A Research on Sustainability Through Re-Use of Traditional Buildings, A Case study of Famagusta, North Cyprus

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ABSTRACT

This research aims to study how old buildings transform with the informal changes, and modifications did by their users. Understanding the level and nature of changes in the houses will indicate the level of sustainability environmentally as well as culturally. It is crucially important to know about potential of these buildings rather than consuming a lot of energy and new resources for constructing new ones when we have enormous housing stock in our hands. The traditional environment of the Famagusta is the selected case in order to analyze the environmental and social sustainability in traditional reused houses.

The first chapter has been dedicated to the explanation of the problem and the necessity of such a study. It provides the general approaches to the subject, the procedure of the study and the main objective.

The second chapter aims to provide a theoretical framework about sustainability in terms of environment and culture; next investigates the traditional architecture, its relation with sustainability and the advantages of reuse with special reference to the Cypriot settlements. It is divided into three parts: sustainability and its principles, meaning and values of traditional architecture, the concept of traditional architecture of Cyprus in terms of sustainability.

The third chapter is devoted to analyze of environmental and social sustainability in reused traditional houses in the walled city of Famagusta. This chapter is divided into two parts. First part provides materials about history and architecture of

Famagusta. In the second part five houses caring traditional architecture characteristic environmentally and contextually adapted to contemporary lifestyle are chosen as the case study. This study illustrates changes and adaptation in space organization, building materials and techniques and environmental control of the reused traditional houses selected in the walled city of Famagusta. It aims to underline the power and potential of the traditional houses in environmental and social sustainability.

The forth chapter is the conclusion. The findings and results are highlighted through this chapter.

Keywords: Sustainability, Traditional architecture, Reuse, Famagusta, North Cyprus

ÖZ

Bu çalışma eski binalara ev sahipleri tarafından yapılan gayrı resmi değişiklikleri ve bu değişimlerin eski binaları nasıl değiştirdiğini incelemeyi amaçlar. Evler üzerindeki değişimlerin seviyesini ve yapılışını anlamak, evlerin çevresel ve kültürel sürdürülebilirlik derecesini anlamamıza yardımcı olur. Üzerinde çalışılabilecek bir çok bina varken, nedensiz yere enerji ve kaynak tüketmemek için binaların potansiyelini bilmek son derece önemlidir. Bu çalışmada, tekrardan kullanılan geleneksel evlerin çevresel ve kültürel sürdürülebilirliğini incelemek için seçilen bölge Gazimağusadır.

Problemin tanımına ve böyle bir çalışmanın gerekliliğine tezin birinci bölümünde yer verilmiştir. Bu bölümde konuyla ilgili genel yaklaşımlar, çalışmanın esas amacı ve çalışma süresince izlenen yol da yer almaktadır.

İkinci bölümün amacı çevresel ve kültürel açıdan sürdürülebilirlik hakkında teorik bir çerçeve oluşturmak ve geleneksel mimariyi, Kıbrıstaki yerleşim yerlerini göz önünde bulundurarak incelemektir. Bu bölüm üç kısma ayrılır: sürdürülebilirlik ve prensipleri, geleneksel mimarinin anlamı ve değerleri, ve sürdürülebilirlik adına Kıbrıstа geleneksel mimari.

Üçüncü bölüm Gazimağusa surlar içinde bulunan ve yeniden kullanılmakta olan geleneksel evlerin çevresel ve sosyal sürdürülebilirliğinin analizini içermektedir. Bu bölüm de iki kısımdan oluşmaktadır. Birinci kısımda Gazimağusa'nın tarihi ve mimarisinden bahsedilmekte, ikinci kısımda ise çevresel ve bağlamsal açıdan geleneksel mimarinin özelliklerini taşıyan fakat güncel yaşam standartlarına uyum

sağlamak amacı ile adapte edilmiş olan 5 ev, tezin örnek durum çalışması görevini görmektedir. Bu çalışma, Gazimağusa surlar içinde seçilen evlerde mekan kurgusu, yapı malzemeleri, ve teknik ve çevresel kontrol açısından, yeniden kullanılmakta olan geleneksel evlere yapılan değişiklik ve adaptasyonları göz önüne sermeyi amaçlarken, çevresel ve sosyal sürdürülebilirlik açısından geleneksel evlerin sahip oldukları gücün ve potansiyelin öneminin de altını çizer.

