Assessment of Thermal Tourism Facilities (TTFS) from the Perspective of Ecological Architecture - The Case of Eastern of Turkey

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ABSTRACT

Thermal springs located almost everywhere in the world; face us as different architectural works in different cultures, climates, topographies and materials. It is seen that some of these works were designed with a holistic approach to the natural environment. The most important output of the ecological architecture is the designs made specifically for the site where the facility is located. Region-specific design increases the value of the work. In this study, it is aimed to add to the literature, how to apply the ecological design parameters in Thermal tourism facilities (TTFs). A field study has been done for this. No previous studies on the selected facilities have been found in the literature. Therefore, this work is a unique study. Located in the Eastern Anatolia region of Turkey, Kös, Golan and Bagin thermal hot springs were found to be worth examining in this study because of the natural environment-friendly life. In this context, the existing facilities in the region are examined in the light of ecological principles and solutions are suggested about what should be considered in the way of being an eco-facility. First, natural environment data that are the most important parameters of ecology are examined. Information on the spatial use and physical condition of the facilities was determined by observations, interviews made with users and facility owners, photographs, sketches and architectural surveys. The information obtained reveals the ecological successes and failures of these plants. Thus, a guideline was created for the new facilities of the future. In this study, it is aimed that eco-identity of the regions with thermal source will be evaluated as an escape alternative from the city.

Keywords: Ecological architectural design principles (EADPs);Thermal tourism facilities (TTFs); Local architecture; Eastern of Turkey

INTRODUCTION

As the awareness of ecological problems in the world increased, so did the attention paid to tourism, and the way tourism has been viewed has started to change. Sustainability, conservation-use balance, diversification, complementarity, integration, competition, brand, image and etc. appear as the most mentioned concepts(Ataberk & Baykal, 2011). The saturation of mass tourism, the damages it has inflicted to the natural environment and the fact that tourists are headed for different attractions instead of sand-sun-sea and look for different excitements have brought the concept of "alternative tourism" to the agenda(Ataberk & Baykal, 2011). Alternative tourism is one of the concepts that are mentioned in the context of diversification of touristic products(Emekli & Baykal, 2011). Alternative tourism activities such as health tourism and eco-tourism have gone mainstream, forcing facilities to adapt. Parallel to the ever-changing needs of people, there has been an increase in recent years in the number of travelers for thermal tourism (TT) within the context of health tourism(Emir & Saraçli, 2011).

The human need for places that offer healing and rehabilitation through natural, thermal and mineral springs has been present for a long time, and its tradition is particularly established in Europe(Dimitrovski & Todorović, 2015). TT, which started in Europe towards the end of the 18th century to serve the needs of urban populations, is now a rapidly developing branch of tourism in Turkey. TT has recently become one of the most important recreational alternatives(Hsieh, Lin, & Lin, 2008)in Turkey. Many thermal tourism regions are being planned and modern TTFs are being constructed. Use of ecological designs(Calkins, 2005; Shu-Yang, Freedman, & Cote, 2004; Thompson & Steiner, 1997; Van der Ryn & Cowan, 2013; Yeang, 2006) in these efforts would ensure a healthier process of development for TT, and minimize the damage to the environment. Designers should strive for a fine balance between efficiency and use of resources in buildings. The contemporary architectural approach of "Less is more (Mies van der Rohe)" (Schulze & Windhorst, 2012) refers to decreased use of materials, energy, and water and soil resources, with a focus on comfort and design value.

The phenomenon of eco-thermal facilities are gaining attraction in many parts of the world. Turkey has yet to build many facilities, and the adoption of ecological architecture(Bicer & Ozlem, 2016)would increase its market share in this sector without compromising the rights of future generations.

This study examines sample facilities in the eastern part of Turkey, in line with selected ecological architecture design principles (EADPs), and offers solutions to the problems identified. The traditional and local architecture, which is being observed by a critical ecological perspective, is nearly an example for ideal ecological architecture. The reason of conformity of local architecture to ecology is the establishment of natural design process which is arising both by the universal relations of settlement and environment, and by the space and time experience of human through simple, but meaningful systematic relations. It also develops principles to be followed for the sustainable development of TTFs in Turkey. These principles can serve as a guide for new facilities to be built. The present study thus sheds light on design principles for TTFs.

ECOLOGICAL ARCHITECTURAL DESIGN PRINCIPLES (EADPs)

As we know, architecture is about creating a better living space for human life and development, as well as considering the nature and resources of the planet from a global sustainable perspective. Sustainable architecture must not solely become a question of CO□ emission reducing. It is necessary to consider sustainability from a holistic point of view that considers financial, cultural, and social issues as well as wider ecological and environmental aspirations (Li, 2011). The continued depletion of fossil energy resources and the increase of related emissions have comprised a major concern of sustainability action(Chan, 2012). There is a search for common architectural solutions to global problems such as global warming, environmental pollution, depletion of water resources and the disturbance of the ecological balance.

