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Comparative Analysis of Traditional and Contemporary Wooden Architecture in Turkey, From the Perspective of Sustainability

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Abstract: In the context of this paper, the ways of use of wooden building material in traditional and contemporary Turkish architecture is compared. This comparative analysis is made in terms of ecological, economic and socio-cultural sustainability. The concept of sustainability is envisioned as closely bounded up with the ways of achieving sustainable urban development of the country. In this context, on one hand, the physical and spatial features of traditional wooden buildings - both monumental buildings and examples of civil architecture - are evaluated in terms of sustainability indicators. On the other hand, concerning the same indicators, another evaluation is made for the contemporary examples of wooden architecture. The traditional examples for the comparison are chosen from valuable heritage sites in Turkey, whereas the contemporary ones are chosen from big cities where it is possible to use modern building techniques. The comparative analysis of these two types of buildings, made up of the same building material but having different structural systems and building techniques, enables us to set out the principles of sustainable architecture from past to present and also from tradition to contemporary. It is thought that, the results of this comparative study could light the way for achieving sustainable urban development of settlements with different urban or rural scales in especially developing countries, like Turkey.

Keywords: traditional wooden building culture; contemporary wooden building techniques; sustainability

1. Introduction

In the 20th UIA Congress, the challenge of our times is denoted as to forge an equitable way of living on this planet, within the limits of nature. This challenge is seen as a design problem, a major part of which is an urban design, urban management and an architectural design problem. Realizing these problems, the concept of sustainability is envisioned as closely bounded up with the ways of achieving sustainable urban development, in the context of this paper. “Sustainable development” is taken into consideration neither about economic excellence nor about bio spherical stability, but about local livelihoods, as Sachs (1997) indicates. The aim¹ of sustainable development which is to improve the quality of human life without exceeding the carrying capacity of the ecosystems that sustain it, complements its definition. In order to achieve the aim of sustainable development, sustainability should be taken into consideration as an integrated concept with its environmental, economic and social dimensions.

In the light of these, the authors put stress on the importance of the culture of wooden constructions in Turkish architecture to achieve sustainable urban development in the country. It is mostly adopted by the authorities that to satisfy the requirements of sustainability throughout the design and application processes of architectural products is inevitable in order to achieve sustainable urban development. Barton,et.al.(1995), indicate one of the most important aims as reducing the lifetime environmental impact of any development by reducing the energy and resources used and waste produced at each stage of the development life cycle – construction, occupation and, if necessary, demolition. They express the achievement way of this necessity as reducing dependence on the wider environment for resources and reducing pollution of the wider environment by waste products – in other words by making any development both in its original construction, and throughout its lifetime, as self-sufficient as possible.

From this point of view, traditional wooden buildings of Turkish architecture are excellent examples of self-sufficiency in building scale. The wooden material and the wooden construction systems used in these buildings satisfy the necessity of reducing the energy and resources used and the waste produced during their life-cycles. Although individual buildings are very minor interventions to the environment, as Carmona(2009) says, the succession of minor changes can add up to major modifications to the overall natural systems of the neighbourhood, town, city region and eventually to the earth’s biosphere.

2. Traditional and Contemporary Wooden Building Culture in Turkey

In traditional Turkish architecture, wooden has been used so much structurally by its handling strength, isolation properties, suitability for different dimensions, adaptability for variety of forms and assembling properties. In traditional Turkish houses, the wooden material -that is made of alternatively chestnut, pine tree, willow and poplar trees, according to the regional climatic conditions- is mainly

¹ This aim was indicated in the Report Caring for the Earth: A Strategy for Sustainable Living which was prepared by International Union for Conservation of Nature [UCN], United Nations Environmental Program [UNEP], and World Watch Foundation [WWF] in 1991.

used for the constructive elements. These elements form the buildings affecting their aesthetic texture and integrate with the traditional differences (Ozturk,Cahantimur,2010).

Doğangün,et.al.(2006), and Öztank,(2010), classify traditional wooden buildings in Turkey depending on the structural elements in the walls. This classification is summarized as follows;

- Log Houses: The oldest and historical method of wooden construction in which logs slightly processed are overlapped and anchored at the ends. Walls constituted with logs make a function both bearing and dividing. Modern log houses have been started to construct using new techniques in Turkey in recent years (fig 1)

Figure 1. Traditional log houses, Black Sea Region



- “Hatıl” Construction: In the Hatıl construction, horizontal timbers embedded into bearing wall masonry(fig 2). In hatıl construction system the main materials of construction are mostly stone with mud mortar and slightly wood.