Anahtar kelimeler: Sürdürülebilirlik, geleneksel mimari, yeniden kullanım, Gazimağusa, Kuzey Kıbrıs

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Chapter 1

INTRODUCTION

Architecture plays a vital role to achieve sustainability and preserve environment and resources. Moreover, it represents the distinctive challenge in the field of sustainability. Sustainability in Architecture has become again one of the most central issues. Although according to the definition of Brundlant: “The sustainable city has been recognized as the city that enables all its citizens to meet their own needs and to enhance their well-being, without degrading the natural world or the lives of other people, now or in the future.” (WCED, 1987, P 8.)

This study conducts an investigation of sustainability and its relation with informal reuse of traditional buildings in Cypriot settlements. In order to achieve this goal some of Traditional dwellings in the walled city of Famagusta, which are reused by their owners, are chosen to analyze, for identifying the models of sustainability.

1.1 Statement of the problem

During the history, humans have made built facilities to protect themselves and their properties and to encounter a diversity of needs, which were serious about human existence. However, the effects of these amenities on the ecosystem have not always been instantly apparent and their increasing results on our planet over time have become progressively hard to deny. In this respect sustainability has offered as a supervisory program to generate the new genre of built environment. Sustainability is fundamentally anthropocentric, because it is the prosperity of humans with which we are concerned. More than a concern for just survival, sustainability is a wish to

accomplish, to have the best life achievable.

The spirit of sustainability in architecture is not only related to the way of constructing, it should be concerned as a life style. As Al- Zubaidi (2007) mentioned, "Conceptually, sustainability is not all about energy conservation, renewable resources, or building materials. Sustainability is a way of living, and society cultural character. Sustainable development is not about policies and local strategies; Human being daily activities are the spirit of sustainability, the life style, performance, construct, work, create, plant, and travel. Sustainability is not a term to be understood; it is a life to be experienced". (Al-Zubaidi 2007,P.47)

Nowadays, we witness uncontrolled population growth, fast technological progression without adequate usage. Furthermore, jumping to non-localized modernity is another significant problem. These factors have led to the unpleasant appearance of residential buildings and inefficient usage of energy. As Edwards (1996) stated: today most cities and towns deal with a set of problems, which are mostly, related to the decline of the environmental resources through overpopulation, deterioration of housing, water and air pollution and lack of valuable space. Accordingly, the concept of sustainability has been offered, as the tactical clue, it means to achieve sustainability the design concerns should be associated with environment resources. (Edwards, 1996)

When we look back to the past it is noticeable that traditional architecture was sustainable by its nature. The builders have though throughout the users need, local building techniques and with the respect to the site. They have used accessible

natural material, the traditional construction process and technical talents to generate buildings. As Frank Lloyds Wright states that: "Folk buildings growing in response to actual needs, fitted into the environment by people who knew no better than to fit them to it with native feeling. Wright expressed the opinion that traditional architecture was superior to self-conscious academic attempts to use a historical style in generating architecture". (Oliver, 2003, P.13) Traditional buildings were constructed to bring comfort for their residents traditional house is the result from the collaboration of many people over many generations as well as the collaboration between makers and users of buildings and other artifices. (Rapoport 1969)

