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kerpic'16

Cultural Landscape: Rebuilding after Decay

International Conference

17-18 December 2016
Istanbul, TURKEY

PROCEEDINGS

For the Fifth International Conference

Kerpic'16

Cultural Landscape:

Rebuilding after Decay

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Cultural Landscape:
Rebuilding after Decay

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Istanbul Aydın University
Kerpic Network

Themes of the Conference

1. Rebuilding cultural landscape after disaster, war, terrorism
2. Social, cultural, touristic reuses of heritage
3. Commercial development
4. Changes in traditional heritage value of society
5. Housing environment
6. Standards and guidelines for rebuilding
7. Advances in researches

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Dear Colleagues,

Istanbul Aydin University and The Kerpiç Network are pleased to welcome you to the fifth International Conference on **kerpic'16 - Cultural Landscape: Rebuilding after Decay,** 17-18 December 2016, Istanbul, Turkey.

Kerpiç–network is carrying researches over thirty years on durability, seismic response and production techniques on earthen construction material. Durability researches are based on gypsum & lime stabilization of earth, called "alker"; seismic response researches are based on horizontal energy dissipation surfaces in the load bearing walls and production techniques are based on compacting and shote-crete production of earthen walls.

The conference scope will focus on Diyarbakır- SUR area in Turkey or on nearly problems arround the world, and the study will range from the graduate programs, preparing the students to the contemporary knowledge and skills, and bring together the academics and professionals to exchange results and experience. It will be an opportunity to understand the strategy and the advances of the Cultural Landscape.

Our deepest thanks goes to ICOMOS, ISCEAH members who supported the conference as scientific committee.

It is our pleasure to welcome you to the international conference kerpic'16.

Prof. Dr. Bilge IŞIK, Conference Chair

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kerpic'16 - Cultural Landscape: Rebuilding after Decay,

5. International Conference

17-18 December 2016, Istanbul Aydın University, Turkey

OPENING REMARKS

Speaker 1. Prof.Dr. Bilge IŞIK (Conference Chair)
Speaker 2. Ayşe Deniz Özkan (Vice Director of International Relations, IAU)

Dear participants,

Welcome to the kerpiç'16 conference hosted by Istanbul Aydin University. As the vice-director for Global Education and Partnerships, I am proud to say that our university puts great emphasis on international collaborations. As this conference gathers esteemed speakers from various universities of different countries, this is exactly the kind of scientific activity we hope to see on our campus. Your endeavors here are important for not only exchanging ideas and sharing expertise internationally but also bringing different cultures and perspectives together in dialogue.

I wish you all a productive conference.

Ayse Deniz Ozkan
Vice Director
Global Education and Partnerships
Istanbul Aydin University

SATURDAY 17 DECEMBER

9:00-9:30 CONFERENCE REGISTRATION

9:30-10:00 OPENING SESSION

Dr. Mustafa Aydın	Istanbul Aydin University Board of Trustees Chairman, IAU
Prof. Dr. Yadigar İzmirli	Rector, IAU
Prof. Dr. Turhan Nejat Aral	Dean of Architecture and Design Faculty, IAU
Prof. Dr. Bilge Işık	Conference Chair, IAU
Prof. Dr. Celal Nazım İrem	UNESCO Chair Holder, Cultural Diplomacy, Governance and Education, IAU
Asst. Prof. Dr. Ayşe Deniz Özkan	Vice Director, Global Education and Partnerships, IAU

10:00-11:00 SESSION 1

10:00-10:20 **Prof. Dr. Marcial Blondet**, Nicola Tarque, Julio Vargas, Pontifical Catholic University, Lima, Peru
(Re)construction of earthquake-resistant earthen buildings

10:20-10:40 **Assoc. Prof. Dr. F. Meral Halifeoglu**, Dicle University Faculty of Architecture, Diyarbakır, Turkey
The culture of the city regaining a historical mansion in Diyarbakır: Cemil Pasa mansion

10:40-11:00 **Assoc. Prof. Dr. Kamuran Sami**, Dicle University Faculty of Architecture, Diyarbakır, Turkey
Diyarbakır historical Suriçi and a conflicting environment: a cultural heritage with its color fadded and devastation of collective memory

11:00-11:30 Coffee Break

11:30-12:30 SESSION 2

11:30-11:50 **Assoc. Prof. Dr. Seyed Mohammad Hossein Ayatollahi**, Fatemeh M. Bafghi, Amir S.Pakseresht, Yazd University, School of Art and Architecture, Yazd, IRAN
The role of wind as a generator of cultural landscape in desert climate of Iran

11:50-12:10 Dr. Somayeh Omidvari, **Elaheh Golzari**, Science and Art University, Yazd, Iran
Tourism of Qanat: renewal after drought

12:10-12:30 **Asst. Prof. Dr. Neriman Farahza**, Sassan Seyedkalal, Yazd University
School of Art and Architecture, Yazd, Iran
Vazir historical complex: past, present, future
conservation, restoration, rehabilitation and revitalization

12:30-14.00 Lunch

14:00-15:20 SESSION 3

14:00-14:20 **Prof. Dr. Zülküf Güneli,** IAU, Faculty of Architecture and Design, Istanbul,Turkey
Urban texture and identity from past to present in Diyarbakır Suriçi

14:20-14:40 **Dr. Şeniz Atik**, Altan Atik, Merve Özkılıç, IAU Faculty of Architecture and Design, Istanbul, Turkey
Reconstruction of cultural landscape after disasters

14:40-15:00 **Aysel Tarım**, Asst.Prof.Dr. Sibel Hattap, Mimar Sinan Fine Arts University, Istanbul, Turkey
Global rebuilding: Cumalıkızık Case

15:00-15:20 **Asst. Prof. Dr. Murat DAL**, Munzur University, Department of Civil Engineering, Tunceli, Turkey
Decay occuring in the structure in the adobe materials

15:20-15:50 Coffee Break

15:50-17:40 SESSION 4

15:50-16:10 **Asst. Prof. Dr. Fatma Sedes**, IAU, Architecture Restoration Program, Istanbul, Turkey
Man's decay to historical environment in Zeyrek: a change on the physical texture

16:10-16:30 **Asst. Prof. Dr. Şefika Ergin Oruç**, Dicle University Faculty of Architecture, Diyarbakır, Turkey
Cultural landscape in the rural settlements of Diyarbakır province

16:30-16:50 **Chiara Braucher**, Mattia Giandomenici, Genova, Italy
Lessons from Van territory (step 1) adobe construction heritage, technics

16:50-17:10 **Asst. Prof. Dr. Seyhan Yardımlı**, Murat Dal,
Istanbul Aydin University Faculty of Architecture and Design, Istanbul, Turkey
Water deterioration in adobe structures and measures to take

17:10-17:30 **Negar Javadi**, Sara Khooshro, Zangan, Tehran, Iran
Temporary Accommodation and Build shelter for survivors of disasters (Sur-Turkey)

17:30-17.40 Closed Ceremony

Secretary of Conference Gökçen F. YÜCEL, Faculty of Architecture and Design, gokcenfyucel@aydin.edu.tr

CONTENT

(Re)Construction of Earthquake-Resistant Earthen Buildings

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ABSTRACT
Earthquakes have caused losses in human lives and the destruction of earthen dwellings and historical monuments. Safe earthen construction methods should therefore be developed and implemented in order to protect the lives of millions of people and to ensure the stability of historical constructions during future earthquakes. Researchers at the Pontifical Catholic University of Peru (PUCP) have developed a technique that can be used for rebuilding or retrofitting earthen buildings located in seismic areas. It includes a procedure to *repair* seismic damage by injecting mud grout in the seismic cracks and a system to *reinforce* the earthen buildings with a mesh made of nylon ropes. A full-scale adobe house model was built at the PUCP´s Structures Laboratory and tested on its shaking table, in order to evaluate the efficacy of this technique. The unreinforced model was first subjected to shaking in order to induce extensive wall cracking. The cracks on the walls were then repaired via mud grout injection and, after the grout had completely dried, the walls were reinforced by covering them with an external mesh made of nylon ropes. When the retrofitted adobe model was tested again on the shaking table, the repair and reinforcement technique proved to be effective, as the structural integrity was maintained. An engineered design procedure has been recently been developed and a new shaking table test is being planned to evaluate its effectiveness. It is hoped that the results obtained will be useful for the (re)construction of safe earthen construction around the globe.

Keywords: Earthen construction, earthquakes, seismic repair, seismic reinforcement

1. INTRODUCTION

Humans have used soil to build their homes and monuments since the beginning of civilization. The conservation of existing historical buildings and monuments made with earth and located in seismic areas is particularly challenging, because these constructions are part of a unique cultural heritage and must be repaired and strengthened to ensure their stability during future earthquakes. This is complicated because of the conflicting requirements of providing additional strength and stability to the structure while preserving as much of the original fabric as possible, as stated by the conservation charters and doctrinal texts [1].

In many developing countries soil is still a widely used construction material because it is readily available at little or no cost. Most underprivileged people in these countries, therefore, have no alternative but to build with soil, because the cost of manufactured or industrial materials such as wood, fired clay bricks, cement, or reinforcing steel is completely beyond their economic possibilities. As building with earth is relatively simple, it is usually performed by the residents themselves, without technical assistance or quality control. These buildings are extremely vulnerable and suffer significant damage or collapse

during earthquakes. The high seismic vulnerability of earthen buildings is due to a perverse combination of the mechanical properties of their walls: earthen walls are dense and heavy, have extremely low tensile strength and they fail in a brittle fashion, without any warning. As a consequence, every significant earthquake that has occurred in regions where earthen construction is common has produced tragic loss of life and considerable material damage (Figure 1) [2] .

Figure 1. Total destruction of adobe houses caused by earthquakes in El Salvador (2001, photo by Dominic Dowling, left) and Pisco, Peru (2007, right)

Many historical earthen constructions have been able to withstand severe earthquakes because of their massiveness and regular configuration. For example, the Chan-Chan archeological site (1200 CE), located on the coast of Peru, is considered to be one of the world's largest mud citadels, and has survived many severe earthquakes during the past 600 years. Decorated boundary earthen walls, some of them up to 9 m tall and 3 m wide at the base, can be found in the citadel. Many long and slender walls without buttresses are still standing (Figure 2, left). Massiveness is not, however, a guarantee for earthquake endurance. For instance, the 2003 Bam earthquake in Iran destroyed several thousands of poorly made adobe houses and important ancient historical monuments such as the earthen citadel of Arg-e Bam (500 BCE; Figure 2, right). The architectural design of the Bam citadel and surroundings includes upper thin walls standing over thick base walls, irregular plan configurations, and high wall densities. It seems that slender walls have collapsed, impacting adjacent walls and constructions, causing total destruction of the site, in spite of its massiveness.

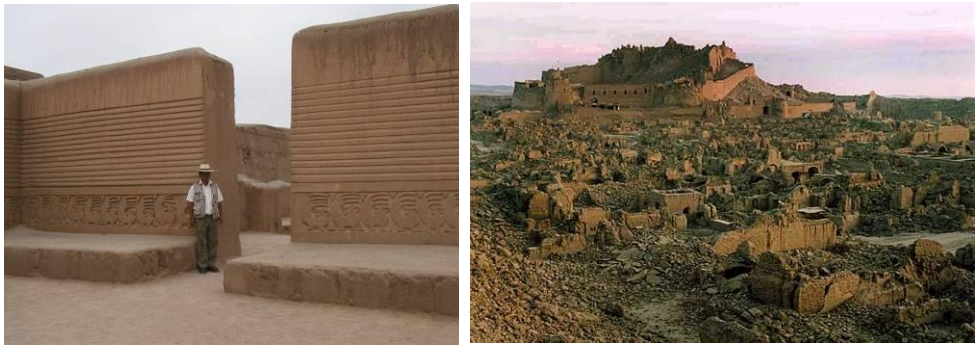

Figure 2. Ancient earthen citadels of Chan-Chan, in Peru (left) and Arg-e Bam, in Iran (Photo credit: Cultural Heritage News, right)

It is the duty of the world engineering community to find ways of protecting earthen constructions built in seismic areas. This paper summarizes some preliminary results

obtained during an ongoing PUCP research project regarding the seismic reinforcement of earthen monuments and vernacular dwellings.

2. PROPOSED SEISMIC RETROFIT TECHNIQUE

A group of researchers is currently working at the PUCP on a retrofit method consisting of a procedure to *repair* seismic damage on adobe walls by injecting mud grout in the larger cracks, combined with a technique to *reinforce* the earthen buildings by wrapping all the walls with a mesh made of nylon ropes.

2.1. Repair by Injection of Mud-Based Grout

The repair procedure was devised to be applied mainly on historical monuments, and is intended to recover as much as possible of the original strength and stiffness of the undamaged walls [3].

To prepare the grout sieved soil should be thoroughly mixed with water and the desired additives, until a uniform fluid paste is obtained. In this project the soil was sifted through a #10 sieve (2 mm opening), combined with 50% of dry chopped grass (in volume), and mixed thoroughly in a mortar mixer with 35% water (in weight). The wall cracks should be opened to allow for full penetration of the grout. This may be in contradiction with the conservation principle of minimum intervention. Also, in the cases of historical monuments it seems advisable to proceed step by step with the sequence of crack opening and grout injection. Figure 3 illustrates the process of repairing an adobe wall.

Figure 3. Repair of seismic cracks on a damaged adobe wall. Mud grout was injected in cracks that were opened, cleaned with water, and covered with silicone (left). Wider seismic cracks were filled manually with mud (right).

2.2. Reinforcement with Nylon Rope Mesh

The technique of providing an external mesh reinforcement to earthen walls has shown to be effective in the seismic protection of vernacular dwellings and historical monuments [4]. It is consistent with the conservation principles of minimum intervention, compatible reinforcement and reversible solutions.

The purpose of the mesh reinforcement is to maintain the integrity of the walls after they have been severely cracked by an earthquake, by preventing broken wall portions from overturning and falling off. The use of nylon ropes is recommended because these ropes are cheap and widely available. Once a certain quality rope has been selected, its mechanical properties (strength and stiffness) must be estimated in order to specify the required mesh spacing, according to the principles of mechanics.

All the walls must be completely covered on both faces by the rope mesh, which must be securely tied to the indispensable crown beam. It is desirable to have the mesh spacing consistent with the masonry layout and configuration. Rope crossties placed in the mortar joints at regular intervals should also be provided to join the exterior and interior meshes. Figure 4 shows some details of the reinforcement provided to an adobe model.

Figure 4. Nylon rope mesh provided to reinforce a full-scale adobe housing model to be tested on the shaking table. The nylon rope used had a nominal diameter of ¼". The vertical ropes were placed through the bottom mortar layer and around the wooden crown beam. The horizontal ropes were spaced every two adobe masonry courses. Thinner nylon cross-ties (red ropes on the photos) were placed to join the mesh on both faces of the walls.

All reinforcing ropes must be tightened as much as possible to provide adequate confinement to the walls. Metal turnbuckles can be used for that purpose. These devices, however, are relatively expensive (around US$ 1.20 each in Peru) for use by rural dwellers in developing countries. If turnbuckles or other mechanical devices cannot be used, the ropes should be tightened by hand using appropriate knots. The selected knots should be able to keep the tension in the ropes for a long time. The recommended knot combination is shown in Figure 5.

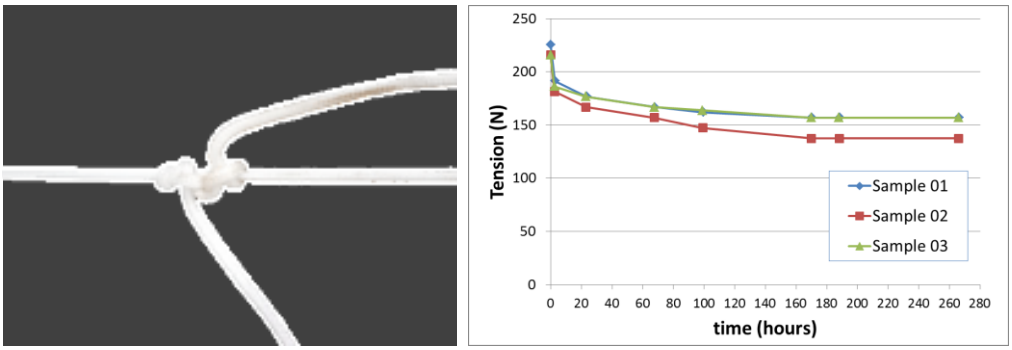

Figure 5. Combination of an "eight" knot and a "half-hitch" knot, used to tighten the nylon ropes (left). Constant load tests showed that 5/32" halyard ropes joined with this knot combination were able to hold about 60% of its initial tension after a week (right).

The recommended nylon rope mesh reinforcement technique is simple and low-cost. It can be learned and applied with little previous technical knowledge in construction, and it does not require extra equipment or machinery. The nylon rope mesh therefore holds great potential for seismic reinforcement of earthen dwellings in seismic areas [4], and thus it may help to mitigate the seismic risk in which millions of families live.

3. VALIDATION OF THE PROPOSED REINFORCEMENT TECHNIQUE

An experimental testing campaign is currently underway at the PUCP, with the aim of evaluating the efficacy of the mesh reinforcement retrofit system. A full-scale adobe house model has already been tested on the shaking table. The model consisted of four adobe walls (3.00 m long and 0.25 m wide) with a sloping roof. Adobe blocks measuring 250 x 250 x 90 mm were made using soil, straw and coarse sand (5:1:1 in volume). The adobe blocks were joined with 20 mm thick mud mortar also made with soil, straw and coarse sand (3:1:1 in volume). The test protocol consisted of several shaking phases with increasing intensity of peak table acceleration of 0.30 g, 0.60 g, 0.90 g and 1.30 g.

The undamaged model was first subjected to moderate shaking in order to induce representative seismic damage. Afterwards, it was repaired via mud grout injection, and then the walls were reinforced with an external mesh made of nylon ropes (halyard) with ¼" nominal diameter. The vertical ropes were placed at 250 mm intervals (the length of one adobe block). The lower part of the rope was inserted across the wall through the bottom course of mud mortar. The top part was placed over the walls, nailed to the wooden crown beam and joined to the lower part on each side of the wall, using metal turnbuckles. The horizontal ropes were also placed at 250 mm intervals (two and a half courses of adobe masonry) in two parts joined by turnbuckles. The average tension force in the turnbuckles was about 200 N. The meshes on both faces of each wall were joined together by 1/8" halyard crossties, which crossed the walls through the mortar joints at selected places. Figure 6 presents the retrofitted model before being tested on the shaking table.

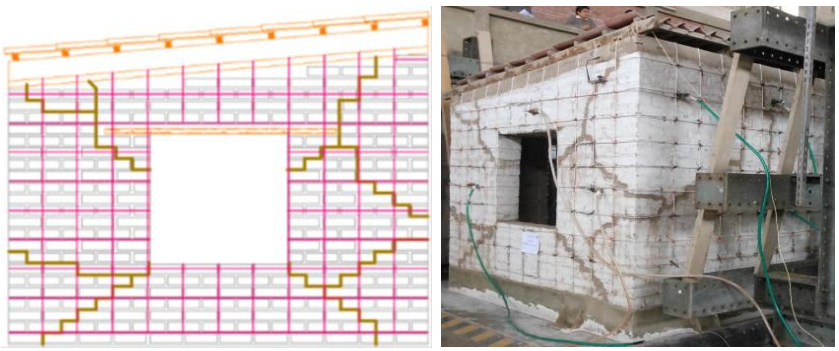

Figure 6. Full-scale adobe model repaired via mud grout injection and reinforced with a ¼" nylon rope mesh. The figure at left shows the repaired cracks and the location of the nylon ropes. The photo at right shows the model on the shaking table before testing.

After placing the retrofitted model on the shaking table, it was subjected to successive testing phases with 0.30 g, 0.70 g, 1.10 g and 1.53 g horizontal acceleration. The adobe walls, as expected, suffered severe damage, but they did not collapse. Figure 7 below shows the damage induced by the strong shaking sequence.

Figure 7. Cracking pattern and a snapshot of the reinforced adobe model after the test.

The seismic response of the retrofitted model during the strongest shaking was considered to be excellent because the reinforcement maintained the structural connection between roof and walls, controlled excessive displacements and avoided partial collapses, thus preserving the integrity of the structure.

4. SIMPLIFIED DESIGN PROCEDURE

Although general guidelines for the reinforcement of earthen historical monuments and dwellings located in seismic areas are available in the literature [5], a simple design procedure of the rope mesh reinforcement, aimed at practitioners, does not yet exist. Furthermore, analysis of retrofitted adobe constructions using elastic finite element methods (FE) would be inaccurate because their seismic response is highly nonlinear. The dynamic interaction between the different broken wall portions joined by the nylon ropes is particularly difficult to model using commercial software. It seems important, therefore, to find relatively simple methods to estimate the amount and distribution of mesh reinforcement to protect earthen constructions subjected to earthquakes.

A first attempt to generate a procedure to estimate the seismic forces in the ropes, in order to specify the required spacing for a given nylon rope reinforcement, has been recently developed at the PUCP. It is based on the dynamic analysis of rigid blocks, as illustrated in Figure 8 below.

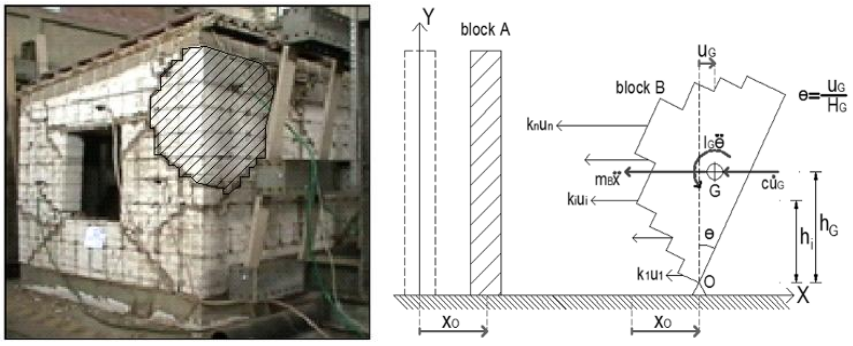

Figure 8. The forces on the ropes due to the overturning of a broken adobe wall portion such as that hatched on the photo at the left, can be estimated from the dynamic equilibrium equation of block B shown at the right. The main structure is assumed to move as a rigid body.

The simplified procedure has been successfully applied to explain the observed response of several reinforced adobe models tested previously on the shaking table [4]. A new adobe

model has been built, and its nylon mesh rope reinforcement has been designed, this time using thinner 5/32" nylon ropes. These ropes are very cheap and readily available in the rural areas of Peru. The model will be tested next year, by subjecting it to a single severe ground motion of 1.50 g. If the reinforcement is able to prevent partial or total collapse, the proposed design procedure will be deemed adequate.

5. TECHNOLOGY TRANSFER TOOLS

This research program would be useless if its results did not reach the people it is supposed to benefit. The researchers at the PUCP, therefore, have developed a portable shaking table and an illustrated construction manual to be used to disseminate the nylon rope mesh seismic reinforcement in rural areas of Peru, where most houses are made of traditional adobe and built without any technical assistance [6, 7]. The portable shaking table can be used to perform dynamic tests on reduced-scale adobe models (Figure 9, left). Its main goal is to educate community members about the high seismic vulnerability of their dwellings, and to show the value of building earthquake-resistant reinforced adobe houses. The illustrated construction manual is a technical document that fully describes how to reinforce an adobe house with nylon ropes using simple language and easy-to-follow drawings (Figure 9, right).

Figure 9. Dissemination of the reinforceement procdure in a ruaral community of the Peruvian Andes. The photo on the left shows a demonstration using a portable shaking table. The figure on the right is an illustration of the recently developed construction manual.

6. CONCLUSION

The proposed retrofit technique developed at the PUCP to protect earthen buildings in seismic areas has shown to be efficient in full scale unidirectional shaking table tests. The technique is reversible and not very intrusive, and therefore it seems suitable for the seismic protection of earthen monuments. It is also relatively simple and cheap, and therefore seems convenient for the construction of safe adobe rural dwellings. Simple analysis and design procedures aimed at engineers and architects were also developed, but they still need to be adequately evaluated. At the same time, a huge effort must be made to disseminate the techniques for safe earthen construction amongst actual users.

ACKNOWLEDGMENTS

The authors would like to thank the PUCP's Research Vice rector, who provided the funds for the research project described in this article. Thanks are also due to the Structures Laboratory director and staff. Many students participated in this project: Carlos Sosa, Jonathan Soto, Javier Sarmiento, and Malena Serrano. Their contribution is gratefully acknowledged.

REFERENCES

[1] ICOMOS (International Council of Monuments and Sites), *International letter related to Conservation and Restoration of Historical Monuments*. Venice, Italy, 1964.

[2] Blondet, M., Vargas, J., Tarque, N. & Iwaki, C., Construcción sismorresistente en tierra: la gran experiencia contemporánea de la Pontificia Universidad Católica del Perú, *Informes de la Construcción*, 63(523), 41-50, 2011.

[3] Blondet, M., Vargas, J., Morales, K. & Iwaki, C., Preliminary study on the usage of mud mortars to repair structural cracks in historical adobe buildings (in Spanish), *Proc. Adobe USA 2007*, El Rito, New Mexico, USA, 18-20 May, 2007.

[4] Blondet, M., Vargas, J., Sosa, C. & Soto, E., Seismic simulation tests to validate a dual technique for repairing adobe historical buildings damaged by earthquakes, *Proc. KERPIC2013: New Generation Earthen Architecture: Learning from Heritage*, Istanbul, Turkey, 11-14 September 2013.

[5] Tolles, E., Kimbro, E. & Ginell, W, *Planning and Engineering Guidelines for the Seismic Retrofitting of Historic Adobe Structures*, The Getty Conservation Institute, GCI Scientific Program Reports, Los Angeles, California, 2002.

[6] Instituto Nacional de Estadística e Información (INEI), *Tenth National Census of Population and Fifth of Housing–Final Results*, National Institute of Statistics and Informatics, Lima, Peru, 2007.

[7] Cribilleros, D., Espinoza, J., Gutiérrez, G., Noa, A., Serrano, M. & Rubiños, A. *Situational Diagnosis of the Pullo District (Parinochas, Ayacucho)*, Internal Report from the Academic Direction of Social Responsibility of the Pontifical Catholic University of Peru, Lima, Peru, 2014.

Prof. Dr. Marcial Blondet is Professor of Civil Engineering at the Pontifical Catholic University of Peru (PUCP). He obtained his PhD in Engineering at the University of California, Berkeley. Professor Blondet is a specialist in earthquake engineering with ample experience on the experimental study of the seismic behavior of structures. His main research interests are the development of low-cost solutions to mitigate the seismic risk of informal earthen and masonry dwellings, and the conservation of earthen historical monuments in seismic areas.

The Culture of the City Regaining a Historical Mansion in Diyarbakır: Cemil Pasa Mansion

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ABSTRACT
Cemil Pasa Mansion is located in the southwestern zone of Suriçi region, which is an urban protected area. Even though the town's being surrounded by walls necessitate constricted settlement order, it is one of the unusual constructions whose shape is like an island that is surrounded by streets. The construction reached the present day integrally by protecting the formation features of traditional Diyarbakır houses, and consists of harem[1] and selamlık[2] which is the part of a house reserved for men and service sections. Harem section consists of four wings that surrounds the big courtyard in the middle. Selamlık, which remains in the middle of harem and service sections, consists of a big iwan[3] whose three sides in the south is open and two-layered part back of this. Service section that is in the east of mansion consists of courtyard and the places surrounded that, however nowadays, it is separated into four parts due to the ownership problems.

In this study, Cemil Pasa Mansion that has an important place in the traditional urban area of Diyarbakır will be introduced in terms of architectural and construction features. Damages that occurred in the construction will be defined, and also design studies that were prepared, restoration interventions that were made with analysis, laboratory research and refunctioning stage that was chosen to protect the mansion will be explained.

Keywords: Diyarbakir, Cemil Pasa Mansion, restoration, traditional house

1. PLACE OF THE ARCHITECTURE OF MANSION IN THE TRADITIONAL URBAN AREA OF DIYARBAKIR

Traditional urban area of Diyarbakır was established in a zone that was surrounded by walls. That zone, which is called as Suriçi, has many monumental constructions that reflect different period's construction practice and understandings about history and art. Some of them have protected its originality and managed to reach today whereas considerable part of those is in the cultural heritage that we lost.

The most important construction group of the area inside the walls, which Diyarbakır walls restricted, are the traditional houses and mansions. Houses and mansions of Diyarbakır, which were shaped by family structure, economical structure, acculturation, walls, climate, geological structure and material, have an important place being the cultural heritage of the city with their unique architectural features.

[1] Mansion part where the family lives
[2] The portion reserved for men
3 A room with one side open to a court

Houses of Diyarbakır consist of an isolated courtyard that is independent within itself and the wings that is surrounded by the court. Square shaped court is a hypaethral pool area that rooms, iwan, kitchen, toilet, cellar, barn etc. are around. The floor of the courtyard which provides a connection between sections and where people spend most of their time in summer, is covered with vesicular basalt, and some parts of it is arranged as a garden.

Wealthy family houses are the buildings, which have gone beyond the traditional house dimension in terms of location, usage manner and layout, and were arranged as mansions. Harem section that the family lives in and selamlık section that male guests are accepted, constitute two main structures of the mansion. Besides, there is a service section that domestic workers such as housekeeper, gardener, cook and some of the servants stay in. The main room, which is located in the selamlık wing, is the biggest place of mansion and has the area that is suitable for crowded meetings. There is a transition space that connects harem and selamlık to each other, and a rotatory cabinet that enable the food that was cooked in harem to transfer to selamlık section. Even though barn and a special office for making coffee are located in the selamlık section, food is only cooked in the kitchen of harem section. There are separate toilets in both areas. Streets that are going to some mansions are privatized and transformed into cul-de-sacs. There is barn, corners that horses can be roped and feedboxes separated from harem. Mansions are the places that urban issues are discussed and some of the social events are being solved since they are the residence of large families. In this respect, families that have mansions are usually the ones from the important part of the society.

2. ARCHITECTURAL AND CONSTRUCTIONAL FEATURES OF CEMIL PASA MANSION

2.1. Place and History

Cemil Pasa Mansion is located in southwestern zone of Suriçi region, which is an urban protected area (Figures 1, 2). Even though thr town's being surrounded by walls necessitate constricted settlement order, it is one of the unusual constructions whose shape is like with an island that is surrounded by streets. Mansion, which is located in the Alipaşa Neighborhood, is restricted by Köylü Street from north and east, Binici Street from south and Ekinler Street from west.

Figure 1, 2. Cemil Pasa Mansion location in the map

In the direction of information on pendentive stones in the entrance door of selamlık section, it can be learned that starting date of the construction of mansion was around

1887-1888 (H.1305), and the date completed was around 1888-1889 (H.1306). In addition to these, in the writing on two-winged wooden door of selamlık section and thought to be added in certain time after the death of Cemil Pasa, it can be understood that Cemil Pasa passed on 1902 (H.1320)[1].

2.2. Architectural Features

The construction reached the present day integrally by protecting the formation features of traditional Diyarbakır houses, and consists of harem, selamlık and service sections (Figure 3). Harem section consists of four wings that surrounds the big courtyard in the middle. Important part of southern wing collapsed approximately one century ago. Other wings consist of sections like iwan, rooms, kitchen, toilet, store and hamam. Selamlık, which remains in the middle of harem and service section, consists of a big iwan. Near the entrance of harem, there are two entrances from streets, one in north and one in south. Service section that is in the east of mansion consists of courtyard and the places surrounded that, however nowadays, it is separated into four parts due to the problems of ownership.

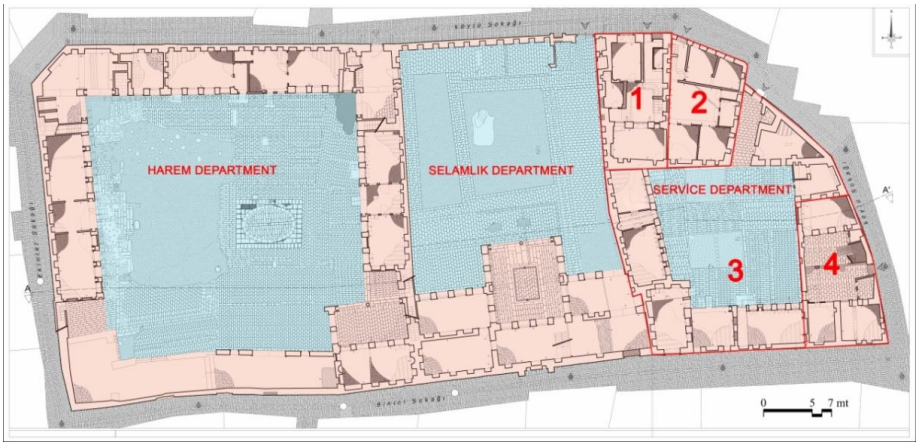

Figure 3. Cemil Pasa Mansion plan [2]

2.3. Confirmed Structural Damages

Since the building is not being used for a long time, the destructions and deteriorations originating from misusage are prevented, even though it also formed a basis for damage. In this respect, deformations that can be caused from human effect and over loading that come from effort to maximize utilization of construction, cannot be detected. This condition ensured the protection of original format and details of the construction. Restoration works was only in harem and selamlık sections since the ownership problem of service section cannot be solved, and harem and selamlık sections are arranged as Diyarbakır City Museum.

Even though the construction were not being used for a long time, there were no important *load-bearing column problem* in construction apart from the wings whose cover coat were collapsed totally or partially, and small-scale fade-ins near to them. Southern part of the harem section, summertime wing (Figure 4), mostly *collapsed* and became unusable. In addition to this, north, west and east wings of harem section's original earth-shelter partly fell down and grass grew over earth shelter in a size to block to perceive roof covering. Both roof and mezzanine floor of selamlık wing are not existing (Figures 5, 6).

Figure 4. Summertime wing in the harem

Figure 5. Selamlık

After mansion was abandoned by its owners, families that live in a part of the harem section of the construction did *parget and whitewashes* on the surfaces with face stone in the direction of their own will. Grass vegetated after long-term neglect, plants and partly shrubs that brushed out of joint spacing of flagstones in the court spread into wide areas by taking root (Figure 7). The tree that took root near the ellipse pool had reached to a size that can budge the stones of the pool and court (Figure 8).

Figure 6. The roof and floor are not existing in selamlık

Figure 7. The soil and grass on the roof

Families that used the mansion *obturated* many windows in the door way and abat-jour bay in the wings they live, with bricks in order to prevent the heat loss. *A large extend of materials have been lost; building elements* die out such as door, window, railing, meshwork, closet etc. in time, and some of the decorative objects like some wood (bağdadi[4]), metal and plasterwork which were exposed to depreciation and deteriorations (Figures 9,10, 11 and 12).

Figure 8. Some wood-adobe deterioration

Figure 9. The tree near the pool

Figure 10.The moisture problems

In facade metal elements were *decomposed and corrosed* (Figure 13). Many metal objects such as railings, window meshworks were stolen in the periods when the mansion was empty.

[4] Filledwoodwall

Figure 11. Closed windows

Figure 12. Painted

Figure 13. Metal elements walls

2.4. Research - Analysis and Project Study

The whole building survey of the building was measured with the help of total station in 2010 spring, and the section map analysis was made, in which damage on the building and constructional problems were processed and prepared. Afterwards, researches about other mansions and traditional houses in the city were made, and restitution project and analysis of the construction were prepared by examining not only the previous design studies, written and visual sources; but also making oral communication with owners of mansion that are alive. Refunctioning arrangements were made with mansion's restoration project and analysis in accordance with restitutive decisions, information came from construction and traditional construction principles. Building that was refunctioned as city museum was added an elevator near southern entrance of selamlık wing for new utilization. Afterwards, 2 parget and 9 pointing stuff examples were taken from different parts of construction, and were analyzed in Mardin Museum Restoration-Conservation and Analysis Laboratory. When Diyarbakır Cultural Heritage Preservation Board approved all projects, the restoration work was begun.

3. CEMIL PAŞA MANSION'S RESTORATION WORK AND REFUNCTIONING AS CITY MUSEUM

Cemil Pasa Mansion was refunctioned as *City Museum* by being publicized and restorated with the financial support of Diyarbakır Governorship and Diyarbakır Metropolitan Municipality in between 2010-2014. Southern wing (summer wing) in the harem section was handled separately in itself, excavated under the control of Diyarbakır Museum Directorate in order to get more information about the construction wing. Two building surveys were prepared after excavation, and decisions were made on restoration and contemporary additions.

In addition to this, general interventions were made to harem and selamlık sections of mansion such as cleaning, reinforcement- strengthening, integration, renovation and reconstruction. For *Cleaning and Disassembly Work;* iwan, windows and doors that were recently obturated totally or partially in harem section, north, east and western wing of mansion were disassembled with man power and returned to their original forms. Excavations that accumulated in time in the basement were taken, and surface cleaning were made on original floor (Figure 14). In southern wing, after excavation, surface cleaning was made on the floor, existed walls and cincture (Figure 15). All floors that were changed to reinforced concrete, recently in the first floor were disassembled and cleaned.

Figure 14. Took down roof

Figure 15. Joint on the wall

Figure 16. Paving with basalt stone

As in reinforcement; especially the selamlık wing whose false floor collapsed and the walls that were decomposed due to the lack of bonders' binder grout and lack of materials in the north and eastern wing of harem section were strengthened with injection system. In addition to this, pointings that became empty due to the moisture in street facades and joint spacings due to the cleaning in indoors, were refilled with the material that close to original grout. *As for renovation;* wooden joisting that mostly decayed and had partly slumps were renewed in accordance with the original size and form. Joisting that were collapsed or partially destroyed, were reconstructed. The maintenance and protection work were done to the ones, which are preserved in their position. The existing pattern and texture templates were made, and after analyzing stain, conservators applied on the jointing that were renewed and reconstructed.

Figure 17. Adobe filled wood wall

Figure 18. Basalt barrier

Figure 19. Wooden beams design

As for integration; from gargoyles, which are facing street from harem's north and east wing and selamlık from west wing, that cannot reach the present day and the ones that in cracked condition were integrated to the ones in stone cladding court of harem and selamlık, and the hearthstones of kitchen. As a reconstruction work in the mansion; cracked covering court of harem section, some part of the wall in southern wing that lost its handling and court wall, and iwan and other two rooms were reconstructed.

