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Ecological Approaches in Historical Public Buildings; Talas Old American College

Z. Özlem Parlak Biçer[1], Fazıl Akdağ*[2] and Esra Ateşoğlu[3]

[1]Erciyes University Architecture Faculty, Architecture Department TURKEY
(Corresponding Author's E-mail: parlakoz@yahoo.com, akdagfazil@gmail.com)

ABSTRACT

The need for shelter has been one of the most basic requirements of mankind throughout the ages. All built structures have become affected and affecting in the entire ecosystem, both in terms of production and use, with priority being given to the near surroundings. The integration of the constructions with the natural environment and the fact that the harmful effects to the environment are minimized and the resulting structures become part of the ecosystem, reveal the concept of ecological architecture. In ecological architecture the use of environmental factors as a design input is essential. In today's world, ecological criteria and parameters are determined by various certification systems.

The buildings produced before the concept of ecological architecture is located in the literature, can also be subjected to ecological evaluation under their own conditions. Even it can be said that some bases of the concept of ecological architecture expressed in the frame of certain rules today are based on this constructions. In the study, buildings of the American College built as a campus in the late 18th century in Kayseri-Talas in central parts of Turkey were evaluated in terms of ecological architectural criteria. As a result of the study it's been seen that the structures produced by traditional methods provide the majority of the ecological architectural criteria of today.

Keywords: Ecology, Ecological architecture, Talas American College facilities, Traditional buildings

INTRODUCTION

The term ecology was first used in 1858 by Henry Thoreau, but no description was made. In 1866, it was derived by Ernst Haeckel from ancient Greek oikos = house-space and logos = science (Kislalioglu, Berkes, 1994). Baarschers defines ecology as a branch of biology as a science that oversees all organisms' relations with each other and their surroundings (Baarschers, 1996, Dedeoglu, 2002). Since the term has been coined in literature, it has become a popular field of study in many different braches of science. In the field of architecture, many researches and studies about ecology have been made and the concept of ecological architecture has emerged. In order to enable future generations to live at least under today's conditions, ecological architecture aims to produce a harmoniously compatible architecture with the natural environment by using energy and non-renewable resources sparingly, acting sensitively to human beings and nature, and encouraging the selection of harmonious materials (Anon, 1997 Dedeoglu, 2002). In order for a building to meet the ecological design criteria, the building should be integrated with the environment, not imposed on the environment (Fletcher, 1999, Dedeoglu, 2002).

The concept of sustainability is first seen in texts about protection of forests produced by Johann Carl Von Carlowitz, a mining worker who lived in the 17th century. Carlowitz said that the sustainability of forests could be possible only if the number of trees planted is greater than the number of trees cut (Zor, 2012, Vural, 2016). The concept of sustainability is basically defined as development that is able to sustain ecosystem continuity without consuming non-renewable resources, providing opportunities to ensure the balance between ecosystem and economy, meeting the needs and desires of future generations (Göksal, 2003, Nobahar, 2014). Despite the increase in the consumption rate of natural resources, the inadequacy of production pushes the world into search for solutions. It is thought that it is very important to act with sustainability philosophy in order to ensure the continuity of limited natural resources (Vural, 2016).

In 1988, the concept of sustainable design emerged at the Gavle in Sweden after the World Congress of Architecture. Agenda 21 "Sustainable Construction" prepared by the CIB (Fr: Conseil International du Bâtiment, İng: International Council for Building) has made a classification related to standards about sustainable design (Bozdoğan, 2003).

