

**The Evaluation of Kayseri, Ağırnas Traditional Houses
in the Frame of Ecological Design**

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Abstract

As the result of intensive urbanization and construction activities, cultural historical environments are facing with the threats such as abandonment and deterioration. In this context, traditional housing areas are the mostly effected areas in the urban fabric. One of the most important responsibility of the communities is the preservation of natural & cultural values of traditional settlements as well as their memorial & symbolic values. So, planning and design processes must be based on ecological basis, and nature friendly approaches should be adopted to ensure the sustainable urban development as far as spatial and sociocultural factors are concerned. Traditional/vernacular architecture of the region was shaped due to environmental factors and ecological data throughout history which carries all the requirements of energy efficient ecological design. The most important reasons why settlements belonging to historical religions reached today is the formation of the buildings by using local material by using environmental sources efficiently. Ağırnas which is a sub settlement of Kayseri that is located on the east of the city centre is dating back to 3000 B.C. Ağırnas which was declared as an urban site that has to be conserved has been a settlement of various civilizations and cultures through history which is characterized by its traditional stone masonry houses. Societies that have lived in Ağırnas through history have built their monumental buildings and houses using natural stone and timber with appropriate techniques and structural systems. In this declaration, Ağırnas will be introduced with its natural and cultural qualities, landscaping features and urban characteristics. Then, housing areas & houses of Ağırnas are going to be evaluated in the frame of ecological design criteria. Besides, proposals for the sustainability of the ecological, spatial and socio cultural values of the local character & the settlement is offered.

Keywords: Ağırnas, traditional settlements, traditional Anatolian houses, ecological design, landscape design

INTRODUCTION

Mankind imitated nature while interfering nature in their physical surroundings throughout history. They used basic natural and local building materials that was supplied easily from their near environs (Erdoğan & Yıldız, 2017). Environmental conditions and the local structure are the main determinants in the formation of the traditional architectural character. Stone and timber are the most commonly used building material from prehistoric times to today as easily accessible, robust, recyclable, environmentally sensitive building materials that can easily obtained from local sources.

Most of the monumental buildings erected by different civilizations were built with stone and timber with different methods according to their usage have reached today.

However, cultural environments are faced with danger such as lack of care, abandonment as a result of the changing World so that cultural landscapes are transforming due to various reasons and the mostly effected areas are the traditional mostly effected areas are the traditional urban environments that are facing with dense building activities and urban developments. In this context, the effective use of resources and ecological design concepts with the aim of sustainable ecological design principles in traditional settlements are on agenda.

Nature-based ecological design can be expressed as an environmentally sensitive design approach aiming the efficient use of natural resources and the creation of optimum environmental conditions for living things in case of space organisation (Aklanoğlu, 2009). Ecological design is an organic and holistic approach that is primarily based on human health and human ecology. However, it's integrative and environmentally harmonious phenomenon using resources&building material efficiently in order to transfer them to future generations.

As the result of technological developments there are radical changes in urban environments and building activities giving harm to nature. So, the design principles of traditional settlements that were easily integrated with nature are taken into consideration in the design of actual urban environments. The spaces that contributed to the urban identity providing the integration of the city with the natural environment will be created by use of these criteria. In addition to the natural and cultural values of the historical cities, the preservation of the memorial and symbolic values they carry and their transfer to future generations is a necessity. The ecological, spatial and sociocultural sustainability of traditional settlements will be ensured by spanning the planning and design processes on ecological basis and the application of nature friendly design approaches.

Traditional/vernacular architecture having historical identity consists features that are shaped due to the environmental conditions throughout history protecting urban ecology, and compatible with energy efficient design principles (Tel Öztürk & Erdoğan, 2014). The most important reasons why settlements belonging to historical periods reached today is the way that they are utilizing the construction technology of their period using natural building material and environmental sources effectively (Tel Öztürk, 2014). In this context, Ağırnas Town which is a sub-settlement of Kayseri has traditional/vernacular houses built with stone by using environmentally conscious natural building materials protecting natural resources to a great extent.