Environmental awareness and energy efficiency in architecture have become a major concern for designers and the emphasis laid on research of environmentally-economically appropriate buildings has increased(Abdelwahab, 2012). To be able to assess buildings in ecological terms, ecological building approaches first need to be identified. Ecological architectural design is an approach that considers human-nature interaction, regards climate and topographical data as essential givens, and tries to make efficient of use existing resources. This approach treats buildings as part of the world ecology and as living habitats. So TTFs are required to be evaluated in this context. On the other hand, it will be possible to make mention of a real ecological design through realization of designs considering the climate, natural formation, ecosystem, weather, earth and water sources of the location.

EADPs were selected from the related literature cited in this study(Abdelwahab, 2012; Canan & Varolgüneş, 2017; Erdogan & Tosun, 2009; Gómez-González, Neila, & Monjo, 2011; Lan, 2011; Varolgüneş, 2014; Verderber, Jiang, Hughes, & Xiao, 2014; Younesi & Roghanian, 2015; Yusof & Jamaludin, 2013). The EADPs were grouped under six mainand twenty-seven sub categories (Table 1).

Table 1 Ecological Architectural Design Principles (EADPs).

Main categories	Sub categories
1.Integrated with nature and environmental optimization	1.1.Topography 1.2. Climate 1.3.Architecture and landscape design 1.4. Coexistence between man and nature 1.5. Materials and technical selection
2.Energy Efficiency	2.1.Efficient use of natural light 2.2.Creating a green roof 2.3.Setting up solar energy absorption systems 2.4.Purchasing low energy consuming materials 2.5.Using the energy saving light bulbs in rooms
3.Water Efficiency	3.1.Using treated water in garden irrigation 3.2.Wastewater treatment 3.3.Using photocell water armatures 3.4.Using water-saving measures on linen change
4.Waste reduction	4.1.Solid waste separation at source 4.2.Creation of waste disposal sites 4.3. Purchasing materials with recyclable feature 4.4.Cooperation with recycling firms
5.Protecting the Ecosystem	5.1.Education and training for environmental awareness 5.2.Getting guest opinions about environment to hotel activities 5.3.Donation for saving wildlife, natural disaster 5.4.Organic fertilizer 5.6.Thermal source distance
6.Comfort Conditions	6.1.Thermal control 6.2.Ventilation 6.3.Natural lighting/ Shadowing 6.4.Acoustic conditioning

MATERIAL AND METHODS

Individual observation, project analysis and group interviews were conducted in Kös, Golan and Bagin thermal springs in Bingol, Karakocan and Tunceli, respectively, all of which are located in the Eastern Anatolian region of Turkey.Data on the facilities were collected via a field study. Photographs were taken and building surveys were undertaken by taking measurements at the units. After the interview session observation of the EADPs was carried out using checklist.Thus, guidelines were developed for new facilities to be built.The data collected were used to assess TTFs in Eastern of Turkey in terms of design principles, and the ecological strengths and weaknesses of the facilities were identified.

GENERAL INFORMATION ON THE STUDY AREA

The study area was selected as Kös, Golan and Bağin thermal springs in Eastern of Turkey, which are not well explored yet and maintain their ecological characteristics (Figure 1).

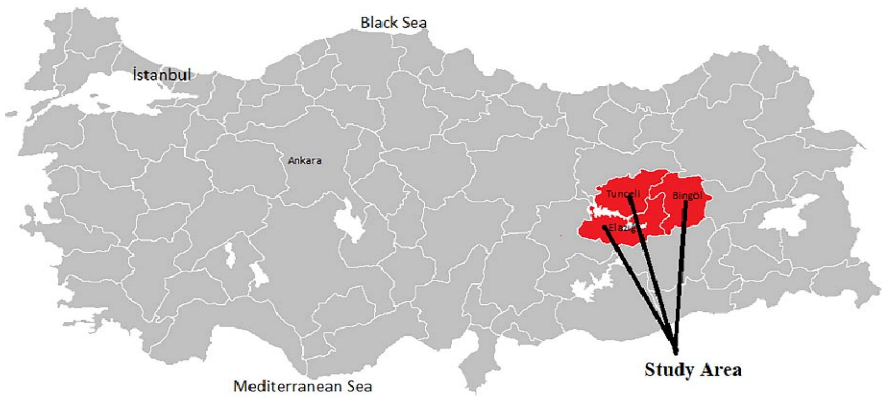


Figure 1 Location of Study area on Turkey Map

In addition to its thermal spring resources, this is also a suitable rehabilitation area for human health, thanks to its rich vegetation and natural beauties (Figure 2a,b; Figure 3a,b). The area’s rehabilitation value is increased since it is away from the city center and noise and air pollution are absent. In the facilities located in the study area; solar, geothermal, and bio energy are used as renewable energy sources. Studies are continuing for the use of geothermal energy in the Kös thermal spring. As a result of observations and studies carried out in the area, it was seen that there were very serious deficiencies regarding water reuse and waste recycling. It is very important that recycling conditions are provided in order for these facilities to acquire ecological characteristics and to provide the conservation of resources.

