International Journal Of Engineering Research And Development
e- ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com
Volume 16, Issue 4 (April 2020), PP. 14-21

Evaluation of Malatya HanifiTanbay House in the Context of the Energy Use Analysis of Sustainable Traditional Architectural Principles

NihalArda Akyıldız[1], Tuba Nur Olğun[2]
[1]*Department of Architecture, Faculty of Architecture*
[2]*Department of Architecture, Faculty of Architecture*
Fırat University, Elazığ, TURKEY
Corresponding Author: Tuba NurOlğun

ABSTRACT: *Sustainability has become a frequently discussed concept in the discipline of architecture, especially in recent years. Rapid consumption of resources and the major role of the building sector in this consumption have caused an intense questioning of the sustainability of architectural studies. In this context, the sustainability of the design, implementation and use of structural products has become one of the basic principles of today's architectural approaches. From this point of view, while considering principles of sustainability in modern building designs; on the other hand, traditional architectural approaches of the past were examined from this point of view and it was seen that sustainability was at the forefront in these approaches.*

The aim of the study is to analyze the buildings in terms of space comfort conditions, effective and efficient use values of energy, which is one of the advantages of traditional architectural culture with its quality of being a solution to problems related to sustainable building design and applications; In this context, it is to evaluate the design parameters of the mentioned architecture related to climate and natural resource use. Within the scope of the study, the parameters related to energy use were discussed and HanifiTanbay House in Yeşilyurt district, one of the traditional architectural examples of Malatya, was examined over the relationship between sustainability and traditional structure. In terms of energy conservation and efficiency of the building; evaluations are made in terms of both environmental temperature values, utilization of sunlight, natural ventilation and wind, and structural form values, building form, building envelope and distance between structures; the relationship between traditional architecture's energy use and efficiency and sustainability has been revealed. As a result, it is thought that the study carried out will draw attention to the structural energy conservation and sustainability approaches in architecture in the context of the values of traditional structures.

KEYWORDS: *Traditional architecture, energy use, sustainability, Malatya HanifiTanbay House.*

Date of Submission: 13-05-2020 Date of Acceptance: 26-05-2020

I. INTRODUCTION

In parallel with the development of the industry, the changes in the social and economic structure, as well as the population increases that became visible worldwide; changes in technology, health and living standards have altered both the social structure and spatial preferences. Large and horizontal houses that meet the needs of the traditional family structure have been replaced by the nuclear family structure and the spatial structure types that have less square meter, functional and vertical structure to meet its needs.

Since 2004, considering the final energy consumption average for the construction industry (residential, non-residential, etc.) sectors in European countries; 30% of the total energy is used by the housing sector, 12% by the non-residential sector and 2% by the construction industry (Itard and Meijer, 2008). Reinforced concrete structures standardized with developing technologies have led to increases in energy consumption by using active and smart systems to increase indoor comfort conditions with their aesthetics, function and technology possibilities. Construction and manufacturing decisions, in which the energy efficient approach is ignored, lead to a gradual increase in energy consumption.

According to the data of United Nations Environment Program, it has been determined that buildings are responsible for 40% of global energy consumption, 25% of global water, 40% of global resources, and about 1/3 of greenhouse gas emissions (UNEP and SBCI, 2013).| In addition to energy consumption, modern buildings of today are changing the quality of spatial planning along with energy problems and natural / structured environment relationship all over the world. Since such structures take less consideration of the climate characteristics of the region or the consumption of natural resources, energy consumption has reached very high

values. In this context, considering the fact that energy resources are under the risk of being exhausted and increasing costs; Energy conservation and increasing energy efficiency in buildings have been one of the most important issues.

