Students' quest for sustainability

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Abstract

Sustainability was an umbrella term in a design studio in one of the architecture schools in Turkey. Students were offered a site on the flat plains of Central Anatolia. The objective of this paper is to depict certain design propositions that investigate sustainability in cultural facilities reinterpreting the organizational and spatial structure of the existing surroundings. The students were asked to design a project focusing on the following issues:

- To design a culture complex or building near the existing fabric of an ecology-friendly "Village Institute" on the site, these institutes being widely acknowledged as a significant attempt of the early years of the Republic to create an integrated education and production system in Anatolia.
- To develop a spatial program to discover new potentials for a contemporary culture complex, providing its users with a maximum of outdoor facilities.
- To foster a design for a zero-carbon environment through recycling the water of the nearby river and through waste management and the design of an eco-farm, balancing strategies for emission and dispersion on the site.

Examination of the integrated system of the institutes, which fits with the distinct character of the place and the global culture and environment, laid the groundwork for the design solutions. Ultimately a site visit, discussions with experts in the studio, research studies and a series of workshops allowed for very fruitful propositions. These projects also incorporated miscellaneous eco-strategies discussed in the studio toward the goal of a zero-carbon environment.
Keywords: architectural design studio, village institutes in Turkey, awareness in sustainability.

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1 Introduction

As with a number of regions in the world, Istanbul and the other large cities of Turkey have also suffered their share of environmental pollution and planless development. In this experimental project, students in the diploma design studio at the Yildiz Technical University School of Architecture in Istanbul worked up environmentally friendly projects and did research on the concept of sustainability. The project was carried out in the village of Hamidiye, situated 42 kilometers south of Eskisehir, a city in Central Anatolia. In addition to what they had seen in architecural journals, observed in the course of field trips or attempted to capture in terms of modern architectural aesthetics, the students were encouraged to observe their surroundings in the village site which had been offered to them, to grasp the campus of the "Village Institute" which occupied it, and to employ sustainable strategies in the project they designed. The students themselves worked out the program for the cultural complex which was their design assignment. In the process they visited the neighboring village institute, chatted with its graduates, and in meetings and seminars studied the curricula of the institutes, which left their stamp on one period in the history of the Turkish Republic [1]. As a result of their research and observations, the students took as their point of departure the environment-friendly principles of planning followed by the village institute campus until 1954, the year the institutes were closed, and they arrived at the conclusion that after said date the campus, which under a new administrative structuring had continued to fulfill an educative function, had seen its harmony of nature and plant disrupted due to the addition of new buildings. In their design project the students therefore took as a model the pre-1954 state of the existing campus, which was still a home to education and living. This model called for the low-density, fragmented arrangement of buildings which were a planning principle of the pre-1954 campus, as well as recycled use of water from the Seydi Suyu creek, a balance of emission and dispersion on the site, and the use of agricultural areas as an eco-farm, the hallmark of the effort being that cultural projects have a zero-carbon framework rather than using up the environment.

Being well aware of the fact that contemporary design problems cannot be limited to a specific building program and creation of a perfect form, or the planning of an artistic event, the students were not only asked to meet the space requirements but also to grasp the structure of an ecology-friendly institution as well as the place, and in the light of analysis and assessments to develop ideas through an integrated design approach. Thus, the objective of the studio was grounded in the exploration of interrelated systems while creating a new cultural context.

The process, in which academicians from various universities took part as well as experts from interdisciplinary fields, students, and representatives from non-governmental organizations dealing with village institutions, commenced with the presentation of the subject and a site visit. Ideas emerged in subsequent workshops, preliminary studies and lectures, with critiques being developed throughout the process.

Ultimately there emerged design behaviors which can be listed, from the standpoint of sustainability, under certain headings. In this paper priority is given to describing the site plus the village institutes and their importance; then there is a presentation of the design criteria deemed necessary by the participants; and finally the solutions incorporated in the designs are given in a classified manner and reassessed in terms of sustainability.