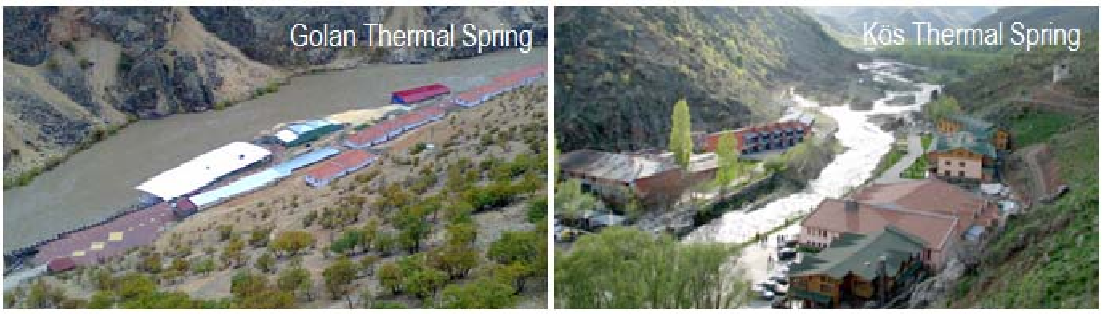


Figure 2 a, b The general appearance of the study area (Kös and Golan thermal springs)

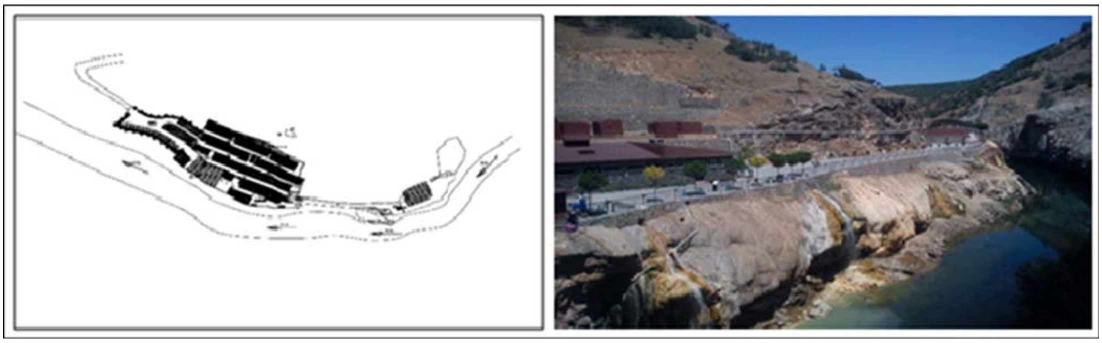


Figure 3 a, b Bagin thermal facility settlement

According to the investigations carried out in the three thermal spring regions, it was observed that the designs of the facilities consisted of a cure park, cure (therapy) units, and an accommodation unit center (Figure 4a,b ; Figure 5a,b,c). The ecological thermal facility development plan was prepared for all the three spring facilities. In all the three facilities, the cure (therapy) units were designed for separate use by women and men. It was observed that besides hotel type accommodation units, residence type accommodation units designed for families were also available. Facilities were designed as simple plan-type, small scale, compact and respected environmental boundaries in macro and micro scale.

Figure 4a, b The terrain settlement of accommodation units in the Golan thermal facilities

