist silently.

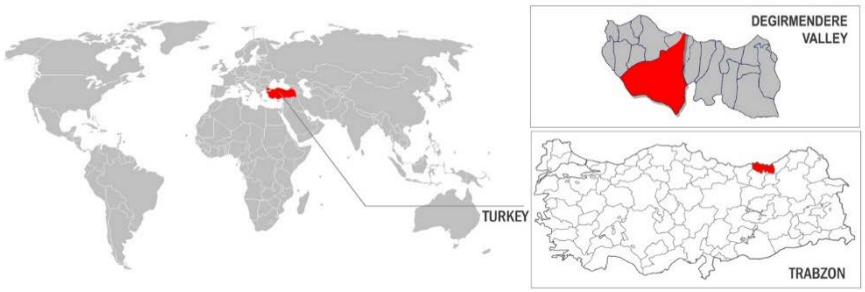

Figure 1. Geographical location of Trabzon-Değirmendere Valley, Turkey (Prepared by Authors).

The valley hosted a dense, non-Muslim population consisting of Orthodox Christians called Greeks, from the conquest of Trabzon by the Ottoman in 1461 until the beginning of the 20th century, it seems that the non-Muslim artifacts pertaining to the Ottoman period have been neglected. The level of the building stock potential is not exactly known other than the three large monasteries which are most renowned and mainly registered by the Cultural Heritage Preservation Board and the churches which were converted into mosques following the Ottoman conquest. Hence, there is no doubt that there are several non-Muslim places of worship, most of which were built in the 19th century and used as pastures, meadows, barns, stables, etc. They are present in addition to the buildings which functioned as places of worship until new mosques were built (yet, it can be said that these group of buildings are fortunate in terms of preservation).

Many questions on matters such as whether the rise in construction of churches in Ottoman, particularly upon granting extensive rights and privileges to non-Muslims after the 1839 Imperial Edict of Gülhane and 1856 Imperial Edict of Reform (Pekak, 2009) had any correspondence in Değirmendere Valley and its branches too, and which qualities the buildings that were built if a construction practice is in question and whose traces have been erased until now or perhaps are being erased today had are still awaiting answer.

It aims to reveal the non-Muslim places of worship established as a result of the political and social dynamics that took place in the course of history when the Ottoman Empire ruled, starting with the conquest of Trabzon in 1461 until the Turkish-Greek population exchange in the region in 1923.

It is known that construction activities continued in their traditional form in the Ottoman Empire while it was obligatory to receive permit for the construction and repair of churches, even in villages. Although it

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is known that the activities in question are mostly not reflected in the documents, it is obvious that the area itself contains data that will provide the answer for many of the questions quoted above. In this study, answers to these questions were sought through use of archival documents, travel books and buildings referred in current studies, as well as tracing method conducted directly in the area. Considering the Değirmendere Valley provides a large and extensive settlement, Hamsiköy Valley which is a branch of it, extending from the center of Maçka to Zigana in the south, was selected as the area of study. The main reason for the research covering Hamsiköy Valley is that the valley has the densest non-Muslim population and accordingly, the building stock compared to the other four valley branches following the Ottoman conquest. Another reason is that these buildings were distributed evenly across the valley and spread over too many settlements instead of being concentrated on one place.

This study intends through a field work, to trace and document the places of worship built by non-Muslims in Hamsiköy Valley, which is a branch of Değirmendere Valley, which once had the densest non-Muslim population, not included in the current literature or not made subject to comprehensive determinations and analyses (either survived until now or demolished due to various reasons). In line with the purpose established, the study was configured on three basic steps. The first step consists of creating an inventory of non-Muslim places of worship located in Hamsiköy Valley, which are included in the literature, by examining archival documents, travel books Committe of Conservation of Cultural Assets (CCCA) registration forms and current researches. Within this context, the names, location, etc. data obtained from the literature about the buildings together with the data and the route where the study would be carried out was determined and the field work was planned in communication with the mukhtars of the quarters in order to carry out on-site identification work quickly and without interruption. In the second step of the study, on-site identification studies were carried out as accompanied by the local people who were contacted. All registered and unregistered buildings that can be reached in the area have been identified on site at this stage. Coordinates of 19 buildings which are the subject of the study and cannot be associated with the buildings whose names are found in the literature were established, measurements were conducted if the building/remnant is existing and schematic plans were drawn and photographs were taken to create a visual archieve. The third step of the study includes the documentation and examination of the data obtained in the field. Inventory forms containing the name of the buildings, villages/quarters they are located in, registration status, original function, current situation, material and construction technique, coordinate information, as well as sketches and photographs thereof were generated for 19 buildings/remnants identified in the area for this purpose. Also, maps were generated in order to document the positions/locations of the

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remnants that were destroyed and generally covered by dense vegetation, and moreover, to demonstrate their relations with each other and the topography of the area. The buildings were processed on the maps generated via Google Maps and Google Earth based on coordinate information of their location while creating the maps. The buildings that are identified to be churches are named as churches/chapels since their structural integrity is not impaired and/or the plan diagrams are legible in the evaluation of the existing conditions of the identified buildings. Even if the other remnants are referred to as a church by oral sources, they are named as buildings when the available data are insufficient to assert that the building in question is a church or chapel. These names are coded as C (church) and B (Building) to facilitate reading generated inventory forms and maps. All written and visual documentation obtained after the inventory study were evaluated both in the context of ground-building and examined together with the geographical, commercial and demographic dynamics of the valley.

GENERAL INFORMATION ABOUT THE HAMSIKOY VALLEY

Historical Background

Hamsiköy is located 50 km from the center of Trabzon and 20 km from Maçka district. Located within the borders of Maçka district and known as a village until 2012, Hamsiköy became a quarter in 2012 with Trabzon becoming a metropolitan city. While the exact period of settlement in the Değirmendere Valley, which has always been an important hub because of its strategic location, is unknown, the region's history can be traced back to 1000BC since it is inextricably linked to Trabzon (Durmuş, 2010). Some historians state that the name Hamsiköy derives from the archaic Hellenic word “Xemadia” which means winter quarters, wintering place, while others state that it derives from the word “Hasi”, that is, the 5 cold months of the year, based on the climate or geography of the region (Karagöz, 2006). With its accessible and secure location, Hamsiköy Valley has always been a renowned area available settlement throughout history. While the autochthonous people of the Eastern Black Sea Region lived in the 400s BC according to Ksenephon, the first written source on the region's history (Ksenephon, 2011), various Turkish groups from the Caucasus and Central Asia settled in and around Değirmendere Valley and influenced the region socially, culturally, and economically (Tellioğlu, 2009). It was ruled by Alexander, King of Macedonia since 312 BC, by Pontus State since 280 BC, by Roman Empire from 63 BC to 395 AD and by the Eastern Roman Empire until the foundation of Komnenos Dynasty in 1204 (Aydın, 1997). Formerly ruled by Komnenos, with the conquest of the city of Trabzon by Mehmet the Conqueror in 1461, the valley was also annexed to the Ottoman. Hamsiköy Valley and Değirmendere, of which it is a branch, continued to be important in the Ottoman period as a caravan route connecting the coastline to the interior from the early periods of

its history. During this period, it gained the attribute of a military route and played an important role in the transportation of submunitions and foodstuff, which are brought to Trabzon by sea, to the inner regions and the eastern border (Aygün, 2005). Although the administrative change has caused no change in the commercial and military significance of the valley, it is possible to indicate that a demographic transformation has occurred in the region as a consequence of the settlement policies implemented. While the presence of Muslim Turks in the region increased upon the conquest, it is known that non-Muslim ethnic groups lived in the region for a long time. It is known that the density of Christian population was high in the region, the Greeks left the region with the population exchange following the War of Independence and the Turks were settled after 1923 (Durmuş, 2010). Although the region is a strategic location which has been referred to as the entrance gate of Trabzon or the Eastern Black Sea Region throughout history thanks to the geographical passages it features, this ancient route started to be used as a road with the new highway opened in 1989, as well as offering access to the plateaus and neighborhood settlements, as well as a voyage route for tourism purposes (Kadıoğlu, 2006).

Figure 2. Google Earth view of Değirmendere Valley's topography (Processed from Google Earth by Authors).

Geography of the Valley: Topography/Connections/Mountain Passes/Trade Routes

Değirmendere Valley is distinguished from other valleys in the Eastern Black Sea Region as it is geographically quite far from the coast and features several valley systems. Having an extensive basin, the valley is divided into five branches as Galyan diverging to the east from a point near Esiroğlu, Meryemana diverging to the south from a point near Maçka center, Larhan diverging from the west of this branch, Hamsiköy extending from Maçka center to Zigana on the south, and as the valleys that Mulaka Rivers flow, upon diverging from Çatak vicinity to the west after a short distance from the center (Figure 2-3).

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Hamsiköy Valley, among these branches, stands out with its topography which offers the most suitable option for settlement in this valley network, which does not feature wide plains, providing passage to mountainous areas through its very steep slopes. The valley is bounded on the north by Değirmendere, on the east by Larhan, on the west by Mulaka Valleys, and on the south by Gümüşhane. The suitable topographic structure of Hamsiköy Valley, which offers isolated living spaces for many communities who want to be out of sight also made it possible to establish a lot of churches spreading deep in the valley.

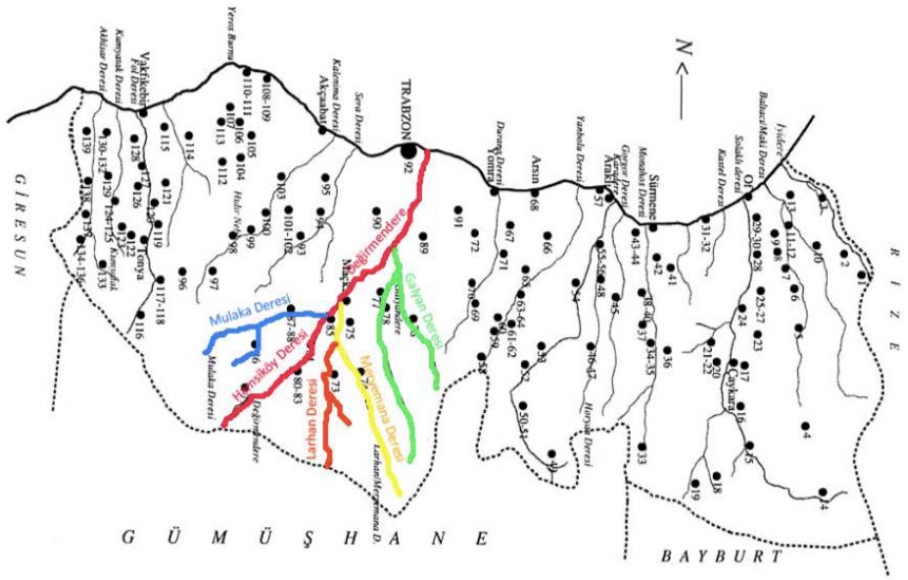

Figure 3. Map showing Değirmendere Valley and its branches (Processed from Brendemoen, 2002; Kazaz, 2016).

The route which is the oldest one and recorded in writing in the region which also comprises Hamsiköy Valley, where the flat land is rarely found, the mountains rise and the valleys get deeper as moving away from the coast was the route used by Greek mercenaries, in other words, the Ten Thousand in 400s BC for the military expedition called Anabasis to pass through Anatolia and reach Trabzon Port (Ksenephon, Anabasis Onbinlerin Dönüşü, 2011). The oldest road that connects the valley to its surrounding are the military roads built by Roman Empire in the mountains surrounding the Trabzon region to secure the east of Trabzon, along with military arrangements (69-79 AD). Over time, through addition of new secondary roads to these existing ones in accordance with the political and geographical conditions of the era, the mobility in commercial and military activities was made more fluent (Özsait, 2000). Considering the proximity of the valley to Trabzon, which is a coastal town, additional trade routes come into question in addition to these peripheral connections, which were initially provided for security reasons only. While these roads were connecting the Black Sea and Eastern Anatolia by extending through Değirmendere Valley, the relationship established with the southern regions caused the valley to gain strategic importance (Öztürk, 2011). Caravan routes were established on two routes for summer and winter according to the

geographical and climatic structure of the valley, suitable for commercial transport, providing access to Anatolian midlands from Trabzon port. The first route, known as the winter road, starts by following Değirmendere Valley, which flows to the Black Sea in the east of Boztepe in Trabzon, and follows the valley to the south, climbing the slopes of the valley and reaching to Zigana Pass located at an altitude of 2000 meters by passing over Hortokop, Yayandon, Hamsiköy, as with their former names. And the summer road follows various routes depending on the accommodation locations (Taşkın, 2008).

While the valley exhibits the character of a link between the coastal-midland areas with the roads on it, it has become a principal trade route with the layover-accommodation and assembly points as a spatial organization requirement related to trade. Also, the villages in Hamsiköy branch, which provide a connection to Zigana for the region, have also played a significant role especially in ensuring the security of these routes.

Demographic Structure and Population Movements

The large region in which Hamsiköy Valley is located hosts three large monasteries (Meryemana/Sümela, Vazelon and Kuştul Monasteries) that are highly important for the Orthodox Christian sect. The region is still considered as the third holy place for the Orthodox after Jerusalem and Hagion Oros (the Holy mountain), today (Ayar, 2017). So to say, the endued sanctity is among the significant factors which determine the ethnic and demographic fate of the valley. The region constitutes an exception with regard to the changes that occur mainly as a part of a tradition in many regions of Anatolia. It remained outside of the circle formed around it by Turkish-Islamic states for a long time until 1461, when the Komnenian Dynasty ended. As a matter of fact, the former people of the region were not affected by such change too much for a long time following the Ottoman conquest. The majority of the local inhabitants embraced Islam only in the second century of the Ottoman rule. It is also known that many of these Muslims, who were the descended from the former Byzantine inhabitants still continue to speak their mother tongue (Meeker, 2005).

The register books prepared for Trabzon right after the conquest (1468, 1523, 1553, 1583) and the provincial yearbooks of later date provide intriguing results regarding the Muslim/non-Muslim population of the Ottoman Period (Lowry, 2005). The Muslim population brought from other locations was settled in this holy area as a part of the settlement policy enforced upon the Ottoman conquest, which resulted in an increase in the number of Muslims in time. However, the census conducted nearly 120 years after the conquest indicates that the non-Muslim population in the region is still considerably higher than the Muslim population. In fact, the non-Muslim population increased even more as a result of the political decisions made by the Ottoman Empire towards mid-19th century. Actually, according to the population records

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pertaining to the 19th century dated 1842-1845, it is understood that only Muslims lived in 14 of the 40, Muslims and non-Muslims lived in 15, and only non-Muslims lived in the remaining 11 village settlements in the region (Jennings, 1986) (Table 1-2).

As a matter of fact, Hamsiköy Valley hosts the densest non-Muslim population of Değirmendere Valley (Table 1). The fact that Hamsiköy Valley is a branch of it, which constitutes the southern link of the region which is far away from the coast and Trabzon can also be suggested to have an effect on dense non-Muslim population. The influence of Vazelon Monastery, which is located in the south of Hamsiköy and being one of the three important large monasteries for the Orthodox Christian world and is known to have higher authorities than other monasteries (Bryer et al., 2002), on the population cannot be overlooked.

Table 1. Villages accommodating non-Muslim population in branches of Değirmendere Valley according to population data dated 1835-1845 (Durmuş, 2011)

	DEGIRMENDERE VALLEY				
	GALYAN	**MERYEMANA**	**LARHAN**	**HAMSIKOY**	**MULAKA**
Quarters of Non-Muslims	Kuşçu	Meryemana	Ardıçlıyayla	Hamsiköy	Çeşmeler
	Yemişli	Kozağaç	Coşandere	Güzelyayla	Ocaklı
	Alataş	Ortaköy	Akarsu	Çıralı	
	Kuştul			Anayurt	
				Bağışlı	
				Başar	
				Gürgenağaç	
				Dikkaya	

The distribution of population in the valley, the origin of the distribution, beliefs and social life differ from other valleys in the region according to the Timar Register of 1486, the Population Record of 1835 and Trabzon Provincial Yearbook of 1876. No signs of Armenians or any other nation have been found in Hamsiköy Valley. Muslim-Greek or Muslim-Orthodox Christians are residing here (Durmuş, 2011; Emiroğlu, 2002).

Table 2. Population distribution of Hamsiköy Valley according to 1486 timar register, 1835-45 population record and 1876-77 provincial yearbook (Durmuş, 2011; Emiroğlu, 2002)

	1486 TIMAR REGISTER			1835-1845 POPULATION RECORD			1876-1877 YEARBOOK		
QUARTERS	**NM**	**M**	**F**	**NM**	**M**	**F**	**NM**	**M**	**F**
Güzelce / Bondila	124	?	24	130	305	71	926	59	526
Sukenarı / Hamurya	149	?	29	277	102	117	473	32	?
Köprüyanı / Sahanoy	40	?	8	149	35	27	?	?	?
Hamsiköy / Habsi	31	-	6	341	-	60	502	-	215
Anayurt / Kıransa	5	-	1	164	-	57	?	?	?
Bağışlı / Konaka	112	-	22	8	-	1	194	85	99
Dikkaya / Zavera	15	-	3	?	-	?	?	?	?
Başar / İstama	?	-	?	101	-	34	?	?	?
Yazılıtaş / Yanandoz	?	?	?	66	?	25	?	?	?
Güzelyayla / Ferganlı	?	-	?	38	-	119	?	?	?
Çıralı / Melanlı	?	-	?	?	-	?	68	?	36

* Acronyms in the table have their corresponding meanings as NM: Non-Muslim, M: Muslim, F: Family
* ?: Popoulation details are unknown

According to the population information of Hamsiköy Valley, while Muslim and Christian populations live together in Güzelce/Bondila,

Sukenarı/Hamurya, Köprüyanı/Sahanoy villages; Hamsiköy/Habsi, Güzelyayla/Ferganlı, Çıralı/Melanlı, Dikkaya/Zavera, Anayurt/Kıransa, Bağışlı/Konaka, Başar/İstama, Gürgenağaç/Yanakandoz villages are registered as Christian villages (Durmuş, 2011) (Table 2).

While a large part of the valley was populated by of Orthodox Christians, who were called Greeks, until the beginning of the 20th century, the Greek people moved away from the region as a result of the population exchange that took place after the Russian War dated 1918 and Lausanne Treaty signed in 1923 and people from different parts of Trabzon were made to settle in the vacant places. Particularly, some of the newly built churches would have to be abandoned before they could be completed (Durmuş, 2010).

OTTOMAN PERIOD NON-MUSLIM PLACES OF WORSHIP IN HAMSİKÖY VALLEY

The Değirmendere Valley region, in which the Hamsiköy Valley is located, has importance in terms of its unique geographical structure and its diversified social-cultural texture. It is indisputable that the geographical structure of the region was one of the decisive factors in its cultural formation, as well as the construction activities. Without any doubt, this has been the most basic element that determined the character of the commercial settlement pattern, together with the region's distinct topography. The fact that people lived in the region continuously–as early as the Ottoman conquest–was decisive in the formation of architectural culture in relation to the political, economic, and social dynamism observed in the history of the region. Nonetheless, the Ottoman Empire protected non-Muslims' freedom of religion and conscience, as well as their lives, property, and honor (Pekak, 2009). It is seen that the Ottoman Empire did not follow a policy of making radical changes through Islamization movements in the region but followed a policy of maintaining the balance between Muslims and non-Muslims rather than completely Islamizing the region (Bilgin, 2007). Even though a flexible attitude was not demonstrated towards places of worship as it was in other matters, repairs were permitted now and then and construction of new buildings were permitted in later periods when necessary. In particular, the criterion of being ancient (existing at the time of the conquest) was sought in the construction and repair of places of worship belonging to non-Muslim populations, which became ruined over time, suffered fires and earthquakes or became insufficient due to population increase. If the church was ancient, it was either not touched or allowed to be repaired; if not, it was demolished or not allowed to be repaired (Kenanoğlu, 2004). While it was stipulated that the existing plan type and dimensions should be preserved if repair was needed, the reconstruction of a church was only permitted if it could be proven that a church was present there in the past and could be built in the same place with the same properties (Karaca, 2008).

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Although these policies regarding the construction activities of non-Muslims were implemented consistently, it is clear that the arrangements made particularly with 1839 Gülhane and 1856 Reform Imperial Edicts after Treaties of Küçük Kaynarca and Aynalı Kavak signed in the 18th century, were in favor of non-Muslims. Although the issue of obtaining permit continued, many new churches, most of which are large, were built in almost every part of Anatolia especially after the second half of the 19th century, since such would not have caused any restriction in the construction activities of non-Muslims (Eryılmaz, 1990). On the other hand, apart from the edicts released by the state, the priests encouraging everyone who "wants to get entitled to a mansion from heaven" for building a church can be considered as another triggering reason for such increase in construction of churches (Bilgin, 1990).

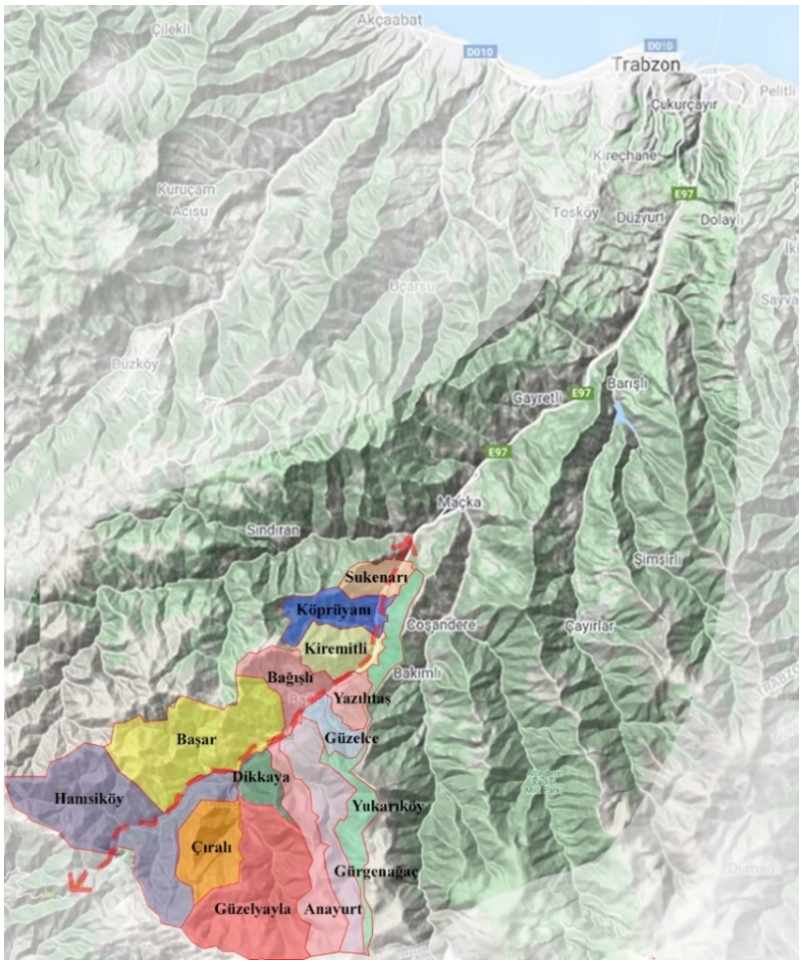

Figure 4. Settlements-quarters in Hamsiköy Valley (Processed from Google Maps by Authors).

In contrast to the usual increase in the Muslim population and mosque construction that we are accustomed to seeing in many parts of Ottoman Anatolia, Hamsiköy Valley draws attention with its non-Muslim population, its prevalence of churches and the influence these had, along with the freedom of belief provided by new regulations enacted by the state and the freedom in construction of places of worship. This caused a serious increase in the number of churches in the region, as in almost

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every region of Anatolia, especially since the 19th century. Hence, while the total number of churches across 20 non-Muslim settlements has been 30 until 1856, the number of churches in Değirmendere Valley, which includes Hamsiköy, reached 80 in 1879 (Durmuş, 2013), summarizing the reflections of the state-wide practices in the district setting. However, they had to move away due to the population exchange between Turkey and Greece after the Treaty of Lausanne signed in 1923 and it was not possible for some buildings in construction to be completed.

These buildings, which were built during the Ottoman Period, are scattered over a total of 14 quarters in today's Hamsiköy Valley, including the quarters of Anayurt, Bağışlı, Başar, Çıralı, Dikkaya, Gürgenağaç, Güzelce, Güzelyayla, Hamsiköy, Kiremitli, Köprüyanı, Sukenarı, Yazılıtaş and Yukarıköy (Figure 4).

A total number of 47 non-Muslim worship places were identified in Hamsiköy Valley in the current literature. Only 14 of these 47 buildings could be located during the land study. Further 19 structures that could not be matched with the literature information were identified during the field work. Within this framework, while there is a possibility that the 19 buildings identified in the area may coincide with these 47 buildings, information on existence of a total number of 66 structures has been obtained as 7 in Anayurt, 10 in Bağışlı, 8 in Başar, 4 in Çıralı, 3 in Dikkaya, 7 in Gürgenağaç, 3 in Güzelce, 2 in Güzelyayla, 4 in Hamsiköy, 6 in Kiremitli, 3 in Köprüyanı, 2 in Sukenarı, 3 in Yazılıtaş and 4 in Yukarıköy. 14 of these buildings that can be found in the current literature and that can be identified in the area are as follows; 1 in Anayurt, 3 in Bağışlı, 1 in Gürgenağaç, 1 in Hamsiköy, 4 in Kiremitli, 1 in Sukenarı and 3 in Yukarıköy (Table 3).

Table 3. Non-Muslim places of worship in Hamsiköy Valley

	Places of Worship in the Literature			Places of Worship in the Literature and that have been Located	Found in the Fieldwork But not Matched with Places of Worship in the Literature	
Anayurt Quarter	**1**	Anayurt Quarter Mosque	(CCCA Archive; Durmuş, 2011; İmamoğlu, 2014)	Anayurt Quarter Mosque	-	
	2	?	?	?	Unnamed Church I	**C1**
	3	?	?	?	Unnamed Church II	**C7**
	4	Church with Umbrella	(Bryer & Winfield 1985)	?	?	
	5	St. Anna Church	(Bryer & Winfield 1970)	?	?	
	6	Theotokos Church	(Bryer & Winfield 1985)	?	?	
	7	Theotokos Monastery	(Bryer & Winfield 1985)	-	-	
Bağışlı Quarter	**8**	Unnamed Church I	(CCCA Archive)	Unnamed Church I	-	
	9	Unnamed Church II	(CCCA Archive; Sümerkan & Okman, 1999)	Unnamed Church II	-	
	10	Unnamed	(CCCA Archive)	Unnamed	-	

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		Chapel I		Chapel I		
	11	St. Basil Church	(Bryer & Winfield 1985)	?	?	
	12	St. Gregory Church	(Bryer & Winfield 1985)	?	?	
	13	St. Pankratios Church	(Bryer & Winfield 1985)	?	?	
	14	St. Constantine Church	(Bryer & Winfield 1985)	?	?	
	15	St. Helen Church	(Bryer & Winfield 1985)	?	?	
	16	St. (Theodore) Gabras Chapel	(Bryer & Winfield 1985)	?	?	
	17	St. Gregory of Nyssa Monastery	(Bryer & Winfield 1985)	-	-	
Başar Quarter	**18**	?	?	?	Unnamed Church I	**C2**
	19	?	?	?	Unnamed Church II	**C8**
	20	?	?	?	Unnamed Building I	**B8**
	21	St. Cosmas St. Damian Church	(Bryer & Winfield 1985)	?	?	
	22	St. Longinos Church	(Bryer & Winfield 1985)	?	?	
	23	St. John Prodromos Church	(Bryer & Winfield 1985)	?	?	
	24	St. Sabbas Church	(Bryer & Winfield 1985)	?	?	
	25	St. Nicholas Church	(Bryer & Winfield 1985)	?	?	
Çıralı Quarter	**26**	?	?	?	Unnamed Building I	**B4**
	27	Holy Savior Church	(Bryer & Winfield 1985)	?	?	
	28	St. John Chrysostom Church	(Bryer & Winfield 1985)	?	?	
	29	The Taxiarchai Church	(Bryer & Winfield 1985)	?	?	
Dikkaya Quarter	**30**	?	?	?	Unnamed Church I	**C9**
	31	Unnamed Church II	(Durmuş, 2011)	?	-	
	32	St. Christopher Church	(Bryer & Winfield 1985)	?	?	
Gürgenağaç Quarter	**33**	Gürgenağaç Quarter Mosque	(CCCA Archive; Sümerkan & Okman, 1999)	Gürgenağaç Quarter Mosque	-	
	34	?	?	?	Unnamed Church I	**C3**
	35	?	?	?	Unnamed Building I	**B9**
	36	Theotokos Church	(Bryer & Winfield 1985)	?	?	
	37	St. George of Rachata Church	(Bryer & Winfield 1985)	?	?	
	38	Evangelistria Chapel	(Bryer & Winfield 1985)	?	?	
	39	Theotokos Lachanas Monastery	(Bryer & Winfield 1985)	?	?	
Güzelce Quarter	**40**	?	?	?	Unnamed Builidng I	**B5**
	41	?	?	?	Unnamed Building II	**B10**
	42	Unnamed Church III	(CCCA Archive; Sümerkan & Okman, 1999)	?	-	
Güzelyayla Quarter	**43**	?	?	?	Unnamed Church I	**C4**
	44	?	?	?	Unnamed Building I	**B1**
Hamsiköy Quarter	**45**	Hamsiköy Mosque	(CCCA Archive; Sümerkan & Okman, 1999)	Hamsiköy Mosque	-	
	46	?		?	Unnamed Building I	**B2**

	47	Koimesis of Theotokos Church	(Bryer & Winfield 1970)	?	?	
	48	Holy Savior Chapel	(Bryer & Winfield 1985)	?	?	
Kiremitli Quarter	**49**	?	?	?	Unnamed Church I	**C5**
	50	?	?	?	Unnamed Building I	**B3**
	51	Panagia Keramesta	(CCCA Archive; Sümerkan & Okman, 1999)	Panagia Keramesta	-	
	52	Vazelon Monastery	(CCCA Archive; Bryer et al., 2002)	Vazelon Monastery	-	
	53	Church of Vazelon Monastery	(CCCA Archive; Bryer et al., 2002)	Church of Vazelon Monastery	-	
	54	Chapel of Vazelon Monastery	(CCCA Archive; Sümerkan & Okman, 1999)	Chapel of Vazelon Monastery	-	
Köprüyanı Quarter	**55**	?	?	?	Unnamed Church I	**C6**
	56	The Taxiarchai Church	(Bryer & Winfield 1985)	?	?	
	57	Gregory of Neocaesarea Church	(Bryer & Winfield 1985)	?	?	
Sukenarı Quarter	**58**	Sukenarı Quarter Mosque	(CCCA Archive)	Sukenarı Quarter Mosque	-	
	59	?	?	?	Unnamed Building I	**B6**
Yazılıtaş Quarter	**60**	?	?	?	Unnamed Building I	**B7**
	61	St. Eugenios Church	(Bryer & Winfield 1985)	?	?	
	62	St. Marina Chapel	(Bryer & Winfield 1985)	?	?	
Yukarıköy Quarter	**63**	Unnamed Church I	(CCCA Archive)	Unnamed Church I	-	
	64	Unnamed Chapel I	(CCCA Archive)	Unnamed Chapel I	-	
	65	Unnamed Chapel II	(CCCA Archive)	Unnamed Chapel II	-	
	66	Ayane Monastery	(Durmuş, 2013)	-	-	

A total number of 19 buildings identified during the field work, however, which could not be matched with 47 buildings included in the current literature were distributed as 2 in Anayurt Quarter, 3 in Başar Quarter, 1 in Çıralı Quarter, 1 in Dikkaya Quarter, 2 in Gürgenağaç Quarter, 2 in Güzelce Quarter, 2 in Güzelyayla Quarter, 1 in Hamsiköy Quarter, 2 Kiremitli Quarter, 1 in Köprüyanı Quarter, 1 in Sukenarı Quarter and 1 in Yazılıtaş Quarter (Table 4).

While it became known that out of 47 buildings identified in Hamsiköy Valley from from the literature, 2 were built before the Ottoman Period (...-1461), 3 were built before the Tanzimat Reform era (1461-1839), and 3 were built after Tanzimat Reform era (1839-...) (Zerzelides, 1959; Sinclair, 1989; Durmuş, 2011), information on dates of construction of the remaining 39 buildings could not be reached. While it became known that out of 14 buildings, whose locations could be identified, 2 were built before the Tanzimat Reform era (1461-1839), 3 were built after the Tanzimat Reform era (1839-...) (Durmuş, 2011), information on dates of construction of the remaining 9 buildings could not be reached. It is not possible to reach a definite judgment on the construction date of the 19 buildings that are the subject of the study. It

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is not possible to reach a definite judgment on the construction date of the 19 buildings that are the subject of the study.

Table 4. 19 buildings that could not be matched with 47 buildings in the current literature

NAME OF QUARTER	NAME OF BUILDING		CURRENT STATE
Anayurt Quarter	C1	Anayurt-Unnamed Church I	Still Standing
	C7	Anayurt-Unnamed Church II	Demolished-Quarter is Known
Başar Quarter	C2	Başar-Unnamed Church I	Still Standing
	C8	Başar-Unnamed Church II	Demolished-Quarter is Known
	B8	Başar-Unnamed Building I	Cannot Be Located
Çıralı Quarter	B4	Çıralı-Unnamed Building I	Another Building/Mosque is Built Over
Dikkaya Quarter	C9	Dikkaya-Unnamed Church I	Demolished-Quarter is Known
Gürgenağaç Quarter	C3	Gürgenağaç-Unnamed Church I	Still Standing
	B9	Gürgenağaç-Unnamed Building I	Cannot Be Located
Güzelce Quarter	B5	Güzelce-Unnamed Building I	Another Building/Mosque is Built Over
	B10	Güzelce-Unnamed Building II	Cannot Be Located
Güzelyayla Quarter	C4	Güzelyayla-Unnamed Church I	Still Standing
	B1	Güzelyayla-Unnamed Building I	Demolished-Quarter is Known
Hamsiköy Quarter	B2	Hamsiköy-Unnamed Building I	Demolished-Quarter is Known
Kiremitli Quarter	C5	Kiremitli-Unnamed Church I	Still Standing
	B3	Kiremitli-Unnamed Building I	Another Building/Mosque is Built Over
Köprüyanı Quarter	C6	Köprüyanı-Unnamed Church I	Still Standing
Sukenarı Quarter	B6	Sukenarı-Unnamed Building I	Another Building/Mosque is Built Over
Yazılıtaş Quarter	B7	Yazılıtaş-Unnamed Building I	Another Building/Mosque is Built Over

While some of the buildings among those, which still exist today, preserve their genuine structure, some of the remaining were destroyed and some of them have been replaced by another structure (mosque/masjid) constructed or are known only for their property. It was revealed that among 19 buildings considered within scope of the study, 1 (Kiremitli-Unnamed Church I) has partially preserved structural integrity, 4 (Anayurt-Unnamed Church I, Başar-Unnamed Church I, Gürgenağaç-Unnamed Church I, Güzelyayla-Unnamed Church I) have fully preserved foundations and partially preserved walls; 1 (Başar-Unnamed Church II) has only walls preserved and impaired structural integrity; 5 (Dikkaya-Unnamed Church I, Güzelyayla-Unnamed Building I, Hamsiköy-Unnamed Building I, Gürgenağaç-Unnamed Building I, Güzelce-Unnamed Building I) have been fully destroyed, 5 (Kiremitli-Unnamed Building I, Çıralı-Unnamed Building I, Güzelce-Unnamed Building I, Sukenarı-Unnamed Building I, Yazılıtaş-Unnamed Building I) have been fully destroyed and replaced by another structure/mosque constructed. The remaining 3 buildings (Anayurt-Unnamed Church II, Köprüyanı-Unnamed Church I, Başar-Unnamed Building I) could not be reached due to valley topography and the current status of the building could not be identified since on-site examination of the building could not be carried out.

INVENTORY

Buildings Still Standing Today

C1-Anayurt-Unnamed Church I: It is located in Trabzon province, Maçka District, Anayurt Quarter, Countryside Vicinity, lot 104 and plot 6. Being built on a sloped land, the main walls of the church are below the ground level. While the foundation walls of the building are intact,

only some of the main walls have survived. It measures 4m-1.6m inside-to-inside, oriented east-west and has a single apse. Remains of frescos in red and yellow are present on the northern main wall (Table 5).

Table 5. Inventory form of Anayurt-Unnamed Church I in Hamsiköy Valley

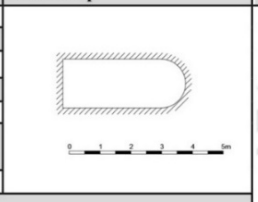
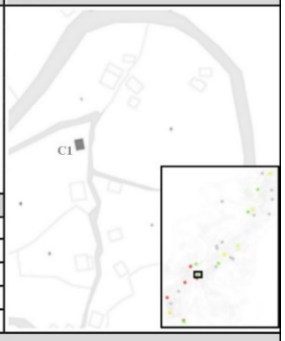
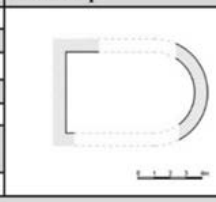
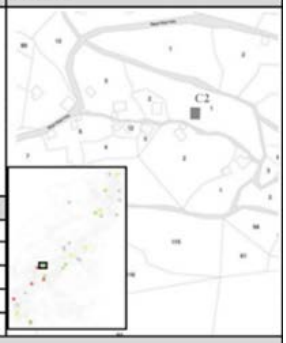
HAMSIKOY VALLEY – ANAYURT QUARTER			C1
ANAYURT-UNNAMED CHURCH I			
Province	**Coordinates**	**Sketch Map**	**Position**
Trabzon	40°42'30.24"N, 39°30'27.00"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Anayurt	Unknown		
Construction System	**Construction Material**		
Masonry	Rubble Stone		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			
Structural integrity is impaired		Wall + Roof	
		Wall	X
		Foundation	X
Photos			
			

Table 6. Inventory form of Başar-Unnamed Church I in Hamsiköy Valley

HAMSIKOY VALLEY – BASAR QUARTER			C2
BASAR-UNNAMED CHURCH I			
Province	**Coordinates**	**Sketch Map**	**Position**
Trabzon	40°42'56.34"N, 39°30'20.93"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Başar	Unknown		
Construction System	**Construction Material**		
Masonry	Rubble Stone		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			
Structural integrity is impaired		Wall + Roof	
		Wall	X
		Foundation	X
Photos			
			

C2-Başar-Unnamed Church I: It is located in Trabzon province, Maçka District, Başar Quarter, Taşlı Vicinity, lot 153, plot 1. It is situated in the woodland located 150m east of Başar Quarter Mosque. While the foundation walls of the building are intact, the western and northern main walls are partially surviving and the remaining walls are completely destroyed. The church measures 5-8.3m inside-to-inside and has a single apse and a barrel vault dome. The church's apse and the

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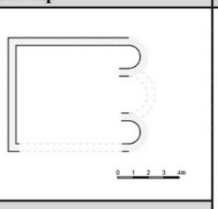
southern main walls have been mostly ruined. It is thought that the vault roofing was supported by a row of columns and semicircular arches connected to these columns, as understood from the columns on the north wall, which are partially more intact and have average thickness of 80cm (Table 6).

C3-Gürgenağaç-Unnamed Church I: It is located in Trabzon province, Maçka District, Gürgenağaç Quarter, Lahanoz Vicinity, lot 127 and plot 4. The church is oriented in east-west direction, with three naves and features a basilica plan. Measuring 7.4m-9m outside-to-outside, the northern body wall of the church has been partially ruined, the western and southern main walls have been mostly ruined, and the roofing system has been completely ruined. Traces of window openings can be found in the apse which is partially intact. However, it is not possible to reveal the shapes and numbers of window openings due to dense vegetation. The naos is being used as a chicken coop (Table 7).

Table 7. Inventory form of Gürgenağaç-Unnamed Church I in Hamsiköy Valley

HAMSIKOY VALLEY – GURGENAGAC QUARTER			C3
GURGENAGAC-UNNAMED CHURCH I			
Province	**Coordinates**	**Sketch Map**	**Position**
Trabzon	40°42'57.69"N, 39°31'35.05"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Gürgenağaç	Unknown		
Construction System	**Construction Material**		
Masonry	Rubble Stone		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			
Structural integrity is impaired		Wall + Roof	
		Wall	X
		Foundation	X
Photos			
			

C4-Güzelyayla-Unnamed Church I: It is located in Trabzon province, Maçka District, Güzelyayla Quarter, lot 106 and plot 21. The nave of which resting on four pillars, the apse and some of the main walls of the domed church were destroyed in the 1960s due to the use of wall stones of church in construction of other buildings. The window apertures on the south main wall of the church built of smooth face stone were covered and the entrance door was opened. Known to be used as a mosque in the past, the church is used as a warehouse today (Table 8).

C5-Kiremitli-Unnamed Church I: It is located in Trabzon province, Maçka District, Kiremitli Quarter, Countryside Vicinity, lot 107 and plot 5. Although the integrity of the building is partially preserved with its main walls and roof, its apse has been completely destroyed. The

interior of the church, which was built of face stone, has vault roofing (Table 9).

Table 8. Inventory form of Güzelyayla-Unnamed Church I in Hamsiköy Valley

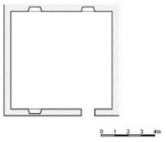
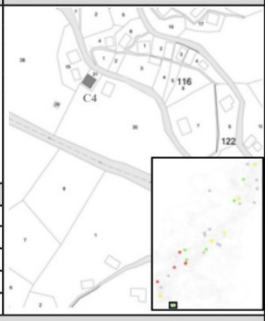
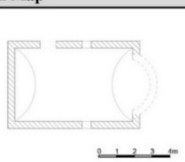
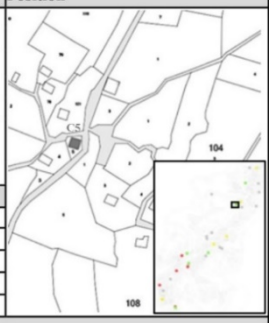
HAMSIKOY VALLEY – GUZELYAYLA QUARTER GUZELYAYLA-UNNAMED CHURCH I				C4
Province	**Coordinates**	**Sketch Map**		**Position**
Trabzon	40°40'31.1"N, 39°29'39.8"E			
District	**Other Name**			
Maçka	Unknown			
Quarter	**Date of Construction**			
Güzelyayla	Unknown			
Construction System	**Construction Material**			
Masonry	Rubble Stone			
Current State				
Structural integrity is preserved				
Completely demolished / Not in place				
Structural integrity is impaired		Wall + Roof		
		Wall	X	
		Foundation	X	
Photos				
				

Table 9. Inventory form of Kiremitli-Unnamed Church I in Hamsiköy Valley

HAMSIKOY VALLEY – KIREMITLI QUARTER KIREMITLI-UNNAMED CHURCH I				C5
Province	**Coordinates**	**Sketch Map**		**Position**
Trabzon	40°45'8.18"N, 39°33'14.55"E			
District	**Other Name**			
Maçka	Unknown			
Quarter	**Date of Construction**			
Kiremitli	Unknown			
Construction System	**Construction Material**			
Masonry	Rubble Stone			
Current State				
Structural integrity is preserved			X	
Completely demolished / Not in place				
Structural integrity is impaired		Wall + Roof		
		Wall		
		Foundation		
Photos				
				

C6-Köprüyanı-Unnamed Church I: It is located in Trabzon province, Maçka District, Köprüyanı Quarter, Countryside Vicinity, lot 126, plot 1. It is situated on a large rock, above the Trabzon-Gümüşhane road. Making a detailed description of the church, which was largely ruined, is not possible since it is closed to access (Table 10).

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Table 10. Inventory form of Köprüyanı-Unnamed Church I in Hamsiköy Valley

HAMSIKOY VALLEY – KOPRUYANI QUARTER			C6
KOPRUYANI-UNNAMED CHURCH I			
Province	**Coordinates**	**Sketch Map**	**Position**
Trabzon	40°46'37.28"N, 39°33'46.46"E	(Could not be reached to the land)	
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Köprüyanı	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			
Structural integrity is impaired		Wall + Roof	
		Wall	X
		Foundation	X
Photos			

Buildings that are Demolished, but with Known Land or Quarter

C7-Anayurt-Unnamed Church II: It is located in Trabzon province, Maçka District, Anayurt Quarter, Countryside Vicinity, lot 103 and plot 1. Thought to have existed on a rock called "church rock" by the inhabitants of the area, no remains of the church can be found. Since the rock on which the church is settled is fully covered with vegetation it is very difficult to determine the existence and location of the church (Table 11).

Table 11. Inventory form of Anayurt-Unnamed Church II in Hamsiköy Valley

HAMSIKOY VALLEY – ANAYURT QUARTER			C7
ANAYURT-UNNAMED CHURCH II			
Province	**Coordinates**	**Sketch Map**	**Position**
Trabzon	40°42'20.67"N, 39°30'22.78"E	(Could not be reached to the land)	
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Anayurt	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			

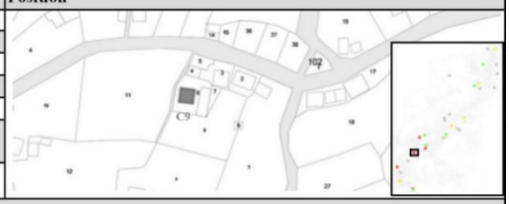
C8-Başar-Unnamed Church II: It is located in Trabzon province, Maçka District, Başar Quarter, lot 149 and plot 28. It is situated on what the locals of the quarter refer to as the church plain. Only remains of a 6.27m long wall are left from church, which was largely ruined (Table 12).