Agenda 21 on Sustainable Construction prepares a study of international standards for sustainable development. The study has created a different perspective for researchers. Concepts such as ecology, human health, economy, life expectancy, performance, functionality and aesthetics come to the forefront in the evaluations of the study. When we look at architecture and building production from today's ecological standards, the factors such as waste rate, recycling suitability, use of building materials and construction systems requiring low energy consumption, use of local materials and reduction of transportation energy are considered as the most important factors (Hamamcı, 2002). In terms of human health, factors such as respiratory air quality, suitability to thermal and acoustical conditions, and daylight availability and natural lighting are at the forefront. From an economic point of view, it is important to select low-cost, long-life materials, and to use construction systems compatible with it, as well as to use economic materials and construction methods. In terms of usage and performance, the use of systems and materials that are easy to maintain is important. At the same time, in terms of performance, the physical and mechanical conditions targeted during the predicted life of the building also needs the requirements for the foreseen lifetime. In ecological and sustainable design, functionality and aesthetic concepts are properties that can be achieved by decisions taken at the design process in addition to evaluating all other data together (Hamamcı, 2002)
Recently, it has been observed that in all areas, with increasing energy problems, the CIB criteria are taken into consideration in conventional and traditional construction methods as an input that shapes the process of design and production (Bozdoğan, 2003).

Within the scope of the study; in the light of the CIB criteria, issues such as the relationship between the context and the natural conditions of the topography, effects of the natural environment in terms of ecological standards to the design process, material use and sustainability are discussed. The study aims to raise awareness of ecological and sustainable architectural issues and to emphasize the importance of these concepts for both today's architecture and the future.

ECOLOGY AND SUSTAINABILITY

The industrial revolution has caused considerable changes in the building sector as well as in many other fields. This change has affected many components of the building industry from building techniques to building materials. With each change, new problems have emerged. Rapid production and use of new materials have also affected other systems that will come after themselves, and even though different materials are used for problem solving, thus situations that affect the health of living have begun to emerge. In this process, like domino effect, the solution was tried to be found with ecology (İnanç, T., 2010, Parlak Bicer et al., 2016). As a result, the concepts of sustainability and ecology have begun to be discussed, and these issues have gained popularity in the academical environment. Especially in the housing field that constitute a large part of the production activities in the building sector, issues like; low-cost, rapid production, transportation, natural resources and energy use for infrastructure work for health care have become popular. In the construction field, sustainability and ecology have come to the forefront with the conservation and proper use of energy and natural resources and the importance of the work in this area has been increased (Hoşkara, E., Sey, Y., 2016, Parlak Bicer et al., 2016).

The reports prepared by the CIB (Fr: Conseil International du Bâtiment: Eng: International Council for Building) in the construction sector are important in terms of guiding the sector and determining the boundaries (İnanç, T., 2010, Parlak Bicer et al., 2016). CIB has established criteria for the ecological status of a building and these criteria are widely accepted. Within the scope of the study, a lodging structure within the Talas American College campus was selected and examined and evaluated within the principles of ecological and sustainable design considering the framework of the CIB criteria.

KAYSERİ, TALAS AND YUKARI TALAS

Kayseri, which is geographically close to the center of the country in Central Anatolia, is between the southern of Central Anatolia and the Taurus Mountains (Figure 1-a). Talas district, which is one of the central districts of the city of Kayseri, is divided into Lower and Upper Talas. The part, which is located in the foothills of Ali Mountain, is known as Upper Talas, the part which is located in the more flat areas is known as Lower Talas (Figure 1-b). As in Kayseri, it is seen that the terrestrial climate is dominant in Talas. However, due to the higher altitude of Talas, the effect of eastern and southwestern winds is more apparent. The difference in altitude between Lower and Upper Talas also causes the climate to harden at short distances. It is known that the first reason for the district to be chosen as a settlement is the water channels in the foothills of Ali Mountain. In particular, the topographic structure of the Upper Talas and the fact that the ground is easy to process is one of the factors that made the district to be chosen in the past as a settlement area. Because of these characteristics, Talas can be regarded as a settlement with a rich cultural heritage, which has hosted different ethnic societies, where Armenians, Greeks and Muslims used to live together.

