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Evaluation of street tissues in historical settlements in the context of sustainable energy use and conservation

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Abstract
Transportation networks, in which today's urban settlements are communicated, have been one of the most important arguments of urban design. If we think of cities that grow with the increasing needs of time as a puzzle; It is a whole that encompasses all users with its belonging to the point where each part is located, its contact with other settlements and its organizational ability. Healthy and uninterrupted nutrition of residential areas that are part of the whole and serving social life are provided with street textures. The potential of the streets to establish important connections within the city is much more important in the historical and traditional settlements.
Developing technology and industrialization have damaged the design criteria, energy conservation / use value and architectural sensitivities of the buildings and streets belonging to traditional and historical settlements, as well as the city's residential areas, as well as changing social life. In this sense, the energy-related parameters of the streets, which are the most important transition points from the private area of a traditional settlement to the public area, should be examined and evaluated in detail.
The purpose of this study; to analyze planning decisions and application criteria that support sustainable energy conservation and use of traditional and historical residential areas and street textures. From this point of view, it is possible to carry the design decisions and material choices to achieve maximum benefit in the energy use of historical street textures to today's construction process. Within the scope of the study, the literature on design decisions and energy use / conservation of street textures in historical settlements were examined; In the light of the data obtained, planning, land placement, local material selection, usage decisions of natural resources and sustainable energy efficiency characteristics of street textures in some historical settlements of Anatolia were examined. As a result of the study, it is aimed that the qualities of the street textures belonging to traditional residential areas for energy efficient use will also be a reference to today's modern street architecture.

Keywords: Historical residential areas, street textures, sustainability, energy use, energy conservation.

1. Introduction
Settlements represent a whole that occurs with the occupancy and space organizations of the spaces (Kuloğlu, 2013) [13]. Structures in residential areas provide a synchronization compatible with an ontology that defines occupancy and streets constitute spaces. The roads and streets that feed the settlement with transportation networks are open spaces that can provide the organization of random coexistence both for the city and its users. These connection roads that offer life by feeding the city have the ability to slow down social life by making the residential area idle even with any careless design (Akyıldız, 2017: 60) [2].
The streets that establish the connections of the residential areas are urban elements that make everyday life easier. More than just a road for street users, it has many qualities that support sustainable movement such as increasing accessibility of space / space, controlling vehicle use, strengthening pedestrian connection to the street and also reducing traffic speed (Ayaz and Yamaçlı, 2019: 79) [3]. Planning decisions taken for residential areas are targeted with streets, squares, green spaces and street textures that give the city a third dimension; offers the purpose of the design, aesthetics and standards of realizing a healthy life (Ünal, 2014: 97; Demirtaş and Çelikyay, 2019: 147-148) [19, 7]. All spatial formations of residential areas are related to the culture of their communities. Based on this, residential areas that do not have a regular structure sequence along a defined square or street are defined as 'the indicator of a non-urbanized culture' (Bilsel, 2002) [4]. Thus, the definition and quality of a

residential area is understood by the building culture of that region, the design and use value of its streets. The aim of the study is to analyze the street parts that define and characterize the residential areas through traditional and historical areas and analyze them in the context of energy conservation with various criteria. Within the scope of the study, by analyzing the literature on the subject, the data obtained from the Anatolian settlements, where historical street textures are common, were evaluated. It is aimed to highlight the effects of the data obtained from the study on the use and conservation of street patterns in terms of construction and planning through historical settlements.

2. Material

Historical settlements appear as unique textures consisting of original structures built using traditional methods. Semi-public and public spaces, as well as the structures that make up the said tissues, stand out with their unique features. The streets leading up to these areas are of great importance as the first crossing points that connect residential users from private areas to public spaces.

In addition to the streets, structures and various elements in the historical settlements, it also has unique features in many ways with its users consisting of people, animals and plants. In this sense, the controlled use of energy sources such as sun and wind is one of the main concerns of street textures in historical settlements. For this reason, it will be useful to examine the measures taken in terms of energy use and conservation in the settlements by examining the general characteristics of street textures in historical settlements.

2.1 Street Textures in Historical Settlements

The streets gain aesthetic value and silhouettes with the structures that provide it with the third dimension plane while mediating access, transportation and reunification. In the residential areas from the past to the present, people have used urban open spaces, squares and streets to combine social, commercial, cultural, economic and religious activities (Yalçınkaya, 2007) [22]. The advantages of street textures on architectural planning principles in many areas with its quality of being the scene of social and cultural life;

- In addition to pedestrian comfort and bicycle use support, as well as the design principles that support accessibility norms, it encompasses all children, disabled and elderly users,
- With the design principles that give hierarchical transportation priority to pedestrians, the streets support social life with the nature of encouraging the use of fewer vehicles,
- Streets contributes to sustainable social, economic and cultural life with its semi-public space quality that can support traditional food, handicraft, souvenir production and exhibition,
- It has been determined that it provides support to the tourists who visit the historical area together with the inhabitants of the settlement area by providing a social and cultural spatial plane.

