Kliment Ohridski University

THE SCIENCE
AND EDUCATION
AT THE BEGINNING
OF THE 21ST CENTURY
IN TURKEY



VOLUME: 4

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I. SOCIAL SCIENCE

VERNACULAR AND TRADITIONAL HOUSING ARCHITECTURE OF BURSA IN SUSTAINABILITY CONTEXT

Z. Sevgen PERKER

1. INTRODUCTION

Today, the human-environment relations are important. In this context, the concepts of "sustainability" and "sustainable development" attract attention. A sustainable development alleged to be a solution to environmental, economic, social, and physical problems and hitches—encountered by all settlements—is a very comprehensive subject in both natural and built-up environments. Sustainable development is considered as a primary goal and holistic solution approach in almost every area that concerns the environment and community. Architecture takes on important tasks in the creation of a sustainable environment and society, as well. In this context, one of the priorities of sustainable development is the creation of sustainable architectural products. And the other is to ensure the sustainability of structural-cultural heritage.

2. CONCEPTUAL FRAMEWORK: RELATION BETWEEN SUSTAINABIL-ITY AND VERNACULAR-TRADITIONAL RESIDENCE

20. The late 19th century has been a period, when natural resources were rapidly depleted, the world was contaminated, and adverse conditions took attention in terms of the future of humanity on a global scale. In this period, the world was acquainted with the concept of "sustainability", and the efforts intended for enabling this concept to be implemented in all areas concerning the life were started. The concept of sustainable development emerged in light of these thoughts has been introduced as a solutions-seeking tool, in a wide range from local to universal (Hoşkara, 2007).

Sustainable architecture is one of the important topic titles covered by the concept of sustainable development that covers all areas of the life. In the era we live in, the depletion of natural environment and energy sources at a speed making their renewal impossible; as well as the adverse effects that built-up environments will create on the ecosystem in the course of time, lead architects to product buildings, which are the most harmless to the natural cycle, compatible with the nature at the highest level, and which minimize the energy consumption during their production.

The relation of sustainability with architecture can be dealt with in two different scales as structural and urban. Structural sustainability includes the production of buildings, which meet the daily requirements, reduce the consumption of natural resources, and contributes to the conservation of energy. And urban sustainability depends on ensuring structural sustainability, production of eco-designs, and performance of research and applications as well as production of projects related to the nature (Madras et al., 2000; Z S. Perker, 2004b).

The consumption of natural resources and energy is quite high in both the supply and processing of raw materials used in the materials required in the construction sector. On the other hand, built-up environments cause a decrease in natural areas, and an increase in pollution sources. Another problem is that the currently available resources are not utilized efficiently enough. Life cycle of an architectural structure consists of some stages such as design, construction, utilization, maintenance - repair / demolition and reutilization. All the stages mentioned above occur in interaction with the nature; and therefore, all of stages should be dealt with in terms of environmental impact. In addition, the fact that today's human spends a significant portion of his/her time in buildings necessitates the investigation of impacts of buildings on human health. When viewed from this aspect, an architectural structure directly affects the user of the building and his/her immediate environment in the short term; and the ecosystem in the long term (Özmehmet, 2007).

The major subjects that can be discussed in the context of sustainable architecture include considering topographic data, vegetation and climatic characteristics; adoption of the nature-related building trend; creation of high-quality functional living spaces with suitable dimensions that do not adversely affect the physical and psychological health of human; and making design decisions that ensure some comfort conditions such as heating, cooling, ventilation, and lighting to be supplied by natural ways as soon as possible, and that minimize the use of energy—in design—; ensuring materials to be durable and long lasting, produced from renewable resources and with minimum energy consumption; minimizing the use of non-renewable resources; ensuring the use of materials with high-level recyclability as well as efficient use of the currently available resources—in construction and maintenance/repair—; and preferring the solutions that minimize the use of energy, in which adverse environmental impacts, wastes and pollution sources would be at the minimum level; and producing reusable buildings—in utilization and demolition (Çetin, 2010; Hoşkara, 2007; Özmehmet, 2007; Sev, 2009; Tönük, 2001).