Moreover, traditional buildings were constructed as an appropriate response to the everyday lives of the communities. In addition, Fulfillment of the user's requirements and desires were the only aspect of these building's design. Namely, the design principles for these buildings were the contextual characters and cultural values of the people. Paul Oliver (1997) in his book "encyclopedia of vernacular architecture" mentioned that: "It is particular characteristics of traditional architecture that each tradition is intimately related to the social and economic imperatives; it has developed to meet specific needs within each cultural milieu. Seen in the context of hamlet, village or town, the larger frame of the social structure has been bearing on the spatial organization of settlements. Families may require proximity to kinsfolk and clan members or to the sites associated with ancestors. Exogamous marriage, inheritance rights and other specifics of custom and tradition can affect location and settlement growth. Within the dwelling, customary norms in organization and utilizing space may persist through generations, requiring places for working and sleeping, or for the preparation and cooking of food. Often they are

gender or hierarchically differentiated, changing rarely and only as societies change". (Oliver, 1997.p xxi)

On the other hand, it is simply distinguishable that traditional architecture is more sustainable than the contemporary one in comparison. Traditional architecture is a way that created by informal people in harmony with environment, socio economic and cultural aspects and employment of available technology at the same time. As Mahgoub (1997) mentioned, "Sustainability was manifested in traditional architecture, in different aspects, while modern architecture neglected natural resources and ambient environment, which led to the absence of sustainability in contemporary architecture". (Mahgoub, 1997.p 117)

As it mentioned traditional architecture is sustainable by its very nature because of the use of locally accessible materials, careful placement of buildings to take advantage of natural ventilation, and the usage of strong materials it means that traditional buildings already meet many of the sustainability principles. Most investigations for sustainable design have been for new construction with little attention to the rehabilitation, reuse or recycle of these existing valuable structures.
The renewal, conversion and reuse of older buildings can play a crucial role in the sustainable growth of each society. The preservation and reuse of old structures have profit for the environment by decreasing waste and pollution. The island of Cyprus has many prime examples of old valuable buildings, which has not protected; many of them are well designed and have potential to be reused.

In this respect, the island of Cyprus, which has a long historical background and distinctive traditional architecture, has been chosen to be investigated. As Pulhan(2001) mentioned that the island of Cyprus has a unique traditional built environment due to its multicultural identity over its long history, diverse ethnical groups have been lived in both rural and urban areas of the island. while rural and urban settlements usually experienced varied impacts of prevailing rules, specific diversity is defined in their architectural developments. (Pulhan, 2002.P. 1)

The town of Famagusta, which is one of the old cities with its long lasting historical background, celebrates existence of such rare houses. They are not formally renovated, but they are informally re-owned, re-paired and re-used. As Rudofsky (1964) states that they are the product of architecture without architects, and any informal chance on them can be admitted a step in their natural lifecycle.

The traditional urban patterns of most Cypriot cities, including the walled city of Famagusta are in sharp contrast to the new developments outside them. Identity of the pattern in walled city of Famagusta is gotten from the aesthetic value of its irregular paths and square surrounded by houses, traditional buildings with historic character, and the Existence of diversity of old structures for different purposes. Architectural characteristics explained in different times in history due to different cultures. Therefore, there are not only aesthetics or visual continuity but also a continuity of cultural memory within the city pattern. (Abbasoglu, Guley 2005.P 92)

As Oktay (2008) mentioned in the contemporary housing environments in North Cyprus, the lack of environmental quality, energy efficiency and socio-cultural

identity can be seen. Therefore, they cannot be considered as sustainable. However, the good examples of sustainable housing exist in traditional Cypriot settlements. These unpleasant features in new housing patterns can be seen, almost in all new generations of regions and buildings with no respect to sustainability. At the same time, the towns have perfect samples of sustainable traditional buildings in its old areas. Unfortunately, we witness the neglect of enough attention to historical parts and develop new buildings without having any consideration to existing old houses. However, the existing old ones have still enough potential to be used by adapting them to the contemporary living conditions. (Oktay, 2008)

We can re-use old structures instead of making new buildings. With reuse of these buildings, we can save environment, provide sustainability as well as achieve conservation of historic contexts. As Ozkan (1999) points out a successful conservation includes the sustainability of original users; the contribution and participation of local users and encourage the affluent population or society to pay respect to their cultural heritage. Then, others would emulate or follow the process. The motivated people restore and establish the broken continuities from the past. Thus, the main problem of reoccupation is solved by giving them back to people rather than reoccupying with a new function like turning a building into a museum that no one visits or new art gallery where no one stays. Hence the owners restore and pay more attention to their environment. (Pulhan, 2008)