As for reconstruction; destroyed or extracted windows, and door leaves and doorframes were reconstructed from deal wood in accordance with comparative studies in harem and selamlık. Floor of harem section that was renewed as concrete and floor of the upper floor rooms were detailed, and timber covered floor and wooden beams were made in accordance with the traditional construction technique (Figures 16, 17, 18 and 19). All cover coats of harem and selamlık section were reconstructed as earth-shelter on wooden beam in the direction of the project that was prepared. Depressed arch that cannot reach the present day in upper and all mezzanine floor of selamlık section were reconstructed.

Figure 20. Harem section after restoration

Figure 21. Selamlık after restoration

4. CONCLUSION

Protection reaches its goal by protecting totality of social and architecture of cultural heritage of the property. However, this does not take a long time in conventional houses. Although first owners of the houses or the next few generations that use the houses, later on the houses are abandoned due to the reasons like the portion of the inheritance, migration to other cities, desire to live in new and modern houses that have recent comfort conditions, corrosion and not being able to meet the requirements. With the abandoning of last generation of Cemil Paşa family in 1980s, the construction was exposed to harmful effects of the nature by leaving it alone. The end of social continuity turns the architecture into a construction mass that nobody lives in, unused, not functioning, detached from society and urban life, wearing off rapidly day-by-day, proceeded to disappear. The effort of Diyarbakır Metropolitan Municipality and Diyarbakır Governorship, and with the support of ÇEKÜL, studying to protect mansion and use it as a city museum, started in 2000. After long-continued ownership problems, the restoration work that started in 2010 was completed in 2014 (Figures 20, 21). The arrangement ofthe building as a city museum still continues.

To conclude, Cemil Pasa Mansion, which has an important place in Diyarbakır traditional urban area with its location, construction feature, material, form and construction technique, being reintegrated to city culture with its original values, constitutes an important step and model application for sustaining another cultural property by preserving it.

REFERENCES

[1] Diyarbakir Protection of Cultural Assets Directorate Archives, Diyarbakır, 2016.
[2] Halifeoglu, F.M, Güler, M. Ş., İnal,S., Diyarbakir CemilPasa Mansion Survey, Restitusion and Restoration Project Report, 2011.

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The Role of Wind as a Generator of Cultural Landscape in Desert Climate of Iran

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ABSTRACT
Hot and dry regions in central desert of Iran have created such harsh conditions for living that people have become dependant on all the aspects of nature to create genius technologies to coordinate with nature during past centuries. Earth, water, wind and fire are four sacred elements of architecture that have been combined by the traditional people man to solve their problems and fulfill their needs. Wind as of the element of air is the gift of God for the people to be manipulated with the other three sacred elements of architecture to create cultural landscapes by the people of the world. Windcatchers have been created to capture the cool wind and with the use of "water" comfort have been made for the people of the desert region. In this paper the windcatchers that have been given the name of "City of Boud-Geers" for Yazd are introduced and the emphasis is made on the technological and cultural aspects of the windcatchers as a combination of the work of nature and people.

Keywords: Cultural Landscape, wind, nature, windcatchers, Yazd

1. INTRODUCTION

As of the definition, cultural landscapes are "properties that represent the combined works of nature and of man". Air and air movement (wind) is the work of nature and is and of the four sacred elements of nature, which have been used by man in philosophy, literature, science, medicine and architecture for many centuries.

Many of the cultural landscapes around the world have been recognized as a gift of nature and many of them are the results of the work of human society and nature. When people are faced with constraints and limitation their genius and experience come in play to create the combination work of man and nature for their wellbeing and survival.

In the country of Iran, with his rich wealth of culture and civilization, there are many examples of cultural landscapes, ranging from landscapes that have been designed and created intentionally by man, organically evolved landscapes or as an associative cultural landscape such as religions ceremonies, artistic or cultural associations of natural elements, but the main cultural landscapes have been created as a result of the gift or force of nature. Many of the cultural landscapes that have been created by the gift of nature have been preserved and developed for the use of the traditional man.

These kinds of cultural landscapes vary as the use of human habitat such as in Meimand, Kandovan, Masuleh, Abianeh or etc.

Qanats, windcatchers, cisterns and ice houses are among the examples of the genius technologies that have been created as cultural landscapes during past centuries by traditional Iranian man. Some of them are hidden under ground like Qanats and cisterns, and some represent the identity of cities such as Yazd, Ardakan, Meibod, bafgh or southern cities of Iran such as Qeshm, laft, khaf etc.

In this paper, after a brief review of the natural and manmade cultural landscape, explain the four cultural and technological landscapes that have been created according to the need of coordinating with brash climate of desert cities, and then focus on the development of wind-catchers during ages and explain some of its technological aspect and finally bring up the question of what the modern architecture and city planning is doing to our traditional cultural landscapes.

2. NATURAL AND MANMADE CULTURAL LANDSCAPES

In 2005 Meymand village (Figure 1), in Kerman province with regard to preserving the village's interaction with nature and unique natural and historical characteristics, was awarded the Melina Mercouri Prize.

The minaret look of these houses were dug by hand from the rocky mountains. Meimand architecture is of the few rocky architectures in the worlds, and only 50 kilometers from Tabriz, Kapad and Kieh in Turkey enjoy this type of architecture. Of course, the residential units and stream of life in rocky house is of their advantage.

This 3000-year-old village, is registered on the national heritage list. The village has about 400 houses (kitchen) with more than 2,500 rooms and approximately 150 people currently live in the village.

Figure 1. Meymand village

Masooule village (Figure 2), in north of Iran has a cultural landscape that nature, architecture and man have lived by each other for many years and still this interaction continues. The sustainable landscape is the result of preserving the identity and continuity to the past, so this village is a best example of sustainable cultural landscape.

Figure 2. Masooule village

Shushtar Historical Hydraulic System (Figure 3), is an island city from the Sassanid era with a complex irrigation system. Located in Iran's Khuzestan Province Collection of Shushtar water mills in Khuzestan province, including dozens of grinding mills is the largest industrial complex before the Industrial Revolution in general. Water use based on climatic conditions by creating an underground network beneath the old city, is considered one of the most intelligent form of water urban architecture.

Figure 3. Shushtar Historical Hydraulic System

Windmills are another example of exploiting the power of nature by Persian people. "Windmills or Asbads (Figure 4) can only be found in a limited number of areas in Iran, because using such mills requires constantly blowing and powerful winds. Since the winds in the southern part of Iran have these required features, windmills were used for many years in there. " [1].

Figure 4. Asbads

3. FOUR MAN MADE KEY TECHNOLOGICAL STRUCTURES AND CULTURAL LANDSCAPES IN DESERT

The four key structures that have used the four sacred elements of nature (air, water, earth and fire) are ice houses, qanats, cisterns and wind catchers. Harsh climate conditions in desert areas of Iran have common characteristics such as:

- Limited water resources;
- Warm and dry summer, cold and hard winters;
- Low rainfall;
- Low humidity;
- Scant vegetation;
- Large variation between day and night temperatures; and
- Dusty winds and sandstorms [2].

The above key structures have been developed to perfection by the traditional man during the ages and have combined the forces and gifts of nature with their genius for the sake of human comfort.

Water and air are the most sacred and important elements of nature that play the key roles for the four key structures to become as cultural landscapes in desert parts of Iran.

Qanats and wind catchers are the outcome of technological values that have been developed to help the Iranians to survive and show their culture and civilization to the world.

3.1. Ice house

Ice houses in Figures 5, 6 buildings used to store ice throughout the year, commonly used prior to the invention of the refrigerator. Some were underground chambers, usually man-made, close to natural sources of winter ice such as freshwater lakes, but many were buildings with various types of insulation.

During the winter, ice and snow would be taken into the ice house and packed with insulation, often straw or sawdust. It would remain frozen for many months, often until the desert application of the ice was the storage of perishable foods, but it could also be used simply to cool drinks, or allow ice-cream and sorbet desserts to be prepared. During its heyday a typical commercial ice house would store 2,700 tons (3,000 short tons) in 9x30 meters (30x100 ft.) and 14-metre-high (45 ft.) building [2].

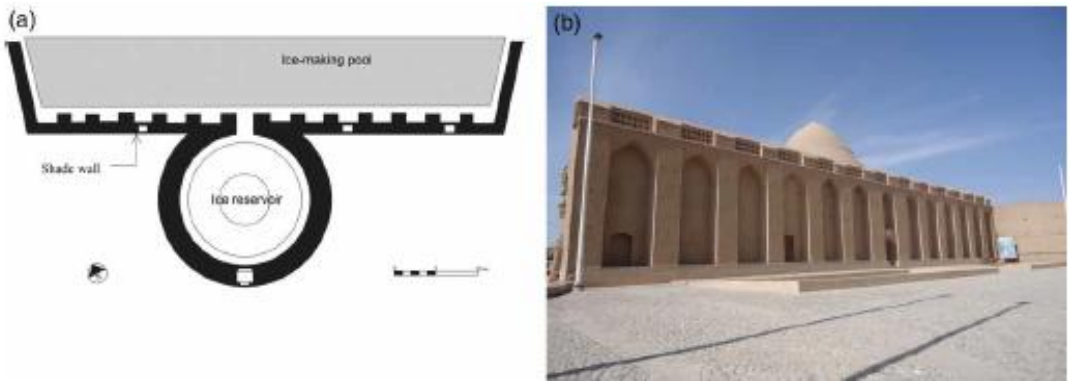

Figure 5. Ice House**:** Plan, ice making pool and ice storage of an Ice House

Figure 6. Ice House

Figure 7. Cistern

3.2. Cistern

Cistern or Abanbar (Figure 7), is a traditional water reservoir for drinking water built in different locations of the city or the villages or caravan routes related usually to Qnats and wind catchers. Water was taken from qanats according to some rules set by the traditional people at defined times and by an experienced and trusted person. The air movement from the wind catchers keeps the water ventilated and keeps it healthy and fresh for a long period of time.

3.3. Qanat

Iranian people to overcome the water shortage in hot and arid and semi-arid regions, by the use of simple techniques of digging wells and tunnels and by understanding the law of gravity, invented the most genius underground structures called "Qanats" (Figures 8, 9).

Most of the city and village structure were developed according to underground canals of qanats to reach water for drinking or agriculture. To fulfill these purposes, the qanat has operated in conjunction and relation to other key structures such as cisterns for water, ice-houses for ice storage and wind catchers for natural ventilation and watermills for grinding grains.

The figure in below shows the simple diagram of how the qanats work from mother well to mazhar where the water flows above the ground at or near settlement site and is a point where people take water and it is generally located in the main square of a village or the city.

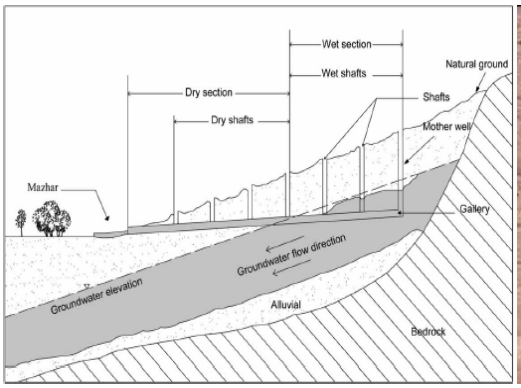

Figure 8. Diagrammatic Section through qanat **Figure 9**. Qanat foot print

3.4. Wind catcher

Baud- Geers have been used in central and southern cities of Iran and many other countries for many centuries for natural ventilation and cooling. According to different predominant wind direction, Baud- Geers have been designed to catch the cool and cleaner air. Four sided Baud- Geers are common types in Yazd and one sided Baud- Geer are common in city of "Ardakan", about 50 Km from Yazd [3].

Wind catchers (Figure 10), use in hot and dry climate of Yazd is one of the Iranian masterpieces which have played an important role in passively cooling and ventilating the spaces of traditional summer side of the houses. Since the seasonal and daily blowing winds are very critical in shaping the climate of desert cities, the wind catchers of Yazd have acted to catch the cool.

The wind is cooled down after passing through the walls of the wind catcher and guided to the related spaces [4]. Some of the wind catchers cool the spaces by only air displacement and natural ventilating and some of them cool the spaces by the use of evaporative cooling of the humidity of qanats and cellars. "The qanat's canal, which passes beneath the basement, has also been used to increase the humidity and the coolness of the airflow. The flow of the incoming air from the wind catcher is directed across the vertical shaft opening of the qanat to the basement that creates a lower pressure and draws cool air up from the qanat tunnel".

"A wind catcher operates in various ways during day and night according to fluctuations in the air temperature, the intensity of solar radiation, the wind velocity and other climatic variables" [2]. When there is no wind which it happens often during the summer season. The wind catcher acts like a chimney and draws the hot air and replaced by the air that passes through the pond, trees and humidity of the courtyard and cools down the spaces like the talar or the courtyard.

Many different typologies of wind catchers have been developed in different region according to the climatic conditions. "Traditional Baud-Geers (wind catchers) were capable of capturing breezes above roof level and have been designed as: one sided (Pakistan, egyptianer, "Ardakan" or…), two or four sided (Iranian, "Yazd") [5].

The graph below shows the efficiency for different wind catcher design (Figure 11). The two or four side wind catchers and much less efficient than either of the one sided types.

Figure 10. Wind catchers

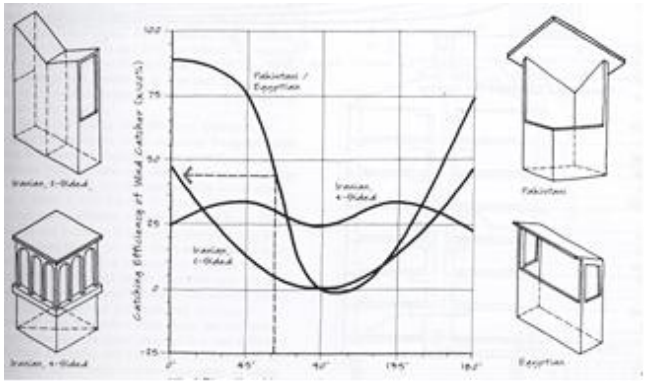

Figure 11. Catching efficiency for different wind catcher designs [4]

4. CONCLUSION

The cultural landscapes have many different types and according to Ziaie Mariam, the cultural landscape foundations can be categorized in material, links and immaterial shown in figure below. As it was mentioned earlier, all different types of cultural landscapes have developed during past centuries ranging from human built forms, urban artifacts, hydrography, monuments, agriculture, methods and techniques, food, dance and etc.

The work of nature and the act of traditional man have created the most magnificent cultural landscapes, but the four key structures by the use of four sacred elements of nature such as air, water, earth and fire have played the key role to create the manmade cultural landscapes.

Ice houses, cisterns, qanats and wind catchers are the four key structures that the genius people f the desert have developed to overcome the forces of the nature and as a way of survival, manipulate the condition for their comfort.

Wind caters have made Yazd as a city of Baud- Girs and have become part of the identity of the city, but during the past 40 years, they have been endangered. Some of them have been ruined down on purpose or due to the people leaving the old city. Many important decisions must be made to preserve the identity of the city and this valuable cultural landscape.

REFERENCES

[1] Saeidian Amin, Gholi, Mojtraba, Zamani, Ehsan: windmills (Asbabs): Remarkable Example of Iranian Sustainable Architecture- Architecture civil engineering environment, The Salesian university of technology, 2012.

[2] Rafie farnood, the role of four key structures in the creation and survival of cultural landscapes in the desert environment, in, journal of architecture conservation, 2014.

[3] Ayatollahi, S. M. Hossein., Enhancing the applicability of wind catchers for contemporary use, The center for coordinating with nature, UNDP, 2005.

[4] Ayatollahi, S. M. Hossein, A study on different typologies of wind catchers (Baud geer), 37th IAHS World Congress on Housing, Santander, Spain, October 2010.

[5] Brown G. Z. and DeKay, M., Sun, Wind and Light: Architectural Design Strategies, 2nd ed., John Wiley, New York, 2001.

[6] Ayatollahi, S. M. Hossein**,** Preserving the traditional "Wind catcher" to preserve the urban identity (Yazd-Iran), Proceedings for the first international conference: Living in Earthen Cities- Kerpic'05, 6-7 July, 292-302, Istanbul Technical University (ITU), Istanbul, 2005.
[7] Ayatollahi, S. M. Hossein, Natural Ventilation and Quality of Life, T.I.A. International seminar, Yazd, Iran, 2003.
[8] Bahadori, M. N., Haghighat, F., Passive cooling in hot, arid regions in developing countries by employing domed roofs and reducing the temperature of internal surfaces, *Building and Environment*, 20(2):103-113, December 1985.
[9] Ziyaee, M., Urban Cultural Landscape Foundations: Materials, Immaterial and Links, Urban cultural landscapes: Past, present and future, Tehran, Iran, 2014.

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Tourism of Qanat: Renewal After Drought

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ABSTRACT
Qanat reflects the interaction of man and nature. This human structure and invisible phenomena created a desert style architecture and landscape involving not only the qanats themselves, but also associated structures, such as cistern, water mills, public bath, payab, In the past years, most qanats suffered from a shortage of water or have dried up. This paper attempts to identify the continued importance and potential of passive qanats and non-use historic hydraulic structures. The results indicate that qanat tourism while protecting the environmental and cultural heritage, renewal of heritage places as creative and attractive venues for tourists and local residents alike.

Keywords: Qanat, tourism, drought, renewal

1. INTRODUCTION

Qanat is the cornerstone of prosperity in desert towns and villages. In arid and semi-arid regions, it has resulted in the creation of a desert style architecture and landscape involving not only the qanats themselves, but also associated structures, such as cistern, water mills, public bath, payab, as well as urban and rural desert architecture [1]. In the past years, urban growing, drought and mainly using of modern water pumps have lowered water tables and drying up many qanats. In continuance, researchers according to descriptive sources and case studies, presented some concepts for renewal passive qanats and reuses of the associated historic hydraulic structures. Qanat technology apparently originated in the highlands of western Iran, northern Iraq, and eastern Turkey some 2.500 years ago, possibly in connection with early mining ventures in that region. Laessoe has argued that qanats supported a flourishing civilization near Lake Reza'iyeh (Urmia) which was destroyed by Sargon II in his eighth campaign in 714 B.C [2].

Karez (Qanat) are found in 38 countries worldwide (39 including Palestine/West Bank), in both western and eastern hemispheres, though most are concentrated in the Middle East region and the frequency of karez increases in proximity to Iran, where the greatest number and variety of them are found [3:3]. The Persian qanat has a special niche in the cultural, social, economic, political and physical landscapes of the country. Without these kinds of traditional irrigation system, thousands of villages and towns would not have been theme at all. Although life has changed over the centuries, qanats have maintained their importance and significance at the heart of community well-being and survival of many communities (Figure 1) [1].

Figure 1. Qanat wells [4]

2. QANAT AND HISTORIC HYDRAULIC STRUCTURES

Qanats (kariz) are constructed as a series of well-like vertical shafts, connected by gentle sloping tunnels. This technique, where the water table is closest to the surface. From this point, the slope of the qanat is maintained closer to level than the surface above, until the water finally flows out of the qanat above ground. To reach an underground aquifer, qanats must often be of extreme length (Figure 2) [5:63].

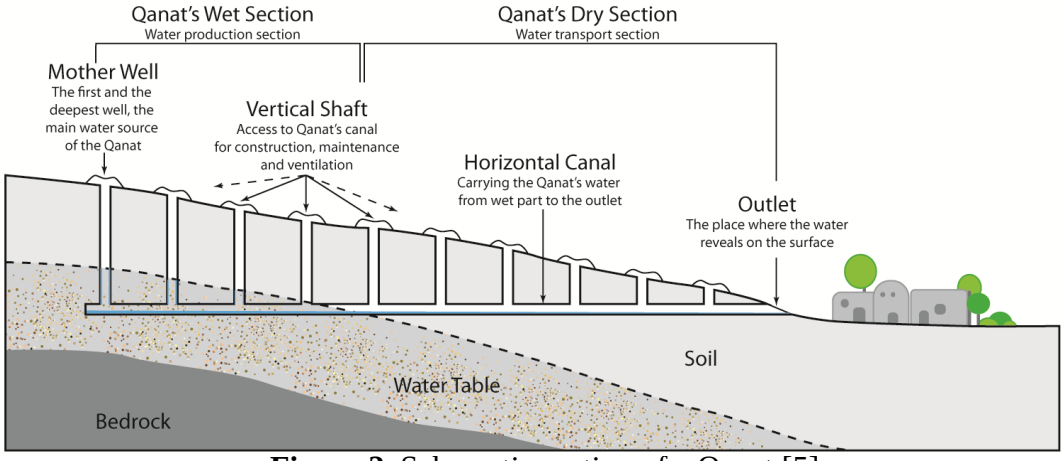

Figure 2. Schematic section of a Qanat [5]

Associated historic hydraulic structures include: Waterwill, cistern, persian bath, payab.

2.1. Watermill

According to evidence; watermills have a long history in Iran, at least 1,700 years, and a few of them have managed to operate continuously to the present day [6]. Watermills located in dry areas are generally Qanat-fed and use Qanat water flow to move millstones [7]. The common method used in Qanat-fed mills is to gather the water from the Qanat in a pool (Tanoureh) after the Qanat's outlet point, then drain the water through a tiny nozzle in the bottom of the pool. The pressure of this flow was enough to move wooden blades attached to the upper millstone. Thus, almost all Qanat-fed watermills are located a few meters underground, depending on the height of the pool (Figure 3) [8].

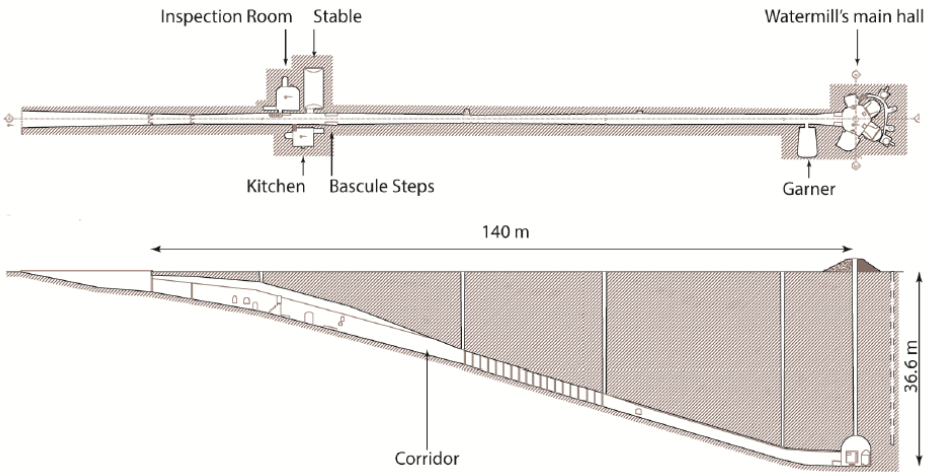

Figure 3. Plan and section of Mohammadabad double-stone watermill, Meybood [5]

2.2. Cistern

Traditional cisterns called "Ab-Anbar" can be divided into two groups: 1) public cisterns located in neighbourhoods, caravserais and in the path road of caravans 2) private once inside of houses [9:127]. Private cisterns were built in urban and rural houses, mostly under the building or under the yard surface. The tanks of these cisterns are usually in cubic or rectangular cubic form with a flat or cradle-like ceiling. Public cisterns are usually large and impressive buildings and they have been built by local benevolent people or nobles or rulers who have paid for the construction by their personal properties or public findings [10:125].

2.3. Persian bath

A public bath was an important part of the complex of buildings in large cities in Iran. Publicbaths were divided into four main parts: an entrance, a cloakroom, a main door (middle corridor)and a hot chamber (garmkhaneh) where washing took place. Cloakrooms were usuallyoctagonal, occasionally square. A handsome, usually octagonal pool surrounded by a foot-washing channel (pa shuyeh) stood at the center of the cloakroom (Figure 5) [11:470].

2.4. Payab

Payab is a stairway leading to an underground channel where there is a polygon slice on the floor on the passage of Qanat to provide access to water.Payab is located in the main urban public place and is used for taking drinking water (Figure 6).

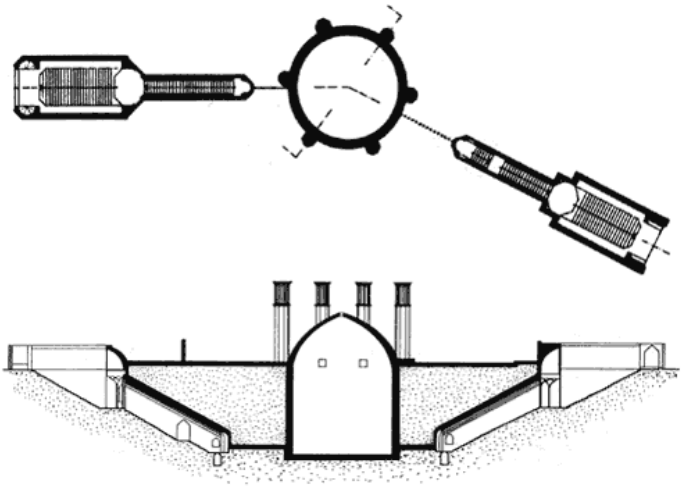

Figure 4. Plan and section of SheshBadgiri Cistern, Yazd [12]

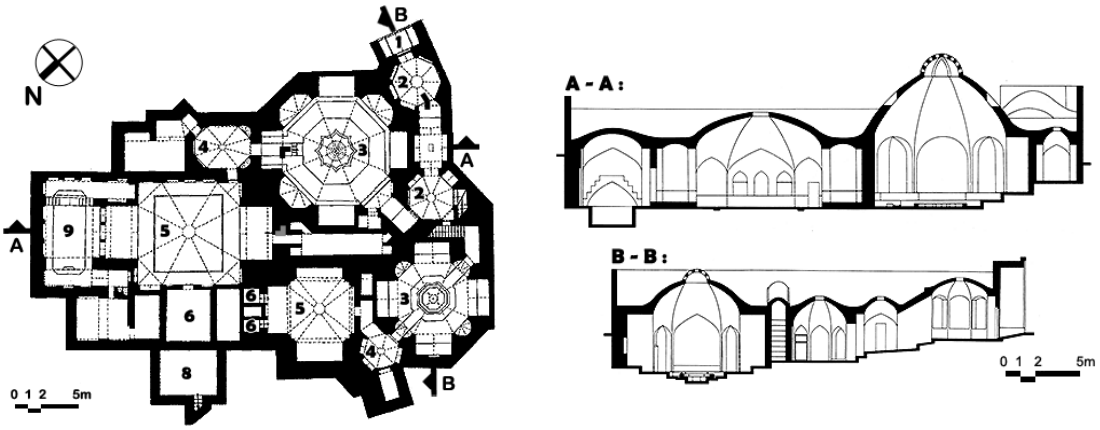

Figure 5. Plan and section of Golshanhammam, Yazd [12]

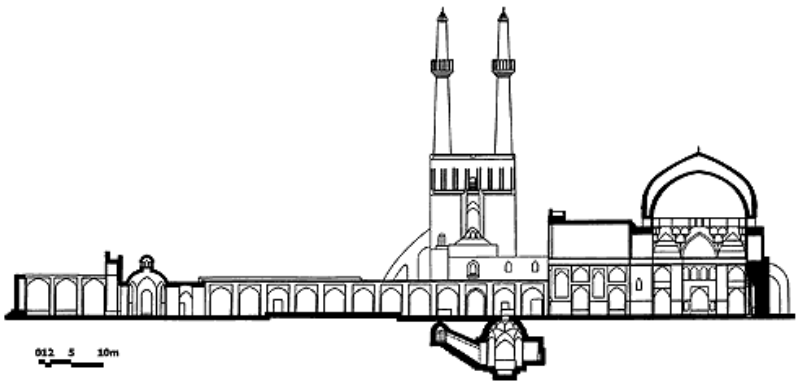

Figure 6. Jame mosque payab, Yazd [13]

3. DROUGHT AND PASSIVE QANATS

Most qanats suffer from a shortage of water or have dried up mainly because of pumps operating around them and, to a lesser extent, due to successive years of drought," says Abdolhamid Rasekhi, an expert on Tehran's qanats. Qanat is a valuable part of the cultural landscape of Iran. "We developed *qanats* and introduced them to the world, then we lost them. It's so sad that one of the most sustainable ways of water harvesting is almost gone," says Dr.Kaveh Madani, an authority on Iran's water at Imperial College, London.

While passive qanatsystems cannot replace modern advances in water resources management, they still have a role to play as a cultural heritage. One of the most important potential of passive qanats is the tourist attraction. The underlying concept behind the renewal of passive qanats is to present it as a symbol of appropriate use of resources and of the relationship between cultural heritage and sustainable development. This touristic use has a double effect: first, the revival of these traditional structures, second; preservation and revitalization of cultural landscape.

4. TOURISM OF QANAT

Cultural tourism is one of the largest and fastest-growing worldwide tourism sectors. The tourism has used to the revitalization of redundant structures for contemporary purposes, providing opportunities for sustaining traditional and contemporary cultural values. Passive qanats and historic hydraulic structures that are left abandoned are at risk of physical decay, and represent a loss of opportunity to revitalize structures that contribute to the identity of Iranian community and its social traditions. Tourism of qanat helps to preserve the cultural landscape. In continuous, some examples of this tourism have explained.

4.1. Kishqanat

This qanat which goes back to 2000 years ago is located in Kish Island, south of Iran. It's 17 km long and has 274 wells. In some points along the main tunnel, the diameter of the tunnel increases to 10 m. This Qanat is now rehabilitated and is a museum which attracts many tourists each year (Figure 7) [14:7].

4.2. Kosh'e Nou Watermill

Koshk'e Nou watermill is located in Yazd and dating back to Safavid dynasty, about 1700 AD, to Qajar dynasty. The watermill was built 22 meters deep in the ground to use the water current of qanats and people accessed them via a staircase. Nowadays watermill has become a tourist spot for cultural and desert eco-tours in Yazd city (Figure 8).

4.3. Setti Fatemeh Cistern

Setti Fatemeh Cistern is located in Yazd city near to Amir Chakhmaq square. Amir-Chakhmaq complex was built in the 15th century by Jalal-al-Din Amir-Chakhmaq, the governor of Yazd in the Timurid era. The cistern founded by SettiFatemeh, wife of Jalal-al-Din Amir-Chakhmaq. In the last years, this building reused as Zoorkhaneh (traditional Iranian gymnasium) and has become a tourist spot for intangible cultural heritage (Figure 9).

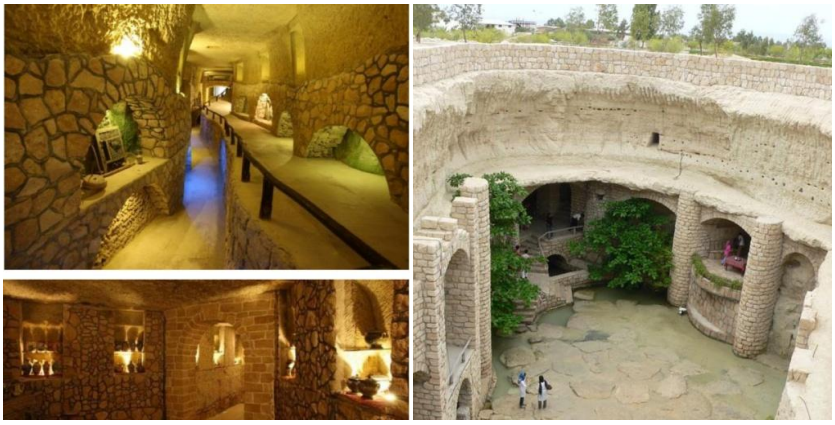

Figure 7. Kish Qanat, kish [15, 16]

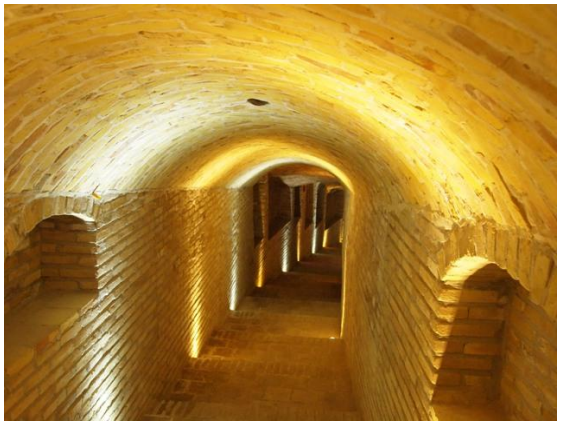

Figure 8. Kosh'e Nou Watermill, Yazd [17]

Figure 9. SettiFatemeh Cistern, Yazd [18]

4.4. Khan Hammam

Khan hammam known as light garmkhaneh was built by Mohammad Taghi Khan Bafghi, the governor of Yazd in the 17th century. Khan bath was built in an 1170 square meters with 900 square meters infrastructure that includes several sectors, including Gavro, cloakroom and a hot chamber. In the last years the building is used as a tearoom and a traditional restaurant for local people and tourists (Figure 10).

Figure 10. Khan Hammam, Yazd [19, 20]

4.5. Jame mosque Payab

Jame mosque Payab is a stairway leading to an underground chamber in Yazd Jame mosque. This payabaccess to Zarchqanat, the longest qanat in the world. Since 2016 this payab reused as a historic hydraulic structure of Zarchqanat tourist path (Figure 11).

Figure 11. Jame mosque Payab, Yazd [21]

5. CONCLUSION

Qanat and historic hydraulic structures in the desert environment of Iran take the role of keystructures in the creation and survival of the cultural landscape. If we can bring life in these structures, collective memories will revive and resuscitate and preserve local and regional identities. Qanat tourism while protecting the environmental and cultural heritage, re-use or renewal of heritage places as creative and attractive venues for tourists and local residents alike.

REFERENCES

[1] World Heritage Center, http://whc.unesco.org, last accessed on 19/06/2017.

[2] Ward, P. J., *The Origin and Spread of Qanats in the Old World*, Proceedings of the American Philosophical Society, Vol. 112, No. 3 (Jun. 21, 1968), pp. 170-181 Published by: American Philosophical Society Stable, 1968.

[3] Lightfoot, D.R., Survey of Infiltration Karez in Northern Iraq: History and Current Status of Underground Aqueducts, A report prepared for UNESCO by Department of Geography, Oklahoma State University, 2009.
[4] Qanat, http://openbuildings.com/buildings/qanat-profile-1324, last accessed on 28/06/2017.
[5] Mostafaeipour, A., Historical Background, productivity and technical issues of qanats, *Water History*, Springer Link, Volume 2, Issue 1, pp 61–80, 2009.
[6] Saeidian, A., Watermills as a renewable energy in Iran, dezful, 2012.
[7] Harverson, M., Watermills in Iran, Iran, Vol. 31, pp. 149-157, British Institute of Persian Studies, 1993.
[8] Mahmoudian, S. A., and Mahmoudian, S. N., *Water and water supply technologies in ancient Iran*. Evolution of Water Supply through the Millennia, 91, 2012.
[9] Hejazi, M, Mehd izadehSaradj, F., *Persian Architectural heritage, Architecture, Structure and conservation,* WIT press, 2015.
[10] Dorraj, P, Eskandani, O, Hasanzadeh, J, GhariHeidari, M., *Manifestation of Water in the Formation of Iranian Art and Architectural Desert.* Journal of Applied Environmental and Biological Sciences, 2014.
[11] Mashayekh, H., Mashayekh, H., Hammam: Bath House, an Ancient Heritage in Iran, http://archive.bridgesmathart.org/2008/bridges2008-469.pdf, last accessed on 12/06/2017.
[12] Yazd Ghool Abad™ Foundation, http://ghoolabad.com/, last accessed on 28/06/2017.
[13] http://morarchitect.blogfa.com/, last accessed on 28/06/2017.
[14] Alemohammad, S. Y., Gharari, S., Qanat: An Ancient Invention for Water Management in Iran, Water History Conference, Delft, The Netherlands, 2010. http://hamed.mit.edu/sites/default/files/Qanat_WHC_2010.pdf, last accessed on 12/06/2017.
[15] irandehkadeh.com, last accessed on 28/06/2017.
[16] www.kishsafari.ir, last accessed on 28/06/2017.
[17] yazd.ir, last accessed on 28/06/2017.
[18] http://www.tishineh.com/, last accessed on 28/06/2017.
[19] www.makanbin.com, last accessed on 28/06/2017.
[20] www.kojaro.com, last accessed on 28/06/2017.
[21] seeiran.ir, last accessed on 28/06/2017.

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Vazir Historical Complex Past, Present, Future
Conservation, Restoration, Rehabilitation and Revitalization


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ABSTRACT
A fundamental change in form and concept of mobility after modernism has left us with a large number of caravanserais, historical transportation and resting hubs along ancient trajectories that are gradually decaying to the point of ultimate disappearance. These neglected places represent *genius loci* of the historical and cultural landscapes that we dwell in.

The aim of this study is to explore some of the ways in which we can give a new life to such historical hubs through renovation and revitalization. As a case study this paper introduces and reviews Vazir Complex, one major "research to design" project in historical context of Yazd-Iran. Vazir historical complex established in 1881 along the ancient Silk Road is located between Yazd and Meybod and today it presents a complex spatial program providing places for diverse activities from resting to social interaction. This Complex includes various components: a garden and a pavilion, a Caravanserai, a small market (Bazarche), a bathhouse (Hammam), a cistern (Abanbar), a passage (Sabat) and a carriage house. The paper aims to introduce a process of change in the life of Vazir Complex which undergoes various phases of change from a) a significant hub in Qajar Era,b) historical remnants subject to archaeological studies, c) restored and revitalized complex to d) a vital cultural complex today.

Meanwhile envisioning a proper future for Vazir Complex requires more research and speculation which necessitates understanding of its evolving context and prediction of its future development.