Table 12. Inventory form of Başar-Unnamed Church II in Hamsiköy Valley

HAMSIKOY VALLEY – BASAR QUARTER BASAR-UNNAMED CHURCH II			C8
Province	**Coordinates**	**Position**	
Trabzon	40°42'50.40"N, 39°30'2.16"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Başar	Unknown		
Construction System	**Construction Material**		
Masonry	Rubble Stone		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			
Structural integrity is impaired		Wall + Roof	
		Wall	X
		Foundation	
Photos			
			

C9-Dikkaya-Unnamed Church I: It is located in Trabzon province, Maçka District, Dikkaya Quarter, Top of Road Vicinity, lot 112 and plot 6. It is considered that the church, which is situated south of the Dikkaya Quarter Mosque, was demolished by the inhabitants of the quarter in the 1960s. Only a garden wall with dimensions of 14.5m-25m surrounding the church on four sides remains of the church (Table 13).

Table 13. Inventory form of Dikkaya-Unnamed Church I in Hamsiköy Valley

HAMSIKOY VALLEY – DIKKAYA QUARTER DIKKAYA-UNNAMED CHURCH I			C9
Province	**Coordinates**	**Position**	
Trabzon	40°42'9.69"N, 39°29'43.62"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Dikkaya	Unknown		
Construction System	**Construction Material**		
Masonry	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			
			

B1-Güzelyayla-Unnamed Building I: It is located in Trabzon province, Maçka District, Güzelyayla Quarter, lot 114 and plot 18. The building, situated 100m north of Güzelyayla Quarter Church I and on the side of the road was ruined. Inhabitants of the quarter state that a Greek

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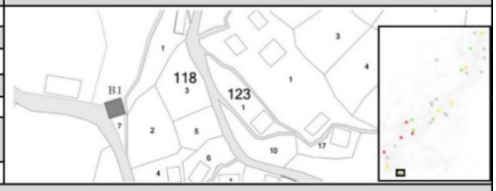
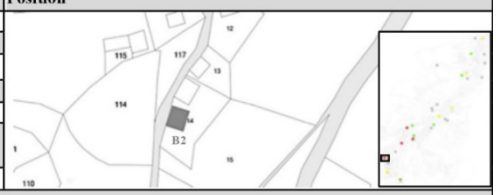
cemetery was used to be present to the west of the building in the past, but it was then filled and covered (Table 14).

Table 14. Inventory form of Güzelyayla-Unnamed Building I in Hamsiköy Valley

HAMSIKOY VALLEY – GUZELYAYLA QUARTER GUZELYAYLA-UNNAMED BUILDING I			B1
Province	**Coordinates**	**Position**	
Trabzon	40°40'32.90"N, 39°29'38.69"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Güzelyayla	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Fotoğrafları			
			

B2-Hamsiköy-Unnamed Building I: It is located in Trabzon province, Maçka District, Hamsiköy Quarter, Naraburnu Vicinity, lot 162 and plot 14. Making a detailed description is not possible since no information is available other than the details provided by the inhabitants of the quarter that it used to exist in the past but then was ruined (Table 15).

Table 15. Inventory form of Hamsiköy-Unnamed Building I in Hamsiköy Valley

HAMSIKOY VALLEY – HAMSIKOY QUARTER HAMSIKOY-UNNAMED BUILDING I			B2
Province	**Coordinates**	**Position**	
Trabzon	40°41'31.61"N, 39°28'44.37"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Hamsiköy	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			
			

The Ones with Another Building/Mosque Built Over Them

B3-Kiremitli-Unnamed Building I: It is located in Trabzon province, Maçka District, Kiremitli Quarter, Countryside Vicinity, lot 118 and plot 6. Domicile of an inhabitant of the quarter is situated on the site of the

destroyed building. However, the remains of the garden wall of the building can be found in the garden of the domicile (Table 16).

Table 16. Inventory form of Kiremitli-Unnamed Building I in Hamsiköy Valley

HAMSIKOY VALLEY – KIREMITLI QUARTER KIREMITLI-UNNAMED BUILDING I			B3
Province	**Coordinates**	**Position**	
Trabzon	40°45'13.49"N, 39°33'29.73"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Kiremitli	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			
			

B4-Çıralı-Unnamed Building I: It is located in Trabzon province, Maçka District, Çıralı Quarter, Countryside Vicinity, lot 106 and plot 18. Inhabitants of the quarter state that a Greek cemetery was used to exist to the south of the building in the past, then turned into a mosque and finally demolished by the early 1960's to build a school on the property. No remains of the Greek cemetery could be found. The school building, which was constructed on the building's property, is in ruins (Table 17).

Table 17. Inventory form of Çıralı-Unnamed Building I in Hamsiköy Valley

HAMSIKOY VALLEY – CIRALI QUARTER CIRALI-UNNAMED BUILDING I			B4
Province	**Coordinates**	**Position**	
Trabzon	40°40'53.18"N, 39°28'53.15"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Çıralı	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			
			

B5-Güzelce-Unnamed Building I: It is located in Trabzon province, Maçka District, Güzelce Quarter, Kıran Vicinity, lot 112 and plot 7. It is

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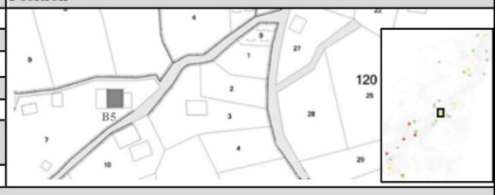
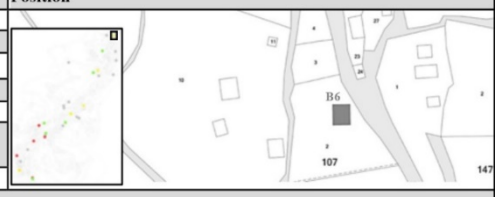
known to the inhabitants of the quarter that the building was demolished and a primary school building was constructed on its property (Table 18).

Table 18. Inventory form of Güzelce-Unnamed Building I in Hamsiköy Valley

HAMSIKOY VALLEY – GUZELCE QUARTER GUZELCE-UNNAMED BUILDING I			B5
Province	**Coordinates**	**Position**	
Trabzon	40°43'20.64"N, 39°31'54.84"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Güzelce	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			
			

B6-Sukenarı-Unnamed Building I: It is located in Trabzon province, Maçka District, Sukenarı Quarter, Bottom of Road Vicinity, lot 107 and plot 2. Sukenarı Quarter Mosque was built in 1972 on the property of the building which was destroyed and cannot reach today. It is not possible to make a detailed description since further information about the church was not available (Table 19).

Table 19. Inventory form of Sukenarı-Unnamed Building I in Hamsiköy Valley

HAMSIKOY VALLEY – SUKENARI QUARTER SUKENARI-UNNAMED BUILDING I			B6
Province	**Coordinates**	**Position**	
Trabzon	40°46'46.78"N, 39°34'31.29"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Sukenarı	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			
			

B7-Yazılıtaş-Unnamed Building I: It is located in Trabzon province, Maçka District, Yazılıtaş Quarter, Countryside Vicinity, lot 112 and plot

3. Yazılıtaş Quarter Köyiçi Mosque in situated on the property of the building, which was destroyed and could not survive until now. The imam of the mosque stated that the church was destroyed since the foundation of the church was not strong and the soil was poor.

It was stated that small chambers formed of four corners resembling a cellar and several human bones were found under the ground when excavating the foundation of the mosque's minaret and that the minaret was built at another point. 4 pillars and various objects pertaining to the church are found in the courtyard of the mosque. The imam of the mosque considers that Yazılıtaş Quarter might have been an important place of worship for non-Muslims in the past based on the ruins of the church (Table 20).

Table 20. Inventory form of Yazılıtaş-Unnamed Building I in Hamsiköy Valley

HAMSIKOY VALLEY – YAZILITAS QUARTER YAZILITAS-UNNAMED BUILDING I			B7
Province	**Coordinates**	**Position**	
Trabzon	40°43'41.79"N, 39°32'39.66"E		
District	**Other Name**		
Maçka	Unknown		
Quarter	**Date of Construction**		
Yazılıtaş	Unknown		
Construction System	**Construction Material**		
Unknown	Unknown		
Current State			
Structural integrity is preserved			
Completely demolished / Not in place			X
Structural integrity is impaired		Wall + Roof	
		Wall	
		Foundation	
Photos			
			

The Ones Which Cannot be Located

B8-Başar-Unnamed Building I: It is located in Trabzon province, Maçka District, Taşlı Locality. It was situated in the east of Başar Quarter Church II, down the river, under a big rock according to the inhabitants of the quarter. However, its location could not be revealed.

B9-Gürgenağaç-Unnamed Building I: Known to be situated in the forest, the location of the building could not be determined due to the geography of the valley. It was known to the inhabitants of the quarter that it was the most spectacular church in the village in the past and was demolished after being used as a barn for a long time.

B10-Güzelce-Unnamed Building II: It is located in Trabzon province, Maçka District, Güzelce Quarter, Countryside Vicinity, lot 122 and plot 29. The building, which is known to the inhabitants of the quarter to be stated to be in the woods, was demolished.

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RESULTS: EVALUATIONS ON PLACE-BUILDING RELATIONSHIP

The Ottoman Empire had secured the freedom of religion and conscience of all its people, regardless of their belief or nationality. As a result of this, emphasis was given to the protection of places of worship, and their construction and repair depending on the necessity. Accordingly, non-Muslims had to make do with the repairs and reconstruction of the existing churches in the period before the 19th century, when it was forbidden to build churches. A significant increase in churches had occurred in the Değirmendere Valley and its branches by the 19th century, when it became easier to build a church as a result of the extensive rights and privileges granted to non-Muslims through the Imperial Edict of Gülhane. By virtue of the resettlement policy applied by the Ottoman Empire after the conquest, many population emigrations have occurred in Trabzon-Hamsiköy Valley, with those resettled from different places of Anatolia and exiled, and as a consequence of the Turkish-Greek population exchange at the beginning of the 20th century. As a result, communities from various socio-cultural and ethnic backgrounds live together and established their architectural practices in the valley, where it was impossible to speak of a homogeneous population. The region where the Hamsiköy Valley is situated has also been in communication with Anatolia, the Middle East, the Far East and the Caucasus throughout history with its mountain passes and trade routes, unlike other valley systems that have been isolated as a consequence of the geography of the Eastern Black Sea region, which is very rough and covered with forests, meaning even neighborhood relationships were impossible. This situation has led to the emergence of a social and cultural structure even in the farthest settlements where transportation is difficult.

The Hamsiköy Valley, among the five valley branches of the Değirmendere Valley, is the first point of contact south of Trabzon. In addition to its geography that is relatively more suitable for settlement, the passes, which strengthen the connection with the defense and trade routes extending to Trabzon, have affected the fate of the settlement area with consideration to the overall geography of the region.

Security: The valley has served a defensive military function in most periods with its presence of trade routes and as a gateway to Trabzon military-defensive function, which emerged as a result of these roads. This suggests that topographic dynamics and trade routes, marketplaces-traveler layover locations, as well as ensuring security and communication needs were considered in the decisions regarding settlement and regarding where buildings would be constructed, due to the introverted character of the valleys. Hence, it is rather remarkable that even the churches and monasteries in Hamsiköy Valley are often located on the ridges and hilltops, meaning they can be seen from both slopes of the valley.

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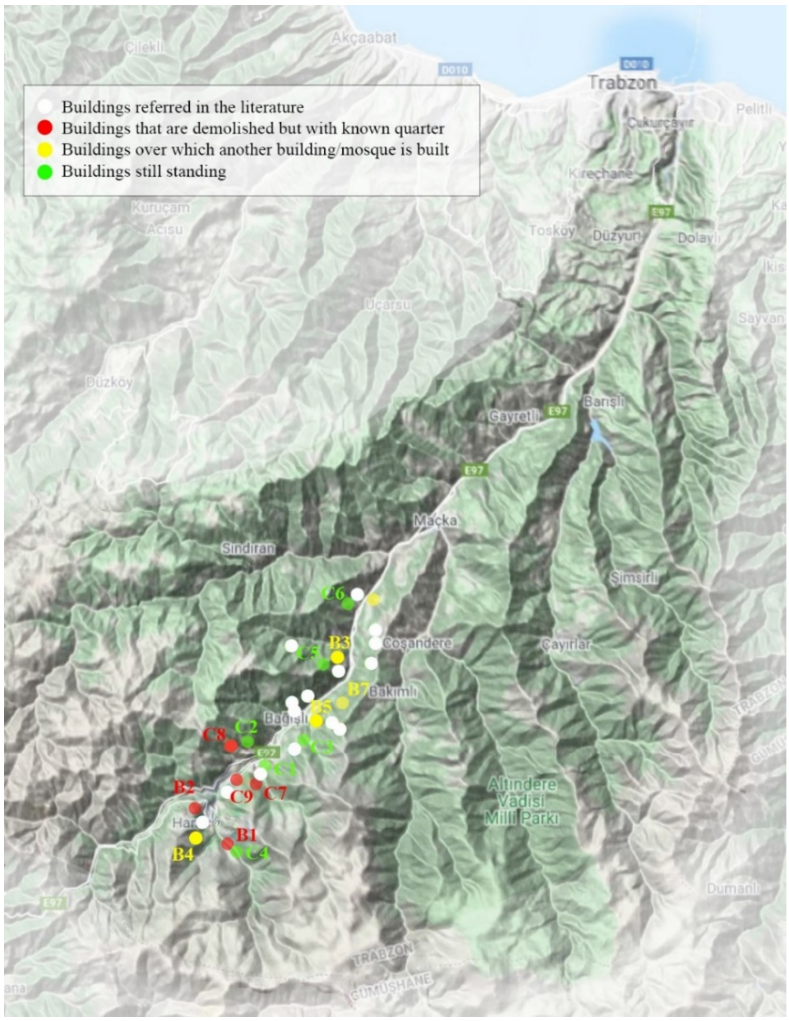

Figure 5. The in-valley distribution of the churches located in Hamsiköy Valley (Processed from Google Maps by Authors).

In fact, buildings discovered on opposite slopes of the valley were positioned in such a way that they were visible from each other, in addition to those discovered in the same settlement area. For instance, just like the Anayurt Mosque and Unnamed Church I in Anayurt or the Sukenarı-Köyiçi Mosque and Unnamed Church I in Sukenarı, the Dikkaya-Unnamed Church II and Hamsiköy-Unnamed Church I, which are situated in different settlements are also on opposite slopes of the valley, are within sight of each other.

It is thought that the reciprocal positioning of the churches throughout the valley without blocking each other's view was the result of a communication system that enabled them to communicate with each other in order to guard against raids etc. and to report to Trabzon any unusual occurrences in the valley (Köse, 2019). Despite the fact that the people in the region regard and refer to these buildings as churches, it is possible that some of the buildings assumed the main function of being observation posts or watchtowers. However, it should be noted that while these buildings were used for surveillance purposes, they also might have had a function as small observation chapels, serving as places of worship for the monks (Durmuş, 2011; Köse, 2019) (Figure 5-6).

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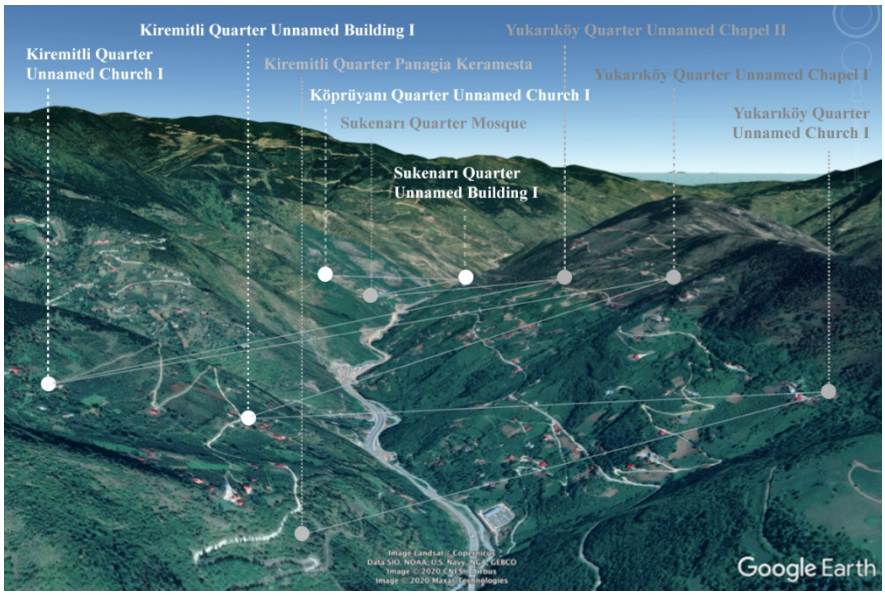

Figure 6. Non-Muslim places of worship identified in Hamsiköy Valley (processed from Google Earth by Authors).

Routes: The presence of these trade routes and the economic-commercial activities that emerged as a result led to the formation of hubs that gained regional importance as marketplaces and layover points for travelers. This is despite the fact that the valleys are isolated as a consequence of their geography. In Hamsiköy Valley, almost every identified building is on or near the trade route.

This could indicate that churches were established along economically, religiously, and socio-culturally significant routes to serve not only for worship but also as accommodation for travelers in regions where caravanserais were not available. It is demonstrated that the link with the route is established purposely since these monasteries and churches create an important source of revenue for the community buildings' needs through donations received from the travelers under the title of Selametiye. On the other hand, they provide for the layover-worshipping needs of the travelers from their own sect and nationality in their guesthouses. It is notable that the marketplaces and layover locations, where economic activities are decisive, were also effective in the construction of churches in addition to the relationship established with the route. It can be said that the presence of a marketplace in the Hamsiköy and Başar quarters, where only non-Muslim populations live, and the layover function of the Hamsiköy Quarter played a decisive role in the construction of churches in those regions and the selection of their locations. Apart from the marketplace's position as a commercial hub, the requirement for religious centers as locations where various social, economic, and cultural activities occur explains why churches were established near these areas. Unnamed Church I and II in Başar, Merkez Mosque and Unnamed Church I in Hamsiköy can be shown as the most noteworthy examples of the churches built in relation to the marketplace (Figure 7).

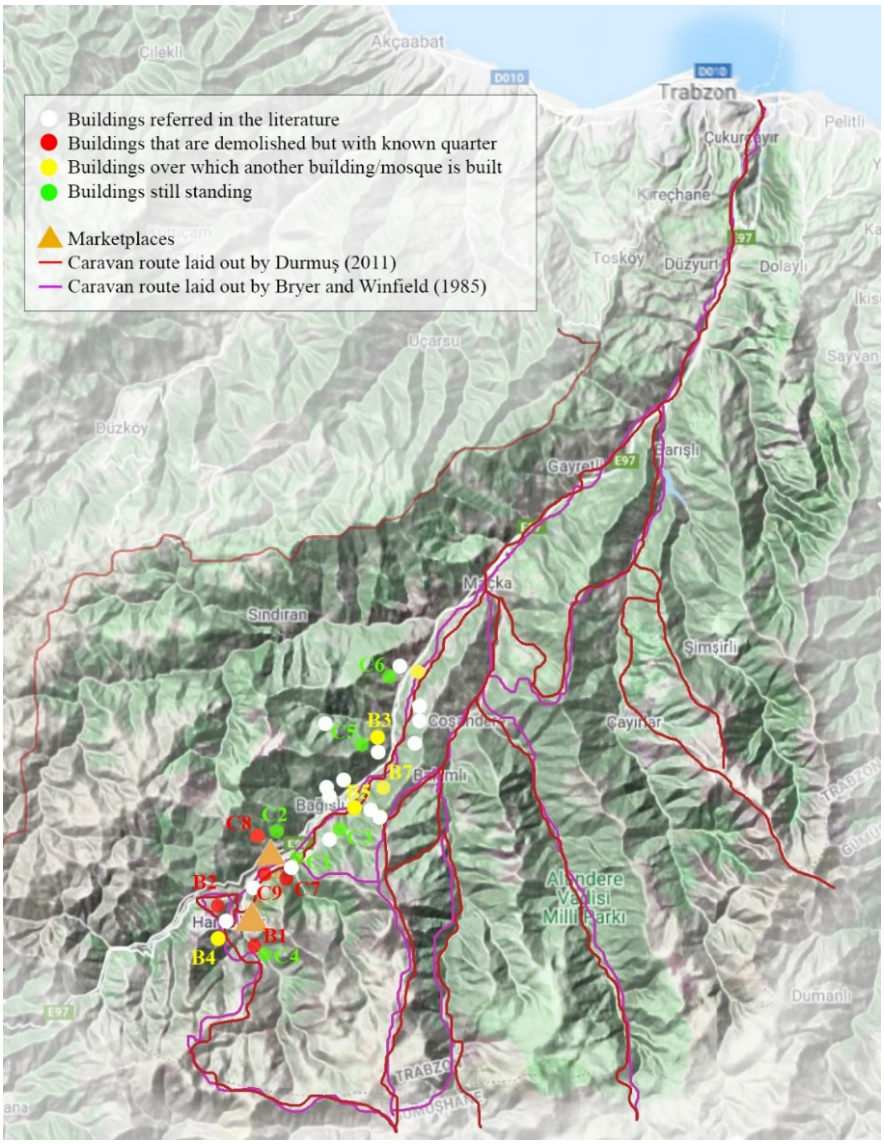

Figure 7. Marketplace/trade route relationship of the churches locations of which were identified (Processed from Google Maps by Authors).

Population Movements: In Hamsiköy Valley, the Orthodox Christian faith and churches continued to establish the religious and architectural aspects in the region until the non-Muslim population left the region through the population exchange in 1923, including the period following the Ottoman conquest of Trabzon in 1461. This holds for all the churches, except for Bağışlı-St. Gregory of Nyssa Monastery, Kiremitli-Vazelon Monastery, and Yazılıtaş-St. Marina Church, which are known to be constructed before the conquest. Dikkaya-Unnamed Church II, Kiremitli-Vazelon Monastery Chapel, and Yazılıtaş-St. Eugenios Church are known to be constructed during the 15th and 16th centuries, and Anayurt Village Mosque, Kiremitli-Monastery of Panagia Theoskepastos, and Kiremitli-Vazelon Monastery Church are known to be built after the 19th century. The construction dates of other buildings in the region are disputable. Reaching a definite judgment regarding the construction date of these buildings does not seem possible in an environment where most of the churches in the region, apart from those whose names are mentioned in the literature, are not even known to exist. However, the

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extensive rights and privileges granted to non-Muslims through the Imperial Edict of Gülhane and similar practices suggest that most of the buildings that are thought to have been built during the Ottoman Period might have been built after the 19th century. When the Greek population moved from the region with the population exchange in 1923, the Turkish population was settled in the region due to the resettlement policy, and the demand for places of worship was met by turning the churches/chapels into mosques or masjids as a result of the change in the demographic structure. Anayurt Village Mosque, Bağışlı Quarter Mosque, and Hamsiköy Mosque, which still exist today, are among the buildings that have been turned from churches into mosques. It is possible that since the existing building was ruined or did not provide a suitable indoor area for collective worship, Güzelce-Unnamed Church I, Sukenarı-Unnamed Church I, and Yazılıtaş-Unnamed Church I were demolished on different dates, and a new mosque was built in their place. However, it is quite remarkable that the materials extracted from the demolished churches/chapels were used to construct the mosques that were built to replace them.

The fact that the highest building concentration throughout Hamsiköy Valley is found in the Anayurt, Bağışlı, Başarj and Gürgenağaç Districts rather than the Hamsiköy District, which has the highest non-Muslim population, necessitates further consideration. This situation suggests that there may be other buildings in Hamsiköy Quarter that cannot be traced due to the valley's geography, or that changes in the quarter's boundaries might have occurred since. On the other hand, such building density seems to be unexceptional, considering that the Anayurt, Bağışlı, Başar, and Gürgenağaç quarters were registered as Greek villages in Ottoman documents. However, it is notable that the revealed building stock is still in excess of the need when the population information of these quarters is taken into consideration. The privileges granted with the Tanzimat Reform can be shown as the cause of this disproportionate increase compared to demographic data; however, it should also be considered that this can be caused by the buildings mentioned in the literature, whose location is unknown, and those discovered in the area that all point to the same church.

6 buildings are all planned in basilical form in terms of their plan typologies and they can be a discussion subject since they are the only ones still standing among 19 buildings that cannot be matched with the buildings Hamsiköy Valley, which are identified from the current literature and have been identified during the field work. Varying in terms of dimensions in the implementation of the same plan typology, these buildings are featured with their single or triple naves and barrel vault domes. Standing out among those with a single nave is Unnamed Church II in the Anayurt Quarter, which is planned in such a way that it does not allow for collective worship. It contains a space smaller than a room and accommodates only one or two people. It is considered that this building might have been a modest family church/chapel that was

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opened to neighbor visits once a year to allow them to visit each other's churches. This is known to be a common practice in the valley. Although sufficient information about the dates of the buildings is unavailable, it is considered that the Unnamed Church I in Gürgenağaç Quarter, which features a three-nave basilical plan, had been constructed before the Tanzimat Reform, when the three-nave basilica type featuring a bidirectional hipped roof and separated with supports became common in architecture at that time and when monotony prevailed as a result of the rules imposed by Ottoman for church construction.

CONCLUSION

It can be understood that construction of churches in Hamsiköy Valley, particularly after the conquest, was a consequence of the extensive rights and privileges granted to the non-Muslim population by the 1839 Imperial Edict of Gülhane and the 1856 Imperial Edict of Reform, as well as the ratio of this population to the Muslim population in the valley. It is clear that the pragmatic settlement practice, which is shaped mainly according to the geographical and topographical features of the valley, and also, the. military and commercial dynamics of the area have a significant and formative effect on the selection of the location where the churches would be constructed. The mountainous and rough valley geography in Hamsiköy Valley, higher sections of which are covered with forests and where field and plateau settlements which are only used in summer are common makes it difficult to identify the non-Muslim building stock. Except for 14 buildings whose locations have been identified among the 47 buildings in the current literature, there are 33 buildings whose locations could not be determined due to uncertainties in the literature in terms of their location, architectural definitions and naming and/or failure to make a comprehensive identification. The existence of buildings which can be matched with each other between these 33 structures in the literature and the 19 structures identified in the area and made subject to the study makes it impossible to make a definitive judgment about the valley's building stock (Figure 8). These buildings, on which no sufficient information is available in the literature even if there are matching ones among them, their coordinates were determined, sketched and photographed for a significant contribution to the inventory. Although different denominations indicate that the same building may appear to increase the number of churches, it is also possible that buildings, which cannot be traced as they had been destroyed for various reasons, could have existed. There is no doubt that further information will be available when archaeological studies become widespread in the region, existing buildings and their ruins are evaluated, and documents that have not been transcribed or discovered yet are found and examined.

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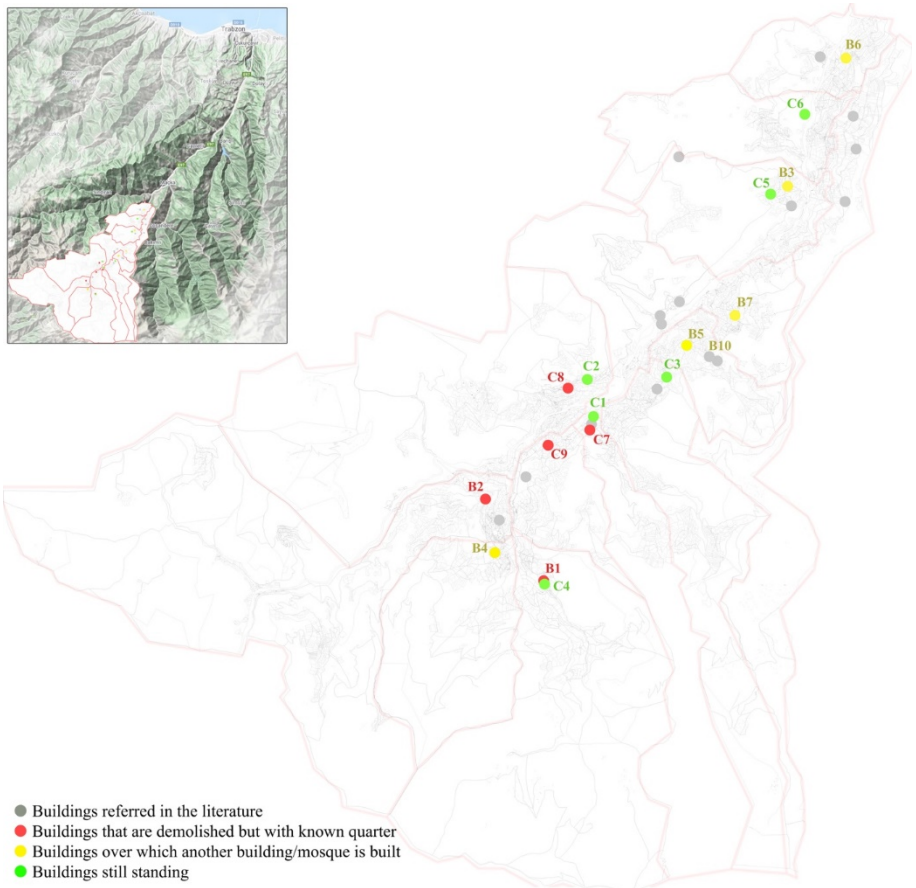

Figure 8. Non-Muslim places of worship identified in Hamsiköy Valley (processed from Google Maps by Authors).

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REFERENCES

Ayar, T. (2017). Osmanlı'nın son dönemi Maçka'da kiliselerin tamiri ve yeniden inşası. *History Studies*, 9(1), 1-19.

Aydın, M. (1997). Trabzon. In *Eczacıbaşı sanat ansiklopedisi*. (Vol. 3, pp. 1814-1816). YEM Publications.

Aygün, N. (2005). *Onsekizinci yüzyılda Trabzon'da ticaret.* Serander Publishing.

Bilgin, M. (1990). *Sürmene tarihi*. Sürmene Municipality Press.

Bilgin, M. (2007). *Doğu Karadeniz tarih-kültür-insan.* Ötüken Publications.

Brendemoen, B. (2002). *The Turkish dialect of Trabzon I-II*. Harrassowitz Verlag.

Bryer, A. & Winfield, D. (1970). Nineteenth-Century monuments in the city and Vilayet of Trebizond: Architectural and historical notes part III. *Archeion Pontou*, (30), 228-385.

Bryer, A. & Winfield, D. (1985). *The Byzantine monuments and topography of Pontos-I*. Dumbarton Oaks Publication.

Bryer, A., Winfield, D., Ballance, S., & Isaac, J. (2002). *The Post-Byzantine monuments of the Pontos*. Routledge Publishing.

Durmuş, A. (2010). *Tarih ve kültürü ile Maçka*. Eser Ofset Matbaacılık.

Durmuş, A. (2011). *Tarih ve kültürü ile Hamsiköy ve Meryemana Vadileri Maçka*. Eser Ofset Matbaacılık.

Durmuş, A. (2013). Soyut ve somut kültürel belgelerle Meryemana Vadisi'nin tarihi. *Dergi Karadeniz,* (20), 204-228.

Emiroğlu, K. (Ed.). (2002). *Trabzon Vilayeti Salnamesi-1876*. Trabzon İli ve İlçeleri Eğitim, Kültür ve Sosyal Yardımlaşma Vakfı.

Eryılmaz, B. (1990). *Osmanlı Devleti'nde gayrimüslim tebaanın yönetimi*. Risale Publications.

Jennings, R. (1986). The society and economy of Maçuka in the Ottoman Judicial Registers of Trabzon 1560-1640. In A. Bryer & H. W. Lowry (Eds.), *Continuity and change in late Byzantine and early Ottoman society* (pp. 129-154). Dumbarton Oaks Publications.

Kadıoğlu, Y. (2006). Zigana (Kalkanlı) Geçidi'nin karayolu ulaşımındaki rolü ve önemi. *Türk Coğrafya Dergisi, (*44), 45-60.

Karaca, Z. (2008). *İstanbul'da Tanzimat öncesi Rum Ortodoks Kilisesi*. Yapı Kredi Publications.

Karagöz, İ. (2006). *Grek, Bizans ve eski Türk kaynaklarına göre Trabzon yer adları*. Derya Publishing.

Kazaz, E. (2016). *Trabzon kırsal cami mimarisi* [Unpublished doctoral dissertation]. Karadeniz Technical University.

Kenanoğlu, M. (2004). *Osmanlı millet sistemi: Mit ve gerçek*. Klasik Publications.

Köse, İ. (2019, May 4). *Sümela Manastırı'nın bir bilinmeyeni daha ortaya çıktı. Milliyet Gazetesi.* https://www.milliyet.com.tr/yerelhaberler/trabzon/sumela-manastirinin-bir-bilinmeyeni-daha-ortaya-cikti-12561473

Ksenephon. (2011). *Anabasis Onbinlerin dönüşü*. Kabalcı Publishing.

Lowry, H. W. (2005). *The Islamization & Turkification of the city of Trabzon (Trebizond) 1461*-1583. The Isis Press.

Meeker, M. E. (2005). *İmparatorluktan gelen bir ulus, Türk modernitesi ve Doğu Karadeniz'de Osmanlı mirası*. İstanbul Bilgi Üniversitesi Publishing.

Özdiş, H. (2009). Vadide iktidar oyunları: Of'ta hakimiyet mücadelesi. *Karadeniz Araştırmaları Dergisi,* 6(6), 161-177.

Özsait, M. (2000). İlkçağ tarihinde Trabzon ve çevresi. In K. Çiçek, K. İnan & H. Öksüz (Eds), *Trabzon tarihi sempozyumu bildiri kitabı* (pp. 35-43). Trabzon Belediyesi Publishing.

Öztürk, T. (2011). *Osmanlıların kuzey ve doğu seferlerinde savaş ve Trabzon*. Serander Publishing.

Pekak, M. (2009). Osmanlı İmparatorluğu Döneminde gayrimüslim vatandaşların imar faaliyetleri ve Mustafapaşa (Sinasos). *Bilig Journal of Social Sciences of the Turkic World,* (51), 173-174.

Sinclair, T. (1989). *Eastern Turkey: An architectural and archeological survey-II*. The Pindar Press.

Sümerkan, R. & Okman, İ. (1999). *Kültür varlıklarıyla Trabzon, Cilt 1 (İlçeler ve Köyler)*. TC Trabzon Valiliği İl Kültür ve Turizm Müdürlüğü Publishing.

Taşkın, M. (2008). *Trabzon ticaret-tarım-fındık-çay*. Eser Ofset Matbaacılık.

Tellioğlu, İ. (2009). *Kommenosların Karadeniz hakimiyeti Trabzon Rum Devleti (1204-1461)*. Serander Publishing.

Tezcan, M. (2002). İpek Yolu ve XIV. yüzyıla kadar İpek Yolu ticaretinde Trabzon'un yeri. In M. K. Aslan & H. Öksüz (Eds), *Trabzon ve çevresi uluslararası tarih-dil-edebiyat sempozyumu bildirileri 3-5 Mayıs 2001* (pp. 71-90). Trabzon Valiliği İl Kültür Müdürlüğü Publishing.

Tuluk, Ö. İ., Düzenli, H. İ., & Düzenli, E. (2010). Osmanlı'da fetih sonrası dinsel mekanı camileştirme anlayışı: Trabzon örneği (1461-1665). In Ö. İ. Tuluk &

DOI: 10.15320/ICONARP.2022.202

H. İ. Düzenli (Eds.), *Trabzon kent mirası yer-yapı-hafıza* (pp. 55-92). Klasik Publications.

Tuluk, Ö. İ. (2016). Of'un mimarlık mirasının kökenleri üzerine yorumlar. In H. Öksüz, A. M. Coşar & V. Usta (Eds.), *Başlangıçtan günümüze her yönüyle Of* (pp. 429-438). Karadeniz Technical University Press.

Zerzelides, G. (1959). Toponymiko tis ano Matsoukas. *Archeion Pontou,* (23), 87-188.

Resume

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Cittaslow Movement as a Tool to Strengthen the City Image: Case Study of Osmaneli (Bilecik)

Özlem Candan Hergül*
Parisa Göker**

Abstract

Intense urbanization movements, unconscious usage of energy sources, along with rural-urban migration based on various reasons and rapid population growth are the common problems of today's cities. The natural results of such problems can be summarized as the emergence of environments that are naked of aesthetics, changes in the habits of urban-dwellers with regards to their life styles and cultures, along with the negative impacts on the life quality of people. With this study, it is aimed to analyze the suitability of Osmaneli town to be a part of the Cittaslow Movement through the questionnaires to be conducted, along with identifying the physical effects of participating in this movement on the development of Osmaneli's urban image, and developing planning & design suggestions. The historical and natural landscape elements of Osmaneli surviving to date, along with its characteristics that strengthen the city image, are analyzed within the scope of the study. Field surveys have been carried out within the scope of the study method. In this direction, questionnaire study was carried out in order to detect the elements that bear the city image characteristics and brand value, while also measuring the participation and compliance rate of the public in case of becoming a part of Cittaslow Movement. A city that wants to join the Slow City Movement must meet certain conditions and undertake to provide others. Osmaneli settlement is in a lucky position in this context. Since it is a small settlement in Bilecik, it was not affected much by urban interventions and preserved its original texture. In addition, strengthening the city image of Osmaneli and increasing its tourism potential will provide economic development to the city. In this context, various determinations and suggestions have been developed and a tourism route has been created for the identity elements of the city.

Keywords:
Urban image, identity, cittaslow, Osmaneli

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INTRODUCTION

The main characteristics a city that distinguish it from a rural area can be defined as the replacement of agricultural activities with industrialization, formation of business lines towards this aspect, settlement of an order where individuality gains more importance in social practices, systematical processing of the life itself, and emergence of different income groups. The desire to have a high quality of life, while having financial difficulties and the urban life dream created by the visual media urge people to migrate from rural regions and villages to metropolitans. So this paves the way for the dense structuring in cities as the days pass, along with the emergence of infrastructure and security problems. The main reason for any individual to maintain his/her life with his/her family is the limited employment opportunities in rural areas where he/she lives. Finding a job and starting a new life is quite challenging, particularly for the young population living in rural areas.

There is an interactive compelling relationship between urbanization and ecological environment (Zhou et al., 2020). Urban areas typify very critical regional entities shaped by intense human activities affecting urban ecosystems (Tarsitano et al., 2020). Leading the urban microclimate to go under changes, thus causing impacts on the health of people in the hand, the process of global urbanization forces the paces for the population growth in cities (Wang et al. 2015). Preserving mental health and well-being in urban settings is particularly difficult, partially due to reduced interaction with green space among some urban residents (Coldwell and Evans, 2018). Cittaslow Movement comprises of a valuable approach in terms of providing urban development for small towns. The studies to be carried out in these small towns wishing to protect, maintain their identity and local values while ensuring development, will pave the way for noteworthy gains towards cities.

In Osmaneli, as a town in Bilecik, there area 90 registered houses, and 201 traditional architecture structure in total in the center of town, where the historical texture that is certified to be a historic archeological area (Ergöz Karahan, 2017). However, it has been conferred that 9 of these houses have been consumed by various reasons such as fire, etc., despite being registered in the books. Accordingly, there are 90 registered structures, involving 81 registered traditional Osmaneli houses, 4 religious structures, a government office, a historic fountain, a turkish bath, an old town tavern and a primary school, in the area which was confirmed to be an urban archeological area in 2003 (Okuyucu and Somuncu, 2012).

In today's world, where the living conditions, construction techniques and traditions are swiftly changing, Osmaneli's streets and houses managing to protect its spatial characteristics and elements, have survived to date as an historical data thanks to its construction techniques, architectural identities displayed and spatial designs (Pamir and Yücel, 2005). Formed as per the silk farming and cocoon business activities in particular, which were the main means of living in 17th

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century, Osmaneli houses are remarkably attention-grabbing with the architectural properties they possess (Okuyucu, 2011).

City Image

How people perceive urban spaces has been an interesting question for city planners, policy makers, psychologists and even marketing researchers for years. Kevin Lynch published his seminal book The Image of the City in 1960. Since then, it has had a tremendous impact on the disciplines of urban design, environmental psychology, marketing, and social science. (Jiao et al. 2018). The image of a city comprises of the whole ideas and experiences of that city, while also varying from person to person in terms of perceptual aspects (Fırat and Kömürcüoğlu, 2015). The cities to have certain form and characteristics towards specific purpose bring along the matter of bearing identity-borne aesthetical values, thus creating a town image and holding a moving qualification for emotional memory (Oğurlu, 2014). There are a number of factors that affect the image of a city and perception of the same by those not from that city. Among these factors can be named the following: the characteristics of the urban-dwellers, their status and political power, population density, crime rate, socio-economical structure and employment situation, number and characteristics of the national institutes located in the city, its location and history, movies and TV series shot in the city, attention of the media towards the city, the atmosphere created, recreational opportunities, touristic and cultural values & physical presence (Avraham, 2004). However, the perceived image of a place is highly subjective. For this reason, it can differ between individuals or different population groups, as in the perceived images formulated, for example, by tourists and residents of a city (Priporas et al. 2020).

Examining the term “image” from the perspective of urban branding, it can be said that many cities take steps in the direction of introducing themselves with the help of iconic structures nowadays (Riza et al., 2012). This shift in the basic understanding of place branding and its role in the development trajectories that communities open to them coincides with a similar transformation of urban planning practices (Cleave and Arku, 2020). Branding of cities is ensured oriented at increasing the number of people visiting the city, paving the way for the investments to be made on the city, enabling people to prefer the city for living or educational purposes. These efforts are oriented at creating the difference in the city, while contributing with positive values and strengthening the image accordingly within the axis of the weaknesses and strengths of the city (Can and Başaran, 2014). In particular, image destination activities aim to create a positive sense of place by conveying physical, emotional and functional quality choices from one place (Widayati et al. 2020).

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Cittaslow Movement

The interactions created by the global world, the rate of urbanization, industrialization, technological developments, wars and migration movements have led to great changes in cities. As a result of this situation, cities turn into places that have damaged historical areas, are disconnected from their past, and have no unique identity, where urban elements do not contain a holistic design approach. (Perihan and Aşur, 2020). Globalization has create a "fast-moving world", where landscapes with more and more changes, yet resembling each other despite these changes are present, where the feeling of characteristic space is not satisfactorily protected, and where public social life make its presence felt less. This fast-moving world is substantially the product of capitalism expanding in global scale (Knox, 2005). The combination of technology and speed is recognized as a significant political and economical both by the systems and the individuals (Carp, 2012). Western societies in the center of the industrialization attribute defective and negative meanings to the term "slow". Moreover, slowness is recognized as a mood of idleness which needs to be avoided in today's world where speed and timeliness are declared to be the ultimate goals of our modern era (Doğrusoy-Türkseven and Dalgakıran, 2011). Penetrating in our lives, timeline and environment with its negative and dark side, "speed" started to damage the spirit of time (zeitgeist) and spirit of space (genius loci), bearing and narrating the traces from the past (Polat, 2011). In the global economical system, the conception that states "time is money" is predominant, and as a consequence, there is always an acceleration in our lives thereupon. The fast-moving world is defined as a presence comprising of modern communication systems, along with materialist consumption and international communication & entertainment, and where people and spaces are directly included as the producer and consumer, within an industry going beyond national borders (Knox, 2005). This is how an international movement came into being, founded on the idea of improvement of the quality of life of residents, savouring "slow", healthy lifestyle, drawing on the tradition and history and respecting the natural and cultural environment of small towns (Jaszczak and Kristianova, 2019).

Urban social movement research explored struggles over mass consumption sites such as housing, public space, public and community services, and the environment (Taylor, 2020). In addition to all these concepts, Slow movement is recognized as the effort or desire of individuals to spare time for "doing something meaningful" under the domination of speed (Güven, 2011). Today, As an international network comprising of small towns, Cittaslow objectifies the slow food philosophy, while correlating it with the urban design and planning which is in a war with the problems related to the twentieth century cities. Cittaslow Movement focuses on a series of objectives that aims at improving the life quality of both citizens and the visitors (Elovich, 2012). While Cittaslow movement is an international movement, the local

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authorities is endeavoring to gain resistance against certain forms of globalization since this movement has developed a model within the framework of local-oriented initiatives (Pink, 2009).

On the global world, the problem of losing the uniqueness is seen in metropolitan urban centers, but it also concerns the small towns, as well (Grzelak-Kostulska et al., 2011). Thanks to being a slow city (Cittaslow), the city will be able to exist with its own identity, while ensuring that the urban dwellers will lead a healthy and happy life, that the nature will be protected, and that the resources will be sustainable (Günerhan et al., 2010). Cittaslow has started as an actional movement seeping into Italy, and it encouraged the towns for using a series of urban design and planning tools oriented at re-addressing the challenges related to "fast living" (Semmens and Freeman, 2012). The idea behind the International Cittaslow movement is to promote a culture of good and harmonious living in small cities as an alternative to metropolitan bustle and advancing globalisation (Farelnik 2020). The movement underlines the use of new technologies, gastronomical sources, and the quality of local environment in order to achieve the ultimate welfare level jointly (Miele, 2008). Cittaslow attempts to focus on urban and regional plans by means of protecting the subjects that comprise of the unique characteristic of each and every urban area within the main presence of area-based identity within the organized network of small towns (Radstrom, 2011).

Applying various development methods in the cities that are included in this network within the framework of the Cittaslow configuration, it is aimed at ensuring a local sustainable development by means of adding new attraction points alongside the unique characteristics of a city such as its nature, history, culture, economy, gastronomy -as its existing potentials-, while also providing a high-quality and comfortable living environment not only for the urban dwellers, but also for the visitors (Yalçın and Yalçın, 2013).

