

**ECOLOGICAL PROBLEMS OF RESTORATED TRADITIONAL  
SETTLEMENTS: A CASE STUDY IN KALEİÇİ (ANTALYA)**

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**Abstract:**

Historical fabrics of the cities reflect the cultural backgrounds of the societies. For centuries in historical urban settlements formed via experiences the most appropriate structure type to the climatic conditions and the region, has been produced. With the industrial revolution, to be able to have more comfortable places in the settlement, fossil fuel based energy consumption began to be generally preferred. As a result, the ecological balance in the nature has begun to deteriorate in an irrevocable way. To find a solution for the situation, in ecological architecture and planning issues various ecological structure criteria is defined. Accordingly, buildings appropriate to the local and climatic characteristics are meant to be constructed besides the use of renewable energy sources and minimizing energy consumption. When historical city fabrics are analyzed in the ecological context, one can observe that these include sustainable structure characteristics. In order for the buildings to be renewed and restored in accordance with their original structures, great care should be given in terms of financial resource, manpower, material and control.

Antalya Kaleiçi which was chosen as the working area was analyzed in terms of settlement structure, building form and structure cover, place organization, material choice, renewable, clean energy usage and water saving and usage and it was determined to have ecological, sustainable settlement characteristics. Traditional architecture samples which have been built by the people after trial and error for centuries and with the solutions appropriate to the climatic and environmental conditions are highly appropriate to the ecological design criteria as structures and settlements peculiar to the district. However the mistakes in the restoration of the buildings used for touristic aims after 1970s, adding of new necessary functions to the buildings, not taking care of the original structure and materials show that historical urban fabric of the city is faced with the danger of losing its ecological feature.

In this study, Antalya-Kaleiçi historical urban settlement which was built in the context of the ecological design criteria and which has conventional houses that achieved to reach our day has been discussed. When houses with historical fabric which are experiencing a function shift to ensure sustainability in today's conditions are analyzed in terms of ecological design criteria, we will mention the sustainability

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of the criteria obtained in terms of availability and the problems faced with the restoration.

**Key words:** Ecological Architecture, Historical Cities, Restoration Problems, Antalya, Kaleiçi.

## 1. Introduction

In 1990s a number of designers wished to produce sustainable products. However they were faced with problems such as difficulty in finding the appropriate technology and material besides their being costly. In 2000s the situation did not improve. Sustainability is a concept which is hard to define precisely and it was first begun to be used in the report prepared by the World Commission on Environment and Development. After the use of the term “sustainable” the terms such as “green”, “ecological” and “environmentally friendly” were begun to be used in order to define the products and activities (Strongman, 2007).

While ecological structure practices can be classified in terms of the energy systems used in the buildings or the materials, they can also be classified into two groups as the re-usage of the ancient buildings and the new environmentally sensitive designs. (1) Re-usage of the ancient buildings and (2) environmentally sensitive designs. The ecological architecture concept includes the whole period until the termination of the economic lifetime which is the destruction phase of the building. In this context making maximum use of the available buildings is also within the context of ecological architecture besides the new environmentally sensitive and low-energy designs (Bozdoğan, 2003).

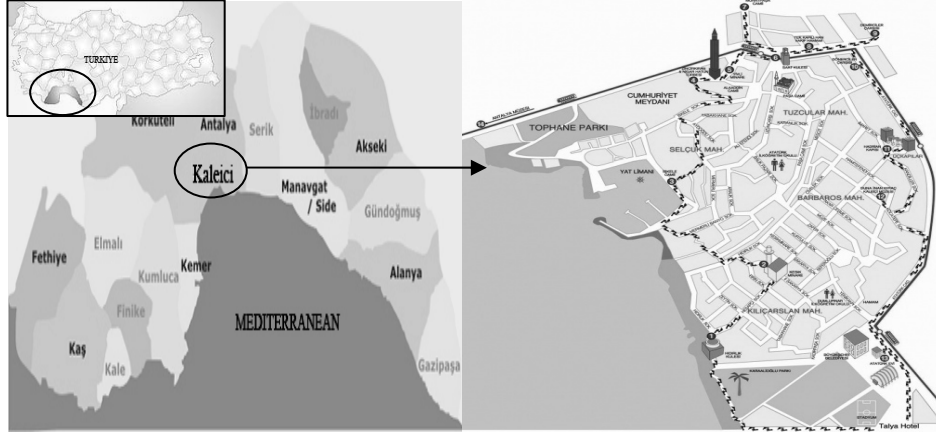
Traditional architecture samples reached our day as artifacts which have been built by the people after trial and error for centuries and with the solutions appropriate to the climatic and environmental conditions of the region and in these samples people reflect their own life styles, cultures, customs and traditions (Aktuna, 2007). While reusing these buildings it should be ensured that they do not lose their ecological features.