Keywords: Historical complex, conservation, restoration, revitalization, genius loci

1. INTRODUCTION
Vazir historical complex is in HojjatAbad, a village in Sadooq region. It is located at the verge of Yazd-Maybod road, 20 kilometers far from Yazd and is surrounded by various gardens and old village houses at its north and northeast borders. Vazir historical complex established in 1881 along the ancient Silk Road and today it presents a complex spatial program providing places for diverse activities from resting to social interaction. This Complex includes various components: a garden and a pavilion, a Caravanserai, a small market (Bazarche), a bathhouse (Hammam), a cistern (Abanbar), a covered passage (Sabat) and a carriage house. The main features of Vazir complex are aligned on a longitudinal axis with a cistern placed at the beginning and the carriage house at the opposite end. Existence of various water features such as the pool in front of the pavilion, the cistern and water flow on green areas of the site all imply that water has a major role in shaping the organization of the spatial features in this complex (Figure 1).

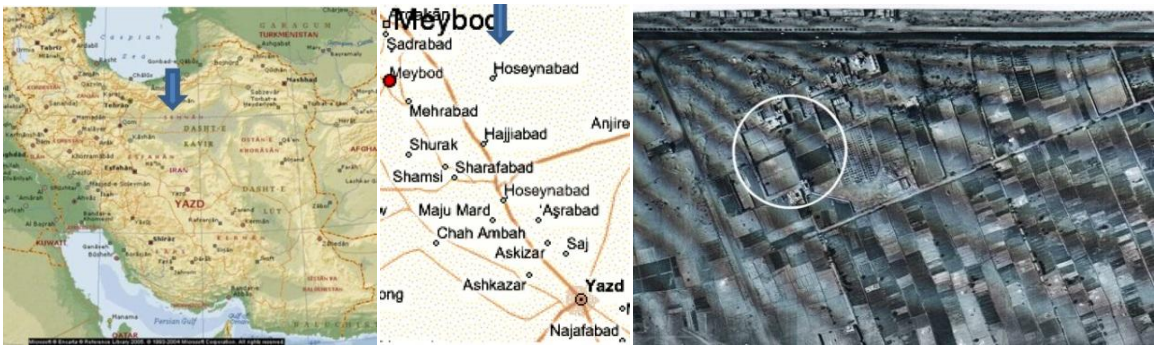

Figure 1. Hojjatabad position

Although the exact date of its construction is unknown but the caravanserai was surely the first building to be constructed on the site. Some evidence remained from the past indicates that construction of the pavilion, cistern and garden dates back to the year 1298 Islamic Calendar (Hijri Qamari).

All architectural and spatial features in the complex have their own aesthetic, architectonic and engineering significance but vazir complex has a unique quality that brings all of these features together in a harmonious way Figure 2.

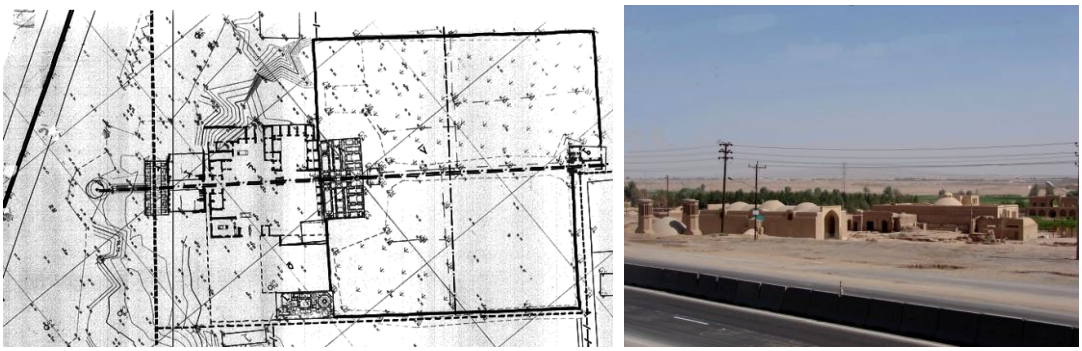

Figure 2. (left) Longitudinal Axis conforms to water flow Axis –
(Right) view from the new road

2. COMPONENTS OF VAZIR COMPLEX

2.1. Cistern and Covered Passage (Sabat)

In many of the historical building complexes of the region, covered pathways (Sabats) would lead caravans to Cistern and Caravanserais. Rooms of Caravanserais would offer places of refuge for Caravans' travelers.

Cistern in Vazir complex had been destroyed, all marks of its existence had completely vanished, and there were no photograph or drawing that would inform us about its original composition and form, therefore our research team studied aerial photos, made interviews with local people and reviewed similar case studies in the region to come up with an understanding of the spatial configuration of original Cistern of the complex in order to be able to develop a proper design and accordingly build a new cistern.

Water was being supplied by two subterranean aqueducts (qanats) both of which have dried up through the years. In the new design for Vazir complex it is proposed to use Cistern as main water supply and Sabat as temporary resting area for the guests (Figure 3)

Figure 3. Old and new views of Cistern and covered passage-
Ruins of caravanserai after excavation- 1967 Aerial Photo shows qanat wells

2.2. Market (Bazarcheh) and Caravanserai

The Small market and caravanserai have been damaged seriously. In the past years they have been demolished for various local businesses such as cattle farm and car mechanic shop removed and replaced them. In the middle of the caravanserai's courtyard there is a pathway that reaches to the qanat's water at one and half meters lower than courtyard's level. In archaeological excavation only traces of foundation, some parts of footings and traces of loadbearing walls were identified. In our plan it is proposed to restore the original function of the caravanserai and market Figure 4.

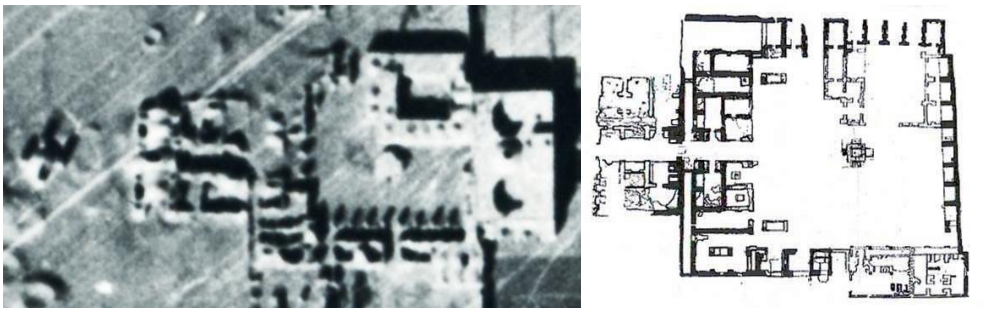

Figure 4. 1967 Aerial Photo and archeological drawing of
Market (Bazarche)and Caravanserai

2.3. Bathhouse (Hammam)

The bathhouse of the complex includes two interconnected large and small baths which are ruined seriously. The large one has more facilities such as a toilet, a washing podium (pashooye) with turquois tilings and a cleaning room. All surfaces are insulated with traditional water proof materials. Hammam performs hygenic/recreational function in our proposed plan Figure 5.

Figure 5. Bathhouse (Hammam) before and after conservation

2.4. The pavilion

The two-story pavilion was built adjacent to Hojjatabad caravanserai. The ground floor is raised about the garden level. The Springhouse is at the level of the garden to allow water flow. Access to the interior is provided from three directions. The transparent surfaces and openings of the building are oriented toward wind and they look over the view of surrounding landscape. The main entrance includes a grand terrace which is connected directly to Springhouse.

The most precious part of this building is Domed Hall (Gonbadkhaneh) with a springhouse that includes a stream running from caravanserai to the middle pool in the building and reaching to the pool in the garden. There are two inner courtyards in the first floor that are in close relation with Domed Hall and two cross shaped rooms offer vast views over the green fields and surrounding landscape.

The pavilion will serve as a guest house and gives services for 3 meals a day. The ground floor offers snacks and drinks and the upper floor for more sophisticated kind of foods and entertainment (Figure 6).

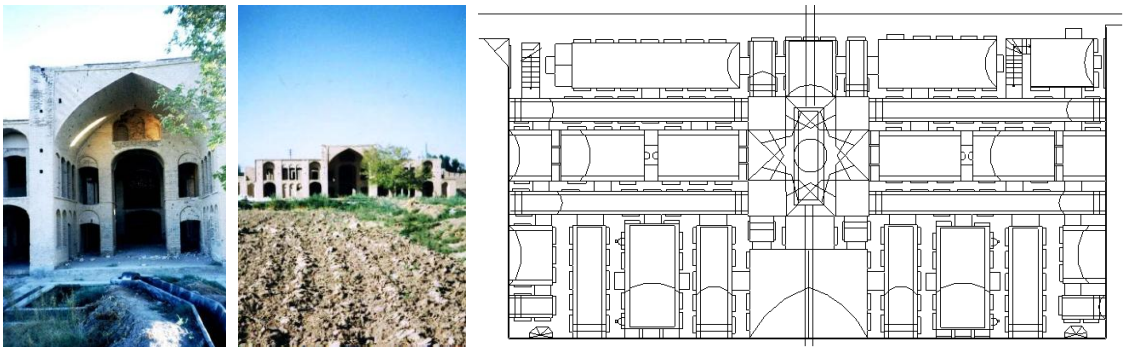

Figure 6. Pavilion and Garden before conservation-First floor plan

2.5. Garden

The garden of Vazir Complex is inspired by spirit of the Persian Gardens in the region. There were various models to be studied. The aim of design was to follow design principles of Persian Garden: Spirituality (symbols, numbers, metaphors, history), order (geometrical, axial, central, proportional and hierarchical), Harmony with nature (land form, climatic forces, etc.), productivity (functionality, productivity of landscape) (Figure 7).

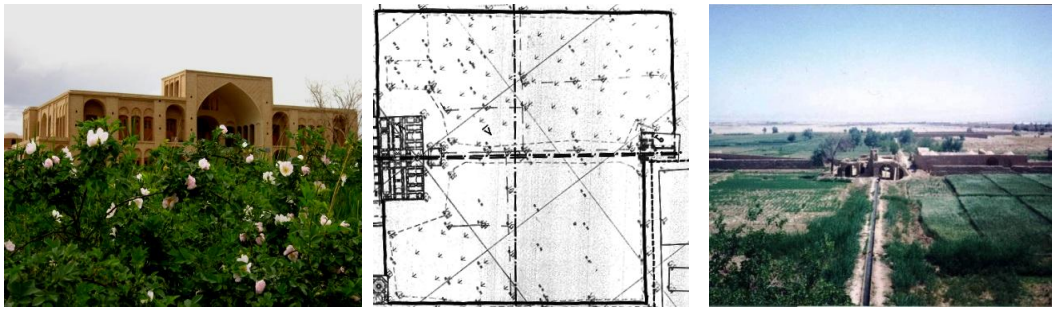

Figure 7. Pavilion after restoration - Garden's plan and view before conservation

2.6. Carriage house

At the end of the longitudinal axis of the complex the carriage house stands between the agricultural fields and the complex. This building originally has been the Entrance to the garden but during years new buildings were annexed to this entrance and gradually it started to function as the carriage house of the complex. The second floor of the building is the superintendent's residence. Carriage house provides the opportunity and facilities for visitors to stroll around with carriages and enjoy the scenery of surrounding farms and gardens .The carriage house was intentionally assigned as the starting point of the visitors' journey throughout Vazir Complex, as it used to be in the past (Figure 8).

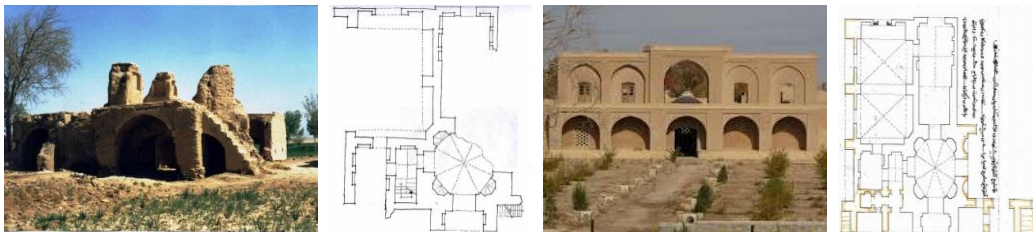

Figure 8. Carriage house before and after restoration and reconstruction

3. RESTORATION AND DESIGN PRINCIPLES

The following restoration and design principles represent our vision toward the research-design process of Vazir Complex Project**:**

- Minimum intervention: to preserve old fragments and segments remained from the past and to be respectful to the original and historical design
- Architectural Character: to revitalize the original spatial and architectural character of the buildings and garden
- Research-based design: To conduct a comprehensive research regarding the original design, and to study the context of the project in time and place. Furthermore the analysis of various styles and techniques was undertaken in order to minimize arbitrary decision-making in the process of planning and design
- Continuation of time: to make a link between past, present and future by planning and housing new activities in old physical body of the complex and to make a reconciliation between the historical complex and today's needs and lifestyles.

3.1. Goals of landscape design

- To organize all scattered and conflicting human movements and actions outside of the site and in proximity of the project
- To renew the axis of movement that would align old path of caravans with Sabat
- To restrict any construction activity and building of new structures in the land between the main vehicular road and Vazir complex and to create a proper landscape design solution for this area

3.2. Essential design requirements

- Planning for vehicles: Parking lot for caravanserai guests, Parking lot for short trip travelers
- Planning for pedestrian movement: to allow easy access to all the service areas on the site
- Planning and designing short term resting and sitting spots for travelers
- Planning for children playground
- Providing maximum security for permanent users of the complex (Figure 9).

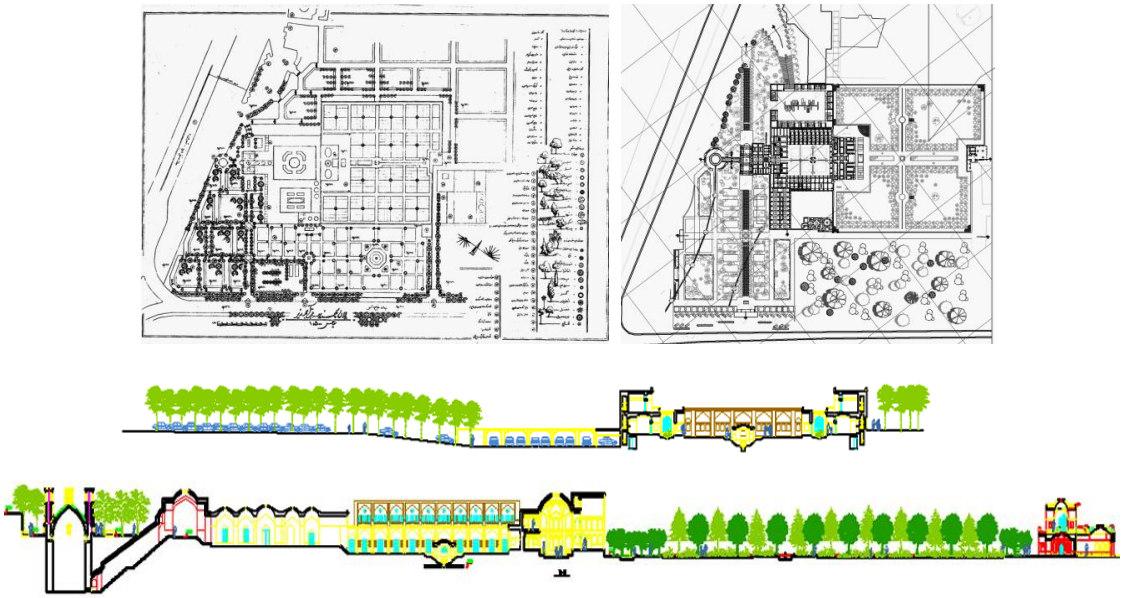

Figure 9. Landscape Master Plan – Developed design

3.3. Revitalization plans for Caravanserai

Based on the report of archeologists the study of the history of the project was undertaken. The study would help to gain an understanding of how introduction of new functions and activities to the project without any change in original form of the project was possible. It was proposed to provide accommodation, recreational and commercial facilities:

- preparing rooms and suites with proper diversity for different travelers with different tastes and needs
- providing a proper parking lot for visitors and parking places close to caravanserai
- creating a space(terrace) in close relation with main courtyard
- larger rooms close to market will be assigned as group accommodations (Figure 10).

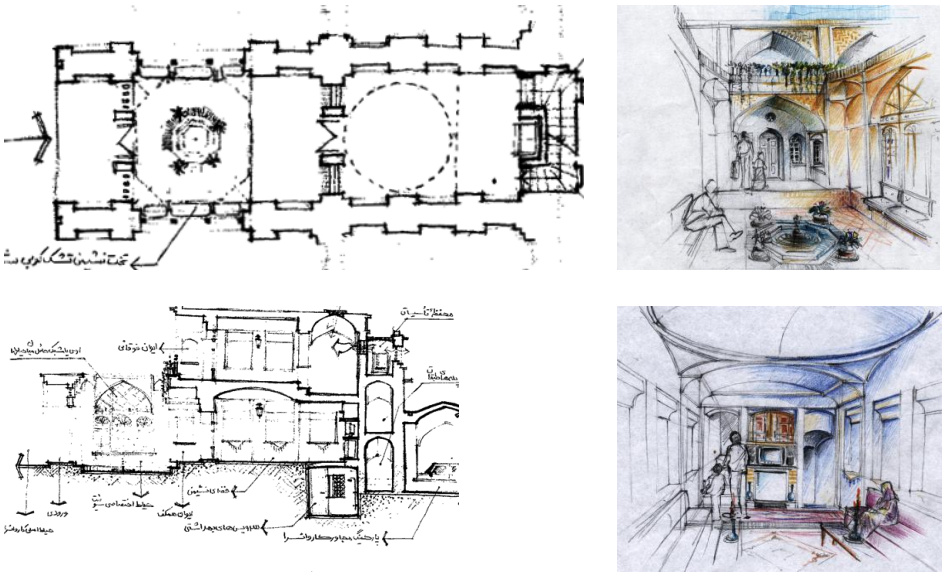

Figure 10. Caravanserai interior details

4. CONCLUSION

Historical buildings and landscape design works of the past represent aesthetics, materialistic and spiritual values, and lifestyles of the predecessors, where part of our identity is rooted in, they are part of our cultural landscapes. Nevertheless only a limited number of such works have the potential to be restored, some are severely damaged an ruined and some totally eroded and finally disappeared.

The case study presented in this paper is one of the examples in which architecture and landscape are inseparable; together they create an environment that has long been attached to its physical, spiritual and cultural context. Restoring is not just the nostalgic act of archaism but it has the capacity to be a link between past, present and future since in each architectural/ landscape restoration project there are new ideas to be introduced, new activities to be planned, new atmospheres to be created and new understandings of time and space to be explored.

Figure 11. Cultural landscape continuity

To ensure the quality of restoration and revitalization projects the concept of time should be revisited: any built environment as part of a cultural landscape is not a mere crystallization of space in time. It endures changes and it evolves as human life changes dramatically each day. Meanwhile we should make sure that with our interventions in physical environment we are connecting to the genius loci of the places. As environmental designers we need to regard the historical and geographical context of each restoration/rehabilitation project as a major determining factor to start with.

In case of restoration projects that are used by public, there are various cultural and aesthetic values that are communicated via spatial experiences of each individual. People learn while they use, move and live in restored environments, and they rehabilitate these environments by doing so. They live and learn in places that can be called cultural landscapes.

Aside from didactic aspect of such projects, restored and revitalized built and natural environments can be used to their full potentials in terms of functionality and economy. In many cases it is easier and more economical to build and create on top of relics of the past that start from the scratch. Furthermore there are works of architectural/ landscape design of the past that possess the highest quality as both man-made environments and artworks. A comprehensive research-design approach can assure planners and designers to explore new directions and possibilities in restoration and rehabilitation of historical architecture and landscape design projects in future, new horizons for cultural landscapes in future.

REFERENCES

[1] Jackson, A. V. Williams, R., Persia, Past and Present, translated by Amiri, M. and Badrei, F., second Edition, Tehran, 1978.
[2] Omran, G., Archeological Report of Hojjatabad Vazir, Iranian Cultural Heritage Organization, 2000.
[3] Farahza, N, A collection of Reports on restoration and Rehabilitation of Vazir Complex, 2000.
[4] Farahza, N., The Second Phase Report on restoration and Rehabilitation of Vazir Complex, 2007.
[5] Sykes, Sir Percy Molesworth, Ten Thousand Miles in Persia, translated by Saadat Nouri, H. Second Edition, Ebnesina Publications, 1987.

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Reconstruction of Cultural Landscapes After Conflicts



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ABSTRACT
This paper mainly focuses on the reconstruction of cultural landscape in post-conflict situations. After the case of armed conflict, restoration of cultural assets along with reconstruction of cultural landscapes that have been damaged during catastrophes, rest as critical elements of recovery process. In the last century, many countries of the world undertook reconstruction projects for numerous post-conflict areas due to fact that reconstruction of cultural landscape effects rehabilitation of society positively as it strengthens the perception of a common history among the members of society. Today, Diyarbakır's Sur district is facing a challenge to reconstruct its cultural landscape as well.

This paper aims to contribute to the recovery process by presenting several examples for procedures and results of reconstruction projects undertaken around the world, concentrating on post-World War II and post-Bosnian War sites.

Keywords: Cultural landscape, reconstruction, recovery

1. INTRODUCTION

Cultural assets or cultural heritage implies every tangible and intangible values that belongs to common history of humanity which contains creativity, knowledge, adaptation to environment and progress. Cultural landscapes, depicts human and land relationships since earliest times and denote natural landscapes that includes human-made elements which were shaped by requirements, artistic tendencies and cultural accumulations. These accumulations, created by societies and perceived as civilization, are in fact contributions to life by transfer of cultures, traditions, *consuetudo*. These contributions may be in form of architecture, small artifacts, written documents, music, poetry, literature that have permeated social and individual lives, forming a collective memory and shaping their future. However, we usually perceive them natural as they are parts of nature and not realize their contributions to our lives, and sometimes ignore them. Moreover, we may be voluntary to cast them aside to replace them with another, appealing novelty. These values that we may discard easily today, values that have overcome millennia, are called cultural assets that will shed light on our future and it is essential to protect and preserve them. Due to globalization, values in question are names as cultural heritage and terms of their operation and preservation are defined by international standards, instead of being trusted

into initiatives of countries. Leading international standards were set by La Haye Convention in 1954, Venice Charter in 1964 and European Charter of the Architectural Heritage in 1975. Additionally, institutions as UNESCO (United Nations Educational, Scientific and Cultural Organization) are close followers of the subject.

Despite all these efforts, "cultural heritage" faced unprecedented destructions in several countries over the last quarter of the century. Especially armed conflicts, wars, civil wars, terror and smuggling activities in many countries that include Egypt, Syria, Iraq, Afghanistan, Philippines, Azerbaijan and Balkan countries as well was Turkey, caused great loss. Cultural assets that are lost, damaged or looted could not be protected by any national or international laws.

Additionally, apart from the aforementioned forceful situations, urbanism today faces a conundrum due to modern requirements of ever-growing cities. In fact, physical transformation of cities encompasses a time period of past, today and future. Each city has a life experience or historical past. As historical cities must meet the new demands and adapt to changing conditions as many living organisms of nature do, today's cities are also exposed to a difficult urban development process which includes protection of core values. Urban development, in its natural progress, aims to balance economic growth, environmental protection and social evolution [1, 2]; on the other hand, as seen in sustainable cities of developed countries, it includes protection of ecological medium, natural resources, historic and cultural heritage elements with its authentic past[5].

While development process and protection of cultural heritage of historical cities are carried out with difficulty, extraordinary situations such as war, conflict, terror, natural disasters etc., renders these processes more problematic. As destructions reach its highest and peace is attained, notion of reconstruction emerges.

2. EXAMPLES OF RECONSTRUCTION OF CULTURAL LANDSCAPE AFTER CONFLICTS

Upon cease of armed conflict, restoration of cultural assets along with reconstruction of cultural landscape that have been damaged during catastrophes, rest as critical elements of recovery process. In the last century, many countries of the world undertook reconstruction projects for numerous post-conflict areas due to fact that reconstruction of cultural landscape effects rehabilitation of society positively as it strengthens the perception of a common past among the members of society [3, 4]. Within this context, when examples of post-conflict reconstruction of cultural landscape are examined, inclusion of inhabitants to process seems vital.

Reconstruction projects that emerge as a severe problem after disasters in historical areas, can be problematic and it is essential that these projects are supported by academic studies. Documentation processes necessary for preparation of restoration projects can sometimes lead to new archaeological discoveries and in turn reconstructions require integrative evaluation under light of these new discoveries. Cultural landscapes, which have evolved over a period of time as to reflect tangible and intangible cultural values and to visualize

[5] Countries such as United Kingdom, Germany, France, Italy, Spain and Portugal are appropriate models for protection of architectural heritage of settlements with vast histories dating back to antiquity, both for preservation of urban culture and sustainable urban life.

human-nature relationships, are very important in defining the relationship between the individual and the society. Due to the importance of public spaces for an individual's life, reconstruction studies must be evaluated so as to reflect a historical continuation along with new projects that include recent discoveries and current needs of society. Reconstruction of a cultural landscape that gained importance upon massive destructions in Europe during World War II, led to many studies on the subject. Works by Germany, the defeated party of WWII constituted a vast source for the reconstruction process as they turned into international collaboration for required studies by reconstruction projects [5]. Today, experiences of WWII countries became milestones for a road map of reconstruction processes [6]. Some good examples of post-WWII reconstruction include French, German and Japanese cities as seen in Figures 1-7.

Figure 1. France, Post-WWII reconstruction, comparison of 1944 and 2009, photograph: Patrick Elie [7]

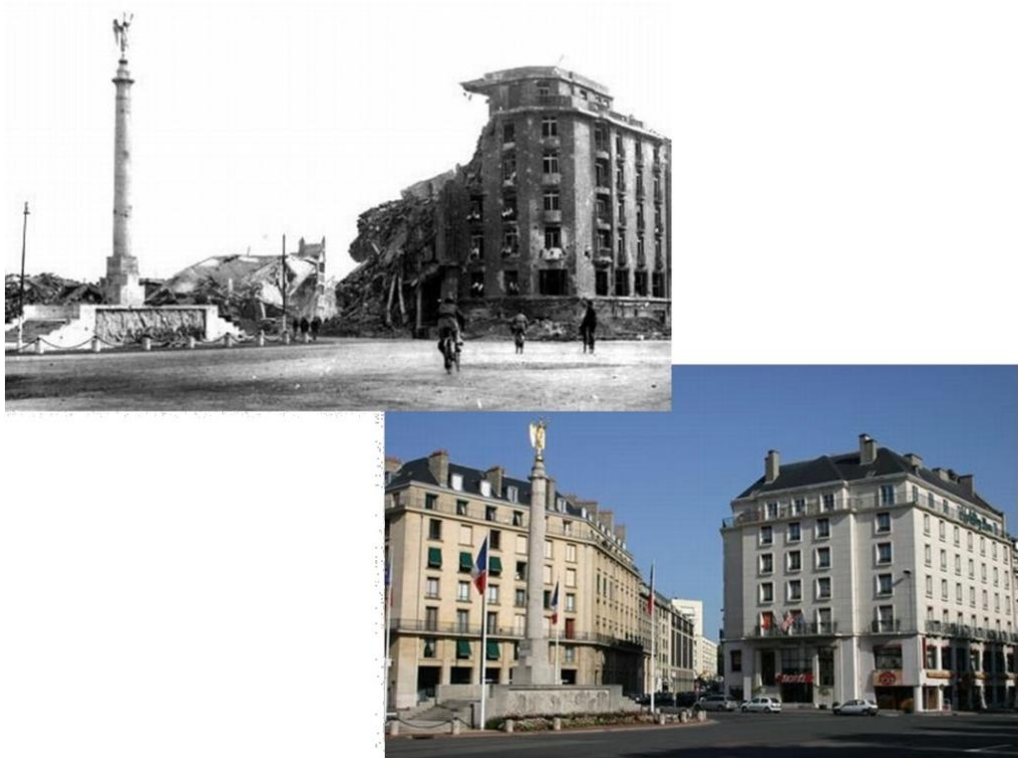

Figure 2. France, Post-WWII reconstruction, comparison of 1944 and 2009, photograph: Patrick Elie [7]

Figure 3. France, Post-WWII reconstruction, comparison of 1944 and 2009, photograph: Patrick Elie [7]

Figure 4. Germany, Post-WWII reconstruction (comparison of 1945 and 2015) Berlin Borsig Street, photograph: Georgiy Samsonov/Fabrizio Bensch [8]

Figure 5. Germany, Post-WWII reconstruction (comparison of 1945 and 2015), Berlin Reichstag Building, photograph: Georgiy Samsonov/Fabrizio Bensch [8]

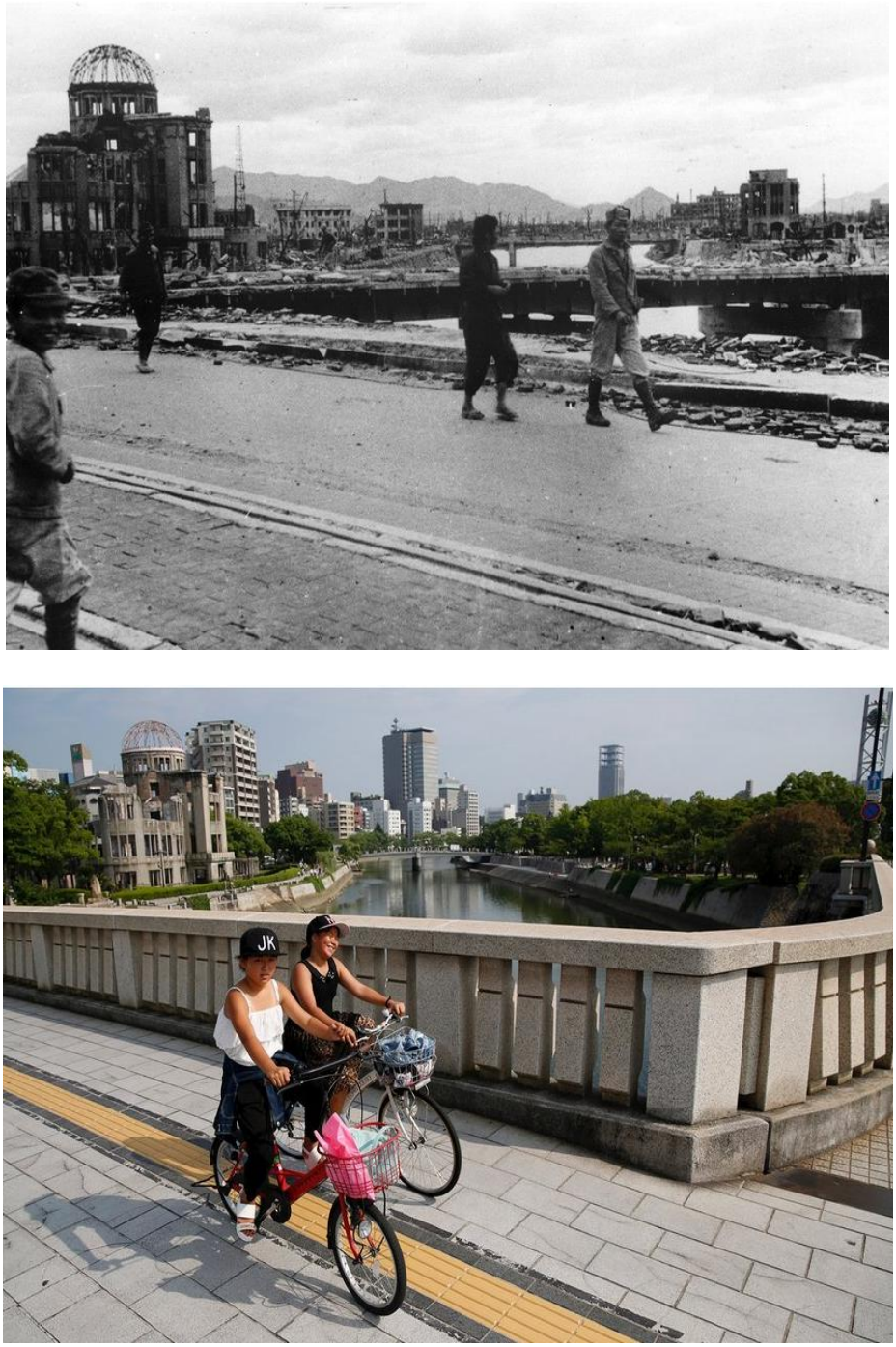

Figure 6. Japan, Post-WWII reconstruction (comparison of 1945 and 2015) Aioi Bridge, photograph: Shigo Hayashi/Issei Kato [9]

Figure 7. Japan, Post-WWII reconstruction (comparison of 1945 and 2015) Hiroshima Peace Memorial, photograph: Toshio Kawamoto/Issei Kato [9]

More recently, as Lebanon was faced a similar problem following the civil war in late 20th century, reconstruction process of country's capital, Beirut, presented several problematic situations that should be taken into account while dealing with cultural landscape reconstruction projects [10]. A crucial archaeological study opportunity was denied when large portions of site were sacrificed to bulldozers, and this unfortunate experience leads to a form of "memorycide" by annihilating the oppourtunity of documenting millennia old cultural heritage.

Balkan Wars in Europe in the 1990s caused similar destructions rendering reconstruction necessary (Figures 8, 9 and 10). As cultural heritage of Bosnian cities were targeted to erase tangible cultural assets and memory, these conflicts brought the terms “urbanicide” and “memorycide” to prominence [11, 12]. Due to extent of destruction, cooperation of international institutions became critical [13, 14, 15, 16].

Figure 8. Bosnia, University Library, comparison of 1997 and 2012, photograph: Jim Marshall/Barcroft Media [17]

Figure 9. Bosnia, Mostar Bridge in 1994, photograph: Profimedia [18]

Figure 10. Bosnia, Mostar Bridge in 2004, photograph:Giles Clarke/Getty Reportage [19]

Due to the increasing intensity of armed conflicts in the Middle East that harm monuments of World Heritage List, studies of reconstruction of cultural heritage emerged as an urgent need in recent years [20]. Thus, UNESCO organized a meeting on "Post-Conflict Reconstruction in the Middle East Context and in the Old City of Aleppo in particular" last year to seek out new approaches for reconstruction processes which include current technological and intellectual accumulation on the subject [21].

3. THE CASE OF DIYARBAKIR

Our country with its richness of cultural heritage is a well-known land by the civilization values it preserves. Almost as old as the humankind, these lands house history of all humanity. Diyarbakır presents a cross-section for the cultural heritage of humanity and when we focus on the Sur district (Figure 11), we face a very rich cultural accumulation spreading over several millennia. These constitute important sites to be preserved and studied. Sur district named after city walls of Diyarbakır, is a district of settlement which housed different civilizations with their rich cultural accumulation. Dating back to 7500 BC, Sur was named among the oldest settlement areas of the world. Sur housed Hurrians, Mitannis, Hittites, Assyrians, Meds, Persians, Romans, Byzantines, Arabs, Seljuks, and Ottomans etc. with its continual habitation throughout centuries.

Sur district has a settlement area of 132 hectares with its 5.8 km long city walls that has Roman and Ottoman structures added on citadel walls dating back to 3000 BC [22, 23]. With its importance due to historical past and geographic situation, Suriçi (area inside city walls) is regarded as a valuable settlement and it has been reported that site began to lose its medieval character by the second half of 19th century. It is also noted that development process for the district has been difficult as first intervention to 19th century texture was made by demolishing of northern part of walls with Dağ Gate (Harput Gate) [22, 24]. These interventions continued with construction of wide streets and large public buildings [22, 25]. Processes of construction of wide streets and widening or demolishing of fortification gates continued until the 1940s, and by 1950s, rural populace migrated to Diyarbakır for employment, which in turn transformed the texture of Suriçi area [22, 26]. Percolation process in historical cities witnesses movement of local inhabitants towards modern residences of the city while immigrants settle to locals' former residences. This period of "percolation of urban center" realized with Diyarbakır's own dynamics, took about 40 years [22]. As this period continued until the arrival of second wave immigrants in 1990s, Suriçi has been declared an urban site (1988) with its first preservation plan presented in 1990 [22]. The 2000s mark a new beginning for Suriçi as excavation and restoration works under the direction of Turkish Ministry of Culture and Tourism began to reveal multilayered texture of Citadel. By year 2002, Metropolitan Municipality of Diyarbakır initiated "Preservation Band for Diyarbakır City Walls", aiming to clean City Walls from encroaching commercial and residential buildings. Further, the plan aims to restore Gabriel's map of the 1930s. According to Preservation Plan approved in 2012, 150 monumental and 448 civil, a total of 598 registered architectural structures were detected.

With its nomination for World Heritage List, Diyarbakır Metropolitan Municipality prepared and published a "Function Determination Work for Diyarbakir Historic City Wall Towers Along with their Proximity" in 2013 [27] and "Cultural Landscape Site Management Plan for Diyarbakır Fortress and Hevsel Gardens" in 2014 [23]. Reports prepared with contributions from non-governmental organizations, approaches with an integration of the subjects. Urban Transformation Project prepared by Diyarbakır Metropolitan Municipality with consultancy of TMMOB (Union of Chambers of Turkish Engineers and Architects) Chamber of Landscape Architects in 2007, focused on urban renewal area, citadel, fortress, city walls, evaluating Tigris Valley area bordered by Dicle University. The project was not put into motion although an integrative manner was provided to supply recreational areas for inhabitants, qualitative facilitation of arts, science and environmental values, along with attaining balance between protection and use of cultural landscape. Nevertheless, nomination of Diyarbakır's Fortress and Hevsel Gardens

for World Heritage List continued and they were included in 2015. Unfortunately, due to recent conflicts in the area, cultural landscape has been damaged (Figures 12, 13) and several initiatives have been taken to reconstruct the area. Diyarbakır Metropolitan Municipality's Cultural Heritage Damage Assessment Report on Sur, dated May 30, 2016, demonstrates severe destruction resulting from conflict [28] and in return government promises 4 million TL investment for reconstruction of Sur district of preservation of 1000 historical artifacts and rebuild of 8000 houses in compliance with cultural landscape [29].