The manufacturing sector, which negatively affects the natural environment and air quality in many ways, needs to be in search of new environmentally friendly construction techniques and building materials (Vardy and MacDougall, 2007). For these reasons, it has been designed according to the climatic conditions and user requirements; at the same time, designing structures that benefit more from natural daylight, minimum energy consumption and natural ventilation has become an updated need. In the light of all these data, the traditional architectural approach, which is a solution to structural and environmental problems, has important criteria in terms of meeting the comfort conditions at the highest level together with its sensitivity to natural environment and resources. The parameters of this architectural understanding; harmony with the existing topography, directing with the maximum benefit from solar energy, preferences of recycled materials, natural lighting and ventilation elements provided by the occupancy and void rates in planning stand out with its contributions (Çetin, 2010).

Anatolian lands have hosted many civilizations with their ancient past, so the values, culture and tolerance of many different nations have been reflected both in social life and in the residential areas (Akyıldız, 2018). In this sense, the traditional architectural approach in Malatya, one of the rich architectural settlements of Anatolia, contains many sample data in the context of sustainable energy use. The purpose of working from this point of view is to emphasize this quality by evaluating the buildings that use energy efficiently in the traditional architecture. Within the scope of the study, by examining the relevant literature, one of the characteristic traditional residential buildings in Malatya, HanifiTanbay House was detailed. As a working method, on-site observations were carried out in the light of literature reviews. The data obtained as a result of the study is aimed to highlight the energy efficient qualities of traditional buildings and to be a guide in modern building design in this sense.

II. ENVIRONMENTAL AND STRUCTURAL PARAMETERS IN ARCHITECTURAL STRUCTURES IN THE CONTEXT OF ENERGY USE

Building designs, as part of everyday life, is a projecting process that includes the most architecturally ideal design decisions by evaluating the demands of the building, together with the data of the land on which it will be built (Olğun and BahtiyarKaratosun, 2019). In the context of energy use, it is necessary to analyze solutions in architectural design decisions as structural and environmental parameters, building comfort conditions and support for energy efficiency. Environmental parameters, climate / outside temperature, sunlight utilization, natural ventilation and wind, structural parameters can be considered as building form, building envelope and distance between buildings.

Climate and temperature, which is one of the most important reference points of environmental parameters, differ according to the geography and region. Changing humidity and temperature averages due to the influence of Köppen's geography and topographic conditions are classified in five different climate classifications around the world (Chen and Chen, 2013). Turkey is also located on the temperate climate of these climate types. Referring to Turkey's climate zones according to climatic variability in characteristics is seen as having one of the characteristics of a region can experience four seasons (Figure 1).

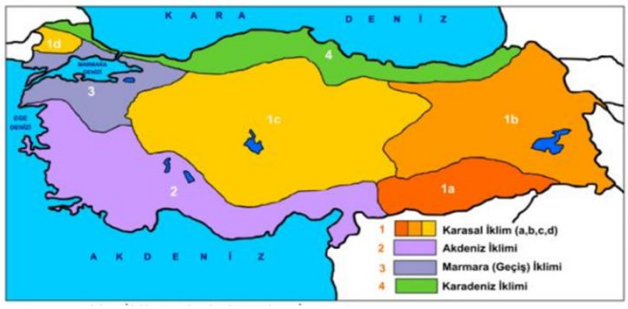

Figure 1: Turkey climatic zones (Atalay, 1997)

Sunlight, which is one of the most important sustainable sources, is one of the primary parameters in spatial planning criteria. For building designs, it is sufficient to utilize the sunlight at the highest level in cold climatic conditions, while it is sufficient to use the sunlight at the minimum level in hot climate regions where heating is not needed. Analysis of the need for solar heat in order to determine the effect of the sun on the area where the building is located at different times of the year and to provide space comfort conditions are the

elements that should be considered for passive solar design (Roafvd, 2003). In addition, the most efficient use of passive solar energy is related to the material selection and positioning style of the buildings.

The dominant wind and its direction is another important factor in the positioning of the structures and in the design of the structure. Air currents formed from high pressure to low pressure point due to atmospheric pressure differences are defined as wind (Oral, 2010). Wind and natural ventilation are effective in natural heating and cooling of the buildings and play a role in improving the comfort conditions in the interior and keeping the energy efficiency at the maximum level in the buildings. In preventing the formation of microclimatic effects, wind cutting and routing conditions of the buildings are among the parameters to be considered.