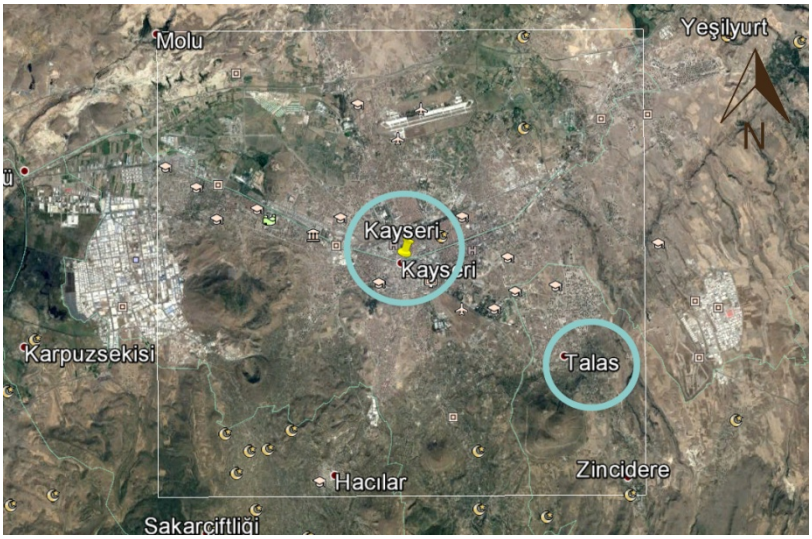

Figure 1 (a). Aerial view of Kayseri and Talas (google maps, 2018)

Figure 1 (b). Center Talas and Upper Talas (google maps, 2018)

Upper Talas American College Campus

The area under review is part of the settlement of American schools in Talas. Talas American College opened in 1871 as a girl and in 1882 as a male school and closed in 1968. The school, which was opened in Talas in the 19th century by missionaries within the context of American missionary movements, was reorganized in 1889 as a residential secondary school (talas.bel.tr, 2016). Until the end of World War I the missionary school was not closed at the end of the Treaty of Lausanne and remained as a foreign school in the management of US educators. Doctors and nurses working at the American Hospital in the school campus during the First World War and the War of Independence performed the treatment of soldiers injured in the war that transferred there. However, some of the soldiers who were seriously injured and unable to withstand long road conditions were martyred. Local people believed that soldiers were martyred by the americans there. The building complex which was used by Kayseri Province Youth and Sports Directorate since 1976 as a hospital and dormitory was transferred to Erciyes University in 1978 (wikipedia, 2018).

There is a house with a golden window in a children's fairy. The hero of the fairytale sees a house with golden windows in the skirts of a hill every day. One day the boy starts climbing the hillside to reach that house. When he comes home he understands that the reflections of the sunset that falls on its windows makes the windows shine like gold (Richards, L. E., 1916). Talas American College also has such a settlement in its location. Talas American College is located on the slopes of Ali Mountain and west of Talas and Kayseri, and overlooks the sunset. The college settlement has the view of the entire Kayseri, Talas and the sunset like in a fairy tale. "The sun sinks differently from this hill every day" says Miss Hemingway who has teached for many years in the college, the relative of famous writer Ernst Hemingway. In the study, the building identified as the "number one building" by Erciyes University's Department of Building Construction is examined (Figure 2 a,b). The building is one of the 8 buildings of different sizes within the campus. To the west of the building there is a building as big as itself and a garden gate to enter the campus courtyard. It is thought that this door was made by opening existing garden walls after the building group was transferred to Erciyes University. This situation makes it the first building in the campus to be reached. The garden area to the south of the building is used as a car park after the transfer process. In the present case, there are solar panels to meet the hot water needs of all the campus buildings in the south east, while there are gardens with large historic trees in the north, and other buildings ahead. The building examined (number one building) within the campus is more detached and independent than other buildings. This also allows the daylight to reach the building without interruption at any time.

Figure 2 (a). The position of the building in the campus (google maps)