Cittaslow has prescribed a number of rules that are to be followed based on the commitments undertaken by all the cities and towns joining in the unity from all the continents, and which are regularly controlled as per certain standards (Anonymous, 2011):

- Applying an environmental policy that substantially aims to improve the characteristic of the region and urban texture, along with protecting and developing the same by means of comprehending the recycling techniques.
- Implementing infrastructure policies that comprise of region-related functional analyses.
- Utilizing the technologies with the objective to improve the environmental quality and urban texture.
- Freshening the production and use of food products that are manufactured through the use of natural methods and are eco-friendly, while avoiding the use of transgenic products, as well as establishing facilities in order to ensure the protection and development of characteristic products that are under danger, where deemed required.

- Protecting the autochthonous (local) production that are deep-seated in terms of cultural and traditional aspects, contributing into the standardization of the same by means of the utilization of regional areas and methods, as well as organizing events and areas that are qualified to gather the consumers and high-end producers.
- With the removal of physical and cultural barriers related to the widespread use of the city, it is encouraged to create a real communication network with quality hospitality and social qualities.
- It is encouraged to raise awareness on living in Cittaslow by means of providing systematical tasting trainings to rising generations in schools, along with the citizens and the business owners.

Cittaslow movement has chosen "snail" as its symbol. The snail represents slowness and resting, which is the main philosophy of Cittaslow Movement (Keskin, 2010). Snail is gifted with all the opportunities to enjoy life with ultimate comfort (Jackson, 2007). Cittaslow criteria are gathered under seven main subjects. There are approximately 70 articles under these subjects, which are deemed as a must to be fulfilled for a town that aims to be a Cittaslow.

RESEARCH METHOD

The research area is Osmaneli district, located in Bilecik province, 34 km North of the city centrum. The historical and natural landscape elements of Osmaneli surviving to date, along with its characteristics that strengthen the city image, are analyzed within the scope of the study. Osmaneli district has been selected as the research area, for its capacity to meet the requirements of Cittaslow Movement with its historical houses, quality urban texture, local products and city image.

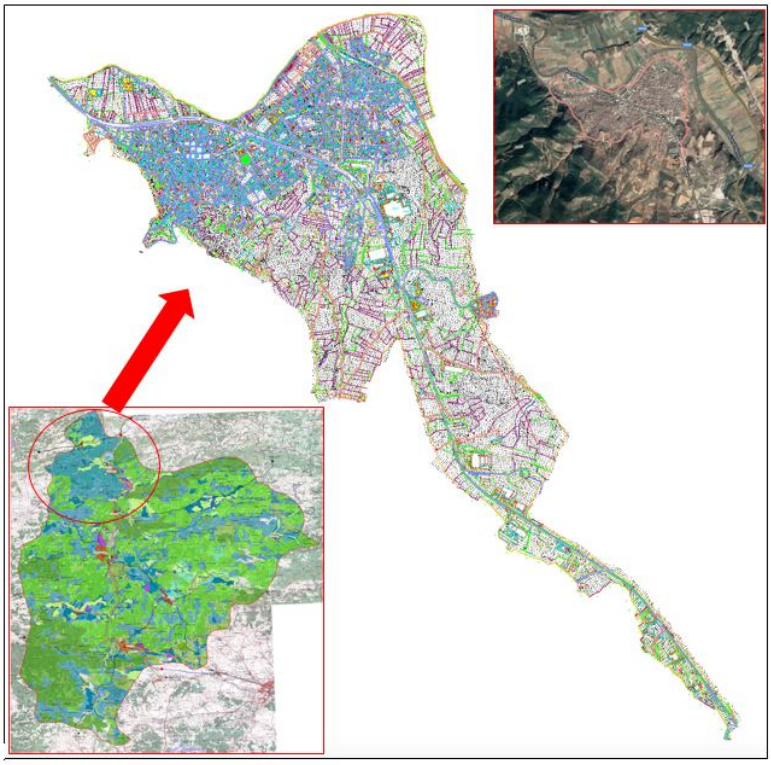

Figure 1. Location of Osmaneli

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Field surveys have been carried out within the scope of the study method. In this direction, questionnaire study was carried out in order to detect the elements that bear the city image characteristics and brand value, while also measuring the participation and compliance rate of the public in case of becoming a part of Cittaslow Movement. The survey and evaluation studies are based on the perceptual and visual evaluations of the people living in the city. The decisive point here was that especially the people residing in the city filled out the questionnaire. Because the group that will observe the change in the city emotionally and cognitively is the people living in the city and their experiences of the city are determinative because it provides a projection for the past and the future. Participation and perceptual determinations of people who will be directly affected by the change that will occur if Osmaneli joins the Slow City Movement is an important focus point that guides the study.

Various resources have been analyzed within the scope of identifying the questionnaire-related sample size, Since the population of Osmaneli is stated as 21,071 according to the current data of the District Governor's Office, it was determined as 244 at p 0.8 significance level (significance value) based on the 25,000 limit with a 5% sampling error in Table 1, but it was studied with the aim of reaching the maximum number of people which was settled as 244 with a sampling error of 5% as per Table 1, while, on the other hand, the study was carried with the objective to contact with the highest number of people possible. In this context, the questionnaire study was carried out on 296 participants, and 274 of the questionnaires have been found to be in compliance. The number of those to participate in the questionnaire study was determined with a sampling error of +5% on a significance level of α=0.05. The data obtained has been transferred into the SPSS data analysis program using a computer. The data transferred has been interpreted with the help of supporting tables.

Table 1. Various target group sizes, and sample sizes that are deemed required for error levels (Baş 2003)

	Sample sizes for α= 0,05					
	± %3 sampling error (d)		**± %5 sampling error (d)**		**± %10 sampling error (d)**	
Size of Target Group (N)	p=0.5 q=0.5	p=0.8 q=0.2	p=0.5 q=0.5	p=0.8 q=0.2	p=0.5 q=0.5	p=0.8 q=0.2
100	92	87	80	71	49	38
250	203	183	152	124	70	49
500	341	289	217	165	81	55
750	441	358	254	185	85	57
1000	516	406	278	198	88	58
2500	748	537	333	224	93	60
5000	880	601	357	234	94	61
10.000	964	639	370	240	95	61
25.000	1023	665	378	244	96	61
50.000	1045	674	381	245	96	61
100.000	1056	678	383	245	96	61
1.000.000	1066	682	384	246	96	61
100.000.000	1067	683	384	246	96	61

Examining the data obtained in the town and the above mentioned data, along with the results therewith, various analyses have been made concerning the procedures to be followed in case of participating in the Cittaslow Movement. Additionally, the town-oriented design suggestions are developed, thus being supported with planning strategies in this context. In addition to these, an image route of tourism and travel has been established through the elements of the town with prestige and identity value via the questionnaire results and face-to-face interviews.

RESEARCH FINDINGS

According to the table revealing the survey participant profile (Table 2); 59.9% of the participants are female and 40.1% are male. In addition, in terms of age group, it was determined that the highest number of participants was from the 25-34 age group with a rate of 28.5%. When the educational status of the participants is examined; It is determined that the majority of the participants with a rate of 42.3% are university graduates and 41.6% of them have been residing in Osmaneli for more than 25 years.

Table 2. Results concerning the participant characteristics obtained through questionnaire study.

Participant Profile		Frequency (n)	Percentage (%)
SEX	Female	164	59,9
	Male	110	40,1
Age Group	Younger than 24	48	17,5
	25-34	78	28,5
	35-44	74	27,0
	45-54	47	17,2
	55-64	25	9,1
	Older than 65	2	0,7
Educational Background	Primary school	44	16,1
	Elementary school	30	10,9
	High school	76	27,7
	University	116	42,3
	Master/PhD	6	2,2
	Other	2	0,7
Employment	Public sector	90	32,8
	Private sector	43	15,7
	Retired	10	3,6
	Student	18	6,6
	Unemployed	96	35,0
	Other	17	6,2
Period of living in the research area (Year)	0-5	42	15,3
	6-10	28	10,2
	11-15	29	10,6
	16-20	22	8,0
	21-25	39	14,2
	More than 25	114	41,6

The answers for the question “Can you check three of the most important elements that represent the image of your town?” are as

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follows as it is seen in Table 3: According to the questionnaire study, the most important elements that represent the image of Osmaneli are the Osmaneli Mansions, Sakarya River (including the facilities therein), İçmeler Region and the related Facilities in this area.

Table 3. Order of importance of the elements that represent the city image

Elements of image	Density (N)	Percentage (%)
Osmaneli Mansions	204	74,5
Rüstem Paşa Mosque	107	39,1
Aya Yorgi Church	91	33,2
İçmeler	190	69,3
Sakarya River and Facilities	196	71,5
Other	13	4,7

Analyzing the answers for the question "What are the three words to describe Osmaneli to describe it to a friend/relative of yours, who has never seen Osmaneli before?" directed to those participating in the questionnaire study, it can be seen that these words are "relaxing, peaceful, natural, having a historical texture, convenient Daily life, etc.".

Table 4. Order of importance of the products and elements of Osmaneli bearing marketing (brand) value

Elements with brand value	Density (N)	Percentage (%)
Turkish delight	203	74,1
Quince	207	75,5
Watermelon	227	82,8
Osmaneli Mansions	135	49,3
İçmeler Facilities	144	52,6
Other	22	8,0

The answers for the question "What are the products of Osmaneli that bear the brand value?", directed to the participants, along with the graphical distribution, are as follows (Table 4). In this context, the most important product that lay the brand value of Osmaneli in the center is the watermelon. Then comes the quince and Osmaneli delight. Additionally, lefke fabric and Osmaneli tomato paste are the other elements with brand value, which were included in the "Other" section of the answers.

Table 5. Order of importance of the characteristics of Osmaneli that come to forefront

Characteristics of the town that come to forefront	Density (N)	Percentage (%)
Agricultural products	121	44,2
Nature Tourism	60	21,9
Sakarya River	209	76,3
Historical Mansions	197	71,9
Local dishes	31	11,3
Natural beauties	109	39,8
Other	11	4,0

Examining the answers for the question "What characteristics of Osmaneli come to forefront in terms of its image?" directed to the participants, it can be seen in Table 5 that the first one is Sakarya River, followed by the Historical Osmaneli Mansions.

In the last section, which was drafted as per the requirements of Likert Scale, the rate of agreement of the individuals to the suggestions that are laid out in line with the Cittaslow Movement has been settled concerning the development of the town. In conclusion, it has been conferred that these individuals substantially agree with some of the suggestions, while they do not with some other suggestions. The answers directed within the questionnaire study have been analyzed as follows in Table 6, with regards to the suggestions given on the changes projected for the physical structure of the town.

Table 6. Evaluation of the Osmaneli Citizens concerning the urban development and participation in Cittaslow Movement

		I completely agree	I agree	I' m undecided	I disagree	I completely disagree
I believe that the identity elements of the town (the ones that define the town, such as social, historical characteristics, etc.) are satisfactorily preserved.	**N**	46	128	53	34	13
	%	16,8	46,7	19,3	12,4	4,7
I believe that the historical structures of the town are protected.	**N**	48	137	54	22	13
	%	17,5	50,0	19,7	8,0	4,7
I believe that the amount of green areas in the town are is satisfactory (parks, playgrounds, etc).	**N**	47	96	59	49	23
	%	17,2	35,0	21,5	17,9	8,4
I believe that the in-town forestation is on a satisfactory level.	**N**	33	94	66	55	26
	%	12,0	34,3	24,1	20,1	9,5
I believe that the amount and size of the assembly areas (squares) in the town are satisfactory.	**N**	35	72	83	51	33
	%	12,8	26,3	30,3	18,6	12,0
I believe that the building façades in the town are to be renovated.	**N**	72	124	62	12	4
	%	26,3	45,3	22,6	4,4	1,5
I believe that the fitting equipment in the town (lighting, garbage dumpster, benches, etc.) are on a satisfactory level (in terms of amount, quality, aesthetics, density, etc.)	**N**	29	81	80	56	28
	%	10,6	29,6	29,2	20,4	10,2
I believe that the in-town transit systems (bus, train, etc.) are to be improved.	**N**	91	104	53	18	8
	%	33,2	38,0	19,3	6,6	2,9

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I believe that the bicycle trails and bicycle parks in the town are not on a satisfactory level.	**N**	89	86	56	26	17
	%	32,5	31,4	20,4	9,5	6,2
I believe that the parking areas in the town center are satisfactory.	**N**	23	55	69	76	51
	%	8,4	20,1	25,2	27,7	18,6
I believe that the promotional efforts for the town are to be increased.	**N**	120	110	37	5	2
	%	43,8	40,1	13,5	1,8	0,7
I believe that joining in an urban network (Cittaslow Movement, Smart Cities Union, etc.) will provide positive contribution in the social structure of the town (festivals, organizations, meetings, etc.)	**N**	131	81	53	5	4
	%	47,8	29,6	19,3	1,8	1,5
I believe that joining in an urban network (Cittaslow Movement, Smart Cities Union, etc.) will provide positive contribution in the tourism activities of the town.	**N**	118	97	47	7	5
	%	43,1	35,4	17,2	2,6	1,8
I believe that joining in an urban network (Cittaslow Movement, Smart Cities Union, etc.) will provide positive contribution in the development of the town	**N**	104	100	62	2	6
	%	38,0	36,5	22,6	0,7	2,2
I support Osmaneli to join in an urban network (Cittaslow Movement, Smart Cities Union, etc.)	**N**	110	95	58	1	10
	%	40,1	34,7	21,2	0,4	3,6

The last four suggestions directed to the Osmaneli citiens were basically oriented at measuring and analyzing the thoughts and participation level of the citizens in terms of joining in the Cittaslow Movement. The answers given in the questionnaire study (in Figure 2) show that majority of the citizens consider joining in an urban movement such as Cittaslow Movement would provide positive contribution in the social structure, tourism activities and development of the town. (Figure 2).

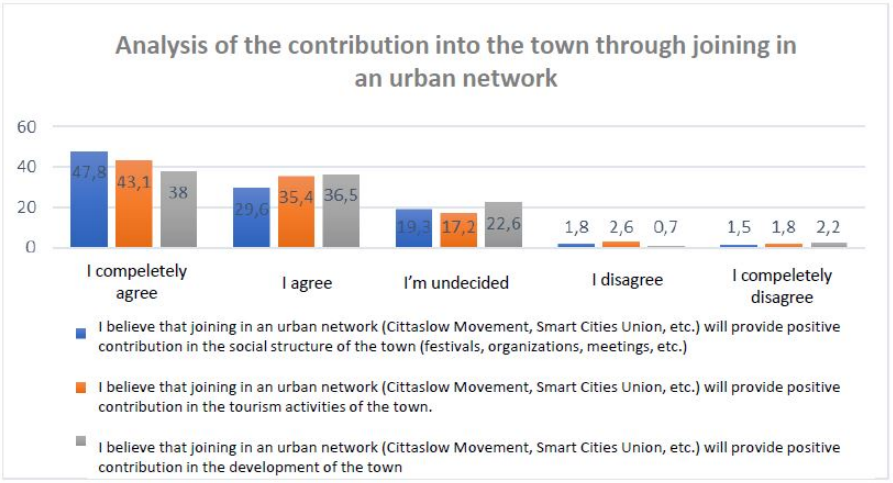

Figure 2. Graphical distribution of the answers given concerning the contribution to Osmaneli in case of joining in an urban network

Assessment of Conformity to Cittaslow Movement Requirements

Osmaneli district in Bilecik province is an important settlement area with both its historical texture, architectural characteristic, and its local products, along with the elements that develop an identity for the town. It is aimed at carrying out an assessment of conformity to Cittaslow Movement Requirements for Osmaneli within the scope of the project. In this section, you can find the direct and indirect parameters oriented at strengthening the city image and identity of Cittaslow Movement. In addition to explaining these parameters, the suggestions and analyses to strengthen the current status and city image of Osmaneli can be found as detailed in Table 7.

Table 7. Table of analyses for Osmaneli with regards to the parameters of Cittaslow Movement towards city image and identity

Parameters directing the City Image	Descriptions	Status of Osmaneli	Suggestions
Minimizing the visual pollution and traffic noise	In general of the slow cities, it is supported to use a uniform signs and boards for stores that are in harmony with the aesthetics of the area in order not to lead to visual pollution. The use of car horns is restricted, while also controlling the vehicle entrance to the city centrum, within the scope of the traffic noise.	Despite having certain examples within the criterion of visual pollution, there are some stores that use similar boards made of natural wood materials. Since it is a quiet area in general, there is no inconvenience with regards to traffic noise.	It is deemed suitable to standardize the use of all the store boards by means of generalizing the boards and signs used in certain areas.
Minimizing the public light pollution	This criterion represents the chaotic environments caused by cast lights, business boards and related lights in the general of the town.	No specific problem has been detected in the town within this context. The light variance problem in certain areas can be conveniently solved.	The standardization to be applied on the signs and boards within the town will render lighting more convenient.
Efficient bicycle trails that are under the control of public buildings	Establishing bicycle trails in the cities, as well as ensuring the active use of the same, will ensure the use of motor vehicle in the city to be minimized, thus granting positive effects into the ecological system.	There is no bicycle trail in the city that is actively used.	A bicycle transportation plan can be developed for the town. The topographical structure of Osmaneli, along with the close distances between main areas, makes it possible to establish and use bicycle trails in the town.
Bicycle parking areas in transit centers such as subway and bus stops	This criterion represents the required areas for the bicycles to be parked within the city.	There is no bicycle parking area in the town.	The bicycle parking areas should also be specified within the framework of bicycle transportation plan.

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Programs for improving the city-specific values, as well as increasing the value of the city centrums and public buildings	This criterion represents the strategical studies and practices to be carried out oriented at the improvement of elements such as urban squares, structures, etc., which identify the urban aesthetics and city image.	It can be said that the town texture in Osmaneli has been fundamentally preserved. Moreover, certain part of the registered structures in the town have been subjected to restoration in different period of time. There are also certain elements in the town, which damages the aesthetics, thus not being in harmony with the unique identity.	Some of the design suggestions oriented at the town's aesthetics can be seen in Figure 5.17 and Figure 5.18.
Establishing and/or enhancing the social green areas using fertile plants and fruit trees	Use of endemic species and/or naturally-grown plants and fruit species in the forestation of the urban areas in compliance with the requirements of the urban ecosystem.	The ground cover of Osmaneli is suitable for planting various types of plants. Various fruit and plant species are grown in and around the town.	The social green areas have been diversified with plants that complete the green texture in general. The design suggestions oriented at green areas can be seen in Figure 5.25 and Figure 5.26
Improving the inhabitability of the city	Carrying out studies to make the city more inhabitable. (i.e. shifting the entrance and exit times based on the working hours for schools and public institutes in order to inimize the traffic jam; encouraging the establishing of day-care centers in the workplaces, etc.) (Anonymous, 2020a)	Osmaneli is a town with its spirit in compliance with the Cittaslow requirements. Socially and physically, it is a town where life is convenient for all.	Improving the transit systems and increasing the number of social events in the town will surely improve the life quality of citizens.
Re-evaluating and using the marginal areas	Re-arranging, renovating and functionalizing the idle areas in the city	There is no specific data for Osmaneli with regards to the presence of such areas.	Osmaneli Aya Yorgi Church (Figure 4.6) is not classified as a marginal area, and it is not open to visit for danger of collapsing. A restoration, preserving the originality of the area, in order to open it to visit will surely be a significant gain.
Monitoring and minimizing the pollutants	This criterion comprises of the measures to be taken oriented at monitoring and minimizing the systems that lead	There is no notable major problem in the town within this scope.	Audits & inspections can be carried out through environmental project in cooperation with

	pollution, such as noise and electricity.		the University and BEBKA.
Supporting the social infrastructure	Increasing the practices to improve the social life in the city.	Watermelon Festival is organized annually in the town, however it is not deemed satisfactory.	Artistic and social events (concerts, cinema days, etc.) will have positive contributions into the social life in the town.
Encouraging the public sustainable urban planning	Following up of sustainable approaches in urban planning. Encouraging the use of Technologies such as passive home, smart home, etc.	There is no study that is conducted in the town within this scope.	There is no building-based sustainable works & studies carried out in the town. For a sustainable town, the use of sustainable energy in the public buildings, as well as increasing the number of bicycle trails thus minimizing the use of motor vehicles are the prioritized practices that also need to be encouraged.
Utilizing the manageable green areas in the town with fertile plants	Growing local-specific plant species and/or fruit trees in the green areas of the city	Osmaneli is a district with substantially fertile soils, where a number of fruit and vegetable species are grown. There is no fruit-tree planting practice in the green areas of the town.	Planting fruit trees in particular within the parks and green areas in the town, thus selling the products (i.e. jams, etc.) to be cultivated with these trees under a cooperative will provide income to the town budget.
Protecting and increasing the values of workshops – establishing natural/local shopping malls	Supporting traditional butchers, bakeries, grocery stores, etc. located in the historical city centrums (Anonymous, 2020a)	There are few stores where such local products as quiche delights and lefke fabrics, produced in the city, are sold.	The local products, along with the ones produced by women living in rural areas of the town will not only strengthen the economy of the town, but it will also increase the popularity of the local products of the town.
Amount of concrete used in the green areas	Detecting the amount (m^3) of concrete used in green areas	The number of green areas is quite high in Osmaneli. There is no study conducted with regards to the amount of concrete in such areas.	There are a wide green area in Osmaneli. Detecting the amount of concrete used in such areas can be performed with remote-detection systems of direct land surveys.
Protecting hand-crafted and labelled or branded craftsman/artist products	Supporting the local products produced in the city	Courses are provided for woman entrepreneurs in order to increase the production of local products in the town within this scope (the production of lefke fabric in particular).	Branding of local products can be encouraged through cooperation in the town. Identifying the local products in the town with the potential for protection, a

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			number of promotional events can be organized accordingly.
Protecting local and traditional cultural events, as well as increasing their values	This criterion comprises of the studies & works oriented at the protection of local and traditional events in the city.	Osmaneli sustains a Greek culture, originating from a Turkish, Ottoman periods layered through interchanges.	Local events and dishes can be supported and sustained with various festivals
Possessing slow routings	Establishing slow travel routes in the city, as well as introducing the same both in hard copies and electronic media.	There is no slow routing in Osmaneli, since it is not a part of Cittaslow Movement yet.	A travel route suggestion has been developed within the scope of the project for the town, as can be seen in Figure 5.27.
Presence of areas and a youth center where youth activities are carried out.	Presence of youth-specific areas and organizing events accordingly	There is no specific area in the town within this scope.	Such areas will ensure the youth to have more quality and enjoyable time in the town, while increasing the participation in the town-life.

CONCLUSION

Bilecik is one of the smallest scaled provinces with lowest population in Turkey. It displays a resistant structure with regards to the protection of historical and cultural texture in terms of town centrum and the settlements in the town borders. As one of the districts in Bilecik, Osmaneli is a settlement with substantially preserved historical silhouette, along with a high branding value with a great variety of agricultural products and local dishes. Hosting various civilizations in the past, where the silk farming and cocoon business activities were carried out, along with the fact that Ottoman Empire ruled over an ear in Bilecik and its surrounding, including the influence of Greeks settling in the interchange period, displays an architectural and cultural mosaic.

Within the scope of the Scientific Research Project, various observations have been conducted concerning the research area in different timelines between 2019 to 2020 with the objective to analyze the potential of Osmaneli settlement in Bilecik Province to join in the Cittaslow Movement through its city image, while also taking photos and conducting questionnaire studies. Data related to Osmaneli such as visual resources, letters and reports have been obtained by means of utilizing the publications of various organizations and institutes, while also carrying out face-to-face interviews with the local authorities, citizens and visitors. An ordered database has been constituted by means of subjecting the obtained findings to a systematical classification.

Within the scope of the study, the results of our analyses are as follows, setting forth the participant profile following the questionnaire studies conducted with the citizens living in Osmaneli:

- According to the Table 2, which sets forth the participant profile, 59,9% of the participants are male, while 40,1% are female. Notwithstanding that the number of female participants is higher in

terms of gender-participation ratio, it can be said that the gender distribution is balanced. Additionally, there is no significant age group that comes to forefront in the participants.

- The numeric data concerning the educational background shows that majority of the participants have Bachelor's Degree. This reason for this is thought to be that Osmaneli Vocational School of Higher Education, affiliated to Bilecik Şeyh Edebali University, is located in this area.
- People from various business groups have been interviewed, and majority of the participants have been living in Osmaneli for a long time.

Thanks to having historical and natural beauties, standing out with its agricultural products, Osmaneli possesses a number of factors that bear the city image characteristics. In this context, the participants have been directed certain questions with the objective to set forth the city image. The analyses conducted based on the answers given concerning the perspective of local citizens are as follows:

Figure 3. Products manufactured from Lefke fabric (Anonymous, 2020)

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- The most distinct element that forms the image of Osmaneli is the historical mansions that comprise the architectural texture. Notwithstanding that a certain part could not be preserved, while the rest has been preserved through restoration, these mansions are recognized as the structures identifying the unique architectural characteristics of the area. Another important matter is the Sakarya River passing through Osmaneli, along with the facilities established by the riverside. Moreover, İçmeler Facilities, which is known to have healing waters, is one of the areas that is thought to be effective in terms of city image.
- Another significant indicator of the city image is the identification of marketing-value bearing products, as well as setting forth their brand values. Additionally, the local turkish delight products of Osmaneli, made of quince and various fruits, bear branding value, as well. Also, it was stated during the face-to-face interviews that the textile product, produced from the textile product "Lefke Fabric" mostly by local producers and woman entrepreneurs, bears high branding-value in Osmaneli.
- The characteristics of Osmaneli that stand out are also the elements of directing its identity and image. The answers given to this question in the questionnaire are supporting the ones given in the previous questions. In this context, Sakarya River and Historical Mansions are selected the most in the questionnaire. Then comes the agricultural products and natural beauties.

In the next section, which was drafted as per the requirements of Likert Scale, the rate of agreement of the individuals to the suggestions that are laid out in line with the Cittaslow Movement has been settled concerning the development of the town. While drafting this question group, the main qualifications that are expected from a slow city are taken as basis. The analyses on the answers given to these questions are as follows:

- According to the questionnaire study, it is believed by the participants that the identity and historical structures, as the important elements that identify the city, are preserved. Since the most important subject of this study is the development of city identity and image, Osmaneli, where its identity is protected, meets the requirements of this standard.
- Additionally, it is believed by the participants of the questionnaire that the amount of green areas and forestation is on a satisfactory level. Slow cities bear the characteristic of having high quality of life. Given that the green areas are vital elements increasing the life quality in terms of social, psychological and physical aspects, this is a critical finding that needs to be analyzed in the event that Osmaneli is accepted in the Cittaslow Movement.
- The assembly areas in the city are the ones that make it more convenient for people to socialize. It can be said that the local citizens are undecided about whether these areas are on a satisfactory level, or not.

- The sufficiency of the fitting equipment in the city, along with meeting the related requirements in a manner contributing into the city aesthetics, is a vital parameter in terms of slow cities. Notwithstanding that "I agree" option is the highest in terms of amount, quality, aesthetics sufficiency, etc., there is still a certain part of participants that went with "I'm undecided" or "I disagree".
- Another one of the critical parameters of slow cities is the active and proper operation of transit systems. With the properly and conveniently operating transit systems, the traffic will be cleared of motor vehicles to the extent possible, thus providing significant contribution for the environment. Additionally, non-motorized vehicles, such as bicycles, are encouraged to be used in this context, as well. According to the results of the questionnaire, the transit systems are to be improved, and the number of bicycle trails are not on a satisfactory level. Moreover, it is of vital importance to lay out the in-town parking systems accurately and sufficiently in terms of settlement areas, and it can be seen from the numeric data that the participants feel negative on this section regards to Osmaneli.
- In addition to setting forth the image value of the town, increasing the town-related promotional activities will not only improve the popularity of the town, but it will also ensure economic development with the visitors. According to the questionnaire results, the promotional activities oriented at the popularity of Osmaneli are to be increased.
- The last four suggestions directed to the Osmaneli citizens were oriented at measuring and analyzing the thoughts and participation level of the citizens in terms of joining in an urban network. In this context, the idea of joining in an urban network to contribute in the development, social structure and tourism activities of the town is more prominent. Given that the agreement ratio in the last suggestion "I support Osmaneli to join in an urban network" is 74,8%, it can be seen that the citizens clearly agree with such action.

Suggestions

As mentioned in the above sections, it is a must for a town, wishing to join in the Cittaslow Movement, to meet certain requirements, as well as undertaking to meet the others. Osmaneli town is in a lucky position in this context. Due to being a small district in Bilecik province, it was not that much affected from the urban interventions, thus preserving its unique texture. Additionally, strengthening the city image of Osmaneli, while increasing the tourism potential, will surely ensure economic development in the town. In this context, the following suggestions are presented in order to underline the image of Osmaneli and to ensure that Osmaneli becomes a Slow City:

- Informing the municipality and all the local authorities in detail with regards to joining in the Cittaslow Movement, and organizing this process in cooperation with Bilecik Şeyh Edebali University.

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- Organizing informative meetings and workshops oriented at the local citizens,
- Carrying out studies in order to identify and eliminate the deficiencies in the town
- Taking the inventory of the banners, documents, etc., that comprise of data concerning registered historical buildings & structures or those suggested to be registered
- Taking tourism inventory by means of analyzing the characteristics of the town all together oriented at strengthening its image
- Drawing up a travel touring for introducing the town to the visitors, and preparing the required documentation for this process (Figure 3)
- Drawing up introductory brochures that highlight the nature tourism, and establishing tourism routes
- Establishing bicycle trails for Osmaneli,
- Serving the introductory videos and images to media in cooperation with the local and national press units
- Communicating all these inventories both through digital media and in hard copies to people by means of the kiosks to be established in the strategic points of the town.

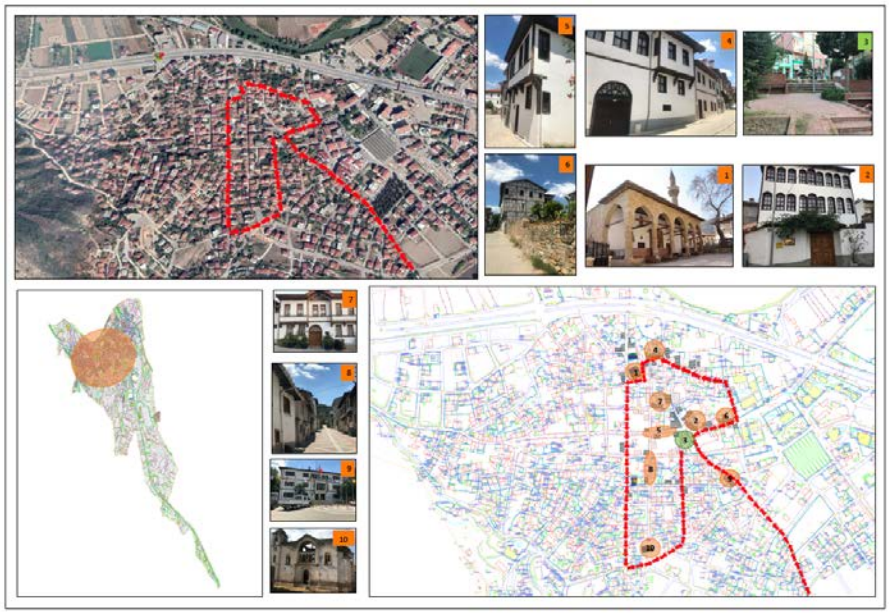

Figure 4. Travel route oriented at strengthening the touristic image of Osmaneli (Original, 2020)

As a result, the data, evaluations and observations obtained within the scope of the study show that; The reasons such as the fact that Osmaneli is a small settlement, has a historical texture, and is on the shore of the Sakarya River give it an advantage in being a Slow City. However, in addition to such positive features, as in many local settlements it is a fact that unplanned urbanization and partial rent concerns are experienced in Osmaneli. In addition to the traditional housing pattern, some carelessly built buildings, unaesthetic urban furnishings, floor coverings,

visual pollution created by the signboards of the shops, irregularities in the public transportation systems and the like affect the city negatively. The determinations made within the scope of this study reveal the dynamics that physically direct the city and improving the image of the city will provide a development input potential to the city. In this context, the Slow City Movement should be seen as a road map and the determinations made within the scope of this study should be used as a guiding and effective tool for local governments and should be included in urban practices.

REFERENCES

Anonymous. 2011. International Cittaslow Charter. Web Sitesi: http://www.cittaslow.org/section/association/charter, Erişim Tarihi: 10.03.2012

Anonim 2020. Web Sitesi: https://www.osmaneli.bel.tr/guncel/, Erişim Tarihi: 10.07.2020

Avraham, E. 2004. Media strategies for improving an unfavorable city image. Elsevier, Cities 21(6): 471-479.

Can, M.C., Kazancı Başaran, Z. 2014. Kent Markası ve İmajının Belirlenmesi: Rize Örneği. Marmara Üniversitesi Öneri Dergisi, 11(42): 27-42.

Carp, J. 2012. The Town's Abuzz: Collaborative Opportunities for Environmental Professionals in the Slow City Movement. Environmental Practice, 14; 130-142.

Cleave, E., Arku, G. 2020. Place branding and growth machines: Implications for spatial planning and urban development, JOURNAL OF URBAN AFFAIRS 2020, AHEAD-OF-PRINT, 1-18.

Coldwell, D.F. and Evans, K.L. 2018. Visits to urban green-space and the countryside associate with different components of mental well-being and are better predictors than perceived or actual local urbanisation intensity. Landscape and Urban Planning 175 (2018): 114–122.

Doğrusoy-Türkseven, İ. and Dalgakıran, A. 2011. An Alternative Approach in Sustainable Planning: Slow Urbanism. ARCHNET-IJAR, International Journal of Architectural Research, 5 (1); 127-142.

Elovich, M.A. 2012. Beoming Cittaslow A City's Journey To Becoming A Cittaslow Member. Faculty of California Polytechnic State University, In Partial Fulfillment of the Requirements for the Degree Master of City and Regional Planning.

Ergöz Karahan, E. 2017. Geleneksel ve Günümüz Konutunda Sürdürülebilirlik ve Yaşam Alışkanlıkları: Osmaneli Örneği. Megaron, 12(3): 497-510.

Farelnik, E. (2020). Cooperation of slow cities as an opportunity for the development: an example of Polish National Cittaslow Network.Oeconomia Copernicana, 11(2),267–287.

Grzelak-Kostulska, E., Hotowiecka, B. and Kwiatkowski, G. 2011. Cittaslow International Network: An Example of a Globalization Idea?. The Scale of Globalization; Think Globally, Act Locally, Change Individually in 21st Century conference, University of Ostrava, p. 186-192. Ostrava.

Günerhan, S.A., Erdem, Ü. ve Günerhan, H. 2010. Çevre ve Enerji Açısından Yavaş Şehir Hareketinin Gelişimi. 32-37.

Güven, E. 2011. Yavaş Güzeldir: 'Yavaş Yemek'ten 'Yavaş Medya'ya Hızlı Tüketime Dair Bir Çözüm Önerisi. Selçuk İletişim, 7(1); 113-121.

DOI: 10.15320/ICONARP.2022.203

Jackson, S. 2007. The Slow Movement: On The Snail's Trail. http://www.suejackson.com.au/documents/tsmotst.pdf. Erişim tarihi:10.10.2011.

Jaszczak, A., Kristianova, K. 2019. Social and Cultural Role of Greenery in Development of Cittaslow Towns. IOP Conf. Series: Materials Science and Engineering 603 (2019):1-9.

Jiao, J., Holmes, M., Griffin, G.P. 2018. Revisiting Image of the City in Cyberspace: Analysis of Spatial Twitter Messages During a Special Event. Journal of Urban Technology, 25(3): 65-82.

Keskin, E.B. 2010. Sürdürülebilir Kent Kavramına Farklı Bir Bakış Olarak Yavaş Şehirler (Cittaslow); Seferihisar Örneği. Dumlupınar Üniversitesi, Sosyal Bilimler Enstitüsü, Kamu Yönetimi Anabilim Dalı, Yüksek Lisans Tezi. Kütahya.

Knox, P.L. 2005. Creating Ordinary Places: Slow Cities in a Fast World, Journal of Urban Design, 10(1); 1–11.

Mayer, H. and Knox, P. 2009. Pace of Life and Quality of Life: The Slow City Charter.

Miele, M. 2008. CittàSlow: Producing Slowness against the Fast Life, Space and Polity. 12(1); 135-156.

Oğurlu, İ. 2014. Çevre-Kent İmajı-Kent Kimliği-Kent Kültürü Etkileşimlerine Bir Bakış. İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi, 13(26): 275-293.

Okuyucu, A. ve Somuncu, M. 2012. Kültürel Mirasın Korunması ve Turizm Amaçlı Kullanılmasında Yerel Halkın Algı ve Tutumlarının Belirlenmesi: Osmaneli İlçe Merkezi Örneği. Ankara Üniversitesi Çevrebilimleri Dergisi, 4 (1): 37-51.

Okuyucu, A. 2011. Osmaneli İlçe Merkezinde Kültürel Mirasın Korunması ve Turizm Amaçlı Kullanımına Yönelik Bir Araştırma. Ankara Üniversitesi, Sosyal Bilimler Enstitüsü, Coğrafya (Beşeri Ve İktisadi Coğrafya) Anabilim Dalı, Yüksek Lisans Tezi, Ankara.

Pamir, A.B., Yücel, A. 2005. Osmaneli'nde sosyo-ekonomik değişimlerin konut tipolojisine etkileri. İtü Dergisi/a mimarlık, planlama, tasarım, 4(2): 70-78.

Polat, E. 2011. Kentsel Yaşam Kalitesi, Ağır Ağır Çıkacaksın Bu Merdivenlerden: Yavaş Kent Hareketi (Cittaslow). Mimarlık Dergisi, ISSN 1300-4212 (359).

Pink, S. 2009. Urban social movements and small places: Slow Cities as sites of activism. City: analysis of urban trends, culture, theory, policy, action, 13(4); 451-465.

Priporas, C., Stylos, N.,Kamenidou, I. 2020. City image, city brand personality and generation Z residents' lifesatisfaction under economic crisis: Predictors of city-related social media engagement. Elsevier, Journal of Business Research, 119 (2020): 453- 463.

Radstrom, S. 2011. A Place-Sustaining Framework for Local Urban Identity: an Introduction and History of Cittaslow. IJPP - Italian Journal of Planning Practice, 1 (1); 90-113.

Rıza, M., Doratlı, N. and Faslı, M. 2011. City Branding and Identity. Elsevier, Procedia - Social and Behavioral Sciences 35 (2012); 293 – 300.

Semmens, J. and Freeman, C. 2012. The Value of Cittaslow as an Approach to Local Sustainable Development: A New Zealand Perspective. International Planning Studies, Routledge, Taylor&Francis Group, 17 (4); 353–375.

Tarsitano, E., Rosa, A.G., Posca, C., Petruzzi, G., Mundo, M., Colao, M. 2020. A sustainable urban regeneration project to protect biodiversity. Urban Ecosystems, https://doi.org/10.1007/s11252-020-01084-1.

Taylor, M. 2020. The Role Of Traders And Small Businesses In Urban Social Movements: The Case of London's Workspace Struggles. International Journal Of Urban And Regional Research, 44(6): 1041-1056.

Wang, Y., Bakker, F., Groot, R., Wörtche, H., Leemans, R. 2015. Effects of urban green infrastructure (UGI) on local outdoor microclimate during the growing season. Environmental Monitoring and Assessment (2015) 187: 732.

Widayati, C.C., Ali, H., Permana, D., Nugroho, A. 2020. The Role of Destination Image on Visiting Decisions through Word of Mouth in Urban Tourism in Yogyakarta. International Journal of Innovation, Creativity and Change, 12(3): 177-196.

Yalçın, A. ve Yalçın, S. 2013. Sürdürülebilir Yerel Kalkınma İçin Cittaslow Hareketi Bir Model Olabilir mi?. Sosyal ve Beşeri Bilimler Dergisi, 5(1): 32-41, ISSN: 1309-8012.

Zhou, P.C., Li, Y.T., Yang, Y. F., Zhang, H.M. 2020. Analysis on the coordinated development of urbanization and ecological environment of the city cluster along the middle reaches of the Yangtze River in China. Applied Ecology And Environmental Research, 18(6):7881-7900.

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Examination of the Diversity in Rural Architecture in Kırklareli Through Factors

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İzzet Yüksek**

Abstract

The study aims to document the settlement, spatial, constructional, and cultural characteristics of Kırklareli rural area to reveal the variations of the region. In addition, the region is a hybrid location with elements from both the Black Sea and inner Anatolia. So, the characteristics of the region are compared with the Black Sea and inner Anatolia.

The method of the study is composed of two phases, first, the effect of environmental features such as natural environment, topography, climate, and the economic situation on settlement and plan and constructional characteristics and material usage of the houses in Kırklareli were documented. Second, the Thrace region's rural characteristics were compared to those of the Black Sea and inner Anatolia.

As a result, the natural environment, geography, climate, and culture all had a role in the formation of rural settlements and houses. (1) Topographical features influenced daily living and agricultural productivity, resulting in changes in settlement structures. (2) The differences in plan characteristics of rural dwellings were mostly influenced by regional climate conditions. The presence, form, and size of common places and open spaces varied based on climate conditions. (3) Local materials used in house construction were influenced by landforms and the natural environment. It has been observed that house construction strategies have altered as a result of the most widely accessible material from the surroundings. (4) Even though there were physical variances between houses due to topographical changes in the area, Turkish people's nomadic culture and Islamic beliefs provided certain similar elements in the houses, such as introversion and privacy. Thrace Rural area contains different settlement, spatial and constructional characteristics due to the differences in its geography. Many rural homes have been abandoned, and there is a risk of becoming lost. Therefore, documentation of authentic characteristics of the rural houses and sites considering environmental features will provide a base for the sustainability of original rural houses and areas.

Keywords:
Comparative study, construction system, rural settlement, spatial organization, thrace

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INTRODUCTION

The rural heritage reflects the culture of the people who live there, as well as their relationship with the environment (Icomos, 1999). Rural settlements are symbolic of the geographical, climatic, economic, social, and natural qualities of the sites. These different features cause different settlement morphology, house positions, plan types, construction techniques, and material usages. Research and documentation are the initial steps in preserving the rural heritage's long-term sustainability. As a result, it is necessary to do study and documentation settlement characteristics, building groups, and traditional construction systems (Icomos, 1999).

The documentation of each rural area's characteristics highlights the area's uniqueness. Most of the studies focused on settlement characteristics (Fuentes, 2010; ECOVAST, 1996; Ruda, 1998). Vernacular or rural houses have long been the subject of research carried out in different parts of the world with different approaches to the built environment in rural areas. In some studies, settlement and housing types in specific regions are focused (Dickinson, 1949; Enhayat, 1952, Kaushik, 2020). There are studies about the environmental sustainability of rural settlements and houses (Vissilia, 2009; Cardinale et al., 2013; Oikonomou and Bougiatioti, 2011, Quintana et al., 2022). Construction techniques and material usage in rural houses are another common study area (Ngowi, 1997; Delgado and Guerrero, 2006; Ottoni and Borghi, 2016). There are also lots of studies about reusing rural houses (Fuentes, 2010; Alcindor and Coq-Huelva, 2020; Philips, 1993; Gonzales, 2017).

In Turkey, there are many studies about rural houses in towns, cities, and regions. Aran (2000) Batur and Gür (2005) compared rural regions. Postalcı-Altınkaya, et al (2011) and İner and Erdoğan (2007) studied towns in Marmara Regions; Akış et al (2013), Akyüz-Levi and Taşçı (2017), Deniz (1992), Etlacakuş and Turan (2016, 2017), Başoğlan-Avşar (2016), İşcanı and Eres (2017), Koca (2019) studied towns and cities in Aegean Region, Dağ-Gürcan (2017), Kurtuluş and Güçhan (2015), Kavas (2011) studied Mediterranean Region. Özgüner (1970), Batur (2005) and Zorlu and Faiz (2012) studied the rural architecture in villages of Eastern Black Sea; Samsun, Trabzon, Artvin and Giresun. Kafesçioğlu (1949) studied structural characteristics of Middle Anatolia Rural Houses; Eskişehir, Ankara and Kayseri. Studies on construction techniques, particularly in rural houses are rather scarce (Eriç, 1979; Batur and Gür, 2005; Sarıoğlu, 2017). There are also studies on the environmental performance of rural houses (Yüksek and Esin, 2013; Hasgül et al., 2021).

Different plan-type classifications of traditional Turkish houses have been done until today. Eldem (1968) classified plan types of Turkish Houses as houses without sofas, houses with outer sofas, inner sofas, and central sofas depending on the presence, position, and form of the sofas. Houses without sofas seen in hot climates are the simple and

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oldest types of Turkish Houses. These houses are composed of rooms lining up next to each other and opening a courtyard. In the houses with an outer sofa, the sofa opens each room. The houses with central and inner sofas are mostly seen in city centres (Eldem, 1968). Anatolian Turkish houses are also classified depending on climate conditions, landforms, and material usage. Kuban (1995) classified houses as stone houses (Southeast and central Anatolia), stone masonry houses with timber beams (Northeast Anatolia), timber-framed houses (East Black Sea Region), flat-roofed cubic houses (Aegean and Mediterranean Region), hımış houses (inner Aegean, northern slopes of Taurus mountains, Balkans).