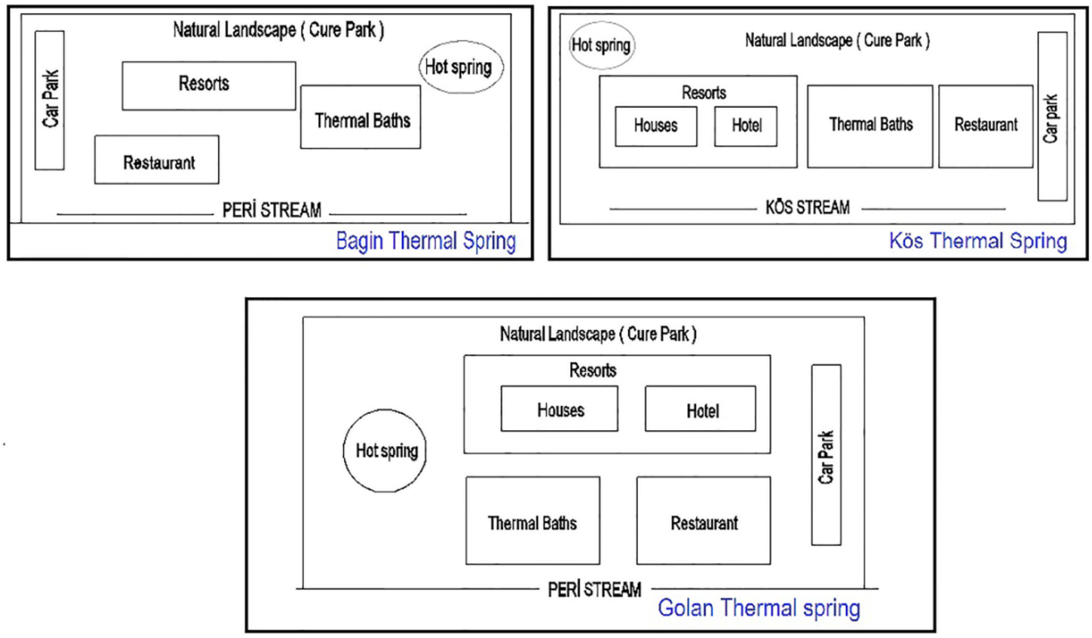


Figure 5a, b, cKös, Golan and Bagin thermals settlement plans

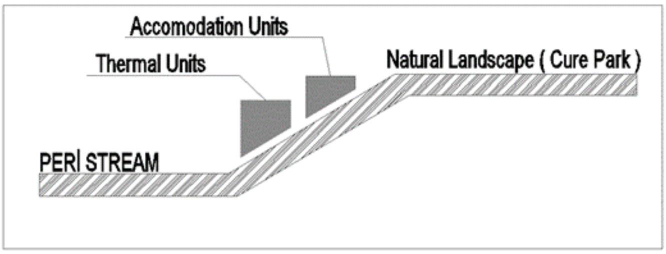
RESULTS AND DISCUSSION

INTEGRATED WITH NATURE AND ENVIRONMENTAL OPTIMIZATION

TTFs exist in almost all corners of the world. These facilities are in the form of different architectural works in different cultures, climates and topographies, built with different materials. These works usually have designs that are compatible with the natural environment. To create livable physical environments, people have created spaces using appropriate materials and construction techniques, building upon the experience handed down from earlier generations. The most important input in ecological architecture is that it should be unique to every region. This input adds value to the field studies conducted. This section presents the field study conducted in the facilities, provides an assessment of ecological principles in separate subsections, supported by buildings surveys and photographs taken, and makes a conclusion on the basis of the findings. First, elements of the natural environment, which constitute the most important parameters of ecology, were examined.

Topography

Locating the building in a way that minimizes disturbance to aboveground and underground resources and the existing terrain is one of the main principles of the ecological design approach. The study area has a very rough and high terrain. All three facilities in the area have good compatibility with the topography. The slope of the terrain was utilized in the construction of the facilities. To facilitate better integration of the units with the terrain, units were located separately from each other, and energy costs were minimized. Units of the Kös thermal resort were located side by side in the valley floor. Therapy units of Golan thermal resort were designed to be located at the spot with the lowest elevation in the area. Restaurant and cafeteria units, on the other hand, were located at a higher elevation compared to therapy units, with better views. The location of therapy units and pools by the spring ensures continuous circulation and natural cleaning of the water. However, the water disposed is not recycled. Accommodation units in the facility are located on the slope, side by side and facing the nature view. Units do not obstruct each other's view or sunshine. In the facility in Bagin thermal resort, the restaurant and cafeteria unit is located at the lowest elevation, right by the Peri stream. In this facility, therapy units are located at a higher elevation, making better use of the natural flow of the water. Accommodation units, similar to other facilities, are designed at an elevation higher than that of other units, with simple plans, small scales and compact build. As is the case in other facilities, little leveling was undertaken in the building of this facility, to better integrate with the terrain (Figure 6 a,b).