2 The significance of village institutes and the place for the creation of a sustainable environment

The village institutes were an advanced mode of organization involving the vision of a hybrid order which today can be seen only through experiencing it. This mode of organization brought together rural and scientific knowledge as well as rural and urban culture through the creation of an environment in which they were actually applied. In the present project, students were offered a site in a rural part of Eskisehir Province, one where an example of these institutes had been built. That such a place had been chosen as a project site automatically brought up a question: Apart from invoking contemporary architectural solutions to create a sustainable environment, could a consistent but now abandoned system be revived thanks to this project, and its strong, ecological features be used as an opportunity?

The basic aims of the Village Institutes were to interface the fragmented and impoverished social, economic, educational and physical patterns of the country, to improve the qualities of these in concord, and to modernize social relations by educating young people in rural areas using the approach of *learning through doing*. "This project aimed at 'making the steppe green' and it succeeded in doing so" Baran and Sahin [2].

Figure 1: The Village Institute buildings with the project site.

This system was followed in 21 centers located in different parts of Turkey from the 1930s until 1954, when for various reasons it was abandoned. The Cifteler Village Institute campus too, where the students carried out their project, at this time underwent changes parallel to those being made elsewhere in the

educational system and lost its function. This campus occupies an area of 2,500,000 square meters of land west from the village of Hamidiye at the junction of the Eskisehir-Konya and Eskisehir-Ankara highways. Its buildings are grouped around an axis running northwest to southeast and entered from the highway which constitutes the western border of the campus. Housing units stand near the entrance on either side of a road defined by dense poplar trees. The road crosses a bridge over a creek called Seydi Suyu and reaches a square which is the general gathering place and surrounded by buildings for instruction, dormitories, a mess hall, a gym and shops. Continuing southeastward from this square, the road eventually reaches the village of Hamidiye. In later years a pool was removed from this central gathering area and replaced by a high school building. The instructional buildings and dormitories are bounded on the north by a hill, while an axis designed to be perpendicular to the road continues southwestward before reaching land to the south which is currently used for agriculture. The students were given, for their project, a triangle of land bordered by the highway to the west and by this axis running southwest. The power plant to the east of this site was built by students in the 1940s, and using water brought from Seydi Suyu by a canal produced electricity to meet the needs of the campus. Looking at the buildings individually one notes a preference for separated structures having few floors. Constructed using a solid block bearing system and with sloping roofs, these buildings are made of local materials in line with the general fabric and architectural practices of the nearby village. Examination of the integrated system of the institutes, which fits in with the distinctive character of the place and the global culture and environment, paved the way for the various worthwhile design proposals.

3 Basic requirements and design criteria

As not only the preservation of a physical entity but also of an existing fund of knowledge, conservation was suggested as one principle underlying sustainability. Thus it was stressed that the students should understand the existing structure as a whole both organizationally and spatially, and that sustainability should be grasped with all its components, ecological, cultural, spatial, economic, political and the like, while an analysis was requested of "the place together with the Village Institute compound, which was the structure that had chosen that place for itself precisely because of its characteristics."

As a result of research and studio discussion [3], Zweibel *et al* [4, 5] the matters which the students were asked to consider in developing their design are listed below:

1. Through sustainable site planning and architectural solutions to arrive at solutions requiring a minimum of earth removal, to prevent runoff of rainwater, to conserve open areas, and to prevent erosion
2. To avoid adverse effects which would act on existing farmland if new functions were assigned
3. A minimum of intervention in the natural environment

4. Proper orientation to derive maximum benefit from the natural features of the site—topography, sunlight, shade and breezes
5. To avoid the formation of heat islands which might threaten the micro-climate of the environment
6. Making choices which reduce the consumption of fossil fuel, using renewable energy sources, consuming as little energy as possible, stressing natural light and natural air conditioning
7. Choice of suitable building materials (such as local, renewable, sturdy materials which require a minimum of upkeep)
8. A rereading of the village institutes and of the extant example on the site
9. Using modern technologies to reinvoke the principle of self-sufficiency contained in the village institute philosophy, along with producing one's own energy largely from natural resources to revive the idea, held at the time the institutes were opened, that this energy would contribute to the exploitation of the nation's and the region's natural resources, all constitute an answer to the question, "What would the village institute concept be like if it had been implemented today?"
10. Frugal use of resources: Preference for a conservative approach harboring innovation (preservation of existing buildings and principles, plus using and recommending such strategies as recycling and flexibility)
11. To work up solutions which would limit the impact of the highway passing by the western tip of the site while reducing the release of exhaust in the campus—to consider this criterion in solving the problem of in-campus transportation and parking.