In energy efficiency, inputs related to the artificial environment are as important as environmental parameters. The form of the structures and the climatic conditions of the selected building materials must be taken into account. The building form is effective on the heating and cooling energies of the building. As the surface area of the buildings increases, the use of the sun increases while the amount of heat lost also increases. While more compact forms are chosen in order to minimize heat loss in cold climates, the use of long fronts open to the direction of wind emerges in hot and humid climates. In hot and dry climates, closed compact forms and facades facing the courtyard are created to reduce solar radiation (Zeren et al., 1987). Considering the facade designs, which are the building envelope of the buildings according to climate data; In hot and humid climates, it is important to design insulated walls that will provide comfort conditions in the interior, openings to provide heat control and insulated pitched roofs. In hot and dry climates, design parameters such as the presence of more openings in the areas facing the courtyard with smaller openings on the exterior, the use of shading elements and the use of flat roofs come to the fore. On the other hand, it is important to use more solid walls and insulated roofs in cold climates (Manioğlu and Oral, 2010). The thermal properties of the building envelope are very important in providing heat protection of the buildings. Some materials used such as opaque and transparent elements are factors in heat exchange; walls, floors and windows are the structural elements that have the highest heat loss and heat loss. Insulation gains importance in minimizing the heat loss in the floors, and it is important to choose in the direction of minimum heat loss for the floor thickness and material.

In addition, the windows used as building elements with rational material selection and details; are the elements that provide efficiency in natural ventilation, natural light and visual contact. Glasses with different heat transmittance of windows; these are the building materials that should be applied in line with the need for insulation according to the climate and wind load.

The position of the buildings relative to each other, the distance and height ratios between the buildings are another important parameter of sunlight and wind positioning where the wind effect is desired. Since the facades are required to provide maximum benefit from solar radiation in cases where heating is needed, the building intervals should be equal to or greater than the longest shaded depth of field created by the surrounding buildings. In addition, since the building intervals in areas where solar radiation should be minimized should be less than the shadow depths of the surrounding buildings, direct sunlight is prevented from the direct frontage of the facades under the shadow of the surrounding buildings (Oral, 2010). In settlements built perpendicular to the prevailing wind, the wind can be taken up to the inner parts, while cutting the wind is possible with some rational planning decisions as shown in Figure 2.

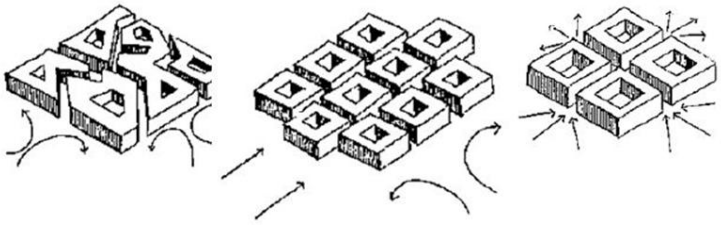

Figure 2: Different street texture samples according to the wind direction (Olgyay, 1963)

III. TRADITIONAL ARCHITECTURAL DESIGN PARAMETERS AND SUSTAINABILITY RELATIONS

Architectural projects come to life; along with the natural environment, the natural resources of the region and the use of energy, it plays an important role in the consumption of energy. For this reason, architecture, which is the discipline of creating space, has been a professional science branch that contributes to sustainability, which is one of the most important issues of recent years, by designing buildings that respect the natural structural environment in accordance with the topography and climate data of the region. In this sense, the design criteria, construction process and material selection issues of traditional architectural structures that are environmentally friendly, sustainable and sensitive to energy saving have become one of the important

issues for today. When these architectural structures are examined, sustainable environmentally friendly architectural examples are; it combines with the master-apprentice-journey organization and traditional construction techniques as an ideal solution (Akyıldız&Olğun, 2019).