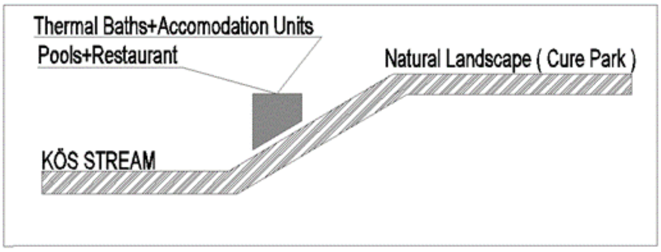


Figure 6 a, b Kös (below), Golan and Bagin (above) facilities terrain settlement plan

Climate

Climate conditions should also be taken into account when locating buildings in accordance with topography. Minimizing heating and cooling loads of buildings by optimum orientation plays an important role in the overall energy efficiency of a building. Facilities in the thermal resorts under study were situated by taking the Sun's position into account. Flexible and adaptable solutions have been developed to make optimum use of and get optimum protection from the sun and the winds in both summer and winter, from an energy efficiency perspective. The suns direction was taken into account in the positioning of the facilities present in the study area. In terms of energy effective approach, flexible and adaptable solutions were developed for protection/utilization of the sun and the wind during the summer/winter seasons. It can be seen that the building facades were oriented towards south and southeast, which are the most suitable directions. The accommodation and social units in the Kos and Golan thermal springs can benefit from sun light during the day. In the Bağin thermal spring, the space organization and the windows were designed to utilize the sun light.Since the facilities are located in a cold climate region, the design was prepared to include concepts such as maximum utilization of the warming effect of the sun during the coldest seasonal period, protection from wind, and containment of heat within the building.

Architecture and Landscape Design

Decades after the first energy crisis in 1970s, building energy efficiency has drawn attention for research all over the world. Buildings account for 30-40% of total energy usage, as well as emit 30% of CO□ (Chedwal, Mathur, Agarwal, & Dhaka, 2015)A simple form was used when designing the facilities in the study area, and the designs are successful in terms of employing principles of ecological design. For this reason, the carbon footprint is very small. Facilities in Kös, Bagin and Golan thermal springs have different architectural characteristics. However, all three provide a peaceful, relaxing and sustainable atmosphere to visitors with their nature-compatible architecture and the natural green areas surrounding them. The facilities have designs that are respectful of environmental boundaries. A cure (therapy) park, cure (therapy) units and accommodation units are the core units in the facilities. The units were built of natural stone, wood and brick materials. Therapy units of the facilities have square and rectangular designs. Our observations showed that roof slopes of these spaces, which have intense steam, were not designed appropriately. Because wet spaces have intense steam, therapy units with thermal pools should have designs featuring skylights. Roofs that are not vaulted or domed should have steep slopes to facilitate disposal of steam, and these building should have powerful ventilation systems. Steam control in the units is achieved by skylights and small natural ventilation holes in the walls (Figure 7a,b).

Figure 7 a, b Steam control in the units is achieved by skylights and small natural ventilation holes in the walls

Therapy units of Golan and Bagin TTFs are smaller in scale compared to those in Kös facilities. Therapy units of Golan and Bagin facilities have windows on the walls. These windows provide natural light and help with the control of steam and gas emanating from the thermal pools. In addition to natural lighting, there are niches in the lower and upper parts of the walls. It was observed that the hot water taken from the springs arrived at the thermal facilities in the study area with its natural attractions intact. Therapy units have plans that follow the direction of the flow of thermal water, with a steam room, which is the basic unit in thermal spas, a general pool, and bathing niches designed around this pool (Figure 8).

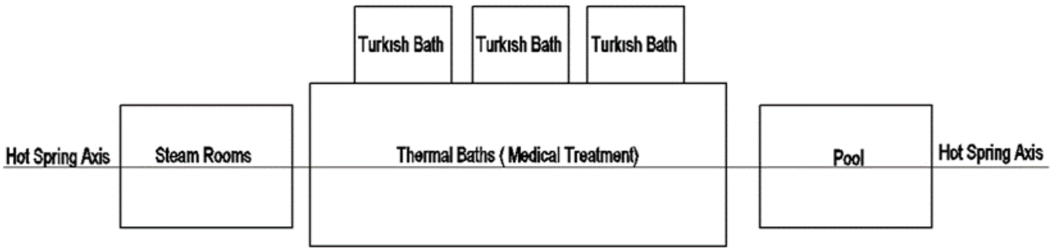


Figure 8 The cure (therapy) unit that was designed along the hot spring axis

Thermal water should enter the building via the steam (sweat) rooms. This way, hot water will create intense steam in the first room it enters, and will flow to the pool inthe warm area with a lower temperature. Thus, the water in the pool will have a temperature suitable for bathing. The temperature of the thermal water will have dropped gradually, shaping the spatial design and overall arrangement of the building as well. Functional chart of the therapy units can be developed on this basis, taking different needs into account (Figure 9).

Accommodation units are just as important as bathing units in a thermal spring units.

This is because, to be effective on human health, hot water needs to be used on a regular basis, at least twice daily, for a period of 21 days(Karagülle & Doğan, 2002). Accommodation units of the facilities in the study area have simple square or rectangular designs, small scales and compact build. For energy conservation, the units were designed to min. heat gain on hot days, and max.heat gain on cold days. The internal space was used efficiently, avoiding unnecessary volume. Accommodation units of Kös TTFs were built of wood and stone materials. Therapy units of Golan and Bagin facilities, on the other hand, were made of stone and brick material. They have sufficient internal lighting, and offer necessary comforts.