The streets, which constitute the transportation networks of the cities, but also contain many social data, emerge as an important part of the urban identity with their unique textures. In street textures, which are generally limited by buildings and structural elements, the said elements were also shaped and applied with the concern of energy conservation. In this sense, street textures containing unique values in terms of energy conservation are also frequently encountered in traditional residential areas. From this point of view, the evaluation of street textures in traditional settlements and their evaluation in the context of energy conservation are important in terms of developing modern streets in this context.

2.2 Energy Use and Conservation in Settlements

The world has encountered environmental and climatic problems such as global warming, resource depletion, energy, air-water pollution and waste problems, especially with the increase in population in the last thirty years. These developments have made it necessary to integrate sustainability with many issues such as life, building sector, resource use, environmental and climate approaches (Salman, 2004; Salman, 2018: 5) [17, 18]. Incorrectly planned spatial designs that increase energy demand and carbon emissions and deform ecosystems and settlements are threats to the world as “negative ecological footprint” (Rees, 1996; Laffta and Al-rawi, 2018) [16, 14].

Increasing energy problems focused on the understanding that started with the concept of sustainability, which provides more sensitivity to making an environmentally sensitive structure (Dikmen, 2014: 71; Dikmen and Toruk, 2016: 716) [9, 8]. The life cycle process of the building, which was created with a sustainability approach, is planned by reducing the negative effects on human health and the environment in the process of land selection, settlement, design, construction, operation / maintenance / repair and demolition, while also focusing on the effective use of energy, water and materials (Cassidy and Wright, 2003; Kilincarslan *et al*., 2019: 10) [6, 11]. The building sector, which is the main actor of natural resources and environmental pollution, therefore plays a key role in sustainability practices (Akıner *et al*., 2010) [1].

Sustainability, by its nature, is an 'architectural' approach and it is in the nature of revealing planning decisions on environmental and climate issues (Koester, 1995; Salman, 2018: 6) [12, 18]. Cities with traditional residential areas, which are the best examples of this, have enabled to create more livable cities with ecological and environmentalist approaches, especially by using sustainable planning and design principles (Wheeler, 2004) [20].

3. Qualities of street textures in the context of energy use and conservation in historical settlements

The quality of the place in the cities plays a role that is closely related not only to the buildings but also to the streets with its role in ensuring its relationship with the environment. It is a value that increases the social welfare level by contributing to a pleasant and safe time while providing the transportation opportunity of the streets (Ayaz and Yamaçlı, 2019) [3]. Although it is thought that the time spent in the street texture is limited, it has a capacity that increases the comfort of the surrounding buildings and affects energy usage with the right design decisions. Street textures planned with climate, environmental and energy rational use decisions also revive the residential area where it is located by turning it into energy-friendly areas.

The organization established by buildings with street structures especially in traditional and historical settlements is of great importance. Street textures are open spaces that demonstrate and display the continuity of the local

architectural style in these areas, planning principles according to the climate, energy efficient efficiency decisions, and unique materials of building materials such as stone-wood-adobe. It is observed that the traditional residential areas generally lead from narrower streets to wider streets, planned with a hierarchy where pedestrian flow is prioritized and sometimes terminated with dead-end streets (Yalçıner Ercoşkun, 2018) [21]. These areas are the social space planes of the living with the quality of being a semi-public space. As a cultural heritage, the streets incorporate cultural and historical values; In addition to promoting solidarity in the society, mediating commercial relations, sensitivity to religious values, promoting local products, they have been the places that mediated the preservation of many local, social and cultural values such as traditional crafts, cultural practices and construction techniques.

In traditional residential areas, the streets are arranged in a way to sustainably direct energy resources according to the climatic conditions of the region in which they are located in terms of user comfort. In this sense, when we look at the designs created in the context of street-sustainable energy use relationship;

- Surface movements, occupancy rates and surface textures of the traditional residential areas on the walls forming the border of the street are very important in the formation of the street form (Figure 1).
- The function of the small / frequent window spaces used by traditional buildings to get more and to get light to the street and the protruding / bay windows that open space on the facade are the designs and applications that affect the form and silhouette of the street (Özbek and Uluoğlu, 2018) [15]. (Figure 1).