Aran (2000) examined rural houses depending on location and climate, form and design, building form, materials, and workmanship. Batur and Gür (2005) determined the factors affecting rural house forms as climate, landform, material, and environmental factors including humans and nature. Also, they emphasized that cultural, social, and personal factors are also effective in determining rural house forms. However, cultural factors changed depending on geography, such as religions, beliefs, and lifestyles that provide houses having common characteristics.

There are also studies examining rural villages in Kırklareli in terms of architectural and settlement characteristics (Yeler, 2021; Polat-Pekmezci et al. 2013); cultural and natural landscapes (Kabataş and Kiper, 2021); and evaluating the identity of Kırklareli Rural area (Eres, 1999; Eres, 2014). Yüksek (2008) examines the environmental performance of the rural houses in Kırklareli.

Rural areas were explored in this research by focusing on a single feature, such as settlement features, plan organization, etc. However, the Thrace Rural area contains different settlement, spatial and constructional characteristics due to the differences in its geography in terms of topography, natural environment, and climate. It has zones with varying topographical characteristics such as mountains, plains, and hills, as well as flora and agricultural produce such as woods, sunflowers, and other crops. Both temperate and harsh climates are also seen in the region. People of various religions and civilizations have lived in Thrace Rural Area. Muslims currently make up the majority of the population. The houses mostly reflect Muslim customs and lifestyles.

Therefore, the study aims to document the settlement, spatial and constructional characteristics of Kırklareli rural area to reveal the variations of the region. Research and documentation of the rural diversity of Kırklareli are important for the sustainability of the identity of the area. In terms of terrain, natural environment, and climate, the region is also a hybrid location that combines elements of the Black Sea and inner Anatolia. As a result, the Thrace region's characteristics are compared with those of the Black Sea and interior Anatolia.

METHOD

The method of the study is composed of two phases. First, the impact of environmental factors such as terrain, climate, and economic condition on settlement, plan, and constructional characteristics, as well as material usage, of houses in Kırklareli, Thrace Rural Region, is documented. In the second phase, the Thrace region's rural characteristics are compared to those of the Black Sea and inner Anatolia to see if there are any common consequences of similar environmental conditions.

The research is mostly based on field observations and analyses of settlement morphology, house locations, house, garden, street, and neighborhood relationships, as well as the spatial and structural arrangement of Krklareli houses. The relationship between house, garden, street, and neighborhood, plan typologies, and structural elements and materials are documented during field observation. Visual observation and literature were used to collect data on the region's environmental characteristics, such as the natural environment, terrain, climate, socio-cultural elements, and economic status, as well as the materials and construction techniques used.

Visual analysis, photographic recording, and traditional measuring procedures were used in documenting the dwellings. Conventional techniques were used for the measurement of the plans. Steel tapes and survey rods were the conventional instruments used. To document structural system details, the walls and floors were visually analyzed; and the structural elements which could be reached were measured in detail.

CHARACTERISTICS OF KIRKLARELI, THRACE RURAL AREA

Kırklareli, Thrace Region, located in the northwest of Turkey, is on the transition zone connecting Asia and Europe (Figure 1). It contains different environmental features in terms of climate, topography, socio-culture, and natural environment. It has hosted many cultures such as Greek, Bulgarian and Turkish due to its strategic position. Today, the inhabitants of the rural area are Turkish. Spatial characteristics of the houses constructed by non-muslims were changed by the traditions and lifestyles of Turkish people. Thus, the houses represent the socio-cultural lifestyle and traditions of Turkish local people.

The area is divided into three areas in terms of topography: plain (south), mountainous and forested (north), and stony (central transition zone between plain and forested area). While flat plains, ridges, and hills are in the southern part, Yıldız Mountains lie in the north and northeast part of Kırklareli. The buffer zone between plain and forest are stony.

Both temperate and harsh climates are also seen in the region. The forested area is under rainy climate conditions due to the Black Sea, while in the south part, the continental climate is dominant. In the buffer zone, both the effect of continental and black sea climate is seen (see Figure 1). Winters are cold, and summers are dry and hot in the

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Thracian continental climate, while the Black Sea climate is mild and rainy in all seasons (Turikish Encyclopedia, 1982).

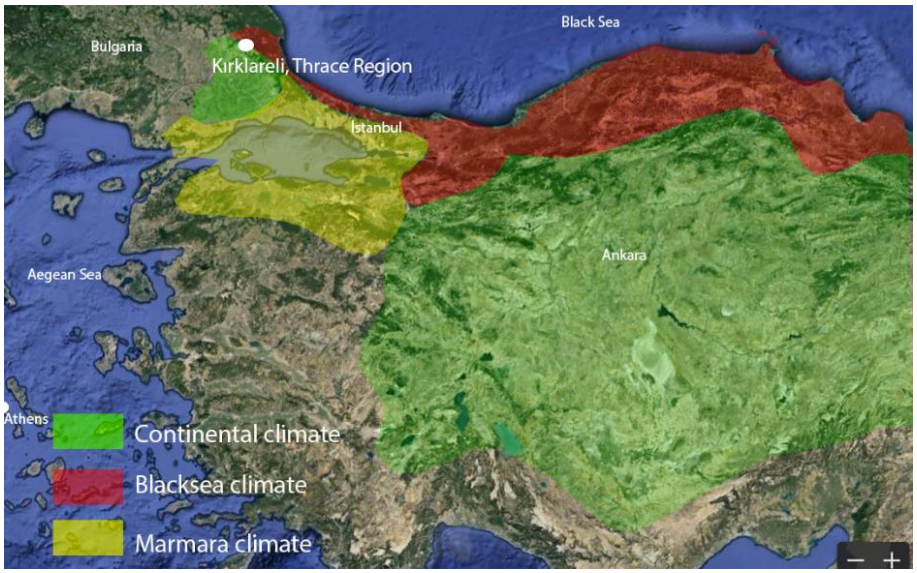


Figure 1. Location of Kırklareli and climate data of East Thrace and Anatolia (revised from Yandex Map)

Forests, sunflowers, and other types of flora and agricultural production are found in the area. Agricultural production is common in the area's south, with sunflowers being the most common crop. Sheep and goat farming is common in the north, whereas stock farming is common in the transition zone.

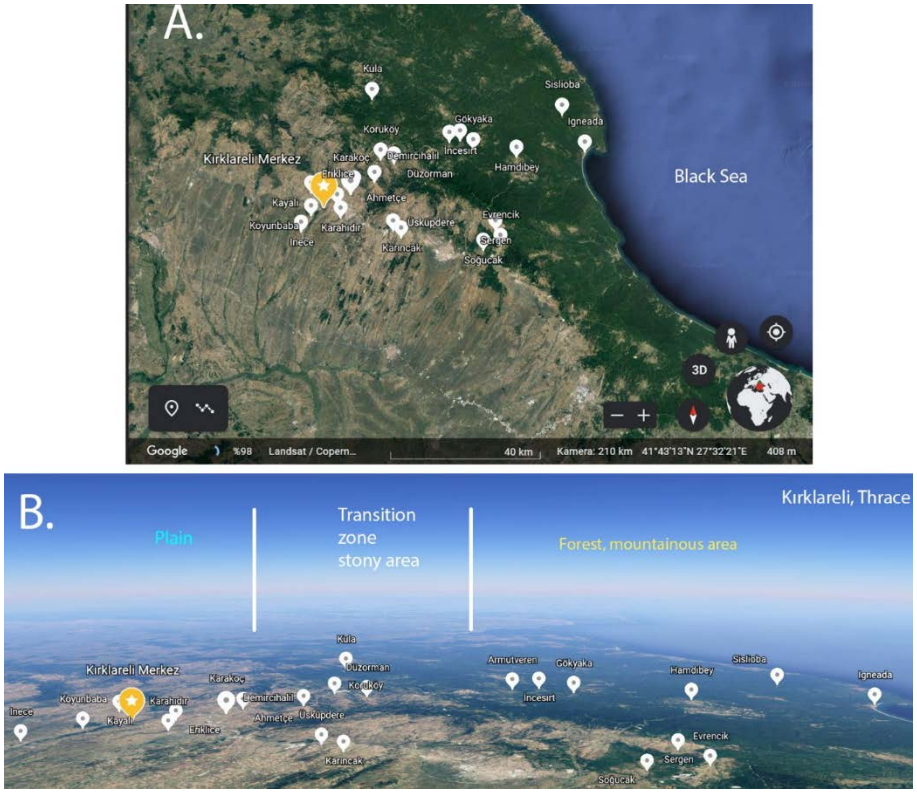


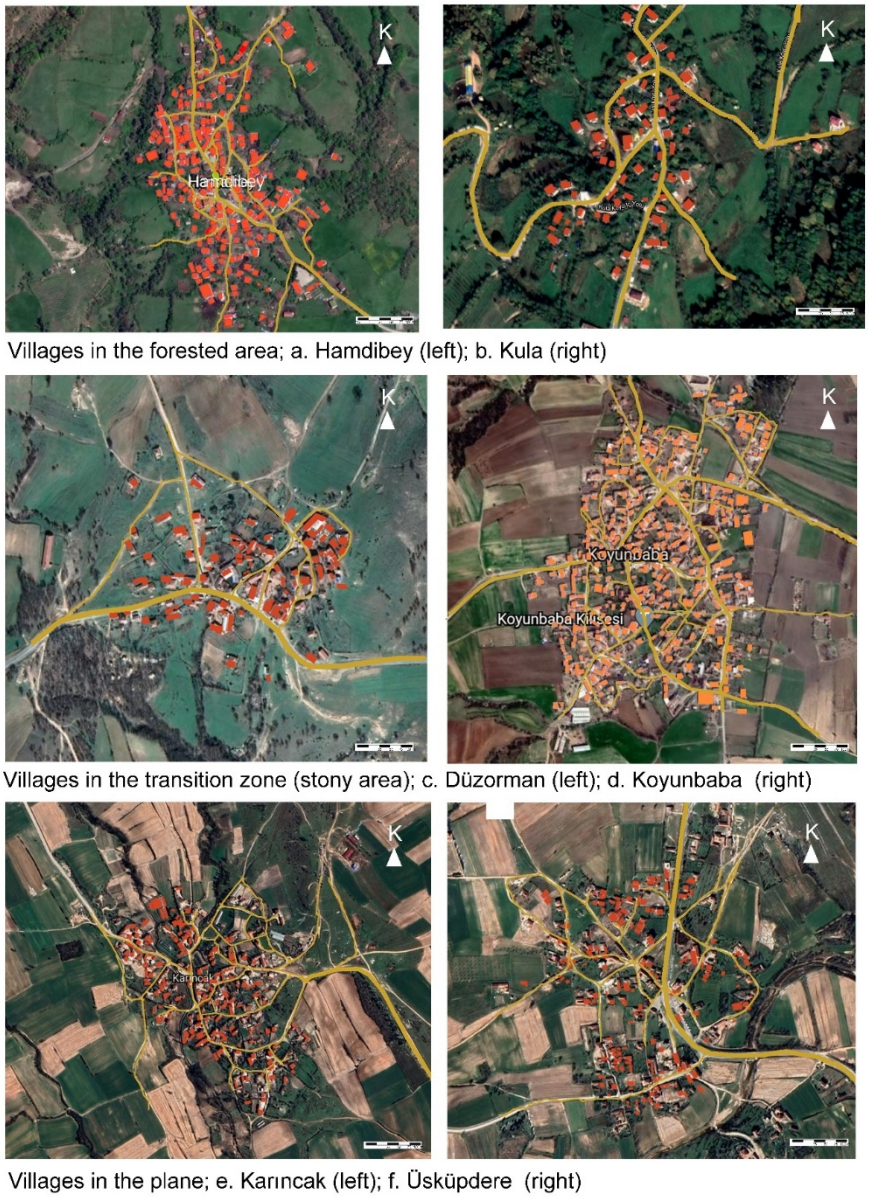
Figure 2. Kırklareli Rural Area a. Location of villages (revised from Google Earth) b. Topography differences in Kırklareli

The studied villages are in the plain of Ergene basin of Thrace (İnece, Karahıdır, Karıncak, Koyunbaba and Üsküpdere); in the forested area (Kula, Koruköy, Armutveren, İncesırt, Gökyaka, Kızılağaç, Sergen,

Evrencik, İğneada, Soğucak, Hamdibey and Sislioba) and in the transition zone between plain and hilly area (Ahmetçe, Eriklice, Demircihalil, Kayalı, Düzorman). Armutveren (Paspala) and Sislioba (Pılaça) were old Bulgarian villages, Hamdibey (Trulya) and Soğucak (Krionero) located in forested area were old Greek villages in the past (Figure 2).

Settlement morphology

There are two types of settlement patterns in the forest area. An organic settlement organization with buildings adjacent to each other is observed in regions where the slope is smaller, such as Hamdibey. Single buildings, organized according to the slope of the land, are positioned far apart in areas like Kula, which is situated between dense forests on mountainous terrain.



Villages in the forested area; a. Hamdibey (left); b. Kula (right)

Villages in the transition zone (stony area); c. Düzorman (left); d. Koyunbaba (right)

Villages in the plane; e. Karıncak (left); f. Üsküpdere (right)

Figure 3. Settlement morphology of the villages that have different topography and natural environment a. Hamdibey, b. Kula, c. Düzorman, d. Koyunbaba, e. Karıncak, f. Üsküpdere (revised from Google Earth)

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The density of dwellings varies depending on terrain and the natural surroundings. In the transition zone, villages have organic settlement organizations and houses that are near to one another. When a village is located in a hilly area, such as Düzorman, the distance between houses increases. The houses are located far from each other in the plain areas since there are fields or gardens between the houses for agricultural activities. The agricultural spaces between the dwellings are visible, especially in the southern part of the city, in villages like Üsküpdere. (Figure 3).

House positions

When looking at the positions of the houses on a larger scale, the houses on the hilly land of the forest are close together, and the plot borders are defined by garden walls. Each house has its barn. There can be two houses facing a garden or a courtyard. When looking at the mountainous area, it is clear that garden walls are not used between houses due to the dense forest, yet, like the hilly area, their barns are close to the houses. Barns were likely built close to the dwellings in this region, where sheep and goat farming is common. (Figure 4).

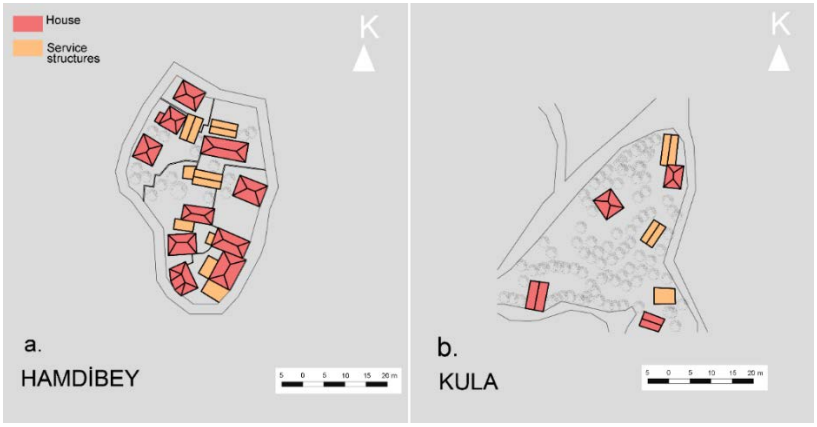

Figure 4. House positions in the villages of the forest area; a. Hamdibey, b. Kula

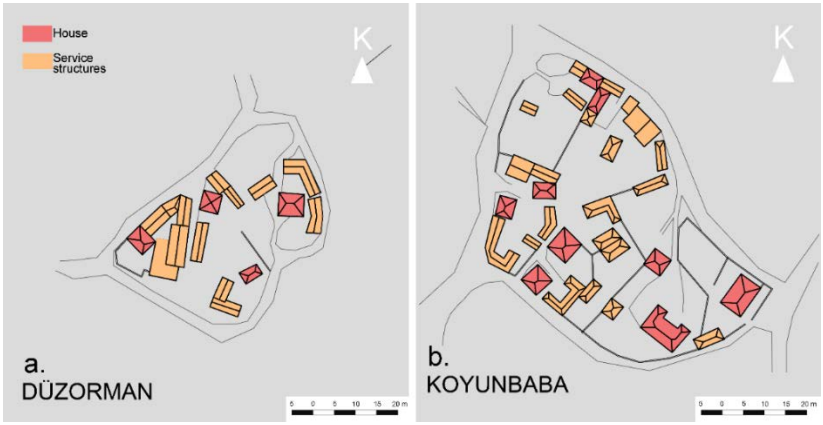

Figure 5. House positions in the transition area, a. Düzorman, b. Koyunbaba

When the villages in the transition zone (stony) are examined, the irregular plots consist of houses, barns, and warehouses surrounding a courtyard. Because the plots are smaller and the borders are designated by barns and warehouses, garden walls are used less frequently than in

plains villages. Each house-barn-storage group planned to create a courtyard within itself. These courtyards are directly connected to the streets. The layout was most likely shaped by the need for space for cow breeding. (Figure 5).

The layout of the villages is more regular in comparison to stony and forest areas. Houses, agricultural areas, and warehouse groups exist on the plains; however, due to the large agricultural grounds, these groups are separated from one another. Garden walls are commonly seen between agricultural areas on the plains, although there is no distinction between houses and streets. The majority of the houses are near the street, and plots are accessible directly from the street. (Figure 6).

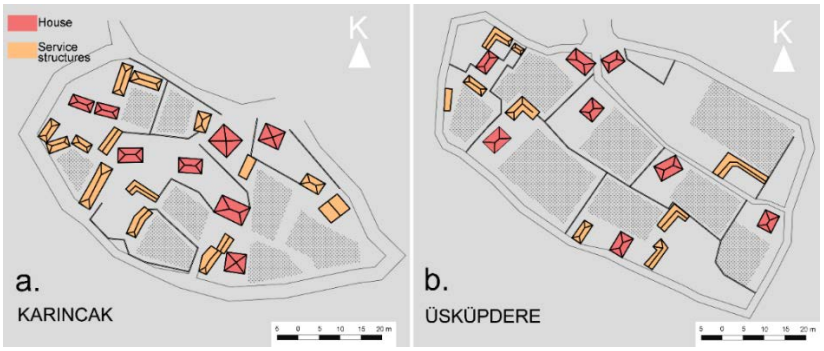

Figure 6. House positions in the plain area; a. Karıncak, b. Üsküpdere

House, garden, street, and neighborhood relation

Two neighboring houses with their barns and warehouses facing a courtyard are peculiar to the stony area. The plot boundaries are marked by U and L-formed barns that surround the courtyard. Paths connect the streets to the courtyard. The neighborhood relations are the strongest in this area. The buildings' sofas face the courtyard, while the facades facing the streets are more shuttered, making the houses introverted.

The position of the house on one side of the plot enables broad agricultural areas in the plain area, and the houses and their sofas always open the agricultural area, with massive facades facing the street. Each house has a rectangular or L-formed warehouse (Figure 7).

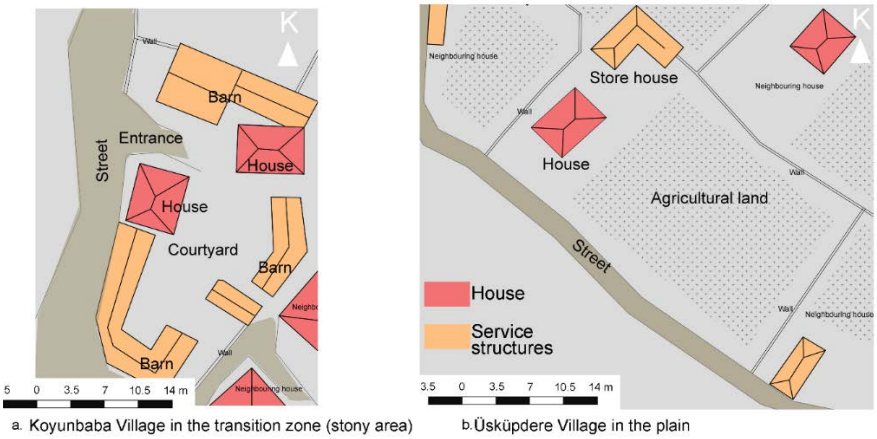

Figure 7. House, garden, street, and neighborhood relation of villages in the transition zone and plain; a. Koyunbaba, b. Üsküpdere

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In the forested areas, there are more modest houses and barns. A house and a barn are located in a small garden. There are trees in the gardens (Figure 8).

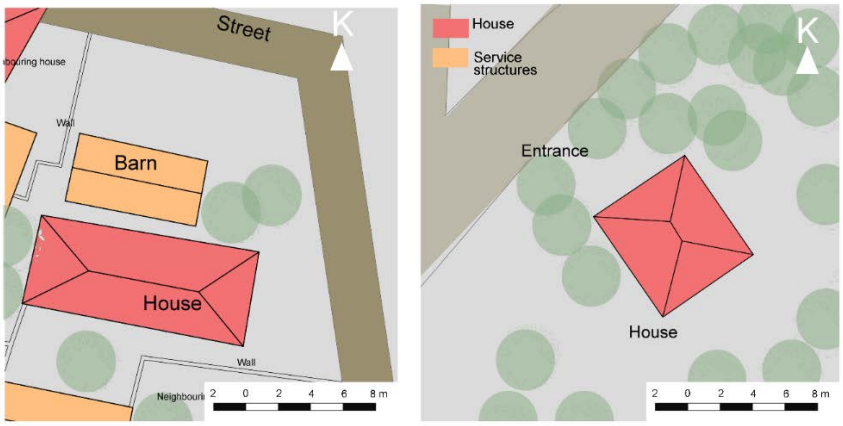

Figure 8. House, garden, street, and neighborhood relation of villages in the forest; a. Hamdibey, b. Kula

Spatial characteristics and architectural elements of the houses

When the rural houses in the region are classified depending on the position and relation of rooms, sofas, and open areas, four different plan types are determined (Figure 9).

Figure 9. The rural house examples in Kırklareli, Thrace Region; a. Armutveren House, b. Evrencik House, c. Sergen House, d. Demircihalil House, e. Soğucak House

In plan type 1, the houses are mostly one-storied, the rooms lined up to each other, and open sundurma (outer sofa). There is no relationship between rooms. This type of house is seen in both timber-framed or mud-brick masonry houses, in the Central and Demirköy Districts. While one-storied and mudbrick house examples of type 1 are seen in the plain areas (Üsküpdere Village); two-storied, timber-framed house examples of type 1 with three and four rooms are seen in the forested villages (Sislioba, Karakoç, and Ahmetçe) that are under the effect of Black Sea climate. Since the walls of one-storied and mudbrick houses are thick (app. 60 cm), there are cupboards and niches in the walls. Also, fireplaces and bathrooms can be seen in the solid north walls (Figure 10).

Plan type 2, composed of a closed sofa and rooms around it, is seen in one or two-storied houses. Ground floors are used as stable, hayloft, kitchen, or storage in two-storied houses. The sofa, located in the middle, opens the rooms on the first floor. Plans vary depending on the number of rooms. There are rectangular planned houses that have sofas opening two rooms, and nearly squared planned houses that have sofas opening four or five rooms (Figures 11 and 12).

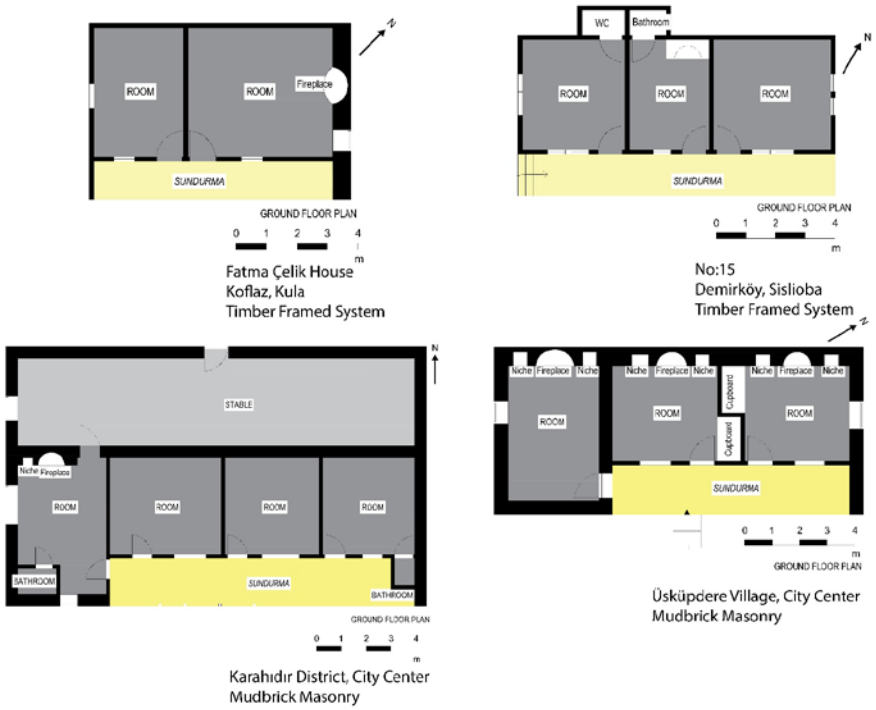

Figure 10. Plan type 1 opening outer sofa (sundurma)

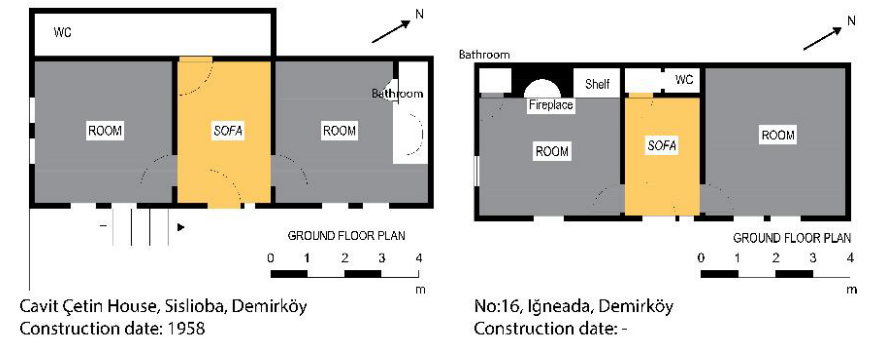

Figure 11. Plan type 2; Houses with closed sofas opening two rooms

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Sadık Arlı House, Armutveren, Demirköy
Construction date: app. 1900

Emin Aşut House, Soğucak, Vize
Construction date: app. 1850

Figure 12. Plan type 2; Houses with closed sofas opening four rooms

Raşit Duman House, Kızılağaç, Vize
Construction date: app. 1850

Güral Çalkan House, Soğucak, Vize
Construction date: app. 1800

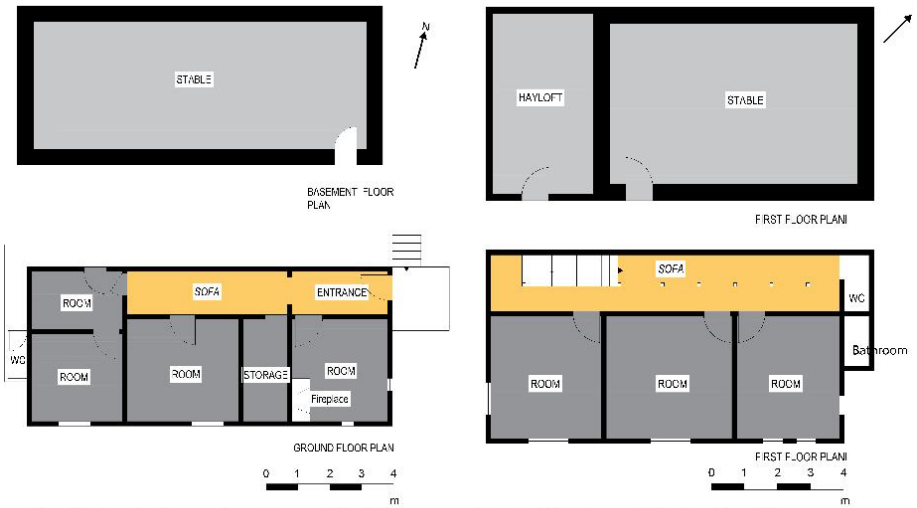
Figure 13. Plan type 3; Houses with closed corner sofa

Type 2, which is one-storied and composed of two rooms, is seen in lowland villages that are under the effect of continental climate as İnece and Karahıdır. One and two-storied houses with two rooms are seen in

villages that are forest or lowlands as Demircihalil, Koruköy, and Kula. Two storied houses composed of four rooms are mostly seen in forested villages that are under the effect of the Black Sea Climate as Hamdibey, Armutveren, and Soğucak.

Plan type 3, composed of a corner sofa and rooms, is seen in two-storied houses. Ground floors are used as stable, barn, or storage similar to plan type 2. On the first floor, a closed sofa is located at the corner of the house and rooms open the sofa. Type 3 with three rooms is mostly seen in Kızılağaç Village which is located in forested and hilly areas under the effect of the Black Sea climate (Figure 13).

Plan type 4, which is seen in two-storied houses, has a linear sofa or staircase landing opening three or four rooms. Ground floors are used as stable, barn, and storage similar to the other types. Even if the position of the sofa is similar to the outer sofa, it is designed as closed. This type is mostly seen in hilly and forested villages such as Sislioba and Armutveren (Figure 14).



Yusuf Habuşka House, Armutveren, Demirköy
Construction date: app. 1700

Pembe Atik House, Sislioba, Demirköy
Construction date: app. 1850

Figure 14. Plan type 4; Houses with closed linear sofa

Briefly, type 1 represents houses with an outer sofa. Type 2 is similar to the houses with an inner sofa. It is an important example representing the transition to a closed hall in a rural area. Type 3 represents houses with a closed corner sofa. Although type 4 is similar to the houses with the outer sofa, the sofa is closed. Since it is closed and narrow, it is probably used for circulation purposes rather than daily work (Figure 15; Table 1).

Most of the houses have similar architectural elements such as gusülhane (bathroom), cupboards, niches, and fireplaces on the solid of the houses, positioned in the north, however in some villages such as Soğucak and Armutveren (see Figure 12), there are not any cupboards in the houses or cupboards and gusülhane spaces were added later. These houses were probably belonging to the non-muslims in the past, they are altered with the lifestyle of Turkish local people.

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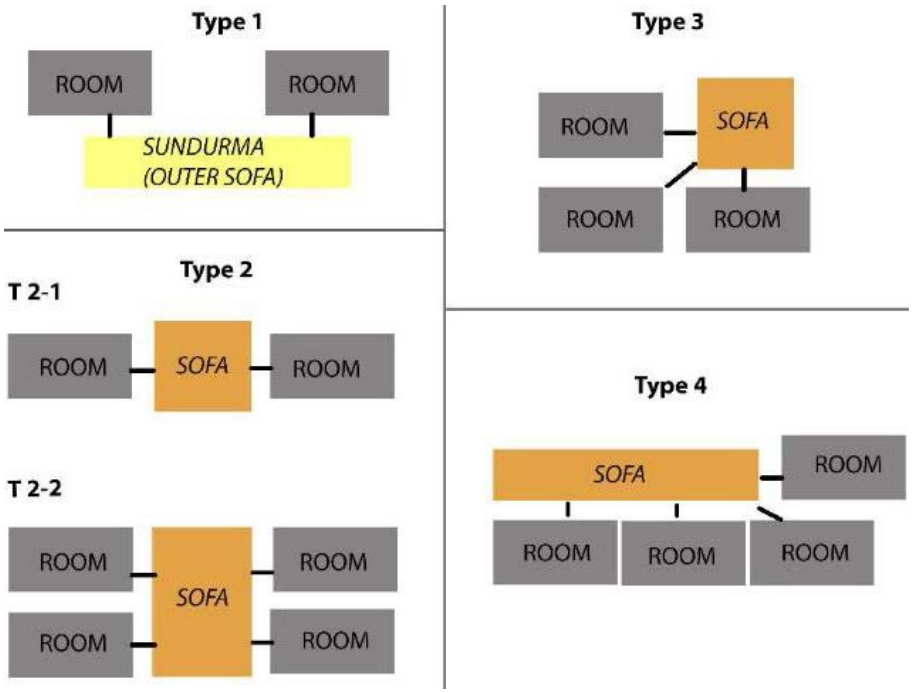

Figure 15. Plan types in Kırklareli Rural Region

Construction technique and material usage of the houses

Construction techniques and material usage of the houses are examined in terms of their roof, wall, and floor system, respectively.

Table 1. Spatial characteristics of the village houses

Villages	Land form	N. Of Story	Ground Floor Function	Plan Type Depending on *Sofa* or Hall	Open Space
İnece, Karahıdır, (Central)	Plain	1	Living	Inner closed *sofa* with 2 rooms	-
Demircihalil (Central)	Plain and hill	1-2	Stable, storage	Inner closed *sofa* with 2 rooms	-
Kayalı	Plain and hill	2	Stable, storage	Inner closed *sofa* with more than 2 rooms	-
Kula (Kofçaz) Koruköy (Central)	Forest	1-2	Stable, storage	Inner closed *sofa* with 2 rooms	
Hamdibey, Armutveren, (Demirköy)	Plain and hill	2	Stable, storage	Inner closed *sofa* with 3 or 4 rooms	-
Eriklice	Plain and hill	2	Stable, coop	Inner closed or open *sofa* with 3 or 4 rooms	*Sofa*
İnece, Karıncak (Central)	Plain	1	Living	Inner closed *sofa* with 3 or 4 rooms	-
Kızılağaç, Soğucak(Vize), Gökyaka	Forest	2	Stable, storage	Corner closed *sofa* or Inner closed *sofa* with 3 rooms	
Sislioba (Demirköy)	Forest	2	Stable, storage	3 or 4 rooms opening *Sundurma*	*Sundurma*
Karakoç, Ahmetçe (Central)	Plain and hill	1-2	Stable, storage	3 or 4 rooms opening *Sundurma*	*Sundurma*
Üsküpdere (Central)	Plain	1	Living	2 rooms opening *Sundurma*	*Sundurma*
Sislioba (Demirköy)	Forest	2	Stable, storage, hayloft	Linear closed *sofa* with 2 rooms	-

The timber-framed techniques have lots of different types depending on their infill material such as stone, and mudbrick. Timber framed systems are also combined with wattle and daub or timber laths. The variation in material usage increases based on the sources of the forested area (Figure 19).

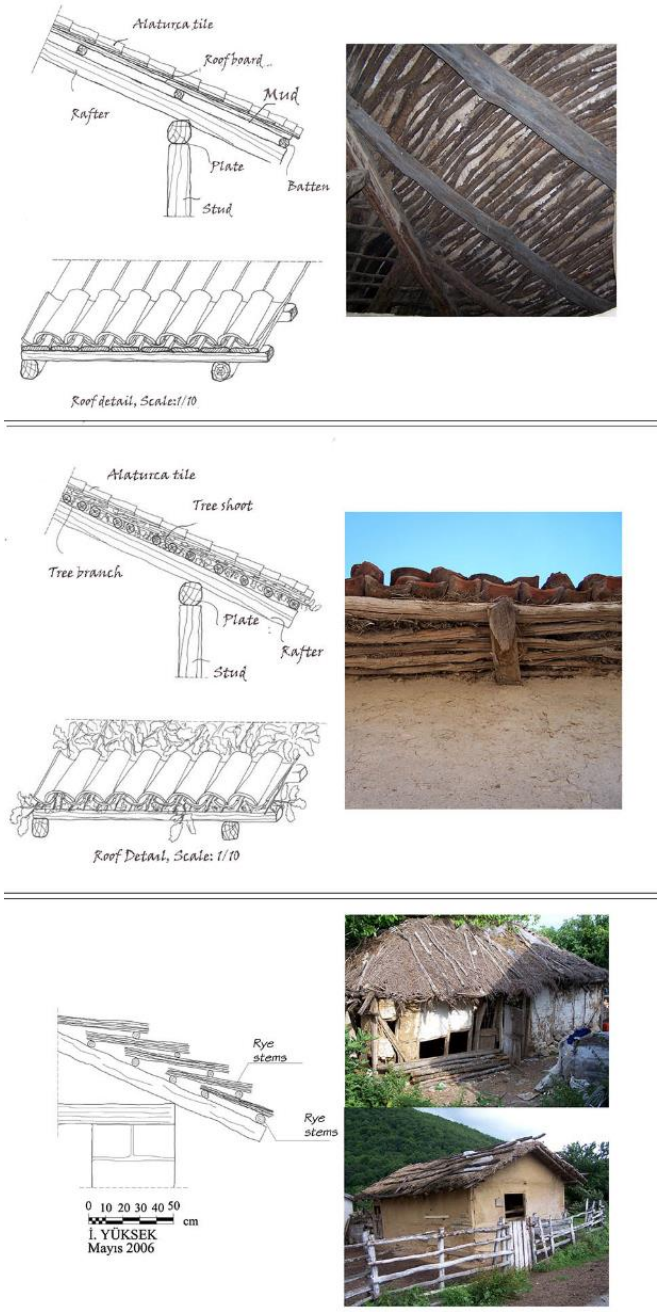

Figure 16. Timber framed roof system details (usage of mud, tree shoots, and rye stems)

Timber beam roof systems are observed in lowland, forested, and rock areas, but the isolation layers present differences in forested and plain areas. Mud is observed in plain areas, while tree shoots, tree branches, wattles, and ferns are used as isolation layers under the tile in the forested area. The roof systems that are out of totally rye stems were observed in the forested area. It was thought that rye stems are the

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original materials of the roofs in the Thrace Region, however, this material has been damaged and disappeared in time (Figure 16).

Construction techniques of the walls show certain differences depending on the characteristics of the regions. In lowland areas, mudbrick masonry is used, while in the buffer zone stone masonry is used. Mudbrick and brick can be used together; for example, to protect mudbrick from rain, the exterior layers could be brick while the inside layers could be mudbrick. The width of the outer layers is 25-30 cm, while the inner layers are 50 cm in width. The walls are supported with timber lintels at 150 cm intervals along with the height of the wall. Both timber-framed and combined construction techniques (stone masonry bottom floors and timber-framed upper levels) are seen in the forested area. (Figures 17 and 18).

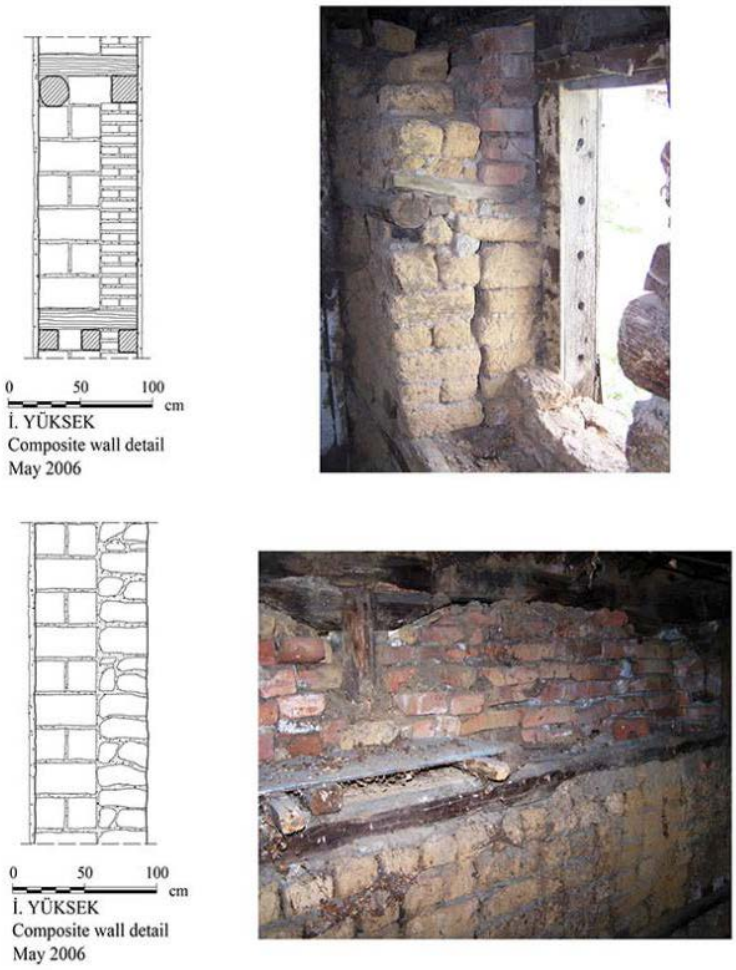

Figure 17. Composite masonry wall systems

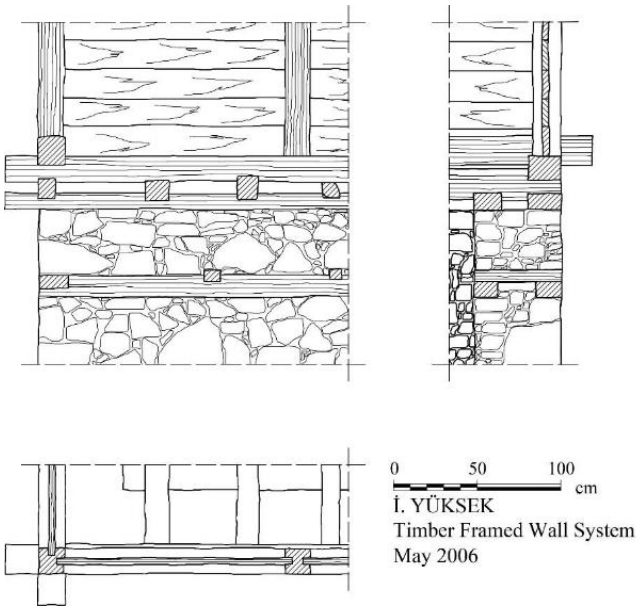

Figure 18. Timber-framed wall systems

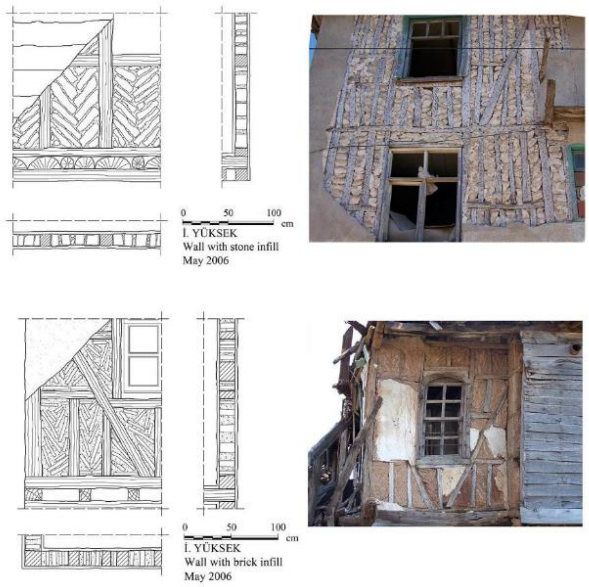

Figure 19. Timber-framed systems with stone and brick infill

The use of timber joist floor systems has been noticed. Floors are comprised of four main layers: timber beams, timber covers, soil, and straw covering; however, in forested areas, tree shoots can be used instead of timber floor covering. Sunflower stems grown in plain places are utilized to cover the roofs of lowland houses as ceiling coverings (Figure 20).

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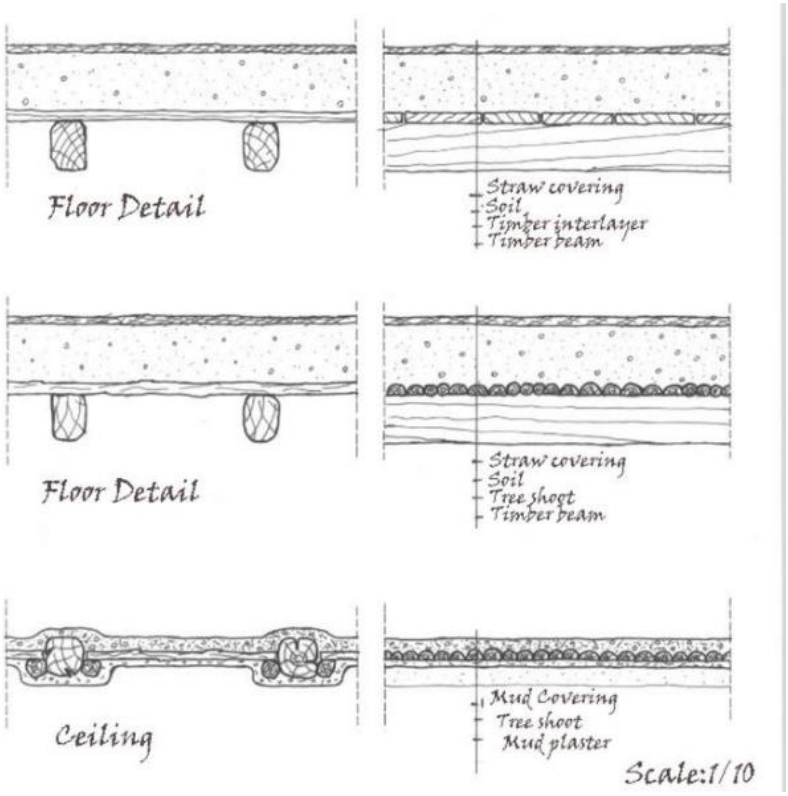

Figure 20. Timber floor system details

DISCUSSION

The Thrace region presents different climate and topography conditions, it is a hybrid area composed of features of the Black Sea and inner Anatolia in terms of topography, natural environment, and climate. As a result, in this section, the characteristics of the Thrace region are compared to those of the Black Sea and inner Anatolia to identify effective environmental factors influencing settlement and plan, as well as material usage. (Table 2).

Topography affects settlement characteristics and livelihood. While houses and warehouses are opening to agricultural areas, enormous barns and warehouses are being built in the stony area around the courtyard.