Sustainability is an important argument that includes the potential to guarantee a rational improvement in the use of all riches such as soil, water, underground / above ground and natural vegetation (Akyıldız, 2020) . For this reason, while almost every country has been working in this area, due to its quality of being a solution to today's energy problems, they have started to focus on the sustainable design principles and practices of their local structures that adorn the traditional residential areas they have from the past to the present. Because many countries are sensitive to their climatic data and have adapted their unique traditional structures to their geographical structures; By transferring these architectural systems, which consume much lower energy and cause less environmental pollution compared to today's modern buildings, they have offered socially more comfortable, reasonable and sustainable living environments (Fathy, 1986; Abro, 1994; Sahebzadeh et al., 2017: 1,2). In this sense, the forms of traditional buildings that have existed for centuries are the most ideal spatial planning representatives designed in harmony with the climate. These are structures that are sensitive to revive the economy of the region by using the harmony of the environmental and regional climatic conditions, the structural form that meets the user requirements, and the local economy by using local building materials (Schittich, 2003).

IV. EVALUATION OF MALATYA / YEŞILYURT HANIFI TANBAY HOUSE IN TERMS OF ENERGY EFFICIENCY

Throughout history, Malatya has been an important transit point between the east and west of Anatolia (Figure 3). The city is located on the 'silk road', which passes through the Southeast Region, Gaziantep and Malatya, on Thrace and on the Aegean, Black Sea and Mediterranean coasts to reach Europe via important ports (URL 1). The fact that it is on this historical trade route has made Malatya rich in cultural and architectural heritage as well as economically. Traditional residential areas, one of its architectural richness, feed the city from many branches, and traditional buildings that adorn these areas add a different spatial value to this city (Figure 3). These structures have many important design principles; The most important of these are the principles that take into account the natural / structural environment and climatic values and the success of planning and implementation in the parameters it has in terms of energy use.

Figure 3: Location and general view of Yeşilyurt (Yeşilyurt Municipality, 2017; URL 2)

Malatya YeşilyurtHanifiTanbay House, which is an important example of planning and implementation success, has been the focus of the study due to these basic references. 13 registered civilian architecture such as HanifiTanbay House in Yeşilyurt district of Malatya, except for the Ottoman-style mansions, are located within the urban sites of exemplary architectural sites and also contributes to Malatya city aesthetics and street silhouette (Figure 4).

Figure 4: General view of the street where HanifiTanbay House is located (Karaarslan and Çelikyay, 2019)

Malatya is a city with a decent and conservative social structure, which is also embedded in the common urban culture of the Southeast and Eastern Anatolia Regions. Although the city is on the Silk Road and is home to many ancient cultures and civilizations, it has managed to maintain and maintain its conservative social structure spirit. As well as its tendency to live intangible cultural heritage values in urban spaces, it has succeeded in transferring its 'traditional buildings and streets' with concrete cultural heritage values to today's generation (Figure 4). The street structure was constructed with a structure scale and height ratios that will not interfere with each other's daylight and heat together with the tissue that feeds the neighborhood units, and street silhouettes were created with this sensitivity.

Figure 5: General view of HanifiTanbay House before and after restoration (Durgun, 2006; Malatya Governorship, 2012).

HanifiTanbay House, located in Malatya YeşilyurtHıroğlu Neighborhood, is a two-storeymudbrick wall braided, cradle-fitting roof and a roofed roof over the stone foundation. The middle part of the building is located on the second floor in an octagonal shaped world. Cihannüma is usually located on the upper elevations of the houses and provides plenty of light and natural ventilation (Durgun, 2006: 34). In addition, the building also has three coriander on the street facade, the coriander in the middle of the building adds aesthetics and richness to the facade with its three-cornered form (Figure 5). Of the 12 "Traditional Yeşilyurt Houses" located in Adıyaman Street, only this house is a junctional building and it has been restored within the scope of the "Street Health Project" due to its facade and architecture, and it has come to life as the cultural heritage value of the city (Malatya Governorship, 2012: 521).