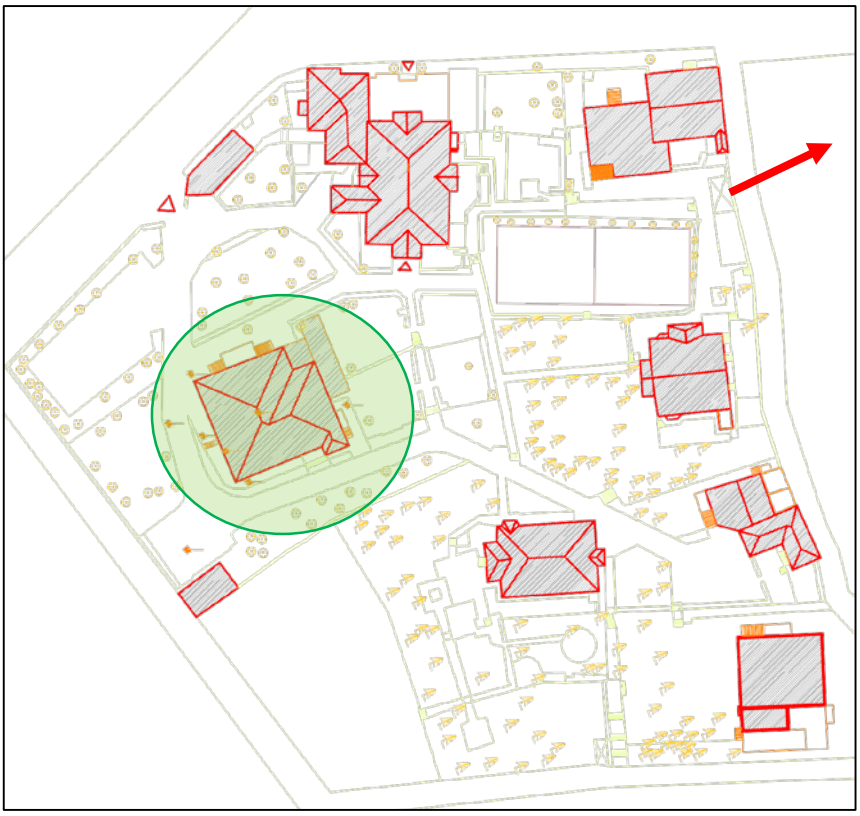

Figure 2 (b). Site plan of campus and the building examined (ERÜ general directorate of construction, 2017)

There are 6 more buildings in the campus whose survey drawings were made. But these structures are only half of the whole complex. The projects of the buildings transferred to the institutions such as the Special Provincial Administration are not available in the related institutions. This disrupts character integrity of the building site in the campus. Because the buildings are being treated with different approaches, conservation and renovation techniques.

The building in the area has different floor heights. Floor height and ground surface areas of buildings vary according to their functions. It is known that the buildings are used with functions such as married or single teacher residences, manager's lodgings, student bedrooms and dining halls, nursing lodgings, clinics and doctor's lodgings. In the past, the buildings passing through Erciyes University were used as temporary accommodation and social facilities for the lecturers and guesthouses.

The examined building is the largest building on the campus which consisted of, a basement floor, first floor and the second floor that is used together with the roof. The building is settled in the area by arranging different levels on the ground. This allows the basement and ground floor to be accessible from different levels. While the basement is used as an annex, it has begun to be used as a kitchen for the restaurant which is held in the garden in hot seasons. In addition, the boiler room is also located on this floor (Figure 3 a). The ground floor which was transported by monumental staircases from the west side, adapted to the current living conditions by the addition of bathrooms. In addition, wet spaces that can be used without entering the building from the garden are added later. In addition to the four bathrooms, there is also a room used for management functions (Figure 3 b). There is a one-armed staircase leading to the upper floors,

opposite off the main entrance.On the ground floor there are rooms set around a central stair and a space for common use.

Figure 3 (a). Basement floor plan (ERÜ general directorate of construction, 2017)

Figure 3 (b). Ground floor plan (ERÜ general directorate of construction, 2017)

The first floor, which is reached by the one-armed central staircase, is also consisted of bedrooms. The balcony overlooking to the west is accessed from a bedroom and it covers the entrance. Another communal balkony is reached from the common usage area which is overlooking to the east side. Wet volume solutions have been made on the same area as in the ground floor. Wet volumes are located to the north-east of the structure (Fig. 4 a, b). The second floor of the building is located inside the attic. Roof height is kept higher than required and inter-roof spaces are created by the volume this height granted. This floor, where the central plan scheme is seen, also has wet spaces as later additions to the bedrooms. Wet spaces do not exist in the initial planning but the wet volumes in the north east, which all units use together, were thought to be in the initial planning.