In this study while examining Antalya-Kaleiçi which is one of the examples of traditional urban fabric achieved to reach our day, we will deal with the sustainability of the criteria obtained in terms of availability of the historical city under today’s conditions and with the problems faced during restoration within the ecological design context.

## 2. Material and Method

The City of Antalya is situated in the south of Turkey, in Mediterranean Region and on the inland sea coast of the Mediterranean (Figure 1). The Taurus Mountains and cities of Burdur and Isparta in the

north, Konya in the northeast, İçel in the east and Muğla in the west form the land frontiers of the city which lies along the West Mediterranean frontiers of Turkey.



**Figure 1.** Location and map of Antalya-Kaleiçi Region

City center was built on the rugged rocks and on a travertine terrace which is approximately 30 meters high from the sea in respect of the general geography of the City of Antalya. Antalya Plain, which is bordered by the Gulf of Antalya in the South, Bey Mountains in the East, Taurus Mountains in the North and the West, is approximately 100 km long. Kaleiçi settlement is on a 6-10% inclined field on the coastal cliffs (Anonymous, 2000; Avcı, 2005). During the summer months the average temperature is 28-36 °C and in January it changes between 10 and 20 °C. Average annual temperature is 18.7 °C. Antalya is sunny on approximately 300 days of the year. Snow fall and frost are hardly seen. When the weather is not rainy, it is usually clear and sunny. Approximately 40-50 days are rainy. The average humidity rate in the weather is 64% (Anonymous, 2008a).

Kaleiçi region is situated on the cliffs on the coastal lines. Tuzcular, Selçuk, Barbadous and Kılıcarslan districts are included in Kaleiçi (Figure 1). In the Kaleiçi Region the prevailing wind directions are northwest and southeast. “The North-east wind blows warmly in the summer and blows coldly in the winter. However the situation is different on the coastal line. The North-east wind crosses over the Gulf of Antalya while reaching the coast and becomes refreshing with the effect of the sea. Therefore the North-east wind is desired. One of the prevailing winds in the region is breeze which blows in the South and southeast directions. The wind which is called as Manavgat and which blows in the east is refreshing and desired. The wind which is called as “Pour” is a wind which blows through the valleys among the mountains bordering the coast and it blows for short periods. It is peculiar to the region and has a refreshing effect” (Aktuna, 2007).

According to the findings obtained from the caves in immediate surroundings, the settlement history of the Pamfilya Region in which the city was situated during Ancient Period goes back until Prehistoric Period. Attelia which was once one of the Pamfilya cities is nowadays Kaleiçi district at the city center of Antalya. It is known that the city was founded by Pergamon King II. Attalos Philadelphos (B.C. 158-138) and was named after its founder. Attaleia which was the name of the city is mentioned in some publications as Satalia or Adalya (Avcı, 2005). The city went on its development during Roman, Byzantine, and Seljuk and Ottoman periods after it had shown a great improvement during Pergamon Kingdom Period. During 12th and 13th centuries, namely during Seljuk period, the city had a cosmopolitan composition with Muslims, Greeks, Christians and Jews. Muslims mostly lived in the north of the city around Yivli Minaret and with the increasing population they were separated by a city wall from the others. During the I. Aladdin Keykubat, Seljuk Sultan, period the second city wall was built. After the city was conquered by the Ottomans in 15th century, the port function of the city diminished and people began to be engaged in agriculture in the fields out of the city. In 15th and 16th centuries it was seen that the city expanded northwards besides the areas surrounded by the city walls behind today's "Kale Kapısı" (Avcı, 2005).

While addressing Antalya-Kaleiçi district in ecological design context, the primary criteria is collected under the following titles. 1) Settlement structure 2) Building form and building cover 3) Place organization 4) Material choice 5) Renewable, clean energy usage, water saving and usage (Krusche, 1982; Tönük, 2001; Filik, 2004). In the study ecological features, which are lost during the repair and restoration of Antalya-Kaleiçi historical fabric, are reminded.