HanifiTanbay House not only contributes to the city and its region with its visual richness in terms of aesthetics, architecture and cultural values, but also attracts attention with its rational planning and implementation decisions in using climatic, environmental data and using natural resources.

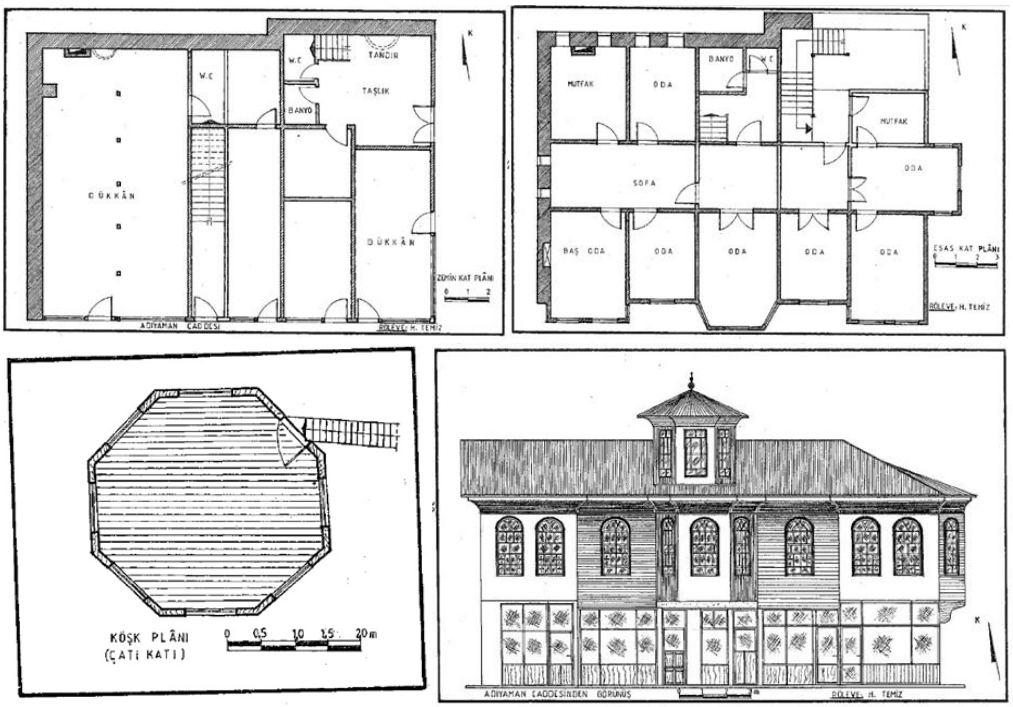

Figure 6: HanifiTanbay House floor plans and appearance (Temiz, 1990)

When the design decisions of the building are examined; In addition to environmental parameters such as temperature, sunlight, natural air conditioning, it has been analyzed about the rational planning / implementation principles in terms of energy use and efficiency in terms of structural parameters such as building form, distance between buildings / building height ratio and building envelope.

It is seen that the climatic properties of the region in order to benefit from sunlight, which is one of the environmental parameters, are planned by considering environmental parameters such as temperature, sunlight, and natural air conditioning in the design decisions of the building. Malatya Yeşilyurt has shown terrestrial climate characteristics as a region (Figure 1), and these climatic features are generally very cold and long in winter, summer is cool, but in low altitude areas, temperatures are high in summer. During the cold period, this region is under snow and frost is common (Şensoy et al., 2005). Temperatures up to -4 ° C in winter in Malatya province; In summer, it reaches an average temperature of 26.8° C. In Malatya, 17.8 mm in spring.52 mm of precipitation in winter and autumn.while there is precipitation; rarely, precipitation is observed in the summer months (URL 3). It is seen that all these climatic features are benefited by the original planning decisions on the walls, roofs and insulation.