In sustainable development, the role of architecture is not limited to the production of sustainable buildings. In addition, ensuring the sustainability of urban and rural areas that have attained their current identities and have taken shape under the effect of many social, cultural, economic, political, technological features etc.—in which the community has continued its existence from past to present—is extremely important in terms of development. In this context, especially the historical environments that give their identities to urban and rural areas attract attention as important components of local, national and global cultural heritage. The historical environments are very important in terms of the perception of communities' social, cultural, economic, political and technological structures, and they should be protected and transferred to the future. Protection includes the aims to keep the currents values undamaged today, and to transfer these values to the future for enabling them to be perceivable for also the posterity. In this regard, the concept of protection should be seen as strongly associated with sustainability. Protection of structural-cultural heritage also means ensuring the sustainability of social and cultural values of communities. In this respect, especially vernacular and traditional houses are of great importance.

From past to present, architecture is a result of people - nature relationship. In this context, the most important example is vernacular and traditional house. In consequence of the investigation of vernacular and traditional domestic architecture, it is concluded that the currently valid sustainable design principles have been applied for centuries. Vernacular and traditional houses are of importance in terms of being the pioneer examples, to which the subjects mentioned above and all other subjects among the main themes of sustainable architecture are applied; and which play a guiding role with regards to today's sustainable architecture. Also in terms of sustainable development, such houses that are important elements of structural-cultural heritage are required to be protected and transferred to the future.

3. BURSA VERNACULAR AND TRADITIONAL HOUSES, IN THE CONTEXT OF SUSTAINABILITY

Bursa, which is the first capital city of the Ottoman Empire, has great importance in analysis of the vernacular and traditional Anatolian housing. In Bursa, there are numerous traditional houses. The houses are different from one another in terms of construction date, physical environment, users, socio cultural environment and etc. However, all of them are vernacular, national and global cultural heritage and sustainable architecture examples.

In the urban and the rural area of Bursa, there are numerous traditional wooden houses. In Orhan Gazi Period; in the antique city area inside Bursa Citadel; the neighbourhoods were set up and in latter period; the Inns Area which was the central business area and the neihbourhoods around it and the Çekirge – Yeşil – Muradiye and Yıldırım neigbourhoods were set up (Oğuzoğlu, 1999). The mentioned neighbourhoods are the residential units where the tradiitional resident structure is rich (Z. S. Perker, 2004a; Z. S. Perker & Akıncıtürk, 2010). In Figure 1 and 2 traditional houses placed in Bursa urban area.

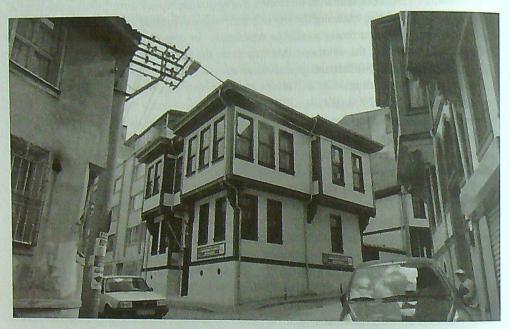


Photo 1. Traditional Houses Placed in Bursa Urban Area (Z.S.Perker, 2012)

Mudanya, which has been interacting with Bursa since the old times, has the feauture of being the most important coast that the city reaches to. Mudanya was joined to Ottoman Empire during the reign of Orhan Gazi and it has a great significance of traditional resident structure. In Mudanya; the urban housing structure shaped up in two ways. One of those structures is the organic urban structure. The other structure is the housing structure along the seashore where Girit immigrants were accomodated in 1877. In the organic area; where traditional wooden (timbered) houses are found; generally there we can see two or three storey buildings whereas there can three or four storey houses be seen (Z. S. Perker, 2004a; Z. S. Perker & Akıncıtürk, 2010). In Figure 3 traditional houses placed in Bursa rural area