### **3. Ecological Review of Antalya Kaleiçi Settlement and Problems Faced during the Restoration**

**In terms of Settlement Structure:** Location of each variously scaled-settlement, a small hut or a large urban settlement, can lead to important reasons and results in terms of ecosystem. All of the stages –the choice of location, field to be designed, usage of the object or the building –affect the user, environment and the ecosystem. While choosing the location ecosystem, geological, geomorphologic and micro-climatic criteria are effective. The location choice criteria are the criteria which should be taken into account especially for the large settlements and master plans. Therefore, they are important decisions which take place at the beginning of the ecological design and which start the ecological life standards in terms of societies. With correct planning, the big mistakes that influence the world ecosystem such as the transform of the fertile lands into industry and settlement areas, contamination of natural resources, making ecologically

infertile investments which will disappear in a short time (because of earthquake, landslide etc.) and consequently will cause the resources to be consumed can be avoided. Since these decisions concerning the world ecosystem will have greater results, they are extremely important (Filik, 2004).

Antalya-Kaleiçi historical houses have conventional settlement characteristics in terms of being in harmony with the topography. The houses are appropriate for the land slope and built above the sea level since the city is at a hot-humid climate region. Most of the streets harmonious with the topography spread in the northwest- southeast direction which is the prevailing wind direction and since the houses are built in a way that they could make use of prevailing breeze as much as possible they are acceptable for ecological design criteria. Since the buildings are adjacent they have two fronts –northeast and southwest- and their front receiving the sun light is limited. Due to narrow streets, the buildings overshadow each other and the building surfaces do not warm up. The garden areas among the buildings are in the same direction with the wind so one can benefit from the wind inside the building thanks to the halls opening to the gardens. The trees appropriate for the climatic conditions of the region are used in order to provide shade and prevent the building fronts from warming up (Figure. 2) (Aktuna, 2007).



*Figure 2.* Antalya-Kaleiçi Region (Anonymous 2008b)

The buildings built on the empty building parcels should have the same features with the historical fabric during their usage in Kaleiçi. The destruction of historical buildings, changing their volumes and building attaches form an obstacle in terms of Kaleiçi's being a site area and to eliminate this problem its sustainability should be ensured. In the restoration projects, care should be given to keep the originality of the building. During

restoration, the garden also should be restored in accordance with the historical fabric besides the building. One of the primary problems is that plants which do not have the climatic features of the Mediterranean Region are used at the restored buildings. The volume and scale features of the new buildings to be built on the empty parcels should not change the historical urban fabric.

**In Terms of Building Form and Building Cover:** In Antalya/Kaleiçi Houses, because of climatic characteristics “I, L and U” type outdoor hall plans were applied. While the exterior frontal area and the heat loss at the building surface increase, the heat retention of the building decreases. The building form and the window structure help the building refresh by receiving and canalizing air streams. Especially in hot climates in order to keep hot air away from the building dual air conditioning is needed. In Kaleiçi houses by opening the entrance doors at the first floor, dual air conditioning between hall and the exterior place is ensured. The air streams provided around the building refresh the surfaces (Aktuna, 2007).

The ceiling height is around 3.00-3.50-4.00 meters and this creates air circulation. However in some houses the ceiling height is low and therefore there are winter rooms which easily warm up. Terraces with wide fringes, balconies and the high courtyard walls of 2.00-2.50 meters in height are effective tools to create shadow effect. The half-closed, shadowy and stone-covered halls are placed at the entrances and they are cool places where people live during the summer months. In some buildings, there are air tunnels between the travertine on which the building is located and the sea in order to provide refreshing air stream.

In hot humid climates it is important to have air outlets so that the humidity inside the building can be disposed. For this reason the windows are positioned on many fronts of the room. At the rooms facing north, top windows ensuring that the rising warm air is disposed are striking. The wood shutters on the windows on the South fronts of the buildings are also used to protect the building from the salty water effects coming from the sea and they are used as sun shades.

In the restored buildings, some mistakes such as turning outer halls into indoor places using glass construction elements and creating extremely hot places with the greenhouse effect are observed. Going beyond the traditional building dimensions in terms of fringe sizes and wall heights or designing new buildings without balconies affect the rate at which the street or the building is becoming shaded. If the wood shutters are not renewed in accordance with their originals, this influences the air stream. And similarly if some of the windows are disabled, this blocks the air circulation inside the building.

**In Terms of Place Organization:** In hot humid climate regions it is necessary to be protected from the sun and warm air and to benefit from the wind as much as possible in place organization. In Antalya historic Kaleiçi Houses, the place construction is shaped according to the climatic characteristics (Aktuna, 2007). While the exterior halls are directed to south and southeast which are open to breeze, the rooms opening to the hall are directed to the North. The rooms directly open to the exterior hall and there aren't any narrow corridors. Courtyards similar to the halls open to south and southeast so that they can receive wind. In summer months the cook stove in the courtyard is used as the kitchen. The pool or the well in the courtyard has a refreshing effect. The aggregate floor coverings have a refreshing effect when they are watered because of their porous structure.