4 Students' design intents to contribute toward the creation of a sustainable environment

Some of the principles envisaged in the creation of a consistent environment as observed in the students' designs can be collected and instanced under the following headings.

4.1 Reinterpretation of the existing fabric and of the material

Having been constructed using local materials, with the planting of trees (especially species such as poplar which are of economic value) and the production of their own electricity, the village institutes offered a range of evidence pointing toward a self-sufficient or self-contained system. This attribute might to some extent be considered as an indication of the quality of sustainability. The students' designs were required to follow the spatial and organizational system of the village institutes. It was the students who asked that the main heading for their projects be "a sustainable cultural complex." They defined it and outlined their architectural programs themselves. The students' projects may be grouped as an agricultural research and education center, a handicrafts research and education center, a musical education center, an

archeological museum, a science center, a model airplane center, and a conference center. The chief functional areas designed within these scopes can be listed as exhibition areas and a library, conference facilities, education and research centers, social areas and open areas, accommodation units, greenhouses and educational fields, service areas, and car parking.

A look in greater detail at the different examples with a project base reveals that a mission similar to that of the village institutes is implicit in the design of the agricultural research and education center, which creates an environment for development and the sharing of knowledge so that new technologies can be employed, the soil conserved, and sound crops grown. Designed by Aysegul as an organic agricultural center, the project with its scattered buildings around a central pedestrian area brings together a variety of functions. The scattered configuration in this project also allows for independent use of the units. It was thought that the matter of accommodation for people coming from the city to take part in organic farming could be solved by assigning new functions to existing buildings. Burcu's agricultural research center project brings together meeting functions, shops, an administration center, laboratories and classrooms in a linear arrangement parallel to the highway. Emel's project, a handicrafts research and education center, maintains the dispersed composition of the existing buildings, and calls not only for glass and wood items, both local handicrafts, but also for exhibition halls, boutiques, and shops to carry out meerschaum carving and sales.

4.2 Site planning, building configuration and orientation

Existing buildings have generally been preserved on the site, with new buildings suggested observing a certain distance. The element of water on the site was employed both visually and as a utility. By setting up parking lots along the borders of the site for vehicles entering from the highway, which is the chief means of access, entrance was restricted for vehicles burning fossil fuel, apart from shuttles. In orienting buildings an attempt was made to achieve optimum orientation so as to make use of sunlight. The locality has strong, cold winter winds, so designs included vegetation, walls and windbreakers. In doing this, care was taken to stay with plant species native to the locality.

In the Music Education Center designed by Ece, it is proposed as an alternative to fossil-fueled vehicles that recourse be had to walking, bicycles and mass transportation. Also seen in all the projects is a general gathering area and a building solution that involves a courtyard plus square envisaging dispersal from that area to the related units. The advantages this entails stem from a desire to protect against the road, which is a source of noise and exhaust pollution, and to provide for an appreciation of the architecture in all its components.

However much it may conceal its spaces, with the novel geometries it develops on the site Ekin's archeological museum project emphasizes the extranatural hidden in the natural. Being subterranean, this project uses the heat of the earth as thermal mass in answer to climatological changes. In some projects stress has been laid on orienting and giving form to the buildings with an eye to the direction of the wind, thus aiming to minimize the use of energy.