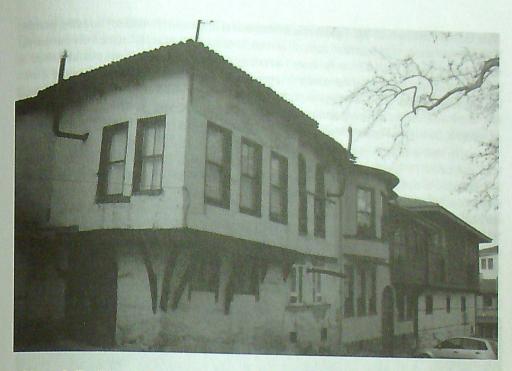


Photo 2. Traditional Houses Placed in Bursa Urban Area / Muradiye (Z.S.Perker, 2008)

Zeytinbağı (Tirilye) is connected to Mudanya which is 12 km west of the town and which is located on a bay. Formerly; Greek families were living in Zetinbağı and Turkish immigrant families started to live later on after barter (Çevik, Beşgen, Tuzuk, Vural, & Cordan, 1999; Z. S. Perker, 2004a; Z. S. Perker & Akıncıtürk, 2010). Zeytinbağı is a residential area which is located in rural side of Bursa and is very rich in traditional housing pattern. In Figure 4 traditional houses placed in Bursa rural area / Zeytinbağı.



Photo 3. Bursa Rural Area / Mudanya



Photo 4. Bursa Rural Area / Zeytinbağı

Cumalıkızık, which has a great role in traditional timebered (wooden) housing pattern with a great variety of historical – cultural and constructive features, is located on the northern slopes of Uludağ and 12 km far from Bursa city centre. Cumalıkızık was established in the 1300 A.D. and it is one of the seven villages which was set up by Kızıks from the Turkish Kayı Tribes after the Ottomans captured Bursa. In its constitution; it shelters original ish Kayı Tribes after the Ottomans captured Bursa. In its constitution; it shelters original traditional houses that are civil architectural models (Z. S. Perker, 2004a; Z. S. Perker & traditional houses that are civil architectural models in Bursa rural area / Cumalıkızık. Akıncıtürk, 2010). In Figure 5 traditional houses placed in Bursa in the village status in the past

Misi that is called Gümüştepe District at present was in the village status in the past. Misi is located 15 km west of Bursa city and is on Orhaneli Road – west of the Nilüfer Stream. Misi is overspread on a sloping land and surrounded by forests. Misians who immigrated to Southern Marmara Region from Trakya in 1816 B.C. and who were named Misians set up three residential areas lived there until the Byzantine Period (A.D. the midst of 5th Century). In 1316, Orhangazi gathered Misi to Ottoman lands. During those times Misi was known as the centre of the Christianity. Misi is conditioned in the rural side of Bursa and is very rich with traditional housing pattern (Çevik, Beşgen, Tuzuk, Vural, & Cordan, 1999; Z. S. Perker, 2004a; Z. S. Perker & Akıncıtürk, 2010). In Figure 6 traditional houses placed in Bursa rural area / Misi.



Photo 5. Bursa Rural Area / Cumalıkızık



Photo 6. Bursa Rural Area / Misi

Within the scope of the study, the vernacular and traditional houses selected from the urban and rural areas of Bursa and located in the areas mentioned above were investigated. In the investigation, the life cycle stages of architectural structures were discussed under four main headings as design; construction, maintenance and repair; utilization and demolition; and reutilization.

3.1. REVIEW INTENDED FOR THE DESIGN STAGE

Relation with topographical structure and vegetation: In the settlements investigated, it is seen that a very strong relation with topographic structure has been established; organic streets respecting the nature have emerged in the sloping terrain; and grid settlement model has been implemented in the flat lands. The upstairs bays ordered in such a way as to create an organic street tissue in the sloping terrain have been enriched with windows, which allow

for looking at the street on one side, and green tissue and the sea (if any) on the other side. This feature is very important in terms of the relation of human - house - street - nature. I is seen that the traditional houses located in the sloping terrain do not hinder each other's sunlight. And as a significant settlement decision in the seaside settlements with grid plan, the sea can be seen from all the streets. In the design, the relation between the house and the natural scenery created by the topography has been attached importance. The relations of the houses with the vegetation that they are located in attract attention, as well (Figure 7). It is observed that especially the rural houses located near the densely forested land have large gardens, where trees and agricultural crops are grown; and the houses are seen to be in an intensive association with the green tissue. In addition, it is observe that most of the vernacular and traditional houses in the city have semi-open or open areas called courtyard, dominated by green tissue. The trees in the gardens embower and cool the building and garden in hot summer months. On the other hand, as an important feature in terms of the relations with the vegetation, wood that is one of the main construction materials of most of the traditional houses with its renewable source is obtained from the immediate environment; and the trees selected are the ones available in the existing vegetation.