Figure 11. Diyarbakır Sur, DHA [30]

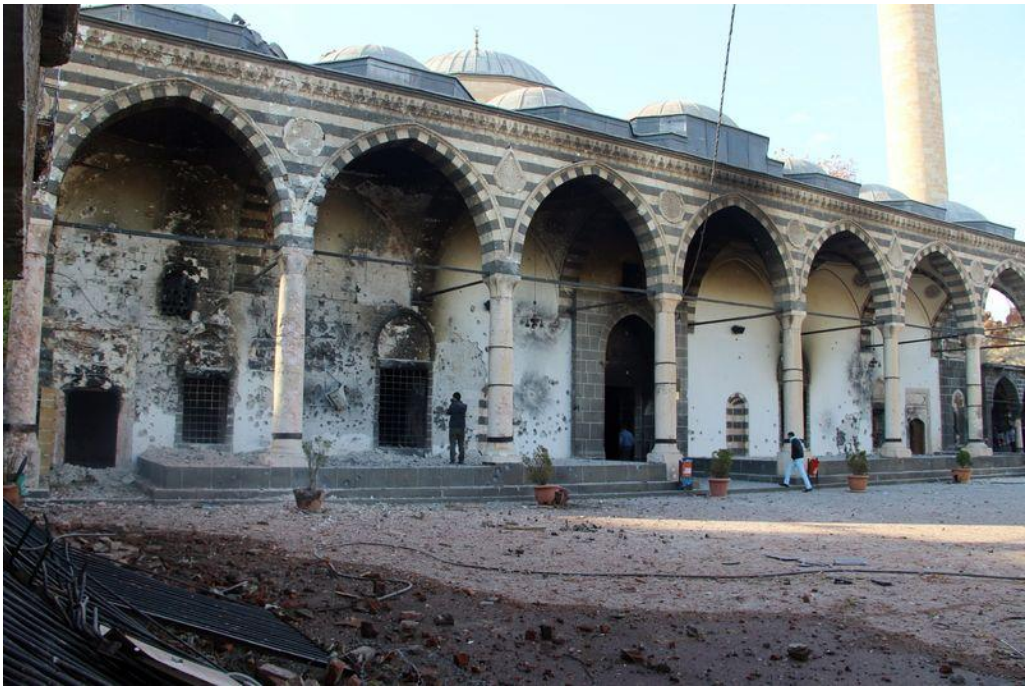

Figure 12. Diyarbakır Sur, Kurşunlu Mosque after conflicts, photograph: Ömer Yasin Ergin [31]

Figure 13. Diyarbakır Sur, after conflicts [32]

4. CONCLUSION

In the last century, world witnessed many reconstruction projects for numerous post-conflict areas in order to contribute rehabilitation of society. Today, Diyarbakır's Sur district is facing a challenge to reconstruct its cultural landscape as well. As seen above, Diyarbakır's heritage areas consist of two main components. One of them, Diyarbakır City Walls constitutes cultural and historical landscape while Hevsel Gardens with its historical importance, constitutes a cultural and natural landscape. Sur district constitutes a buffer zone between these heritage sites. Even though they give the impression to be separate structures, together they constitute a whole composition; therefore they should be evaluated as a whole. This cultural landscape that was created over several millennia ago by different cultures acting together, faced with some form of catastrophe due to conflicts caused by recent changes in cultural dynamics, reminds us once more that values achieved over long periods of time can be destroyed at an instant as it emphasizes emergency of unity and common mind elements in reconstruction process. As the examples around the world demonstrate, reconstruction is a process and has an utmost importance to enable inclusion of public cooperation and academic studies in reconstruction projects for cultural landscapes that were damaged by conflicts. Since earliest periods of human history, cities existed with unity of differences, thus, for cultural landscape to reinforce sense of belonging of inhabitants towards the city, after economic and social reconstruction of post-conflict areas, an integrative cultural landscape reconstruction should take precedence to strengthen public's perception of recovery. Although this might seem as a long and difficult process, at the end, everything that promotes human element and public awareness is worth the effort.

REFERENCES

[1] Çöteli M. G., Kültürel Peyzajın Korunması ve Sürdürülebilir Kentsel Gelişmenin Yaratılması Yönünde Bir Politika Önerisi, Sosyal Bilimler Enstitüsü Dergisi, Sayı: 32 Yıl: 2012/1, 71-110.

[2] Costanza R., d'Arge R., de Groot R., Farber S., Grasso M., Hannon B., The Value of the World's Ecosystem Services and Natural Capital, Nature, Vol. 387, No.15, 1997, 253-260 Tolles, E., Kimbro, E. & Ginell, W, Planning and Engineering Guidelines for the Seismic Retrofitting of Historic Adobe Structures, The Getty Conservation Institute, GCI Scientific Program Reports, Los Angeles, California, 2002.
[3] Cultural Heritage in Postwar Recovery: Papers from the ICCROM FORUM held on October 4-6-, 2005 (ed. Nicholas Stanley-Price), 2007.
[4] Kostadinova T., Aid for the reconstruction of cultural heritage in Southeast Europe, A peace building model?, *The Jean Monnet Papers on Political Economy 02/2013*, The University of Peloponnese, Tripoli, 2013.
[5] Diefendorf J. M., Urban Reconstruction in Europe After World War II, *Urban Studies* (1989) 26, 128-143.
[6] Diefendorf J. M. (ed.) Rebuilding Europe's Bombed Cities, Palgrave Macmillan, 1990.
[7] Sinclair, D., 2017. Normandy- Then and Now, http://www.mybirdie.ca/files/76898156326d065f36fd43e858ff66cf-8375.php, last accessed on 12/06/2017.
[8] Sim, D., Berlin then and now: Photographer recreates photos taken as Soviet troops entered Hitler' s capital in 1945, http://www.ibtimes.co.uk/berlin-then-now-photographer-recreates-photos-taken-soviet-troops-entered-hitlers-capital-1945-1499200, last accessed on 12/06/2017.
[9] Kato, I., After the A-bomb: Hiroshima and Nagasaki then and now-in pictures, https://www.theguardian.com/artanddesign/gallery/2015/aug/06/after-the-atomic-bomb-hiroshima-and-nagasaki-then-and-now-in-pictures, last accessed on 12/06/2017.
[10] Naccache, A. F. H., Beirut's Memorycide: Hear No Evil, See No Evil, Meskell L. (ed.) Archaeology Under Fire: Nationalism, Politics and Heritage in Eastern Mediterranean, *Taylor & Francis*, 2002, 140-158.
[11] Karasu, M. A., Bir Kentin Ölümü: Kentkırım (Bosna-Hersek Örneği), *Çağdaş Yerel Yönetimler*, Cilt 17, Sayı 3, 2008, 51-64.
[12] Keser, U., Manevi Miras Katliamı: Bosna-Hersek'te Kentkırım, *Motif Akademi Halkbilim Dergisi*, Balkan Özel sayısı II, 2012, 274-298.
[13] Agnoletti M. (ed.), The Conservation of Cultural Landscapes, CABI, 2006.
[14] Layton R., P. G. Stone, J. Thomas (eds.), Destruction and Conservation of Cultural Property, Taylor & Francis, 2004.
[15] McManamon P., A. Hatton (eds.), *Cultural Resource Management in Contemporary Society*, Taylor & Francis, 2003.
[16] Meskell L. (ed.) Archaeology Under Fire: Nationalism, Politics and Heritage in Eastern Mediterranean, Taylor & Francis, 2002.
[17] The Telegraph, Pictures of Sarajevo 15 years ago and today show the city has changed, http://www.telegraph.co.uk/news/picturegalleries/worldnews/9270205/Pictures-of-Sarajevo-15-years-ago-and-today-show-how-the-city-has-changed.html?frame=2221181, last accessed on 12/06/2017.
[18] Čevelová, J., Vyzúriť sa na dedičstve minulosti. Pozrite si pamiatky, ktoré zničili vojny, http://cestovanie.sme.sk/c/6695368/vyzurit-sa-na-dedicstve-minulosti-pozrite-si-pamiatky-ktore-znicili-vojny.html, last accessed on 12/06/2017.
[19] Storm, C., People Still Hate Each Other: Inside A Bosnian City Still Ravaged By Civil War, Twenty Years Later, http://www.businessinsider.com.au/mostar-bosnia-photos-2014-8, last accessed on 12/06/2017.

[20] Cunliffe E. *Damage to the Soul: Syria's Cultural Heritage in Conflic*t, Dunham University and Global Heritage Fund, 2012.
[21] http://whc.unesco.org/en/events/1286/, last accessed on 12/06/2017.
[22] Dinçer, İ., Bir Dünya Mirası Olarak Suriçi'ni Korumada Önkoşul: Tüm Paydaşların Ortaklaşmış Değer Algısı, *Mimarlık Dergisi/389*, 2016.
[23] Diyarbakır Fortress and Hevsel Gardens Cultural Landscape Site Management Plan, 2014.
[24] Arslan, R., Diyarbakır ve Çevresinde Şehirleşme Hareketleri, Ziya Gökalp Derneği Yayınları, 1979.
[25] Meral F., Erken Cumhuriyet Döneminde Diyarbakır'da Kamu Binaları: 1923-1950 Dönemi, *Mimarlık*, Sayı:358, 2011.
[26] Kejanlı, D. T. and Dinçer, İ., Diyarbakır Kale Kenti'nde Koruma ve Planlama Sorunları, *Megaron*, Cilt: 6, Sayı:2, 2011, 95-108.
[27] Diyarbakır Tarihi Sur Burçlarının Çevresi ile Birlikte İşlev Tespit Çalışması Proje Raporu, 2013.
[28] Cultural Heritage Damage Assessment Report on Sur, Diyarbakır, 2016.
[29] Star gazetesi, Sur'a 4 milyar liralık dönüşüm, http://www.milliyet.com.tr/sur-a-4-milyar-liralik-donusum-gundem-2173525/, last accessed on 12/06/2017.
[30] Arkitera, UNESCO Dünya Mirası Komitesi, Diyarbakır Surları ve Efes'i görüşürüyor http://www.arkitera.com/haber/25053/unesco-dunya-miras-komitesi-diyarbakir-surlari-ve-efesi-gorusuyor, last accessed on 12/06/2017.
[31] Bianet, Yasağa 17 Saat Ara Verilen Sur'dan Yıkımın Fotoğrafları, https://bianet.org/bianet/insan-haklari/170100-yasaga-17-saat-ara-verilen-sur-dan-yikimin-fotograflari, last accessed on 12/06/2017.
[32] TRT HABER; Diyarbakır Sur Operasyonundan Kareler, http://www.trthaber.com/foto-galeri/diyarbakir-sur-operasyonundan-kareler/9047/sayfa-1.html, last accessed on 12/06/2017.

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Global Rebuilding: Case of Cumalıkızık


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ABSTRACT
Living spaces of civilizations have been in continuous change and transformation throughout history. Interventions with these spaces have diversified and intensified with the momentum in the process of economic, technological, political and socio-cultural changes. At this point, the focal point of these interventions has been the conservation of cultural values because of the effects of globalization in terms of elimination of diversities. The natural and built environment interacts with the urban identity in the sense of socio-economic and socio-cultural aspects. The important point in this interaction system is that interventions cover the society in general and aim for not only physical but also for social development. The purpose of the article is to shed light on the processes of cultural preservation, development, sustainability and protection while benefiting from cultural values of a living space. From this perspective, Bursa / Cumalıkızık has been chosen as the example of living space and the region's change, transformation, globalization, cultural identity, cultural sustainability, rebuilding and preservation processes are reviewed. The relationship between the building state in the region and cultural sustainability and cultural identity with traces of traditional architecture has been evaluated. Under the light of these assessments, it has been determined that cultural sustainability can be realized with preservation of the current built environment. It has been concluded that formal research on traditional architecture and culture would be insufficient and the first step in establishing ties with this type of building would be to preserve and protect them and then to analyze and use accurately.

Keywords: Rebuilding, preservation, Cumalıkızık, historic buildings

1. INTRODUCTION

Since the beginning of our time, human beings are able to build, change and transform space and reflect the change through space. Societies and spatial formations have been immensely transformed towards the end of 20th century by means of changes in the global flow of capital, culture and information. In this period, movements of globalization led to societal, cultural and economic integration which in turn changed the meaning and structure of the living space.

In line with the aim of profit maximization, cities have become new focal points of capital accumulation in world economy. Cities compete with each other by reinventing their public image and reconstructing their identity through various events and projects to secure their place in world economy. Being categorized as metropolitan, big and small according to their scales, cities strive to gain a seat in this competitionby using differentiated strategies.

Cities with similar infrastructural characteristics and similar aims have turned to localization policies to distinguish themselves from others. Hence, cities have been effected by the two complementary tendencies of globalization and localization. As part of global economy, cities aim to exhibit their unique attributes that reflect local material and societal transformations.

Therefore, cultural characteristics have been highlighted through various interventions. However, cities are confronted with a threat of losing their local identity due to interventionist policies.

Living spaces reflect cultural values of the societies. Culture is produced within living space and its perpetuity is secured by the living space. Therefore, to question the relationship between the identity of the space and the nature of intervention; and to prevent possible societal and material challenges caused by interventions will be important steps to protect our cultural values and secure perpetuity. Having been listed as a world heritage, Cumalikizik has been studied since it is an appropriate example in cultural, religious and spatial means.

2. GLOBALIZATION, CHANGE, TRANSFORMATION AND ARCHITECTURAL IDENTITY

Differentiation, localization and efforts forgetting a share from global economy have become the underlying dynamics of the environment within which cities compete with each other. For this reason, urban space has become the focus of societal and physical interventions.

In this context, interventions to urban space, the way they are implemented and the new structures they create are in constant relationship with the culture and identity of the city. Therefore in this paper of Cumalikizik will provide a general understanding of the concept of change-transformation; globalization; global restructuring; spatial and societal change; spatial transformation; architectural and cultural identity; contextual relevance of the structure; and cultural perpetuity.

2.1. The Concept of Change -Transformation

Cities are the living spaces built by civilizations. All characteristics of the cities reflect the characteristics of the nations. In time, civilizations and their living spaces experience change. Radical innovations, destructions and new formations leave their traces on urban space.

When we look at the dictionary definition of “change”, it states: “The totality of the specific changes within a time period” [1]. Change happens within a time period; therefore, the concept of change is directly related to the concept of time. Time is conceived as a stage of all events produced by change; events disappear within the concept of time; they can continue to exist only as memories. Hence, change happens constantly and it is inevitable [2]. hange becomes an important concept to a desired end in every aspect of life. Since change is inevitable, being aware of it and steering it have critical importance.

Transformation is a product of change. Dictionary definition of "transformation" states: "Changing form or condition; alternation; reform" [3]. If a matter is subject to change for a while, it transforms. It takes a different form. Change leads to transformation.

Human beings have materialistic and semantic relations with the environment they live in. Material and semantic relations shape each other; therefore, transformations in material environment also effect semantic relations between human beings and their living space [4]. Semantic relations are products of symbols and images produced through psychological processes. Hence, human beings themselves change through the changes in their semantic relations with the environment they live in [5].

City is a space where culture of any kind is produced; concealed or not concealed; valued or not valued; understood or not understood; corrupted; subject to destruction and violence [6].

In many cities, old urban fabric is destructed when it does not comply with new needs. Transport networks shape planning of urban space and urban transformation emerges to create new residential spaces [7]. The transformation of the city and the focus of interest position of Cumalikizik is based on an identity search for the purpose of conservation and sustention of the cultural heritage by urban people witnessing a rapid housing and moving away from their origin. Local people could not move away from the region and a mutual attraction and interaction has started between the city and Cumalikizik.

2.2. The Concept of Globalization

The root of the word "globalization" is "globe" which means earth while "global" means "encompassing globe". Dictionary definition of "globalization" states: "Increasing global union, integration, and solidarity in economical, social, technological, cultural, political and ecological aspects" [8].

The concept of globalization is defined as compression of time, space and popular perception of the world as one single place. In this context, we can see that processes and actions effected by globalization have been continuing for centuries. According to Waters, "globalization is a key concept for societal change in the third millennium". Hence, today, globalization exists with all the debates it has intensified [9]. Mainly, globalization is understood as upscaling in human relations, economical and societal organization from local to interregional, intercontinental and global. Globalization has intensified socio-cultural and economical relations among societies which leads to societal and spatial transformations. Globalization should be examined in technological, economical, political and socio-cultural aspects [5].

2.3. Global Restructuring

Global culture, consumerist life style, increasing competition and brand value are the new societal dynamics. Societies that had been standardised by these dynamics entered into a new phase of "localization" in line with their quest for differentiation and multiplicity. In the process of global restructuring, "localization" has become a prominent phenomenon that effects cities.

Globalization has transformed the world into a common global market. Instead of performing individual economic activities, nation states started to serve for the interests of

most powerful capital through integrated policies. Hence, globalization has changed the perception of nation state and its place in the world.

Harvey uses the notion of "compression of time and space" in his analysis of global restructuring. According to Harvey, we had to change the way we see the world due to revolutionary changes in objective qualities of space and time. He claims: "I use the term 'compression' because on the one hand, increasing pace of life marks the history of capitalism; on the other, I think we can strongly argue that we overcome spatial limits as if the whole world will soon collapse upon us" [10].Time-space compression means shrinking of the world and interlocking of different societal values. The changes in the societal structures caused by globalization appear in different forms.

Cities use images to differentiate themselves from others in a competitive environment. Cities try to develop brands through material and societal interventions to urban space. Mega urban transformation projects are conducted to attract capital. Images and power of brand making started to govern architecture. According to Aydinli: "Today, global culture highlights universal values for marketing of architecture by using the power of images". This phenomenon is clear in new residential areas and tourism architecture. Historical images are delinked from their contexts and redesigned to be "authentic". The theme of authentic "dream world" is used for marketing architecture [11].

Cumalikizik is a significant model that worths restructuring due to its nature, location, unique city pattern and architecture.

2.4. Architectural and Cultural Identity

We should first define what architectural product is in order to understand its architectural identity. The most important elements of human life, houses, schools, mosques, churches, bazaars, shopping centres, museums, concert halls, movie theatres, roads, parks, gardens, landscapes and etc.; including their scientific, philosophical, moral, mathematical, aesthetical, historical, sociological and psychological aspects, are among the architectural products, the most important expression of human creativity [12].

Architectural product is an output of social and economical structures of the society it belongs to. During all phases of civilizational history, architecture has reflected economical, cultural and societal transformations. When we define identity as an essence that works to differentiate something from others, we also argue that human beings, society, and social, economical and cultural characteristics of the historical period determine the architectural identity.

Hacihasanoglu defines architectural identity as:"Architectural identity is the characteristics defined by the architect or the users to differentiate the structure from others and from its environment. As a subbranch of cultural and urban identity systems, architectural identity is in constant relation with city and conservation plans, architectural orders, architectural languages, construction and environment policies, material and technology, and attitudes towards environment" [13].

As much as an architectural product belongs to its local geography, it gains identity. Belonging refers to locality and temporality. In this context, Cumalikizik is a considerably rich settlement area in terms of its architectural and cultural identity that has 700 years of background in its geography. Architectural identity is a language formed by

societal values and it is unique to each society. Similar to the language we speak, architectural language also contains language games and secondary meanings. Societies have architectural identities shaped by their languages and cultures. As the example of 'Mediterranean architecture' shows, architectural identity can be of regional scale. It can also show unique characteristics to one society. Architectural products can be attributed meanings according to their form and texture. At first glance, the external structure of the buildings gives ideas about environmental and aesthetical values of the system they belong to [14].

It is argued that architectural identity is the expression of the national values in architecture. These values shall be formed by ways of life, traditions, construction techniques and technologies and etc. Architectural interpretations based on cultural identity and traditions; as well as approaches with universal tendencies all result from the relationship between the architectural form and aesthetic-intellectual and philosophical background; and worldviews about history-art-society [15]. Architectural works with identity are important elements of urban identity and built environment. They are also important for the formation and perpetuity of the city identity.

Hence, architectural identity is related with locality; differentiation from other constructs; order; construction technology; function and etc. In this context, local characteristics that shape architectural identity and the way that harmony between local characteristics and architectural product is expressed, gain importance.

Culture takes various meanings in everyday language. Culture as a concept is also sourced by its various meanings. The first definition of culture by Turkish Language Association reads: "All material and immaterial values created within socio-historical development process and the totality of the means for value creation and transmission to other generations which shows the level of human domination to his natural and social environment; harvest". Other definitions include: "The totality of ideas and art works unique to a society or a group of people", "the form of judgement, pleasure and criticism skills developed through education and personal experiences" and "personal knowledge".

According to Murdock, culture is not instinctive or genetic. Rather, culture is about behaviours, habits and knowledge gained through personal experience and education. All living species learn skills to protect themselves during their lives and transfer them to other generations. In this sense, culture is perpetual. However, culture also changes according to society and geography. Hence, we might define subculture as culture that changes according to society and geography. Since culture depends on society, its future depends on the future of the society [16].

2.5. Contextual Relevance of the Structure and Its Cultural Perpetuity

It is important to secure perpetuity of culture in city spaces in the context of the relation between city identity and interventions to urban space during global restructuring process. Hence, culture is tried to be protected and developed in urban spaces where it is produced. If we look at Tylor's definition of culture, in general terms, culture is the totality of values gained, taught and protected; and transferred to new generations through education. There are multiple and intensified relationships between four main variables of culture: Human beings, society, education process and cultural content [17].

We cannot separate city and culture as we cannot separate human beings and culture. When we look at city from a cultural perspective, we should pay attention to societal and individual ideas and practices that constitute urban life and urban form.

Cultural perpetuity might be defined as protection of societal identity, essence and changes in society in line with the realities of the historical period. The essence of societal partnerships lays in common life experience and culture. In this perspective, culture is the totality of meanings commonly attributed to concrete or abstract things by people who have lived together for a long time.

Culture and cultural perpetuity are interrelated concepts. In order to provide perpetuity, it is important to develop consciousness in society. It is only possible if society understands, embraces and turns it into a cultural expression. It is significant for people to consciously accept the necessity of perpetuity in order to further develop the positive efforts to provide perpetuity in future. When the necessity of cultural expression will be integrated in social life as a way of life and habits, cultural transmission and perpetuity will be accomplished [18].

Perpetuity of culture is realized through interaction between city, identity and culture. If culture is the totality of values transmitted from the past, then it includes perpetuity within its own structure. Phenomenon that is embraced through consciousness of perpetuity and cultural elements used in daily life are transferred from generation to generation and are perpetual.

Based on these facts, the fact that local people could not move away from their old settlements completely has become effective in cultural continuity and conservation in Cumalikizik case.

3. CUMALIKIZIK: A CASE OF RESTRUCTURING

Cumalikizik is a residential area selected as an example of restructuring and conservation. Being significant for its societal and environmental values, Cumalikizik region will be analyzed in terms of studies in and about the region and their methods.

3.1. Social and Environmental Heritage of Cumalikizik Region

Cumalikizik Village is one of seven Kizik Villages built by Oghuz Tribe 700 years ago in 10 km. east of Bursa on the skirts of Mountain Uludag. Cumalikizik Village has protected its rural civil architectural structure and it is the only example with unique 300 years old wooden houses that have survived numerous fire hazards [19].

It is 340 metres above sea level. It is built upon an area of 10 hectares. After the establishment of Bursa Metropolitan Municipality in 1987, Cumalikizik Village was included in the jurisdiction of Yildirim Village and it is located between Karapinar and Degirmenonu Neighbourhoods. It has borders with Hamamlikizik Village in the west, Degirmenonu Neighbourhood in the north and skirts of Mountain Uludag in the south (Figure 1).

Figure 1. Bursa / Cumalıkızık [20]

Being an association village with best conservation practices, Cumalikizik Village represents a unique city planning system. This system was operational during the establishment of first capital city of Ottoman Empire from the beginning of 14th century until mid-15th century. Later, it has been used as a method of development for the already established cities.

Important examples of Ottoman Empire era, rural architecture are located in Cumalikizik where climate and topography effected a residential organization. Traditional wooden houses were built contiguously around a centre in line with the topography. There are 180 houses with 2 or 3 floors, 57 of which are registered. Ground floor of the houses were constructed with wooden flank stone walls technique while upper floors were constructed with mud-brick wooden frame technique. Roofs are constructed with Turkish style tile cover cross roof technique. Houses are entered via dipterous wooden yard doors. Wooden materials are frequently used in walls, pavement, ceiling, roof, joinery and stairs in traditional Cumalikizik houses. In exterior structure, windows and window screens, entrance doors and buttresses are the most interesting wooden construction materials (Figure 2).

Figure 2. Bursa / Cumalıkızık, photographed by author 1

Cumalikizik Village has a very rich cultural and historical heritage. There are 7 cultural and 2 environmental assets from Turkey in UNESCO World Heritage List. Besides, 19 environmental and cultural assets were nominated in UNESCO Temporary List of World Heritage in 2000. Cumalikizik Village, which transfers traditional Ottoman rural architecture to today, was nominated and accepted to be part of World Heritage List which shows the richness of rural culture in Turkey.

3.2. Practices in the Region and Their Methods

The population of Cumalikizik increased from 1035 in 1935 to 3971 in 1985. On 27.06.1987, Bursa gained the status of metropolitan municipality while Yildirim district became a central district. Cumalikizik, which was a village until then, gained the status of neighbourhood within the jurisdiction of Yildirim central district. During Greek invasion

between 1920-1922, other villages in the region were set to fire while Cumalikizik survived from this fire and transferred Ottoman architecture until today (Figure 3).

Figure 3. Bursa / Cumalıkızık, photographed by author 1

Cumalikizik Conservation-Sustention Project is implemented to protect and transfer the physical and cultural texture of the village to future generations. This project was initiated by municipality, office of governor, civil society organizations, university, business sector, volunteers and villagers [21]. Women living in Cumalikizik established "The Association for Cumalikizik Village Women's Education Solidarity and Development" to promote and develop the village. Village women are also integrated into the tourism sector. The rate of village women's participation to tourism sector was increased. They wore their traditional clothes during their tourism sector work. Hence, they also promoted their traditional clothes. In this context, courses on operating a boutique guest house, social behaviour and practice of English language were organized.

Cumalikizik Ethnography Museum and Art House were established in 1992 by donations of the village families. Various objects and equipments from 18th, 19th and 20th centuries are exhibited in the Museum and Art House. Ornaments, objects used in social life, dresses, trade objects, manuscripts, kitchen equipment, heating equipment, hunting equipment, lightening equipment and social and cultural objects are among them. Museums are important for transferring cultural heritage to future generations [22]. The establishment of Cumalikizik Ethnography Museum is critical for protecting local colours and characteristics against standardization tendencies of globalization [23]. It is also important for cultural tourism. However, protection of abstract cultural heritage cannot be realized through museums. Rather, it is only possible through education starting from primary school [24]. Various movies and TV series were shot in Cumalikizik. These movies and TV series were significant for the promotion of Cumalikizik. Raspberry Festival has been organized annually in the last week of June since 1998. This festival aims to protect 700 years of cultural heritage and its transmission to future generations. It also aims to promote the region internationally and domestically (Figure 4).

Figure 4. Bursa / Cumalıkızık, photographed by author 1

Practices in Cumalikizik Village after 1980 include:
1980- Master Architect Recai Coskun wrote his master thesis in Istanbul Technical University, Faculty of Architecture about Cumalikizik Village.

1980- High Council of Immovable Monuments and Antiquities took Cumalikizik Village under conservation.
1981- Cumalikizik was defined as Urban and Environmental Protected Area. Two monumental buildings (mosque-bath), two monumental trees (plane trees) and fifty-seven examples of social architecture were registered.
1983- Aga Han Association and Chamber of Architects organized a project competition among architecture students in Turkey to examine the changes in Cumalikizik by 2007 due to life-space-time factors.
1992- Yildirim Municipality turned the shepherd house to a guesthouse. Village head's house was renovated and started to exhibit ethnographic materials.
1993- Yildirim Municipality requested "Cumalikizik Conservation Development Plan" from Yildiz Technical University. Bursa Cultural and Natural Heritage Conservation Board, Metropolitan Municipality and District Municipality approved the plan.
1996- Chamber of Architects started Cumalikizik 2007 project. A house from the village was rented for five years to serve as a research centre and to start a relievo-restoration work. Department of Architecture in Middle East Technical University (METU) also joined the project.
1997- A summer school was organized by METU and Chamber of Architects. The house that was rented was cleaned and relievo project started. Workshops and forums were organized with national and international participants during the summer school.
1997- Bursa Metropolitan Municipality allocated a place on village road as picnic area.
1997- Bursa Tophane UNESCO Youth Association and Germany KulmbachPlassenburg Club started collaboratively working on buying a house from the village and renovatinge it.
1998- Suggested by Head of Bursa Metropolitan Municipality Erdem Saker, a comprehensive conservation-sustention project for Cumalikizik, conducted by Oya Bozkurt and Zubeyde Kocabay, was decided to be implemented.
1998- Village elders were consulted about the conservation project and they promised their support.
1998- First project meeting with broad participation was organized in Yerel Gundem 21 House. Cumalikizik Conservation-Sustention Project was presented and first implementaion board was formed.
1998-Cumalikizik Photography and Inventory Exhibitonwas opened.
1998-Cumalikizik Conservation-Sustention first action plan was prepared and opened to discussion.
1998- First meeting to incorporate women living in the village to the project was organized. The problems and needs of village women were discussed.
1998- A leaflet to present the village and the project was prepared. A meeting to organize village women was conducted.
1998- Maintenance was conducted for ethnographic materials exhibition area.
1998- The house on the entrance hall of the village that had been renovated by Yildirim Municipality and was being used by Village Cooperative was turned to handworks sales area.
1998- In order to raise awareness among Bursa residents about Cumalikizik and among Cumalikizik residents about themselves, Raspberry Festival was organized with broad participation.
1998- Reinforcement work started in the village.
1998- In order to improve economic infrastructure of the village, research, improvement, production and sale work for agricultural, husbandry and handwork products were conducted.

1998- The roof and exterior space of a damaged house in the village were repaired. Other houses in the village were planned to be maintained according to the order of priority through sponsorship.
1998-Relievo, cut-out and detail work were conducted during university summer internship. Department of Architecture in Uludag University coordinated the summer work.
1998- An invitation letter to join Cumalikizik Conservation-Sustention 98 Action Plan was sent to all partners.
1998-An evaluation meeting for Cumalikizik Conservation-Sustention 98 Plan was organized. Association for Protection and Promotion of the Environment and Cultural Heritage (CEKUL) prepared project exploration agreements for four houses. CEKUL also assumed the preparation of project promotion film.
1998- First report of 'Cumalikizik Conservation Sustention 98' was prepared.
1998- Bursa Metropolitan Municipality organized a tour for villagers with Yerel Gundem bus to visit similar other villages for inspiration (Sirince, Birgi).
1998- In order to sell house products-hand works, a village bazaar in Cumaikizik Village Square was planned.
1999- Ramadan shows in Karagoz House were organized within night festival.
2000- Cumalikizik was registered in Unesco Temporary List of World Heritage.
2007-Restoration project covering almost all houses were prepared and restoration started.
2014- Cumalikizik was registered in Unesco World Heritage list.
2015- Cumalikizik Restoration won Sustention of Cultural Wealth Award.
2016- Cultural tours are organized from different parts of Turkey to the region.

4. CONCLUSION

Conservation of architectural heritage may only gain perpetuity once this concept is adopted in principle and supported by all segments of the society. It is possible to talk about the holistic environment created by globalization, differentiation by its negative socio-economic cultural effects on societies, loss of values, and becoming ordinary. In such a situation, the values namely "the culture" appears as a fact being scared from losing and put into the focus of discussions.

Cumalikizik had successfully completed a highly challenging and demanding process until it has been listed in Unesco World Heritage. Although the works performed during this troublesome historical journey are considered as assertiveness for local people in the region, they have constituted a greatly beneficial and useful model for the local people and our country in economical, social and cultural sense. Moreover, local people have become participants of all the works performed voluntarily and with their own free will.

The changing dynamics which affect societies, also change the life styles and living spaces in common with the social culture they influence. This situation is stated by Turgut as follows: "Rapid change in living conditions and the conflict between the universal culture and local cultures add new dimensions into culture space interaction". In such an environment, the question regarding which people should act to ensure cultural, comes to the forefront. Associated with this situation, it should be stated that the conservation of cultural heritage is not an obstacle but rather a precondition for development [25].

As stated above, the phenomenon coming to the forefront at the point of protecting the

cultural heritage is the phenomenon of conservation. The phenomenon of conservation is described as the wholeness of preservation, maintenance and repair, restoration and the process of changing function in immovable cultural and natural properties according to the Code of Protection of Cultural and Natural Properties. According to Tanyeli, the conservation has three functions in general, as for the first, the economic function of the use of structures which have lost their function by functioning them back again.Secondly, the historical function, to ensure the urban environment to remind historical incidents or the ancient socio-cultural structures by means of protection. Lastly, the cultural function should be the most fundamental function of conservation and the conservation should aim to create "a storage of cultural facts". At this point, conservation in architectural sense is described as the conservation and sustention of the architectural property coming from the past, but the point required to be stressed is that the conservation is not a self-induced phenomenon but rather a conscious effort [26].

The identity of urban spaces on which the culture is reflected is greatly important on behalf of perpetuity of the cultural values which are in a constant formation and transmission. Interventions made on architectural identity of cities create unqualified environments and may lead to improper transfer of the culture. At this point, analyzing architecture that is the refection of culture with the identity values it has properly is a significant requirement to deliver qualified products having contextual compatibility and to ensure cultural perpetuity. French philosopher Bergson expresses the benefit of the past for today and the necessity of cultural perpetuity as follows with translation of, Özer [27]: "Our perpetuity is not only composed of leaving the place of one moment to another. Rather, perpetuity is the overflow of the past into the future and flooding as long as it overflows. Since the volume of the past is continuously expanding, there is no boundary for its conservation. "
Cumalikizik Village has not changed in terms of residence pattern, agricultural lands and general order. Being an association village with best conservation practices of the Ottoman period, Cumalikizik preserves its authenticity, traditional living style and original land usage practices.

Restoration works are ongoing in Cumalikizik houses listed as protected by the support of public and private enterprises. Cumalikizik is just as an outdoor museum which brings the residence pattern of the Ottoman period with 270 houses in total including 176 registered and 180 still in use and some of which are undergoing conservation and restoration works (Figure 5).

Figure 5. Bursa / Cumalıkızık, photographed by author 1

One of the preconditions for conservation of traditional structures significant in historical, cultural and architectural aspects for Turkey and the world and their transfer to future generations is composed of the conservation and restructuring studies.

Cumalikizik is included in the World Heritage List as 998th with the name of the rise of Ottoman Empire and the significance of the project being implemented comes to light one

more time at this point. The fact that the real owners of the project is local people, employment possibilities are attractive, cultural values facing extinction are tried to be conserved and the nature of the project as rising from the base all decrease the attractiveness of the city for people living in the locality and so increase the value of Cumalikizik village. This project also ensures that villagers deal with and feel responsibility towards the place they live in. Being a realistic and authentic practice in the country's rural development, "Cumalikizik Conservation-Sustention Project' 98" and all other activities should be thought as a model and generalize throughout the country, should be considered a highly significant instrument for improvement of socio-cultural structure of the rural segment.

REFERENCES

[1] Türk Dil Kurumu, http://www.tdk.org.tr/index.php?option=com_gts&arama=gts&guid=TDK.GTS.5845dd838959f6.56208893, last accessed on 12/06/2017.

[2] Çakır, N., Günümüz Kent Dinamiklerinin Kentsel Dönüşüme Etkileri, Yüksek Lisans Tezi, İTÜ, İstanbul, 2006.

[3] Türk Dil Kurumu, http://www.tdk.org.tr/index.php?option=com_gts&arama=gts&guid=TDK.GTS.5845d65c81c751.64702030, last accessed on 12/06/2017.

[4] Rapoport, A., Kültür, Mimarlık, Tasarım çev. Selçuk Batur. Yapı Yayın. İstanbul, 2004.

[5] Turgut, H. ve İnalhan, G., İstanbul'da Kültürel ve Mekansal Dinamikler: Konut ve Çevresine İlişkin Tercihler ve Beklentiler, *Kent, Kültür, Konut Bildiri Kitabı*, Der. Hülya Turgut Yıldız, Ahmet Eyüce, Bahçeşehir Üniversitesi Yayınları, İstanbul, 2010

[6] Çotukseven, B., Kent, Kimlik, Kültür Yerel Yönetimler Sempozyumu, TMMOB Odası, YTU 2009, http://www.betulcotuksoken.com/kent- kimlik- ve-kultur, 2009, last accessed on 12/06/2017.

[7] Özden, P. P., Yasal ve yonetsel cercevesiyle sehir yenileme planlaması ve uygulaması: Türkiye orneği , *Doktora Tezi*, İ.T.Ü. Fen Bilimleri Enstitusu, İstanbul, 2002.

[8] Türk Dil Kurumu, http://www.tdk.org.tr/index.php?option=com_gts&arama=gts&guid=TDK.GTS.5845dde73c4cd1.38951902, last accessed on 12/06/2017.

[9] Aslanoğlu, R. A., Kent Kimlik ve Küreselleşme, Ezgi Kitapevi, Bursa, 2000

[10] Harvey, D., Postmodernligin Durumu, Metis Yayınları, İstanbul, 1990.

[11] Aydınlı, S., Küresel Kültür ve Mimarlık, *mimar.ist Dergi*, sayı-16, 2005.

[12] Kuban, D., Mimarlık Kavramları, Yem Yayınları, İstanbul, 2010.

[13] Hacıhasanoğlu, O., Kimlik Sorunu; Mimarlığın Evrensel ve Yerel Boyutları, Uluslararası VIII. Yapı ve Yaşam Kongresi, Mimarlık ve İletişim, Nisan 1996, Bursa, Bildiriler Kitabı, 257-264, 1996.

[14] Özgen, S., Ege Adaları'nda Mimari Kimligin Yeri, *Yapı Dergisi,* İstanbul, 260:69-73, 2003

[15] Yücel A., Farklı Mimarlıklar, *mimarlık* sayı-234, Ankara, 1989.