Figure 2.Traditional Hatıl Construction in Taraklı/Turkey



- “Himis” Construction: A timber frame with masonry infill such as bricks, adobes or stones. This type of construction is a variation on a shared construction tradition that has existed through history in many parts of the world, from ancient Rome almost to the present. In this type of construction the timber elements constitute important elements by providing the armature for the masonry infill(fig 3).

Figure 3. Traditional Hıms House in Cumalıkızık/Turkey



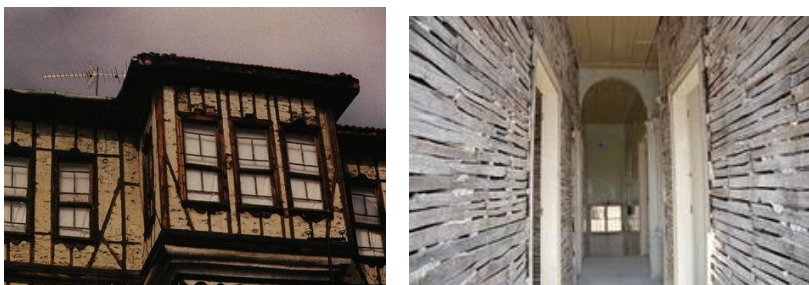
- “Dizeme” Construction: In some regions of Turkey, like North-west Anatolia, wood is used as infill materials of building constructions instead of masonry. Short rough timbers elements called as “dizeme” are used as infill and they are lightly nailed studs or horizontal framing elements in this construction(fig 4)

Figure 4. Traditional timber framed house with wood infill “Dizeme” construction in Turkey



- “Bağdadi” Construction: In this type of construction, the voids between timber framing members is filled with lighter materials or with trunk shells are transformed into a filling material by sand and lime mortar. The interior surfaces of walls are covered by lath and plaster work or wood, whereas the outer surfaces are either plastered or non-plastered or wooden plastered (fig 5).

Figure 5. Traditional “Bağdadi” construction examples in Turkey



Güçhan(2007), states that the main construction system of traditional timberframed buildings in Anatolia is the “hıms” construction technique, whereas the timber log technique is quite rare. In masonry buildings, the main construction materials are stone, brick and mud brick, while timber is used only as ties or spanning elements. The main characteristic of the hybrid “hıms” technique is the construction of the ground floor in masonry, and the upper floor(s) using the timberframed technique.

Houses constructed in the himis technique show a great variety in mass, plan, facade, architectural elements and ornamentation, but have quite similar constructional characteristics.

Güçhan(2007) defines the main sections of a timber-framed house in three main groups as; masonry base,timber-framed section floor(s), and timber roof. He describes the construction system of different floors of the houses in a very clear way as follows. The “masonry base” of the house, consisting of the ground floor and the foundations, is generally constructed in stone or by using stone and mud brick together. In this part of the building, the binding material is usually mud mortar, but in some cases the use of lime-enriched mortar can also be found. The masonry base of the building functionally consists of two parts: the foundations and the main walls of the ground floor. The foundations, which are built with rubble stone in a continuous, alternating or discontinuous order, extend at least up to the ground floor level. The ground floor walls constructed on the foundations are made of stone or mud brick and they are combined with timber tie plates regularly placed every 70–100 cm. The masonry base fits the shape of the lot on which the building is located, whereas the upper floor is constructed in a regular geometrical shape with the projections built within the capabilities of the timber-framed system. Before the construction of the upper floor, the timber wall plates are placed on the inner and outer edges of the ground floor main walls. The free-standing posts placed in the semi-open circulation spaces. In the upper floors, the floor beams are placed on the wall plates below, forming the shape of the upper floor and the geometry of the room. The floor beams are spaced at 40–60 cm intervals, parallel to the short side of the room. The spatial dimensions are usually determined according to the size of the available materials, whereas in some larger spaces such as the sofa—the main circulation hall in Ottoman houses—and taslik where a wide span is required, long timber beams with a relatively larger cross-section are used (Güçhan,2007).

Today, new wooden houses are still being constructed with traditional construction systems in Turkey(fig 6). On the other hand, laminated wood technology that provides many advantages for architectural design is used for construction of various kinds of buildings(fig.7).