Oktay (2006) stated that traditional residential environments are the reflections of the socio-cultural and economical features of the societies. These kinds of settings have their own characteristics related with the existing environmental conditions as

well. Therefore, it might be said that each traditional setting has its particular image and context. However, these environments are under the threat of losing their physical and cultural identity as a result of the changing circumstances throughout the time. (Oktay 2006)

One of the most important conditions that undergo profound changes might be considered as the change in the way of life. This is caused to significant demand for housing. Some people buy a new house for living in whereas some of them buy for investment. Consecutively, this demand increases the constructions in the areas where the lands are available. The increase in the construction brings many problems together, which one of the most important one are the inappropriate housing solutions. These newly suggested houses have no relation with the existing context of the related settlement.

1.2 Research objectives

Under this scope, the proposed study aims to study how old buildings transform with the informal changes, and modifications did by their users. Understanding the level and nature of changes in the houses will indicate the level of sustainability environmentally as well as culturally. With these purposes, a set of questions will be answered in this study such as: Which space's functions and spatial boundary is changed? What kinds of spaces are added? With which purposes? Is there any use of contemporary material? As it is important to understand the level of cultural sustainability, the changes in the user profile will also be searched? It is thought that there might be certain indifferences between the buildings, which are inherited by the family members and the others.

It is crucially important to know about potential of these buildings rather than consuming a lot of energy and new resources for constructing new ones when we have enormous housing stock in our hands. It would be helpful for sustainability of historical and cultural heritage, revitalization of social life, sustainability of resources and saving energy. Ultimately, Reusing existing buildings can lead us to the number of benefits; To minimize the use of the resources and construction waste through the re use of remaining materials, to preserve visual characteristic, traditional buildings are fit in the site and are subtle in terms of scale, form and color, Helping adaptability, they are easily adapted to the environment, and to conserve and support important traditional building as trace of the past.

1.3 Research Methodology

Literature survey

Literature survey and review are carried out to know what has been done in the field of sustainability and traditional architecture to evaluate the contribution of others and to define areas of theoretical and empirical weaknesses. About traditional architecture in Cyprus, there are a number of studies on sustainability definitions, and traditional architecture. However, the topic on informal reuse of the traditional houses and sustainability has not been touched or studied thoroughly. The research conduct to highlight these issues with analyze of space organization, use of materials and response to the environmental concern in the informally reused traditional buildings.

Field's study

In this investigation, five houses, which carrying the traditional characteristic and adapted to contemporary life style randomly have been chosen from different neighborhoods in walled city of Famagusta as the case study. (Figure 1.1) These are

the buildings, which carry the influences of Latin, Ottoman and the British Colonial periods.

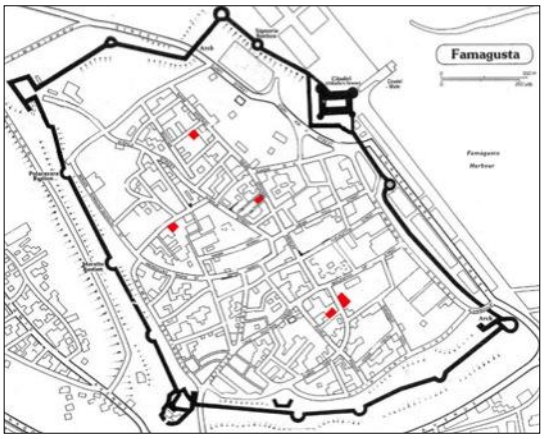


Figure 1.1: Location of the cases in walled city of Famagusta

For each case, inventory sheet has been prepared. (Figure 1.2)