The edges and ceiling of the 'kiosk', which is made of octagonal based on the roof, are also built as octagons. In order to benefit from the use of daylight at the highest level, windows were built on all seven fronts, and the other facade was evaluated by building a door that was reached by wooden stairs to provide access to the space (Temiz, 1990: 34). The mansion place, which adds a unique aesthetic to the structure, has provided reasonable use of natural ventilation and wind, which is one of the environmental parameters of the building, and supported low energy consumption. The roof of the mansion site, which stands out with the value it adds to the façade silhouette, is in the shape of an octagonal pyramid in accordance with its form, and the visual value is enriched by symbolic meaning by making a 'realm' on it (Figure 6).

On the front of the building, there are three protrusions, which are more prominent in the foreground, and the 'side climbs' with bevelled edges on both sides, which are also equipped with a large number of windows. The dislocations are local reflections of social factors due to differences in customs, traditions and beliefs, sometimes shaped by some important basic needs such as gaining space in the space and watching the street by increasing the landscape and sometimes making more use of light (Evren, 1957: 10; Durgun, 2006: 80). These climbs provide the highest level of use of daytime heat and light, raising the structure to an important value in energy use. Supporting the spaces arranged for providing light and air to the interior with movable elements such as windows and doors with control and control mechanisms are the most suitable architectural elements for the requested light and ventilation (Izgi&Aysel, 2003).

In terms of building form, which is one of the structural parameters, the building is in rectangular form, in order to benefit more from the sun's heat and light; it is seen that the long side of the rectangle is used on the street facade. The seating area of the building is rectangular, and the building consists of three floors with the pavilion built on the ground, main floor and roof (Figures 5 and 6). According to the typology that SedatEldem

(1968) classified traditional houses; In terms of the function diagram of the main floor, it is included in the building class, which is in the type of 'interior sofa' plan (Figure 6).

It is seen that the building shell, which is another structural parameter, is covered with adobe walls, and is also supported with adobe infill plasters that provide insulation of the facade and prevent / delay wear from rain / external factors.

The western and north facade walls of the building were built with small windows and thick walls to meet the need, and especially the 'insulation effect with decoration' was provided by planning the built-in cupboards on these facades.

The interior sofa of the house - with its small windows - is located on these facades rather than living spaces, with spaces such as the kitchen and bathroom. These measures, which were taken to manipulate the undesirable effects of the north facade in terms of the prevailing wind and the day temperature of the west facade, show that the right planning decisions were made for the building in the name of energy efficient efficiency. Currently, with the restoration under the "Street Health Project", the insulation value and visual aesthetics of the building are also supported with the wooden posts, window frames and wooden bay windows (Figure 5). It is seen that the energy efficiency provided in taking and protecting the heat of the sun together with the repairs contributes to the indoor comfort and low energy consumption.

V. DISCUSSION AND CONCLUSION

With the energy problems of the modern world, concerns about using energy effectively and efficiently, the interest in spatial design decisions in traditional settlements has increased day by day. Architectural structures that decorate traditional residential areas in our country are the best examples of sustainable architectural structures for years, with their many special features such as their adaptation to the structural environment and nature they are built in, their sensitivity to climate, and their contribution to the economy of the region with the use of local materials. With the values it has preserved from the past to the present, with its environmentally friendly and practical solutions for energy consumption, traditional architectural structures continue their existence and special importance. This architectural heritage; In addition to its responsibility in protecting environmental resources, compliance with topography and ecological sensitivity, it has also enabled to create comfortable interior spaces with its preferences in roof and facade systems.

When these properties are evaluated in Malatya YeşilyurtHanefiTanbay House, they were analyzed in terms of building energy consumption and thermal performances throughout the building life cycle, and the aspects that attracted special attention in terms of design and implementation were as follows;