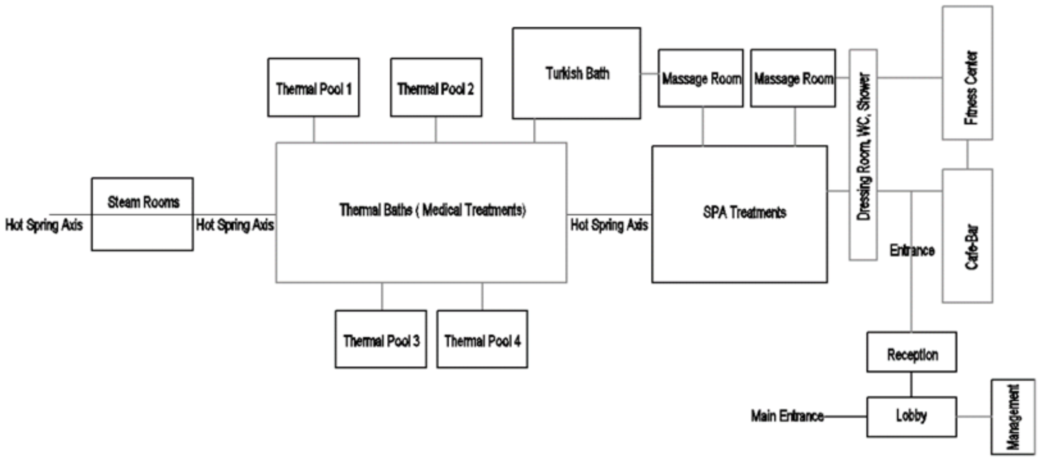


Figure 9 The proposed cure (therapy) unit design along the hot spring axis

Landscape design is another factor that needs to be taken into account for efficient utilization of the building site. In addition, ecological design requires protecting and adding to existing green space. In the study area, more than 50% of the terrain was designed as open landscape to preserve and improve bio-diversity. Plants resistant to the cold climate were preferred for the landscape. These plants protect the exteriors of the buildings from sunshine during summer, and allow direct sunshine to enter the buildings during winter.

Materials and technical selection

Considering the relationship between ecology and materials, wood is one of the main materials that are perfectly compatible with ecological design criteria. As a natural raw material requiring minimal energy input into the process of becoming construction material, timber represents one of the best choices for energy-efficient construction, since it also functions as a material with good thermal transmittance properties if compared to other construction materials. Moreover, it plays an important role in the reduction of CO2 emissions, has good mechanical properties and ensures a comfortable indoor living climate(Leskovar & Premrov, 2011). Wooden material was preferred in some of the units in Kös TTF. An important factor in the construction of ecological buildings is that all materials should be locally sourced (Figure 10a,b; Figure 11a,b).

Figure 10 a, b The settlement of the accommodation units in the Kös TTFs

Figure 2a, b The interior view of the cafeteria (Kös TTFs)

Data on the structure of the facilities and the materials used were collected via analyses conducted in the area and interviews with owners of the facilities. Use of natural and local materials (stone, sand, brick) and a nature-compatible design is in line with principles of ecological architecture. Stream stone from the Kös stream were used in the construction of the bathing (therapy) units of Kös facility. The stone material used ensures that the building is compatible with nature (Figure 12a,b).

Figure 3a, b Stone utilization in the Kös thermal spring cure unit exterior

Golan and Bagin TTFs were made of local stone material only (Figure 13). Overall, natural and local materials were used in the construction of TTFs in the study area. Planned as ecological buildings, these facilities are unique and compatible with the environment with their materials and philosophy. In Bagin and Golan TTFs, bio-fuel is used for heating, helping with the protection of agriculture and forestry in the area. Dry oak branches are used as a source of energy. Most of the goods and services offered to customers by TTFs in the study area are based on local and organic products. Sales of local handicrafts would contribute to the financial well-being of the local community.Useof materials that do not exist or are not produced in the region where the building is to be constructed will result in unnecessary energy expenditure for transportation.