In this decleration, first of all Ağırnas Town was introduced with it's natural&cultural values, landscape features were introduced. Than, urban fabric of Ağırnas&the vernacular houses were evaluated&criticised as far as local identity&design principles are concerned. And finally suggestions were offered for the settlement both in planning & design scales due to the urban&building analysis studies.

MATERIAL and METHOD

The main material of the research in Ağırnas Town is first degree urban and archaeological sites declared by the decision of the Regional Board for the Protection of Cultural and Natural Assets of Kayseri, dated 30.05.2002 and numbered 3018. Ağırnas is a sub-settlement of Kayseri situated in the middle Kızılırmak section of Central Anatolia Region (Figure 1), 26 km north-east of Kayseri Province, within the boundaries of Melikgazi District, 35° 31' east longitude and 38° 43' north latitude (Anonymous 2017a).

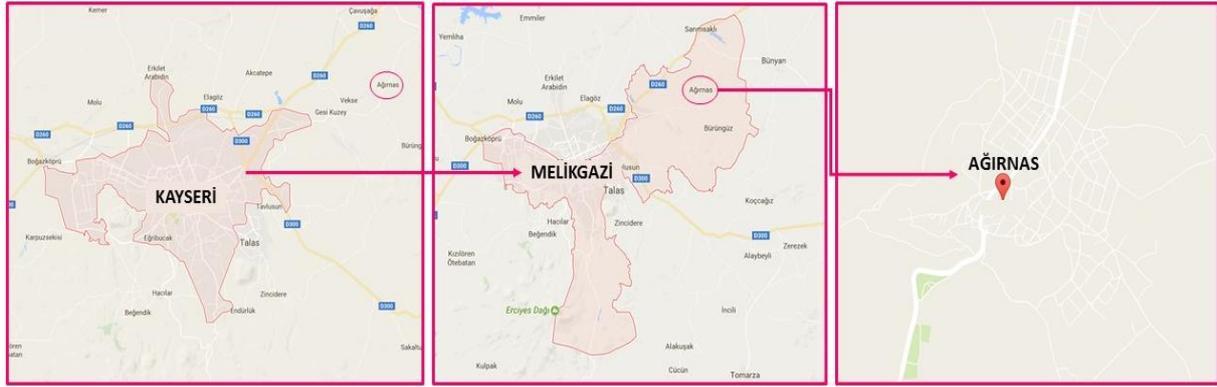


Figure 1. Ağırnas, geographical location (Anonymous 2017b).

Ağırnas, which is selected as the study area; is an Anatolian settlement built with traditional Ağırnas stone, that is situated on a rocky valley on the southern slopes of the Koramanlar Valley. The residential area is located above the underground cities formed by rock carved structures on the northern slopes of the valley in the vicinity of Ağırnas. Ağırnas is an important ecological source within the context of the microclimatic effects and the natural landscape characteristics; having the potential to sustain its presence as a sustainable settlement in the future near the Kayseri province and its ecological character has been effective in choosing the research area. The method used in the research has mainly three stages. At the first stage, natural, cultural values & landscape features of Ağırnas&it's near environs were introduced. At the second stage, national and international sources were evaluated in cases of ecological design, local identity and preservation of cultural landscapes. Besides, site analysis studies were held to determine the current situation, problems and potentials of the area and the reconstruction plan of Ağırnas at 1/1000 scale for the protection of the area obtained from the municipality of Melikgazi was searched. At the final stage, the present situation of Ağırnas Town; the urban fabric and stone masonry houses were criticised in the frame of ecological design and evaluated according to EU Sustainability indicators to set the requirements indicated. Then, suggestions have been developed with the aim of ensuring the sustainability of ecological, spatial and socio-cultural values of Ağırnas Town.

RESULTS and DISCUSSION

In this section, Ağırnas Town was introduced with its natural, cultural characteristics and traditional settlement pattern and Ağırnas houses built with cut-stone were evaluated within the scope of EU Sustainability indicators and ecological design criteria.