- Considered as one of the tangible cultural heritage values of Malatya, the structure, in order to transfer its physical and design value to the future; it was taken under protection by restoration and its energy conservation value was further increased with repair,
- The building is planned taking into consideration the climatic and environmental data of the region with its design suitable for street texture, height of the building, roof eave widths,
- The upper covering surface of the building is kept to a minimum, and it is ensured that both the building itself and the street on which it is located are benefiting from the sun in a controlled manner,
- With its loggias on the front of the building and three pieces of coriander, it not only provides a unique visual contribution to the silhouette of the Yeşilyurt Town Adıyaman Street, but also enables the house to benefit from the intense daylight and heat,
- By using materials obtained easily from local sources such as mudbrick masonry mesh, mudbrick filling plaster and locally wooden wood on the stone foundation of the building; heat insulation and energy conservation are provided,
- The window openings and the frequency, which the building increases with directing to the sun and exits, have achieved significant savings in energy costs that can be spent during use with its lighting and ventilation gains in getting the daylight and light,
- With the use of fewer and smaller windows on the north and west facades of the building, this facade is also made thicker than the others; both heat losses are reduced and they are exploited in a controlled manner from the dominant wind and western daylight,
- The mansion place, which adds an aesthetic symbol value to the building, supports the low energy consumption as a reasonable solution in terms of natural ventilation and wind usage, as well as the building utilizes daytime heat and light,
- Equipping the 'middle exit' on the front of the building and the 'side extension' on the side on both sides with numerous windows; Increasing daylight / heat intake levels and reducing the cost for natural ventilation, contributing to space comfort,
- The energy efficiency issue in the design decisions of the building has been increased with the restoration; It has been determined that the support of the roof covering material of the roof, renovation of the plaster on

the facades and repair of the facades and windows with wooden decorative materials not only increases the lifetime of the building but also increases the energy efficiency and insulation rating of the building and fixes the title of being a 'low energy consumption building'.

YeşilyurtHanefiTanbay house, which is one of the important structures of Malatya as a cultural heritage, has revealed that it is an original architectural structure with its planning and implementation principles along with its aesthetic sense to the street it is located on. Besides the spatial and cultural values of the building, with the data revealed within the scope of the study; It is also determined that it is an energy friendly structure that takes environmental and climatic values into consideration. If we consider that the energy use parameter evaluations made in this building are taken into account in almost all traditional residential areas as much as possible; it is necessary to say that today's modern architectural structures have a lot to learn from this design understanding and principles.