Agricultural lands and gardens surround the houses in the plain in the south of Krklareli, as they do in Central Anatolia (Eskişehir, Ankara, Aksaray). Stony areas (Kayseri) as the transition zone of Krklareli (Figure 21) show a more organic settlement organization, surrounded by barns and warehouses (Kafesçioğlu, 1949; Aran, 2000).

Table 2. Environmental, settlement, spatial and constructional characteristics of Kırklareli, Thrace Region

ENVIRONMENTAL FEATURES		REFLECTION ON ARCHITECTURE				
		Settlement	**Architectural features**	**Number of stories**	**Construction technique**	**Material usage**
CLIMATE	Continental climate		*Sundurma*, open *sofa* and closed *sofa*			Mud, straw covering, soil, sunflower stems
	Continental and black sea climate		Open and closed *sofa*			tree shoots, tree branches, wattles and ferns, straw covering
	Black sea climate		Closed *sofa*			Tree shoots, tree branches, wattles and ferns, rye stems, timber lath, wattle and daub straw covering, soil, tree shoots
TOPOGRAPHY	Plain	Houses, warehouses opening agricultural areas			Mudbrick Masonry	
	Transition zone (hilly)	Large barns, warehouses around a courtyard			Stone masonry	
	Mountainous (North)	Single houses were located on the slope or in the hilly area			Timber framed system	
NATURAL ENVIRONMENT	Soil, Agricultural areas (Sunflower, wheat, rye, corn, and grape gardens)	Agricultural areas between houses, Houses far from each other		One storied	Mudbrick Masonry	Mud, straw covering, soil, timber covering sunflower stems
	Stony hills	Houses located around a courtyard		One-Two storied	Stone masonry	Mud, tree shoots, tree branches, wattles and ferns, straw covering
	Forest	Houses far from each other		Two storied	Timber framed system	Tree shoots, tree branches, wattles and ferns, rye stems, timber lath, wattle and daub straw covering,
SOURCE OF INCOME	Agriculture	The agricultural areas between houses are far from each other				
	Stock farming	Houses with gardens and barns				
	Sheep and goat farming	Barns located near the houses, small-sized barn structures				
CULTURAL FEATURES						
ORIGIN	Settled					
	Nomadic culture		Usage of cupboards			
RELIGION	Muslims		Introverted house with fewer openings in the corner or outer lavatory			
	Non-muslims		Extroverted houses with more openings, projected lavatory			

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The forest area presented different settlement morphologies depending on its topographical features. Single buildings were located on the slope in the mountainous area, and an organic settlement with houses near one other was seen in the hilly area. Since the settlement area is limited; small-sized barn structures for small cattle were built near the houses. Houses on the Eastern Black Sea Region's slopes are far apart, surrounded by tea and hazelnut gardens, as they are in the north-eastern part of Krklareli (Özgüner, 1970). Organic settlements close to each other were found in the hilly area of the western Black Sea (Figure 22).

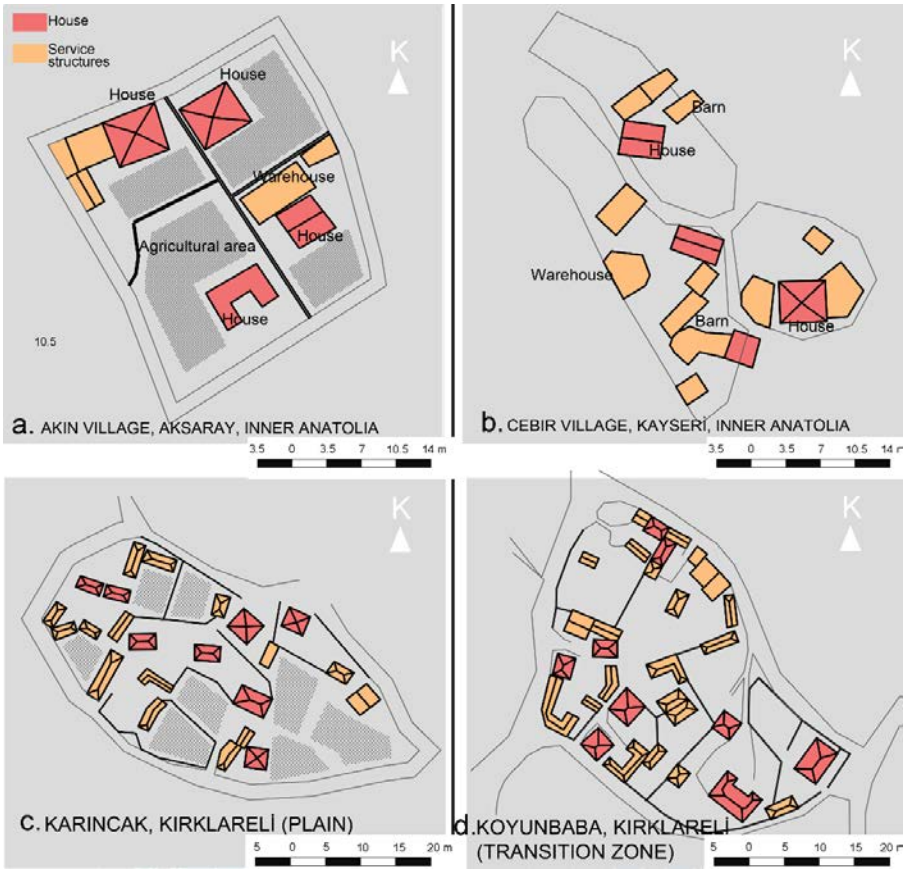

Figure 21. Comparison of settlement morphology between plain and stony areas of Kırklareli and inner Anatolia a and b: Inner Anatolia, c: Kırklareli plain region, d: Kırklareli transition zone

When the plan characteristics are discussed, it is seen that the houses with open sofas are preferred in the northern region of Thrace due to the mild climate. In the plain area, there are houses with a single story with an open sofa or inner sofa. By reducing the use of open space, houses were designed against the continental climate.

Closed or open and wide corner sofas were frequently seen in forest and mountainous areas of Kırklareli. Daily common activities were probably carried out in the sofas in forested and mountainous areas, while the houses, that have small sofas used for only circulation, were seen in forested and hilly areas.

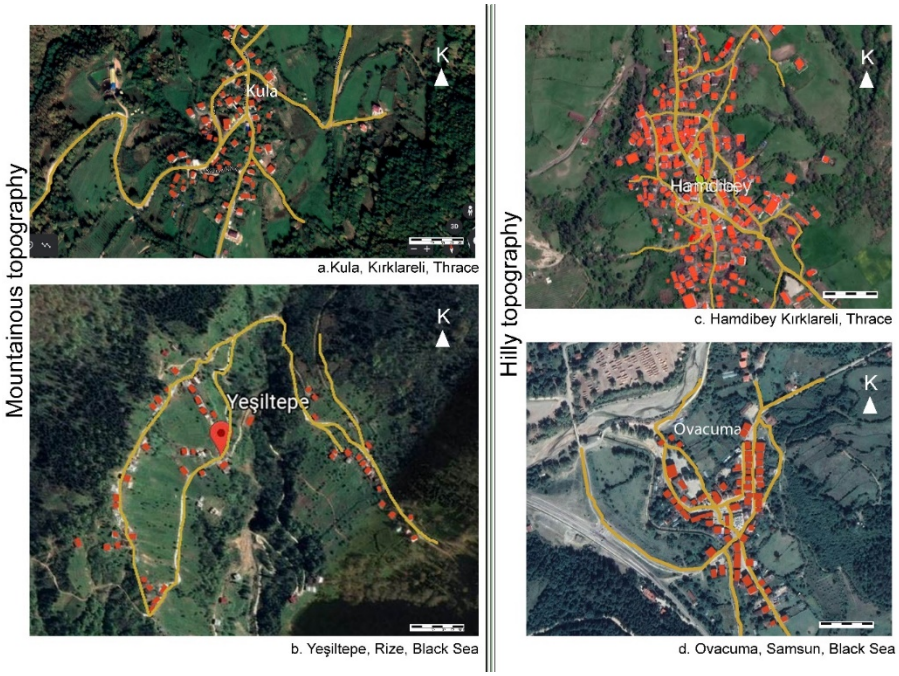

Figure 22. Comparison of settlement morphology between forest areas of Kırklareli and the Black Sea Region (revised from Google Earth)

There were two-story houses in both hilly and mountainous forest areas where the lower floors are used as barns. In the eastern Black Sea region (Samsun, Trabzon, Artvin, and Giresun), where the mild climate and hilly topography are dominating, there are houses with large sofas as north-eastern Kırklaeli, but in the western Black Sea region, houses have primarily narrow sofas (Zorlu and Faiz, 2012). As in northern Kırklareli, the houses are often two-storied, with the ground floors serving as barns. (Özgüner, 1970) (Figures 13 and 23).

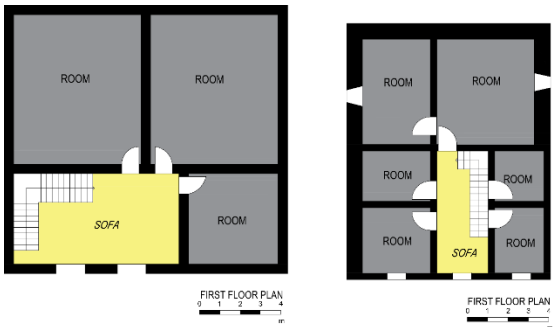

Figure 23. Spatial organization in Black Sea Region (a. plan drawn from Sümerkan, 1991; b. plan drawn from Gül and Batur, 2005)

In the Central Anatolia Region (Eskişehir, Ankara, Kayseri) where the continental climate is observed, single-story, closed-mass, adobe houses are seen, as in the south of Kırklareli. To protect houses against harsh weather conditions, open spaces are quite small, some houses have sundurma or closed inner sofas as Kırklareli plain region (Kafesçioğlu, 1949; Aran, 2000), (Figures 10 and 24).

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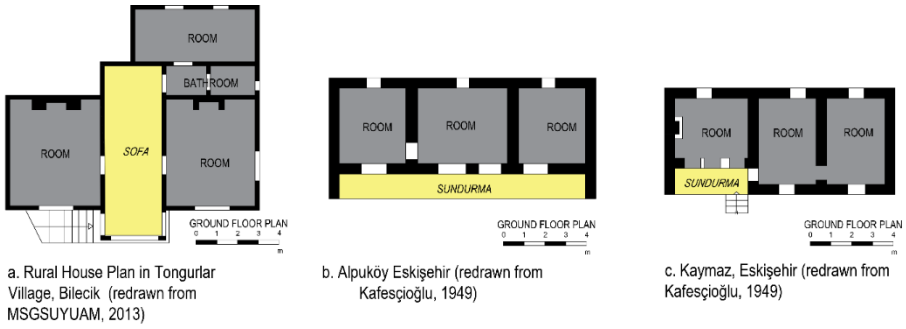

a. Rural House Plan in Tongurlar Village, Bilecik (redrawn from MSGSUYUAM, 2013)

b. Alpuköy Eskişehir (redrawn from Kafesçioğlu, 1949)

c. Kaymaz, Eskişehir (redrawn from Kafesçioğlu, 1949)

Figure 24. Spatial organization in inner Anatolia; a.Tongurlar Village, Bilecik (MSGSUYUAM, 2013); b.Alpuköy,Eskişehir (redrawn from Kafesçioğlu, 1949), c. Kaymaz, Eskişehir (redrawn from Kafesçioğlu, 1949)

Since soil material is much more in lowland villages (İnece, Karıncak, Üsküpdere, and Karahıdır), the houses are constructed with mudbrick masonry. Sunflower stems, that are grown up in this area, are used as ceiling coverings for the roofs. The tree shoots and branches are not seen on the floors and roofs, while mud is used in wall, floor, and roof layers. The flora of the area affected the material usage in the houses.

In the transition zone, a slightly more barren, and rocky land, the building material is stone. Stonemasonry houses are supported with a timber joist system. The ground floors do not have windows and are used as workshops, kitchens, cellars, or stables. In the layers of the roof and floor, tree shoots and branches are rarely seen.

There are timber-framed houses in the Istranca Forest starting from the coasts of the Black Sea to the city centers. Timber-framed houses are generally two-storied. The filling material of the walls is brick and stones. Also, combined techniques are seen, ground floors are constructed with stone masonry supported with timber beams or lintels; walls of upper floors are timber-framed. Local resources such as wood, rye stems, tree shoots and branches, wattles, and ferns are commonly used while constructing structures. Timber lath and wattle and daub techniques are also seen in the timber-framed walls. The vegetation of the area is completely seen as building construction material.

The usage of cupboards and niches is probably a physical reflection of the nomadic culture of the Turkish people. Some of the houses that belong to non-muslims in the past do not have any cupboards, or cupboard additions were seen later by Turkish local people (Kazmaoğlu and Tanyeli, 1979).

Soğucak and Kızılağaç have the same plan type that has a corner sofa, however, the number of openings in Soğucak is more than Kızılağaç, since the Soğucak was a Greek settlement. It is probably based on the religion of the Turkish people. In non-muslim houses, such as Soğucak (Figure 13 and 14), the lavatory is a projection on the second story, however, in Muslim houses, the lavatory is usually positioned on the courtyard or in the corner of the sofa or sundurma.

The architectural materials utilized in the roof, wall, and ceiling layers are largely made from locally grown plants and agricultural items like ferns, corns, sunflowers, and ryes. They were knitted using traditional techniques. Depending on the type of agricultural operations

in the area, the techniques change. Branch knitting techniques are most common in the forest, while stalks knitting techniques are more common in plain settings.

CONCLUSIONS

Rural settlements are constructed to meet the needs of local people with simple techniques and local materials depending on the environmental conditions of the regions. The results show that environmental factors have an impact on the settlement, spatial, and constructional characteristics of rural areas. The natural environment, terrain, climate, and economic position are seen as four key components that form rural settlements and houses.

- Topographical features such as mountains, slopes, and plains affect daily life and agricultural production, thus settlement organizations present differences. Because of the topography, houses in the mountainous area are far apart and there are no neighborhood relations; yet organic villages can be found on the slopes.
    - In mountains and forests, the natural environment and topography influence the source of income; for example, sheep and goat farming is prevalent in the north of Krklareli, therefore the houses are two stories, with the ground floors usually barns and stables.
    - Due to agricultural activity, most houses in plain villages in Thrace and inner Anatolia have larger plots, and there is also large-scale storage for agricultural products.
    - There are houses adjacent to each other and courtyards between houses in the transition zone (stony area).

- The differences in plan characteristics of rural houses are mostly influenced by regional climate conditions. Particularly, the presence, form, and sizes of common areas and open spaces present differences depending on climate conditions. The houses in the south of Thrace have been designed as enclosed without open areas in harsh hot or cold conditions.
    - The use of open spaces is determined by the climate; for example, in the Black Sea region, hot and humid weather conditions increase the use of an open sofa and Hayat space, because most activities are placed outside. Small, closed houses can be found in the harsh climate of southern Thrace. They do not have any large open areas.
- Landforms and the natural environment affect local materials used in the construction of houses. It has been observed that the construction systems of the houses have changed by the most easily obtained material from the nearby surroundings.
    - For example, there are mud-brick masonry rural houses in the plain areas, stone masonry houses in hilly areas, and timber-framed systems in the forested areas.

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- While tree shoots and branches were used as isolation in the forested areas, mud is used as a protective layer in the plain areas against harsh climate conditions.

- Even if there are physical differences between houses due to the geographical differences in the area, the nomadic culture of Turkish people and Islamic beliefs provide some common points in the houses such as introversion and privacy of the houses, usage of cupboards, gusülhane.

Comparison results also demonstrate that the differences in Thrace rural region are similar to the Black Sea and inner Anatolia depending on topographical features, climate, and source of income. Agricultural lands and gardens surround the houses in the plain in the south of Krklareli, as they do in Central Anatolia (Eskişehir, Ankara, Aksaray). Houses on the Eastern Black Sea Region's slopes are far apart, surrounded by tea and hazelnut gardens, as they are in the north-eastern part of Krklareli. In the Central Anatolia Region (Eskişehir, Ankara, Kayseri) where the continental climate is observed, single-story, closed-mass, adobe houses are seen, as in the south of Kırklareli. In the eastern Black Sea region (Samsun, Trabzon, Artvin, and Giresun), where the mild climate and hilly topography are dominating, there are houses with large sofas as north-eastern Kırklaeli.

As a result, rural settlements and houses have provided access to the different life habits and cultures of regions. Today, most rural houses have been abandoned and have the risk of getting lost. Therefore, documentation and analysis of settlement, plan characteristics and construction techniques of rural houses are critical to conserving the data about rural regions.

REFERENCES

Akış T., İnceköse Ü., Tunçoku S S. & Arslan Avar, A. (2013). İzmir Kırsal Alan Konutları. Mimarlık, 370.

Akyüz-Levi, E. & Taşçı, B. (2017). Research of Rural Architecture in Aegean Region: Villages of Bayındır. Megaron, 12(3), 365-384. https://doi.org/10.5505/megaron.2017.12499.

Alcindor M. & Coq-Huelva, D. (2020). Refurbishment, vernacular architecture and invented traditions: the case of the Empordanet (Catalonia). International Journal of Heritage Studies, 26(7), 684-699. DOI: 10.1080/13527258.2019.1678054

Aran, K. (2000). Barınaktan Öte: Anadolu Kır Yapıları. Ege Yayınları.

Başoğlan Avşar, Ö. (2016). Muğla - Yerkesik Kırsalı Örneğinde Kırsal Mimarinin Geleceğinin Tartışılması. Ege Mimarlık, 92, 14-19.

Batur, A. & Gür Ş, Ö. (2005). Doğu Karadeniz'de Kırsal Mimari. Milli Reasürans T.A. Ş.

Batur, A. (2005). Doğu Karadeniz'de Kırsal Mimari (Rural architecture in the Eastern Black Sea Region). İstanbul, Turkey: Milli Reasürans TAŞ and Mas Matbaacılık AŞ.

Cardinale, N. Rospi, G. & Stefanizzi, P. (2013). Energy and microclimatic performance of Mediterranean vernacular buildings: The Sassi District of

Matera and the Trulli District of Alberobello. Building and Environment, 59, 590–598.
Carmen Jimened Delgado, M. and Guerrero, I. C. (2006). Earth building in Spain. Construction and Building Materials, 20(9), 679–690.
Dağ Gürcan, A. (2017). Toroslar'da Kırsal Mimarlık: Bozyazı, Dereköy Örneği. [Masters thesis, KTO Karatay University, Institute of Science].
Deniz, B. (1992). Manisa Yöresi Köy Ev Mimarisi. Arkeoloji-Sanat Tarihi Dergisi, 6, 17-50.
Dickinson, R. E. (1949). Rural settlements in the German lands. Annals of the Association of American Geographers, 39(4), 239–263.
ECOVAST (1996), Traditional rural architecture: A strategy for Europe. Eastleigh, United Kingdom.
Enayat, A. (1952). Rural settlement types in the Uttar Pradesh (United Provinces of Agra and Oudh). Annals of the Association of American Geographers, 42(3), 223–246.
Eres, Z. (2014). Erken Cumhuriyet Döneminde Çağdaş Kırsal Kimliğin Örneklenmesi: Planlı Göçmen Köyleri. Mimarlık, 375.
Eres, Z. (1999). Tarih öncesi kazı yerlerinin koruma, restorasyon, sergileme sorunu ve çözüme yönelik bir uygulama Kırklareli-Aşağı Pınar Örneği. [Master's thesis, Istanbul Technical University].
Eriç, M. (1979). Geleneksel Türk Mimarisinde Malzeme Seçim ve Kullanımı. Yapı Dergisi, 33, 42–45.
Etlacakuş, A. & Hamamcıoğlu Turan, M. (2016). Historical Development of Darkale Rural Settlement in Soma, Manisa. A|Z ITU Journal of the Faculty of Architecture, 14, 13-23. https://doi.org/10.5505/itujfa.2017.83788.
Etlacakuş, A. & Hamamcıoğlu Turan, M. (2017). Darkale'nin Koruma Amaçlı Değerlendirilmesi. TAÇ Dergisi, 8, 4-13.
Fuentes, J. M. (2010). Methodological bases for documenting and reusing vernacular farm architecture. Journal of Cultural Heritage, 11(2), 119-129. https://doi.org/10.1016/j.culher.2009.03.004.
Fuentes, J. M. (2010). Methodological bases for documenting and reusing vernacular farm architecture. Journal of Cultural Heritage, 11, 119–129.
González, P. A. (2017). Heritage and rural gentrification in Spain: thecase of Santiago Millas. International Journal of Heritage Studies, 23(2), 125-140. https://doi.org/10.1080/13527258.2016.1246468
Hasgül, E., Olgun, i. & Karakoç, E. (2021). Vernacular rural heritage in Turkey: an intuitional overview for a new living experience. Journal of Cultural Heritage Management and Sustainable Development, 11(4), 440-456.
Icomos (1999). ICOMOS 12th General Assembly: Charter On The Built Vernacular Heritage. Mexico.
İner, G. & Erdoğan, N. (2007). Edirne/Uzunköprü/Yeniköy Kirsal Konutlarinin Mimari ve Yapisal Karakteri. TÜBA-KED, 14(2), 109 - 113.
İşcanı, B. & Eres, Z. (2017). Datça-Hızırşah Köyü Kırsal Sit Alanı ve Geleneksel Konut Mimarisinin İncelenmesi. In K. K. Eyüpgiller, Z. Eres, A. C. Bilge, M. Arslan Çinko (Ed.) Kırsal Mimarlık Mirasının Korunması: Türkiye'den ve Dünyadan Örnekler (pp.57-74). Arkeoloji ve Sanat Yayınları.
Kabataş, E. & Kiper, T. (2021). Determination of the Natural and Socio-cultural Landscape Values of Rural Settlements: Kırklareli Kocayazı and Kula Village Examples. Journal of the Institute of Science and Technology, 11(3): 2328-2341.
Kafesçioğlu, R. (1947). Orta Anadolu Köy Evlerinin Yapısı. İstanbul Technical University, Faculty of Architecture

DOI: 10.15320/ICONARP.2022.204

Kavas, K. R. (2011). Alanya-İncirkırı Geleneksel Kırsal Mimarisinde Doğa-Kültür İlişkisi. Journal of World of Turks, 3(1), 271-289.

Kaushik, A. (2020). The Continuity of Vernacular Architecture amidst Changes, Village Shyopura, India. ICONARP International Journal of Architecture and Planning, 8(2), 771-800.

Kazmaoğlu, M. & Tanyeli, U. (1979). Anadolu konut mimarisinde bölgesel farklılıklar. Yapı, 3(13), 13.

Koca, G. (2019). Evaluation of Traditional Şirince Houses According to Sustainable Construction Principles. ICONARP International Journal of Architecture and Planning, 7(1), 30-49.

Kurtuluş, B. & Şahin Güçhan, N. (2015). Tarsus Bölgesi'nde Geleneksel Kırsal Mimari ve Yaşam. TÜBA-KED, 13,101-124. http://dx.doi.org/10.22520/tubaked.2015.0006.

Ngowi, A. B. (1997). Improving the traditional earth construction: A case study of Bostwana. Construction and Building Materials, 11(1), 1–7.

MSGSUYUAM. (2013). Orta Anadolu Kerpiç Geleneksel Mimari Araştirma Sergisi. Msgsü Yapi Uygulama Ve Araştirma Merkezi, Msgsü Bilimsel Araştirma Projeleri Birimi.

Oikonomou, A. & Bougiatioti, F. (2011). Architectural structure and environmental performance of the traditional buildings in Florina, NW Greece. Building and Environment, 46, 669–689.

Ottoni, F. & Borghi, F. (2016). Rural Heritage and Cultural Landscape: Guidelines for Sustainable Seismic Reinforcement of Emilian Historic Rural Building in Italy. Procedia Engineering, 161, 1662-1668. https://doi.org/10.1016/j.proeng.2016.08.642.

Özgüner, O. (1970). Köyde Mimari Doğu Karadeniz. Ankara: O.D.T.Ü. Mimarlık Fakültesi.

Phillips, M. (1993). Rural gentrification and the processes of class colonisation. Journal of Rural Studies, 9(2), 123-140. https://doi.org/10.1016/0743-0167(93)90026-G

Polat-Pekmezci I., Eres Özdoğan Z., Topçubaşı M. (2013). Trakya'da Tarihi Bir Kasaba: Kaynarca Geleneksel Yerleşme Dokusu Üzerine Ön Çalışmalar. In K. Eyüpgiller, Z. Eres (Ed.) Prof.Dr. Nur Akın'a Armağan (pp.493-509), Yem Yayınları, İstanbul.

Postalcı-Altınkaya, E., Tekin, Ç. & Eren, Ö. (2011). Kırsal Yerleşim Bölgelerinde Sürdürülebilirlik: Çanakkale Bölgesi Ayvacık İlçesi Adatepe ve Demirciköy. Politeknik Dergisi, 12(2), 109-113.

Quintana, D. C. Díaz-Puente, J. M. & Gallego-Moreno, F. (2022). Architectural and cultural heritage as a driver of social change in rural areas: 10 years (2009–2019) of management and recovery in Huete, a town of Cuenca, Spain. Land Use Policy, 115.

Ruda, Gy. (1998). Rural buildings and the environment. Landscape and Urban Planning, 41, 93–97.

Sağıroğlu, Ö. (2017). Characteristics and Construction Techniques of Akseki Bucakalan Village Rural Dwellings. International Journal of Architectural Heritage, 1(3) (2017): 433-455. https://doi.org/10.1080/15583058.2016.1243277

Sümerkan, M.R. (1991). Doğu Karadeniz'de Kırsal Kesim Geleneksel Ev Plan Tiplerinin Yöresel Dağılımı. Türk Halk Mimarisi Sempozyumu Bildirileri. Kültür Bakanlığı Halk Kültürünü Araştırma Dairesi Yayınları, Ankara, pp. 173-183.

Turkish encyclopedia. (1982). 31. Cilt, MEB Devlet Kitapları. Milli Eğitim Basımevi.

Vissilia, A. M. (2009). Evaluation of a sustainable Greek vernacular settlement and its landscape: Architectural typology and building physics. Building and Environment, 44, 1095–1106.

Yeler, S. (2021). Armutveren Köyü'nün (Kırklareli) Kırsal Mimari Özellikleri ve Koruma Önerileri. Journal of Architecture and Life, 6(2), 717-733.

Yüksek, İ. (2008). Geleneksel Anadolu Mimarlığında Ekolojik Uygulamalar Üzerine Bir Araştıma (Kırklareli Kırsal Alan Örneği). [PhD thesis, Trakya University, Department of Architecture].

Yüksek, İ. &Tülay, E. (2013). Analysis of traditional rural houses in Turkey in terms of energy efficiency. International Journal of Sustainable Energy, 32(6), 643-658. https://doi.org/10.1080/14786451.2013.769992

Zorlu, T. & Faiz Büyükçam, S. (2012). Ekolojik Mimarlık: Doğu Karadeniz Kırsal Konutu. Mimarlık, 367, 56-60.

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Research Article

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Ecological Memory and Socio-Ecological Resilience Approach Within the Scope of Muğla Wildfires

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Abstract

The climate change crisis stemming from anthropogenic reasons has triggered severe weather events and disasters all over the world in recent years. In this context, the main purpose of the paper is to reveal the importance of ecological memory in the face of the wildfires threatening our living spaces and taking place between 29 July-12 August 2021 throughout Muğla Province, and to divulge basic strategies for the future of the region by questioning the resilience of ecosystem. The damage caused by wildfires are determined by using satellite images and remote sensing methods in GIS. Accordingly, the borders of burned areas were determined by using mainly remote sensing data according to the degree of burn severity on the basis of NBR. In turn, these borders were overlapped with CLC data and administrative borders at different scales for determination of the land cover types of the burned areas and the urban areas affected. Subsequently, the actual surface areas of the burned regions were calculated by using SRTM GL1 satellite images. The results show that not only forest assets, but also agricultural areas, production areas, mining areas, urban transportation network and residential areas were damaged by the wildfires. Although burned areas can be calculated by using remote sensing methods as done in this study, exact delimitation of fire zones and precise distribution of the burned areas according to land cover types also require in-situ work. Hence, the scope of the paper doesn't cover these issues that can only be addressed by future studies. Overall, the paper proposes a framework for questioning the socio-ecological resilience of the ecosystem in the upcoming period of the disasters that threaten our living spaces, and formulates a set of strategies for spatial planning by employing a socio-ecological approach for increasing the resilience of habitats by revealing ecological memory.

Keywords:
Ecological memory, ecosystem, Muğla, resilience, wildfires

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INTRODUCTION

In the last century, climate change, which has emerged as a result of the increase in greenhouse gas emissions to atmosphere due to the industrialization and urbanization, causes negative ecological impacts and deteriorations all over the world and threatens our living spaces. While climate change triggers severe weather events and disasters such as heat waves, drought, desertification, floods, and wildfires, it also changes the frequency, intensity and spatial scale of these disasters. It is known that in the face of anthropogenic climate change the responses of ecosystems fluctuate according to the extreme events and disruptions in the past, and this situation creates an ecological memory loss for the ecosystem. With the increasing alterations and losses in the Anthropocene epoch, ecological memory is at risk of not finding the opportunity to renew itself. In this context, in recent years, scientists have been trying to develop a set of strategies to increase the resilience of habitats by revealing ecological memory and predicting future ecosystem reactions.

Ecological memory is defined as the ability of an ecosystem's past evolutionary history and experiences to influence future ecological responses of the ecosystem. The genetic inheritance contained in the ecosystem provides it with a self-healing and self-reproductive ability by increasing its resilience. The nature as a self-organizing system has an inner resilience capacity. However, the change in environmental conditions caused by the increase in industrialization and urbanization and the global climate crisis have weakened the sustainability of this inheritance (Johnstone et al., 2016). Therefore, identifying the ecological inheritance that supports the resilience of the ecosystem will help constitute the right supports by making consistent predictions against the climate change crisis that threatens the ecosystems and settlements today.

The aim of this article is to put forward the basic strategies for the future resilience approach by revealing the loss of ecological inheritance that constitutes the ecological memory by determining the types and sizes of the burned and damaged land through satellite photographs because of the severe wildfires that continued for approximately 15 days between July 29 and August 12 of 2021 in Muğla Province. Especially in the settlements located in the burned areas of Muğla, the fact that human livelihoods depend on the forest structure and its function makes it much more important for us to have a resilient forest ecosystem robust to a variety of shocks, deterioration and changes.

The spatial spread of human actions brought by urbanization has resulted in deterioration of the balance of built and natural environment. These anthropogenic disturbances, unlike the natural climatic changes that took place throughout the evolution of the world, can weaken the self-renewal ability of ecosystems and even trigger permanent changes on the ecosystem. In this respect, it is claimed that we are in a new geological process called Anthropocene, since the damages caused by

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anthropogenic pollution are also recorded within the geological processes (Sümer et al., 2020). This process takes the 21st century resilience debates one step further from the basic resilience approach that advocates the preservation of natural resource stability, towards an adaptive resilience approach that can help overcome the ecological collapses caused by the mismanagement of societies and the increasing human demand on the ecosystem (McWethy et al., 2019).

Parallel to these considerations, wildfires in Muğla, which are the focus of this article, arisen as a result of the deterioration of the natural environment. While the increasing population and the excessive intervention of human actions in forests cause a decrease in forest areas, the deteriorated ecosystem accelerates the transition to a more arid climate, thus increasing the frequency and severity of fires. As the risk of wildfires based on climate change increases from year to year, it is argued that new strategies should be put forward to ensure the economic recovery of communities that make a living from burned forest areas, to increase the resilience of the ecosystem and to ensure justice for the environment. In this context, The Nature Conservancy, a global environmental organization, stated in its report that wildfires require a paradigm shift (1) to significantly increase investments in all forest studies-related programs, (2) to emphasize the avoided costs, public interest and common benefits of wildfire resilience studies, (3) to adopt a holistic, strategic approach to address the scale of needs instead of an incremental and piecemeal approach (Clavet et al., 2021).

In this report, in order to increase resilience, a number of strategies such as creating employment, enabling the economic development of society, advancing environmental justice, protecting infrastructure, ensuring healthy watersheds and supply, supporting the conservation of green spaces, restoring wildlife habitat, creating opportunities for outdoor activities, protecting forest and soil carbon, developing natural and arable land solutions against climate change have been proposed for preservation of the social, economic and ecological co-benefit value. Socio-ecological resilience studies gain importance when determining strategies ranging from effective pre-fire planning to how wildfires are managed and even living with fire (Thompson et al., 2016). In the case of wildfires, resilience studies focus on understanding the relationship between the increasing frequency and severity of wildfires as a result of climate change and the ability of policy and management paradigms to help ecosystems and rural communities adapt to social-ecological change (Selles et al., 2020).

Within the scope of this study, in the next section, the method of analysis for the detection of the damage caused by the wildfires, which occurred suddenly and severely in the province of Muğla, will be explained in order to reveal the ecological memory that will be the basis for resilience studies. In the subsequent sections, first, an evaluation will be made on the land cover, severity of the damage on the identified fire zones and the impact on the human settlements at the neighbourhood

level for exposition of the basic clues regarding the general framework of the socio-ecological resilience approach, and then the strategies that can be followed through these clues will be discussed. In the conclusion part, zone-specific suggestions have been developed to re-evaluate the damages caused by wildfires and to increase socio-ecological resilience based on the strategies discussed.

METHOD AND DATA

In the study, NASA's Landsat 8 (30m) and Shuttle Radar Topography Mission (SRTM) GL1 (30m) satellite images and CORINE Land Cover (CLC) 2018 vector files were used. Landsat 8 satellite images were used to determine the burned areas and degree of burning, SRTM GL1 images were used to calculate the actual surface areas and CLC data were used to determine the pre-fire land cover in the fire damaged areas. Administrative borders used in the study were compiled from the provincial and district borders downloaded from the website of the General Directorate of Mapping. The neighbourhood boundaries obtained from the Muğla Metropolitan Municipality were used for the summary tables compiled on the basis of villages and neighbourhoods regarding the fire areas. The data used in the study were analysed and visuals were produced by using Free and Open Source Software (FOSS) for Geographic Information Systems (GIS) such as Quantum GIS (QGIS) and SAGA (2021), and the special plug-ins in these software packages. In this context, the Semi-Automatic Classification Plugin (SCP) plugin (Congedo, 2021) and output editor in QGIS (2021) were used effectively, especially for preprocessing of images used in the paper.

The raster image created in QGIS by using the bands 4 (Red), 3 (Green) and 2 (Blue) of the Landsat 8 satellite images taken after the wildfires in Muğla can be seen in Figure 1.

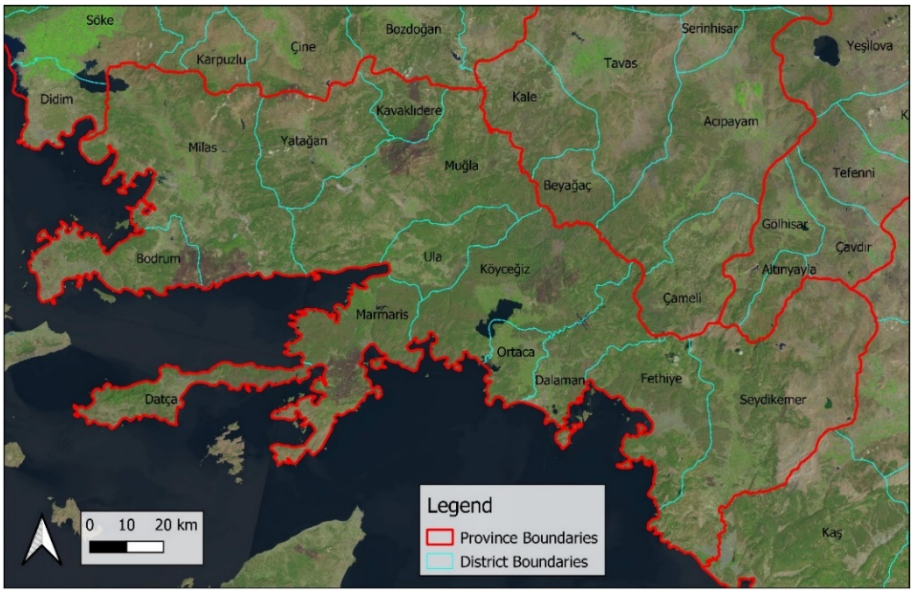

Figure 1. Raster image of Muğla province, created by using Landsat 8 satellite images taken between 14 and 21 August 2021, after the fires.

In this image, although the fire areas are clear as large areas that can be visually distinguished by the brown colour, there are well established

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methods such as those using Normalized Burn Ratio (NBR) index developed for more precise analysis. In this context, the workflow used in the method of detection of burned areas in this study can be seen in Figure 2. The first step in the workflow is the acquisition of satellite images of the burned areas before and after the fire. The dates before and after the fire are extremely important, and as long as possible, should correspond to, respectively, just before and after the fire. Landsat-8 images before and after the fire for the whole of Muğla on 13 & 20 July 2021 and 14 & 21 August 2021, respectively, were downloaded from the USGS (United States Geological Survey) Earth Explorer's website (https://earthexplorer.usgs.gov/).

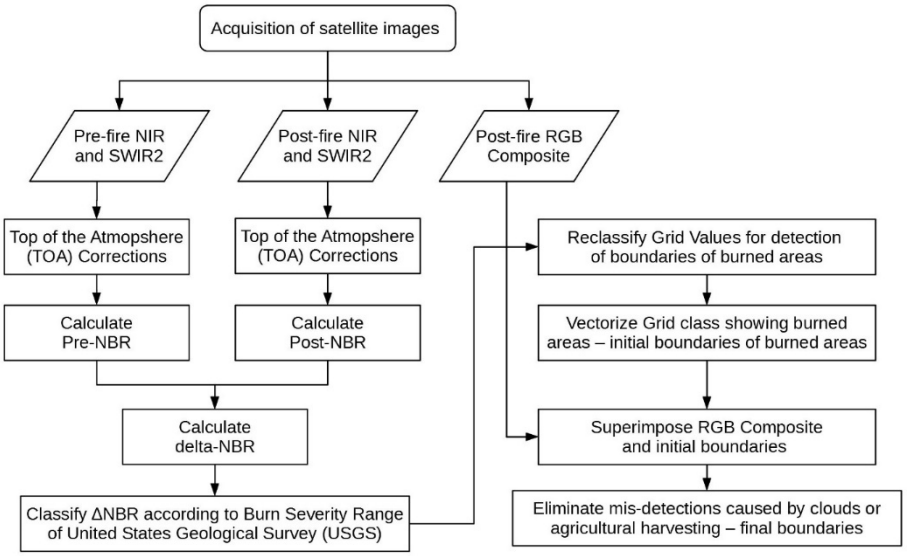

Figure 2. Workflow used in the detection of burned areas in the study.

Normalized Burn Ratio (NBR) index is widely used in the determination of both burned areas and burning severity. In turn, the results of NBR analysis can be used to design policies and strategies to mitigate effects of the wildfires in terms of helping the ecosystem sustain its resilience and maintain its memory. For example, in their study, Strand et al. (2019) use the difference NBR to understand the dynamics and resilience of forest floor vegetation in the ecosystems experiencing wildfires.

By analysing the recovery processes in seven wildfire areas in the USA after one decade following the fires, Strand et al. (2019) demonstrate that plant communities in the forest floor were not deeply transformed by the wildfires that have in fact resulted in the increasing diversity of species, which, according to them, suggests that the wildfires with low to moderate burn severity actually contribute to the long-term care of a diverse and productive forest floor. Although, in terms of ecological resilience, this result confirms the fact that the nature can take care of itself, a socio-ecological framework should take the social implications of wildfires into account, as suggested in this study. In this context, it is important to emphasize that NBR index help us quickly expose the extent of the damage caused by the wildfires. This is as valuable as the post-fire

evaluations made after a relatively long time period for testing the recovery process in the ecological system.

In terms of socio-ecological perspective, this is particularly valuable in understanding both couples of the resilience framework; the social and the ecological systems. As being part of the ecological system, in the forest resilience framework formulated by Johnstone et al. (2016), the centre of attention is ecological resilience in terms of adaptation of forests to a specific historical disturbance regime that can be defined as the patterns of disturbance characterized by regularity, severity, extent, or other attributes. In this framework, ecological memory is composed of two components (Johnstone et al., 2016): (1) information legacies of evolutionary adaptations to a disturbance regime and (2) material legacies (such as seeds, dead trees in an ecosystem after a disturbance event). While the former arises over long time periods with wide spatial scales, the latter rises on short time periods with local spatial scales.

The method of analysis used in this study allows us to draw the context for one of the important disturbances occurred recently in Muğla in terms of expectations for information and material legacies in connection with their social implications. As the prediction of responses of the ecosystem is a complex process, this contextualization provides us with the possible extent of the loss and the risk associated with resilience debt which is defined by Johnstone et al. (2016) as a loss of resilience because of the failure of system in the alignment of information legacies with disturbance. As Peterson (2002) remarks, once ecological memory is vigorous and ecological pattern is stable, pattern tends to be sustained rather than demolished by the wildfire. It is the ecological memory that allows processes for the re-production of ecological pattern.

However, if the magnitude of disturbances is huge, as in the case of recent wildfires in Muğla, it may alter the disturbance regime, and subsequently lead to resilience debt. The extent of resilience debt can be drawn in relation to the safe operating space used by Johnstone (2016: 370) to refer "to biophysical planetary boundaries within which human societies can continue" to progress and prosper. The safe operating space framework can be used for contemplation of interactions of disturbance characteristics and environmental conditions with the components of ecological memory increasing the resilience of forests to disturbance. The method of analysis used in this study actually helps us expose the material evidence to question the creation of resilience debt and its relation with safe operating space.

Because of the vast wildfires, today, it can be argued that in many parts of the world safe operating space is endangered. Combined with the large wildfires, the interaction between climate change, invasive species, and land-use have resulted in the erosion of ecological memory, which has generated a strong interest in regenerating natural processes to mitigate the negative effects of current changes on human eco-cultural & social relationships, and in the contextualization of long-term anthropogenic factors (Eisenberg et al., 2019). During this process, Traditional

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Ecological Knowledge (TEK) has particularly gained importance and been rediscovered as a help to create ecosystems more resilient to wildfires and subsequent negative effects (Eisenberg et al., 2019).

The extent and the degree of the damage caused by the recent disturbance in the socio-ecological system in Muğla can be analysed by delimiting the areas damaged together with the degree of harm, and in turn, by exposing the attributes of material loss having importance in ecological memory. It is within this context that NBR index provides us with the material evidence for exposition of the damage caused by the recent wildfires. Landsat 8 satellite images used in the calculation of NBR index consist of nine spectral bands with a spatial resolution of 30 meters except for Band 8 (panchromatic) whose resolution is 15 meters, and thermal bands 10 and 11 providing accurate surface temperatures and having a resolution of 100 meters. Among them, Near Infrared (NIR) (Band 5) and Short Wave Infrared (SWIR) (Band 7) bands of the spectrum are needed to calculate the NBR (Figure 3).

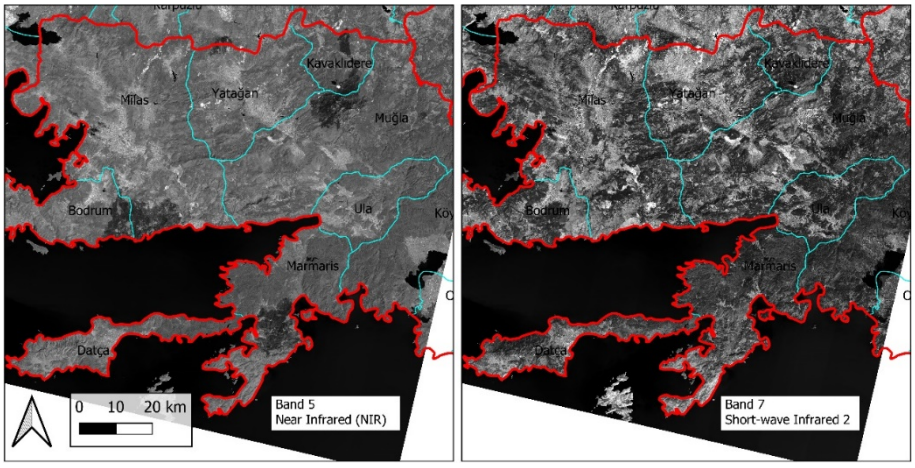

Figure 3. Bands 5 and 7 in Landsat 8 satellite images taken for the western part of Muğla on August 21, 2021.

It is known that the newly burned areas show low reflection in the NIR part of the spectrum and high reflection in the SWIR part of the spectrum, while in healthy vegetation it shows high reflection in NIR part of the spectrum and low reflection in SWIR part of the spectrum. In other words, the difference between the spectral responses of healthy vegetation and burnt areas peaks in NIR and SWIR parts of the spectrum. In this context, NBR is calculated as follows (Equation 1) (Key et al., 2002; Pepe and Parente, 2018; Saulino et al., 2020):

$$NBR = \frac{\text{NIR} - \text{SWIR 2}}{\text{NIR} + \text{SWIR 2}} \qquad \text{Equation 1}$$

NBR can take a value between -1 and +1 (Nasery and Kalkan, 2020). In the method used, using this equation, the images of NBR just before and just after the fire are calculated (Figure 4). However, before making these calculations, it is recommended to perform the Top of the Atmosphere

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(TOA) corrections on the raw Band 5 and Band 7 data (Figure 2). Especially since smoke aerosols have significant effects, it is necessary to correct the reflection of the TOA to the surface reflection in order to apply the burnt area mapping algorithm reliably (Roy et al., 2019). Atmospheric correction is one of the basic procedures applied before the calculations of the NBR (see, for example, Pepe and Parente, 2018; Polat and Kaya, 2021). In this context, atmospheric correction in this study was performed by using SCP plugin (Congedo, 2021) in QGIS for Landsat preprocesses.