Natural Landscape Properties of Ağırnas Town

Although Ağırnas is a hot-arid climatic region which is cold and snowy in winter, warm and dry in summer with the influence of the Erciyes Mountain. It is a rural settlement where also a plateau climate is observed depending on its location. The warmest month is July whereas the driest month is August in the region with an annual average temperature of 18.9°C in which annual rainfall is 7 mm per m² (Anonymous 2017c). Erciyes Mountain located 54 km south west of Ağırnas is active 5-6 million years ago for about 100 years, is the highest mountain of Central Anatolia. Today, basalt and andesitic rocks as well as tectonic depression and elevated areas and 300 m thick volcanic tuff rock structure in yellow and white colors are present around 15.000 km² of the inactive volcanic mountain (Okyay, 2007).

Local yellow stones, which are easily shaped and easily carved for such stone work and decoration, have also been used in the traditional Ağırnas dwellings. Ağırnas settlement in Koramanlar Valley where the Akbin (Değirmenler) stream bed, flowing in the southeast-northwest direction, does not contain forests; there are rather sparse shrubs and grasslands in the depression basins and on the plain. In the region, there are often group of steppe plants that contain geven grass, shepherd's cushion, moss, lambs, cattle tails and poppy species. In other parts of the region, fruit trees, ash, linden, poplar and willow species as well as bushes are also encountered (Anonymous 2016).

Cultural Landscape Properties of Ağırnas Town

It is thought that the settlement history of Ağırnas goes back to the Late Hittite Period according to the data obtained from the archaeological excavations in the tumuliuses and underground cities. Communities that have lived in Ağırnas throughout history have designed urban spaces and traditional houses using yellow colored Ağırnas stone and timber with local construction technique which is stone masonry. As the area has been used as a settlement by different civilizations, the urban patterns were superimposed one another such as caves, underground cities, churches, and stone masonry houses on the north side of the Koramanlar Valley which is a first degree urban site. Meanwhile, original traditional Ağırnas houses built with cut stone were located on the southern slopes of the valley (Figure 2).



Figure 2. Ağırnas, traditional settlement texture (Original 2014)

Traditions, beliefs, local conditions, volcanic rock formations, climatic conditions, topographical structure have influenced Ağırnas' natural and cultural landscaping character as well as the formation of traditional settlement texture. Beginning from the southern slopes of the valley, the structures, streets and neighborhoods in accordance with the topographical characteristics and in organic form extends gradually towards the center of Ağırnas. There are 31 registered buildings consisting of church, residences, school buildings, “bezir seteni” (fabric production building), fountain and prayer hall within the boundaries of the Ist and IIIrd degree urban and archaeological sites. The streets, which are bounded by courtyards and garden walls of two to three storey houses were shaped and shaped by the cantilivers and balconies of the houses, are creating an organic texture that narrows and expands.

The most important open spaces that provide active and passive recreation opportunities to the local people are the squares that were formed by the intersection of streets

embellished with fountains in the urban texture. It is also possible to see "dead-end street" applications in the neighbourhoods where Ağırnas (tuff) stone is used as covering material.

The traditional street structure, shaped due to the topography in an organic form, has been closed down from its extreme points to ensure privacy and security, so that the street closed to general use has been turned into a special area for the use of a particular housing group. Streets are running parallel to the topography on the west-east direction whereas the houses were erected on the north-south direction to supply both sunshine to the houses as well as qualified ventilation.

The entrances of the houses to the courtyard were mostly supplied from north direction. On the other hand, the spaces of the houses were oriented to south in harmonious with the topography. The high walls of the courtyards provides houses both from sunshine during the summer months and cold winds during the winter. Besides, houses were built according to the dominating wind direction to supply air circulation&the inner spaces of the houses.



Figure 3. Traditional houses of Ağırnas (Original, 2014)

Because of the geological rock formations of the region, the volcanic tuff stone (Ağırnas stone) was used as building material and the floor coverings of the houses and on the courtyard walls. The near environs of Erciyes Mountain are rich in volcanic tuff rocks, which has a great load bearing capacity and suitable for carving. Especially in Ağırnas, tuff rocks have been used in the construction of caves, underground cities and traditional Ağırnas houses throughout history because of its easily processable nature.