Fig 1: Structures affecting the form of the street and sustainable energy use in the traditional settlement of Eskişehir / Odunpazarı

- The distance between the buildings that borders the street determines the width of the street and provides the formation of narrow or wide streets in terms of controlled use of solar energy. In addition to this, narrow streets provide wind energy control, thus creating wind corridor effect and natural air conditioning. (Figure 2).
- It is located in deep and long streets by positioning the buildings according to the slope of the land in accordance with the planned streets. This provides important advantages in natural ventilation and energy conservation (Figure 2.4).
- It is seen that in every street texture, planning decisions are taken depending on the climatic features, and this is reflected in accordance with the structures. In parallel with the climatic features, the demands of daylight and heat on the facades of the buildings facing the street were reflected in the planning decisions (Figure 2,3,4,5).
- It is observed that the natural ventilation effect of the wind is also increased to the advantage of the building by increasing the natural ventilation effect of the buildings, especially in the buildings that are able to be positioned in accordance with the topography of the settlements dominated by hot climates (Bektaş, 2005). In the residential areas where this can be achieved, important advantages such as energy efficiency and low energy consumption are provided in the interior comfort of the buildings.

Fig 2: Narrow streets arranged for air conditioning in the traditional residential area of Mardin / Savur (Halifeoğlu and Dalkılıç, 2006) [10]

- The roof fringes of the buildings overflow the streets, allowing the harmful effects of the sun to be easily controlled. In addition, in some settlements, efficient and sustainable use of solar energy was provided by using terrace roofs (Figure 3). In some narrow street textures, it is observed that the roof eaves are not reflected on the street in order not to cut the heat and light of the day and to reduce the effect of natural ventilation and humidity (Figure 2).

Fig 3: Roof fringes overflowing in the traditional settlement of Manisa / Kula and the use of terrace roofs in the traditional settlement of Şanlıurfa / Halfeti

- The intensive use of herbal elements provides sustainable effects in the context of natural air conditioning, shading and reducing the suffocating effect of moisture. (Figure 4).

Fig 4: Street textures using dense vegetative elements in the traditional settlement of Çanakkale / Gökçeada

- The ground walls of the buildings surrounding the street were built with rubble stones and timber walls in accordance with the street flooring, this decision was planned aesthetically and also made significant contributions in reducing the energy use and the stifling effect of moisture (Figure 5).
- Bay windows, with sliding / double-winged and sometimes shuttered windows, are planned to dominate the street. This created aesthetically made canopy for the street, and also supported the indoor comfort of the buildings during the summer and winter seasons (Figure 1, 5). The streets, which are formed in connection with each other considering the climate and terrain slope, were planned with ideal direction decisions, which contributed to energy efficient efficiency (Figure 5).
- The streets have made it compulsory to plan the buildings so that they do not interrupt each other's sun, and the ventilation contribution of the dominant wind is also reflected in the buildings (Figure 5).

Fig 5: Safranbolu Street views (Bozkurt, 2009: 18,19)

4. Conclusions and evaluations

The building structures surrounding the street are of great importance in traditional residential areas as everywhere and reveal the cultural identity of the entire residential area. The fact that these traditional settlements, where the codes of the society are absorbed into the streets and buildings, also have a historical heritage value, gives the tissues that provide access to them more responsibility. Street textures, which are the most important design parameters of these residential areas, have the quality of both fulfilling the daily routines of the user and the expectations of the visitors of the historical area. For this reason, street textures have an important task to make sense of both their existence and the existence of the structures it contains.

Street textures, which have an important responsibility in keeping the historical settlements alive, have many contributions not only to social, cultural life but also to sustainable energy efficiency with climate and environmentally friendly design principles;

- Street buildings have planning principles that give priority to environmental values with the nature of restoring the natural system,
- Street textures protect the heat effect by supporting the compact structure forms on it, organizing the occupancy rates of the residential areas,
- The streets are planned in compliance with the topography and environmental values of the region where they are located, and they realize reasonable land uses,
- By using climatic data, it contributes both to its own plane as an open space and to the interior comfort with reasonable positioning that guides the buildings,
- Climate-friendly street textures provide healthier living conditions with landscape support for sun use / conservation and planning decisions that take into account ecology,
- Street tissues that mediate efficient energy and resource use also contribute to reducing pollution with the support of water, rainwater and wastewater removal,
- It supports the insulation decisions that the building facades try to provide with their positioning taking into consideration the dominant wind direction,
- It supports thermal values with wide eaves shading street texture as well as building facades for sun and rain,
- The streets do not allow modern construction techniques with their dimensions, thus providing support in preserving local construction techniques,

- It has been determined that the streets transfer the natural ventilation effect obtained by the height of the buildings and the occupancy / void ratio to the user and the surrounding buildings with the effect of comfort.

In addition to the access / transportation / intersection task that each residential area expects, street structures are seen to serve with much greater responsibilities for traditional historical textures. It has a responsibility to meet, transmit and access the tourists who visit the region, as well as its users, as well as to preserve the historical heritage value it carries. In addition to architectural and environmental contributions such as energy efficient efficiency, energy use / conservation, we, the users and architects have responsibilities in the task of transferring the cultural heritage values of street textures to future generations.

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