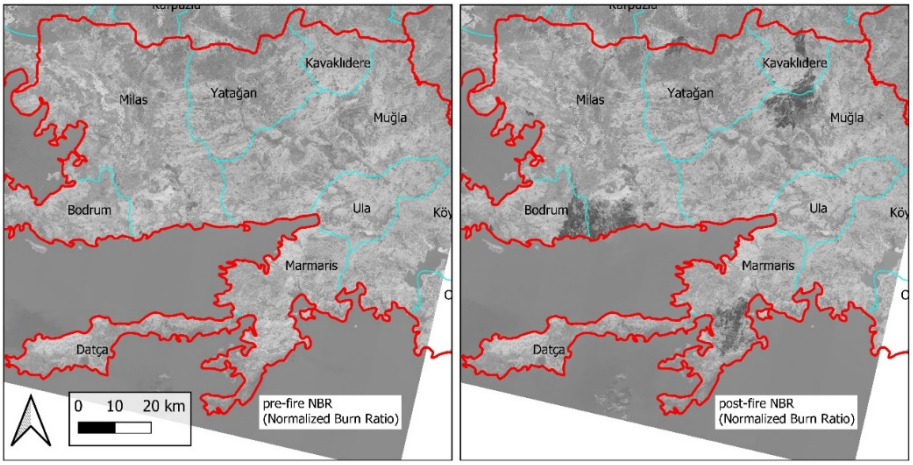

Figure 4. Pre-fire and post-fire NBR images calculated by using Landsat 8 satellite images taken for the western part of Muğla between 13 & 20 July 2021 and 14 & 21 August 2021.

In order to distinguish the burnt areas from the unburned areas and to provide a quantitative measure of the change, the NBR image calculated for the post-fire is subtracted from the NBR image calculated for the pre-fire (Equation 2) and the difference image (ΔNBR) (Figure 5) is obtained. (Key et al., 2002; Key & Benson, 2006; Nasery & Kalkan, 2020; Saulino et al., 2020):

$$\Delta NBR = \text{Pre\_fire NBR} - \text{Post\_fire NBR} \qquad \text{Equation 2}$$

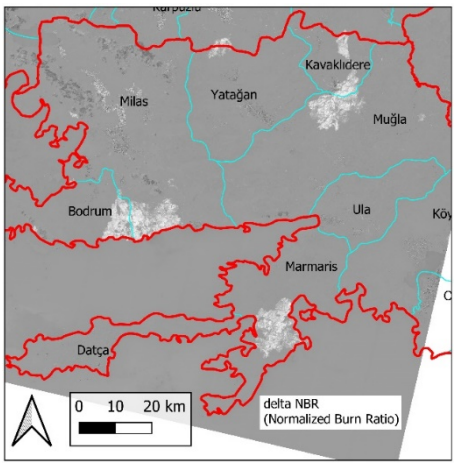

Figure 5. The western part of Muğla for ΔNBR images calculated by using Landsat 8 satellite images taken between 13 & 20 July 2021 and 14 & 21 August 2021.

Although various maximum and minimum ΔNBR values can be observed for different cases, a ΔNBR greater than a certain threshold

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indicates burning and higher values of dNBR indicate more severe damage. In this respect, ΔNBR is also used as a measure of burn severity despite variable results (Key & Benson, 2006; Roy et al., 2019). Indeed, from an optical point of view, a drastic reduction in visible and NIR surface reflection is observed when vegetation is burned. In this context, although empirical studies vary according to needs, burn severity is operationally defined as the loss or change of aboveground and underground organic matter (Keeley, 2009). The depth of respective change is related to the burn severity on vegetation and is captured as a change in the value of the spectral indexes. In fact, NBR has also been developed for this purpose and is typically used as ΔNBR between pre-fire and post-fire conditions (Saulino et al., 2020). Thus, the damage caused by the fire can be used to show the degree of burning such as low, moderate-low, moderate-high and high severity. In this study, the degree of burn was associated with ΔNBR according to the classification proposed by the United States Geological Survey (USGS) (Sobrino et al., 2019; Lutes et al. 2006) (Figure 6). There is also a ΔNBR classification recommended by the European Forest Fire Information Service (EFFIS) (Llorens et al., 2021). Actually, there is no fundamental difference between the two classifications.

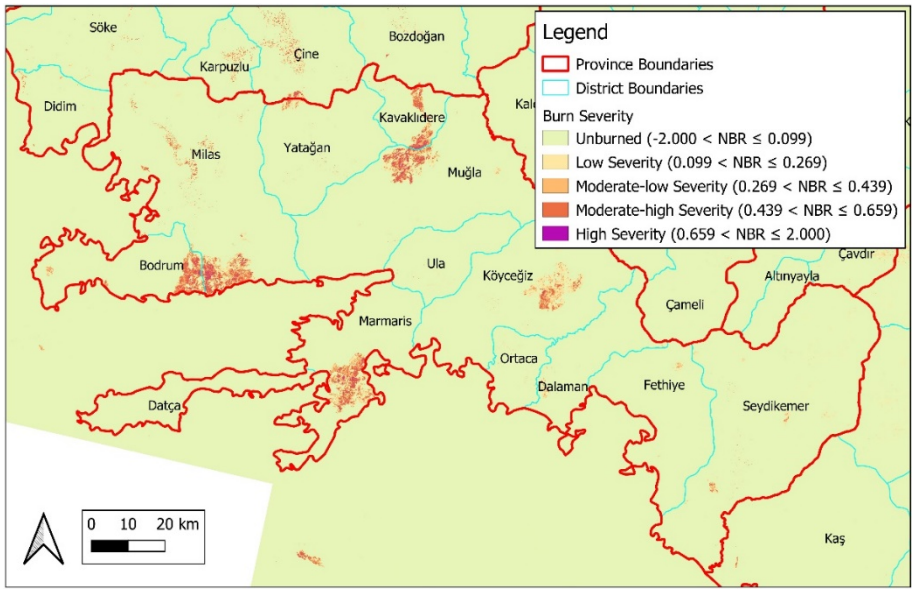

Figure 6. Thematic map showing the damage caused by wildfires in Muğla between 29 July and 12 August 2021.

When the ΔNBR data used in the production of Figure 6 is carefully examined, it can be seen that although there is no fire in some small areas, the range of value in these areas remains within the scale defined for the fire areas. For example, although none of the recent fires were within the boundaries of Fethiye district, a small area in Fethiye looks as if it was burned. It is known that such situations are caused by reasons such as the fact that the sky is cloudy in the respective places during the periods when satellite photographs are taken, or that it coincides with agricultural harvest periods. Indeed, when examined in detail, it was concluded that the situation in Fethiye was caused by the clouds.

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Therefore, in order to determine the boundary of the fire areas more accurately, the ΔNBR data was reclassified by using "Reclassify Grid Values" tool in SAGA for delimitation of only the areas with fire, and the resulting image was vectorized by using "Vectorizing Grid Classes" tool of again SAGA. Later, these boundaries were superimposed on Figure 1 for elimination of the misdetections caused by clouds or agricultural harvesting (Figure 2). As a result of this process, the fire zone boundaries shown in Figure 7 were obtained. A close examination of Figure 7 reveals the fact that there are small unburned areas in the burned areas. Those small unburned areas are actually a centre of attention for some researchers owing to the fact that as being areas unaffected from the fire they are considered as fire refugia having potential for regeneration of the forest from the ashes of the old one (see, for example, Walker et al., 2019).

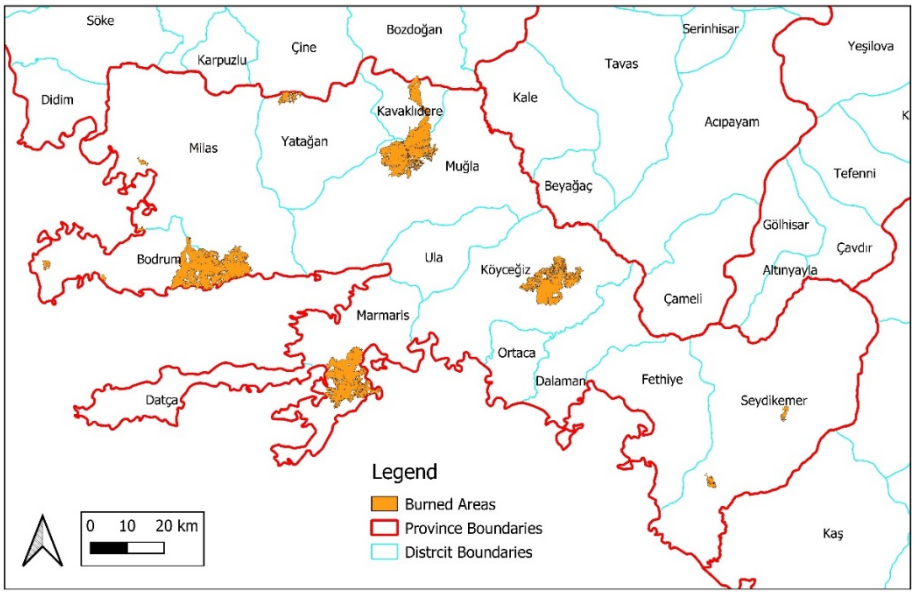

Figure 7. Wildfire zones in Muğla between 29 July and 12 August 2021.

After delimitation of wildfire zones and levels of burn severity, another workflow is used in the study for the production of information in relation to the overlap between the boundaries of wildfire zones & levels of burn severity and the boundaries of land cover types & administrative units (Figure 8). For this purpose, first of all, polygon overlay analysis was performed by intersecting the borders in Figure 7 with the CLC 2018 vector data using the "Intersect" tool in SAGA, and the borders of the burned areas were created according to the land cover types in 2018. Subsequently, the real surface area grid of the entire Muğla province was created by using "Real Surface Area" tool in SAGA and the SRTM GL1 data compiled for Muğla. Consequently, the amount of burned areas left in the fire zones and in the other sub-zones resulting from different polygon overlap analyses was determined by using "Grid Statistics for Polygons" tool of SAGA and the grid concerned. The tables used in the analyses in the next section were produced by using these tools.

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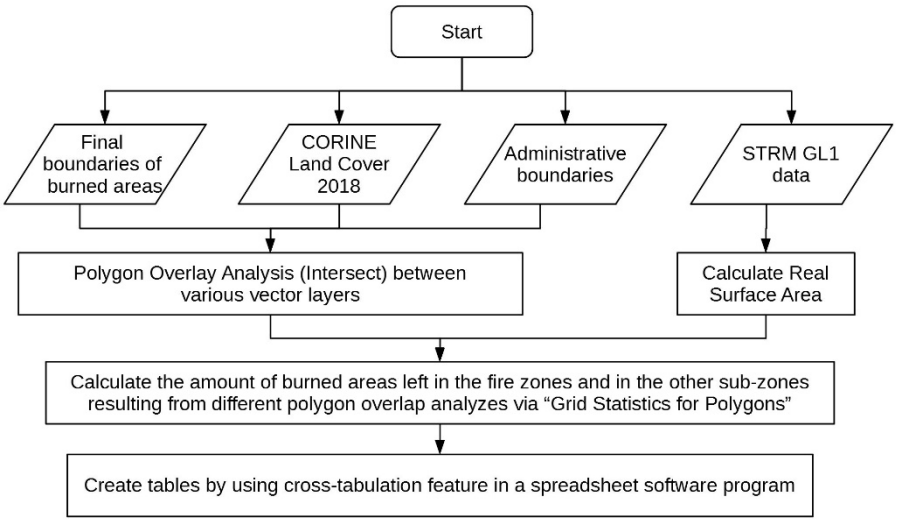

Figure 8. Workflow used in the creation of the summary tables in the study.

ELABORATION OF THE AREAS DAMAGED BY WILDFIRES IN MUĞLA

Severe wildfires, which first started on July 29, 2021 in Armutalan Neighbourhood of Marmaris District and spread in different districts and neighbourhoods in the subsequent days, uninterruptedly grew for about 15 days and damaged large areas of land and neighbourhoods in Muğla province. The fires that caused the burning of rural settlements were titled as 'orman yangını' (forest fires) in Turkish because the fires started in the forest area and burned a large amount of forest land. However, in English, the word 'wildfires' is used for such fires. In addition, since the fires started in the forest area and the institutions that will respond to the fire in the division of authority in Turkey are defined according to the area of origin and spread of the fire, it can be argued that 'orman yangını' can be considered to be more appropriate to describe the related fires in Turkish context.

In order to understand the damage caused by forest fires in Muğla province, it is necessary to define the climatic conditions and vegetation of the geography. Muğla province has a Mediterranean scrub and forest biome under the influence of subtropical Mediterranean climate. While there are forests of mixed species of red pine, oak, larch and juniper up to 2000 meters and above in Muğla, there are bare rocky and/or open areas in areas higher than 2200 meters. A large part of the vegetation cover consists of red pines. Especially in areas with degraded red pine forests around settlements, scrub vegetation has developed over time and has become permanent (Türkeş and Altan, 2013). In Muğla, the total forest area was determined as 829,309 ha (874,254 ha according to CLC 2018 – including 'Transitional woodland-shrub' and 'Sclerophyllous vegetation') before the wildfires by the General Directorate of Forestry in Muğla and it constituted 68% of the total area in the province (OGM, 2021).

The sizes and locations of the wildfire zones identified in Figure 7 are superimposed on top of the map showing the administrative boundaries in Muğla province. Within the scope of this study, the wildfires that spread with different severity and intensity in Muğla were grouped under

7 fire zones that were titled as (1) Mazı-Ören, (2) Bodrum-Milas General, (3) Yatağan, (4) Menteşe-Kavaklıdere, (5) Marmaris, (6) Köyceğiz and (7) Seydikemer. These zones can be grouped into two general categories. The first one covers zones of wildfire uninterruptedly combining very large areas. Mazı-Ören, Köyceğiz, Menteşe-Kavaklıdere, and Marmaris wildfires fall into this category. The second category covers zones of relatively smaller areas disconnected from each other. Bodrum-Milas General, Yatağan and Seydikemer wildfires fall into this second category.

The size of areas in different fire zones according to the burn severity in low, moderate-low, moderate-high and high severity categories are given in Table 1. In total, 57,153.90 ha land in Muğla was burned in the last wildfires. According to the news published on August 9, 2021, a total of 66,000 hectares of land was burned in different districts of Muğla (Cumhuriyet Gazetesi, 2021; Sözcü Gazetesi, 2021). However, since natural disasters progress regardless of the provincial and district boundaries, it would be more appropriate to elaborate the damage caused by the wildfires with reference to the fire zones, as done in this study, instead of administrative divisions.

Table 1. Size of damaged areas according to the burn severity and fire zones in Muğla.[1]

	Burn Severity				
Wildfire Zones	**Low**	**Moderate Low**	**Moderate High**	**High**	**Total**
Mazi-Ören (1)	2784.00 (16.83)	3395.91 (20.53)	5227.23 (31.6)	5133.93 (31.04)	16541.06 (28.94)
Bodrum-Milas General (2)	173.31 (19.45)	247.68 (27.8)	376.95 (42.31)	92.89 (10.43)	890.83 (1.56)
Yatağan (3)	429.88 (39.54)	337.91 (31.08)	227.10 (20.89)	92.19 (8.48)	1087.08 (1.90)
Menteşe-Kavaklıdere (4)	3578.43 (24.42)	3314.27 (22.62)	3756.74 (25.64)	4003.61 (27.32)	14653.05 (25.64)
Marmaris (5)	3153.8 (25.72)	3609.95 (29.44)	3315.82 (27.04)	2182.02 (17.80)	12261.58 (21.45)
Köyceğiz (6)	5068.50 (47.13)	3337.04 (31.03)	1582.82 (14.72)	766.62 (7.13)	10754.98 (18.82)
Seydikemer (7)	388.80 (40.28)	293.91 (30.45)	213.26 (22.09)	69.33 (7.18)	965.31 (1.69)
Total	15576.72 (27.25)	14536.67 (25.43)	14699.92 (25.72)	12340.60 (21.59)	57153.90 (100.00)

[1] Sizes are given in hectares, the ratio of the burned area in the wildfire zone to the total fire area is given as % in parentheses.

According to the surface areas calculated by taking the topography and slope into account, the wildfire in Mazi-Ören was the wildfire with the widest damaged zone covering a surface area of 16,541.06 ha corresponding to 28.94% of the burned areas in Muğla. Menteşe-Kavaklıdere wildfire zone comes in second place with a surface area of 14,653.05 ha and it constitutes 25.64% of the burned areas. Marmaris

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wildfire zone (21.45%) with an area of 12,261.58 ha and Köyceğiz wildfire zone (18.82%) with an area of 10,754.98 ha, respectively, come after Menteşe-Kavaklıdere wildfire zone. When we examined in terms of burn severity, it was determined that the most severe fire damage was in Mazı-Ören wildfire zone.

It is important to re-emphasize that the results of scientific studies and the statistics given in the news in the media are different (see, for example, Nasery and Kalkan, 2020). However, in contrast to Nasery and Kalkan (2020), it is pleasing that on the basis of the total size of the burned areas there is no great difference between the statistical data given in the media about the Muğla wildfires, which is the subject of the study, and the results obtained in this study. For example, Nasery and Kalkan (2020) state that the results of their studies correspond to an area approximately 3-4 times larger than those mentioned in the media. The ratio between the burned area calculated in this study and the burned area given in the news in the media is only 1.16.

The size of the burned area according to the fire zones and the land cover types are given in Table 2 together with their ratio in the total burned area. According to the table, 52.37% of the residential areas damaged in the wildfires in Muğla remain in the wildfire zone in Marmaris. While 35.45% of the damaged residential areas is in the wildfire zone that started in Mazı and expanded towards Ören (Mazı-Ören wildfire zone), 12.05% of them is in the wildfire zone that started in Kavaklıdere and spread towards Menteşe district (Kavaklıdere-Menteşe wildfire zone).

In the province of Muğla, the most damaged wildfire zone of the Coniferous Forests, in which the red pines that are the product of the dominant vegetation are categorically included, is Menteşe-Kavaklıdere wildfire zone and it corresponds to 27.66% of all Coniferous Forests burned in the wildfires in Muğla. In the wildfires that are the subject of this study, 99.96% of the Broad-Leaved Forests burned in Muğla remains in Mazı-Ören wildfire zone covering almost all of the Broad-Leaved Forests burned in the wildfire. 90.66% of the burned Olive Groves are also in the Mazı-Ören wildfire zone. The wildfire zone, where agricultural areas were most damaged, is again Mazı-Ören wildfire zone. About 50% (49.41%) of the burned Mixed Forests remains in the wildfire zone of Marmaris. The results show that not only forest assets, but also agricultural areas, production areas, mining areas, urban transportation network and residential areas were damaged by the wildfires. It is seen that the ecosystem as a whole was damaged together with the components produced by human beings.

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Table 2. The size of the burned areas in Muğla according to the land cover types and the wildfire zones.[2]

	Wildfire Zones							
Land Cover Types	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Beaches, dunes, sands	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	4.78 (100.00)	0.00 (0.00)	4.78 (0.01)
Broad-leaved forest	1218.61 (99.96)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.51 (0.04)	0.00 (0.00)	0.00 (0.00)	1219.13 (2.13)
Burnt areas	115.66 (100)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	115.66 (0.2)
Complex cultivation patterns	806.72 (63.95)	15.71 (1.25)	0.00 (0.00)	81.07 (6.43)	316.55 (25.09)	8.47 (0.67)	33.00 (2.62)	1261.53 (2.2)
Coniferous forest	6032.7 (18.37)	96.85 (0.29)	781.16 (2.38)	9078.25 (27.65)	8381.45 (25.52)	7762.33 (23.64)	705.25 (2.15)	32837.98 (57.4)
Discontinuous urban fabric	16.14 (35.45)	0.06 (0.13)	0.00 (0.00)	5.49 (12.05)	23.84 (52.37)	0.00 (0.00)	0.00 (0.00)	45.52 (0.08)
Industrial or commercial units	29.51 (100)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	29.51 (0.05)
Land principally occupied by agriculture, with significant areas of natural vegetation	1776.48 (65.59)	28.66 (1.06)	16.27 (0.6)	326.65 (12.06)	406 (14.99)	39.56 (1.46)	114.76 (4.24)	2708.38 (4.73)
Mineral extraction sites	0.00 (0.00)	0.00 (0.00)	8.09 (100)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	8.09 (0.01)
Mixed forest	246.32 (19.4)	0.00 (0.00)	0.00 (0.00)	139.6 (10.99)	627.47 (49.41)	256.62 (20.21)	0.00 (0.00)	1270.01 (2.22)
Natural grasslands	507.54 (37.78)	351.14 (26.14)	0.00 (0.00)	48.37 (3.60)	43.94 (3.27)	392.24 (29.20)	0.00 (0.00)	1343.24 (2.35)
Non-irrigated arable land	3.06 (3.24)	0.24 (0.26)	0.00 (0.00)	79.47 (84.11)	11.71 (12.39)	0.00 (0.00)	0.00 (0.00)	94.48 (0.17)
Olive groves	442.45 (90.66)	5.11 (1.05)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	40.46 (8.29)	488.02 (0.85)
Pastures	2.59 (100.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	2.59 (0.00)
Permanently irrigated land	31.77 (100.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	31.77 (0.06)
Road and rail networks and associated land	2.19 (100.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	2.19 (0.00)
Sclerophyllous vegetation	423.94 (23.1)	196.41 (10.7)	215 (11.71)	397.98 (21.68)	439.55 (23.95)	142.31 (7.75)	20.29 (1.11)	1835.49 (3.21)
Sparsely vegetated areas	96.73 (16.86)	0.00 (0.00)	0.00 (0.00)	356.45 (62.12)	118.48 (20.65)	0.00 (0.00)	2.19 (0.38)	573.85 (1.00)
Sport and leisure facilities	32.99 (63.65)	13.9 (26.82)	0.00 (0.00)	0.00 (0.00)	4.94 (9.53)	0.00 (0.00)	0.00 (0.00)	51.82 (0.09)
Transitional woodland-shrub	4755.66 (35.95)	182.74 (1.38)	66.56 (0.50)	4139.73 (31.29)	1887.15 (14.26)	2148.66 (16.24)	49.35 (0.37)	13229.86 (23.12)
Total	16541.06 (28.94)	890.83 (1.56)	1087.08 (1.90)	14653.05 (25.64)	12261.58 (21.45)	10754.98 (18.82)	965.31 (1.69)	57153.90 (100.00)

[2] Sizes are given in hectares, the ratio of the burned area in the wildfire zone to the total fire area is given as % in parentheses.

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Table 3. The size of the burned areas in Muğla according to the land cover types and the severity of the wildfire.[3]

	Burn Severity				Total Burned Area	% of Total	Total in Muğla
Land Cover Types	**Low**	**Mod. Low**	**Mod. High**	**High**			
Beaches, dunes, sands	4.78 (100.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	4.78 (0.01)	0.12	3967.98
Broad-leaved forest	152.48 (12.51)	187.46 (15.38)	235 (19.28)	644.19 (52.84)	1219.13 (2.13)	6.80	17940.3
Burnt areas	10.72 (9.27)	29.42 (25.43)	68.46 (59.19)	7.07 (6.11)	115.66 (0.20)	20.29	569.99
Complex cultivation patterns	623.64 (49.44)	421.86 (33.44)	178.6 (14.16)	37.43 (2.97)	1261.53 (2.20)	1.44	87542.76
Coniferous forest	9077.02 (27.64)	8550.56 (26.04)	7583.32 (23.09)	7627.07 (23.23)	32837.98 (57.40)	7.89	416423.46
Discontinuous urban fabric	28.39 (62.37)	10.73 (23.56)	5.63 (12.37)	0.77 (1.69)	45.52 (0.08)	0.33	13614.56
Industrial or commercial units	17.5 (59.31)	10.49 (35.55)	1.52 (5.14)	0.00 (0.00)	29.51 (0.05)	1.29	2293.3
Land principally occupied by agriculture, with significant areas of natural vegetation	830.38 (30.66)	834.4 (30.81)	715.81 (26.43)	327.79 (12.10)	2708.38 (4.73)	2.82	96000.55
Mineral extraction sites	5.67 (70.02)	1.56 (19.33)	0.86 (10.65)	0.00 (0.00)	8.09 (0.01)	0.11	7144.8
Mixed forest	339.42 (26.73)	291.86 (22.98)	233.53 (18.39)	405.2 (31.91)	1270.01 (2.22)	3.95	32140.87
Natural grasslands	369.49 (27.51)	367.96 (27.39)	463.43 (34.5)	142.36 (10.6)	1343.24 (2.35)	3.55	37838.74
Non-irrigated arable land	58.15 (61.54)	25.25 (26.73)	10.01 (10.59)	1.08 (1.14)	94.48 (0.17)	0.36	26235.33
Olive groves	150.82 (30.90)	156.51 (32.07)	126.39 (25.90)	54.3 (11.13)	488.02 (0.85)	1.57	31109.36
Pastures	1.00 (38.64)	1.53 (59.09)	0.06 (2.27)	0.00 (0.00)	2.59 (0.00)	0.15	1714.41
Permanently irrigated land	11.67 (36.74)	18.33 (57.71)	1.76 (5.56)	0.00 (0.00)	31.77 (0.06)	0.09	33820.68
Road and rail networks and associated land	1.95 (88.75)	0.25 (11.25)	0.00 (0.00)	0.00 (0.00)	2.19 (0.00)	0.69	316.55
Sclerophyllous vegetation	452.23 (24.64)	433.79 (23.63)	658.22 (35.86)	291.24 (15.87)	1835.49 (3.21)	1.29	142173.8
Sparsely vegetated areas	264.16 (46.03)	168.75 (29.41)	114.92 (20.03)	26.02 (4.53)	573.85 (1.00)	1.23	46765.02
Sport and leisure facilities	20.41 (39.38)	13.56 (26.16)	11.61 (22.41)	6.24 (12.05)	51.82 (0.09)	0.83	6234.34
Transitional woodland-shrub	3156.85 (23.86)	3012.38 (22.77)	4290.79 (32.43)	2769.84 (20.94)	13229.86 (23.12)	4.98	265575.48
Total	15576.72 (27.25)	14536.67 (25.43)	14699.92 (25.72)	12340.60 (21.59)	57153.90 (100.00)	4.31	1312022.51

[3] Sizes are given in hectares, the ratio of the burned area in the wildfire zone to the total fire area is given as % in parentheses. While the column named 'Total in Muğla' shows the area covered by the relevant land cover in Muğla Province, the column named '% of Total' shows the share of this area in the total land cover of Muğla Province.

In Table 3, the size of the burned areas in Muğla are given according to the land cover type and the severity of the wildfire together with their ratio to the total area for each category in Muğla. According to this table, it is seen that 57.40% of the burned areas in Muğla are Coniferous Forests. 23.23% of the burned Coniferous Forests were severely damaged, 27.64% were damaged with low severity, and a total of 49.13% were moderately-low or moderately-high damaged. When we look at the general, it was calculated that 7.89% of all Coniferous Forests in Muğla were damaged.

2.13% of the burned areas in Muğla are Broad-Leaved Forests. However, when we look at the province in general, it has been determined that 6.80% of all Broad-Leaved Forests in Muğla have been damaged. 52.84% of the burned Broad-Leaved Forests were severely damaged, 12.51% low, and a total of 34.66% moderately-low or moderately-high damaged.

Table 4. The size of the burned areas in Muğla according to type of the urban areas damaged in wildfires and the neighbourhood units (size of the areas is given in hectares).

Name of the District	Name of the Neighbourhood Unit	Discontinuous urban fabric	Industrial or commercial units	Mineral extraction sites	Road and rail networks and associated land	Sport and leisure facilities	Total Urban
Bodrum	Dereköy	0,06	0	0	0	0	0,06
	Kizilağaç	0	0	0	0	0	0
	Kumbahçe	0	0	0	0	0	0
	Mazı	1,85	0	0	0	0	1,85
	Total	1,91	0	0	0	0	1,91
Kavaklidere	Çamlibel	0	0	0	0	0	0
	Menteşe	5,49	0	0	0	0	5,49
	Total	5,49	0	0	0	0	5,49
Marmaris	Armutalan	0	0	0	0	0,31	0,31
	Hisarönü	3,82	0	0	0	0	3,82
	İçmeler	19,22	0	0	0	4,26	23,47
	Osmaniye	0	0	0	0	0,07	0,07
	Turunç	0,62	0	0	0	0	0,62
	Total	23,66	0	0	0	4,63	28,29
Milas	Beyciler	1,65	0	0	0	0	1,65
	Bozalan	8,05	0	0	0	32,67	40,72
	Gürceğiz	0	0	0	0,2	0	0,2
	Meşelik	0	0	0	0	13,9	13,9
	Türkevleri	4,58	29,51	0	1,99	0	36,09
	Total	14,29	29,51	0	2,19	46,56	92,56
Yatağan	Hisarardi	0	0	8,09	0	0	8,09
	Total	0	0	8,09	0	0	8,09
Muğla	Total	45,34	29,51	8,09	2,19	51,2	136,34

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Urban areas and settlements with livelihoods based on forest resources were also damaged by the wildfires. In Table 4, the distribution and size of the urban areas damaged by the wildfire is given according to the type of urban areas and the neighbourhood units in Muğla. When the table is analysed, it can be seen that the most damaged area regarding 'Discontinuous urban fabric' was in the wildfire zone of Marmaris with an area of 23.66 ha. The urban area that was most affected by the wildfire in Marmaris is İçmeler neighbourhood unit with an area of 19.22 ha. Milas wildfire zone suffered the most damage with an area of 46.56 ha in terms of 'Sport and leisure facilities' and with an area of 29.51 ha in terms of 'Industrial or commercial units'. The urban area that was most affected by the wildfire in Milas is Bozalan neighbourhood unit with an area of 8.05 ha.

EVALUATION

Unfortunately, approximately 8% (7.57%) of Muğla's forest assets (total of Broad-Leaved Forests, Coniferous Forests and Mixed Forests) were lost in the recent wildfires in Muğla. 2.67% of agricultural lands (total of Complex cultivation patterns, Non-irrigated arable land and Permanently irrigated land) were also damaged. In some zones, the wildfires damaged urban areas, and in some regions, rural settlements within the forest. In addition, 1.57% of the centuries-old olive fields, which have somehow become an integral part of ecological memory, have been lost. While making all these remarks, of course, we should not forget that; since burn severity is sometimes defined to include ecosystem responses, it may not yield clear results such that responses in the ecosystem include developments such as soil erosion, regeneration of vegetation, restoration of community structure, and re-emergence of fauna. Therefore, as Keeley (2009) emphasizes, it may not be possible to predict these responses with indexes or ratios developed to measure burn severity.

Indeed, although measuring the severity of burn or delimitation of the boundaries of the burned areas can be done both in the field and with remote sensing methods as also done in this study, the ability to predict the responses of the ecosystem attracts the attention of planners, geographers and managers more. Anthropogenic environmental changes can cause unexpected results by making the responses of the ecosystem unusual. Past dynamics may make it difficult to predict the resilience of the ecosystem in the face of future environmental change. In this context, the importance of ecological memory emerges again. While preserving this memory by leaving it alone for its self-regeneration has been an option until today, re-teaching the ecological memory of the ecosystem, which has started to lose its ability to renew itself by forgetting its past, seems to be another option. In this context, four major wildfire zones in Muğla (Mazi-Ören, Menteşe-Kavaklıdere, Marmaris, and Köyceğiz) offer a good test opportunity for us.

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These regions can be left alone for a certain period of time and the potential of the ecosystem to renew itself can be examined at the end of this period. If some of the areas in those zones are outside safe operating space defined by Johnstone et al. (2016) for the forest resilience framework, as Strand et al. (2019, p. 20) argue, they may be considered as potential cases of resilience debt characterized by the "loss of an ecosystem's capacity to recover due to misalignment between disturbance regimes or post-disturbance conditions and community adaptation to fire". In this process, an adaptive resilience approach can be adopted with external support in some zones if the basic resilience response cannot be demonstrated in those zones failing to renew their memory. However, formulation of some strategies that can be followed in augmentation of socio-ecological resilience will also be an important tool for sustainable development.

It should not be forgotten that wildfires are a primary problem as they have a transformative effect on the climate and ecosystem of the region. It is important to prioritize the strategies developed for augmentation of resilience and to accelerate all actions before and after the fire. For this reason, wildfire management and action planning are urgently needed. These plans should include and spatially describe the analysis of forest conditions and trends for all forest areas, and the relationship of settlements in and around the forest with forests. Research has revealed that the characteristics, location, and physical design of settlements in and around forest areas affect both the probability and outcome of the wildfires. Therefore, the creation of forest management and spatial action plans will play an important role in building socio-ecological resilience and disaster resistance by providing spatial planning information system with an operationalization of the changes in land use (Gonzalez-Mathiesen et al., 2020). As emphasized by Thompson et al. (2016), it is also necessary to develop flexible and adaptable plans according to the changing conditions after the sources and assets that may be affected by the wildfire are identified and included in the plans. In this context, risk maps for future possible wildfires can be created by using the information obtained by remote sensing methods together with the data collected from the field (Kavlak et al., 2020; Kavlak, et al., 2021). These maps, which will be produced and updated in a systematic way, should not only be a base for the decisions taken as a component of spatial planning, but also should be evaluated in a way that creates a dynamic input to the planning process.

For the years between 2017 and 2025, within the scope of the integrated management project for Mediterranean forests with high conservation value in Turkey, fire management plans have been prepared by the Forestry Operations Directorates for different districts in the province of Muğla (see, for example, fire management plans for Köyceğiz (2017–2021), Dalaman (2021–2025), Yatağan (2020–2022), and Kavaklıdere (2019–2022) (OGM, 2022). Fire management plans aims to reduce fire risk and danger via education, awareness and training

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programs with implementation, to reduce carbon release, to protect natural habitats and the communities' life quality.

For this purpose, they predefine management zones according to physiographic factors, fire risk, land use properties and potential fire behaviour in the related project area. Although the preparation of these management plans for each district for verification of carbon, biodiversity and socio-economic benefits via monitoring, validating and reporting documents, and decision support system, is the positive side of this integrated project; we witness that many management plans in Turkey are made just to be made, the goals to be achieved are only a means instead of an aim, and the management plans that are stated to be prepared with multi-participation are helpless when real fires occur as in the summer of 2021. It is a fact that rapid identification of the fire and the ability to act very quickly before the fire grows should be a top priority.

Therefore, it is also important to develop pre-warning systems so that wildfires can be detected quickly and intervened at the right scale. Therefore, the development of new satellite-assisted risk mapping and modelling tools is urgently needed. With the visualization and modelling tools developed, it becomes important to ensure that the scope and scale of the burned areas are comprehensible (Clavet et al., 2021). In this context, monitoring and evaluation centres can be established and risk mapping and modelling processes can be carried out in these centres. Similar types of centres can be established for early warning purposes, as well as to investigate the health effects of wildfires and model the deterioration in air quality as part of resilience studies.

It should not be forgotten that the burned forest areas belong not only to the societies benefiting from that area, but also to the whole humanity, based on the fact that the ecosystem is a whole, and complementary strategies should be developed by going through a cooperation study that goes beyond the borders of the province or district without considering the administrative or political boundaries. It becomes important to ensure the re-establishment of the natural fire regime based on ecological memory by promoting the collaboration of expert from different disciplines and the restoration of ecosystem on the base of scientific knowledge, including integrated research and work in forest areas (Clavet et al., 2021). The centres mentioned above can also provide coordination regarding the participation of the society in this context.

Compared with the other studies using NBR index for the detection of burned areas such as Pepe & Parente (2018), Weirather, Zeug & Schneider (2018), and Mashhadi & Algancı (2021), this study develops a concern for the exposition of the role of NBR and similar indices for the contextualization of the relationships between the socio-ecological resilience and ecological memory, and further formulates a set of strategies to augment the resilience of the system in the face of global climate change engendering ecological memory. While Pepe & Parente (2018) solely focus on the detection of burned areas by using NBR and Normalized Difference Vegetation Index (NDVI), Mashhadi & Algancı

(2021) compare the ability of various spectral indices such as difference NBR, relative difference NBR, Relativized Burn Ratio (RBR), and difference NDVI in mapping burn severity. Interestingly, Weirather, Zeug & Schneider (2018) develop an algorithm for fully automated delineation of wildfire areas from downloading suitable data to determining the burned area via applying the difference NBR, which points to the potential of existence satellites for the establishment of a disaster alert systems regarding the wildfires.

As a matter of fact, the framework presented in this study partly overlaps with the ones available in Strand et al. (2019) and Eisenberg et al. (2019) in terms of employment of NBR in connection with the concepts of resilience and ecological memory. However, compared with these studies in this study resilience is conceptualized in a more holistic manner by marrying social dimension with the ecological one. In this regard, Eisenberg et al.'s (2019) emphasis on TEK (Traditional Ecological Knowledge) has some affinities with the framework formulated in this study in terms of assigning a practical importance to the human component of the system. As Eisenberg et al. (2019, p.10) remark, "collaboration across cultures and disciplines, which includes TEK, can help create more resilient ecosystems" and "the full historical context of TEK and traditional practices must be considered, realizing that TEK applications may need to be adapted to account for current conditions".

CONCLUSION

Mankind as a part of the ecosystem in which he lives is the actor who plays the biggest role in its change. In this context, the climate change we experience today is the result of the Anthropocene epoch. While designing and planning our living spaces, it is no longer possible for us to ignore this fact. This epoch, which is referred to as the human species, may one day begin to be covered by another layer, like other layers in geology. Climate change, triggered by anthropogenic reasons, puts humanity to a test with great disasters. In this test, there is a danger that the ecological memory of the Anthropocene period we are in is perhaps irretrievably lost. In this context, the partial damage to this memory has been exposed by using remote sensing data and GIS on the basis of the severe wildfires that took place in Muğla between 29 July and 12 August 2021. In this context, this paper can be considered as a step to question the formation of a resilience debt with reference to the framework of Johnstone et al. (2016).

As it is evident from this study, remote sensing technologies are critical for the monitoring of landcover changes. One of the areas for the application of remote sensing technologies, as illustrated in this study, is the analysis of the natural assets lost after big fires. In this study, borders of the burned areas after the wildfires are determined by using remote sensing data and GIS. Parallel to this, the damage caused by the wildfires in the built and natural environment are measured by using the standardized methods particularly developed for this purpose.

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The analysis reveals that ecological memory is at risk of being lost in quite large areas. Although some argues that ecosystems are resilient away from an ecological catastrophe, as argued in this paper, as large disturbances such as the recent big wildfires experienced in Muğla become more and more recurrent, it becomes necessary to take actions and to produce strategies for restoration of the historical ecological processes. In this respect, within the scope of the study, the general framework of the strategies to be followed in the future was drawn, and it was asserted that it is possible to compensate for the losses caused by climate change only if resilience is handled in a holistic framework. Taking the resilience of the ecosystem independent of its social and ecological dimensions may cause the same mistakes to be made. In order not to make these mistakes, it will be necessary to maintain the stability of all the tools, methods and risk policies developed and the interaction of actors from different disciplines while transferring the locally experienced wildfire results to the spatial planning context.

The real question we need to ask arises here; do we as designers and planners aspire to an ecological memory of which we are active shapers, perhaps by renewing, adapting, but not forgetting, as a part of the indifference we live in? Future resilience studies will have the opportunity to make the right choices for the ecosystem if they record the processes of loss of ecological memory, which focuses on the response of the ecosystem to all kinds of deterioration. In this context, it is clear that an effective monitoring and pre-warning system is needed. In the summer of 2021, large forest areas were burned not only in Muğla, but also in Antalya and Aydın. In terms of being an example to other provinces rich in forest assets, a monitoring centre can be established in Muğla to serve as a model to other regions in Turkey. The method used to determine the burned areas and burned intensity can be applied more frequently with the data available from different satellites for the detection of fires in places far from residential areas. Some of the recent studies such as the one conducted by Weirather, Zeug & Schneider (2018) is promising in this respect in terms of implementation of an algorithm by using open programming libraries and open satellite imagery for the fully automated workflow. In this respect, future studies may also shed some light on the employment of existing open source tools for the establishment of wildfire alert systems.

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REFERENCES

Clavet, C., Topik, C., Harrell, M., Holmes, P., Healy, R., & Wear, D. (2021). Wildfire resilience funding: Building blocks for a Paradigm shift, *The Nature Conservancy*.

CORINE Land Cover (CLC), (2018). *Arazi Örtüsü Verisi*.

Congedo, L. (2021). Semi-Automatic Classification Plugin: A Python tool for the download and processing of remote sensing images in QGIS, *Journal of Open Source Software*, 6(64), 3172. https://doi.org/10.21105/joss.03172

Cumhuriyet Gazetesi (2021). *Muğla'da 66 bin hektar orman yandı*, https://www.cumhuriyet.com.tr/haber/muglada-66-bin-hektar-orman-yandi-1859130

Eisenberg, C., Anderson, C.L., Collingwood, A., Sissons, R., Dunn, C.J., Meigs, G.W., Hibbs, D.E., Murphy, S., Kuiper, S.D., Spear Chief-Morris, J., Bear, L.L., Johnston, B., & Edson, C.B. (2019). Out of the ashes: ecological resilience to extreme wildfire, prescribed burns, and indigenous burning in ecosystems. *Frontiers in Ecology and Evolution*, 436.

Gonzalez-Mathiesen, C., Ruane, S., & March, A. (2020). Integrating wildfire risk management and spatial planning – A historical review of two Australian planning systems, *International Journal of Disaster Risk Reduction*, 53, 101984.

HGK (2021). *Türkiye Mülki İdare Sınırları, Dağıtım Formatı: ESRI shp*. https://www.harita.gov.tr/urun/turkiye-mulki-idare-sinirlari/232.

Johnstone, J. F., Allen, C. D., Franklin, J. F., Frelich, L. E., Harvey, B. J., Higuera, P. E., Mack, M. C., Meentemeyer, R. K., Metz, M. R., Perry, G. LW., Schoennagel, T., & Turner, M. G. (2016). Changing disturbance regimes, ecological memory, and forest resilience, *Frontiers in Ecology and the Environment*, 14(7), 369–378.

Kavlak, M.Ö., Çabuk, S.N., & Çetin, M. (2021). Development of forest fire risk map using geographical information systems and remote sensing capabilities: Ören case, *Environmental Science and Pollution Research*, 28, 33265–33291.

Kavlak, M.Ö., Kurtipek, A., & Çabuk, S.N. (2020). Coğrafi Bilgi Sistemleri İle Orman Yangını Risk Haritası Oluşturulması: Ören Örneği, *Dirençlilik Dergisi*, 4(1), 33-54.

Keeley, J. E. (2009). Fire intensity, fire severity and burn severity: a brief review and suggested usage, *International Journal of Wildland Fire*, 18(1), 116-126.

Key, C. H., Benson, N., Ohlen, D., Howard, S. M., & Zhu, Z. (2002). *The normalized burn ratio and relationships to burn severity: ecology, remote sensing and implementation* [Paper presentation], Ninth Biennial Remote Sensing Applications Conference, Apr 8–12, San Diego, CA.

Key, C. H., & Benson, N. C. (2006). Landscape assessment (LA). In: Lutes, D. C., Keane, R. E., Caratti, J. F., Key, C. H., Benson, N. C., Sutherland, S., & Gangi, L. J. (Eds.), *FIREMON: Fire effects monitoring and inventory system*, General Technical Report, RMRS-GTR-164-CD, Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station, p. 1-55, 164.

Llorens, R., Sobrino, J. A., Fernández, C., Fernández-Alonso, J. M., & Vega, J. A. (2021). A methodology to estimate forest fires burned areas and burn severity degrees using Sentinel-2 data. Application to the October 2017 fires in the Iberian Peninsula, *International Journal of Applied Earth Observation and Geoinformation*, 95, 102243.

Lutes, D. C., Keane, R. E., Caratti, J. F., Key, C. H., Benson, N. C., Sutherland, S., & Gangi, L. J. (2006). *FIREMON: Fire Effects Monitoring and Inventory System. General Technical Report*, RMRS-GTR-164-CD, Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. https://www.fs.fed.us/rm/pubs/rmrs_gtr164.pdf

Mashhadi, N., & Algancı, U. (2021). Determination of forest burn scar and burn severity from free satellite images: a comparative evaluation of spectral

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indices and machine learning classifiers. *International Journal of Environment and Geoinformatics*, 8(4), 488-497.

McWethy, D.B., Schoennagel, T., Higuera, P.E., Krawchuk, M., Harvey, B. J., Metcalf, E. C., Schultz, C., Miller, C., Metcalf, A. L., Buma, B., Virapongse, A., Kulig, J. C., Stedman, R. C., Ratajczak, Z., Nelson, C. R., & Kolden, C. (2019). Rethinking resilience to wildfire, *Nature Sustainability,* 2 (2019): 797–804. https://doi.org/10.1038/s41893-019-0353-8

NASA SRTM (2013). *Shuttle Radar Topography Mission (SRTM) GL 1*.

Nasery, S., & Kalkan K. (2020). Burn Area Detection and Burn Severity Assessment Using Sentinel 2 MSI Data: The Case of Karabağlar District, İzmir/Turkey, *Turkish Journal of Geosciences*, 1(2), 72-77.

OGM (2021). *Yüzdelik Olarak İllere Göre Orman Varlığı*. https://web.ogm.gov.tr/Documents/Orman_Varligi_Dosyalari/Yuzdelik-Illere-Gore-Orman-Varligi.pdf.