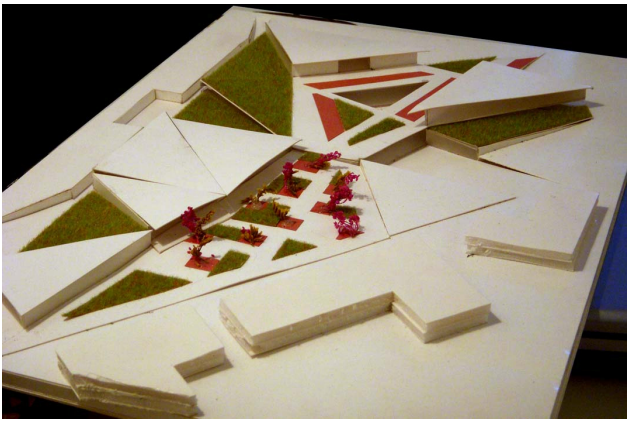

Figure 2: The extranatural hidden in the natural.

4.3 Steps taken to prevent the formation of heat islands

To reduce the heat island effect project designs called for the planting of additional trees to create shady areas, while an attempt was made to take measures which would reduce the number and size of areas with a hard surface. Measures were sought in the projects to keep to a minimum both the effect of heat radiation from surfaces warmed by the summer sun, and also the consumption of energy expended for the sake of cooling.

The archeological museum design on the site preserves the existing entity unchanged, being situated on axes extending horizontally from the latter. Maximum use has been made of sunlight, while to reduce the adverse effects of reflection the design features sliding green roofing and, for exhibitions plus other activities, the creation of open interior gardens.

4.4 Measures to reduce the use of fossil fuel and employ sources of renewable energy

In their designs, students came up with ideas toward the use of renewable energy sources. Exploring strategies of passive solar heating and cooling, in their projects they employed a range of strategies such as the Trombe wall and double envelope, and they investigated ways to integrate active solar systems and photovoltaic systems into their plans. To this end the south facade wall in one project was designed as a Trombe wall, while the north facade was kept as a solid surface.

In the agriculture center project, with its linear masses extending parallel to the highway, the concepts of agriculture and a green environment were incorporated in the roof of the building. This roof shell, thanks to solar energy systems positioned on suitable surfaces, aims to produce essential electricity for the cultural center to reduce the HVAC and lighting loads. The roof shell also has some surfaces that serve as green spaces, connected to the indoors. The rainwater collected from the shell surface is used in wet areas and in the irrigation of farm land.

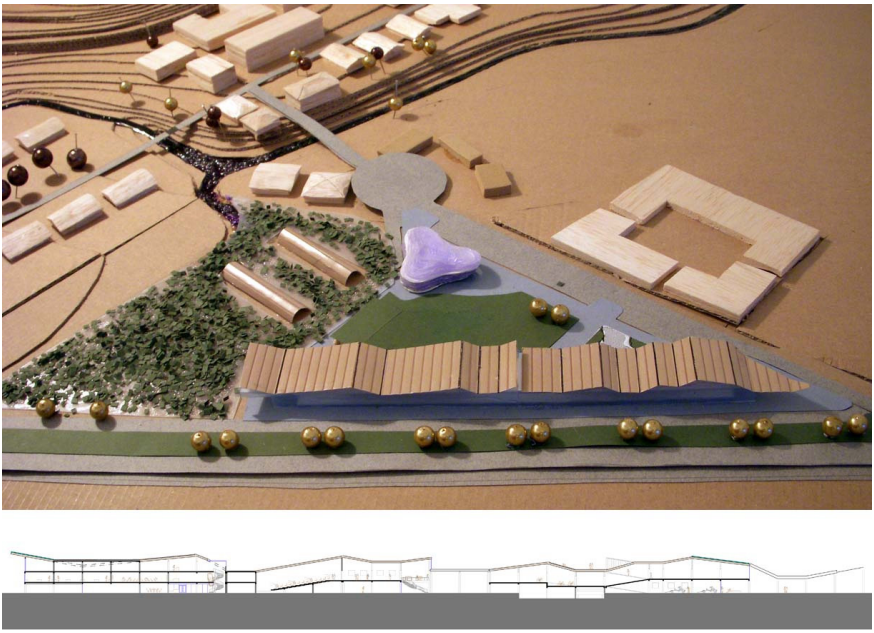

Figure 3: The PV panels in the linear roof shell.