[16] Dönmez, E., Türkiye'deki Kültürel Kimliğin Mimariye Etkisi, Yüksek Lisans Tezi, YTU, Danışman: Işık Aydemir, İstanbul, 2006.

[17] Güvenç, B., İnsan ve kültür. İstanbul: Remzi Kitabevi, 1984.

[18] Çahantimur, A., Sürdürülebilir Kentsel Gelişmeye Sosyo-Kültürel Bir Yaklaşım: Bursa Kenti Örneği, ITU, İstanbul, 2007.
[19] Akıncıtürk, N., 700 Yıllık Cumalıkızık Köyü Yapısal Sorunlarının Fiziksel Boyutu, Uludağ Üniversitesi Mühendislik Mimarlık Fakültesi Dergisi, Cilt 7, Sayı 1, Bursa, 2002.
[20] Google Maps, https://www.google.com.tr/maps/place/Cumal%C4%B1k%C4%B1z%C4%B1k,+16370+Y%C4%B1ld%C4%B1r%C4%B1m%2FBursa/@40.175447,29.170836,15z/data=!4m5!3m4!1s0x14ca3913e9b86529:0x87cc8928170f3064!8m2!3d40.1786592!4d29.1710443!6m1!1e1, last accessed on 12/06/2017.
[21] Bursa Yerel Gündem 21, Cumalıkızık Koruma-Yaşatma 98 projesi. Projenin Hedefleri Sorunları Olanakları, *Aylık Kent Kültürü ve Düşünce Dergisi*, Bursa, 2009.
[22] Altuntaş, Y., Kültürün Korunması ve Turizm Sektörü İçin Müzeciliğin Önemi, *Türkiye'de Halk Bilimi Müzeciliği ve Sorunları Sempozyumu Bildiriler Kitabı*, Gazi Üniversitesi THBMER Yayınları, 177-179, Ankara, 2003
[23] Oğuz, Ö., *Küreselleşme ve Uygulamalı Halkbilim*i, Akçay Yayınevi, Ankara, 2002.
[24] Ekici, M., Somut Olmayan Kültürel Miras Neden ve Nasıl Korunmalı ve Nasıl Müzelenmeli: Sorunlar, Çözümler ve Ülkelerden Örnekler , *Somut Olmayan Kültürel Mirasın Müzelenmesi Sempozyumu Bildiriler Kitabı*, Gazi Üniversitesi THBMER Yayınları, 57-66, Ankara, 2004.
[25] Turgut, H., Dosya: Yeni Binyılda Geleneksel Çevreler: İlkeler ve Uygulamalar, *Mimarlık,* 2002 yıl: 40, sayı: 2, 25, 2002.
[26] Tanyeli, U., Anadolu - Türk kentinde fiziksel yapının evrim süreci (11- 15.yy), Doktora Tezi, ITU, İstanbul, 1986.
[27] Özer, F., Çağdaş Mimari Dizaynlamada Tarihsel Sürekliliğinin Değerlendirilmesi, İTÜ Kütüphanesi sayı 1211, İtü matbaası İstanbul, 1982

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Decays Occuring in the Structure in Adobe Materials

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ABSTRACT
The defects occuring in the structure of the adobe materials are directly related to the structure of the materials used in the production of adobe, production techniques and related to the environmental conditions. In order to understand the reasons which cause the defect, we must understand the decay types and causes. Reasons causing a disorder in the structure of adobe are divided into two groups such as physical and biological reasons. In order to detect the source problems, decays in adobe buildings were grouped and the sort of the decays were considered. The most important sources of the decays are the water and the moisture.

Keywords: Adobe, water, moisture, structure, defect, decay

1. INTRODUCTION

Adobe is a construction material obtained by mixing clay soil of suitable qualities with hay or other vegetable fibers (materials such as reedy plants, weeds, hemp fibers, waste hay gathered from barn feed, dry briar brush, pine needles, tree branches, sawdust, etc.), kneading the mixture with water and shaping it by pouring it into molds and having it dry outside [1]. The microstructure characteristics in adobe material offer differences according to the composite materials (Figure 1).

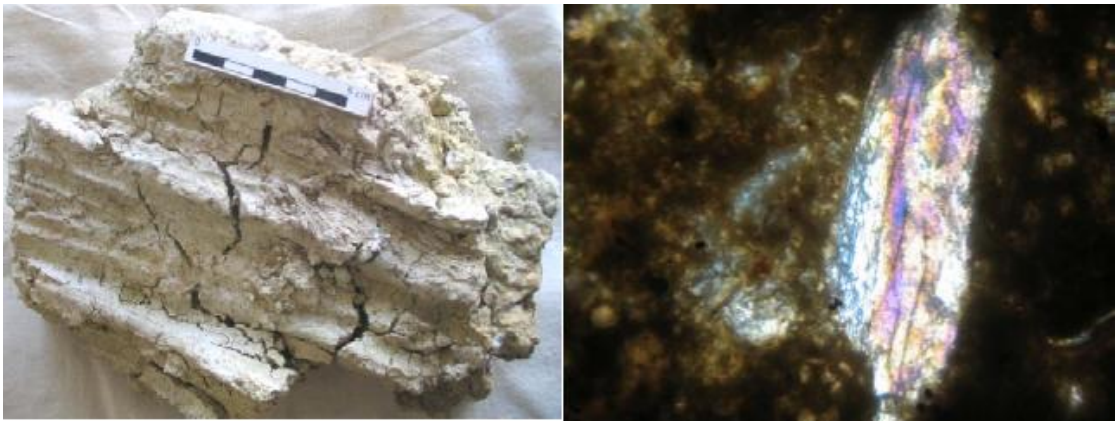

Figure 1. Microscopic view of adobe materials under a polarized microscope [1]

30% of the world's population live in adobe structures (Figure 2). Approximately 50% of the population of developing countries, 20% of urban populations, as well as the majority of rural populations live in earthen and earthen-based structures [2, 3].

Adobe structure is the oldest construction type, dating back approximately 9000 years [3]. In order to sustain their lives, people benefit from the natural materials found in their proximity, such as earth and trees. Adobe was used during early civilization in areas where natural building materials such as stone and timber doesn't exist. The Sumerians, Assyrians, Egyptians and Hittites used adobe to construct masonry (bearing) structures. Besides homes, this earthern material was used since prehistoric times in monumental structures such as barns, palaces, fortresses, city walls, and towers (Figure 3, 4) [4, 5].

Amongst the regions where adobe is commonly used are; Mesopotamia, the Nile Valley, North Africa, Mali, Morocco, Iraq, Iran, Yemen, Afghanistan, India, China, Sweden, Germany, Denmark, France (15% of its population), Spain, Portugal, England, South America, Mexico, and especially in California, where construction of adobe structures rises by 30% a year [2].

Figure 2. Distribution of people living in a building made of adobe material [2]

Figure 3. Building settlement constructed from adobe material, Akçadağ [7]

Figure 4. A house constructed from adobe material, Cumalıkızık, Bursa [8]

The positive aspects of traditional adobe [9, 10, 11, 12]: Soil, which is the main ingredient of adobe, is found in every region. It is easily produced and doesn't require much technical knowledge. It's low cost to produce and the labor fees are cheap. It offers decent insulation against cold and hot temperature conditions. It provides heat insulation in buildings. It is fire-resistant. It provides sound insulation, depending on the material characteristics. It consumes little energy in its production and utilization. For instance, while 300 – 500 kw/h energy is required to produce 1 m³ of concrete, only 3 – 5 kw/h energy is sufficient to obtain the same amount of adobe. It doesn't harm the environment. It's impervious to pest and it's easy to maintain and repair.

The negative aspects of traditional adobe [9, 13]: It is vulnerable against water. Its production depends on weather conditions as adobe cannot be produced in wet weather. It exhibits disintegration subject to tensioning, buckling and cracking during the drying process. Tensioning and contracting forms its internal structure, due to temperature fluctuations. It requires regular maintenance and repairs.

Adobe structures are rare structures that are adversely affected by atmospheric weather conditions. They are structures that suffer heavy damage, particularly from rain, snow and wind. Moreover, degradation is commonly seen from the standpoint of fires, earthquakes and the use of faulty material.

2. DECAYS OF THE ADOBE STRUCTURES

The defects occuring in the structure of the adobe materials are directly related to the structure of the materials used in the production of adobe, production techniques and related to the environmental conditions. In order to understand the reasons which cause the defect, decay types and the decay causes must be understood. Reasons causing a disorder in the structure of adobe are divided into two groups such as physical and biological reasons. The most important sources of the decays are the water and moisture.

2.1. Physical Deterioration

Water accumulating on adobe structure floors in the form of rain and snow causes damage to structure facades as it creeps up the facades via capillary suction. Disintegration and degradation is seen in these facade due to the water and moisture factors. Soluble salts found in high amounts in soil used in making adobe material, bring on structural problems. Adobe in structures that are exposed to this situation begin to break down with the rainwater. Raindrops striking wall surfaces in windy weathers cause piece breakage in the wall [14, 15, 16, 17, 18].

Degradation of the north facade of adobe structures impacted by snow, rain and wind such as plaster cracking (Figure 5), plaster damage (Figure 6), and erosion of adobe materials (Figure 7, 8) are commonly encountered [19].

Figure 5. Decays caused by rain on the sides of the building with and without the effect of the wind

Figure 6. Decays caused by rain at the most outer plaster of the adobe building. The decays does not look aesthetic

Figure 7. Since a periodical maintenance on the building was not done, the plaster and the paint of the building felt down

2.2. Biological Degradation

Hay and other vegetation used in the making of adobe is a source of nutrition for ants and other life forms. Reptiles, rodents, insects, bacteria, fungi and vegetation species that live in the soil environment play active roles in the degradation of adobe structures. For instance, life forms that feed off plant roots in the adobe structure cause the weakening, breakdown and erosion of the adobe by opening channels to reach the roots of these plants (Figure 8, 9) [20, 21].

Figure 8. A view of a wall made of adobe material which consists of big agregate [22]

Figure 9. Plants growing up in an adobe house causes biological decays. Adobe constructed building in Dodoma, Tanzania [23]

2.3. Deterioration Due To Inappropriate Use Of Materials and Faulty Interventions

The high percentage of soluble salts contained in mortar structures with Portland cement used in adobe renovations causes major damage as the renovated structure is very hard and possesses a different thermal expansion coefficient [24].

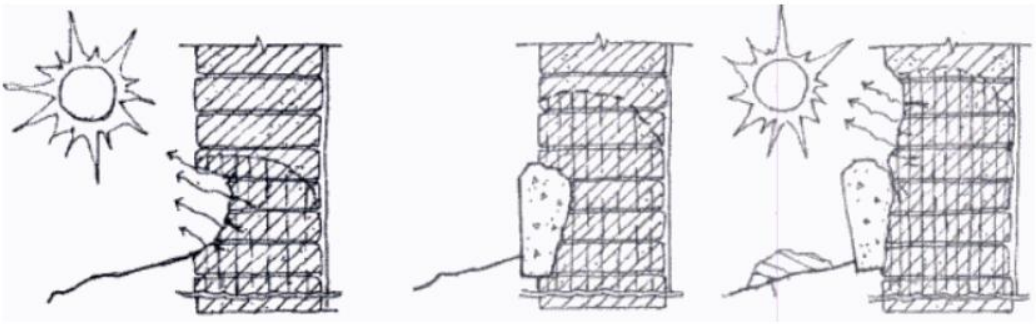

Figure 10. Decays caused by unappropriate materials used in the construction [21]

2.4. Earthquake Damage

Adobe structures are very heavy structures. A layer of mud plaster during annual repairs adds additional weight to the structures. The balance of the walls bearing the weight of the structure is ruined and collapses as it tips over in a minor earthquake [25, 26].

As is seen in Figure 11, some of the adobe structures and the masonry with rubble and earthen mortar stone wall experienced major damage in an earthquake that struck Elazığ on 8 March 2010. When in fact, had a suitable design and project with proper production techniques and production materials been inplemented, these adobe structures would have been sufficiently resistant against such an earthquake (Figure 11) [27].

Figure 11. Destroyed adobe buildings in Elazığ earthquake [27]

3. CONCLUSION

In order to detect the source of the problems, decays in adobe buildings were grouped and type of decays were considered. A great deal of structural damage stemming from water-moisture exists in buildings constructed from adobe materials. Adobe structures built in accordance with technical specifications are quite durable. Because the wall element block and mortar is soil-based, the adobe walls, which exhibit a homogenous cutaway and characteristic, are sufficiently preserved from the effects of rain and frost and are more durable than rubble masonry structure walls. Adobe structures are also more durable than structures with flat roofs, masonry and mud mortar in earthquakes. However, there are some matters that need to be taken into consideration while formulating adobe structures. The life of the structure will be extended and they'll be relatively healthier than other structures as long as these matters are adhered to. First and foremost is that the structure's

foundation section must be made from stone by using concrete mortar. Whenever mud mortar is used instead of concrete mortar, the effect of moisture and water causes major damage to the foundation and reduces the building's resistance. The adobe material to be used after emerging from the foundation must be in accordance with regulations. The soil to be used must have a high element of cohesiveness and should not contain very large aggregate. Grouting needs to be cut straight and bands need to be shot between them. Water-moisture insulation needs to be applied to the structure's outer surface in order to avoid such detrimental affects. Problems shall not occur with the building's durability if the insulation is applied properly. The greatest problems are seen particularly with water flowing off the roof or the wind blasting the rain onto the outer walls. In comparing the facades that are exposed to the wind and those that are not, it is seen that the outer earthern mortar flakes off together with the rain. As there is no such situation on the facade not exposed to the wind, its mortar appears as sound as it was when it was first applied. For this reason, the application of anti-moisture insulation will eliminate several problems.

Measures need be taken in regards to insulation against rising ground water and humidity in the flooring and walls. The rain and snow running off the roof must dissolve in a manner so as not to ruin the adobe materials, and be removed from the structure in the most convenient manner. Today's insulation materials, techniques and technologies must be utilized in the expulsion of the water on the roof. As a result of this study, damage incurred in adobe structures was observed to occur due to precipitation, ground water, water flowing off roof eaves, neglect, lack of interest and misuse.

REFERENCES

[1] Noei, S., Güvercinkayası Kerpiç Karakterizasyonu, *Yüksek Lisans Tezi*, İstanbul Üniversitesi, İstanbul, 2011.

[2] Houben, H., and Guillard, H., Earth Construction, A Comprehensive Guide, *Intermediate Technology Publications*, London, 1994.

[3] Kömürcüoğlu, E. A., Yapı Malzemesi Olarak Kerpiç ve Kerpiç İnşaat Sistemleri, *İstanbul Teknik Üniversitesi,* İstanbul, 1962.

[4] Eczacıbaşı Sanat Ansiklopedisi, *2. Cilt, Yapı Endüstri Merkezi Yayınları*, İstanbul, s.997-998, 1993.

[5] Pfeifer, G., Masonry Construction Manuel,*Edition Detail*, Basel, München, 2001.

[6] TS 2514, Kerpiç Bloklar ve Yapım Kuralları, *Türk Standartları Enstitüsü,* Ankara, 1977.

[7] Aran, K., Barınaktan Öte, *Tepe Mimarlık Kültür Merkezi*, Ankara, 1999.

[8] Başgelen, N., Çağlar Boyunca Anadolu'da Duvar, *Arkeoloji ve Sanat Yayınları*, İstanbul, 1993.

[9] Gündüz, Z., Bağlayıcı Olmayan Katkı Maddeleri ile Kilden Kerpiç İmalinin Mühendislik Özellikleri, *Doktora Tezi, İTÜ Fen Bilimleri Enstitüsü*, İstanbul, 1988.

[10] Anon., VKF Vereinigung Kant. *Feuerversicherungen, Brandschutzregister*, Ausgabe, 1993.

[11] Anon., SIA 181, Schallschutz im Hochbau, SIA 381/1 Baustoffkennwerte.

[12] Kafesçioğlu, R., Gürdal, E., Çağdaş Yapı Malzemesi Alker, *Enerji ve Tabii Kaynaklar Bakanlığı Enerji Dairesi Başkanlığı*, Shell, İstanbul, 1985.

[13] Kafesçioğlu, R., Yapı Malzemesi Olarak Toprak-Kerpiç Ders Notları, *İTÜ Mimarlık Fakültesi,* İstanbul, 1977.

[14] Dehkordi, M. H., Application of Scientific Investigations in Conservation and Restoration of Historical Buildings. *University of Tehran Press*, İran, 2008.
[15] Staff, S. C., Adobe Coservation, A Preservation Handbook, *Cornerstones Community Partnerships*, Texas, U.S.A., 2006.
[16] Von konow, T., The Study of Salt Deterioration Mechanisms, Decay of Brick Walls Influeneced by Interior Climate Changes, *Suomenlinnan hoitokunta*, Helsinki, Finland, 2002.
[17] Feilden, B. M., Climate Causes of Decay, *Conservation of Historic Buildings*, 93-118, 2004.
[18] Torraca, G., Gullini, G., Report on Mud Brick Preservation, Mesapotamia, 7, 287-295, 1972.
[19] Hasbay, U., Dal, M., Kerpiç Yapılarda Görülen Su-Nem Hasarlarının Değerlendirilmesi; Tunceli İli Mazgirt İlçesi Özdek Köyü Örneğinde, Bilim Gençlik Dergisi, 4, 2, 48-61, 2016.
[20] Dede, Y., Aşıklı Höyük Kerpiç Yapılarının Korunması Üzerine Çalışmalar, *Yayınlanmamış Yüksek Lisans Tezi*, İstanbul Üniversitesi Fen Edebiyat Fakültesi, İstanbul, 1997.
[21] Gayurfar, R., Injurious Biological Agents in Historical Buildings, Hampa Publishing, Tehran, İran, 2009.
[22] Koçu, N., Korkmaz, S.Z., Kerpiç Malzeme İle Üretilen Yapılarda Deprem Etkilerinin Tespiti, http://www.yapkat.com/images/Malzeme/Dosya/418239772319794222223758 69.pdf last accessed on 15 May 2016.
[23] http://repository.udsm.ac.tz:8080/xmlui/bitstream/handle/123456789/958/Improving%20Adobe%20Building%20Construction%20in%20Tanzania.pdf?sequence=3, last accessed on 15 November 2016.
[24] Staff, S. C., Adobe Coservation, A Preservation Handbook, Cornerstones Community Partnerships, Texas, U.S.A., 2006.
[25] Leroy- Tolles, E., Siesmic Stabilization of Historic Adobe Structures, *Getty Conservation Institute.* California, U.S.A., 2000.
[26] Khodabande, N., Quality of Earthen Material Used in Bam, Symposium of Bam EarthquakenRecovery and Reconstruction, 101-121, Saba Publishing, İran, 2008.
[27] Binici, H., vd., Kerpiç Yapılar Depreme Dayanıksız Mıdır? Avantajları ve Dezavantajları Nelerdir?, *KSU Journal of Engineering Sciences*, 13(2), 2010.

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Man's Decay to Historical Environment in Zeyrek – A Change on the Physical Texture in the Zeyrek District

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ABSTRACT
Major factors which effect the change of -physical formation in historical Zeyrek- Istanbul are fires occurred in various periods and their destructions beginning from 1960s. Gradually increasing immigration from rural areas to urban areas with industrialization was also another major factor. Though there were always developing activities in walled city, beginning from the second half of 19th century to the end of 20th century these developments caused the disappearance of many of the cultural assets, streets and neighborhoods. The factors which caused to destruction in Zeyrek in those days are very important, because traditional Ottoman wooden architecture was going into extinction. So the samples of traditional Ottoman wooden architecture and restoration programs on such buildings gained great importance. Within this context, the Governorship of Istanbul, Istanbul Metropolitan Municipality, Istanbul 1st Regional Directorate for Foundations, Fatih Municipality and by partnership with several related non-governmental organizations the restoration works have been carried out, and the restoration works of the Molla Zeyrek Mosque is being continued by the Istanbul Metropolitan Municipality.

Keywords: Historical environment, man's decay, Zeyrek, Istanbul, restoration, physical texture

1. INTRODUCTION

There is not any information about initial settlement history and development of the Zeyrek region. This district's name in the Byzantine period is not known. Only one certain information is that it was within the city walls during the Emperor Constantine I period (324-337), however it is not stated in which region it was [1].

As recognized in the beginning periods of Byzantine as a district with monasteries, Zeyrek was a region with habitation density throughout history. The region took a "religious area" characteristic within the city with the Church of Holy Apostles (Havariyyun Kilisesi) which was built by Constantine I. and is a location in which the emperors were interred. Since the Church of Holy Apostles built in 4th century takes the function to be an imperial graveyard, it has begun to leave such a characteristic to the Monastery of the Pantocrator (Pantokrator Manastırı) from the beginning of 12th century forward - which was built on the sets on a hill dominating the urban fabric. Because of its important feature, the Monastery of the Pantocrator became one of the important points of the city for the mid- and late/ Byzantine period [1:555].

Starting from 12th century, which was built by Queen Irene who was the wife of Emperor Iohannes Komnenos (1118-1143), the large part of this monastery, was completed before 1136 which was understood from its establishment guide line called “Typikon”. From this source it's learned that there were rooms that allocated to priests around the churches and a hospital in the monastery as well. Before 1136, a second church was built on the north side of the big principal monastery church and a funerary chapel added between these two; in this way the church composed of three constructions adjacent to one another [2].

Figure 1. Zeyrek 2419 – 35 parcel of lot, photographed by author

After the conquest of Constantinople, a new construction movement began, as the Emperor Fatih the conqueror wanted the Byzantines to turn back who moved away from their habitat. After that a part of these community (Turkish, Greek, Armenian and Jews) were transported to some places in Anatolia and Rumelia by him. The houses in the city were distributed to those seizers or outsiders as a real estate. To the Greek community some neighborhoods were assigned. Also houses and monasteries to military men and cenobites were assigned. Since the period of Emperor Fatih the population of Istanbul increased, due to immigration to the city was continuing. Giving its names -some of them rest until today- to those neighborhoods that they settled, these people inhabited around Bayezid and Aksaray. After the conquest, as big groups they brought from Konya and Karaman, and placed here [3].

After the conquest, there were arising dwelling units around the religious buildings which were effective in Istanbul. It's one of the results of the Turkish-Islamic settlements (Figure 1). By big centers of population -that organized with large and small *külliye*s (islamic-ottoman social complex)- and built on the hills which is easy to be perceived, several religious buildings and neighborhood connections were made, so an urban organization formed for Istanbul [4].

The Zeyrek district is adjacent to many neighborhoods resting in between the Suleymaniye Mosque, Fatih Mosque, Şehzade Mosque and Yavuz Sultan Mosque. Religious buildings were built and the region has turned into a muslim settlement (Figure 2). Together with the already built religious buildings, even the Pantepoptes and Pantokrator churches have began to be used as mosques. Belonging to mid- Byzantine period, the Church of the

Monastery of Christ Pantocrator which reached today, was turned into so-called “Molla Zeyrek Mosque”.

During this period, the monastery buildings were also used as a *madrasa* (muslim theological school) to the completion time of the Fatih Külliye (1463-1470). Given its administration to Molla Zeyrek Mehmet Efendi, this *madrasa* was engaged to a foundation that was established by Fatih the Conqueror. After the *madrasa* was moved to the Fatih Külliye, Ayverdi [4] claims that the monastery buildings were used as dyeing plants in a period. In the first quarter of the 16th century those units were destroyed and instead of those, different buildings built such as, the Zenbilli Ali Efendi School. Relevant to the topic, it is claimed that the Pantocrator Church turned into a mosque. The monastery rooms on the façade of *mihrab* were belonged also to the church extension, where the mosque was used as *madrasa* and they were covered up with vaults in single file, and some parts of them were existing in 1938. Today, excluding the churches, other buildings which belong to the monastery are not found. Merely it's found that the Zeyrek Cistern and other relative little cisterns already in the region that belongs to the Byzantine period, also building basis can be encountered with the cistern structures. Another important monastery church in Zeyrek is the Pantepoptes Monastery which turned into a mosque. Excluding the mosque, other buildings belonging to this monastery cannot reach to present day.

Figure 2. 2419 Ada- 50, 51, 52 Parcel of lots, photographed by author

Some of monumental works in Zeyrek are: Üsküplü Mosque and Bath (Bostan Bath), Salih Paşa small mosque, Kasap Demirhan Small Mosque (1462), Sinan Ağa Mosque, Hacı Kadın Mosque, Hacı Hasanzade Small mosque, Bıçakçı Small mosque, Hamid Efendi Madrasa, Piri Mehmet Pasha Madrasa, Zenbilli Ali Efendi Ottoman elementary-primary school, Çinili Hamam (a bath with tiles), Haydar Pasha Külliye, Çivizade Small mosque and a madrasa that not reached to present day, Damat Mehmet Efendi Madrasa and Gazanfer Ağa Külliye.

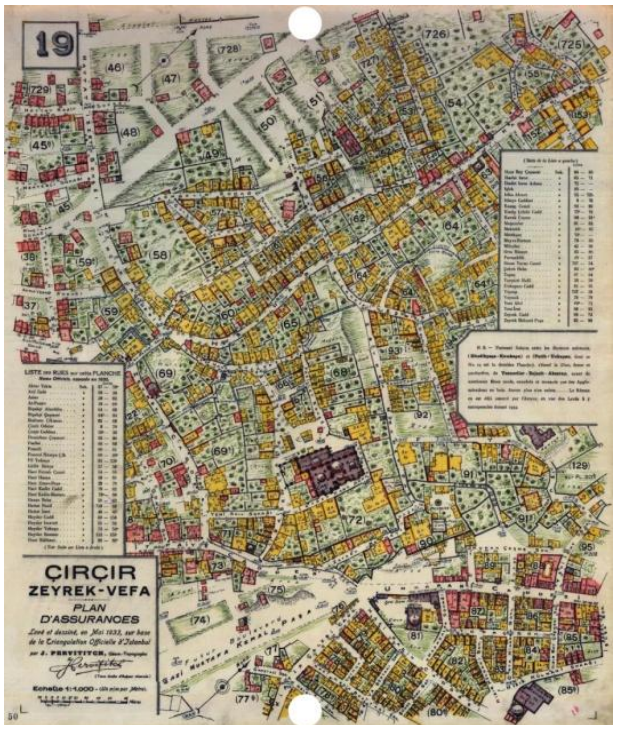

Figure 3. Pervititch Map, 1933 [5]

Figure 4. 2419 Ada-35 parcel of lot, photographed by author

Within the 17th century, the region had three big fires in the years 1633, 1660 and 1693. These fires let to regeneration of many buildings (Figure 4).

In the beginning of 18th century, a fire was started in Cibali which was the biggest up to that time.

From 20th century up to the present day, a destruction process of the structure has began with several reasons such as an erosion on local identity which was generated from migrations and population movements, and due to the followed housing and town planning policies.

2. ARCHITECTURAL FEATURES OF URBAN STRUCTURE PROPERTIES

Zeyrek was established on a hillside that begins from the Ataturk Avenue and the Golden Horn. By high retaining walls which reach up to 15 meters from the Ataturk Avenue, various terracing and sets that were made in Byzantine period. On the formation of architectural and road structure that gives its unique characteristic to the region, the determinant effects of topographical features and education were clear. Depending upon topography, the roads formed as parallel to its declivity lines or as steeps format that establishing connection between the sets [6].

As its spatial organization, developed around the Molla Zeyrek Mosque, the Zeyrek district formed depending upon several factors such as the building forms, dimensions and building types, façade features, a relationship between road wideness-and-building height and ownership structure (Figure 5). Zeyrek is one of the limited in number districts of Istanbul with its organic shaped streets that cut each other by non straight angles and dead ends, wooden houses and monumental buildings, and reached to the present day with its organic urban fabric relatively protected. It has own to it an unique character.

In the region within the boundaries of Zeyrek Mosque and its surrounding World Heritage Site, it's seen that a great majority of the area as having 10.30 ha bigness has filled with housing areas. Usage of housing extended throughout the region. In the area, especially through the Haydar Street in north-south direction going a mixed usage is observing that includes local trade activities, however it can be said that the bigness of these area is quite a little. These small businesses are found in the ground floors of the houses. Making sense that it is a non highly dense-middle class housing zone in this region the service buildings are in number Existing ones are found generally on the edges of the region. Present on the south side of the district, there are some types of buildings for instance the big Çinili Hamam and on the north side found again Architect Sinan's work the Haydar Bath and founding further the north the Azebler Bath and opposite to it located the Çukur Bath as a part of Fatih Kulliye. Composed from wooden buildings an architectural structure is longing up to the Golden Horn by containing the Çırçır district too. Most of the wooden houses which found in Zeyrek are wooden ribbon buildings that were built between the years 1800-1840. Sitting on an average 50 square meter those ribbon buildings are two-storey or 100 square meter gross area. Their parcel wideness change to a length between 5-10m. As looking their living spaces to the street side and founding small gardens on their back sides, those house lines have some common features, for instance an existence of the bay windows. Wooden mansions have reached too little to the present day [7].

After 1930s, in Istanbul, because of both a rarity at wooden material and fire regulations, examples of the masonry constructions have began to be built. Those constructions became dense on the south and west sides of the region. Built after this period houses in the region, despite their plan schemas and forms, materials and construction practices have changed, up to the end of the 1940s originality and harmony with the wooden structure maintained. As for the reinforced apartments which were built after 1950’s are disharmonious constructions with the environment [7].

Figure 5. 2419 Ada-42 Parcel of lot, photographed by author

In Zeyrek there are in number 209 available, 73 disappearing and totally 282 cultural assets. The number of the total cultural assets in the area constitutes approximately 10% of the total cultural assets throughout the World Heritage Areas of Istanbul. Among the cultural assets in the field, 32% of them are monumental work, as for 68% of them are civil cultural assets. The number of available monumental works are 78, disappeared 11. As for the number of existing civil cultural assets are 131 and 62 disappeared. The cultural assets in the area are mainly found on the private property parcels. Constituting approximately 73% of the total 282 cultural assets, in number 207 constructions are private individual property. In the area, the rate of the total 44 cultural assets that publicly owned is approximately 16%, as for the rate of the owned by foundations the cultural assets in number 31 are approximately 11%.

Figure 6. 2419 Ada-13Parcel of lot, photographed by author

3. A CHANGE ON THE PHYSICAL TEXTURE IN THE ZEYREK DISTRICT

Major factors that having effects on the change of physical tissue in Zeyrek are fires and their destructions. Beginning from 1950's with industrialization a gradually increasing immigration movement from rural areas to urban areas.

Like almost every places in Old Istanbul, Zeyrek also affected negatively from big fires that Istanbul had lived. In consequence of those fires, the buildings were should regenerated. Respectively in 1633, 1660, 1693, 1718, 1756, 1833, 1908 and 1918 fires had destructed many of the buildings in Zeyrek and changed the street patterns.

In 19th century an overall implementation that includes reorganizing the fire areas by vertical cutting roads and in the way between them resting a square or rectangle wards, was applied to Zeyrek and its surrounding too. On the south of Zeyrek and Çırçır avenues resting a planned part with its straight angle is different from the traditional organic texture. The area which found between İtfaiye Avenue, Ömer Efendi Street and Old Mutaflar Street clearly separates from the old organic tissue [8].

The region was organized in the direction of the principles of Istanbul Structural Plan which came into force in 1939 prepared by Henri Prost. According to the development implementations and in this context due to the vehicle traffic; the old texture largely was changed by right-angled settlement plans. In 19th century, in the planning after the fires occurred was made points out that a harmony with the texture in the environment has not been taken into accounts. The area around the Molla Zeyrek Mosque, with its different angle roads and dead ends -as it's seen from the 1882-1884 city plan- has survived until today. On the Pervititch map that dated to 1933, mansions -now, some of them disappeared or their number considerable has decreased- and the ribbon buildings can be seen.

Figure 7. 2419 Ada-45 Parcel of lot, photographed by author

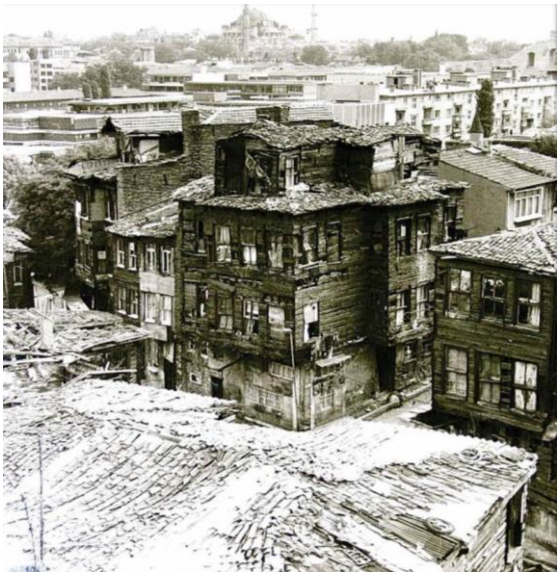

Figure 8. Zeyrek in 1900's [8]

Though there were always development activities in walled city, beginning from the second half of 19th century to the end of 20th century were made development movements caused to disappear many of our cultural assets, streets and neighborhoods. The factors had had effect on the destruction in Zeyrek were;

- Opening the walled city Istanbul and the Golden Horn to industrialization,
- Sourced from an increasing amount of demand to labor force happened immigration wave to the city,
- The development plans that increased the population density in the city,
- From the walled city were passed the many main road axis,
- To make big avenues, boulevards, park and to open coastal roads, an extinguishment of monumental buildings and civil architectural texture,
- For meeting an increased need to parking areas, especially with encouragement to individual transportation and its development, appeared an important issue as unlicensed parking areas, that cannot be prevented, which is known destroys the civil architectural texture.

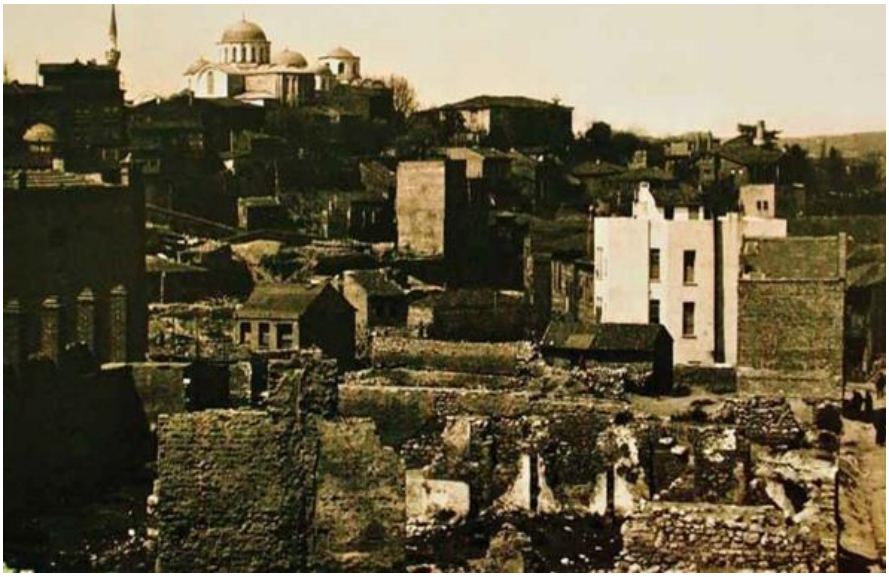

Figure 9. Zeyrek after fire [8]

• While in traditional parcel use, on a building parcel only on the one independent part a family was provided to be sheltered, since the condominium regulation of the civil code, by forming more than one independent parts on a parcel resultant an increase in the density caused to destruction,
• Because of the reasons an increased density and floors in number, separate houses moved to apartments, and so the lanes and infrastructure became as insufficient against the needs.
• Available parcels united, in this way big and multiple-floor buildings were made.

Above explained reasons as the same happened in the historical peninsula, in Zeyrek increased the destruction of cultural heritage too.

Being found on the Ataturk Boulevard and used as administrative unit of the Social Security Administration, as belonging to Sedad Hakkı Eldem -who is a pioneer architect of 20th century- a building complex is also among the cultural assets within the area boundaries. Built between the years 1962-1964 this building complex though accepted as one of the samples of modern Turkish architecture. It had has a determinant role on the change of the unique historical texture.

4. CONCLUSION

As lived a rapid housing and apartment house progressing between 1960-1975 in Zeyrek, after this area has been putted under protection by Ministry of Culture in 1979 by declaring it as a site area. A limit brought to the new housing. In 1985, together with three other areas in the Historical Peninsula, the Molla Zeyrek Mosque and its surrounding has been added to the World Heritage List. In 1995, as declared the overall Historical Peninsula as a site area by Decision no# 6848 in 1995 of Istanbul No# 1 Cultural and Natural Heritage Preservation Board. Zeyrek district also has been identified as Urban and Historical Site Area.

In last periods, in the region, as the samples of traditional Ottoman wooden architecture gained value to the civil cultural assets' restorations intended activities have been realized. Within this context, the Governorship of Istanbul, Istanbul Metropolitan Municipality, Istanbul 1st Regional Directorate for Foundations, Fatih Municipality and with partnership with several related non-governmental organizations the restorations have been carried out, and the restoration works of the Molla Zeyrek Mosque is being continued by the Istanbul Metropolitan Municipality.

Figure 10. Decay in Zeyrek [8]

Figure 11. A ruined house in Zeyrek [8]

REFERENCES

[1] Eyice, S., Dünden Bugüne İstanbul Ansiklopedisi, volume 7, p.555, 1994.

[2] Tanju Oral-Seyhan, İstanbul Türkçesi, Dünden Bugüne İstanbul Ansiklopedisi, c.IV, İstanbul, 1994, s.243-246.

[3] Ayverdi,E. H., Osmanlı Mimarisinde Fatih Devri-III, İstanbul Fetih Cemiyeti Yayınları, 1953.

[4] Çelik, Z., 19. yüzyılda Osmanlı Başkenti, Değişen İstanbul, Tarih Vakfı Yurt Yayınları, Istanbul, pp.18-30, 1998.