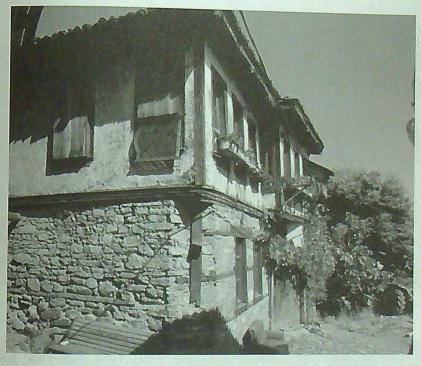


Photo 7. Relations of the Houses With the Vegetation (Z.S. Perker)

Relations with climatic data: It is seen that the directions and prevailing winds are taken into account in the setup of settlements and living spaces in houses. Solutions based on natural ventilation and lighting are observed to be produced, which attach importance to the availability of sunlight in the building, provide conservation of heat in winter conditions, and allow for creating cool places in summer (Figure 8). It is observed that winter storeys in

which conservation of heat is provided by means of thick stone masonry walls and low ceilings, in regions where intense winter conditions are experienced; and summer storeys with external hall and high ceilings, where fresh air can be obtained abundantly in summer, have external hall and pen halls and gardens are generally positioned in southern and eastern been created; and open halls and gardens are generally positioned in southern and eastern directions. The winter and summer storey application is a sustainable architectural approach based on change of place that prevents energy consumption by artificial heating and cooling (Figure 8, Figure 9). In addition to this, wide roof eaves are observed to be made in the houses located in the regions with intense rainfall. It is seen that there is a sensitive urban approach, which enables people passing through the narrow streets to protect themselves against the rain with the wide roof eaves, whereby contributions are made to more protection of the building surfaces against the rain waters, to extend the life of building materials, to reduce the use of resource in terms of building materials, and to decrease the maintenance / repair costs.

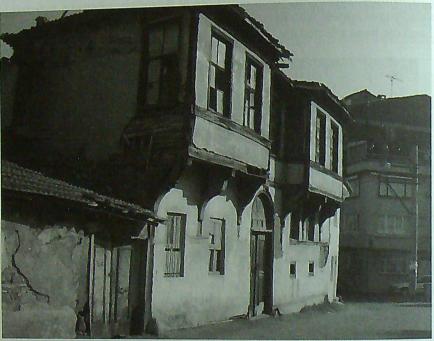


Photo 8. Traditional House and Sunlight

Suitable sized and functional solutions for living spaces: The residential places are observed to be functional to an extent that can meet the human requirements and demands. It is an important feature that each room and common use areas are in the dimensions that can meet the human requirements and demands. As parallel to the space usage of Anatolian houses, the space of Bursa houses have been setup as flexible and adaptable to different uses. As a feature very important in terms of sustainability, each of rooms in the houses of the Ottoman period has been designed as a flexible place, in such a way as to meet many functions such as sitting, eating, and sleeping by use of movable furniture (Figure 10).

Some of the buildings investigated are observed to fail in maintaining today's housing



Photo 9. The Winter and Summer Storey Application (Z. S. Perker)



Photo 10. Flexible Room in Traditional House (Z. S. Perker)

function. However, due to spatial setup that does not allow for flexible use, such buildings are beginning to be used for different functions (sales unit for souvenir, fish restaurants, public training center, etc.) as well.