Figure 4 Bagin thermal pool

Energy Efficiency

There is a perfect balance between the human beings and the environment. Therefore, it is possible to live in harmony with nature without wasting the opportunities and giving harm to the nature unless its principles are taken into consideration(Ozay, 2005). Thanks to theirfeatures, ecological buildings create spaces that offer a high quality of life. The energy conservation, clean air and water, risk prevention, waste reduction, preservation of natural species etc, are among the effective strategies (Abdelwahab, 2012) for the eco-buildings. Building materials that are nature-compatible, do not pollute the environment, are recyclable and do not harm human health are an integral part of ecological design. The main goal in ecological architecture is to reinterpret the nature with a new architectural approach, at the same time preserving the natural state of the environment. In terms of energy effective approach, flexible and adaptable solutions were developed for protection/utilization of the sun and the wind during the summer/winter seasons. It can be seen that the building facades were oriented towards south and southeast, which are the most suitable directions. The accommodation and social units in the Kos and Golan thermal springs can benefit from sun light during the day. In the Bağin thermal spring, the space organization and the windows were designed to utilize the sun light. The used materials are specific to the region and can be easily acquired. The utilization of these materials has contributed to the protection of natural resources.

Water Management

For landscape irrigation, water is brought from the Kös stream in the Bin-Kap thermal facility of Kös thermal springs. Instead of this method, landscape irrigation using rain water collection channels can be more effective with respect to protecting the level of groundwater. When the roofs of Golan and Bağin thermal facility accommodation units were observed, it was seen that rain water collection channels were available. As a result of inspections, it was identified that this system was very simple and was constructed with primitive methods; the size of the tubes was not sufficient in some locations and these did not provide a solution for the storage of rain water. The rain water which is collected from the roof surface has to pass through filters in the gutters and then has to be collected and stored in the rain water reservoir. It can be seen that utilizing the solar cells in the roofs of all three of Kös, Bağin, and Golan thermal facilities, the energy necessary for the hot water used in their accommodation units is obtained. Biological therapies are carried out in the facilities utilizing the pure hot water resources and without any additional chemical based therapies. The utilization system of the thermal waters was planned to protect the natural water conditions are protected.

However, the discharged water is sent to cesspools through tubes. Constructing a system that will provide the recycling of the utilized thermal waters is essential for the ecological sustainability of the facilities. The installation of a system that will provide the recycling of the discharged water and a waste disposal system that will provide the recycling of solid organic wastes will ensure that the facilities acquire a complete eco-identity. Informing customers about water and electricity use and placing the necessary warnings in a written form at specific locations in the facility will ensure water and energy saving and will increase the efficiency.

Waste reduction

In the inspections that were carried out in the facilities, it was observed that there were serious deficiencies in terms of environmental pollution and waste management in these. In the process of architectural design, for the realization of waste management; the designer should consider preferring recyclable and reusable materials, collecting and storing wastes at specified points, and utilizing the stored wastes for the building’s needs such as the heating systems in order to obtain outcomes in terms of ecological architecture design criterial. In addition, during the observations, it was determined that vehicles could access all the units in all three facilities. This results in increased CO_2 emissions. During facility design, while preparing the layout plan, vehicles and similar pollution sources should be kept out of the facility whenever possible; however, when this is planned, the access of handicapped individuals should be also considered.

Protecting the Ecosystem

In general terms, awareness on ecosystem and cultural asset protection has not been created in the facilities. In thermal facility designing, emphasis should be placed on designs that do not harm the natural environment. The designs should be prevented from being a power that eradicates wildlife and should be made harmonious with the environment. It is possible to use design as a power, which protects the nature, by complying with standards that will be developed for this purpose. Facilities have to take measures and carry out studies to prevent the environmental pollution, which destroys the ecosystem. The diversity of the surrounding flora and fauna should be protected.

Comfort Conditions

Bad weather conditions, toxic substances, the absence of sunlight or extreme noise have permanent health effects. Besides creating environmental problems, polluted indoor air also has a direct effect on health. For the creation of healthy indoor environments the objectives should include: protection against outdoor air pollutants, control of pollutant formation within the building, protection against radioactive emissions, utilization of building materials that do not contain toxins, designing the building so that it can receive adequate amount of sunlight, and considering the principles of protection against excess noise in the designs. It was observed that the comfort conditions were generally met in the facilities.

GENERAL EVALUATION

Parameters of ecological architecture were examined on an individual basis in the study area. Table 2 reports the results.At the end of the detailed studies in the study area, the three facilities were evaluated according to the ecological principles grouped in 6 main and 27 subcategories determined in Table-1. Performance ratings of 1 to 5 were given in this evaluation. 1 has the lowest performance value, while the 5 has the highest performance. Each category was scored separately. Looking at the group average and general average, it is seen that the average of the three facilities is above 3,50. As a result of this evaluation, the obstacles in the way of being an ecological establishment will be eliminated by determining the issues that the facilities are missing. In addition, it has been determined that the ideas of the traditional architect can be taken for the design of the new thermal facilities.