[5] Cangul, C., 19. Çırçır, Zeyrek, Vefa (Mayıs 1933), https://get.google.com/albumarchive/102358549153107478316/album/AF1QipMFs90NIz7ewALoftYzdibsMpke7l8VZqBjmUk/AF1QipNJM5tMX4-o0MRBf1UNHjWv-bK05omnaHCW4C4, last accessed on 19/06/ 2017

[6] Karaman, A. ve Önal, Ş., Dünden Bugüne İstanbul Ansiklopedisi, volume 7, p. 553, 555, 1994.
[7] Müller-Wiener, W. and Cramer, J., İstanbul-Zeyrek Studien zur Erhaltung eines Traditionellen Wohngebietes, Deutsches Orient Institut, Hamburg, p.34, 35, 1982.
[8] Gülersoy, N.Z, Koramaz, T.K, Urban Conservation Study Based on Computer Aided Design Techniques: A Case of Zeyrek-Istanbul, ISPRS Commission V Symposium, 2002, Close Range Imaging, Long Range Vision, 2-6 September 2002, Corfu, Greece, pp 369-372

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Cultural Landscapes in Rural Settlements of Diyarbakır Province

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ABSTRACT
Rural settlements are generated with formation of natural environment data in line with the life culture and needs of local people. Within the historical process, these settlements have maintained their formations according to the physical environmental conditions of the region in which they are located as well as the social and traditional life culture. Each settlement area has traces that reflect its own settlement texture and its nature, culture and social life. The variability of interaction of the culture-nature relation in different settlement areas within the same region is reflected in the types of architectural formations and develops cultural landscape formation peculiar to the region. In rural settlements where the natural environment data is preserved and integrated with the traditional life culture, it is observed that the cultural landscape formations have developed naturally and spontaneously. In this study, the cultural landscape formations of the architectural texture that is shaped with the influence of the cultural life style which is developed naturally in the rural settlements in the Diyarbakır Province, have been examined. Through this study, it was aimed to comprehend the characteristics of the rural settlements in Diyarbakır region, to analyze the relations that they have established with nature and to analyze the relationship between the architectural texture and the cultural landscape.

Keywords: Rural Architecture, rural settlements, cultural landscape, Diyarbakir local architecture

1. INTRODUCTION

Human communities and natural data constitute the two most important elements in formation of the landscape. Especially the rural and/or traditional houses have special importance because they are the historical document of the cultural expansions and cultural adaptations that have been experienced from the past to the present day and they increased the wealth of the earth in terms of "locations" [1].

The houses and settlements which reflect the materialistic cultural assets are the best example of the cultural features of people from the past. The rural settlements are places where the houses that reveal as a result of cultural background that people have brought up to today and that are the material objects of culture are best expressed. The rural dwellings are the best reflectors of the material culture with their intrinsic properties and with respect to the fact that they are formed according to the needs of the society, planned according to the social relations, their family structure and life, and at the same time, shaped according to the influence of the physical environment.

Rural settlements are basically characterized with the elements of "a living space with a scene that displays the interaction of culture and nature lasting for periods of time and

generating traditions within a complaint-calm unity" and "the human-society that are shaped by information, experience, traditions transmitted between generations and included in a lifestyle that evolves at almost inconspicuous slowness" [2]. In addition to these values, the use of a common language that is harmonious and integrated with the natural environment, without destroying the natural data of the environment, gives the rural settlements a distinctive characteristic feature in terms of cultural landscape.

In the guide prepared by the UNESCO World Cultural Heritage Committee in 2008, the relationship between nature and human beings is outlined, and cultural landscape is expressed as "reflecting the joint work of nature and humanity". UNESCO describes the concept of cultural landscape as the evolution of human society and settlements formed by the natural environment of human beings and the influence of social, economic, cultural internal and external forces [3]. According to this definition, the cultural landscapes have been constituted as a result of mutual interactions of culture and nature that shape the physical environment over time and constitute today's landscapes [4].

Cultural landscape can be defined as "the areas that are formed as a result of use of the nature by the people in line with various purposes" within a context that will also include meanings such as mythological, religious, etc. along with the activities such as building construction, agriculture and so on. The cultural landscapes formed by the interaction of culture and nature form the essence of rural settlements, and the spaces that are shaped with elements such as mountain, river, valley, plain, forest, trees, etc. and activities such as agriculture, animal husbandry, etc. are formed with the local architectural structures-textures, rituals and everyday life traditions [2].

The cultural landscape develops as a result of the interaction of natural landscape with the cultural values of local people. The stages of development of the cultural landscape in the region gain importance with the qualification of bearing traces with regard to the history of the settlement [5].

The cultural-natural values of the rural settlements in each geographical region are reflected differently on the planning of houses in the settlements, street layouts, use of building materials, details and generate different cultural landscape acquisitions. These cultural landscape differences should be fictionalized by a content that makes sense of the natural-cultural relations in terms of the region inhabited by the settlements with an integrated understanding. The cultural-nature interaction, which varies from region to region, provides different cultural landscape acquisitions in different settlements within the region due to the fact that the natural data in the same region are different from each other. With this point of view, in this study, it was aimed to determine the diversity of cultural landscapes that the nature-culture interaction generated in rural architectural settlements in different regions of Diyarbakır province. For this purpose, the geographical features of the region were considered and the diversity of the cultural landscape acquisitions that the settlement and the texture of the settlement generate was examined. In this study, the settlements in the rural areas of Diyarbakır were visited and the main factors forming the settlement texture were determined. The characteristics of each of the determined factors contributed to the planning of the structures and the formation of the cultural landscapes.

2. PROPERTIES OF DIYARBAKIR PROVINCE

Diyarbakır Province is located in the Southeastern Anatolian Region between the north latitudes of 37 degrees 30 minutes and 38 degrees 43 minutes, and the east longitudes of 40

degrees 37 minutes and 41 degrees 20 minutes. The surface area is 15.355 km^2. The altitude of the center of the city is 670 m. 45% of provincial lands are suitable for dragging. 95% of the lands are suitable for agriculture. The proportion of plains in the province 37% of which is covered by mountains is about 31% [6].

Diyarbakır is located to the south of the South-Eastern Anatolia Taurus Mountains. The wide area extending between the Dicle River and the Southeastern Taurus Mountains is called the Diyarbakır basin. To the south of this section is the elevation of Mardin, which consists of mountains of middle height. The Karacadağ elevation extending in the Northwest South direction separates the Diyarbakır Basin and the Şanlıurfa plateau on the west. Karacadağ that is an extinct volcano with an altitude of 1,954 m. is the highest point in the region. The western border of the region is formed by the Euphrates River. Ambar and Göksu Watercourses are located in the east flow into the Dicle River [6].

There is a continental climate in Diyarbakır surrounded by Şanlıurfa in the west, Mardin in the south-east, Elazığ in the north-west, and Batman in the east. Significant temperature differences occur between day and night. Natural vegetation and forest areas are underdeveloped. Mostly, maquis groves and bush areas are observed [6].

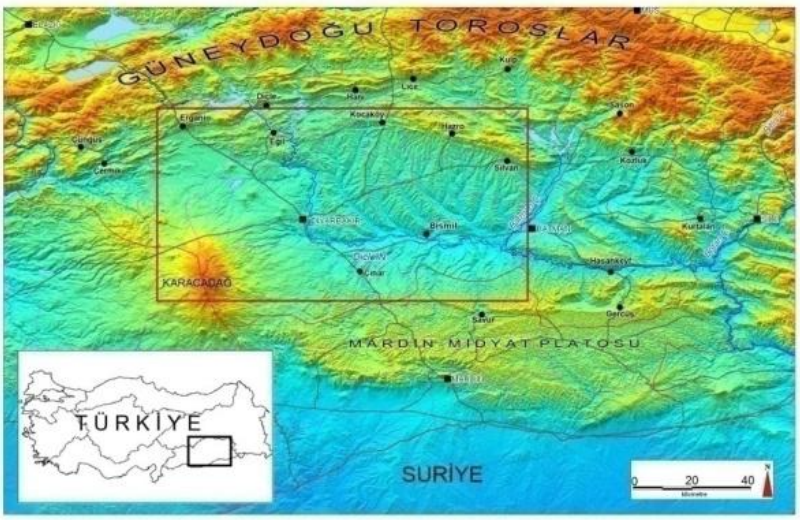

Figure 1. Diyarbakır Province Map

3. PROPERTIES OF RURAL SETTLEMENTS IN THE REGION

Factors such as climate, topography, local material possibilities, social and cultural structure have been effective in the formation of the rural architectural settlements of Diyarbakır province. The rural settlements, reflecting the identity of the local architecture, vary according to the characteristics of the natural elements in the geography they are located. The fact that the architecture of the rural region was shaped different data peculiar to each region generated the diversity of cultural landscapes.

One of the important elements of the settlement geography in rural architecture is the residence. The residence and the areas that make up the residence are the structures that people have developed by adapting to the natural conditions and the environment in order to maintain their lifes. When the structures in rural area are viewed as a single house or a settlement, they reflect the harmony of the interaction between the structure and the natural

environment. The fact that the structure within nature has been integrated with the sustainable environment is also the result of a long cultural process (Figure 2).

Figure 2. Integration of structure and nature, Diyarbakır, 2012, photographed by author

The construction materials used in Diyarbakır province and in rural areas around are related to the topography features where the structure is located. The construction materials generally used in the region vary according to the geological structure of the region. The materials that were present at the place where the rural settlement was located were preferred. The use of stone materials around settlements is widespread in the mountainous regions. Adobe-stone or only adobe materials were used in the settlements in flat areas of land topography. The basalt stones created by the lava flowing from Karacadağ in the southwestern region of the city center are the main materials used in the constructions in this area. The basalt stones in this region were used for gathering or boasting in structures (Figure 3). Since Bismil and the surrounding area located in the southeastern region of Diyarbakır city center is plain, the material used in these settlements is widely adobe. Limestone was used in the settlements around the Silvan district located in the north eastern region of the city center of Diyarbakır province. In the plain settlements of the Silvan district, limestone as well as some adobe materials were used.

Positioning of the houses in the rural settlements of the region varies according to characteristics of the land. The houses in mountainous areas were located adjacent to or close to each other (Figure 4). In the villages situated on the hillside or in the mountainous areas, the houses were singularly positioned with the effect of the land slope, and a natural street texture was formed by the side-by-side arrangement of the houses. The location of the houses in the settlements in the plains is varied. In these settlements, although the houses are seen to be positioned adjacent to or separated from each other, there is also a third use example in which each of the combined structures, where two or more houses were integrated, was located separately (Figure 5). In the plain settlements, there are examples of courtyard use in the houses which were positioned separately from each other.

Since the topographical features of these areas are suitable for applying courtyard planning types, the courtyard planning is used only in the plain settlements.

Figure 3. Use of basalt stone, Ekince village, Diyarbakır, 2012, photographed by author

Figure 4. Positioning types- singular, Diyarbakır, 2012, photographed by author

Figure 5. Positioning types – combined, Karaköy village, Diyarbakır, 2012, photographed by author

4. CULTURAL LANDSCAPE CREATED BY THE SETTLEMENT TEXTURE

In analyzes conducted in the rural architectural settlements of Diyarbakır province, three main factors that make up the settlement texture become prominent. It is seen that these factors, which direct the settlements, are cultural life effect, topographic and climatic factors.

4.1. Cultural Life Effect

Rural architecture can be defined as architecture based on traditions, using natural environment features, social and cultural structure, regional materials and local construction techniques. In this definition, the binding concept is the status of "belonging to a place". Harmony with the environment, integration; reflecting the social and cultural values of the society create the architectural product, especially the status that the residence belongs to the place where it is located [7-8].

The social and cultural life of different societies is the most important factor, especially in the formation and development of the house. A house symbolically refers to a family. The development of the house is also determined over time in line with the development or needs of the family. Basically, the spaces that make up the house are directly related to the means of livelihood of the family. In many regions, apart from the need for accommodation, there are the additional places such as living room, sofa, barn, warehouse, manger, henhouse, etc. among the units that make up the rural house.

The rooms attached to the house later or the additional structures that are part of the house depending on production surround a courtyard or a restricted area depending on the relationship of the house with the garden or the land. Tradition plays the most important role in the formation and development of the home. Maintenance of the house of the family is provided by non-abandonment of the land, which can only be ensured when the next generations using the same house and surroundings. The house is a space that exists representing the family for generations [7,8].

Although there is a developed solution for the climatic factors, in the rural settlements of the region, planning in traditional houses with courtyard has developed with the use of social and economic activities of family structure. The courtyard is surrounded with walls or fences and the private space of the family is restricted with the courtyard, thus creating a buffer zone for the security of the house. The courtyard, which provides an inward arrangement due to the privacy of family life is, for women, a special place opening up to the nature where they spend a great deal of daily works, have a rest, gather, and meet social relationship needs.

Figure 6. Cultural life in rural settlements, Diyarbakır, 2012, photographed by author

The economic activities of the families in rural areas of Diyarbakır province are agriculture and animal husbandry. Since the agricultural areas and activities of the region are scare, the main source of livelihood of the local people is the animal husbandry. For this reason, ensuring the safety of animals, which is the greatest economic resource, is also reflected in architectural planning. The fact that the barns are connected to the courtyard or garden in the rural architecture is more reliable in terms of the protection of the animals, which is the most important livelihood of the families in these regions. In the courtyard-free planning

types, the fact that the barn units are designed in one-floor houses as a single space in the house and in two-floor houses in the lower floor of the house emphasize the climatic effects as well as the protection of the source of livelihoods. The barn, which is included in the building mass in terms of planning, may not consist of a single space. It is seen that two or more space of the house connected to the hall are used as barn and some of them are used as mangers. In structures with more than one barn, the barns and manger are interconnected with each other. One of the manger or barns is connected with the hall. The fact that the barn connected with hall has a connection with the inner part of the house, is related to the security problem of the single economic livelihood source of the local people. In some types of housing, the barn is not connected to the inner part of the building, although it is planned as a unit of the house. There is only a door connection that opens out of the structure from the barn. In the architecture of the rural area, it is seen in the types of buildings built in recent years that the space used as a barn is not planned within the boundaries of the structure that is used by the family members. It is within the boundaries of the house garden and is planned as a separate structure. The fact that the barns are positioned without any interaction with the structure in recent years' planning is reflected as a sign of change in social life culture [9].

The use of the false floor as a flat roof in the rural architecture of the province is also shaped by the reflection of social life. During the summer months, the roof on the false floor of houses is important to meet the needs of spreading and drying winter foods and supplies. In houses with courtyard, this need is met in the courtyards or on the roofs again. In addition, these roofs are cooler in the summer months due to the warm dry climatic characteristic of the area. The household sleep on the thrones placed on the roofs (Figure 6).

The walls, whose duties in the structure are load bearing and separation, have taken different forms throughout history through the influence of economic and cultural factors in different societies. The wall of the structure in the rural areas is the most important indicator of the structure in respect of showing how extroversive the structure is. The privacy need in the structure starts from the garden and is reflected in the ratio of the spaces in the front side. In some areas, the garden walls, and in some areas the face walls dominantly indicate the architectural identity of the region. The use of windows is seen as another architectural element shaped by social cultural life. The provision of an inward-oriented family life and privacy is related to the size and positioning of the windows. The fact that the windows of the houses with courtyards are positioned towards the courtyards, there are no or few windows on the outer face is the reflection of the social and cultural lifestyle. It is also possible to see the effect of the same cultural structure in houses without courtyards. The fact that the sizes of the room, bathroom and toilet windows are high and small, there are no or minimum-sized windows connected to the outer space in the hall is effective in the formation of the architectural identity of the social family life.

4.2. Topography effect

The topographic state of a region is an effective factor in formation of the building types according to the state of the land and in acquisition of authenticity of the architectural texture. The settlements in the Diyarbakir region are located on the plain, hillside and mountainous regions and have different topographic features. It is seen that the settlements whose topographical features have changed are located and shaped in accordance with the land structure. This factor, which is a determinant factor in formation of the rural settlements in the region, has increased creation of the cultural landscape items peculiar to

the region. The topographic features of settlement units in the region have also been effective in formation and development of plan types. It is seen that expansion in the structure is achieved by adding units in horizontal axial to the structure in line with the changing needs in the houses. Local people tried to convert the structure into a multiple-courtyard plan type with the added unit or units. The added units consist of spaces such as room, kitchen, WC, barn. While it is possible to develop a courtyard plan type in settlements with flat land features, this planning change is not achieved in the settlements with sloping land features. Due to the slope of the land in mountainous regions, it is difficult to develop the expansion type in the horizontal axis by adding units to the houses. In these regions with a sloping topography, the planning organization is performed in vertical axis. Houses are generally planned as single or double floor. There are barns on the ground floors of two-floor houses, and on the upper floors, there are places where the households live. In these planning types that develop depending on topography, the entrances of the houses are at a very high level. For this reason, access to the house entrance is provided by a long ladder arrangement. Different topographical features have also been an effective factor in the formation of road or street texture in rural settlements. The network of transportation that has created has the quality to integrate with the natural environment. The roads and streets are wide in the settlements with flat land and it is possible to reach to the nearest places of the houses by car. In mountainous or hillside settlements, the road does not reach to every building. In these regions, the proximity of the houses to each other provides the formation of a natural street texture (Figure 7,8).

Figure 7. Street Texture, Diyarbakır, 2012, photographed by author

Figure 8. Road-environment relationship, Diyarbakır, 2012, photographed by author

4.3. Climate effect

The rural settlements of Diyarbakır province have different microclimatic climate features from the city center according to the geographical and topographical structure of the region in which they are located. In the mountainous parts of the region, the temperature values are lower in the summer and winter than in the city center. The low temperatures in these regions are challenging in terms of climatic comfort in the winter months, but creates a refreshing effect in the summer. And the plain areas have similar climatic features with the city center. Despite this, in the plain settlements, planning and design are pretty different

from those in the city center in respect of the factors related to the built environment such as location selection, building spacing, building intervals, building formation, building direction, space organization and material. The fact that these factors are different in each region of Diyarbakır province has created diversity in architectural formation against the hot-dry climate effect. This diversity in the different regions of the province has contributed to the development of cultural landscape diversity as well as enabling the formation of plans compatible with the characteristics of the local climate.

In some structures in the plain settlements, it is seen that the units making up the houses have been planned side by side. The spaces out of these units used as barns or mangers have been arranged adjacent to the space where the living activities are performed. This planning is effective in reducing the need for energy use by benefiting from the indoor heat of the barn during the cold winter months. In formation of the rural architecture in the mountainous regions, the most obvious climatic factor effect is seen in planning. The vast majority of building types in these regions consist of two floors. The spaces on the ground floors of the houses consist of units such as barns, mangers (Fig. 9). On the top floor of the houses there are other places used by the local people. Planning the barns on the ground floor, it is provided that in the winter months, the animals can take shelter in these spaces. Being the primary source of livelihood of the local people, the bovine animals emit a large amount of heat to the space they are in. This heat spreading in the environment serves as a natural heat source for the living units of households living on the upper floor. Especially with this type of planning, it was ensured that the effect of the low temperature values on the spaces on the upper floor during the challenging winter months in the mountainous regions has been reduced. In the planning types, the natural slope on the land has been used in the best way in respect of adapting to the climatic conditions. Designed as barns, these spaces are not used during periods outside winter. In the summer months the animals are housed in the garden, in their outdoor spaces surrounded by walls.

Figure 9. Place of barns in planning, Diyarbakır, 2012, photographed by author

In some regions with a flat land structure, the formations of the structure have developed singularly or in combination. Individual houses have been located at different distances from each other. In the case of the combined structure types, each of the structures developed as a part of the other, forming a large building mass (Figure 10). These combined structures are formed by positioning two or more structures together. In architectural formation, development of more than one structure in a combined manner with each other is a type of organization developed against the climatic conditions. As the outer wall surface areas exposed to the external environmental conditions of the combined structures are reduced, this is a planning which provides a minimum level of heat losses and a reduction in the energy demand, especially in the winter months.

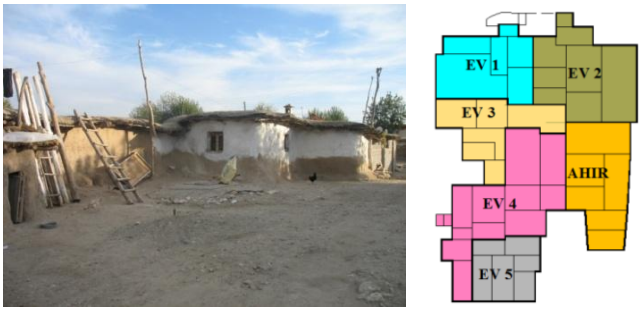

Figure 10. Example of combined planning, Diyarbakır, 2012, photographed by author

Most of the activities of households in the rural architectural planning of Diyarbakır province are limited to a single place. This living space is directly linked to the hall. Living spaces are usually planned in a way to have two external facades. However, there are also few houses with one or three external facades depending on the formation of the building. Reducing the external wall surface area against the climatic effect has been an element that has provided the formation of architectural texture by influencing the form of the structure.

In terms of the climatic characteristics of the region, the hall is an important space in terms of its use in providing climatic comfort. The hall, which has a communal area feature in the planning of houses, provides a passage between spaces. The plan types of houses are shaped according to the organization of the hall and other spaces. The halls are spaces where daily living activities are carried out during the climatic hot summer months. In the summer months, households use them for the purposes of living, resting, eating and doing housework. Particularly in the plan types with a hall in the center, there are connections to the spaces on the mutual sides, and there are doors that open out on the other mutual sides. These two doors, which are kept open during the summer months, provide natural air conditioning by providing a continuous airflow in the hall (Fig. 11). The arrangement of these gaps in the planning of the hall, reflecting the cultural lifestyle, is a good example of the culture-climate interaction.

Figure 11. Use of hall in local architecture, Diyarbakır, 2012, photographed by author

The forms of window usage on the facades of the rural architectural structures have been oriented and dimensioned depending on the climatic characteristics. The structures have facades on different sides depending on the location of the lands. On the eastern, western and northern facades of the structures, the use of windows is low, while the southern facades have been densely preferred. The number of windows used on the facades is low and their sizes are small. The use of this window type aims at reducing the amount of heat loss due to transparent component during the cold periods. These window types, which are used to provide thermal comfort, are inadequate in respect of daylight use in large spaces.

In winter, the window frames are placed inside the wall against the negative conditions of the climate elements such as rainfall and snow (Figure 12).

Figure 12. Type of window use in architecture of the rural region, Diyarbakır, 2012, photographed by author

The material used in the rural architecture of Diyarbakır province is stone and adobe. The only material used in the south western region is the basalt stone. In other parts of the province, it is seen that adobe and limestone stone are used. The wall thicknesses of houses built with the use of local materials range from 50 cm to 80 cm. In some structures, the external wall thicknesses are greater than the inner wall thicknesses. The external wall thickness has been increased in order to reduce the effect of climatic conditions and to reduce the heat losses from external walls. In this way, against the external climatic conditions, the formation and preservation of the internal climatic conditions are achieved with less energy use.

5. CONCLUSION

The rural settlements in Diyarbakır province and the structures built in these settlements have been formed with the decisiveness of the social and cultural life characteristics of the local people. It is seen that in the structures located in the regions of the district with different natural characteristics, the cultural factor has been formed in line with the result of its interaction with the other environmental factors. Although this interaction has developed different types of formations in terms of architecture, the culture of rural life in the region does not change. The fact that the architectural properties such restriction of the family life with garden or courtyard, planning similarities, spatial usage characteristics, usage of flat roof, window sizes are common shows that it reflects the traces of the same cultural effect. It is seen that the cultural interaction and cultural expansion with regard to the living of the people in the regional settlements are reflected on the architectural characteristics. These rural settlements, which also contain traces of the cultural history of the region, are unique in terms of cultural landscape. The rural settlements in which the rural life culture in the region are shaped, formed and developed with different environmental data are the cultural landscapes that must be preserved and maintained.

REFERENCES

[1] Köse, A., Balıkesir Çevresinde Geleneksel Kırsal Avlu Peyzajı veDegisimi (Traditional Rural Courtyard Landscape and Alteration Around Balıkesir), Dogu Cografya Dergisi (journal), Number: 18, Çizgi Kitabevi (Publishing house), Konya, 2007.

[2] Kayın E., Bir Kültürel Manzara-Kültürel Peyzaj Öğesi Olarak Kırsal Yerleşimlerin Korunmasına Yönelik Kavramsal ve Yasal İrdelemeler (Contextual and Legal Probes

With Regard to Preservation of Rural Settlements As An Item of Cultural Scene-Cultural Landscape), *Mimarlık Dergisi*, Number: 367, Chamber of Architects, Ankara, 2012.
[3] UNESCO, World Heritage Centre, (2008c), Operational Guidelines for the Implementation of the World Heritage Convention, Paris, 2008.
[4] Varnacı Uzun F., Somuncu M., Kültürel Peyzajın Korunması ve Turizm İlişkisi Bağlamında Yerel Halkın Görüşleri: Ihlara Vadisi Örneği (Preservation of Cultural Landscape and Views of Local People In the Context of Tourism Relation: Example of Ihlara Valley). Ankara Üniversitesi *Çevrebilimleri Dergisi*, Ankara, 2011.
[5] Leighly John (Ed.), Land and Life: A Selection from the Writings of Carl Ortwin Sauer. University of California Press, Berkeley, 1965.
[6] Diyarbakır İl Çevre Durum Raporu (Diyarbakır Provincial Environment Status Report), Diyarbakır Valiliği Çevre Ve Şehircilik İl Müdürlüğü (Diyarbakır Governorship Provincial Directorate of Environment and Urbanisation), Diyarbakır, 2011.
[7] Çorapçıoğlu, K., Çakır, S., Aysel, N.R., Görgülü, H.C., Kolbay, D., Seçkin, N.P., Ünsal, E., Kırsal Alanda Yöresel Mimari Özelliklerin Belirlenmesi Projesi Kayseri (Project for Determination Local Architectural Properties in Rural Area, Kayseri) T.R. Ministry of Public Works and Settlement, TAU Directorate, Volume 1-6, MSGSÜ Circulating Capital Enterprise Directorate, İstanbul, 2008.
[8] Çorapçıoğlu, K., Diri C., Diri B.Ş., Kurugöl S., Özgünler M., Erem Ö., Gökuç Y.T., Görgülü, H.C., Seçkin, N.P., Oğuz Z., Kırsal Alanda Yöresel Doku Ve Mimari Özelliklere Uygun Yapılaşmanın Yaygınlaştırılması Projesi Balıkesir (Project for Popularization of Constructions Conforming to Local Texture and Architectural Properties in Rural Area), T.R. Ministry of Public Works and Settlement, TAU Directorate, MSGSÜ Circulating Capital Enterprise Directorate, İstanbul, 2010.
[9] Ergin Oruç Ş., Diyarbakır İli Kırsal Mimari Çeşitliliğinin İklimsel Konfor Ve Enerji Etkinliği Açısından Değerlendirilmesi (Assessment of Rural Architectural Diversity of Diyarbakır Province In Respect of Climatic Comfort and Energy Activity), PhD Thesis, Mimar Sinan Fine Arts University Institute of Science, İstanbul, 2015.
[10] Leader-Elliott, L., Cultural landscapes of a tourism destination: South Australia's Barossa Valley, Understanding Cultural Landscapes Symposium, 11-15 July. Flinders University, 2005.
[11] Phillips, A., Cultural Landscapes: IUCN‟s Changing Vision of Protected Areas, Cultural Landscapes: the Challenges of Conservation, UNESCO World Heritage Series Papers; Vol.:7, France, 2002.
[12] Kayserili, A., Tanfer A., N., Horasan İlçesi'ndeki Kır Meskenlerinin Kültürel Coğrafya Bakış Açısıyla İncelenmesi /Examination of Rural Spaces in Horasan District With Viewpoint of Cultural Geography, *Doğu Coğrafya Dergisi*, C. 15, S. 23, Erzurum, 2010.
[13] Darkot B., Diyarbakır, IA, III, İstanbul, 1945, 601; Rıfkı Arslan, Diyarbakır Kentinin Tarihi ve Bugünkü Konumu (History and Present Status of Diyarbakır Province), Diyarbakır Museum City, İstanbul, 1999, 81; Anonymous, Diyarbakır 2000 Kültür Kılavuzu (guide), Diyarbakır, 2010

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Lessons from Van Territory (step 1)
Adobe Construction Heritage, Technics


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ABSTRACT
The contemporary context of the conflict in which the Upper Mesopotamian region is involved, represents a field where it is required an adequate and ecological proposal of reconstruction. The aim of this study is to deal with the definition of ecological balance, attitude and awareness regarding different aspects of sustainable relationship between people and their territory. If the architectural and vernacular heritage is studied on the different aspects of sustainability, this will allow us to develop conscious responses to the changeable needs of our contemporary societies in terms of identity, culture, quality and environment. On this general framework, focusing on adobe building's heritage, the research was conduce in the region of Van in order to outline an operative and practical tool for the empowerment of self-construction practices. The paper explains the analytical method in which the research was carried out in the territory. Based on observation and interviews, the research needed a support to collect systematically all the information obtained. The form is inspired by AeDES ('Field Manual for post-earthquake damage and safety assessment and short term countermeasures') developed by the Italian Civil Protection. After a general identification of the building's characteristics and its orientation in the surrounding environment, the new form develops analytical instruments which allow the comprehension of each structural element (foundation, walls, floors, roof, anti-seismic presides) and it is also useful to catalogue the possible intervention of ordinary and extraordinary maintenance. Starting from the data gathered during the field research, the aim of the work is to outline a practical guideline book for self-construction of adobe structures. The manual provides technological and structural advices, based on engineering analysis developed focusing especially on the seismic resistance. The paper explains the first steps of this research, framed in the debate over sustainability concepts in vernacular architecture, carried out to reach awareness of regional vernacular heritage as a base on which to develop strategies to face contemporary regional issues.

Keywords: Adobe, self-construction, sustainability, vernacular architecture, Van

1. INTRODUCTION

Humans, as any other animal, must satisfy their natural needs in order to establish balanced relationships with the environment. The improvement of the technological capacities brought us to have the opportunity and the choice to leave this balanced condition.

That's why it becomes necessary to define ecological behaviour of awareness leading to an ecologically balanced development. Through ecological behaviours, humanity realizes and improves virtuous exchanging mechanisms with the surrounding territory.

Ecological balance is defined as an objective which can be obtained with an ecological behaviour, concerning different aspects in the sphere of relationships definable as *sustainable relationships* (Magnaghi, 2000), referring to the territory (environmental sustainability) and to the multiple kinds of relationships between people.

Political sustainability is intended as the capacity of a settled community to share the collective discussions, to be self-governed and to adopt horizontal decision processes.

Social sustainability represents a high level of integration in decisional processes, in general it is defined as social equity.

Economical sustainability is defined as the capacity of growing models based on the enrichment of territorial heritage to lead the concept of self-sustainability and to rebuilt the interrupted synergy between territory, environment and production.

Territory is considered here as natural, built and atrophic environment [1].

A necessary condition to activate the ecological behaviour is the consciousness and analysis of the territory through the observation of its characteristics. Regarding territory management practices, ecological behaviour expresses itself through the intervention, individual or shared.

Any intervention of protection or transformation practiced by human beings, should maintain an ecologically balanced condition.

These two characteristics of the action allow managing different needs:

- Transformation responds to expressed needs, proposing a suitable solution,
- Protection ensures knowledge transmission of cultural, historical and materialistic values.

Therefore, ecological behaviour is based on environment observation, the understanding of reciprocal needs and the exercise of conscious practices.

Intervention can be considered virtuous if it proposes answers to specific needs and if it preserves and enriches the memory of territory itself.

The meaning of "vernacular architecture" is "not- architect-designed structures in indigenous styles constructed from locally available materials following traditional building practices and patterns." It has developed through the numerous transformations in history and adapted to answer different and variant community needs. This diversity still enriches territory because it represents the processes that brought humanity to develop knowledge through worthy practices. Indeed, this cultural development is part of the memory of the territory, especially concerning its available materials and tangible heritage. Within this framework, we can move further on the discussion about strategies for future interventions that have been conceived from vernacular architecture lessons.

2. VERNACULAR ARCHITECTURE AND SUSTAINABILITY CHARACTERICTICS

In the last two decades, vernacular architecture has become an important field of research in order to recognize previously settled guidelines from which to develop strategies to deal with the contemporary issues such as building environments, expression of society, cultural and economical changes due to the process of population growth, urbanization, conflict, migration, globalization, unemployment and rapid technological changes.
Vernacular architecture reflects an interesting heritage where important instruments are acquired to use and to improve in the mutating territory.

Vernacular heritage often represents the material expression of ecological equilibrium between man, his needs and the territory. Therefore, studying it through observation can help analyse reality in its complexity as a union of multiple aspects (environmental, economical, social and political implications).

According to an interesting essay of M. Vellinga (2014) concerning the lack of partial researches in which vernacular architecture is studied on its environmental sustainability characteristics [2], it is necessary to report some methodological advices which lead to the comprehension of different aspects of the concept of sustainability.

The advices were defined in the context of the European VerSus Project (2014) in order to explain different dimensions of sustainability:

Environmental sustainability: this concept addresses the human capacity of intervention in order to decrease and even avoid negative impacts on the environment, which is very sensitive to changes. Human intervention is able to integrate nature and bioclimatic features, to control the production of pollution and waste, to preserve health and prevent from natural hazards' impacts.

Socio-cultural sustainability: the sense of belonging, identity, personal and community development. This scope tries to gather all social and cultural positive impacts observed on vernacular heritage. It concerns on the protection of cultural landscapes; the transmission of construction cultures; the capacity to stimulate creativity; the recognition of cultural values (tangible and intangible) and the reinforcement of social cohesion.

Socio-economical sustainability: the capacity of reducing the efforts invested during the construction process, the building performance, the maintenance of buildings and all the impacts that contribute on the improvement of living conditions. The concept of effort and work replaces the idea of cost, especially in contexts where no capital-intensive systems were implemented. Vernacular solutions encourage autonomy and local activity, optimize construction efforts and it extends the lifetime of the building and save resources [3].

Each dimension is defined in five operative categories and through them it is possible to determine the sustainable character of existing building heritage or evaluate the coherence of new projects to sustainability principles, in order to respond to the changeable needs of our contemporary societies in terms of identity, culture, quality and environment.

2.1. Sustainability of the Earthen Construction

The choice to build with earth today is in conflict with the contemporary strategy of the construction sector based on profit accumulation, connected to the mechanism of speculation, pollution production and territory devastation.

This choice supports the creation of community-based systems and ecological collective consciousness. It tends towards self-determination and self- reliance of communities, creating virtuous relationships with nearby communities defending land as a precious resource.

2.1.1. Environmental sustainability

Earth is a material that avoids the production and reproduction processes of the modern capitalistic system distancing itself from serial and massive production. It doesn't need factories or specific machinery for its production. During all its life cycle it does not have an impact on environment with any pollution, it's totally recyclable and after the demolition phase of earthen buildings, the process can start again. Earth is easily available all around the world if soil is not compromised by negative human effects (cementification, pollution, etc.).

2.1.2. Socio-economic sustainability

As a construction material, Earth is convenient in an economical way: it doesn't need expensive production process nor transportation. Thanks to its technical simplicity, it does not require specialized workers during the building phase, allowing self-construction processes. Everyone can supply to his own primary need of a shelter. It is suitable for maintenance and progressive transformation of housing, meeting the changing needs of the inhabitants.

2.1.3. Socio-cultural sustainability

Earthen architecture and masonry in general are part of cultural constructive heritage. These technologies incentivize human-scale settlements encouraging shared spaces within the community. It allows inhabitants to decide about formal and aesthetic character of the house that can be perceived as singular and beautiful, unique in a shared collective knowledge. The process of building can be a common ground in which relationships are strengthened and reciprocal support is guaranteed by the community.

3. CASE STUDY: UPPER MESOPOTAMIAN REGION, VAN

Considering this general framework, the research was carried out over the Upper Mesopotamian region.

Since the re-emerging of the armed conflict in the area, this territory is facing another period in which evacuation, displacement and destruction of settlements which effects the daily routine of inhabitants life.

The research is focused on the earthen building heritage of the Van region. A learning phase was necessary in order to deeply understand some characteristics of its vernacular built environment and develop a conscious proposal for resettlement or reconstruction strategies for the area.

3.1. Field Research Method

Field research is a cognitive practice of direct experience based on observation and interviews. Rural and urban settlements can be studied as the material expression of the relationship between people and their surrounding environment, direct experience of places provides essential information on the territorial framework and the socio-cultural context [5].

The observation of existing structures and their damages throughout their life cycle due to the abandonment or traumatic events which interest the area, such as the recurred earthquakes, is extremely important for technical information.

Interviews with inhabitants and builders represent a direct testimony about technological characteristics and functions of the buildings. Every meeting, tale or explication is part of the oral history of a place and contributes to the development of a more conscious point of view, necessary to advance hypothesis and to imagine coherent answers.

The research included walking through places and sharing time with their inhabitants.

Figure 1. Picture of the 1st house surveyed during the field research (southern corner)

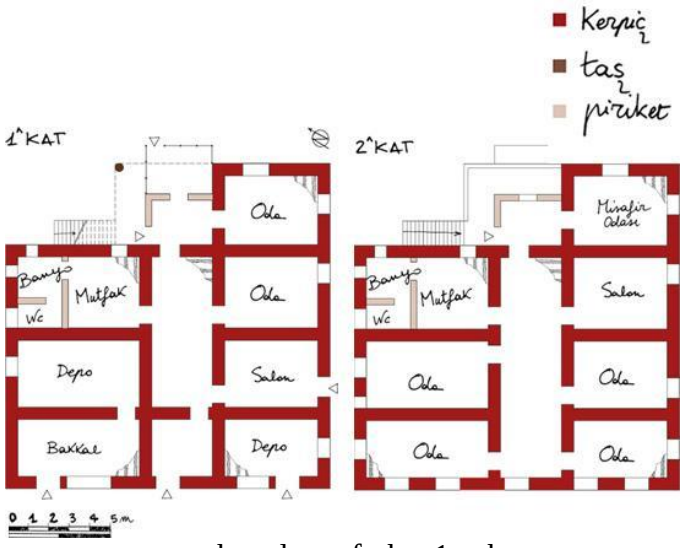


Figure 2. The figure represents the plan of the 1st house surveyed during the field research.

The objective of the field research was, primarily, to verify the effective persistence of multiple earthen buildings (Figures 1,2), traces that testify the widespread presence of technological knowledge that reflects the housing needs of the population.