OGM (2022). *Yangın Yönetim Planları/Muğla OBM*. https://web.ogm.gov.tr/ekutuphane/Dokumanlar/Yangın Yönetim Planları/Muğla OBM.

Pepe, M., & Parente, C. (2018). Burned area recognition by change detection analysis using images derived from Sentinel-2 satellite: The case study of Sorrento Peninsula, Italy. *Journal of Applied Engineering Science*, 16(2), 225-232.

Peterson, G.D. (2002). Contagious disturbance, ecological memory, and the emergence of landscape pattern. *Ecosystems*, 5(4), 329-338.

Polat, N., Kaya, Y. (2021). Çok Bantlı Uydu Görüntüleriyle Orman Yangınlarında Hasar Tespiti, *Bartın Orman Fakültesi Dergisi*, 23(1), 172-181.

QGIS (2021). *Quantum GIS*. https://qgis.org/

Roy, D. P., Huang, H., Boschetti, L., Giglio, L., Yan, L., Zhang, H. H., & Li, Z. (2019). Landsat-8 and Sentinel-2 burned area mapping-A combined sensor multi-temporal change detection approach. *Remote Sensing of Environment*, 231, 111254.

SAGA (2021). *System for Automated Geoscientific Analyses.* http://www.saga-gis.org/en/index.html

Saulino, L., Rita, A., Migliozzi, A., Maffei, C., Allevato, E., Garonna, A. P., & Saracino, A. (2020). Detecting burn severity across mediterranean forest types by coupling medium-spatial resolution satellite imagery and field data, *Remote Sensing*, 12(4), 741.

Selles, O. A., Rissman, A. R. (2020). Content analysis of resilience in forestfire science and management, *Land Use Policy*, 94, 104483, 1-12. https://doi.org/10.1016/j.landusepol.2020.104483

Sobrino, J. A., Llorens, R., Fernández, C., Fernández-Alonso, J. M., & Vega, J. A. (2019). Relationship between forest fires severity measured in situ and through remotely sensed spectral indices, *Forests*, 10(5), 457.

Sözcü Gazetesi (2021) *Muğla'da orman yangınlarının bilançosu ortaya çıktı*. https://www.sozcu.com.tr/2021/gundem/muglada-orman-yanginlarinin-bilancosu-ortaya-cikti-6584017/

Strand, E.K., Satterberg, K.L., Hudak, A.T., Byrne, J., Khalyani, A.H., & Smith, A. (2019). Does burn severity affect plant community diversity and composition in mixed conifer forests of the United States Intermountain West one decade post fire? *Fire Ecology*, 15(1), 1-22.

Sümer, Ö., Akin, A., & Tekin, A. (2020). Antropojen ve Antroposen kavramlarının tarihsel gelişimine yerbilimsel bir bakış, *Türkiye Jeoloji Bülteni*, 63(1), 1-20.

Thompson, M.P., Bowden, P., Brough, A., Scott, J.H., Gilbertson-Day, J., Taylor, A., Anderson, J., & Haas, J.R. (2016). Application of Wildfire Risk Assessment

Results to Wildfire Response Planning in the Southern Sierra Nevada, California, USA, *Forests*, 7, 64. doi:10.3390/f7030064

Türkeş, M., & Altan, G. (2013). İklimsel değişimlerin ve orman yanginlarinin Muğla Yöresi'ndeki doğal çevre, doğa koruma alanlari ve biyotaya etkilerinin bir ekolojik biyocoğrafya çözümlemesi, *Ege Coğrafya Dergisi*, 22/2, 57-76, İzmir.

Walker, R.B, Coop, J.D, Downing, W.M, Krawchuk, M.A, Malone, S.L, & Meigs, G.W. (2019). How much forest persists through fire? High-resolution mapping of tree cover to characterize the abundance and spatial pattern of fire refugia across mosaics of burn severity. *Forests*, 10(9), 782.

Weirather, M., Zeug, G., & Schneider, T. (2018). Automated Delineation of Wildfire Areas Using Sentinel-2 Satellite Imagery. *GI_Forum 2018*, 6, 251-262.

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Research Article

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Cobb-Douglas Hybrid Modelling Approach with Fuzzy-AHP Indexing for Residential Land Value Determining: A Case Study of Konya/Turkey

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Abstract

In this study, for mass real estate appraisal forecasting, the hybrid mathematical model has been developed by combining Cobb-Douglas one of the nonlinear regression models, and linear modeling. The real estate attributes that create the model were grouped under four main-title: local, spatial, physical and legal features. While Cobb-Douglas was used for the value forecast based on the real estate attributes in each part of the model, an integrated model was created with a linear approach. As a different approach, local and spatial features, which are among the real estate attributes, were used as indexes for reasons such as preventing data confusion in the model and using according to the spatial analysis results of distances. Local and spatial index were prepared with the Fuzzy Analytic Hierarchy Process (FAHP) method to use within the model. For indexes, in the central districts of Konya, 10 local-specific attributes were used, while 12 spatial-specific attributes. The data set has been prepared using legal and physical attributes with market values collected from 457 parcels in the study area. Local and spatial attributes were added as indexes to the data set used in the hybrid model. In addition, modeling was done with the data set used in the Cobb-Douglas Hybrid Model (C-DHM) according to the Linear Multiple Regression Analysis (Linear MRA) method. The developed C-DHM's results was integrated with Geographical Information Systems (GIS). The performance values between the hybrid model and market values were examined. Results showed that R2 value for C-DHM and Linear MRA used as indexes was found to be 0,85 and 0,80. When the values obtained from C-DHM and market value are compared, it is seen that model gives successful results.

Keywords:
Fuzzy Analytic Hierarchy Process (FAHP), Cobb-Douglas Hybrid Model (C-DHM), local and spatial indexing, mass real estate appraisal, geographic information systems (GIS)

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INTRODUCTION

Real estate appraisal is important for local managers who are responsible for providing various public services to their citizens. The local government uses real estate taxes that it receives at certain rates according to the type and value of the real estate within the management boundary as the biggest source of meeting these services. Thus, the local government must ensure the fairness of the real estate taxes by accurately deciding the real estate value for both the country and the citizens. The most critical issue to meet the justifications is the methods applied in determining the real estate value. Nowadays, mass real estate appraisal is newly emerging and new methods are being developed.

Mass appraisal refers to the process of determining the value of all real estate in the relevant area. Generally, the common method for mass appraisal is Multiple Linear Regression Analysis (MRA). After years of applications, especially the linear MRA models has been accepted as the most common usage model because of its expression with a clear mathematical formula, the wide use of tax departments and the long-term stable application advantages (Lin and Mohan, 2011; Del Giudice et al., 2017). The traditional MRA model is a type of global model that generates using observed data, in which a single parameter is estimated for each variable in the model (Wang, H. et al., 2020). It is a frequently encountered situation in literature that real estate value estimation and attributes effects of multivariate linear regression method are also used (Yalpir and Bayrak, 2017; Ghosalkar and Dhage, 2018; Georgiadis, 2018; Bartram, 2019; Pérez-Rave et al., 2019; Baird et al., 2020).

Out of Linear MRA, many methods have been developed and contribute to the literature for mass real estate appraisal systems (Peterson and Flanagan, 2009; Wang et al., 2015; Zhou et al., 2018; Dimopoulos and Bakas, 2019; Peter et al., 2020). These methods, which have various expressions such as mass valuation, automatic valuation or advanced valuation method; are used algorithms as fuzzy systems, hedonic modelling, artificial intelligence, random forest. Sometimes we can come across as a hybrid method integrated into these methods (González, 2008; Hill, 2013; Unel and Yalpir, 2019(a); Guan et al., 2008; Zurada et al., 2011; McCluskey et al., 2012; Shi et al., 2020). However, since many of these methods are difficult to implement and understand, they cannot be used in practice. The common property of the mentioned methods is that they use attributes to reach the result. All methods interpret the investigation results according to different mathematical algorithms using subject-related attributes.

All the attributes affecting the value with the Linear MRA method have a direct effect weight on the dependent variable. In other words, this technique calculates by establishing a correlation between independent variables and dependent variable. Whereas, there is a need for a model that needs to be distinguished according to the characteristics of the factor affecting the real estate value. Since the

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value is formed according to the supply and demand in the market conditions, it cannot be expected to be in a linear direction. The hybrid model, created by using Cobb-Douglas (non-linear) model and the linear regression model, enables the opportunity to category the attributes. Cobb-Douglas hybrid model (C-DHM) can be used to produce value maps through Geographic Information Systems (GIS).

Too many attributes that affect the value problems in modelling and database creation. It is possible to categorize the attributes in the appraisal model and then implement a mass appraisal using the coefficients obtained as a result of the modelling. The plenty of local and spatial attributes creates problems in its use in modelling and in creating a dataset. Indexing to reduce these distance-based attributes will reduce the workload time and cost, especially in other applications that must mass appraisal.

There are studies with indexing in the literature. Studies are used in areas such as health and economy (Guler and Bilici, 2017; Dewi et al., 2017). There are different expressions of indexing, sometimes in the form of suitability, sometimes sensitivity and sometimes risk maps, depending on the purpose of the applications (Ozkazanc et al., 2020; Taghizadeh-Mehrjardi et al., 2020; Abedi Gheshlaghi et al., 2020). The main logic here is to add multiple factors to get a single result. In study by Jensen et al. (2012), created Habitat 'Suitability Index Map for practitioners for industrial symbiosis. In the related study, the maps of nine spatial variables formed as a result of GIS analysis were collected with a single index map. Finally, they made them ready for decision support through index maps. The combination of attributes that are effective for such applications also requires a method. In general, it is observed that Multi-Criteria Decision Analysis (MCDA) systems are highly preferred in uses that need spatial combining (Cordão et al., 2020; Bakirman and Gumusay, 2020; Uyan, 2013). Today, hybrid methods that develop with the use of artificial intelligence techniques take place in the literature.

GIS is an indispensable tool in analysing many attributes based on spatial. The real estate appraisal is linked to the real estate location. This location sometimes stands out as a coordinate and sometimes an address. Yet, whatever the case, the locational expression shows that there are also neighbourhood relations that affect real estate. In other words, whether the attributes of real estate are located in the form of spatial or non-spatial, they are affected by the neighbourhood relations. The element that we can see this effect best is the value of the real estate. GIS is also required in the production of value maps (Locurcio et al., 2020; Mete and Yomralioglu, 2019). For an important application such as the property tax system, GIS should be utilized in the most effective use.

This study aims to make mapping that will reduce the number of variables by using Fuzzy Analytic Hierarchy Process (FAHP) for local and spatial attributes in mass real estate appraisal and to create a

method for the real estate value with C-DHM approach. Grouping the attributes make eases the use of the value-determining model, especially by creating local and spatial indexes. How the modelling with the developed C-DHM, is effective in the value determined will be able to display. The application can gain an important place in the literature with a view to producing local and spatial indexes. The difference from similar studies is that the model is established with combining linear and nonlinear approaches (i.e. C-DHM). Thus, when a new/different real estate attribute is included in the model, the model cannot need to be installed from the beginning due to its linear form, and real estate attribute(s) can be added to the existing model. This statement means: If the mass appraisal model is to be applied for a different study area, the model will not be affected by the new attributes of the real estate in the region. So new attributes will be evaluated without affecting the model. Another difference is that: Since the excess of attributes affecting the real estate value complicates the model, producing a single index for location-specific data such as spatial, demographic and neighbourhood relations make provides ease of use. The produced indexes can be used in different studies. Briefly, a developed methodology for the process steps in mass real estate appraisal can be shown as the generalized solution.

REAL ESTATE APPRAISAL METHODS

Real estate valuation has a wide range of applications ranging as taxation, mortgaged sales, and expropriation in the world countries. Besides it has been used in development practices and planning studies to land management Also, the appraisal issue must be considered based on scientific bases and social justice due to today's changing needs. International Association of Assessing Officers (IAAO) examines the appraisal issue, in two groups, as single and mass real estate appraisal (IAAO, 2013). There are various methods for both single and mass appraisals in literature. These methods have been presented in Figure 1 considering current academic research, today's various requirements for the types of different real estates, and IAAO standards. However, there have been significant changes in the use of these methods and content of appraisal issue with the developing computer technology over time. Furthermore, because valuations of real estate are used in different requirements, single appraisal methods produce temporary solutions. These methods do not provide sufficiently today's requirements. Therefore, the need to appraise many real estates at simultaneously has become popular. According to IAAO, mass appraisal is the process of valuing a group of properties as of a given date and using common data, standardized methods, and statistical testing (IAAO, 2013). Mass appraisal is a subject that our country and many other countries of the world are working on. Although there are differences in the locations and living standards of the countries, the general understanding is the same (Barańska, 2013).

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When Figure 1 is examined, firstly, real estate appraisal methods are divided into two groups as single and mass. The single appraisal methods group includes sales comparison, income, and cost methods, respectively. These methods are also known as traditional methods in the literature and provide temporary solutions in real estate appraisal applications. The group of mass appraisal methods, on the other hand, includes various methods that are quite popular today. Foremost of these methods is machine learning techniques, which are often preferred in the literature. Machine learning methods used and to be used in the mass appraisal are multiple linear and nonlinear regression, Support Vector Machines-Support Vector Regression, Artificial Neural Networks, and ensemble learning-based Decision Trees (e.g. Random Forest), respectively. In addition to these techniques, MCDA-based methods such as Fuzzy Logic, Nominal method, Analytic Hierarchy Process (AHP) and FAHP can also be used effectively in the mass appraisal of real estates (Yalpir, 2018; Aydinoglu et al., 2020; Yilmazer and Kocaman, 2020; Chen et al., 2017; Mete and Yomralioglu, 2019; Yalpir et al., 2013; Selim, 2009).

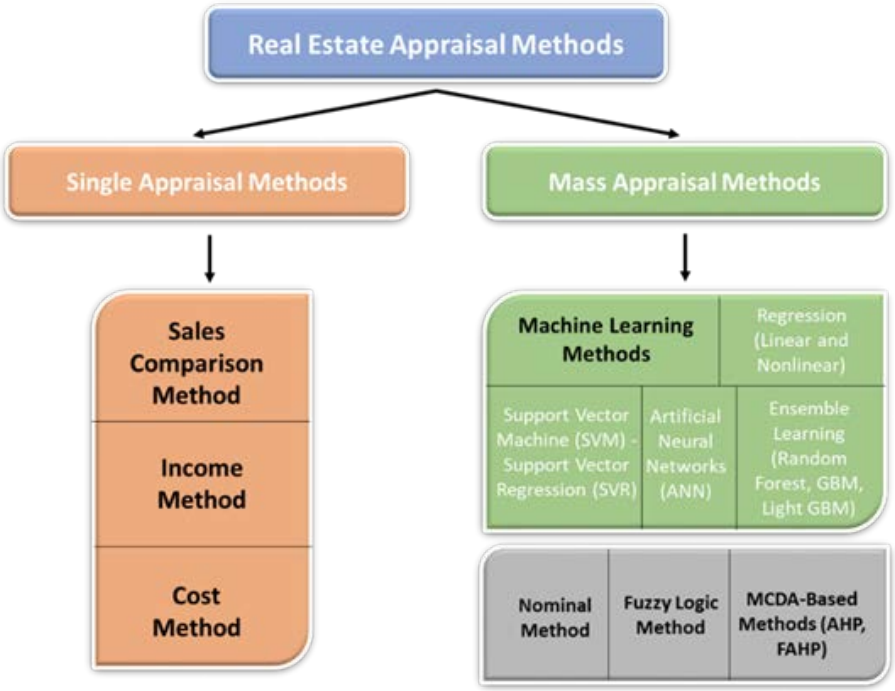

Figure 1. Real estate appraisal methods

Regression Analysis

Regression methods are statistical analysis and estimation techniques used in many different fields such as environment and climate (Sousa et al., 2007), agriculture (Kostov, 2009), electronic (Hong et al., 2010), sustainable energy (Sehgal et al., 2014) and industry (Syazali et al., 2019). On the other hand, regression analysis methods are also currently used in real estate appraisal studies (Božic et al., 2013; Pérez-Rave et al., 2019; Nesticò and La Marca, 2020). Regression

analysis is divided into two as linear and nonlinear regression methods according to the characteristics of mathematical functions.

Linear Multiple Regression Analysis (Linear MRA)

Linear MRA explains the relationship between the dependent variable and independent variables using a mathematical equation (Zheng et al., 2020) (Equation 1). It is a crucial procedure used for data analysis in many applications. Independent variables can affect each other among themselves. As well as many independent variables can come together and affect another dependent variable (Kilic, 2013).

$$Y_n = a_0 + a_1 X_{n1} + a_2 X_{n2} + \ldots\ldots\ldots + a_m X_{nm} + e_n \quad (1)$$

Y_n = Dependent variable (Real estate value), X_{n1}, X_{n2}, ..., X_{nm} = Independent variables (Base area coefficient, Floor area coefficient, Area,..., etc.), e_n = Random error term, a_0 = Regression constant coefficient, a_1, a_2,..., a_m = Regression (variable) coefficients. In the study, the linear MRA method was used to present the success of the new hybrid model comparatively.

Nonlinear Multiple Regression Method (Nonlinear MRA)

Nonlinear MRA aims to establish a nonlinear relationship between the dependent variable and independent variables. Different model functions can be generated in nonlinear regression and many mathematical equations are involved (Wang et al., 2020). Nonlinear regression function examples include exponential, logarithmic, trigonometric, polynomial and Gauss curves. Some functions can be transformed so that they are linear. When so transformed, linear regression can be performed but must be applied within the check (URL1). For the study, the Cobb-Douglas model application, which is one of the nonlinear approaches, has been used in mass real estate appraisal. Detailed explanations about the Cobb-Douglas model are explained in the sub-heading.

Cobb-Douglas Modelling

The Cobb-Douglas model is an economic mathematical model proposed by Charles W. Cobb and Paul Douglas in early the 1930s. With the Cobb-Douglas model, predictions were made for many production functions and solutions were presented for the problems encountered (Nikkhah et al., 2016; Gorgess and Naby, 2017; Kojić and Lukač, 2018; Mahaboob et al., 2019). Generally, the method is used to predict national and regional industrial production (Zhang et al., 2013). It has a mathematical foundation that provides physical connections between input and output through equations containing dependent and independent variables. Inputs are subject-specific parameters, and output is the result of mathematical equations. The mathematical expression of the model is shown in Equation 2.

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$$Y = A(i)\, f(A_i, A_{ii}) = y_i = a_0\, A_{1,i}^{a_1} A_{2,i}^{a_2} \ldots + u_i \quad (2)$$

Y, y_i = Dependent variable; A_i, A_{ii} = Independent variables; a_1, a_2, ..., a_n = Density coefficients (exponential); A(i), a_0 = Constant parameter; u_i = Random error term.

Mass Real Estate Appraisal with Cobb-Douglas Hybrid Model

If we are talking about the concept of mass real estate appraisal, primarily, the methodology put forward should concern the whole real estate. Thus, the methods to be applied should take into account all the real estate and the method should also explain the dependent variable and many independent variables that affect the real estate value. There are many methods of real estate appraisal in the literature. All methods have explained the approach between value of the real estate and attributes with linear and nonlinear models. The most common model is multiple regression model. Multiple regression model is linear and nonlinear models created due to the need to work with multiple criteria in mathematical modelling. In this paper, the hybrid model is proposed for mass real estate appraisal. While the mathematical model for the nonlinear is used as Cobb-Douglas, a model integrated with the linear approach is created. Models created by using linear and nonlinear mathematical models (Equation 3):

$$y = a_0 * \underbrace{\left(M_1^{a^1} * M_2^{a^2} * \ldots\right)}_{1^{st}\ Group\ Attributes} + b_0 * \underbrace{\left(K_1^{b^1} * K_2^{b^2} * \ldots\right)}_{2^{nd}\ Group\ Attributes} + \ldots\ldots + e_0 * \underbrace{\left(A_1^{e^1} * A_2^{e^2} * \ldots\right)}_{n.\ Group\ Attributes} \quad (3)$$

are expressed. Here, the constants of the model are the weights that a_0, b_0,..., e_0 attribute groups (Main-group: local, spatial, physical and legal in this study) add to the model. M_1, K_1....., A_1 attribute groups (Sub-attribute: Base area coefficient, floor area coefficient, number of floors, area of residential land, building layout, , corner/intermediate land, facade length, facade number, geometric shape, infrastructure services, roadway type, healthcare centres, education facilities, shopping centres, public facilities, cultural centres, security units, entertainment centres, green areas, city centre, insanitary areas, transportation, other attributes, population density, education level, favourite neighbourhood, building density, development potential, slope of neighbourhood, geological condition, climate condition, air pollution, noise pollution in this study) and a_1, a_2,...b_1, b_2,..e_1, e_2,... values within the group contain the effect intensities of the attribute within the group. While the basic mathematical expression and coefficients in the model are Cobb-Douglas method, different attribute group's sums include the linearity model. In the study, each group was brought together according to the attribute of real estate. The C-DHM has been created in a way that

counts the attribute of local, spatial, physical and legal groups and the sub-attributes of these groups.

Local and Spatial Indexing

AHP simplifies and analyses a complex multi-criteria decision process. In doing so, it uses numerical scale values in binary comparisons to determine the importance of each criterion. Despite its advantages, the method is short of modelling the fuzziness caused by decision-makers' preferences. Therefore, methods should be developed to assist in deciding fuzzy judgments. It is more possible to use fuzzy methods in a complex and indefinite loop (Goguen, 1967).

Fuzzy logic theory, one of the fuzzy methods, is an approach put forward by Zadeh in 1965 (Zadeh, 1965). The basic principle in the method is that answer to be given about whether an element belongs to a set or not is not based on precise judgments. Consequently, the probability of this element belonging to the respective set is demonstrated by a continuous membership function that can take values between 0 and 1. FAHP is also the method suggested for a similar purpose. The method offers alternatives to select the best option or order the options in a multi-criteria environment using fuzzy sets theory and hierarchy structure. FAHP utilizes triangular fuzzy numbers (TFNs) to model the complexity or fuzziness of decision-makers (Nyimbili and Erden, 2020). TFNs is a peculiar type of number whose membership function is characterized by l, m and u parameters in Figure 2.

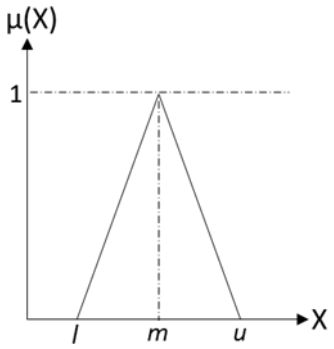

Figure 2. Triangular fuzzy number (l, m, u)

l, m and u parameters represent the lower, mean and upper bounds of the TFN (Mu et al., 2008). Linear representations of each TFN can be defined by the following membership functions (Equation 4).

$$\mu(x;l,m,u)=\begin{Bmatrix}\dfrac{x-l}{m-l}; & l\le x\le m\\ \dfrac{u-x}{u-m}; & m\le x\le u\\ 0; & otherwise\end{Bmatrix} \quad (4)$$

These TFNs are used to create a fuzzy pairwise comparison matrix. TFNs related to FAHP have been used differently by different

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practitioners (Laarhoven and Pedrycz, 1983; Buckley, 1985; Chang, 1996). In our study, it is proposed to use Buckley's (1985) geometric mean method, which is a unique solution and ease of calculation to develop indexes in mass real estate appraisal.

Geometric mean method

The geometric mean method proposed by Buckley was used in this study. TFNs were used to express expert opinions, generating a triangular fuzzy comparison matrix (Table 1).

Table 1. Fuzzy Comparison Matrix

$A = (\tilde{a}_{ij})_{nxn} =$

(1,1,1)	l_{12}, m_{12}, u_{12}	...	...	l_{1n}, m_{1n}, u_{1n}
l_{21}, m_{21}, u_{21}	(1,1,1)	...	...	l_{2n}, m_{2n}, u_{2n}
...	...	(1,1,1)	...	...
...	...	...	(1,1,1)	...
l_{n1}, m_{n1}, u_{n1}	l_{n2}, m_{n2}, u_{n2}	...	...	(1,1,1)

Where, $\tilde{a}_{ij} = (l_{ij}, m_{ij}, u_{ij})$ and $\tilde{a}_{ij}^{-1} = (1/u_{ji}, 1/m_{ji}, 1/l_{ji})$ for i, j = 1, ..., n and $i \neq j$ is represents. Fuzzy set operators of multiplication, addition and subtraction, used in the fuzzy pairwise comparison approach computation for fuzzy sets M_1 ($\tilde{a}_i$) and M_2 ($\tilde{a}_j$) are demonstrated from (Equation 5-7) as follows:

$$M_1 \times M_2 = [(l_1, m_1, u_1).(l_2, m_2, u_2) = (l_1.1_2, m_l.m_2, u_1.u_2)] \quad (5)$$

$$M_1 + M_2 = [(l_1, m_1, u_1) + (l_2, m_2, u_2) = (l_1 + 1_2, m_l + m_2, u_1 + u_2)] \quad (6)$$

$$M_1 - M_2 = [(l_1, m_1, u_1) - (l_2, m_2, u_2) = (l_1 - 1_2, m_l - m_2, u_1 - u_2)] \quad (7)$$

TFNs transformed from linguistic variables representing scores of pairwise comparisons are presented in Table 2.

Table 2. TFN correspondence of linguistic variables

Linguistic Variables	Fuzzy scale	Inverse fuzzy scale
Equally important	(1, 1, 1)	(1, 1, 1)
Moderate	(2, 3, 4)	(1/4, 1/3, 1/2)
Fairly strong	(4, 5, 6)	(1/6, 1/5, 1/4)
Very strong	(6, 7, 8)	(1/8, 1/7, 1/6)
Absolutely more important	(9, 9, 9)	(1/9, 1/9, 1/9)
Intermediate values	(1, 2, 3)	(1/3, 1/2, 1)
	(3, 4, 5)	(1/5, 1/4, 1/3)
	(5, 6, 7)	(1/7, 1/6, 1/5)
	(7, 8, 9)	(1/9, 1/8, 1/7)

Where $\acute{r}_{ij}$ is the **fuzzy geometric mean** value given via (Equation 8),

$$\acute{r}_{ij} = (\tilde{a}_{i1} \times \tilde{a}_{i2} \times \ldots \times \tilde{a}_{in})^{1/n} \quad (8)$$

Normalization of the weights, w_i is then performed (Equation 9).

$$w_i = [\,(l + m + u)\,/\,3\,] \quad (9)$$

After the weights are determined, the process is completed by performing a consistency analysis. If there is any inconsistency, transactions are repeated.

Model Performance Analyses

In order to evaluate the model performance, outputs obtained from the nonlinear hybrid model have been compared with the market values. In comparing, R^2 (Equation 10), Mean Absolute Percentage Error-(MAPE) (Equation 11), Standard Deviation (SD) (Equation 12), Standard Deviation Percentage (SD%) (Eqn. 13) statistical performance methods were used.

$$R^2 = 1 - \frac{\sum_{i=1}^{n}(x_p - x_i)^2}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \quad (10)$$

$$MAPE = \frac{1}{n}\sum_{i=1}^{n}\frac{|x_p - x_i|}{x_p} \quad (11)$$

$$SD = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{(n-1)} \quad (12)$$

$$SD\% = 100 * \frac{SD_{model}}{SD_{market}} \quad (13)$$

Where = x_p is market value; x_i is model value; $= 1, 2, 3, \ldots . n$; n is number of total parcel in the dataset; $\bar{x}$ mean market values. R^2 is a measure of the success of the equation obtained from the regression analysis. MAPE shows that the predicted value is how closer to market value. The low MAPE ratio is recommended for the high prediction accuracy of a model. In studies where methods are developed especially for real estate appraisal, these error rates and model performances were examined (Lin, 2010; Sarac, 2012; Kavas, 2014). SD is the deviation of the approximations in market and model values.

APPLICATION

In this study, first of all, the definition of the problem has been made. After the definition of the problem, the study objective(s) have been determined for its solution. The main objective(s) is;

a-) Mass appraisal of real estates using the developed Cobb-Douglas Hybrid model,

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b-) Creating indexes for real estate attribute groups (spatial and local) with FAHP,

c-) Developing real estate appraisal determining methodology.

Respectively, the prepared flowchart to achieve the objectives has given below (Figure 3.).

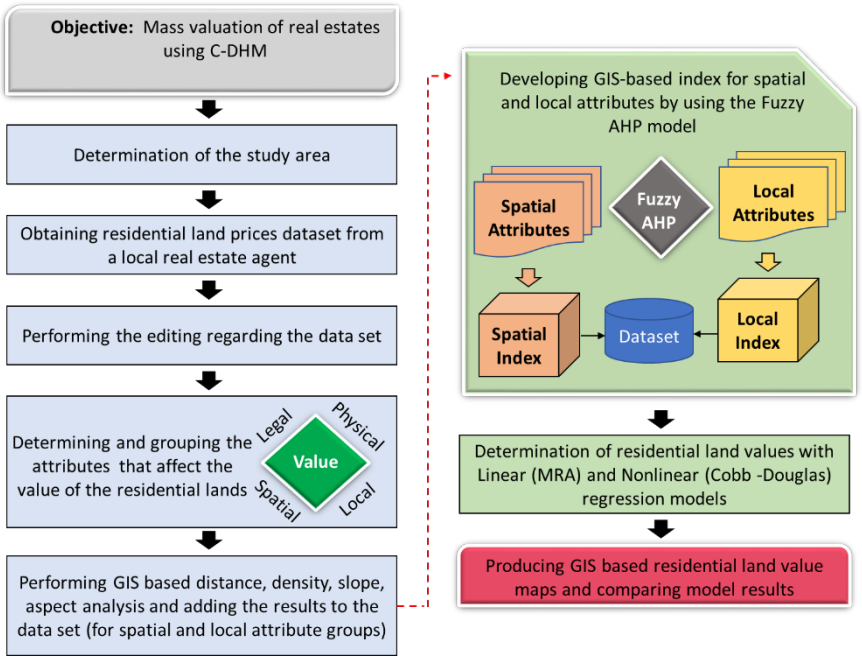

Figure 3. Flowchart for process of mass real estate appraisal

Study Area, Market Samples and Data Obtaining

The Konya province is located in the Central Anatolia Region, which is one region of seven in Turkey. Konya neighbours Ankara province which is the capital of Turkey in the north, Eskisehir province in the northwest, Antalya and Karaman province in the south, Nigde and Aksaray province in the east, Isparta and Afyonkarahisar province in the west (Figure 4). In 2020, the total population of the province is 2.232.374 (URL2). Although it has 31 districts in total, Meram, Selcuklu and Karatay districts are central districts and quite close to the city centre. The intersection of these three district boundaries is the city center. The study area is located in the neighbourhoods of three districts (Meram, Selcuklu and Karatay) that are close to the city centre and where housing is concentrated. The study area covers 269 neighbourhoods with 82.868 residential lands and 30.395 buildings. The study area is approximately 260 km^2. Maps of the study area have been presented in Figure 4.

The market samples were gathered to use in modelling from real estate purchase/sale websites, and local real estate agents, which is located in the study area. A data storage was created with obtained market samples. After data(s) editing, the last remaining dataset includes 457 real estates in residential land type. The sales values belong to the 2019 year in the dataset. The location of market samples throughout the study area is shown in Figure 4 using the red dot markers. Market sample prices range from a minimum of 55.000 ₺ to a

maximum of 2.350.000 ₺. Besides, some descriptive statistics regarding market samples have been presented in Table 3.

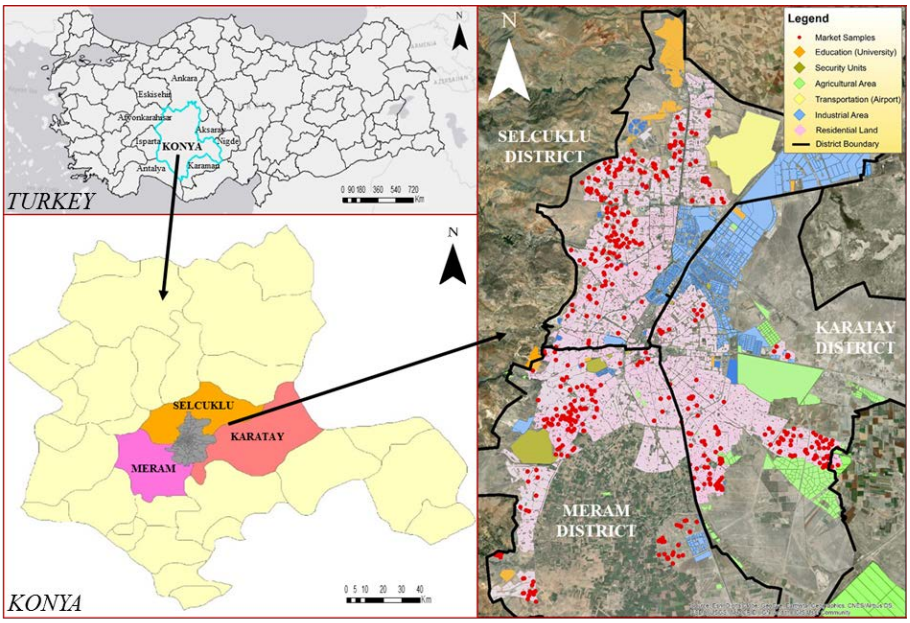

Figure 4. The study area and market samples

Table 3. Descriptive statistics of the dataset (Legal-Physical)

Attribute	Units	Mean	SD	Min	Max
Market value	₺	326253	341912	55000	2350000
Base area coefficient	Rate	0.24	0.07	0.08	0.90
Floor area coefficient	Rate	0.59	0.34	0.15	3.60
Number of floors	Number	2.44	0.93	1.00	8.00
Area of residential land	m^2	868	639	117	5462
Building layout	Text	2.92	0.35	1.00	3.00
Facade length	Meter	25.36	13.26	4.00	100
Facade number	Number	1.46	0.62	1.00	4.00
Infrastructure services	Rate	0.66	0.21	0.25	1.00
Corner/Intermediate Land	Text	1.36	0.48	1.00	2.00
Roadway type	Text	1.36	0.48	1.00	2.00
Geometric shape	Text	1.97	0.17	1.00	2.00

Note: *Attributes in the text (categorical) unit were transformed to numeric values. Building layout (Discrete-3, Contiguous-2, Block-1), Position of residential land in the building block (Corner-2, Intermediate -1), Geometric shape (Regular-2, Irregular-1), Roadway type (two-way-2, one-way-1).*

In hybrid mathematical modelling, scaling was performed on the dataset to more accurately determine the attributes activities and to eliminate the unit differences of the dataset record fields. Scaling the dataset provides both ease of multiple modelling and interpreting the result of models. Therefore, we performed a scaling to the dataset by using Equation 10. These equations were implemented in the dataset for each attribute record field respectively (BAC, FAC, Number of floors, Building layout etc.). In Equation 14, X_{scale} is scaled value for any attributes, X_i is value of i^{st} attributes in the dataset and $i = 1,2,3,\dots,n$, X_{max} is the maximum value of an attribute in column of the dataset.

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$$X_{scale} = \frac{X_i}{X_{max}} \quad (14)$$

In other words, since the mathematical model will be developed from a scaled dataset, the dataset was divided into the highest value of the relevant attribute in the study area. This scaling process was performed for other attributes, which is explained in Section 3.2. After the scaling process, the final dataset for modelling included the scaled value of all attributes. In this manner, the dataset was prepared for linear and nonlinear combination modelling.

Determination of Attributes for Mass Appraisal

The most important part of the real estate value model production is determination of the attributes that affect the value. In determining the value attributes, first, the attributes were grouped under four main categories as local, spatial, physical and legal. In this context, 5 attributes under legal group, 7 attributes under physical group, 12 attributes under spatial group and 10 attributes under local group were determined (Table 4). For local and spatial attributes, respectively, 10 attributes and 12 attributes were examined and an index was created from these attributes. The indexes for the attributes are explained in the next section. Looking at the attributes as a group, **legal attributes** are data arising from the usage rights granted to the property. It includes the property status and easement rights registered in the land registry and the construction information in the Implementation Zoning Plans. The least required to be made on the parcel granted to the real estate owners under the plan conditions is building floor area, floor area ratio, total number of floors and type of construction. Since the area of the parcel where these conditions will be realized is also a legal right, it is included in this group. **Physical attributes** include the feature that arises from the physical conditions where the parcel is located spatially.

Spatial attributes of all subtitles are based on data from plans (Table 4). Spatially, by determining the locations of these attributes, proximity analyses were performed and map bases were used. Each of the features has been transferred to ArcGIS software in separate layers. Proximity analysis was applied considering the impact service areas of the attributes. With the help of proximity analysis, the weights of each of the spatial attributes were determined as a result of the survey study. **Local attributes** were taken from the Turkey Statistical Institute (TUIK) and also, from the local government for use in small-scale mapping (Table 4). Taking into consideration the central neighbourhoods in Meram, Selcuklu and Karatay districts, a map base with neighbourhood borders on a small map scale was arranged (Figure 4). Based on this map, attribute data such as population density, structure density and level of education regarding local attributes were taken from TUIK. These data were associated with neighbourhood boundaries in ArcGIS and analysis maps of attributes specific to central neighbourhoods were created. Development potential, slope of neighbourhood and geological

situation were obtained from the local government and datasets were created with GIS integration. Data of five stations belonging to the meteorological institution in the region were used for climate conditions and air pollution. Noise data were used by integrating into the map according to the data obtained from the Municipalities as a result of the measurements in the related areas (ring roads and crossroads on main streets, train and tramlines, industries, airport noise measurements). In favourite neighbourhoods, factors such as trade mobility and frequency of preference taken from local managers are handled in an integrated way. In determining these attributes, the results of the studies conducted in The Scientific and Technological Research Council of Turkey (TUBITAK) projects have been handled (Unel, 2017; Unel and Yalpir, 2019(b)).

Table 4. Grouping of real estate appraisal attributes

	Attributes (Sub-attributes)	Abb	Description	References
Legal Attributes (5)	Base area coefficient	BAC	Building base area.	Antipov and Pokryshevskaya, 2012; Unel and Yalpir, (2019b)
	Floor area coefficient	FAC	Total building area.	Kontrimas and Verikas, (2011); Unel and Yalpir, (2019b)
	Number of floors	NF	Number of floors ≥10m; Number of floors <10m.	Portnov, (2005)
	Building layout	BL	The state of the building layout being discrete, block or contiguous.	Kontrimas and Verikas, (2011)
	Area of residential land	ARL	Area of the parcel.	Schulz, 2003; El-Gohary, (2004)
Physical Attributes (6)	Corner/Intermediate land	CIL	The parcel's corner or intermediate parcel status.	Ong, (2013); Antipov and Pokryshevskaya, 2012
	Facade length	FL	Garden distances (m).	Lin, (2010)
	Facade number	FN	Number.	Lin, (2010); Antipov and Pokryshevskaya, 2012
	Geometric shape	GS	Geometric status of the parcel.	Dmytrów and Gnat, 2019
	Infrastructure services	IS	Parcel's utilize of technical infrastructure services.	Wilkowski and Budzyński, (2006)
	Roadway type	RT	Whether the road is one-way or two-way.	Portnov, (2005); Comertler, (2007)
Spatial Attributes (12)	Healthcare centres	HC	Distance to healthcare centres (m).	Unel and Yalpir, (2019a)
	Education facilities	EF	Distance to primary, secondary, high school and university facilities (m).	Casas, (2014)
	Public facilities	PF	Distance to facilities belonging to official institutions (m).	Kisilevich et al., (2013)
	Security units	SU	Distance to facilities belonging to security units (m).	Wilkowski and Budzyński, (2006)
	Shopping centres	SC	Distance to shopping centres	Yomralıoglu, (1993);

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			(malls, grocer) (m).	Demircioglu, (2004)
	Cultural centres	CC	Cinema, tourist attraction fields etc. distance (m).	Kisilevich et al., (2013)
	Entertainment centres	EC	Sports, entertainment centres etc. distance (m).	Kryvobokov, 2005
	Green areas	GA	Distance to park, playground, picnic area and forest (m).	Damigos and Anyfantis, (2011); Hammer et al., (1974)
	Transportation	T	Distance to bus, tram and train stations and bus terminal (m).	Son et al., (2012); Dmytrów and Gnat, 2019
	Insanitary areas	IA	Distance to industrial and waste discharge areas etc. (m).	Klaiber and Gopalakrishnan, (2012); Bennet, 2013
	City centre	CiC	Distance to city centre (m).	Antipov and Pokryshevskaya, (2012); Mora-Esperanza, 2004
	Other attributes	OA	Trade, bazaar, industrial commercial areas etc.	Portnov, (2005); Damigos and Anyfantis, (2011)
Local Attributes (10)	Population density	PD	The ratio of the total population of the neighbourhood to the area of the neighbourhood.	Casas, (2014)
	Education level	EL	The total number of persons with primary, secondary, high school and higher education in the neighbourhood.	Casas, (2014); Unel and Yalpir, (2019a)
	Favourite neighbour.	FN	Neighbourhood value according to individuals' income status, real estate purchase and sale density and infrastructure facilities.	Dmytrów and Gnat, 2019; Kryvobokov, 2005
	Building density	BD	The ratio of the total number of buildings in the neighbourhood to the area of the neighbourhood.	Antipov and Pokryshevskaya, 2012
	Development potential	DP	Completion rate of infrastructure facilities in the neighbourhood.	Kryvobokov, 2005
	Slope of neighbour.	SN	Slope map of the neighbourhood (%).	Cellmer et al., (2012); Mora-Esperanza, 2004
	Geological condition	GC	Construction cost according to the ground geological condition of the neighbourhood.	Cellmer et al., (2012); Yomralıoglu, (1993)
	Climate condition	CliC	Temperature, humidity and wind speed-direction meteorological station measurements.	Bennet, 2013; Casas, (2014)
	Air pollution	AP	SO_2 and PM_{10} station measurements from air pollution criteria.	Klaiber and Gopalakrishnan, (2012); Kelly, (2013)
	Noise pollution	NP	Noise data measured from specific strategic points.	El-Gohary, (2004); Kelly, (2013)

Note: *Abb: Abbreviation, ** The real estate appraisal attributes used in the literature have been given above with their references.*

Indexing Attributes with GIS Analysis and Fuzzy AHP

This section explains the proposed attribute indexing to include similar (quantitative) attributes in the model more easily and simply while determining value of the real estate in mass appraisal. Index groups created for the study are as in Figure 5. Here, indexing has been performed only for local and spatial attributes.

The GIS-based analysis is needed (1) to include spatial and local attributes determined in Section 3.2 into modelling and (2) to develop

indexes. Therefore, various GIS analyses such as distance, density, slope, and aspect were performed for spatial and local attribute groups. ArcGIS 10.5.1 software was used for analyses. Raster-based maps were produced for each of the spatial and local attributes and these raster maps were reclassified in the 1-5 class range. On the other hand, to develop spatial and local index FAHP method was used. Relative importance of attributes was determined by using this method. The pairwise comparison matrices were developed based on the expert's opinions.

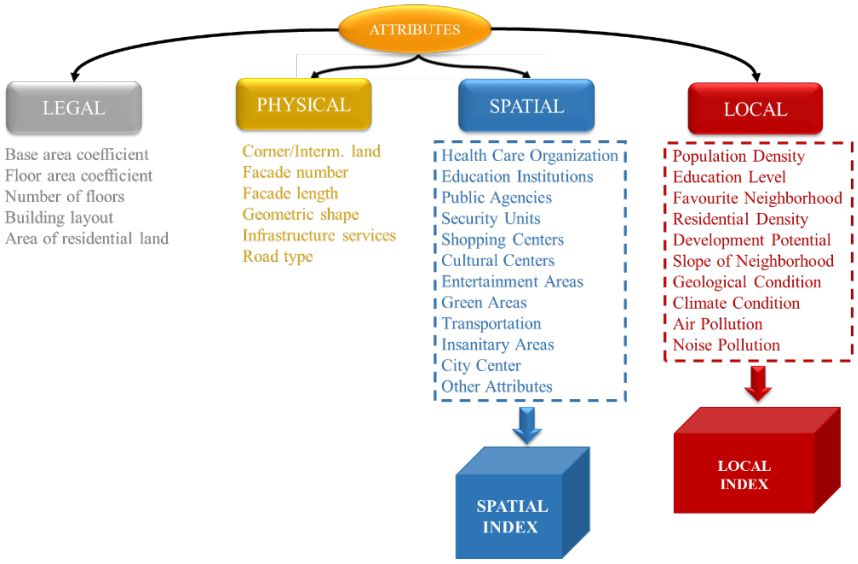

Figure 5. Indexes created for local and spatial attributes

In order to create the pairwise comparison matrices, the survey study within the scope of the project numbered TÜBİTAK-115Y769 was used. The survey was completed with 559 experts. These are the expert participants consisting of experienced people; 2.3% Real Estate Valuation, 29.1% Geomatics Engineer, 6.6% City and Regional Planning, 2.3% Architect, 10.2% Construction Engineer, 1.1% Agriculture Engineer, 0.4% Lawyer, 1.8% Economics and Administrative Sciences, 0.7% National Real Estate Specialist, 0.9% Land Registry and Cadastre Specialist, 6.8% Civil Servants (Land Registry/Cadastre), 6.3% Contractors and 30.7% Real Estate Agents (Yalpir et al., 2017). It was observed that the age of the experts was in the 30-39 age range with a rate of 35%. It was determined that 85% of the participants were male and 72.1% of them were university graduates. Expert participants in the survey study may have more than one task in real estate valuation. Considering this situation, 5% of the expert participants are members of the valuation commission, 5% are academicians, 12% are real estate appraisers, 32% are employed in public institutions, 2% are expropriation expert certificate holders, and 9% are contractors and 28% are real estate agents working in local real estate buying and selling offices.