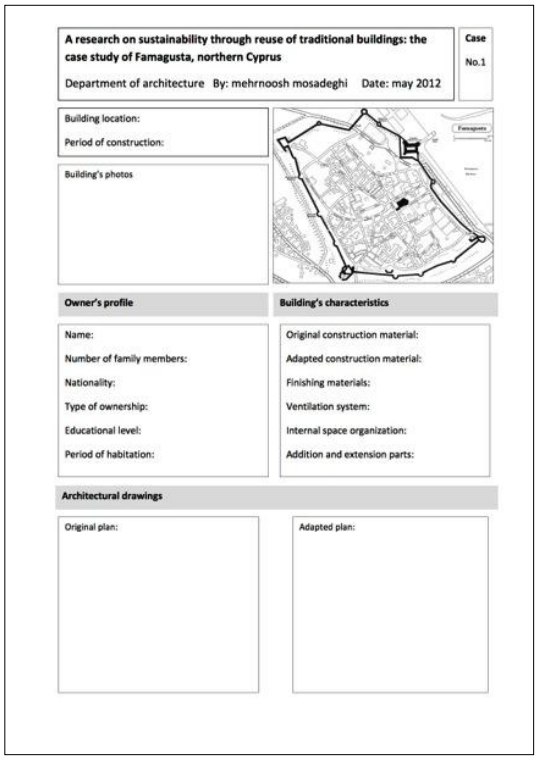


Figure1. 2. A sample of inventory documentation of the houses

Observation and **interview** with the owners are done to record and analysis the issues on the material use, climatic control and the building design with a special emphasis onto the addition/extension parts and changes in interior spaces due to the owners' need and current lifestyle.

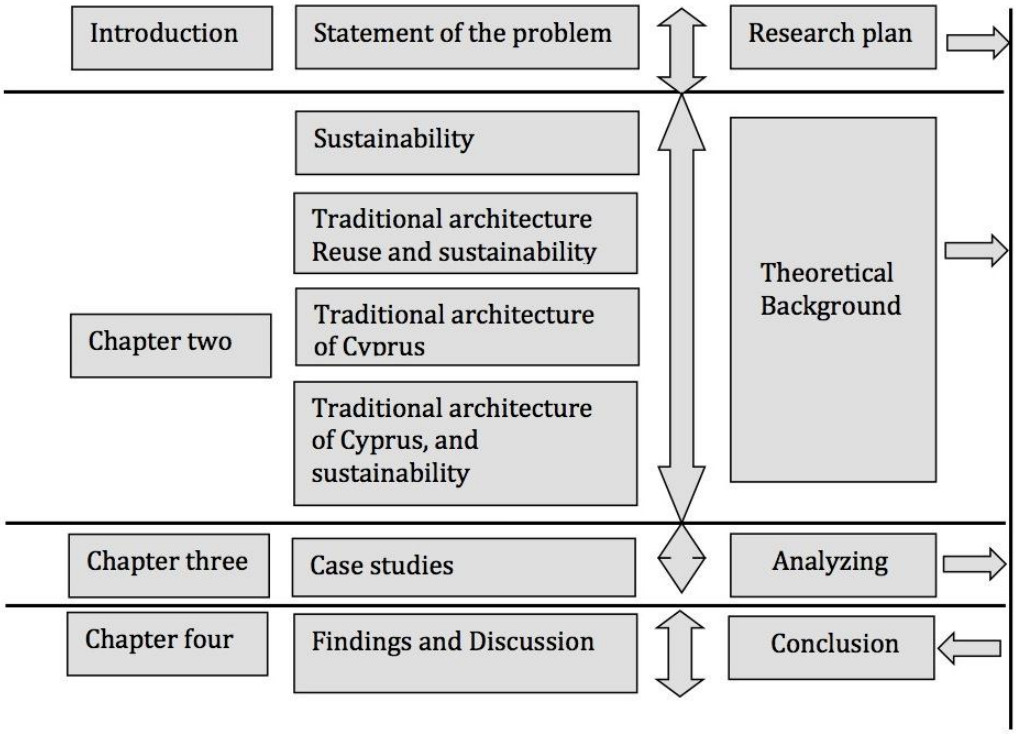
The case number one belongs to the Cypriot dentist and his psychologist daughter. The owner of the second case is the old British woman who was a teacher. The third one is the property of a young engineer. The forth case is for the old retired Cypriot couple, and the last case goes to the owner of a restaurant in the walled city of Famagusta. All of these users are representing the possible user profile that owned such a traditional old buildings in the city. In Famagusta, traditional houses are still used by their original users. They are mostly inherited from their ancestors as in the case number one, three and four. The traditional buildings also attract the foreign people who are appreciating its historical and special values. As the case of British lady grown up in Cyprus and came back to the Famagusta to get the pleasant of living in such houses as in the case two and five. Additionally, it is noticed that the families who are after living long years in abroad prefer to live in these traditional houses as in the case number four.