Ağırnas stone is a tuff stone that has hardened after contacting with air and has a high resistance to cold weather conditions. Besides, this type of stone, which is an effective material in terms of insulation, ensures that the interior is warm in winter, and cool in summer. Thus, use of technologies such as air conditioners and refrigerators and their harmful effects to environment are eliminated. Therefore, it brings the effective user of energy as well as environmentally sensitive ecological design.

The number of open-green areas designed in the traditional city of Ağırnas, which is positioned according to the natural landform, is not much. However, in the Koramanlar Valley, the green vegetation around the Akbin Stream and its surroundings have an important potential in terms of ecology and recreation. The gardens and courtyards of the houses and the fruit gardens located on the south side of the settlement center constitutes the present green areas of Ağırnas. The surroundings of the Agios Prokopios Church and the Ağırnas Library were arranged as a green area after the restoration of the buildings (Figure 4).



Figure 4. Koramanlar Valley, Agios Prokopios Church and Ağırnas Park (Original, 2014)

The Evaluation of Ağırnas Town in the Frame of Sustainability Criteria of European Union (EU)

The main evaluation criteria for Ağırnas Town is the sustainability criteria of European Union (Aklanoğlu & Erdoğan, 2011) and its checklists. So that, Ağırnas traditional settlement pattern was evaluated in this context (Table 1).

Table 1. The Evaluation of Ağırnas Town in the Frame of Sustainability Criteria of EU

EU Criteria	Current Situation of Ağırnas
Sustainable Land Use	3006 inhabitants are living in Ağırnas. The settlement, buildings & landscape application have been developed according to the land form. The houses were integrated successfully as far as wind-direction, sun, topography, climatic factors & flora of the area are concerned. So that, the land was used effectively. Houses were built on the rocky land on the north side of Koraman Valley whereas agricultural lands, fruit gardens & the cemetery are located on the south side of the settlement area. Ağırnas Town fulfill the requirements of a sustainable settlement by it's textural qualities, topographic uses, agricultural lands supplying the food of the inhabitants and effective land use.
Traditional Houses	Houses were built with local cut stone masonry supplied from the region very easily which is an excellent insulator building material which can be considered as energy efficient. Besides, courtyards located in the centre of the houses used as the main space organizers act as microclimatic regulators both in summer & winter months.
Transportation and the accessibility to public spaces & facilities	Residential areas are situated very near the town center. So that, accessible to all facilities such as commerce, educational & health services as well as open green areas by pedestrians. So, there is no need for public transportation. However, Kayseri-Ağırnas Highway is passing through the I. Degree Archeological Site into two sections, and giving harm to the urban tissue. Vehicle traffic accessibility is good in the traditional settlement area supplied by narrow street pattern. The area is also suitable for bicycle transportation; however, it is not common in the town.
Air Quality	There is no measurement done in the town to determine the air quality. However, there is no industrial activity in the region as well as vehicle traffic to produce air pollution. Besides, the valley located on the south side of the settlement polluted air is transferred from the area by the help of the air corridor.
Waste Management	Wastes of the town are transferred to solid waste disposal area. Waste water is also drained to the sewage system. On the other hand, there is no recycling or waste cycling applications in the town.
Noise	There is no noise source in the settlement and it's near environs originating either from industry or traffic. Silence is one of the main characteristics of the area.
Sustainable Management of Local Authorities	There are some building & landscape activities in the town. Open green system of the settlement is supported with new design activities to upgrade the quality of the settlement. There are also restoration & rehabilitation activities in the 1st. Degree Archeological Site Area of Ağırnas. Heavy vehicle traffic is forbidden in the protected area to restrict the damage in the historical environment. Besides, the house of Architect Sinan was restored as well as his ?
Utilities supporting sustainability	There are many local Arts & crafts activities in the town such as stone masonry, stone carving activities, carpets, rugs, coppersmith, plastering. All these handicrafts and local artistic activities are supporting the sustainability and economy of the settlement.
Local participation for ecology	There is no special organisation or application related to public participation. However, local people are very sensitive to the ecology & the environmental resources. Local building material which is a volcanic rock is an excellent insulator. So that, the buildings are warm in winter & cold in summer months for energy saving and there is no need for extra climatization devices. Besides, hot water is supplied by the help of solar energy. On the other hand, underground structures & rock carved buildings are used as cold storage spaces for foods. Consequently, the settlement has a great energy saving capacity which is one of the main objectives of an ecological design.
Energy	
Use of Technology	There is no high technology in the settlement. However, basic technological requirements are fulfilled such as all electronic devices, cellphones & internet communication are available.