Relation with human health and comfort conditions: For a building, it is a must to enable the people living in it to maintain their physical and psychological health. It is seen that the houses investigated within the scope of the study have high-quality natural lighting and natural ventilation; and in addition, they can be heated and cooled without need for the use of high-level energy. Winter storey and summer storey application is the best example for this. On the other hand, the use of natural building materials such as stone, wood, and adobe is an extremely positive feature in terms of human health (Figure 11). In addition, the fact that the users of the houses in question can maintain their existing life culture also at the present time is extremely important in terms of psychological health.

3.2. REVIEW INTENDED FOR CONSTRUCTION, MAINTENANCE AND REPAIR STAGES

Durability and longevity of building materials: The building materials are one of the most important elements that had enabled the investigated vernacular and traditional houses to survive from the period in which they had been constructed to present; and they will enable such buildings to be transferred to the future generations. The main materials of the mentioned buildings are stone, wood, and adobe. As a natural and durable material, stone have been used mostly in the stacking systems in subbasement levels or ground floors of the investigated houses. This use has also contributed to ensuring the conservation of heat in

the houses located in the regions that intensively experience winter season. Wood material has been used as a load bearing element in the subbasement or carcass of the storeys on the ground floor, as well as a facing material in some settlement examples. The wood materials used in the system are durable and highly suitable to be used as building timber, and they have been obtained from some trees species such as chestnut and pine trees that prevail in Bursa and its vicinity. The load bearing systems constituted with natural stone and wood materials have enabled these houses to survive up to the present, in Bursa located in a first-degree seismic zone. Adobe have been obtained from the local soil, and used as a filling material in the gaps of the wooden carcass. Since adobe material is known to be indurable against water in particular, which is at a high risk of water contact, its protection with roof eaves has been considered important.

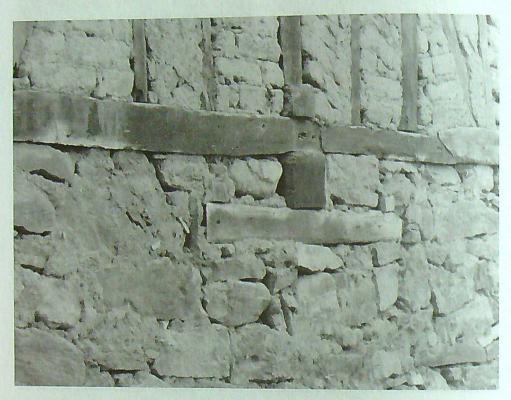


Photo 11. Stone, Wood and Adobe (Z. S. Perker)

Renewability of building materials: The building materials used in the construction of the investigated houses have been obtained from the immediate surroundings. In this regard, they can be alleged to be renewable. However, today's decreased natural resources pose a problem also in terms of renewability of the building materials of the investigated houses in the region. (Although renewability of the materials is technically possible, there is no administration system developed for this purpose.)

Efficient use of building materials: Durability and longevity of building materials are extremely important in terms of minimization of the resources to be used for obtaining

building materials. It can be alleged that the building materials have been used efficiently, when considering that the investigated houses have survived with minimum maintenance from the period in which they had been constructed to present. In addition, it is attention grabbing that some precautions intended for reducing the degradation of materials have been taken during the design of the details constituting the system. The use of treenails for combining the wood components has reduced corrosion problems; the wide eaves helped for the protection of the materials in the exterior walls of the buildings against the rain; and the facing materials have been designed in such a way as to enable the water to rapidly flow away from the buildings. Nevertheless, the existing materials of the investigated houses have been subject to degradation due to physical, chemical, biological, and also human-induced causes through long ages.

Energy use and the economy in procurement of building materials: The stone, wood and adobe materials used in the buildings have been obtained from the immediate surroundings, and included in the buildings, at minimized costs and without higher shipment and labor expenditures. In the supply of building materials, the use of simple hand tools and the labor that does not require craftsmanship attract attention. In this regard, the use of energy in the supply of building materials has been minimized, as well.

Recyclability of building materials, and the relation of their wastes with the ecosystem: The main building materials used in the houses are natural stone, wood and adobe that have the nature of recyclability. An the waste of the mentioned materials are in complete harmony with the ecosystem.