The survey and the description of 50 houses carried out by the field research, is functional to the comprehension of proper building technologies aiming to their operative re-proposition and, at the same time, to the transmission of the regional constructive culture, tangible expression of the memory of this territory (Figures 3, 4) [6].

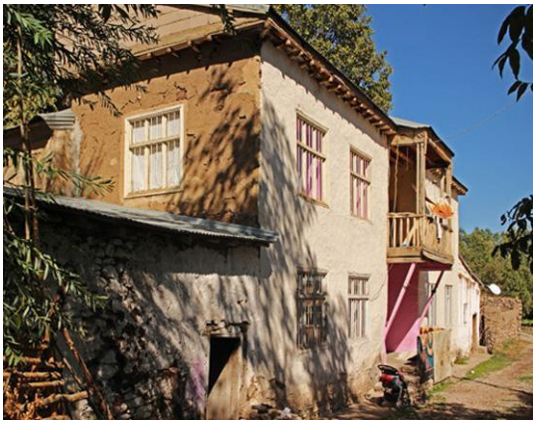


Figure 3. Picture of the 50th house surveyed during the field research (southern corner)

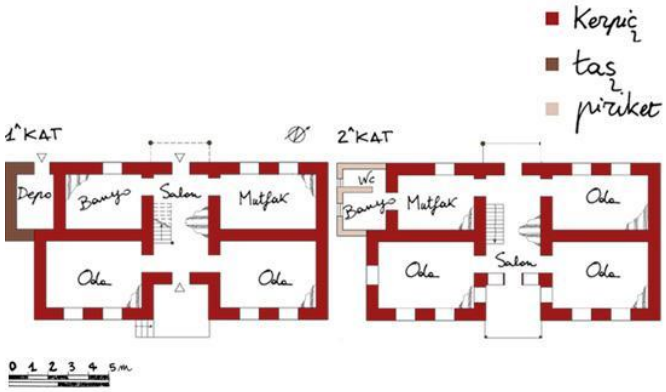


Figure 4. The figure represents the plan of the 50th house surveyed during the field research.

Because of the relatively scarce of literature regarding this built heritage, the research also aims to classify an adequate number of buildings in order to develop some analytical considerations on the typologies and on the regional housing culture in general.
The availability of the inhabitants and the hospitality, rarely neglected to two curious foreigners, allowed to describe the internal distribution of the spaces, to observe the uses of internal, in-between and external spaces, to compare aesthetical and functional recurring characteristics and to collect tales and knowledge.

3.2. Field Research Tools

Aiming to conduct the research with a particular focus on construction technologies and housing typologies, a support that allows to organize systematically a large number of information related to every analysed building was necessary.

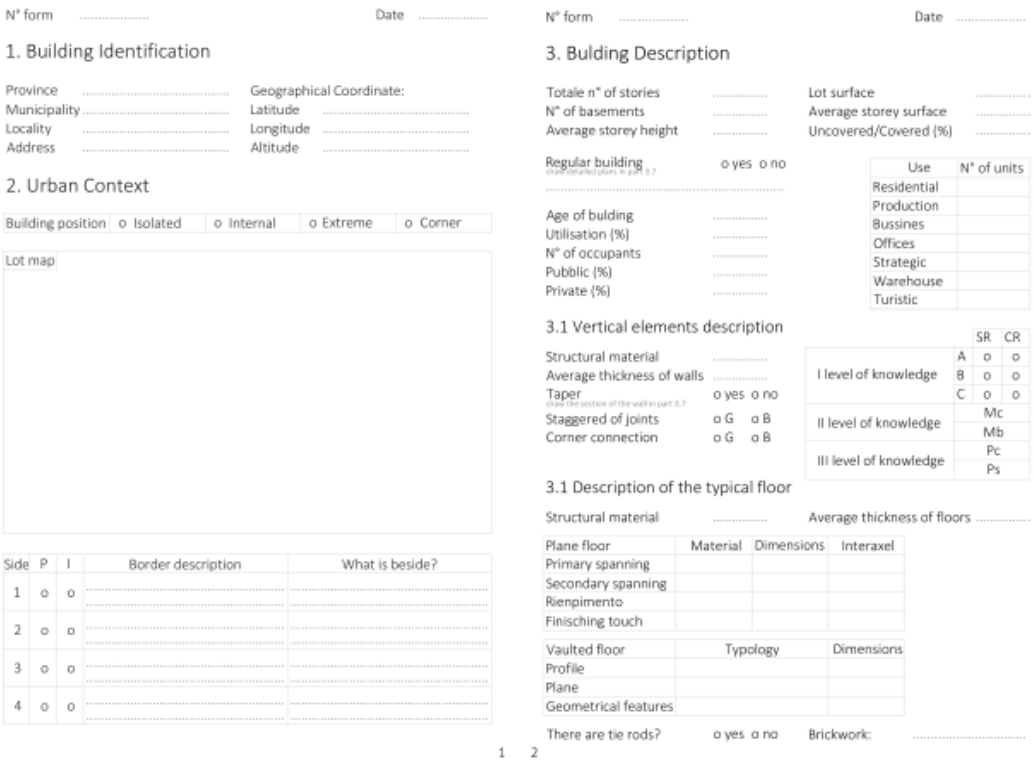
Considering this intention, a data form was prepared, consisting of 6 pages, in order to collect the data regarding each house and different aspects that were believed to be important. The data includes: the permeability of the borders, the diameter of floors' beams, the layout of the rooms, the maintenance intervention carried on external finishing, the efficiency of anti-seismic presides and the average thickness of walls.

The form was based on the model of "AeDES one", realized by the Italian Civil Protection in order to carry the first level emergency assessment of damages due to earthquakes events [7].

After a general identification of the building characteristics and its position in the surrounding environment, the new form was developed for analytical instruments in order to allow the comprehension of each structural element (foundation, walls, floors, roof and anti-seismic presides) and to catalogue the possible intervention of ordinary and extraordinary maintenance (Figure 5).

The form is applicable for the survey of any kind of masonry building (cooked bricks, adobe, concrete blocks... dwellings, schools, commercial buildings, monuments...) and has some additional spaces where it is possible to take notes concerning any unpredictable information, to draw particular details or schematic sketches of unusual technologies.

To complete the form, it is recommended to interview the inhabitants, in order to gather information which is not directly obtainable through observation such as the construction year, internal stratification of the constructive elements, maintenance and transformation interventions, the internal distribution of rooms and the function of different spaces. In the following chapter, the different parts of the schedule is explained.


N° form ..... Date .....

1. Building Identification

Province .....
Municipality .....
Locality .....
Address .....

Geographical Coordinate:
Latitude .....
Longitude .....
Altitude .....

2. Urban Context

Building position	o Isolated	o Internal	o Extreme	o Corner

Lot map

Side	P	I	Border description	What is beside?
1	o	o		
2	o	o		
3	o	o		
4	o	o		

1

N° form ..... Date .....

3. Bulding Description

Totale n° of stories .....
N° of basements .....
Average storey height .....

Lot surface .....
Average storey surface .....
Uncovered/Covered (%) .....

Regular building o yes o no

Use	N° of units
Residential	
Production	
Bussines	
Offices	
Strategic	
Warehouse	
Turistic	

Age of bulding .....
Utilisation (%) .....
N° of occupants .....
Pubblic (%) .....
Private (%) .....

3.1 Vertical elements description

Structural material .....
Average thickness of walls .....
Taper o yes o no
Staggered of joints o G o B
Corner connection o G o B

		SR	CR
I level of knowledge	A	o	o
	B	o	o
	C	o	o
II level of knowledge	Mc		
	Mb		
III level of knowledge	Pc		
	Ps		

3.1 Description of the typical floor

Structural material .....
Average thickness of floors .....

Plane floor	Material	Dimensions	Interaxel
Primary spanning			
Secondary spanning			
Rienpimento			
Finisching touch			

Vaulted floor	Typology	Dimensions
Profile		
Plane		
Geometrical features		

There are tie rods? o yes o no Brickwork: .....

2

Figure 5. First and second pages of the form

3.2.1. Building Identification

In this section (Figure 6) the geographical and administrative information are defined in order to identify the environmental context in which the building is placed.

Figure 6. Building identification chapter

3.2.2. Urban context

In this table (Figure 7) the relationship between the building and its near surrounding is investigated. Through a simple sketch of the lot, it is possible to describe its border as permeable (P) or impermeable (I). There is a section for the general description of the border element and where to note whether this kind of space border allows or does not allow the building to communicate with the street, square, garden or other buildings.

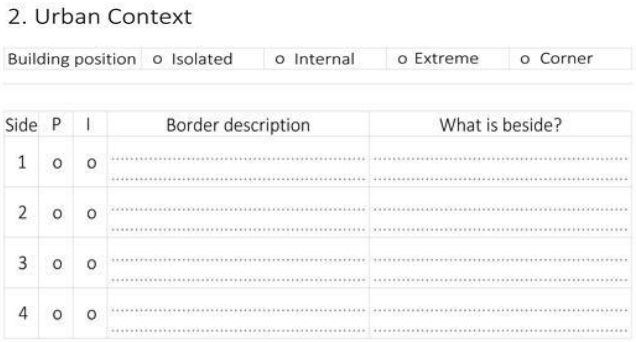


Figure 7. Urban context description

3.2.3. Building description

A series of data of the building are requested in order to provide a general description of the function, aspect and utilization of the building (Figure 8).

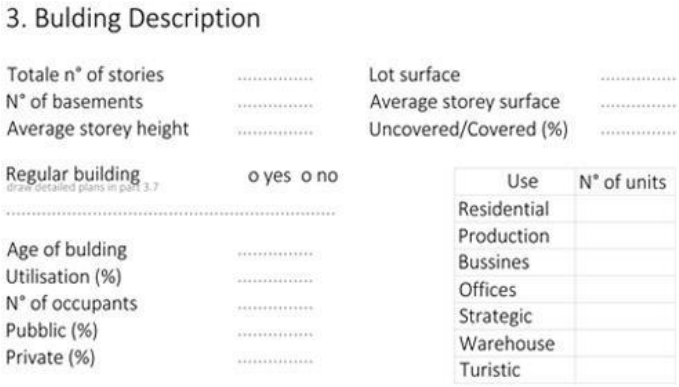


Figure 8. General building description

3.2.4. Vertical elements

This section deals specifically with masonry and the information about the material, dimension and disposition of blocks (Figure 9).

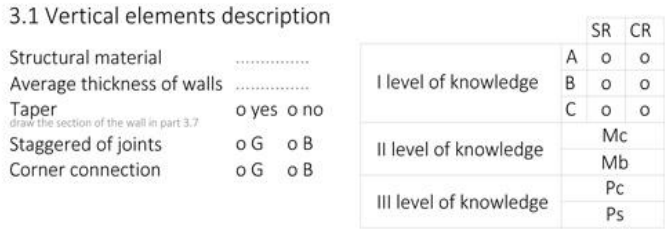


Figure 9. Definition of vertical elements

Adopting the classification proposed by AeDES's form, masonry is analysed through 3 levels of knowledge.

The I. level of knowledge deals with the external surface allowing the classification of three different typologies: A. irregular masonry (shapeless elements), B. hewn masonry (only roughly worked elements), C. regular masonry (regular shaped elements, perfectly rectangular)

In any case, the layout may be (code CR) or not (code SR) strengthened with bricks or regular layer at an almost constant spacing (with the same magnitude of the thickness).

The II. level of knowledge considers the mortar quality evaluated in situ through a scratch test, in order to distinguish bad quality mortars, very friable and easy to crumble (Mc), from good quality mortars which are more resistant (Mb).

The III. level of knowledge evaluates, when it is possible, the wall section, distinguishing the two cases of masonry with well-connected sides (Pc) and disconnected or not well connected sides (Ps).

3.2.5. Description of a typical floor

Concerning the description of floors, after the definition of the structural material and the average thickness of the slab, it is possible to define two different constructive typologies: flat floor and vaulted floor (Figure 10).

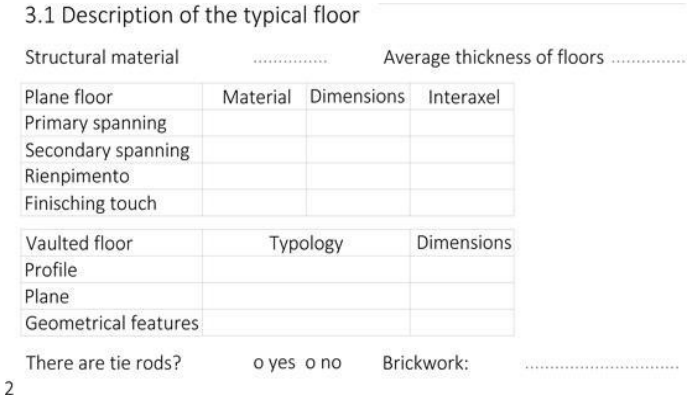


Figure 10. Descriptions of floors

The flat typology (not thrusting) is analysed through a subdivision of its spanning, describing the material, dimension and interaxel. It is also useful to describe the filling up material and the finishing touch in order to evaluate its heaviness and rigidity.

About the vaulted typologies, they are studied concerning the geometrical disposition (plan and section if possible), the presence or not of tie rods that provide a non-thrusting behaviour to the vaulted floor.

3.2.6. Openings

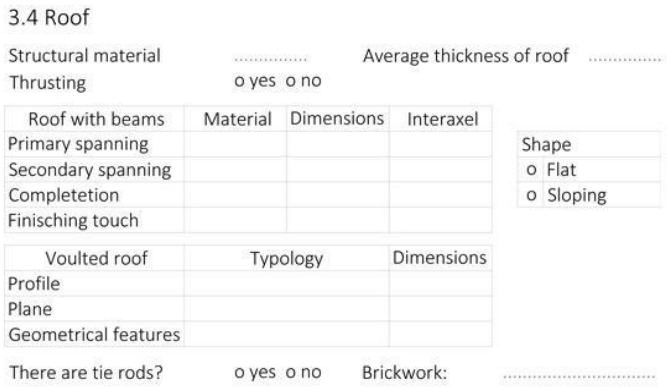
Through a descriptive scheme of the fronts, it is possible to evaluate regularity or non-regularity of openings and their surfaces regarding the surface of the walls. It is possible to define the distance between openings on the same level and the distance from the building corners (width of masonry piers) as well as the distance from the ground level, from another level of openings or from the roof (highness of masonry spandrels).

This data becomes relevant when defining the rigidity of the masonry element and the distribution of efforts in case of earthquake.

3.2.7. Roof

The roof is evaluated at the same way of the typical floor (Figure 11). The form presents a specific request in order to define the thrusting character of the roof, an extremely important element concerning the structural behaviour of the entire building.

A roof can be defined as not thrusting if is flat or if it presents efficient elements such as structural hoops, tie rods, top beam and truss.



3.4 Roof

Structural material ..... Average thickness of roof .....

Thrusting o yes o no

Roof with beams	Material	Dimensions	Interaxel
Primary spanning			
Secondary spanning			
Completetion			
Finisching touch			

Shape
o Flat
o Sloping

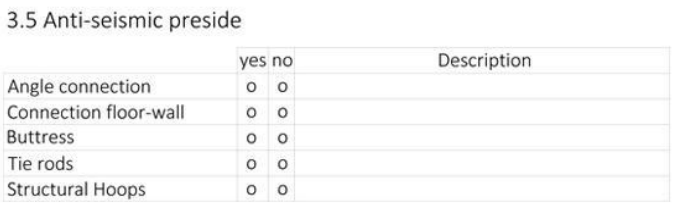
Voulted roof	Typology	Dimensions
Profile		
Plane		
Geometrical features		

There are tie rods? o yes o no Brickwork: .....

Figure 11. Roof description

3.2.8. Anti-seismic presides

This section describes the anti-seismic presides (Figure 12) related to each structural element (floors, masonry, roof) in order to define the behaviour of the whole building during a seismic action.



3.5 Anti-seismic preside

	yes	no	Description
Angle connection	o	o	
Connection floor-wall	o	o	
Buttress	o	o	
Tie rods	o	o	
Structural Hoops	o	o	

Figure 12. Anti-seismic presides evaluation

Normally these elements are useful to provide ‘box behaviour’ of the masonry, the distribution of the horizontal forces on the resistant vertical elements and to avoid out-of-

plane mechanism. The form provides a list of anti-seismic devices in order to simplify their recognition:

- Connection angle between walls,
- Floor-wall connection detail between horizontal and vertical elements,
- Buttresses: massive elements adjacent to walls,
- Tie rods: thin metallic or wooden elements,
- Structural hoops concerns to the whole building or be related to a singular element.

In the form, it's possible to provide a short description to each point.

3.2.9. Foundations

Concerning foundation techniques it is necessary to define the site morphology: crest (>30%); steep slope (15%-30%); mild slope (5%-15%); flat (0%-5%).

After that, it is required to investigate the presence of continuous foundations, the structural material and the presence of drainage systems (Figure 13).

3.6 Description of foundations

Site morfology:	o Crest	o Steep slope	o Mild slope	o Plane

Continue foundations	o yes o no
Material	.....
Foundations drainage	o yes o no
Draning pipe	o yes o no

Figure 13. Foundation description

3.2.10. Plan and elevation regularity

This section focuses on the form of the building, and provides space to draw the buildings' typical floor and, if not regular, to draw the other floors (and, if there are different floors, to draw the others). It is also important to highlight misalignments in plan or elevation.

3.2.11. Conservation of state of structural elements

In this section a qualitative evaluation is suggested about the maintenance state of the structural elements: E (excellent), G (good), B (bad) (Figure 14).

Observing the state of these elements and, if is possible, integrating the information through some specific questions to the inhabitants, it is possible to gain a general understanding about structural qualities of the building.

4.1 State of structural elements conservation

Foundation			Vertical elements			Floor			Roof		
E	G	B	E	G	B	E	G	B	E	G	B
o	o	o	o	o	o	o	o	o	o	o	o

Figure 14. Quality of structural elements

3.2.12. Ordinary maintenance intervention

Interventions on finishing touches, external surfaces or not-structural elements, are catalogued as ordinary ones. In the form, a short description of the process and the motivation is requested, , when the ordinary maintenance was done and by whom. (Figure 15)

4.2 Ordinary maintenance intervention

	Description/motivation	Times	Author
Internal finishing	.....		
External finishing	.....		
No-structural elements	.....		

Figure 15. First and second pages of the form

3.2.13. Extraordinary maintenance intervention

Extraordinary maintenance interventions involve structural elements and is catalogued referring to the involved element. The form requires a short description of process and motivation, when the maintenance was done and by whom.

3.2.14. Transforming intervention

These interventions can have the character of increase, completion or raised part. Here it is required to provide a qualitative description of the connection with the pre-existing structure, the indication of motivation, when the intervention occurred and by whom (Figure 16).

4.4 Transformation intervention

	Qualitative description of connections	Times	Author
o Increase			
o Completion			
o Raising			

Intervent motivation .....

.....

Figure 16. Transformation of spaces

3.3. Self Construction Guide-Lines Book

Starting from the material collected during the field research, the aim of the work is to outline a practical guideline book for the self-construction of adobe structures. This objective comes out from the will to empower, with an operative tool, people and cooperatives in their direct standing for territorial settlement policies. The manual provides technological and structural advices, based on engineering analyses developed especially concerning the seismic resistance. The analyses are carried out through the computer software3MURI, specifically developed to foresee the structural behaviour of masonry, stressed by seismic action. In order to provide security and awareness to the personal choices, the analysis leads to suggest ranges of geometrical proportions between the structural elements. In the manual there are advices about material choices/production (mud-bricks), building process indication, structural element connections, anti-seismic presides gathered also from oral knowledge transmission and specialized literature.

The guideline book's aim isn't to define a unique model of dwelling which represents the best solution regarding structural or climatic efficiency. Rather, the freedom for the inhabitants to choose forms, distribution and aesthetical characters of the house, is an important value to be preserved and empowered.

4. CONCLUSION

Vernacular architecture is considered as the living heritage developed by the stratification of transformation adopted by humans in relationship with the surrounding environment in order to answer the changeable social needs. The main objective of the research carried out in the region of Van it has been to investigate and preserve a companion of constructive knowledge that can still teach many lessons about sustainable relationship within the society. As it has already been stressed throughout this paper, earthen construction heritage and its building process stand as a concrete and ecologically coherent alternative to the address of contemporary dominant and questionable way to build. The paper then, introduced within this framework, reports and proposes a field-research process based on observation and on the interviews with inhabitants and builders, in order to investigate and apprehend the important advices for the earthen construction practice. This research on technologies and functions of the earthen building environment is a starting point, a practical experience that aims to achieve consciousness, although partial, about social, cultural and political issues of the region.

REFERENCES

[1] Megnaghi, A., Bell, D., *Il progetto locale,* Bollati Boringhieri,2. ed.,Torino, 2010.

[2] Vellinga, M. &, 'Vernacular architecture and sustainability: Two or three lesson..., *Vernacular Architecture: Towards a Sustainable Future,* eds Mileto, Vegas, García Soriano & Cristini, London, 2015.

[3] ESG / Escola Superior Gallaecia, Correia, M., A., *Versus, lessons from vernacular heritage to sustainable architecture,* ENSAG-CRAterre École Nationale Supérieure d'Architecture de Grenoble, France,2014.

[4] Van Bruinessen, M., Kurds and the City, in Hamit Bozarslan and Clémence Scalbert-Yücel (eds), Joyce Blau, l'éternelle chez les Kurdes, Paris: Institut Kurde de Paris, 2013

[5] Gabriel, A., *En Turquie,* 1953, edit by Paul Hartman

[6]Hooshmand, A. *The concept of Kurdish city*, The International Journal of Kurdish Studies, Kurdish Library vol. 20, 2006; Hooshmand, A., *The concept of privacy and space in Kurdish cities*, in Urban Theory Beyond the West: A World of Cities, Routledge, 2012

[7] Protezione Civile Italiana,Baggio, C., Bernardini, A., Colozza, R., Corazza, L., Della Bella, M., Di Pasquale, G., Dolce,M., Goretti, A., Martinelli, A,. Orsini, G., Papa, F., Zuccaro, G.,

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Water Deterioration in Adobe Structures and Measures to Take


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ABSTRACT
Having met habitation needs since antiquity, adobe structures are still used despite the technological developments of our age. Concurrently, it is known that these structures are still of decent quality in regard to controlling heat and moisture. One of the most important issues concerning /about adobe structures that are used for so many years is the fact they are weak when it comes to water resistance.

Just as adobe structures can be erected by first having the mud prepared in the construction dry out in the molds, they can also be constructed by pouring and compressing into the molds to form the structure walls. Amongst important methods for protecting these structures against water are; to form a drainage and rock foundation for water coming from ground-level and to raise the structure from ground level. Measures to take for protecting the structure's outer wall surfaces from water would be to make use of overhanging eaves as well as utilizing a more durable type of plaster. The use of water-resistance coating materials and plumbing insulation where deemed necessary ensures wet spaces inside the structure are protected against water.

Constructing these structures by taking preventive measures and detailing them in ways that will protect them against water will extend the life of these structures and increase the comfort while they are inhabited.

Keywords: Adobe structure, water deterioration, water preventive measures

1. INTRODUCTION

Adobe is a rather important construction material that has met people's habitation needs for thousands of years. It is still used in many regions today. Because it's one of the low cost and least problematic construction materials that can be produced, there are no waste materials to recycle and it doesn't damage the environment. These structures offer high thermal comfort as their thick walls easily preserve the inner structure temperature in hot and cold environments. The humidity balance is easier facilitated.

The outer shell materials of the buildings we live in are very important in terms of energy efficiency and bio-climatic comfort. Regarding the research done in CIU, it has been stated that the heat conduction in the 45 cm thick soil wall stabilized with plaster ensures the TS 825 standards, so that this material is suitable for bioclimatic comfort conditions as an outer coating [1]. Considering the increased material diversity and the economic conditions brought about by this diversity, mud brick structures provide a very cost effective and desirable user comfort.

While adobe provides structures with a number of advantages, it also has its weaknesses, particularly its vulnerability against water and its non-resistance towards the pressure [2]. Despite these disadvantages, Henri Van Damme's study showed that the use of soil structures under completely dry conditions caused a decrease in resistance to depression during an earthquake.

Studies regarding the historical process in dealing with adobe's moisture problem as well as taking precautions and melioration continue today. Deformation that occurs in building surfaces of adobe structures can be observed in a manner of physical or chemical erosion. With physical effects, wind intensity increases the proportion of the wall surface affected by rain or snow, but what is really most crucial is the impact of liquid water [4]. The goal of this study is to address water-related issues that occur with adobe structures and take up solutions that may be recommended.

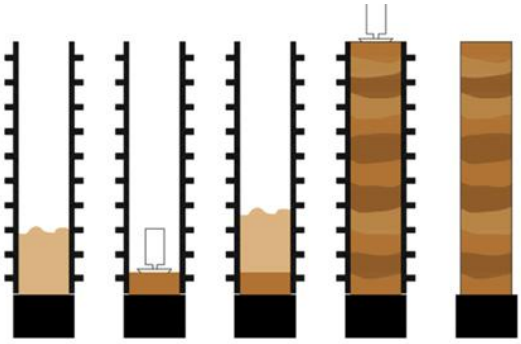
2. TYPES OF ADOBE MATERIAL USED IN CONSTRUCTION

It's quite apparent that building construction technology has taken on some incredible dimensions these days. Despite this, it's estimated that around a third or even as much as half of the world's population live in earthen structures in this day and time. Adobe is a building material made by mixing water and soil without applying any heat. Adobe structures can be produced by either pouring mud into molds of certain dimensions and letting it dry (Figure 1) and pouring into molds that are used in the masonry or else poured directly into mold in order to form a wall (Figure 2).

The amount of clay in the soil affects the quality of the adobe. In order to determine and the sufficient amount of clay, the soil is mixed with water and then made into a palm size sphere. If the material takes shape without sticking too much and is not dispersed when dropped, it is considered to be of the desired quality. Otherwise, the properties of the additives and soil are adjusted to a convenient state [5].

Some additives can be mixed in during the production process in order to increase resistance. These additives and production techniques can vary according to the region. However, generally speaking, clay, sand, lime, gravel and occasionally some cement at low ratios can be used in order to increase the earthen material's durability and cohesiveness [6].

Figure 1. Drying out adobe material in molds [7]



(a) Construction of an adobe building using the mold casting method [8]

(b) An example of an adobe building in which mud is poured into a mold in Vietnam [9]

Figure 2. Wall construction using the method of casting adobe into a wall mold

3. DETAILS IN PROTECTING ADOBE STRUCTURES AGAINST WATER

Adobe structures can be quite long-lasting when they are protected from the elements in a proper manner. Today, water-related problems are the most general cause of deterioration for these structures [10].

When in fact, remnants of the ancient city of Çatalhöyük indicate that the adobe construction technique was more advanced than it is today and that a great deal of its walls remain intact (Figure 3).

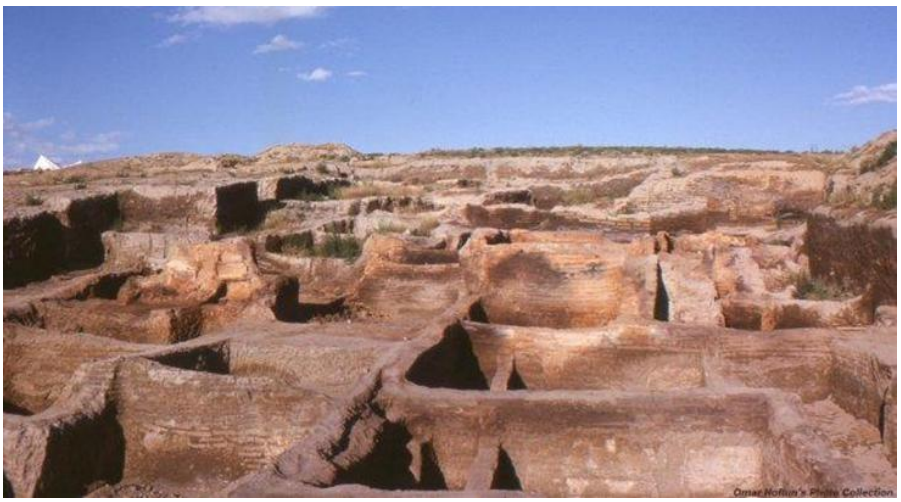


Figure 3. Çatalhöyük adobe wall remnants (7500 BCE) [11]

Today's architectural education has abandoned its historical masters. The preservation of historical heritage has not been taught; hence causing a lack of transmission of the necessary architectural knowledge [12].

As far as today's adobe structures are concerned, they can disintegrate easier with the water's influence whenever construction material is not baked or strong cohesives are not used (Figure 4).

Figure 4. A loss of mass seen with the breakdown of an adobe block under the influence of water.

As a consequence, some details have been used throughout history as well as today in terms of protecting sections of structures that make contact with water. Accordingly, these preservations studies are in progress at present.

The manner of water's influence on a structure depends on the foundation, the outer wall surface as well as the roof. In addition to these, plumbing water in spaces inside the structure such as the kitchen or bathroom can be another factor. Preventive measures that can be taken against all these elements have been touched upon in this study.

3.1. Protective Measures Taken at the Foundation and Socle Level Against Groundwater

Groundwater is considered one of the leading causes of moisture problems in structures. Having risen upwards from the foundation, ground water damages it and its walls through making constant contact. The foundations also need to be protected against water in order to preserve the walls of the structure. Accordingly, water should be moved away from the structure by applying the traditional drainage method (Figure 5) [13]. The drainage system conveys the water away from the structure but installing separate water insulation for the foundation and structure floor will ensure a healthier and longer lasting protection.

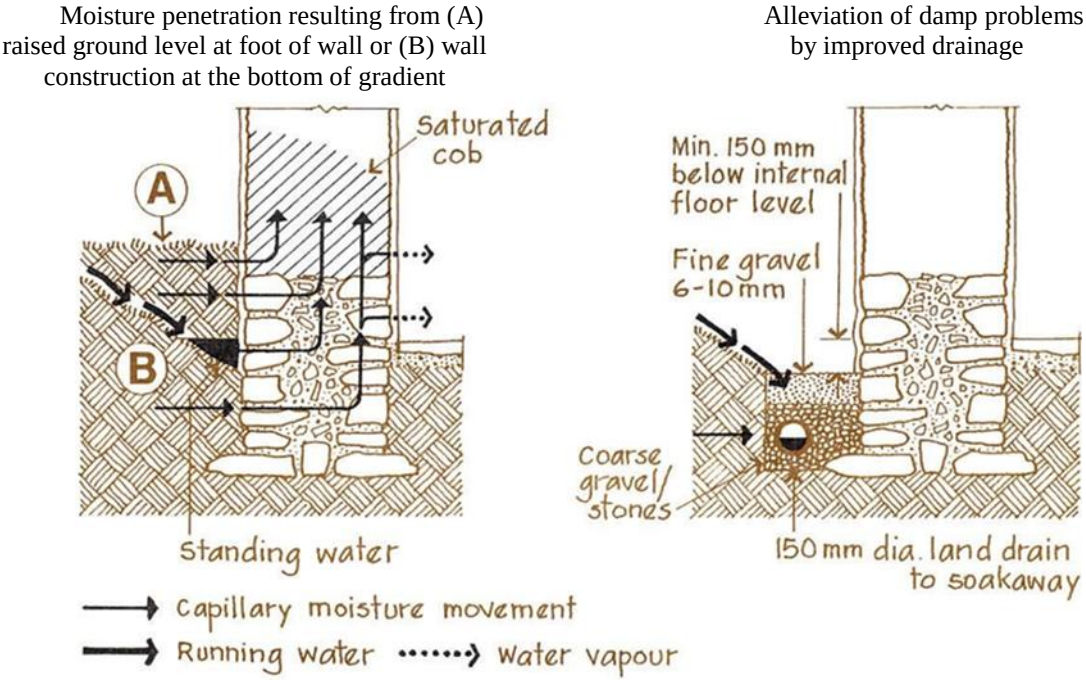


Figure 5. Drainage installation for the preservation of structure foundations [13]

Ground water could cause collapse in structure walls unless water is conveyed away from the structure. A diagram showing how water affects a structure and preventive measures that should be taken are provided in Figure 6.

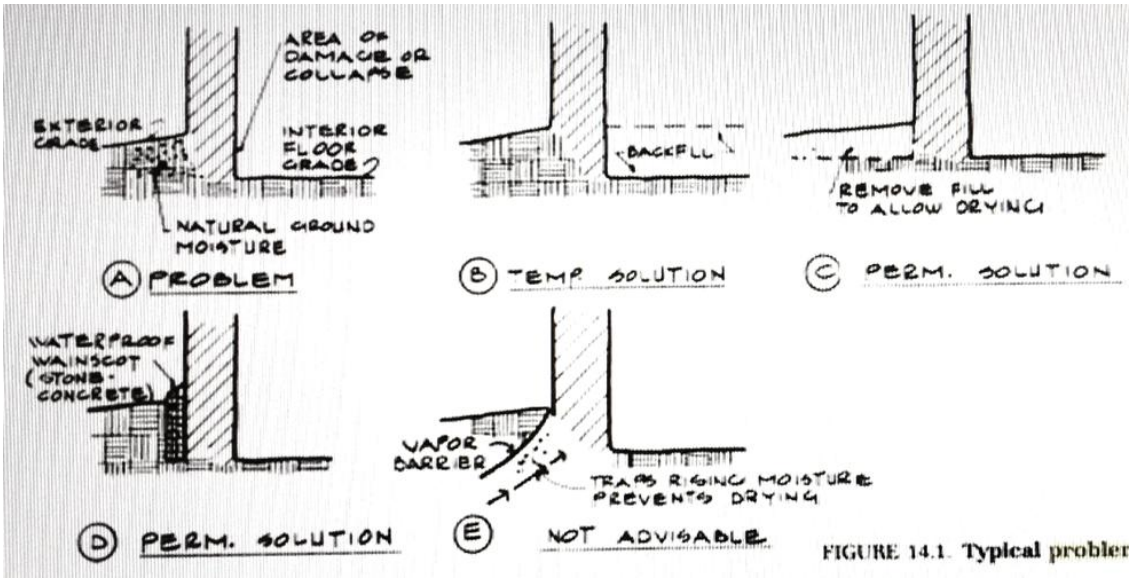


Figure 6. Problems seen in walls beneath the ground [14]

In order to protect walls from water intrusion in adobe structures, one of the traditional construction techniques in our country is to erect the adobe structure over a stone foundation, as it is considered to be one of the healthiest methods available. The adobe homes in Yalvaç, Isparta are great examples of this construction method (Figures 7,8). Of course, putting up stone walls today comes at a high cost and necessitates more labour. For this reason, applying a reinforced concrete foundation on adobe structures will protect the structure wall against humidity.

Figure 7. An adobe house with a rock foundation on Engin Sokak in the Kaş District of Yalvaç, Isparta [15]

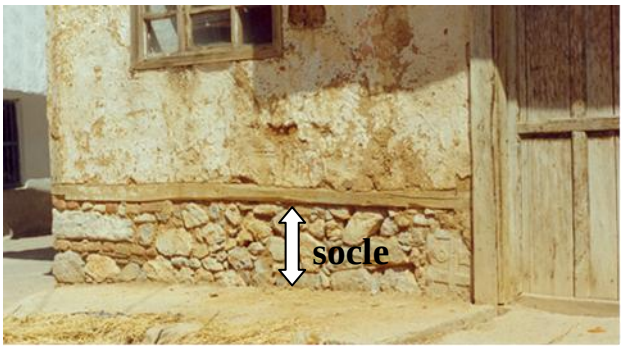


Figure 8. An adobe wall application over a stone wall in the Yalvaç Kaş district

Raising the structure over the ground is also an important and necessary solution. Raising the adobe structures from the floor by around 30-50 cm with water-resistant socle (such as rock or concrete) will protect the wall against water intrusion (Figure 9).

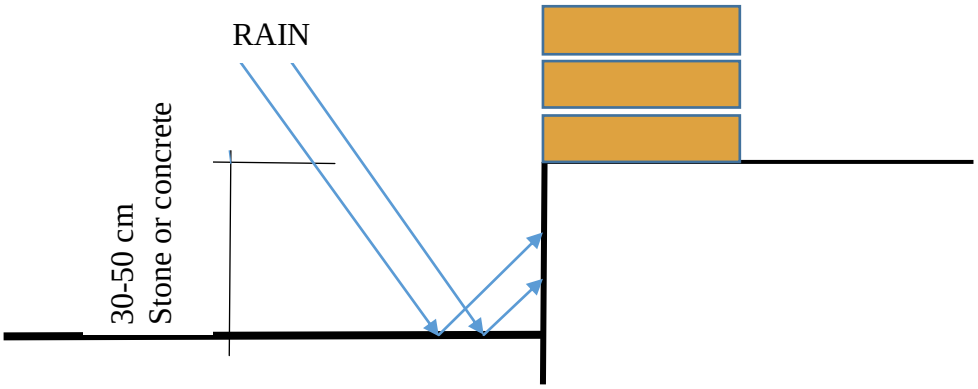


Figure 9. An application of adobe walls raised from the floor

3.2. Preventive Measures to Avoid the Risk of Heavy Rain and Snow Water on Outer Walls

Walls of adobe structures are easily affected by outside weather conditions. In particular, the striking force of raindrops and the increasing wind load can cause structure's outer façade to wear.

A Study has been carried out to increase the resistance and binding of adobe to water and to strengthen the material. In this process, a stronger and waterproof material was obtained by mixing gypsum and lime during the research conducted in Istanbul Technical University where 100 units of soil, 20 units of water (according to soil moisture), 2 units of lime and 10 units of gypsum mixture is used for the alker formation [16].

Despite the reinforced wall material, plaster application is very common for façade protection.

Plaster is applied to the surface in order to protect the structure and the elements from rain intrusion as well as to obtain a straight surface. Plaster is a mortar generally comprising of adobe material that is applied by spreading it in a manner that forms a layer on the surface.

Plaster to the adobe structures surface can initially be applied as a coarse layer continuing with a thin second layer. This plaster sometimes requires repair and maintenance. Application of lime plaster as a third layer in adobe construction increases water resistance [5].