CONCLUSION

According to the research findings & site analysis studies; it is determined that Ağırnas is carrying all the qualities of an ecological settlement. The town is situated and developed according to the natural environmental factors in harmony with the existing topography. The building density in the urban tissue is low and in human scale with it is 2-3

story buildings. Besides, every building has its own open green space either in the form of courtyards or gardens which supplies private.

Open spaces to all buildings as well as its psychological & aesthetical values. However, the open and green areas needs aesthetical design approaches to improve the quality of the urban green areas. There is no comprehensive restoration activity in the registered traditional settlement area. Besides, some of the buildings that were restored are not qualified and some are in ruins. There are huge gaps in the construction plan prepared for the protection of the traditional settlement causing harm in the urban tissue in cases of ruined buildings and undetermined open spaces in the area. On the other hand, new building activities and attached spaces to the original houses done unconsciously cause harmful visual effects and damage to the original street patterns, plan schemes & facades of the stone masonry buildings. There is no conservation decision or proposal as far as open green areas, squares and plant material are concerned.

Furthermore, the underground cities located under the traditional settlement of Ağırnas restricts the plantation applications in the area. On one other hand, active urban green spaces that take place both in Koramanlar Valley and the town center are not distributed homogenously; on the other hand, sport facilities and related areas are insufficient.

Consequently, Ağırnas historical city centre and the traditional houses are carrying the criteria of ecological design which was shaped due to natural and cultural values of the region synthesized throughout centuries. However, new urban development & housing areas are disregarding these criterias. So that, new development areas attached to the traditional center and the buildings should be designed and built according to environmental factors and building material as well as actual needs of daily life.

In this context ecological design criteria for Ağırnas is as such:

- The conservation plan prepared for the Town of ağırnas should be revised in order to protect the existing environmentally friendly ecological urban tissue & vernacular houses of the region.
- Biological diversity & ecological richness of Koramanlar Valley and its near environs and the urban air quality must be protected, and improved by means of planning approaches & legislation.
- The agricultural lands located on the southern side of the traditional settlement must be protected to sustain their function and construction activities in these lands & its near environs must be forbidden legislatively.
- Only local stone should be used both in the traditional urban tissue of Ağırnas and the street coverings. Besides, sewage & drainage system of the town should be improved.
- Traditional Ağırnas houses that needs repair should be restored with convenient restoration approaches & techniques.
- All the buildings & houses should be restored with respect to their original plan schemes, facade elements building material and construction technique.
- The buildings lost their functions should be refunctioned and rearranged accordingly in a conservative approach.
- Ruined buildings in the vernacular urban tissue should be rehabilitated urgently. They can either be reintegrated or consolidated according to the data obtained.
- Landscaping or plantation in the traditional settlement should be combined with the cultural values and plant material that is going to be used should be selected from the species of natural local vegetation of the region.

- As there are underground cities under the vernacular settlement area; infrastructural applications & plantation should be done carefully in order not to give harm to the underground cultural assests.
- An integrative planning and design approach carved underground cities monumental buildings, stone mansory houses & plantation of the urban tissue to protect the urban silhouette & cultural landscape proprieties as well as original structural character of the town.
- The underground cities should be rehabilitated and consolidated to strengthen the carved structures and to keep it's originality.

As Ağırnas is a unique settlement with all it's urban and natural components; it must be preserved with special techniques to sustain the settlement and to transfer it to future generations with it's ecological, local, structural, traditional and aesthetical values.

ACKNOWLEDGMENT

This article was presented at the International Conference on Agriculture, Forest, Food Sciences and Technologies (ICAFOF) held in Cappadocia / Nevşehir on May 15-17, 2017 and published as a summary in abstract proceeding book.

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