3.3. REVIEW INTENDED FOR UTILIZATION AND DEMOLITION STAGES

Status of adverse environmental impact (waste production, pollution generation, energy use): All the investigated houses have the nature of cultural heritage, and are under protection. In this regard, their demolition is not intended and should not be intended under normal circumstances. However, demolition of those dilapidated and damaged due to neglect and abandonment, as well as their reconstruction at their places in accordance with their originals are considered. In case of requirement of their demolition intended for reconstruction, hand tools are used in demolition process, reusable original parts are kept, the resultant waste materials are reduced, and the energy consumption is minimized. And the wastes to be disposed do not pose problems due to that they are natural materials compatible with the ecosystem.

3.4. REVIEW INTENDED FOR REUTILIZATION STAGE

Status of reutilization and refunctioning of buildings: Some of the vernacular and traditional Bursa houses that can be dealt with in the scope of cultural heritage continue to function. And some others among them have been utilized with a function change, within the scope of cultural tourism, because of their original structure and settlement properties. Spatial dimensions, flexible design approach, load bearing system, detail and material properties have enabled the mentioned houses to be utilized with different functions intended for tourism. The new functions include restaurant, boarding house, hotel, sales unit for souvenir, museum, tourist information office etc. (Figure 12, 13).





Photo 12. Hotel (Z. S. Perker)

Photo 13. Restaurant (Z. S. Perker)

4. CONCLUSION

Within the scope of the study, Bursa vernacular and traditional residential architecture having historical, social, cultural and architectural importance has been investigated in terms of sustainable architectural principles. The houses have been evaluated in terms of sustainability in the life cycle, by dealing with their design, construction, maintenance / repair, utilization, demolition and reutilization stages. In this context; some elements among the principles important at the design stage of the buildings, such as relation with topography and vegetation, relation with climatic data, functional resolution of living spaces in suitable dimensions, and relation with human health; some elements among the principles important at the maintenance and repair stages, such as ensuring building materials to be durable and long lasting, renewability of building materials, efficient use of building materials, energy use and economy in the procurement of building materials, recyclability of building materials, and relation of waste with the ecosystem; some elements among the principles important at the utilization and demolition stages, such as the status of adverse environmental effect (waste production, pollution generation, energy use); and the status of reutilization and refunctioning important at the reutilization stage have been investigated. In the buildings dealt with within the scope of the investigation, the principles of sustainable architecture have been observed to be used successfully, in such a way as to set a good example for today's buildings. However, various problems have attracted attention during the investigations, in terms of the sustainability of the mentioned buildings. Especially the depletion of the green tissue of the city—that used to be known as "Green Bursa" at one time—as well as unavailability of timber forest cultivation pose an important threat in terms of renewability of materials used in the investigated buildings. On the other hand, the materials deteriorate in the course of time due to physical, chemical, biological and human-induced causes, even though the precautions intended for ensuring efficient use of the building materials had been taken at the initial design, detailing and construction stages; and problems are encountered at the repair stage, due to property problems and unconscious users in particular, even though the ease of maintenance / repair is seen technically possible. And a different problem is caused by the fact that the balance of protection-utilization cannot be ensured at all times at the refunctioning stage. The investigated houses are considered to be an opportunity for ensuring the sustainability of the regions where they exist, since they are cultural heritage elements important at local, national and global scales; and the existence of various multi-dimensional and multi-partnered studies, projects with social and cultural contents, academic research and supports are considered to be an opportunity for ensuring their own sustainability.

As a result, vernacular and traditional residential architecture is one of the important values of the city of Bursa, which has local, national and global importance in the historical sense, because of that it was the first capital of the Ottoman Empire. In regard to the principles of sustainable architecture, the mentioned architecture has the quality to guide in terms of today's architecture, besides its importance as a historical cultural heritage. This is a feature that increases the current architectural heritage values of these houses. For a world that cannot protect its past values, it is impossible to produce new values. Therefore, our most important task is to ensure the sustainability of these buildings—as well as the ones similar to them—that set an example for today's architecture and architects, with their sustainable features.

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