1.4 Research organization

The research is a survey on traditional buildings, which are adapted according to the current lifestyle and aspiration of users and reused. Because of the scope, this research is divided in to two parts. The first part aims to build theoretical background on sustainability, and traditional architecture. This part consists of two sections discussing the evaluation of sustainability; principals of sustainability in architecture, traditional architecture, buildings reused and finally are defining about

the traditional architecture in the place of the study. The second part that is originated in two sections, dedicated for analyze the environmental and social sustainability in traditional houses in the walled city of Famagusta and case studies, and then the final findings are formulated in the forth chapter named discussion and conclusions. (Figure 3)

Table1. 1: Research organization



Chapter 2

THEORITICAL FRAME WORK OF THE STUDY

This chapter aims to provide a theoretical framework about sustainability in terms of environment and culture. Next it investigates the traditional architecture, its relation with sustainability and the advantages of reuse with special reference to the Cypriot settlements. It is divided into three parts: sustainability and its principles, meaning and values of traditional architecture, the concept of traditional architecture of Cyprus in terms of sustainability.

2.1 The concept of sustainability

In the past decades, the rapid development in construction, industry, and transportation caused many environmental problems, and the human life and earth's atmosphere are affected by these changes. In this situation, the balance of natural environment and future of people is changed. Gathering these issues together bring us to the debates on sustainability. The concept of sustainability has been presented to combine a concern for the welfare of the globe with sustained development and human growth. Sustainability is about fundamental human requirements and needs. People value their health and that of their children, economic safety and contentment. These are main features in our quality of life. The word *"sustainable"* has roots in Latin; "sustain" means, "to hold up" or "to support from below". Oxford Word power Dictionary determines "sustain" as to keep something alive or healthy, to cause something to continue for a long period of time. (Oxford Dictionaries)

Humans to shelter themselves and their properties and to face a diversity of needs that was dangerous to human existence and prosperity constructed built facilities during the history. Even though the impact of these facilities on the environment is hard to deny, but these effects have happened over the time not instantly.

The concept of sustainability is a significant subject these days. The spirit of sustainability should be understood as the life style not just in important issues like government policies and development plans to investigate. In the 1960s, the notion of sustainability arisen, as an answer to concern about the environmental degradation resultant from poor resource controlling. As the ecosystem became more and more significant as a world issue, sustainability was accepted as a frequent political target. Therefore, The concept of sustainability is offered as a key for the purpose of overtaking the conceivable limitation of economic growing in order to cumulative environmental damages affected by human being. Regarding to clarify the model of sustainability and its significance in our current age, it is important to point out the features of the issue, next parts go into the definition and principals of sustainability. (Sustainability Indicators, 2011)