Table 2 Case studies analysis of EADPs

No	EADPs	Kös Thermal Spring	Golan Therma l Spring	Bagin Therm al Spring
1.	**Integrated with nature and environmental optimization**			
1.1.	Topography	5	5	5
1.2.	Climate	5	5	5
1.3.	Coexistence between man and nature	5	5	5
1.4.	Materials and technical selection	5	4	4
1.5.	Architecture and landscape design	4	4	4
	Group mean	**4.80**	**4.60**	**4.60**
2.	**Energy Efficiency**			
2.1.	Efficient use of natural light	5	5	5
2.2.	Creating a green roof	1	1	1
2.3.	Setting up solar energy absorption systems	2	4	3
2.4.	Purchasing low energy consuming materials	4	4	4
2.5.	Using the energy saving light bulbs in rooms	5	5	5
	Group mean	**3.40**	**3.80**	**3. 60**
3.	**Water Management**			
3.1.	Using treated water in garden irrigation	5	5	5
3.2.	Rainwater harvesting	2	3	3

3.3.	Using photocell water armatures	1	1	1
3.4.	Using water-saving measures on linen change	5	5	5
	Group mean	**3.25**	**3.50**	**3.50**
4.	**Waste reduction**			
4.1.	Solid waste separation at source	3	2	2
4.2.	Creation of waste disposal sites	4	4	4
4.3.	Purchasingmaterialswithrecyclablefeature	3	3	2
4.4.	Cooperationwithrecyclingfirms	1	1	1
	Group mean	**2.75**	**2.50**	**2.25**
5.	**Protecting the Ecosystem**			
5.1.	Education and training for environmental awareness	4	2	2
5.2.	Getting guest opinions about environment to hotel activities	5	5	5
5.3.	Donation for saving wildlife, natural disaster	5	5	5
5.4.	Organic fertilizer	5	5	5
5.5.	Thermal source distance	5	5	5
	Group mean	**4.80**	**4.40**	**4.40**
6.	**Comfort Conditions**			
6.1.	Thermal control	5	5	5
6.2.	Ventilation	3	4	3
6.3	Natural lighting/shadowing	5	5	5

. 6.4 .	Acoustic conditioning	2	2	2
	Group mean	**3.75**	**4.00**	**3.75**
	Total mean	**3.79**	**3.80**	**3.68**

Findings from the ecological assessment of TTFs in Golan, Bağin and Kös thermal spring region can be summarized as follows: The construction of the facilities was in line with geographical features. The buildings were mostly made of stone, wood and bricks. The materials used were local materials, easily available in the region. Use of these materials contributed to the preservation of natural resources. Geographical features were taken into account in site selection as well, and topography, terrain orientation, natural landscape and climate data were used in line with principles of ecological architecture. Because the region is rich in water resources, deficiencies were identified in rain water collection systems, recycling of thermal waters, and purification and recycling of waste waters in the units. Removal of these deficiencies would contribute to water conservation. Transfer of thermal water to the facilities via their normal flow as a result of sloped terrain is a good practice in terms of resource conservation, energy conservation, material conservation and the protection of the ecosystem. Ecological design can be achieved with proper spatial arrangement. The diversity of flora and fauna in the area was protected because the facilities have designs that are respectful of the natural environment. Lack of a waste sorting system and failure to reuse waste is a weakness in terms of ecological design principles. Facility managers would be well-advised to pay more attention to these issues to achieve ecological designation indicate that the ecological footprints of water and waste disposal as also pertaining to the accommodation sector (Chen & Hsieh, 2011).

CONCLUSION

Golan, Bagin and Kös thermal springs in the Eastern Anatolia region of Turkey, with pristine resources, follow principles of ecological design in their plainest form. These TTFs do not make much use of technology, and for greater ecological achievement, traditional and modern methods should be used in a delicate balance. On the basis of the data collected and assessment made, it is recommended that features of the natural environment be taken into account in the design of TTFs, as well as vegetation, open air recreation opportunities, natural attractions and any potential downsides. Tourism attractions of the locality should be identified, and decisions should be made concerning which alternative tourism activities to offer in the facility. Facilities should be located in areas with lots of trees. In addition to thermal therapy, facilities should offer climate therapy, nature walks, and sun bathing opportunities. An inventory should be made of the flora and fauna in the vicinity. The design should respect environmental boundaries. What connects a building with its environment and with nature is the terrain. The correct orientation and positioning of a building on the terrain is only possible after analyzing terrain characteristics. Every TTF should receive green building and eco-building designation. In addition, to preserve the ecological balance, training activities should be organized for young and adult visitors, in cooperation with other tourism actors and local organizations. Visits should be organized to historical, social and cultural sites in the city so that visitors can make good use of their time outside therapy. Walking trails and recreation areas should be created within the TTFs. Whilemakingarrangements for human health, the health of nature should also be protected. Ecological buildings minimize their energy needs with design features and materials used in their construction. Given that about half of all energy consumption in the world takes place in buildings, every measure to minimize energy consumption is important to improve our living conditions.

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