However, with the widespread use of cement in the 20th century, a plaster with a cement additive is also used for these structures. While cement is harder and more impervious than other construction materials in these types of applications, once water seeps into the wall structure via capillarities, cement-based plaster traps water inside the structure and causes much greater crackups later on (Figure 10) [17].

Figure 10. Damage in a structure with cement-based plaster [17]

Adobe with increased water resilience is called ‘alker’ and it was first produced as a result of studies conducted in Istanbul Technical University, Turkey. This material was obtained by adding lime and Plaster of Paris to the soil. The application of alker to outer facades rendered the structure’s outer wall more resilient against water effects [18].

One of the preventive measures taken to protect outer wall surfaces is to increase the overhang of roof eaves (Figure 11). Thus, a wider surface swath can be protected. The width of the eaves used in traditional construction methods in Turkey is 50 cm. However, the protection of outer structure surfaces in regions with more precipitation will be easier when this is extended up to 70-80 cm or more.

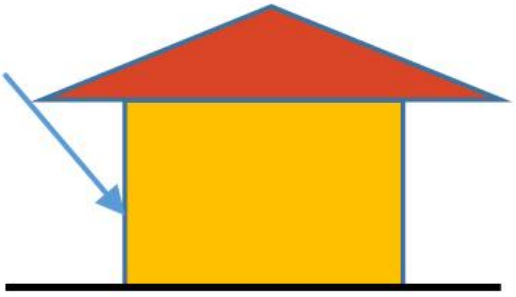


Figure 11. A diagram showing outer facade protection with the application of a wide set of eaves

3.3. Roof Covering on Adobe Structures

Roof coverings on adobe structures vary according to the climate and materials that are available in the vicinity. A flat roof covering is generally used in arid and low-precipitation regions. For a flat roof, a ceiling is formed from materials such as bars, reeds or grass over rafters laid 40 cm apart given that mud is spread and compressed over this surface. Slanted roofs fashioned from reeds and covered with roof tiles can be utilized in rainy regions. A wooden framework is generally used in the construction of these roofs and a top covering material is spread over them. Examples of roof coverings are provided in Figures 12-18.

Figure 12. A flat roof made from mud [19]

Figure 13. Example of tile covered roof application/Gümüşhane Ahmet Kaya house [20]

Figure 14. Reed covered roof Cockington Country, Torquay, England [2.

Figure 15. Structure and coating

Figure 16. View of bearing rafters in a roof covering made using traditional techniques

Figure 17. View of a reed roof structure [22]

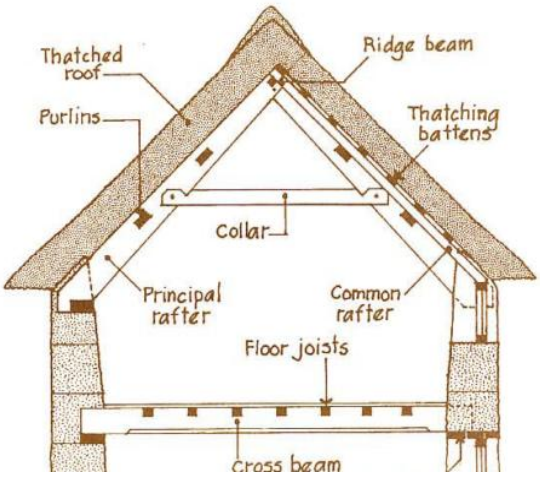


Figure 18. The cob buildings of Devon [13]

3.4. Protective Measures to Avoid the Risk of Water Intrusion in Indoor Spaces

Considering that water can affect a structure from the outside, it is unavoidable to face problems arising from the plumbing and indoor humidity. Indoor water and moisture sources are mostly found in kitchen and bathroom units. The most important point to note about the plumbing for both units is that the plumbing must be installed in such a way as not to cause water leakage and that floor and walls must be coated after carrying out the necessary inspections.

The kitchen counter is the wet section of the kitchen. Covering the counter and behind it with a coating similar to waterproof ceramic will prevent the problem. Ventilation and a working range hood will be enough to prevent moisture and steam build up that forms in the kitchen environment. That is because adobe walls also display a certain characteristic as a humidity stabilizer.

As for the bathroom unit, the upper surface coatings need to be applied by using water insulation materials for the floor and walls. The water insulation layer to be applied over the floor must have a repellent over it, it then need to be covered by a ceramic waterproof coating. The same method is also valid for the walls. If deemed necessary, a wall covering can be made with cement-based panels with a thickness of around 8-10 mm. As this material will form a waterproof surface, you can either create a decorative coating or it can be used without any coating material.

4. CONCLUSION

The water intrusion, which is one of the most important problems of adobe structures, and its negative impacts, and possible solutions to this issue were discussed in this study. With the development and widespread use of building materials as industrial products, adobe is no longer seen as a building material thus manufacturers did not have the need to equip themselves with the necessary knowledge and skills concerning this issue. As a result, the lack of knowledge and experience in the quality of soil construction has led to the occasional damage and even destruction of many mudbrick structures [23].

As is seen, adobe structures, which have been used for many years and are still used as dwellings by a large group of people worldwide, can be protected from damaging effects of water by implementing simple, easy solutions, regardless how much they may seem vulnerable to water.

These solutions show differences such as measures to be taken during construction, detailing solutions and additive materials. Therefore, it is hugely important to take the necessary precautions while erecting a building in terms of providing preventive measures, according to the climate and geographical features where the adobe structure is located. The most important reason for preferring adobe structures is because they are eco-friendly, natural and more affordable. Despite the fact that they do not constitute a suitable method for today's high-rise structures, various efforts can be carried out to make them more popular across the globe and to encourage construction industry to build low-rise adobe structures with the use of more modern methods and materials. Having been used for thousands of years, it seems like adobe structures will continue to be used in the future as well.

REFERENCES

[1] Işık B., Hacaloğlu A., Energy efficient Building in Cyprus: Proposing earthen envelop and steel interiors, Learning from earthen architecture in climate change, kerpic'08 international conference, CIU-Lefkosa-Northern Cyprus, pp. 307, 2008.

[2] Binici, H. Durgun, M. Y., Yardım, Y., Kerpiç Yapılar Depreme Dayanıksız Mıdır? Avantajları ve Dezavantajları Nelerdir? KSÜ Mühendislik Bilimleri Dergisi, 13 (2), 2010

[3] Damme H. V., Water and the cohesion of earthen materials. Towards an optimum water content for earthquake resistance, Living in Earthen Cities

[4] Aubrey Heathcote K., An Investigation Into the Erodibility of Earth Wall Units, Doctor of Philosophy, University of Technology Sydney, pp. 60, 2002.

[5] Duran S., Çakırözü Civelek F., Aktuğlu Y. K., Kerpiç Binalarda Çatı ve Cephe Malzemeleri; Akşehir, Erdoğdu ve Menderes Örnekleri', 8. Ulusal Çatı ve Cephe Sempozyumu, Konu Başlık No: 8. Tarihi yapılarda Çatı ve Cepheler, MSGSÜ, İstanbul, 2016.

[6] Earth Building Asssociation of Australia, Earth Building, http://www.ebaa.asn.au/about/earth-building, last accessed on 20/06/2017.

[7] Çavuş, M., Dayı, M., Ulusu, H., Yılmaz Aruntaş H, Sürdürülebilir Bir Yapı Malzemesi Olarak Kerpiç/ Adobe as a Sustainable Building Material, 2nd International Sustainable Buildings Symposium, 184-192, http://www.isbs2015.gazi.edu.tr/belgeler/bildiriler/184-192.pdf, last accessed on 20/06/2017.

[8] ARCT Company, https://artcarchitects.wordpress.com/environment/tecnologias-y-estrategias-de-diseno, last accessed on 20/06/2017.

[9] https://en.wikipedia.org/wiki/Rammed_earth#/media/File:HouseBuildingInNorthernVietnam.jpg, last accessed on 20/06/2017.

[10] Department of Interior, The Preservation of Historic Architecture: The U.S. Government's Official Guidelines for Preserving Historic Homes, 2004. http://cstones.org/pdfs/uploads/adobe_conservation_handbook_part_2.pdf, last accessed on 20/06/2017.

[11] Dünyanın ilk yerleşim yeri, 28 Mart 2014, http://www.yerelgundem.com/haberler/635344/dunyanin_ilk_yerlesim_yeri_2.html, last accessed on 20/06/2017.
[12] Işık B., Branding earthen architecture in northern Cyprus as cultural capital, Learning from earthen architecture in climate change kerpic'08 Int. Conf., CIU-Lefkosa-Northern Cyprus, p: 359, 2008.
[13] Keefe L., The Cob Buildings of Devon 2, Repair and Maintenance, https://www.devonearthbuilding.com/leaflets/the_cob_buildings_of_devon_2.pdf, last accessed on 20/06/2017.
[14] Graham P., Mc Henry Jr., 'Adobe and Rammed Earth Buildings: Design and Constructions', AIA New Mexico, Chapter 13, Strucrural Engineering for Earth Buildings, by Gerald W. May, Ph.D. President, University Of New Mexico, The University of Arizona Press Tucson, 3UZ4-CHS-T13A, ISBN 13: 978-0-8165-1124-2, pp. 186, 1989.
[15] Eski Yalvaç Evi Restorasyon Projesi, Yalvaç Belediyesi, http://yalvac.bel.tr/index.php?sayfa=kentrehberidetay&h=747, last accessed on 20/06/2017.
[16] Ruhi Kafesçioğlu R., Işık B., The Relevance of Earth Construction for the Contemporary World and Alker – Gypsum Stabilized Earth, Living in Earthen Cities – Kerpic, ITU, İstanbul, pp. 166, 2005
[17] Adobe Conservation, Staff Cornerstones Staff and Cornerstones Staff, p:52, 2006, http://cstones.org/pdfs/uploads/adobe_conservation_handbook_part_2. pdf, all about adobe, last accessed on 20/06/2017.
[18] Türkyapı, 2010, https://www.xing.com/communities/posts/prof-bilge-isik-kerpic-teknigi-yayginlastirilmali-dot-dot-dot-1006985213, last accessed on 20/06/2017.
[19] Ada Mühendislik, http://www.ada-muhendislik.net/, last accessed on 20/06/2017.
[20] Gümüşhane Valiliği, Konaklar, http://www.gumushane.gov.tr/konaklar, last accessed on 20/06/2017.
[21] Cockington Village, https://tr.pinterest.com/cchrisha/cockington-village/, last accessed on 20/06/2017.
[22] https://www.tripadvisor.co.uk/Location Photo:Direct Link - Cockington_Country, last accessed on 20/06/2017.
[23] Işık B., 'Conformity of Gypsum Stabilized Earth-Alker Construction with 'Disaster Code 97' in Turkey', *International Journal of Civil &Environmental Engineering IJCEE-IJENS,* Vol: 11 No: 02, 110502-3939, 2011.

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Temporary Accommodation and Built Shelters for Survivors of Disasters (Sur-Turkey)

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ABSTRACT
Today, home and family have become one of the most important human needs, though living alone has become more common, people still seek to have families and collective lives so that they can get relaxed with their family after a long working day. But it may not be always like this. Sometimes family union changes in the way that the unity of family gets influenced by crisis and breaks up and therefore people get into trouble in fulfilling their needs.

Unexpected accidents which inevitably and surprisingly happen and their widespread influences on earth and human sources affect the natural process of living beings. Without international helps, they become real human disasters. Turkey faces many environmental casualties like earthquakes, snow slides, forest conflagrations, floods and droughts. People usually know earthquakes as unexpected accidents. But war itself is a part of these kinds of accidents which destroys living society and families. One of the difficulties that war causes is that the life becomes difficult for injured and homeless people. In these kinds of accidents losing shelter causes the loss of hope and human dissipation. So the first thing which brings trust back to people is to have shelter and gathering the family back.

One of the ways that reduces those problems is to study and present suitable ideas of temporary pre-built accommodations with a suitable method adjusted to international standards. The purpose of this contest is to study and recognize the exact need of accommodations and respond people's needs facing the crisis. This contest searches the capabilities and possibilities of paper architecture which tries to study the suitable quality of creating a temporary place and also experience the methods of paper use in accommodating injured people. Using paper in building a temporary shelter after an accident is one of the modernist and good ways for building a shelter both in means of cost and time.

Keywords: Temporary accommodations, shelter, injured, natural casualties, paper use in temporary accommodation**.**

1. INTRODUCTION

Designing, planning and providing minimum standards for exigent and temporary settlements are among the basic rights and needs of people who are prone to disasters or conflicts. In the same way as water, hygiene, food, and psychiatric care, a shelter plays a key role in saving people's lives in the early stages of a calamity. A shelter is essential for immunity to diseases and protection from different dangers. It is of great importance in the framework of familial and social system in difficult conditions so that human dignity can be preserved. In fact, the purpose of providing a shelter is to select the right place and plan

for the supply of basic individual, familial and social needs for the creation of a healthy, safe and relatively convenient place to live. It is obvious that the coordination and cooperation of the homeless, help the realization of this goal to a great extent, and the potentially negative impacts of their temporary residence can be mitigated through appropriate and reasonable planning.

Homelessness and how to accommodate the injured temporarily are among the planning issues of crisis management which authorities and executives face after many natural disasters (earthquake, flood, fire, etc.) and manmade calamities (war, tribal conflicts, etc.). The loss of homes due to calamities has always been manifested as a social and political issue throughout history in different ways. Its main burden has always been shouldered by the ordinary people, insofar as they often have to leave their ruined homes and move to other areas because of fear, insecurity and chance of death. They may choose to live in the ruins of their homes if they feel safe.

The current strategies for constructing temporary settlements for the homeless after the recent calamities in Turkey indicate the scant knowledge of executives and planners about different political, economic, social, cultural and environmental consequences of such calamities. The existence of these accommodations caused some problems after reconstruction was finished. In an interview with an Anatolia reporter on refugee crisis, William Spindler, a spokesman for the United Nations High Commissioner for Refugees (UNHCR), stated, "Turkey is currently hosting three million refugees." [1].

It is essential to investigate scientific foundations, document the challenges of temporary settlements, determine advantage and disadvantages, and conduct separate studies on the theoretical topics and specialized literature on providing shelters after calamities.

2. THE HISTORY OF DESIGNING TEMPORARY HOUSING UNITS

In a conference on disasters and development, the United Nations announced, "All the solutions for designing temporary settlements should be chosen with the highest accuracy and caution because they may be used permanently and cause some problems in the long-term development of communities." Investigating relevant experiences indicate that most of the decisions made by reconstruction executives for the temporary settlement of the homeless came from hasty and hurried ideas under political, media and social pressure and lacked foresight. On the other hand, it is hard to predict how to design and plan settlements and when to establish them, which are often accompanied by short-term and superstructure operations of authorities.

In recent decades, many famous designers and architects have presented different types and models for shelters, instances of which include works by Le Corbusier, Aalto, Rudolf, Fuller, and Kurokawa. Considering the complications of designing an exigent or temporary desirable housing unit, these individuals tried to achieve industrial mass production through uniformity. They ran some tests in countries hit by natural disasters. However, these efforts were mostly neutralized by the reality of the disaster and sufferers. Many of the proposed ideas were only considered for the construction of prototypes. Even when they reached the stage of mass and industrial production, they resulted in unexpected failures after being used by the homeless. The current experiences indicate that the

productions used by the homeless were surprisingly changed, or spaces were added and subtracted, something which made these housing units more vulnerable.

Latina, a reconstruction expert, points out these experiences and states, “Many of the shelter ideas proposed by famous architects remained only on paper. Some of the plans were built as prototypes, and some other were manufactured and shipped to the countries hit by disasters. However, the majority of efforts and procurements failed due to the fact that the injured people were not interested in them.” (Figure 1) [2].

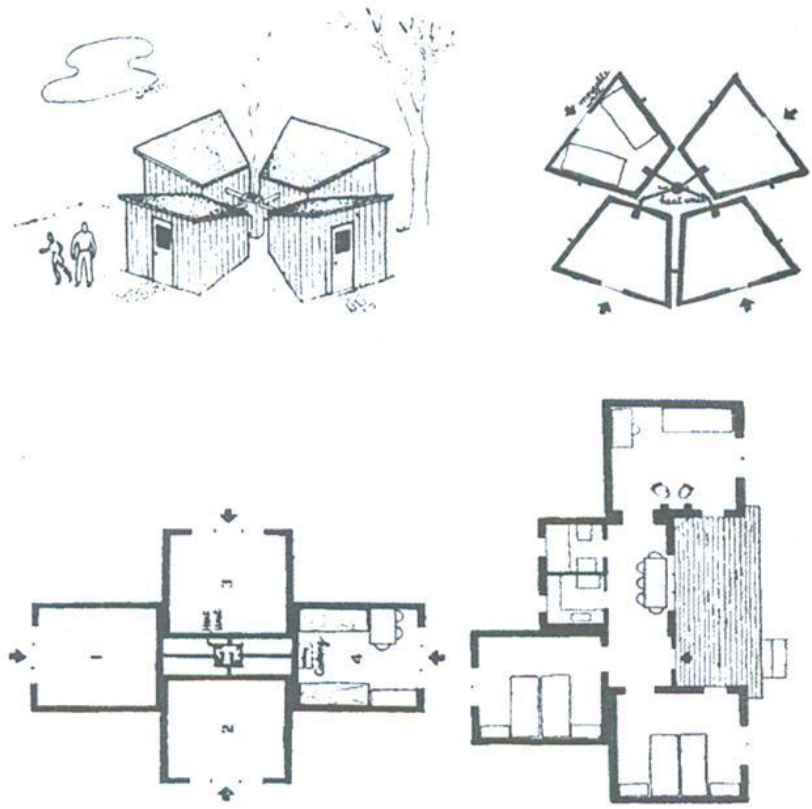

Figure 1. The first plans designed by the famous architect, Alvar Aalto, for settlements after the World War II. These plans were designed for groups of four people and built in site after transfer. These plans were assembled in site. They could be converted into four separate units. A central source of heat was placed in the middle of the four units. Like tents, these units could be transferred to another place [3]**.**

Latina continues, “Our experience (Italy) in this area is relatively new. The first prototype dates back to the 1970s; however the housing unit plans meant for exigent or temporary purposes caught on. However, there are still some serious doubts in the use and mass production of these plans.” (Figure 2).

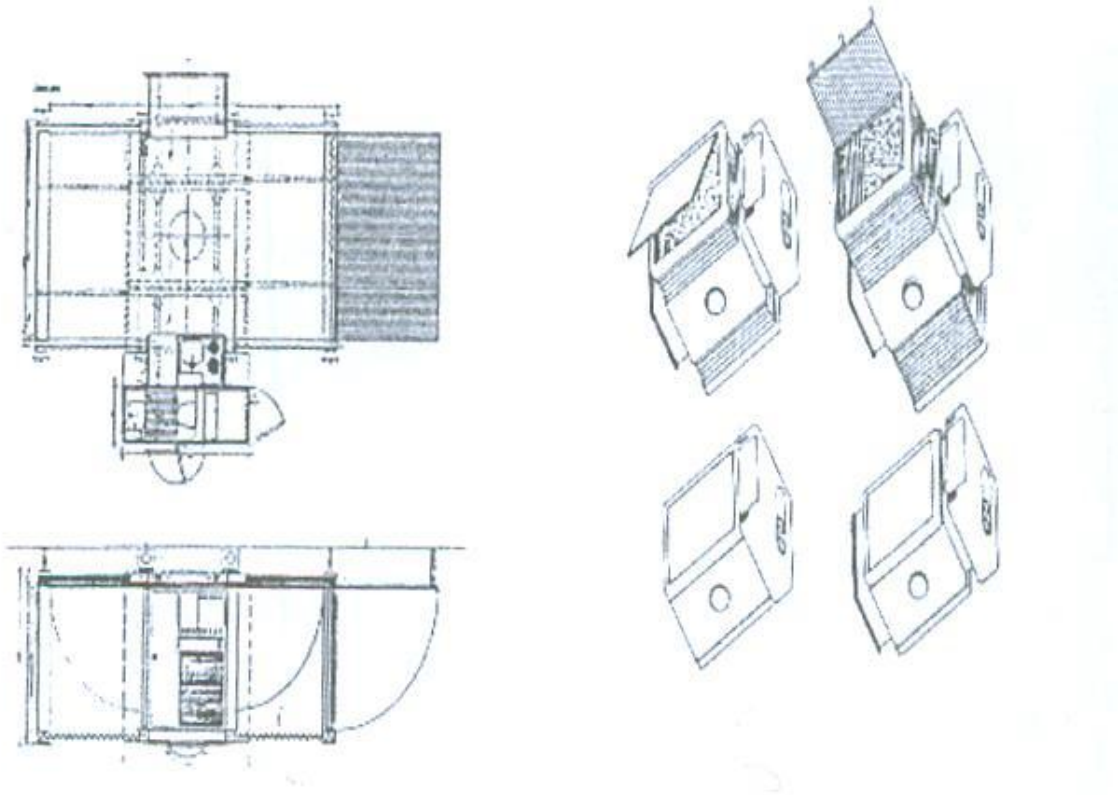

Figure 2. Temporary Housing Units Designed by Italian Architects [3]

Among the building systems used for temporary settlements, only a few models meet the necessary conditions for temporary implementation (meaning easy transfer and setup, assemble and detachment, durability, reusability, etc.). Given the technical and executive quality and lack of proper laws, it has been imagined that building systems used for temporary purposes are mostly expandable productions and not durable items. In other words, temporary housing units have been regarded as unstable, insecure, cheap, and destructible buildings.

Generally, the idea of an all-inclusive design, which can be used in every part of areas hit by disasters, has not been practical due to cultural, climatic and economical differences because damaged communities often have different customs and habits.

3. TEMPORARY SHELTER AND SETTLEMENT

The general meaning of a shelter or temporary settlement is broader than just a place for living. It includes concepts such as livelihood issues, peace of mind, and psychological comfort. In the relevant literature, the definition of a shelter ranges from a simple room which can be built and set up by an individual to the construction of a complete home built by the state. It should be considered that people become homeless after a disaster. In other words, they do not just lose their buildings. This means that families lose their material and spiritual resources after a calamity. Therefore, a shelter is highly regarded as a space for creating serenity, security, peace of mind, and the mental rehabilitation of an individual hit by a disaster. In this regard, the problem of temporary settlements is investigated as an extensive concept and not just as a physical product. It is investigated as a process and something between exigent settlement and permanent housing in different aspects. Mainly, there are three options for the establishment of temporary settlements for individuals who

are prone to a natural disaster or a manmade calamity. These aspects are defined with respect to the type of calamity, the number of homeless people, political issues, and the ability of society to deal with disasters.

- People stay in the site of disaster and like to live near their ruined houses. This usually occurs after earthquakes.
- People move away from their houses and live in host communities or state-run buildings and public spaces. This usually occurs after a typhoon, flood, eruption of a volcano, war and tribal conflicts.
- People move away from their houses; however, they remain in groups. In this regard, it is essential to build a temporary camp for the misplaced people who had to leave their homes. In such circumstances, people basically have to live together in large groups for an uncertain period of time. Planning and designing temporary settlements are meant to help people who are in need of safe housing [4].

After procuring the essential needs of the homeless and refugees for a shelter, clothing and basic requirements which are common in all three aspects, the items related to the selection of the site along with the necessary plans and designs in the second and third options include the challenges of executives and decision makers. Accordingly, not only these people, but also architects and planners should try to find answers to the following questions:

- Are the models of exigent settlement designs have effective roles in decreasing the organization and reconstruction costs?
- Is the process of planning and designing temporary settlements reduce the mental and social pressures of the homeless?
- Does the identification of the climate, environmental, social and cultural aspects influence the stability of temporary settlements in post-crisis conditions?
- Is it necessary to design and plan temporary settlements in a way that they can be exploited after the reconstruction is finished?

Human temporary settlement is a relatively new term. Nowadays it is used instead of the words *camp* or *site*. Although camps are some types of human settlements, some researchers do not agree with this term because a permanent meaning is inferred from it. Nevertheless, since the goals of sustainability and development should be considered at a regional level in planning and designing a group of temporary settlements as well as the human aspects of the people who are going to live in such places, it appears that this term can be appropriate. In fact, if the homeless are considered a community which should respond to short-term and mid-term needs in mutual reaction to their surrounding environments, this term represents its meaning better. Therefore, a human temporary settlement should consider the following aspects:

- Proper employment for the self-efficiency of the homeless.
- Their mental self-belief.
- Letting local residents benefit from the services provided by refugees [5].

Temporary settlement is usually used by the three following terms in the literature on disasters:

- Transitional accommodation: this term includes the process of housing from the moment of emergency until consolidation. The element of time is prioritized as the main indicator.

- Intermediate settlement: this term includes the meaning of the previous term, and it can be stated that it includes the process of time and physical body of temporary settlements at the same time.
- Temporary shelter: in comparison with the two other terms, temporary shelter is more physical and structural. It includes a wide variety of constructional forms of temporary settlement ranging from an emergency tent to a prefabricated home.

In this paper, the concept of temporary settlement is a combination of these three terms. It includes both physical and nonphysical aspects of a shelter or settlement after a disaster. On the other hand, temporary settlement is used in the organization stage before reconstruction. The organization stage refers to returning fundamental services to pre-disaster performances, helping people achieve self-sufficiency and self-belief, repairing damages, granting financial facilities, recovering economical activities, and providing supports for survivors in social and psychological aspects. Therefore, a temporary settlement can be regarded as a group of all activities including the collection and identification of the homeless, transfer of people to shelters and the creation of safe and healthy living conditions until they return to their motherlands or previous residences. The period of a temporary settlement is estimated between six months and two years with respect to conditions, the type of crisis and equipment. Some aid researchers and agencies consider it to be the main core to permanent housing.

3.1. Managing the Places for Temporary Settlement

Different work units should also be defined to manage the places of temporary settlement, and each of these units should have clear and predefined job descriptions. Therefore, it is necessary to standardize the activities and coordinate the actions required for managing the affairs of camps. Camp management is important for several reasons:

The sufferers and affected community

After an earthquake, the survivors experience intense psychological and emotional conditions. They need special care, and the least possible empathy and basic services can be very significant. Providing (just-in-time) help and services for the sufferers in the first hours of an earthquake can significantly decrease human casualties and social harms.

Financial and economic aspects

Managing camps and other emergency settlements and monitoring the helping process can avoid wasting the basic needs, equipment and other procurement to a considerable extent.

Technical Aspects

Necessary actions should be taken to manage procurement groups, aid and rescue, medical services, health services, security, protection, housing, telecommunication, and transfer services by identifying and knowing all the services required for the damaged area and people with respect to the localization of the camp [6].

- The presence of materials with different standards and different shelters can result in problems.
- Security problems are developing the homeless community.
- Very low participation of refugees and local people in planning and providing services for temporary settlement decreases the success of the plan.

4. THE FEATURES OF A TEMPORARY OR EXIGENT SETTLEMENT

Temporary settlements, as places for people to live temporarily, should have special condition. Natural characteristics (topography, geology, slope, etc.) of availability, adjacency to desirable functions and adaptability should be taken into account in finding such a place.

The standardization method includes the minimization of area or an open space required by a suffered family to the formation of shelters (tents and residential units) as well as healthy and cultural places, each of which has its own particular regulations and instructions which are followed in one method in the majority of countries. However, the Islamic and social cultures should also be taken into account in Iran. It is very important to pay attention to different age groups, especially children and the elderly, in the camp. It is also necessary to codify and announce some rules for the management affairs before and after calamities so that they can be effective and the affected people can follow them. Particular plans and thoughts are necessary to decide to shut these spaces down after making huge investments. It is possible that some plans are made to create a particular place and to shut it down after meeting general needs. In other words, the costs of these places are temporary, and only places are left behind after collecting and transferring temporary equipment and infrastructures to another place. For instance, the emergency camps which are created by putting up tents and providing services (like health services) are temporary camps [7].

4.1. Positioning and Planning Temporary Settlements

The first step in positioning a temporary settlement is to form a technical committee to select a piece of land. The members of this committee mostly include the future providers of services and responsible organizations. In addition to what was mentioned earlier, the criteria for selecting an appropriate site is related to the number of homeless families, availability ways, establishment situation, topography, soil, environmental impacts, and agricultural lands. If the planning groups of camps are able to identify different aspects of the land before starting the construction, the possible problems will be mitigated in the establishment of infrastructures. The next step is to evaluate and investigate the quality of site technically. Other necessary activities of selecting the land include the evaluation of available resources, the current and future needs, and quick mapping. The remote evaluation methods and satellite, aerial and ground images can be used to consider the following aspects:

- *Water Resources:* Water should be supplied in necessary and adequate amounts during the year. The availability of resources such as springs, rivers and ponds should be investigated. The water wells which are dug with hand are preferable. These cases are regarded as long-term investments which are then used by the local community after the refugees returned to their homes. The management group of camps invite a specialized technical water evaluation team to investigate the amount of water in the site before establishment. Moreover, the representatives of the host community should be reassured about how water reservoirs change in different seasons.
- *Per Capita Land:* According to the UNHCR Instructions, the minimum camp land used for each individual is 45 square meter per capita. It includes home gardens, too. If there is no garden, this amount is advised to be 30 square meters. Therefore, the population can be predicted by considering the number of homeless people and those individuals who will probably join later in addition to the population growth

by almost 3-4 percent. This amount also includes passages, services, the area of shelters, and gardening spaces.

- *Availability:* Passages are necessary to ensure the supply of goods and aid services during the year. Roads and paths should be usable in all seasons especially in the rain. Therefore, it is necessary to evaluate the performance of roads for the traffic of heavy vehicles such as graders in order to construct and prepare the land. This agricultural land procurement (agriculture and animal husbandry) should be prioritized for the self-employment of people. These types of lands should be located outside the main areas so that it can be possible to prevent animals from damaging the products. The animals should also be formed in herds so that they can be immune to theft.
- *Culture and custom:* Temporary settlements should not be located near sensitive places such as parks and other national, international, cultural, religious and historical sites, monuments and cultural heritage. Moreover, different religions have different rituals and customs for burials and the place of graves; therefore, the appropriate piece of land should be predicted for this purpose.
- *Trash Management:* There should be at least one container or a large trash basket for each population group. It should be established outside the central area of gatherings. Containers should be specified with special signs and fences so that children can be prevented from entering the area and also avoid the possible dangers of parts in trash and the spread of diseases. The trash should be buried in the appropriate periods of time and buried in remote places (the trash is transferred with hand, animals, bicycles, pickup trucks, etc.).
- *Building Materials:* The management organization should provide the building materials of the desired site with the help of the host community at the beginning of the planning process. These materials should be transferred to the site. With this strategy, the shortage of materials and the presence of black market will be prevented at the time of construction, and a friendly and sustainable relationship will be established between refugees and the host community. In the drill area, the plantation and use of local materials which grow quickly (such as bamboo) should be promoted in order to protect the local environment. Moreover, the process of producing local resources in the host community should be encouraged more than ever before. It is essential that the management group investigates the rehabilitation of implementing the foresting project at the beginning and the end of establishing the camp very carefully [8].

4.2. The Use of Paper in the Construction of Temporary Settlements after Disasters

The experiences of paper architecture, the prefabrication capability, establishment speed, the separable parts, and simple equipment of making pipes resulted in the idea of using this technology to provide temporary and exigent shelters after calamities. In 1999, the UNHCR Office and Doctors Without Borders used paper pipes for the exigent settlement and providing temporary group homes for Rwandan refugees (the victims of a genocide in Tanzania and Zaire). Such a decision was made by evaluating the ability of other materials such as wood, bamboo, aluminum and plastic. After expert investigations, the use of paper pipes with plastic covers was selected to construct shelters as large as 4x6 square meters. The main reasons for the selection of paper pipes are as follows:

- Preventing the destruction of local forests by the refugees who would use the wood to construct the building skeleton.
- The production at site, low price, installment speed, reduction in the transfer costs, and reduction in construction trash can be achieved. Paper pipes was used for the

first time to construct tents with trapezoidal frames in the construction of exigent shelters for Rwandan refugees. A plastic tent membrane is pulled over these frames, and the triangle ends of this frame are attached to the ground with wooden nails (Figure 3).

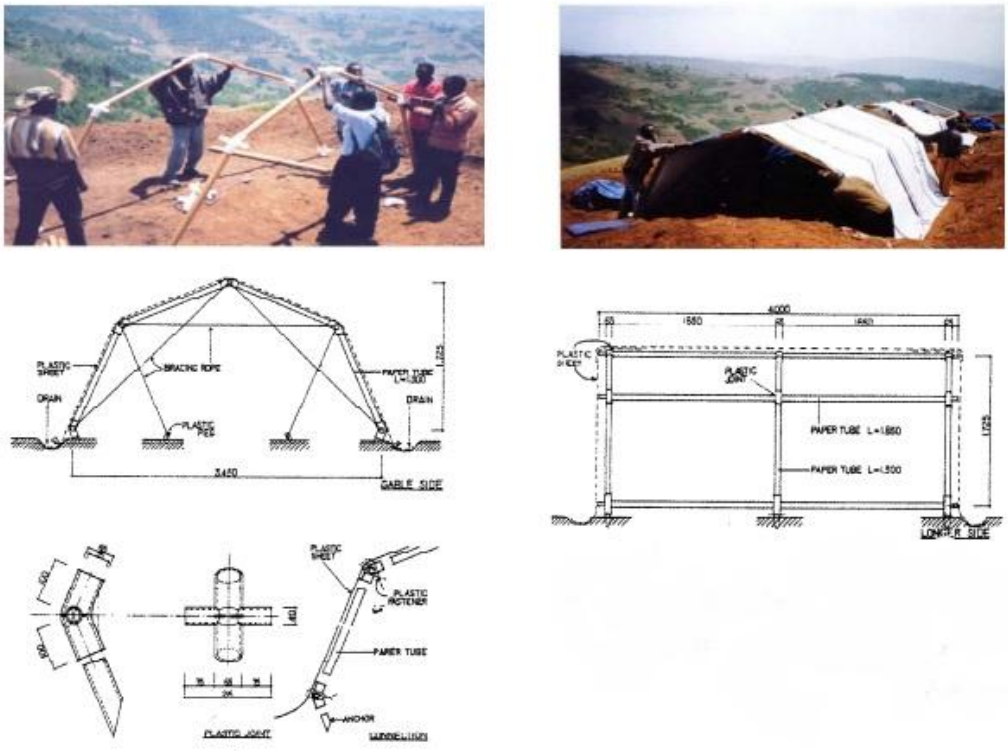

Figure 3. The Emergency Shelters with Paper Structure for African Refugees and the Implementation Details of the Paper Pipe Frame in the Stage of Emergency Settlement [9]

Another experience was the implementation of paper pipes in the destructive earthquake in Turkey in 1999 when 20.000 people were died and 200.000 became homeless. The space of temporary paper settlement in this earthquake was similar to wooden shelters. However, some modifications were made to them in order to match with the climatic and living conditions of Turkish people. These changes were meant to go well with families, coordinate with the standards of seven-layered wooden plates in Turkey and adapt to the weather. Moreover, plastic and cardboard plates were used to increase insulation and proportionate them with the needs of residents [2].

Figure 4. Rescuers Working to Prepare the Floor and Seats of Temporary Paper Homes in Turkey [9]

5. CONCLUSION

Temporary settlement has a short period of duration until permanent establishment is done, this period usually takes several months, and sometimes up to one and two years until the construction of permanent housing. Emergency settlement has a shorter period of time, toward temporary settlement but neglecting life quality of injured in this two-stage process can have undesirable and incurable consequences for injured. We should pay attention to the quality of the physical environment as a platform for life and upgrade its quality in particular for the injured resulting from accidents is a subject that must be considered seriously in the reconstruction architecture. From this perspective, emergency and temporary living space should be prepared in a way of designing a protected environment for the people in such conditions of natural environment such as heat, cold, wind, atmospheric precipitation, supply their conditions of comfort and convenience. So the realization of optimum conditions of residence is considered as a special advantage at all stages of the reconstruction architecture.

The process of development and expansion of paper building technology requires the design and implementation of permanent and sustainable spaces that can be used as strength, performance and aesthetic beauty values of the paper in them. What now seems to be more practical is the using paper on the construction of temporary structures after the accident. Experience of using paper in providing paper temporary shelter that was used for settling earthquake victims in Japan, Turkey, India and Rwanda which has not show a particular problem and doubt using it. Based on this, paper building technology can be used in creating urban temporary structures and the residential place for providing educational temporary shelter such as school, therapy such as clinic and the hospital rats and or religious and cultural place such as chapel or the administrative offices that are located in accident areas. Comparison of the paper methods with other temporary settlement methods in different countries shows memories of life in the shelter that has not the quality values of appropriate space and performance can be stay in mind of injured persons and decrease their pains and tribulations.

Designing the perfect temporary housing not only has positive effects on the injured community and is effective in the improvement of the life quality of injured, but also will effect directly on improvement of their mental and living status.

REFERENCES

[1] Aysan,Y.,Deius,Y., Fallahi, A., *Architecture and Planning Reconstruction*, Shahid Beheshti University, Tehran,2010.

[2] Khoram, M., Sadeghi Naeini, S., Teyrani Najari, M., *Temporary Shelter for Earthquake Design Criteria Approach*, Khorasan Razavi, 2007.

[3] Soltani, G., Design of shelter for temporary accommodation after natural disasters (design of a fiber glass frame structure, reinforced composite with fibers), Zanjan Univerity, Iran, Master thesis, 2011.

[4] Forozande, M. S. A., Architecture of Temporary Settlements After The Accident, 2006.

[5] Godarzi, A., *Design of Crisis Management System*, Ministry of Agriculture, 2009.

[6] Arjmandi, E., Master Plan for Reconstruction Manegment after A Possible for Earthquake in Tehran, Reasearch for A Possible of Earthquake, 2013.

[7] Omidvari, F., Hoseini, A., *Foundations reconstruction of The Accident*, Asre Kankash, 2013.
[8] Falahi, A., Architecture Settlements Temporarily after Accidents, Shahid Beheshti University, 2008.
[9] Sartipipor, M., Architecture with paper materials; the implementation of post-traumatic buildings, Maskan va rosta journal, 2010.

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