Some projects envisage the use of geothermal energy for heating in the winter months. During that season, when the air temperature is four degrees centigrade outdoors, five meters below ground the temperature is about ten degrees. The air to be warmed is first passed through the earth and thus brought "naturally" to 8-10 degrees, only then being fed to the system. In the summer, on the other hand, the air temperature outside is 32 degrees, while the temperature five meters underground is 12-15 degrees. Before entering the air conditioning system the air will be cooled underground and then fed to the mechanical system. In areas which require mechanical heating and cooling, this will significantly reduce energy loads.

In the organic farming research center project, to climatize a region which is naturally arid plans call for the creation of an artificial lake using water from the existing creek, the idea being that said lake will, in hot weather, cool the air through evaporation while in winter it will make the cold air milder. It was suggested that a further saving could be made by purifying waste water used in the facility and collecting it in a pond. Undesirable heat loss and gain are optimized by the heat-insulating glass and louvers used in the facade.

4.5 Choice of suitable building materials

Through the use of local materials an attempt was made to stimulate the local economy while obtaining materials readily and achieving cost efficiency. The reason the use of recycled materials was preferred in the designs is that in this

way the students could avoid the energy loss and environmental pollution which might occur if materials were produced from scratch. Another point taken into consideration in designing the projects was deciding on collection points for recyclable materials to aid in the process of recycling.

In line with the architectural concept and project philosophy generated by the students, the sustainable building materials to be used in the buildings were characterized as non-toxic, recycled and recyclable, renewable, local, of standard sizes, modular, pre-cut to reduce waste, of certified wood, durable and long-lasting. In some projects facade systems and sun shields were conceived as being of aluminum and wood. In the development of the architectural langauge, the natural stone, wood, green roofing and similar elements used in the projects offer suggestions regarding the use of natural materials in fresh forms. Facades and glass surfaces were designed in accord with orientation and the heat-sensitive glass employed, while sun shieds and panels were recommended, all of which constituted an effort to control daylight, sunlight and heat thus reducing HVAC and illumination loads.

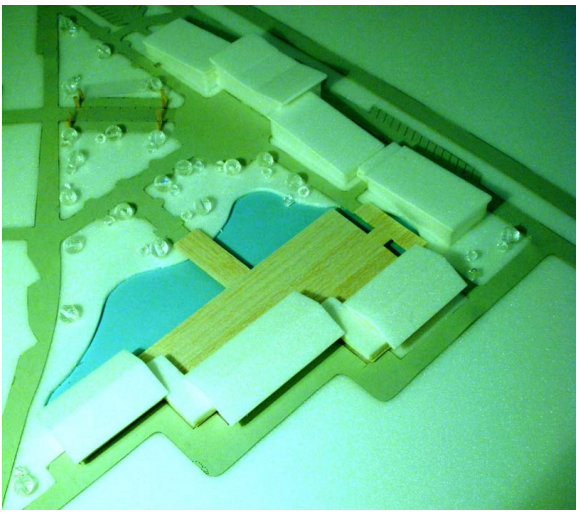

Figure 4: The project, consisting of an artificial lake using water from the creek.

5 Conclusion

The village institutes were extremely important for Turkey. They left their stamp on the Turkish education system while adopting a “creative and integrated” approach to education, and the intention of the present project was that students would further research and comprehend the leadership, creativity and progressive attitude embodied in the village institute system and curriculum as well as in the architectural makeup of their campuses. It was envisaged that the students realize the cultural and symbolic importance of the village institutes in terms of the

educational reform brought about in the early years of the Republic, and that prior to accomplishing the functional and technical requirements embodied in architectural education they would first arrive at an interpretation of social and historical values. The aim was that in making this interpretation the students would study the existing campus in the context of sustainability while gathering hints toward designing a sustainable environment. The projects which emerged not only demonstrated that acquiring knowledge about sustainability or the village institutes, in other words in technical and cultural areas, was able to bring functional solutions to architectural problems, at the same time it served to emphasize the importance of such learning in architectural studio education. Particularly when one considers the shortage of resources in today's world, the students' quest for sustainability was an educational tool which should be a model for all levels in architectural studio learning.

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