Namely, the weight coefficients were calculated for each of attributes with FAHP. For each of spatial and local attributes calculated these

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normalized weights were shown in Section 4.1. Then, above-mentioned reclassified raster maps and these weight coefficients were multiplied in the GIS environment by using Raster Calculator tools. In this manner, GIS-based spatial and local indexes were obtained. The developed index values were re-assigned by scaling in the range of 1-10 classes (Figure 6-7 inside Section 4.1). The latest, developed indexes were joined to the dataset, which includes legal and physical attributes as well as market values. Briefly, for the developed hybrid modelling, the final dataset contains legal attributes, physical attributes, spatial index and local index.

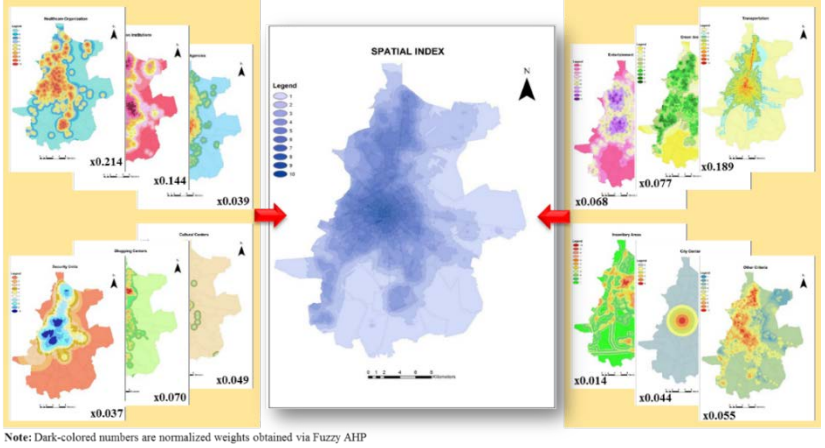
RESULTS

Fuzzy AHP Weights Obtained for Indexing

It is an important approach that the sub-attributes of spatial and local attributes are quantitatively similar and included in the mass appraisal model as an index. Spatial and local attributes in achieving the goal have been examined in detail. Fuzzy pairwise comparison matrices were created according to the relative importance of the attributes (Table 5-6). Spatial attributes chosen for indexing are Healthcare centres (HC), Education facilities (EF), Public facilities (PF), Security units (SU), Shopping centres (SC), Cultural centres (CC), Entertainment centres (EC), Green areas (GA), Transportation (T), Insanitary areas (IA), City centre (CiC), Other attributes (OA).

Local attributes chosen for indexing are Population density (PD), Education level (EL), Favourite neighbour. (FN), Building density (BD), Development potential (DP), Slope of neighbour. (SN), Geological condition (GC), Climate condition (CliC), Air pollution (AP), Noise Pollution (NP). Attribute weights were calculated using fuzzy AHP method in Section 2.1.4. (Table 7).

After the attribute weights were found, reclassified raster maps and these weight coefficients were multiplied in the GIS environment by using Raster Calculator tool. The last stage, in the region where spatial and local indexes are created, index values were made usable for the value prediction model. 12 spatial attributes and 10 local attributes have been converted to a single value map as a whole (Figure 6-7).



Note: Dark-colored numbers are normalized weights obtained via Fuzzy AHP

Figure 6. Spatial index map produced by using weighted combination of spatial attributes

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Table 5. Fuzzy pairwise comparison matrix for spatial attributes

	HC	EF	PF	SU	SC	CC	EC	GA	T	IA	CiC	OA
HC	(1,1,1)	(3,4,5)	(2,3,4)	(4,5,6)	(5,6,7)	(3,4,5)	(4,5,6)	(2,3,4)	(1,1,1)	(6,7,8)	(4,5,6)	(2,3,4)
EF	(1/5,1/4,1/3)	(1,1,1)	(3,4,5)	(3,4,5)	(4,5,6)	(2,3,4)	(3,4,5)	(2,3,4)	(1,1,1)	(5,6,7)	(1,2,3)	(1,2,3)
PF	(1/4,1/3,1/2)	(1/5,1/4,1/3)	(1,1,1)	(1,1,1)	(1/3,1/2,1/1)	(1/3,1/2,1/1)	(1/4,1/3,1/2)	(1/4,1/3,1/2)	(1/7,1/6,1/5)	(4,5,6)	(1/3,1/2,1/1)	(1,1,1)
SU	(1/6,1/5,1/4)	(1/5,1/4,1/3)	(1,1,1)	(1,1,1)	(1/5,1/4,1/3)	(1,1,1)	(1/4,1/3,1/2)	(1/3,1/2,1/1)	(1/5,1/4,1/3)	(3,4,5)	(1,1,1)	(1/3,1/2,1/1)
SC	(1/7,1/6,1/5)	(1/6,1/5,1/4)	(1,2,3)	(3,4,5)	(1,1,1)	(1,1,1)	(1,1,1)	(1,2,3)	(1/4,1/3,1/2)	(3,4,5)	(1,2,3)	(1,2,3)
CC	(1/5,1/4,1/3)	(1/4,1/3,1/2)	(1,2,3)	(1,1,1)	(1,1,1)	(1,1,1)	(1,1,1)	(1/3,1/2,1/1)	(1/5,1/4,1/3)	(4,5,6)	(1/3,1/2,1/1)	(1/3,1/2,1/1)
EC	(1/6,1/5,1/4)	(1/5,1/4,1/3)	(2,3,4)	(2,3,4)	(1,1,1)	(1,1,1)	(1,1,1)	(1,1,1)	(1/5,1/4,1/3)	(4,5,6)	(1,2,3)	(1,2,3)
GA	(1/4,1/3,1/2)	(1/4,1/3,1/2)	(2,3,4)	(1,2,3)	(1/3,1/2,1/1)	(1,2,3)	(1,1,1)	(1,1,1)	(1/5,1/4,1/3)	(5,6,7)	(2,3,4)	(1,2,3)
T	(1,1,1)	(1,1,1)	(5,6,7)	(3,4,5)	(2,3,4)	(3,4,5)	(3,4,5)	(3,4,5)	(1,1,1)	(6,7,8)	(3,4,5)	(3,4,5)
IA	(1/8,1/7,1/6)	(1/7,1/6,1/5)	(1/6,1/5,1/4)	(1/5,1/4,1/3)	(1/5,1/4,1/3)	(1/6,1/5,1/4)	(1/6,1/5,1/4)	(1/7,1/6,1/5)	(1/8,1/7,1/6)	(1,1,1)	(1/6,1/5,1/4)	(1/5,1/4,1/3)
CiC	(1/6,1/5,1/4)	(1/3,1/2,1/1)	(1,2,3)	(1,1,1)	(1/3,1/2,1/1)	(1,2,3)	(1/3,1/2,1/1)	(1/4,1/3,1/2)	(1/5,1/4,1/3)	(1/5,1/4,1/3)	(1,1,1)	(1,2,3)
OA	(1/4,1/3,1/2)	(1/3,1/2,1/1)	(1,1,1)	(1,2,3)	(1/3,1/2,1/1)	(1,2,3)	(1/3,1/2,1/1)	(1/3,1/2,1/1)	(1/5,1/4,1/3)	(3,4,5)	(1/3,1/2,1/1)	(1,1,1)

Note: λ_{max} = 12.92850, Consistency Ratio (CR) = 0.05703 < 0.10, Accepted

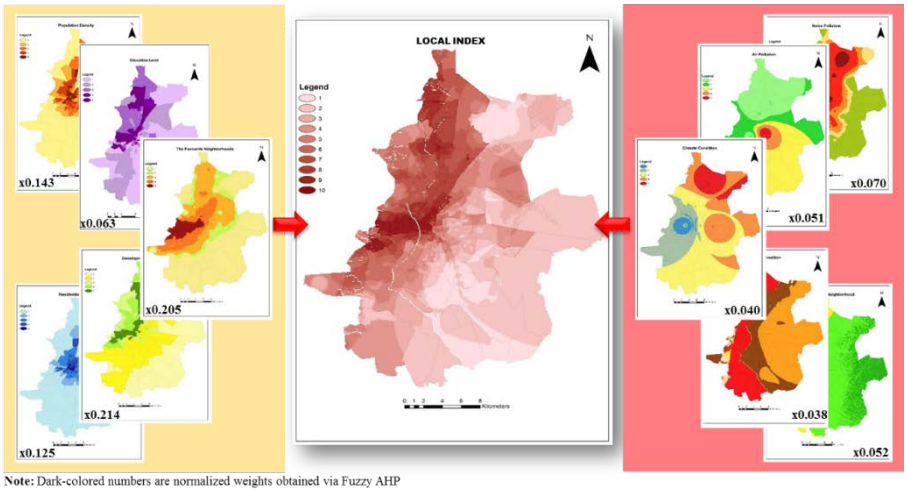
Table 6. Fuzzy pairwise comparison matrix for local attributes

	PD	EL	FN	BD	DP	SN	GC	CliC	AP	NP
PD	(1,1,1)	(3,4,5)	(1/5,1/4,1/3)	(1,2,3)	(1/4,1/3,1/2)	(2,3,4)	(3,4,5)	(4,5,6)	(3,4,5)	(1,2,3)
EL	(1/5,1/4,1/3)	(1,1,1)	(1/4,1/3,1/2)	(1/4,1/3,1/2)	(1/4,1/3,1/2)	(1,2,3)	(1,2,3)	(2,3,4)	(1,1,1)	(1/3,1/2,1/1)
FN	(3,4,5)	(2,3,4)	(1,1,1)	(1,2,3)	(1,1,1)	(2,3,4)	(3,4,5)	(3,4,5)	(2,3,4)	(3,4,5)
BD	(1/3,1/2,1/1)	(2,3,4)	(1/3,1/2,1/1)	(1,1,1)	(1/3,1/2,1/1)	(1,2,3)	(2,3,4)	(2,3,4)	(2,3,4)	(1,2,3)
DP	(2,3,4)	(2,3,4)	(1,1,1)	(1,2,3)	(1,1,1)	(3,4,5)	(4,5,6)	(3,4,5)	(3,4,5)	(3,4,5)
SN	(1/4,1/3,1/2)	(1/3,1/2,1/1)	(1/4,1/3,1/2)	(1/3,1/2,1/1)	(1/5,1/4,1/3)	(1,1,1)	(1,1,1)	(1,2,3)	(1,1,1)	(1/3,1/2,1/1)
GC	(1/5,1/4,1/3)	(1/3,1/2,1/1)	(1/5,1/4,1/3)	(1/4,1/3,1/2)	(1/6, 1/5,1/4)	(1,1,1)	(1,1,1)	(1,1,1)	(1/3,1/2,1/1)	(1/4,1/3,1/2)
CliC	(1/6,1/5,1/4)	(1/4,1/3,1/2)	(1/4,1/3,1/2)	(1/4,1/3,1/2)	(1/5,1/4,1/3)	(1/3,1/2,1/1)	(1,1,1)	(1,1,1)	(1,1,1)	(1,1,1)
AP	(1/5,1/4,1/3)	(1,1,1)	(1,1,1)	(1/4,1/3,1/2)	(1/5,1/4,1/3)	(1,1,1)	(1,2,3)	(1,1,1)	(1,1,1)	(1,1,1)
NP	(1/3,1/2,1/1)	(1,2,3)	(1,2,3)	(1/3,1/2,1/1)	(1/5,1/4,1/3)	(1,2,3)	(2,3,4)	(1,1,1)	(1,1,1)	(1,1,1)

Note: λ_{max} = 10.59232, Consistency Ratio (CR) = 0.04417 < 0.10, Accepted

Table 7. Fuzzy and normalized weights for spatial and local attributes

Attribute	Fuzzy weights	Normalized weights (w_i)
Spatial Attributes		
HC	(0.15381, 0.24134, 0.37176)	**0.214**
EI	(0.09511, 0.16161, 0.25891)	**0.144**
PA	(0.02572, 0.04156, 0.07155)	**0.039**
SU	(0.02686, 0.03948, 0.06710)	**0.037**
SC	(0.04495, 0.07634, 0.12737)	**0.070**
CC	(0.03333, 0.05163, 0.09184)	**0.049**
EC	(0.04760, 0.07486, 0.11969)	**0.068**
GA	(0.04663, 0.08403, 0.14560)	**0.077**
T	(0.13975, 0.21333, 0.32239)	**0.189**
IA	(0.01079, 0.01581, 0.02494)	**0.014**
CiC	(0.02557, 0.04584, 0.08463)	**0.044**
OA	(0.03098, 0.05554, 0.10863)	**0.055**
Local Attributes		
PD	(0.07870, 0.14436, 0.25395)	**0.143**
EL	(0.03346, 0.06145, 0.11403)	**0.063**
FN	(0.11852, 0.21038, 0.35265)	**0.205**
RD	(0.05887, 0.11880, 0.23751)	**0.125**
DP	(0.12703, 0.21998, 0.36724)	**0.214**
SN	(0.02879, 0.04793, 0.09533)	**0.052**
GC	(0.02287, 0.03552, 0.06662)	**0.038**
CliC	(0.02552, 0.04081, 0.06662)	**0.040**
AP	(0.03408, 0.05137, 0.08541)	**0.051**
NP	(0.03868, 0.06940, 0.12579)	**0.070**



Note: Dark-colored numbers are normalized weights obtained via Fuzzy AHP

Figure 7. Local index map produced by using weighted combination of local attributes

The Results of C-DHM and Performance

SPSS 20 software package was used for C-DHM (Equation 3) used in the study. First of all, the dataset was arranged and scaled. The model was established with the dataset formed by 13 attributes (5 legal, 6 physicals, 1 spatial index, 1 local index) belonging to 457 parcels collected from the central districts of Konya. The accuracy of created mathematical model was tested with the mentioned software package. C-DHM was applied in multiple nonlinear regression model approach

and MRA. After The weights of the variables that affect the value of the real estate have been found. Results showed that R^2 value for the C-DHM used as indexes (local/spatial) was found to be 85% (Table 8). Among the coefficients, A0, B0, C0, D0 are related to the local, spatial, physical and legal attribute weights and others indicate the densities of the sub-attributes.

Table 8. Nonlinear Regression Parameter Estimates and ANOVA[a] Results

Attributes	Parameter	Estimate	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
LEGAL	A_0 (constant)	1,009	,527	-,027	2,045
BAC	A_1	-,199	,088	-,372	-,026
FAC	A_2	,272	,076	,123	,421
NF	A_3	,261	,085	,093	,429
BL	A_4	-,014	,077	-,164	,137
ARL	A_5	,728	,054	,621	,835
PHYSICAL	B_0 (constant)	11,627	7,016	-2,161	25,415
CIL	B_1	-,040	,062	-,161	,080
FL	B_2	-,024	,038	-,099	,050
FN	B_3	,078	,057	-,033	,189
GS	B_4	,110	,083	-,054	,274
IS	B_5	,096	,038	,022	,171
RT	B_6	,032	,027	-,021	,085
SPATIAL	C_0 (constant)	,547	1,544	-2,487	3,580
Index	C_1	,785	,566	-,327	1,897
LOCAL	D_0 (constant)	2,861E-13	,000	-3,033E-12	3,606E-12
Index	D_1	6,848	1,288	4,317	9,380

ANOVA[a]

Source	Sum of Squares	df	Mean Squares
Regression	1947253,416	17	114544,319
Residual	14532,377	440	33,028
Uncorrected Total	1961785,794	457	
Corrected Total	96740,965	456	

Dependent variable: Market Value

R^2 = 0, 85

The developed hybrid model expansion is in Equation 15.

$$\textit{Model value (Y)} = \mathbf{A_0}*(BAC^{A1} * FAC^{A2} * NF^{A3} * BL^{A4} * ARL^{A5}) + \mathbf{B_0}*(CIL^{B1} * FL^{B2} * FN^{B3} * GS^{B4} * IS^{B5} * RT^{B6}) + \mathbf{C_0} * (Spatial^{C_1}) + \mathbf{D_0} * (Local^{D_1}) \quad (15)$$

The model coefficients specified as "A_0, B_0, C_0, D_0" have been related associated with local, spatial, physical and legal main attributes. In this model "A_1, A_2, A_3, A_4, A_5" coefficients contain the effect intensities of the legal attributes (sub-attributes). "B_1, B_2, B_3, B_4, B_5, B_6" coefficients contain the effect intensities of the physical attributes (sub-attributes). "C_1" coefficient contains the effect intensities of the spatial index and "D_1" coefficient contains the effect intensities of the local index.

When looking at the model coefficients in Table 8, it is seen that the physical attributes are the most effective from main attributes in model. It can be said that the local attributes make the lowest contribution to

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the model, but the value from the local indexing has effective in terms of impact intensity. Moreover, attributes that are also effective in other groups stand out. For the part of legal attribute, the most effective one has ARL (Area of Residential Land) attribute. Here the size of the parcel significantly affects the real estate value. For the part of physical attribute, the most effective one has GS (Geometric Shape) attribute. It is seen that whether the geometric state of the parcel has regular or irregular affects the value.

Legal attribute from the exponential number values obtained as a result of C-DHM; From BAC and BL and physical properties; CIL and FL were found to be negative. Considering the market conditions, the effects of these attributes are expected to be positive and linear. However, a new modelling result based on the dataset and the study area was obtained in this way. If there is an attribute added to or removed from the dataset, it changes the exponential results and group weights. This result is completely related to which attribute are included in the model.

The power to measure the real estate value of the above equation obtained from the C-DHM, which was created to determine the value of the real estate, was found to be at the rate of R^2 0.85. This ratio shows that the C-DHM predicts the market value with high success according to most of the calculations made with real estate value estimation model approaches (Yakub et al., 2020; Yildirim, 2019; Abidoye et al., 2019).

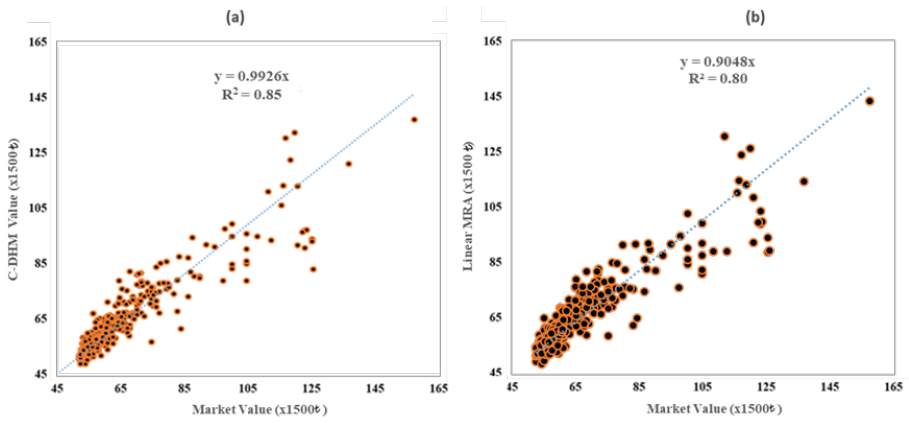

Figure 8. Comparison of C-DHM and market value (a) C-DHM and (b) Linear MRA model

Accordingly, in performance calculations C-DHM was applied to the dataset of the study area. As the graphic, the trend line was formed C-DHM and Linear MRA values with market values, and R^2 were calculated. The distribution and scattering of the model values were also examined (Figure 8). In addition, the 0.9926 multiplier coefficient of the trend line equation indicates that the model is very successful in finding market values with predicted values. Linear MRA was found to be lower than C-DHM with a value of 0.9048 (Figure 8). MAPE values were calculated to compare the models values and market values. If we look at the performance, it has shown that the C-DHM can be used in real estate appraisal, the MAPE rate in the C-DHM approach is 4.84% and Linear MRA is 7.56%. In addition, the error rates (MAPE) between the

C-DHM calculated according to dataset of the real estates in the study area and the market value are calculated and compared in maps.

Consequently, in the calculations, SD_{market} in market values of the real estate was 14.57, while it was found as 13.43 of the $SD_{modelC\text{-}DHM}$ and 13.09 of the $SD_{modelLinearMRA}$. In this case, it shows that the C-DHM catches SD % 92 and Linear MRA catches %90 successful. The fact that the models captures this deviation interval also shows the estimated power in the value range of max and min between the samples. It was seen that C-DHM estimated the value of more successful plot than Linear MRA. For this reason, the results of the application with C-DHM and the market values were used in the mapping.

Value Maps in GIS

GIS was used for generating real estate value maps. The market values of parcels and C-DHM value results were added to the ArcGIS software. Different value maps were produced for market values, and the model results. The maps were utilized for comparison of the models, determining spatial distribution of values and information on parcel values (Figure 9).

MAPE average calculated in the model performance was found to be 4.84%. According to literature implements and Turkey national appraisal standards need to be reconsidered error estimate max 15%. For this reason, GIS was used to determine where these real estates are located spatially and real estates with more than 15% error. With the MAPE calculation was mapped using the relationship in C-DHM and market values (Figure 10). It was determined that 25 of the 447 real estates in dataset had a MAPE value greater than 15%. It has been observed that these real estates are located in the north of the city in areas where reconstruction is intense and they are located in the western part near the city core. It can be said that the MAPE value of a 6% real estate is high in study area.

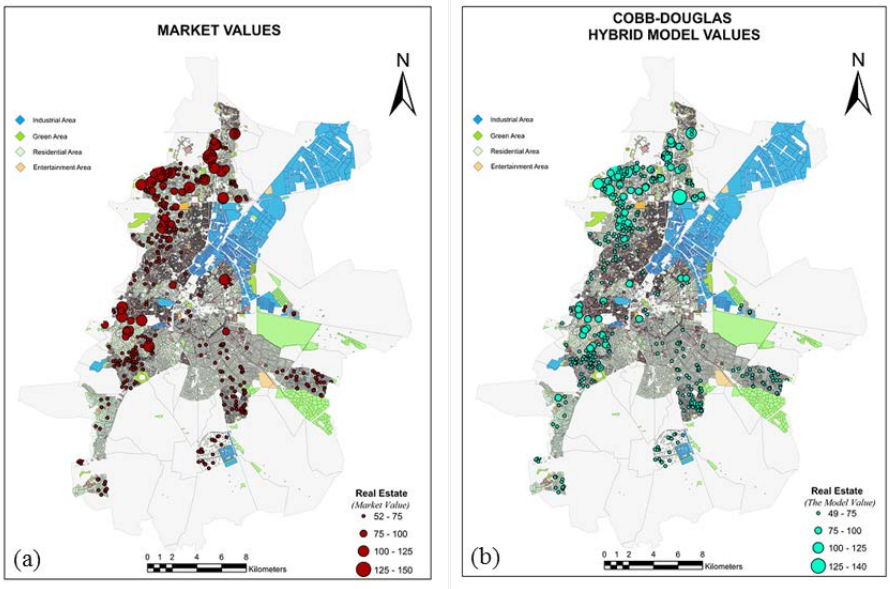

Figure 9. Value maps of sampling parcels: (a) Market value map, (b) Cobb-Douglas hybrid value map

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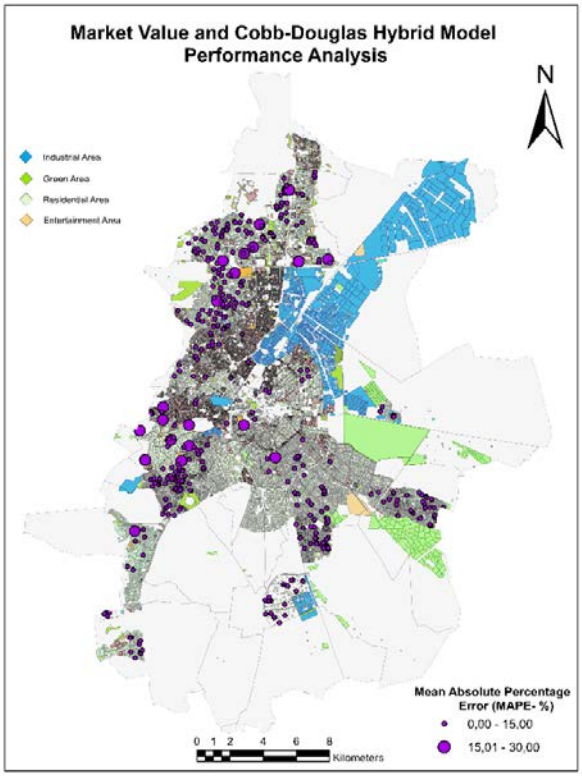

Figure 10. C-DHM and market value spatial MAPE distribution in sampling parcels

CONCLUSIONS

Real estates that have a serious share in economy; are used in different fields such as taxation, investment, zoning implements, project development, etc. Accurate and mass recognition of values of these properties (real estates) is important in the relations of government agencies, even citizens with real estates and private companies. Therefore, the value model should be established for the appraisal of real estates. In this study, hybrid model (residential land as a function) was used for performing mass real estate appraisal applications. C-DHM was applied on the parcels where conditions favourable for construction occurred, in the region covering centre neighbourhoods in Konya. Hybrid model can meet user's (from local manager to citizen) needs to get accurate value information for applications such as mass real estate appraisal especially.

While creating an optimal appraisal model, some topics should be taken into consideration. First of all, the dataset that will be used in the model should be prepared well. In non-hybrid traditional models such as single appraisal or some mass appraisal, some problems arise when building the model on dataset. Encountered the most common problem is the inability to get data for all attributes that affect the real estate value, or the same type of variables are separately entered into the model. For example, it is a reasonable assumption that the variables belonging to residential land located close to each other and their immediate surroundings have similar values. Namely, these variables are spatially auto-correlated. This means that the variables affect the real estate value by the same size. Consequently, it is unnecessary to insert data of the same value and size into the model separately.

Therefore, in the study, it is presented to use Fuzzy AHP method and GIS software together for the spatial and local part of the model. So with the use of this technique, the model will avoid the complex structure and the data-based incompatibilities will be reduced with the developed indexes.

After preparing the dataset for value determining, real estate values were obtained with the C-DHM and Linear MRA in study. It has been observed that the performance results of C-DHM are more successful than Linear MRA. In addition, the fact that MAPE errors between the C-DHM and market values can be analysed by integrating the results into the map has added privileges to the study. The use of the developed C-DHM in real estate value determining has its advantages. In making value estimations, grouping the attributes of the real estate made the model more understandable. Besides, if the attribute in the created model does not have real estate whose value will be determined in the region, it can be used without the need to change the model.

In this study real estate appraisal estimation methodology, it will be able to contribute a great contribution to activities such as fair taxation of real estate, the creation of small and large-scale value maps in applications involving appraisal, and the development of urbanization policies with city-based value maps.

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REFERENCES

Abedi-Gheshlaghi, H., Feizizadeh, B., & Blaschke, T., (2020). GIS-based forest fire risk mapping using the analytical network process and fuzzy logic. *Journal of Environmental Planning and Management*, 63(3), 481-499.

Abidoye, R. B., Chan, A. P., Abidoye, F. A., Oshodi, O. S. (2019). Predicting property price index using artificial intelligence techniques. International journal of housing markets and analysis.

Antipov, E.A. & Pokryshevskaya, E.B., (2012). Mass appraisal of residential apartments: An application of Random forest for valuation and a CART-based approach for model diagnostics. *Expert Systems with Applications*, 39, 1772–1778.

Aydinoglu, A. C., Bovkir, R., & Colkesen, I., (2020). Implementing a mass valuation application on interoperable land valuation data model designed as an extension of the national GDI. *Survey Review*, 1-17.

Baird, M. D., Schwartz, H., Hunter, G. P., Gary-Webb, T. L., Ghosh-Dastidar, B., Dubowitz, T., & Troxel, W. M. (2020). Does large-scale neighborhood reinvestment work? Effects of public–private real estate investment on local sales prices, rental prices, and crime rates. *Housing Policy Debate*, 30(2), 164-190.

Bakirman, T., & Gumusay, M. U., (2020). A novel GIS-MCDA-based spatial habitat suitability model for Posidonia oceanica in the Mediterranean. *Environmental Monitoring and Assessment*, 192(4), 1-13.

DOI: 10.15320/ICONARP.2022.206

Barańska A., (2013). Real estate mass appraisal in selected countries–functioning systems and proposed solutions, *Real Estate Management and Valuation*, 21(3), 35-42.

Bartram, R. (2019). The cost of code violations: How building codes shape residential sales prices and rents. *Housing Policy Debate*, 29(6), 931-946.

Bennett, A., (2013). The Impact of Hydraulic Fracturing on Housing Values in Weld County, Colorado: A Hedonic Analysis*, MSc, Colorado State University, Department of Agricultural and Resource Economics*, Colorado.

Božic, B., Dragana Milićević, Marko Pejić, Stevan Marošan et al., (2013). The use of multiple linear regression in property valuation. *Geonauka*, 1 (1), 41–45.

Buckley, J., (1985). Fuzzy hierarchical Analysis, *Fuzzy Sets and Systems*, 17(3), 233-247.

Casas, C., (2014). Essays in Applied Industrial Organization*. PhD, University of Wisconsin. Economics*, Madison.

Cellmer, R., Senetra, A. & Szczepanska, A., (2012). The Effect of Environmental Factors on Real Estate Value. *FIG Working Week 2012*, Roma, Italy.

Chang, D., (1996). Applications of the extent analysis method on fuzzy AHP, *European Journal of Operational Research,* 95(3), 649-655.

Chen, J. H., Ong, C. F., Zheng, L., & Hsu, S. C., (2017). Forecasting spatial dynamics of the housing market using Support Vector Machine. *International Journal of Strategic Property Management*, 21(3), 273-283.

Comertler, S., (2007). The impact of pedestrianization on residential property rental values/Yayalaştırmanın konut kira fiyatlarına etkisi, *PhD, Izmir Institute of Technology, Institute of Science, City and region planning,* Izmir.

Cordão, M. J. D. S., Rufino, I. A. A., Barros Ramalho Alves, P., & Barros Filho, M. N. M., (2020). Water shortage risk mapping: a GIS-MCDA approach for a medium-sized city in the Brazilian semi-arid region. *Urban Water Journal*, 1-14.

Damigos, D. & Anyfantis, F. (2011). The value of view through the eyes of real estate experts: A Fuzzy Delphi Approach, *Landscape and Urban Planning*, 101, 171–178.

Del Giudice, V., Manganelli, B., & De Paola, P., (2017). Hedonic Analysis of Housing Sales Prices with Semiparametric Methods. *Int. J. Agric. Environ. Inf. Syst.*, 8, 65–77.

Demircioglu, E., (2004). Kentsel alanda yeni planlanan taşınmazların kentsel dönüşümde bir araç olarak kullanılabilirliği: Akmerkez ve Tepe-Nautilus Alışveriş Merkezi örnekleri*, MSc, Gebze Institute of Technology, Institute of Engineering/Science, City and Regional Planning*, Gebze.

Dewi, N., Yusuf, Y., & Iyan, R. Y., (2017). Pengaruh kemiskinan dan pertumbuhan ekonomi terhadap Indeks Pembangunan Manusia di Provinsi Riau, *Doctoral dissertation, Riau University*, Indonesia.

Dimopoulos, T., & Bakas, N., (2019). Sensitivity Analysis of Machine Learning Models for the Mass Appraisal of Real Estate. Case Study of Residential Units in Nicosia, Cyprus. *Remote Sensing*, 11(24), 3047.

Dmytrów, K., & Gnat, S. (2019). Application of AHP Method in Assessment of the Influence of Attributes on Value in the Process of Real Estate Valuation. *Real Estate Management and Valuation*, 27(4), 15-26.

El-Gohary, M., (2004). Property Valuation Model Effect of Traffic Noise on Property Value. *ECE 557 PROJECT, Member*, IEEE.

Georgiadis, A., (2018). Real estate valuation using regression models and artificial neural networks: An applied study in Thessaloniki. *RELAND: International Journal of Real Estate & Land Planning*, 1, 292-303.

Ghosalkar, N. N., & Dhage, S. N. (2018). Real estate value prediction using linear regression. In 2018 fourth international conference on computing communication control and automation (ICCUBEA), IEEE, 1-5.

Goguen, J. A., (1967). L-fuzzy sets. *Journal of mathematical analysis and applications*, 18(1), 145-174.

González, M. A. S., (2008). Developing mass appraisal models with fuzzy systems. *Mass Appraisal Methods: An Internafional Perspecfive for Property Valuers, Wiley-Blackwell, Oxford*, 183-202.

Gorgess, H. M., & Naby, A. A. (2017). Using restricted least squares method to estimate and analyze the Cobb-Douglas production function with application. *Ibn AL-Haitham Journal for Pure and Applied Science*, 25(2).

Guan, J., J. Zurada, & Levitan A.S., (2008). An Adaptive Neuro-Fuzzy Inference System Based Approach to Real Estate Property Assessment. *Journal of Real Estate Research*, 30(4), 395-420.

Guler, M. S., & Bilici, S., (2017). Besinin içeriği, işleme ve pişirme yöntemlerinin glisemik indeks üzerine etkisi. *Gazi Journal of Health Sciences*, 2(3), 1-12.

Hammer, T.R., Coughlin, R.E. & Horn IV, E.T., (1974). The Effect of a Large Urban Park on Real Estate Value, *Journal of the American Planning Association*, 40(4), 274 -277.

Hill, R. J., (2013). Hedonic price indexes for residential housing: A survey, evaluation and taxonomy. *Journal of economic surveys*, 27(5), 879-914.

Hong, T., Gui, M., Baran, M. E., & Willis, H. L., (2010, July). Modeling and forecasting hourly electric load by multiple linear regression with interactions. In *IEEE PES General Meeting*, IEEE, 1-8.

IAAO-International Association of Assessing Officers, (2013). Standard on Mass Appraisal of Real Property. *International Association of Assessing Officers*, Kansas City, Missouri.

Jensen, P. D., Basson, L., Hellawell, E. E., & Leach, M., (2012). 'Habitat' suitability index mapping for industrial symbiosis planning. *Journal of Industrial Ecology*, 16(1), 38-50.

Kavas, S., (2014). Konut fiyatlarının çok kriterli bir karar destek modeli ile tahmin edilmesi. *Istanbul Technical University*, *Institute of Science,* MSc, Istanbul.

Kelly, S.M., (2013). A Model for Predicting Highway Noise Usıng A Geographic Information System: Interstate 73 in Guilford County. *North Carolina, Master of Arts. The University of North Carolina*, Greensboro.

Kilic, S. (2013). Doğrusal Regresyon Analizi. *Journal of Mood Disorders*, 3(2).

Kisilevich, S., Keim, D. & Rokach, L. (2013). A GIS-based decision support system for hotel room rate estimation and temporal price prediction: The hotel brokers' context. *Decision Support Systems*, 54, 1119–1133.

Klaiber, H.A. & Gopalakrishnan, S. (2012). The Impact of Shale Exploration on Housing Values in Pennsylvania. *The Agricultural & Applied Economics Association's*, Seattle, Washington.

Kojić, V., & Lukač, Z. (2018). An alternative approach to solving cost minimization problem with Cobb–Douglas technology. *Central European Journal of Operations Research*, *26*(3), 629-643.

Kontrimas, V. & Verikas, A. (2011). The mass appraisal of the real estate by computational intelligence. *Applied Soft Computing,* 11, 443–448.

DOI: 10.15320/ICONARP.2022.206

Kostov, P. (2009). A spatial quantile regression hedonic model of agricultural land prices. *Spatial Economic Analysis*, 4(1), 53-72.

Kryvobokov, M. (2005). Estimating the weights of location attributes with the Analytic Hierarchy Process in Donetsk. Ukraine, *Nordic Journal of Surveying and Real Estate Research*, 2(2), 5-29.

Laarhoven, P. J., & Pedrycz, W., (1983). A Fuzzy Extension of Saaty's Priority Theory, *Fuzzy Sets and Systems*, 11, 229-241.

Lin, C. C. (2010). Critical analysis and effectiveness of key parameters in residential property valuations, *State University of New York, The Faculty of The Graduate School of The University at Buffalo, PhD,* New York.

Lin, C.C., & Mohan, S.B., (2011). Effectiveness comparison of the residential property mass appraisal methodologies in the USA. *International Journal of Housing Markets and Analysis*, 4, 224–243.

Locurcio, M., Morano, P., Tajani, F., & Di Liddo, F. (2020). An innovative GIS-based territorial information tool for the evaluation of corporate properties: An application to the Italian context. *Sustainability*, 12(14), 5836.

Mahaboob, B., Ajmath, K. A., Venkateswarlu, B., Narayana, C., Praveen, J. P. (2019) On Cobb-Douglas production function model. *In AIP Conference Proceedings, 2177(1), p. 020040. AIP Publishing LLC.*

McCluskey, W., Davis, P., Haran, M., McCord, M., & McIlhatton, D. (2012). The potential of artificial neural networks in mass appraisal: the case revisited. *Journal of Financial Management of Property and Construction,* 17(3), 274-292.

Mete, M. O., & Yomralioglu, T., (2019). Creation of Nominal Asset Value-Based Maps using GIS: A Case Study of Istanbul Beyoglu and Gaziosmanpasa Districts. *GI_Forum 2019*, 7, 98-112.

Mora-Esperanza, J.G. (2004). Artificial Intelligence Applied to Real Estate Valuation, *CT-CATASTRO, 255-265.*

Mu, L., Chen, L., & Liu, P. (2008, October). Real estate investment risk analysis based on fuzzy AHP. *In 2008 4th International Conference on Wireless Communications, Networking and Mobile Computing,* IEEE, 1-4.

Nesticò, A., & La Marca, M. (2020). Urban Real Estate Values and Ecosystem Disservices: An Estimate Model Based on Regression Analysis. *Sustainability*, 12(16), 6304.

Nikkhah, A., Emadi, B., Soltanali, H., Firouzi, S., Rosentrater, K. A., Allahyari, M. S., (2016). Integration of life cycle assessment and Cobb-Douglas modeling for the environmental assessment of kiwifruit in Iran. *Journal of cleaner production*, (137), 843-849.

Nyimbili, P. H., & Erden, T. (2020). GIS-based fuzzy multi-criteria approach for optimal site selection of fire stations in Istanbul, Turkey. *Socio-Economic Planning Sciences*, 100860.

Ong, T.S. (2013). Factors Affecting the Price of Housing in Malaysia. *Journal of Emerging Issues in Economics, Finance and Banking (JEIEFB)*. 185), 414.

Ozkazanc, S., Siddiqui, S. D., & Gungor, M., (2020). Sensitivity Analysis of Earthquake Using the Analytic Hierarchy Process (AHP) Method: Sample of Adana. *IDEALKENT*, 11(30), 570-591.

Pérez-Rave, J. I., Correa-Morales, J. C., & González-Echavarría, F. (2019). A machine learning approach to big data regression analysis of real estate prices for inferential and predictive purposes. *Journal of Property Research*, 36(1), 59-96.

Peter, N. J., Okagbue, H. I., Obasi, E. C., & Akinola, A. O. (2020). Review on the Application of Artificial Neural Networks in Real Estate Valuation. *International Journal*, 9(3).

Peterson, S., & Flanagan, A. (2009). Neural network hedonic pricing models in mass real estate appraisal. *Journal of real estate research*, 31(2), 147-164.

Portnov, B.A. (2005). Factors Affecting Housing Modifications and Housing Pricing: A Case Study of Four Residential Neighborhoods in Haifa, Israel. *The Journal of Real Estate Research*, 27(4), 371.

Sarac, E. (2012). Yapay sinir ağları metodu ile gayrimenkul değerleme, *Istanbul Cultural University, Institute of Science,* MSc, Istanbul.

Schulz, M.A.R. (2003). Valuation of Properties and Economic Models of Real Estate Markets, Berlin.

Sehgal, V., Tiwari, M. K., & Chatterjee, C. (2014). Wavelet bootstrap multiple linear regression based hybrid modeling for daily river discharge forecasting. *Water resources management*, 28(10), 2793-2811.

Selim, H. (2009). Determinants of house prices in Turkey: Hedonic regression versus artificial neural network. *Expert systems with Applications*, 36(2), 2843-2852.

Shi, D., Guan, J., Zurada, J., & Levitan, A. (2020, January). Improving Prediction Models for Mass Assessment: A Data Stream Approach. *In Proceedings of the 53rd Hawaii International Conference on System Sciences.*

Son, K., Kim, G.H., Park, Y.J. & Kim, S.K. (2012). The Impact Analysis of LEED-NC Criteria on Appraised Unit Land Value, The Korea Institute of Building Construction.

Sousa, S. I. V., Martins, F. G., Alvim-Ferraz, M. C. M., & Pereira, M. C. (2007). Multiple linear regression and artificial neural networks based on principal components to predict ozone concentrations. *Environmental Modelling & Software*, 22(1), 97-103.

Syazali, M., Putra, F., Rinaldi, A., Utami, L., Widayanti, W., Umam, R., & Jermsittiparsert, K. (2019). Partial correlation analysis using multiple linear regression: Impact on business environment of digital marketing interest in the era of industrial revolution 4.0. *Management Science Letters*, 9(11), 1875-1886.

Taghizadeh M. R., Nabiollahi, K., Rasoli, L., Kerry, R., & Scholten, T. (2020). Land Suitability Assessment and Agricultural Production Sustainability Using Machine Learning Models. *Agronomy*, 10(4), 573.

Unel, F. B., & Yalpir, S. (2019a). Reduction of Mass Appraisal Criteria with PCA and Integration to GIS. *International journal of engineering and geosciences*, 4(3), 94-105.

Unel, F. B., & Yalpir, S. (2019b). Valuations of building plots using the AHP method. *International Journal of Strategic Property Management*, 23(3), 197-212.

Unel, F.B., (2017). Taşınmaz değerleme kriterlerine yönelik coğrafi veri modelinin geliştirilmesi, *Institute of Science, Selcuk University, PhD,* Konya.

URL1, https://en.wikipedia.org/wiki/Nonlinear_regression

URL2, https://tr.wikipedia.org/wiki/Konya

Uyan, M. (2013). GIS-based solar farms site selection using analytic hierarchy process (AHP) in Karapinar region, Konya/Turkey. *Renewable and Sustainable Energy Reviews*, 28, 11-17.

Wang, D., Li, V. J., & Yu, H. (2020). Mass Appraisal Modeling of Real Estate in Urban Centers by Geographically and Temporally Weighted Regression: A Case Study of Beijing's Core Area. *Land*, 9(5), 143.

DOI: 10.15320/ICONARP.2022.206

Wang, H., Sanchez-Molina, J. A., Li, M., & Berenguel, M. (2020). Development of an empirical tomato crop disease model: a case study on gray leaf spot. *European Journal of Plant Pathology,* 156(2), 477-490.

Wang, X., Yang, L., Li, H., & Lei, J. (2015, November). The Mass Assessment Model of Real Estate Based on GIS and VIKOR Method. *In 2015 International Conference on Architectural, Civil and Hydraulics Engineering*. Atlantis Press.

Wilkowski, W. & Budzynski, T. (2006). Application of Artificial Neural Networks for Real Estate Valuation, *XXIII FIG Congress,* Munich, Germany.

Yakub, A. R. A., Hishamuddin, M., Ali, K., Achu, R. B. A. J., Folake, A. F. (2020). The Effect Of Adoptıng Mıcro And Macro-Economıc Varıables On Real Estate Prıce Predıctıon Models Usıng Ann: A Systematıc Lıterature. Journal of Critical Reviews, 7(11).

Yalpir, S. (2018). Enhancement of parcel valuation with adaptive artificial neural network modeling. *Artificial intelligence review*, 49(3), 393-405.

Yalpir, S., & Bayrak, E. (2017). Real estate valuation in urban regeneration application; case study of Konya. *Selcuk University, Journal of Engineering, Science and Technology*, 5(1), 96-103.

Yalpir, S., Tezel, G., & Unel, F. B. (2013, June). Comparison of SVR and MRA Methods in Real Estate Valuation. *In Proceedings Book of the Fourth International Conference On*, 293.

Yalpir, S., Unel, F. B. & Gulnar B., (2017). Arsa Değerlemesi için Toplu Değerleme Sistemlerinde Kullanılmak Üzere Kriter Azaltımı ve Harita Entegrasyonlu Uygulama. TÜBİTAK-3001 Project, Grant no: 115Y769, 2016-2018.

Yıldırım, H. (2019). Property Value Assessment Using Artificial Neural Networks, Hedonic Regression and Nearest Neighbors Regression Methods. Selçuk Üniversitesi Mühendislik, Bilim ve Teknoloji Dergisi, 7(2), 387-404.

Yilmazer, S., & Kocaman, S. (2020). A mass appraisal assessment study using machine learning based on multiple regression and random forest. *Land Use Policy*, 99, 104889.

Yomralıoğlu, T. (1993). A Nominal Asset Value-Based Approach for Land Readjustment and Its implementation Using Geographical Information Systems*. PhD, University of Newcastle upon Tyne, Department of Surveying*, UK.

Zadeh, L. A. (1965). Fuzzy sets. *Information and control*, 8(3), 338-353.

Zhang, Q., Diao, Y., & Dong, J. (2013). Regional water demand prediction and analysis based on Cobb-Douglas model. *Water resources management*, 27(8), 3103-3113.

Zheng, W., Li, X., Guan, N., & Zhang, K. (2020). Correlation Analysis of Fiscal Revenue and Housing Sales Price Based on Multiple Linear Regression Model. *Mathematical Computation*, 9.

Zhou, G., Ji, Y., Chen, X., & Zhang, F. (2018). Artificial Neural Networks and the Mass Appraisal of Real Estate. *International Journal of Online Engineering*, 14(3).

Zurada, J., A.S. Levitan, & J. Guan., A. (2011). Comparison of Regression and Artificial Intelligence Methods in a Mass Appraisal Context. *Journal of Real Estate Research*, 33(3), 349-387.

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