Figure 4 (a). 1st floor plan (ERÜ general directorate of construction, 2017)

Figure 4 (b). 2nd floor plan (ERÜ general directorate of construction, 2017)

The balcony, that is located on the west side of the building which emphasizes the entrance, is carried with one piece of cylindrical stone pieces. The western side of the building, where

scenery of Kayseri and Ali Dağı can be seen has large window openings that makes possible to take enough amount of sunlight to the inside. This is an important feature for the buildings located in the areas where winter climate conditions are harsh. Although the structures on the south side are additions that made depending on the requirements, it seems that the basic planning approach has not deteriorated. Depending on the usage in the interior, the need to utilize heat and natural light has been decisive in the general character of the interior and window openings. In the building constructed with the masonry system, the window openings have been tried to be kept as large as possible in accordance with the possibilities of the construction system (Figures 5 a and b).

Figure 5 (a). West facade (ERÜ general directorate of construction, 2017)

Figure 5 (b). South facade (ERÜ general directorate of construction, 2017)

The eastern and northern facades have less window openings due to the presence of wet spaces on these two facades, although they are similar to other facades in terms of material, architectural language and construction system (Figure 6). This indicates that insulation is considered especially in colder directions for cold winters (Figure 7 a, b).

Figure 6. North Facade (Kayseri Directorate of Landscape and Monuments archives-2011)

Figure 7 (a). East Facade (ERÜ general directorate of construction , 2017)

Figure 7 (b). North Facade (ERÜ general directorate of construction, 2017)

The bearing walls of the structure which built in the masonry carrier system are consisted of local cutting stones. It is estimated that stone used as building material is brought from local stone quarries considering its characteristics. In addition to this, it is observed that wood is used intensively especially in floors and door and window frames. It is also remarkable that the building is placed compatible to the natural elevations of the topography. There are differences in the number of floors between the facades of the building due to decreasing ridges of the landscape from east to west. Depending on the ridges of the landscape, the building can be perceived as it have three floors or four floors regarging to the observation point. The basement can be accessed directly from the garden, especially in summer by the level differences on the site. The components of carrier system on the roof which is thought to have been built by local masters, is also made of wood (Fig 8 a, b).

Figure 8 (a). A-A section (ERÜ general directorate of construction, 2017)

Figure 8 (b). B-B section (ERÜ general directorate of construction, 2017)

Ecological Traces in the Building Examined

The criteria set out by the CIB has been decisive in ecological evaluation of the building known as the number one building within the Talas American College campus area (Figure 9). Depending on the energy usage and material selection and the use of selected materials, the

locally produced stone was found to be in accordance with the ecological criteria with the use of local craftsmanship through local construction systems. Also, there is no extra energy and human power comsumption to transport the stone, the main material of the structure. In addition, since the stone is heat-retaining, it is suitable for balancing the temperature differences between summer and winter and day to night.

Figure 9. West facade, main entrance (http://mapio.net/pic/p-34376969)

When the building is evaluated in the context of relationship between human health and material choice; it is seen that the architectural and technical elements that make up the building are produced from natural and unprocessed materials (stone, wood etc.) which is harmless to the human health (Figure 10). Ecological approaches can be observed especially in materials used for decoration and fine structure. The use of natural wood in roofs, upholstery, ceiling tiles and doors and windows is seen as an appropriate choice in terms of both air quality and thermal conditions within the scope of ecological criteria. However, some later interventions distorted the originality of the work. An example of this is the painting of interior walls with oil paint, which is a material that prevents breathing. Although the later unattended interventions do not overlap with the original character, the construction techniques and materials used in the initial production of the structure show that the original state of the structure provides many of the currently accepted ecology and sustainability criteria.