Figure 6. Contemporary wooden buildings constructed with traditional systems in Turkey



Figure 7. Contemporary wooden buildings constructed with laminated wood technology in Turkey



As Oztürk states(2004), wood processing techniques come to construction systems over again by development studies of the researchers and construction engineers. As an example; dividing the whole wood into smaller pieces for eliminating the disadvantages of organic properties and meddling to the factors like; humidity and fiber structure that are able to work the organism and combining with physical operations and additives that are able to block deformation is not a many much recent idea (Tokyay,2001). Laminated wood or layered wood technology has short history on structural purposes opposite of minor scaled units. Today, by the developed technology and chemical industry, glued combinations of wood gained stronger resistant than natural wood pieces. To produce structural elements that never lose resistance in adhesion processes in all exposed conditions, including tropical weather conditions, is possible with present glue types and glue based developed techniques. Thus, construction components that are used in different forms and for big open spaces, can be produced by using laminated wood technology (fig.8). These construction components can be produced in many different formations like; flat and curve beams, arcs, shears, and knuckles. All details and metal accessories for combinations are completed industrially in factories (Duman,1964).

Figure 8. Examples of Laminated Wood Technology from the World



3. Comparative Analysis of Traditional and Contemporary Turkish Wooden Architecture from the Perspective of Sustainability

The examples of wooden architecture in Turkey are the products of the thousands of year of cultural heritage of Turkish people. Thus, there are many characteristic types of traditional wooden architecture including domestic and monumental buildings in Turkey, resulting from cultural attributes, related to material availability and climate. The wood is the best material reflecting the traditional way of life. The basic factors that improved the wooden structure

culture can be listed as; local characteristics of the environment, topography, climate, building culture, local culture, functional relations, and organization concepts (Öztürk,Cahantimur,2010) (fig.9)

Figure 9. The examples of wooden architecture in Turkey



On the other hand, it can be said that wood is the best loved of the building materials with its natural and organic qualities. The transformation of its colour and texture through ageing, bleaching by the sun, eroding by rain, worn by the passage of feet and the rubbing of hands, is considered as valuable (fig 10).

Figure 10. Wooden materials usage in houses



Eriç(1988), states that Turkey has unique weather conditions caused by its geographical structure as; being surrounded with seas, the relation of the mountains with the sea and the variety in ground shapes. The wooden houses which are the best examples of civil architectural heritage in Turkey are located especially near shore and forest sides, densely in the Marmara, the Black sea, and the Aegean regions. Economical and technological reasons had given rise wooden to be used as a building material for centuries. Oztürk (2004),classifies the properties of wood that have been satisfying people's needs as; its high carrying strength, its resistance to earthquake and other natural disasters, its great resistance to fire and its being the only renewable source for building(fig.11).

Figure 11. Wooden materials usage in public buildings



The properties of traditional wooden construction systems mentioned above improve their self-sufficiency which is one of the most important necessities of sustainable development as indicated in the previous sections. The life time environmental impact of traditional Turkish wooden buildings are lower than any other kind of buildings through their properties that reduce the energy and resources used and waste produced at each stage of the building life cycle – construction, occupation and demolition.

On the other hand, wooden material is still preferred to be used both in contemporary housing constructions and in public buildings with its superior properties like; having heavy load carrying capacity, ecological availableness, recycling ability, having great resistance to fire and earthquakes. Buildings constructed with laminated wood technology meet the necessities of sustainable development again with their suitable properties.

4. Conclusions

In the report of ICLEI (2002) it was indicated that sustainability, equity and security could be achieved through a fundamental alteration of the values that shape and inform our lives. The report put stress on our commitment for ourselves to living in harmony with our environment and with the fellow inhabitants of our planet and the necessary for ensuring that our decisions reflect the interests of the generations to come. Similarly, Goulet (1995), explains the term development ethics including environmental wisdom with these words: “there can be no social development ethics without environmental wisdom and conversely no environmental wisdom without a social development ethic”. It is evident that we, as design professionals, are all responsible to protect biodiversity and nurture nature as part of the co-evolution of the sociosphere and biosphere in which natural history and human history have been rightly interwoven. To select the right local material at the right place, for the right design and apply it with the right system may be the first choice to take the necessary action. As for the last words, it should be highlighted that Turkish wooden building culture, whether traditional or contemporary, reflects the responsibility of the designers and users. However, more stress should be put on its necessity to become a nationwide construction system in order to achieve sustainable urban development.

Conflict of Interest

"The authors declare no conflict of interest".

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