At the restoration stage, when the halls are converted into indoor places in order to have extra-room, this ruins the place organization and hinders the room from receiving wind (Figure 3-C). Not using the hall in accordance with its usage aim in the buildings which are mostly used for touristic purposes, changing floor covering materials, disabling traditional wells and pools or covering their upper sides are some of the problems faced during the restoration (Figure 3-D). New parts such as bathroom etc. which are added to have more room or added during function shift ruin the place organization.



*Figure 3.* Samples from Antalya Kaleiçi (Original, 2009).

**In Terms of Material Choice:** The stone and wood materials used in Kaleiçi houses are local materials without shipment costs and they do not contain chemicals harmful to the human health. The stone walls of 50-80 cm in thickness refresh the ground floors in summer months. So generally to refresh the building one does not need energy such as electric power. Wood timberwork enables that upper floors of the building take air. The roof is inclined and it is made of perforated roof tile.

The use of stone-covered walls or stone-like walls instead of real stone walls at the restored buildings doesn't let the building make use of the advantages provided by the stone walls (Figure 3-A,B). At the upper floors the timberwork system is commonly used in order for the building to breathe. Most of the time, the historical building is eradicated and rebuilt with the modern materials. The buildings restored with the unnatural materials lose their originality in terms of ecological material feature. When the floor coverings at the halls are covered with other materials, the porous floor coverings are destroyed and the floor coverings lose their refreshing feature (Figure 3-D).

**In Terms of Renewable, Clean Energy Usage and Water Saving and Usage:** Turkey is a country which has every kind of natural opportunity in order to break through renewable energies. Primary renewable energy types are solar energy, wind energy, biomass energy, geothermal energy, hydrogen energy and water based energies (Filik, 2004).

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In historical Antalya-Kaleiçi houses, the rain waters at the terrace are accumulated from the drain pipes and used in cleaning chores. If this traditional re-use system of water is restored without eliminating it, it will be very helpful in terms of ecological benefits. While restoration works are carried out, although they are not economically feasible under today's conditions, it is appropriate to use the systems that produce hot water and electricity by benefiting from solar energy later on. Especially it will be of great use to provide the increasing energy need by means of solar energy for Kaleiçi houses which were begun to be used for touristic and entertainment purposes after 1970s.

#### **4. Discussion and Result**

Traditional architecture samples which have been built by the people after trial and error for centuries and with the solutions appropriate to the climatic and environmental conditions are highly appropriate to the ecological design criteria as structures and settlements peculiar to the district. In the study, Antalya-Kaleiçi traditional urban fabric was analyzed in terms of settlement structure, building form and structure cover, place organization, material choice, renewable, clean energy usage and water saving and usage and it was determined to have ecological, sustainable



settlement characteristics. However it is important to show that as a result of the mistakes in the restoration of the buildings used for touristic aims after 1970s and changes such as adding new necessary functions to the buildings and not taking care of the original structure and materials, the historical urban fabric of the city is now faced with the danger of losing its ecological feature.

Great care should be given in terms of financial resource, manpower, material and control for the buildings to be restored and repaired in accordance with their originals. Most of the historical urban fabrics have the criteria which can set an example for the designers for “creating the structure of that place”. However the buildings are faced with the danger of losing their originality because of the problems arise when the buildings are restored and repaired or their usage aim is changed.

The buildings which cannot be used because their form, function and construction balance lose its functionality in time can be re-used with the ecological architecture concept. However the form, function and construction balance of the building should be re-established based on today’s conditions. “ The architectural rules that can be applied during the re-use of ancient buildings are arranged by Dieter Hoor and Heinrich Reineras as follows: (1) To keep the original plan, cross-section and appearance in the original form (2) To keep the important characteristic features of the building and to provide that the additions to the building are used in harmony with the original form of the building (3) Only to protect the carrier constructions and to use the building by eliminating the distracting elements (Bozdoğan, 2003).

And also if the historical urban fabrics are aimed to serve for the tourism and entertainment sectors, then the following management strategies should be determined with a more planned and professional approach. (1) In order to record the efficiency of the process resulting from the tourism and the status of the touristic environment, reports of the indicators should be kept in an organized way. (2) An organized observation system should be formed to observe the water and air quality and the ecological environment. (3) A research procedure should be set for the annual eco-tourism indicators. The number of the research groups should be for objective and merely tourism-based ecological situation and the pressure. And later on the reaction measures should be taken (Li, 2001).

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