Figure 10. Use of natural materials in and around the structure (Z.Ö. Parlak Biçer, 2018)

From the economical point of view, the first production, energy use, maintenance and repair costs in the construction sector, are also important issues related to the concept of ecology. If needed precautions are taken for the stone and wood that used as the production material in the examined building, they can be considered as long-life materials, that they have a low necessity and cost rate of maintenance. The labor force and transportation expenditures is almost none due to the fact that these materials are gathered from the surrounding areas. These features make it possible to consider the examined building as economic in terms of construction and maintenance costs, energy consumption and expenditures. The materials used in the construction were natural and organic, and at the same time they were also harmless to the environment, can mix to the nature when necessary and can be able to create harmonious integrity with nature. It is also possible that materials used in the building can be reused and transformed to be used in another building if needed. It can be said that the examined building, can be recycled and the entire material which constituted the building can be reused without any loss, which makes building as completely recycleable in the context of waste management. These features indicate that the building is ecologically sustainable.

In the course of building planning, it is important that issues such as service life, cleaning and maintenance, operating costs, etc. are accurately included in the process with accurate forecasting. Depending on the materials used in the structure being evaluated, maintenance periods are reasonable and maintenance costs are not high. It has been observed that renovation and maintenance works have been done especially on timber elements due to deformation and loss of quality due to time. It is known that the technical drawings are made by Erciyes University Department of Building Construction and maintenance and repair works are carried out. The terrace roof, which is often preferred in residential buildings around, is not preferred for this building because it requires frequent maintenance and can not provide sufficient insulation. Instead, a wooden roof is used. Thus, instead of periodic maintenance and repair and material renewal are done depending on the wear and deformation that may occur over time.

Performance assessments are another important criterion for ecology and sustainability. There are some rock carved spaces in the area where the building is located. The local texture of the Talas seems to have been used in the buildings in this area as well, where these rock carved spaces traditionally used in all periods from the past to the present. There is no such place in

the selected building but it can be said that the basement provides the physical and mechanical conditions as in the rock carved spaces that betting. The basement floor, which is already used as an annex, is also available as a cold store for food regarding the daylight intake, the presence of levels in the landscape and the orientation of the building can provide the appropriate conditions. Hence, energy consumption can be saved. Daylight can be taken inside the building in every turn of the year which provides energy conservation. Window openings in the south and west directions of the building are particularly suitable to the climate conditions.

The relation between function and the aesthetics is also seen as an important ecological criterion. The function is reflected to the forms and the aesthetics of the structures in Talas American College campus buildings. Stairs and balconies made to emphasize the main entrance in the evaluated building show that aesthetic concerns are carried in the design of the building. Moreover, the formal worries and ornaments that can be read on the columns and other components of this balcony, which are placed in the landscape direction, give a clue to the aesthetic concerns. The opposing located windows are thought to be related to the general ventilation of the building which are located parallel to the main wind flow line. The roof, which is produced for protection against outdoor weather and climatic conditions, has been included in spatial use, which ensures diversity in the interior organization. This can also be interpreted as an indication of spatial and aesthetic sensitivities.

CONCLUSIONS

This study which aims to evaluate ecological architectural criteria on historical buildings, claims that historical and traditional architectural products can be a reference for new buildings to be produced. It is clear that the ecological features of historical buildings produced by traditional methods and materials will guide the new architectural productions.

The unique examples of local and traditional architecture can be found in Talas. Talas American College, located in the Upper Talas area, where there are not many large-scale works and is planned on a wide area has ecological traces from locality selection, to land settlement, to the production of building with local techniques by using local materials, to the direction of construction. Moreover, the rational solutions of the relations between the use of the dominant climatic data and the function and aesthetics of the building which is oriented towards the scenery are striking.

The presence of many ecological features, even in relatively large-scale traditional structures, is likely to be a guide for similar functional designs in the future. It is thought that the Talas American College buildings covered in the CIB criteria could lead to future work on sustainability and ecological architecture. The aim of the study is to encourage questioning of ecological features which is generally carried out on the housing scale in the larger scales and different functions. At the same time, it is expected that the evaluation made in Talas American College buildings will form the basis for the creation of an architecture that can achieve more accurate, nature-friendly, sustainable and ecological by blending the experiment of the past with the possibilities, techniques and technology of today.

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