REFERENCES

[1]. Abro, R. S. (1994). "Recognition of Passive Cooling Techniques", Renewable Energy, 5 (5-8), 1143-1146.
[2]. Akyıldız, N. A. (2020). "Handling of Eastern and Western Spatial Design Process in Terms of Active Aging", Grafiker Publication, Ankara.
[3]. Akyıldız, N. A. and Olğun, T. N. (2019). "Investigating the Problems Experienced in Traditional Settlements with the Impact of Urban Growth in the Context of Sustainability", VI. International Science, Engineering and Architecture Academic Studies Symposium on Science, Full Text Proceedings, 198-210, Ankara, Turkey.
[4]. Akyıldız, N. A. (2020). "The Value of Open Public Spaces in terms of Sustainable Cities in the Context of Urbanization and Urban Development", National Folklore Magazine, 125, 188-201.
[5]. Atalay, İ. (1997) Turkey Geography, Ege University Publishing.
[6]. Chen, D. and Chen, H. W. (2013), Using the KöppenClassi fi cation to Quantify Climate Variation and Change: An Example for 1901–2010. Environmental Development, 6, p. 69-79.
[7]. Çetin, S. (2010), Ecological Reflections of Traditional Residential Architecture: The Case of Burdur, 5. National Roof and Facade Symposium, DokuzEylül University Faculty of Architecture, Buca, İzmir.
[8]. Durgun Y. (2006). A Study on Traditional Malatya Houses, Master Thesis, Gazi University, Institute of Science, Ankara.
[9]. Eldem, S. H. (1968). Turkish House Plan Types, Publication of ITU Faculty of Architecture, Istanbul.
[10]. Evren, M. (1957). Cantilever in Turkish House, Ph.D. Thesis, Istanbul Technical University Faculty of Architecture, Istanbul.
[11]. Fathy, H. (1986). Natural Energy and Vernacular Architecture: Principles and Examples with Refrence to Hot and Arid Climates, London, UK, University of Chicago Press.
[12]. Itard, L. and Meijer, F. (2008), Towards a Sustainable Northern Europen Housing Stock: Figures, Facts and Future, Sustainable Urban Areas, IOS Press, Amsterdam.
[13]. Izgi, U. and Aysel, B. (2003). Doors and Light Compartments, YEM Publications, Istanbul.
[14]. Karaarslan E. and Çelikyay, S. (2019). Yeşilyurt (Malatya) Investigation of Historical Urban Fabric, Bartın University International Journal of Natural and Applied Sciences, 2 (2): 261-273.
[15]. Kim, JJ and Rigdon, B. (1998), Sustainable Architecture Module: Qualities, Use, and Examples of Sustainable Building Materials, Ann Arbor MI: National Pollution Prevention Center for Higher Education.
[16]. Malatya Governorship (2012). Malatya Cultural Inventory, Malatya.
[17]. Sahebzadeh, S., Heidari, A., Kamelnia, H. and Baghbani, A. (2017). Sustainability Features of Iran's Vernacular Architecture: A Comparative Study between the Architecture of Hot-Arid And Hot-Arid-Windy Regions, Sustainability, 9 (5), 749-777.
[18]. Şensoy, S, Demircan, M, Ulupınar Y. and Balta İ. (2005) Turkey Climate, General Directorate of State Meteorological Affairs, Web: https://www.mgm.gov.tr/files/genel/makale/13_ turkiye_iklimi.pdf Access Date: 01.02.2020.
[19]. Manioğlu, G. and Koçlar Oral, G. (2010), Climate Balanced Facade Design in Ecological Approach, 5.
[20]. Olgyay, V. (1963), Design with Climate. Columbia University Press, USA.
[21]. Olğun, T. and BahtiyarKaratosun, M. (2019). "Rural Architectural Heritage Conservation And Sustainability in Turkey: The Case of Karaca Village of Malatya Region", International Journal of Design & Nature and Ecodynamics, 14 (3), 195-205.
[22]. Roaf, S, Fuentes, M and Thomas, S. (2003), Ecohouse 2, A Design Guide, Oxford: Architectural Press.
[23]. Schittich, C. (2003), Solar Architecture, Strategies. Visions and Concepts, Birkhauser Architecture.
[24]. Temiz H. (1990). Malatya Yeşilyurt Local Architecture Sampling: Analysis and Evaluation, Master Thesis, Fırat University, Technical Education Faculty, Elazığ.
[25]. UNEP and Sustainable Buildings and Climate Initiative (2013), United Nations Environment Program; Join the Global Platform for Sustainable Buildings, Web: https: // energies 2050.org/wp-content/uploads/2017/02/2013-07-UNEP-SBCI_Plaquette-GB12-pages. pdf, Access Date: 01.02.2020.
[26]. URL 1 Web: http://www.silkroutes.net/ipek-yolu-ticaret-tarih.htm Access Date: 12.04.2020.
[27]. URL 2 Web: https://malatya.ktb.gov.tr/tr-58281/yesilyurt.html Access Historical: 12/04/2020.
[28]. URL 3 Web: https://tr.climate-data.org/asya/tuerkiye/malatya/malatya-281/, Access Date: 01.04.2020.
[29]. Vardy, S. and MacDougall, C. (2007), Compressive response of plastered straw ballet wall panels, In Sustainable Construction Materials and Technologies, by Y. M. Chun, P.Claisse, T. R. Naik and E.Ganjian, 789-800.
[30]. Zeren, L., Berköz, E., Küçükdogu, M. and others (1987) Energy Saving and Building New Settlements in Turkey in order to Work Relating to a Regulatory Model, Environment and Urbanization Application-Research Center (UYGAR), ITU, Istanbul.

Tuba NurOlğun, et. al." Evaluation of Malatya HanifiTanbay House in the Context of the Energy Use Analysis of Sustainable Traditional Architectural Principles." International Journal of Engineering Research And Development, vol. 16(4), 2020, pp 14-21.