There are several viewpoints on sustainability, and many definitions have also been offered, some broad and some more accurate. Over 300 definitions, for just one-word sustainability, The well-known definition of sustainability is based on the definition of world commission on environment and development or Brundtland Commission in the famous subject "our common future" in 1987 sustainable development is defined as: "Development that meets needs of the present or current generation, without compromising the ability of future generations to meet their

needs and aspirations." (WCED, 1987, P. 8) In this regard, Phillip Sutton (2000) said that, "sustainability *is not "*about" the integration of ecological, social and economic issues, nor is it "about" widespread consultation nor is it "about" improving quality of life. It is about maintaining or sustaining something. To understand the concept ... you need to identify the focus of ... concern*".* It shows that the concept of sustainability can guarantee this fact ;our current activities and choices do not restrain the future generation chances. It's achieving by working with our earth ecological system not oppose it. Many different methods are defined by sustainability for improving our lifestyle. (The Definition of Sustainability, 2010)

Sustainability has multiple targets. Mainly, it aims to combine ecology and economy into one system and it means: living harmonious with nature, renewing resources, living within the resources without harming the environment now or in the future are the main expectations. Likewise, coexisting with our environment without damage it with human activities and decisions can lead us to sustainability. Accordingly, sustainability discusses about the potential of the natural environment, or the ecosystem, to adjust to human activities, particularly that ones indicated establishing economic development in the long-term.

2.2 Dimensions of sustainability

Sustainability is a tactical vital model for virtually all trades in the present century, and it is developed into an essential term affecting lasting financial feasibility and achievement. The different definitions of sustainability undertake different scales and resolve within the three dimensions: social, economical, and environmental. It does not mean the sustainability need a loss in the value of life, but it needs a change in moral concerning the minus consumptive way of life. Therefore, global

interdependence, environmental stewardship, social responsibility, and economic viability must embrace by these changes. (Figure 2.1)

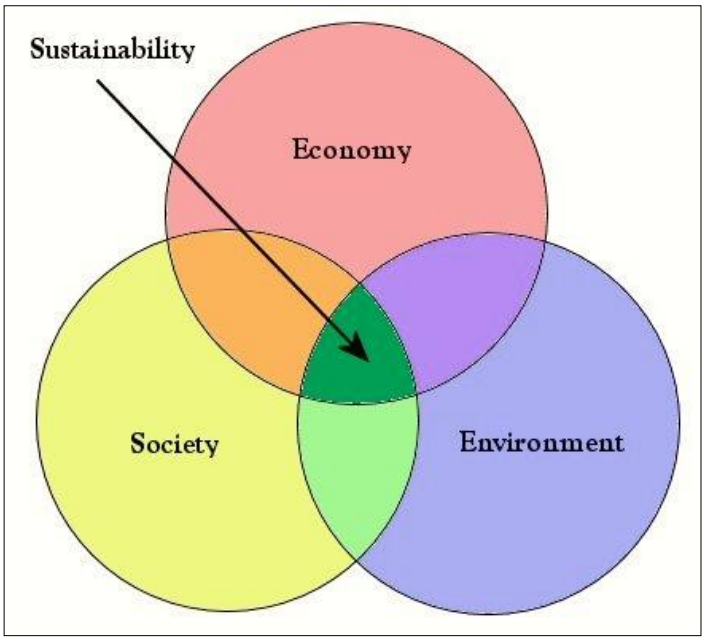


Figure 2.1: Dimensions of sustainability (Al-Zubaidi, 2007)

As it is seen in figure 2.1, Environmental sustainability, in collaboration with economic development and social organization are formed the constituents of sustainable growth aim at human wellbeing. As Hancock mentioned, a system that is not destructive of either the ecological web of life or the social web of life of which we are a part, and upon which we depend for our health, well being and quality of life. Thus, any discussion of socially sustainable communities must include a discussion of the physical design of the community and the economic system of the community. (Hancock, 1993)

2.2.1 Environmental dimensions

Environmental sustainability is a lasting conservation of environment constituents for future generations. It is the power to preserve the possibilities that are respected in the physical environment. Its purpose is to sustain: human existence, means that

the natural environment has to sustain the living conditions for people and other breed, dependence on renewable resources, and accepted quality of life for all people preserving live ability and advantage of the environment. (Vancouver City Council, 2005, P.4)

In another words, environmentally sustainable organization is based on avoiding the extreme use of natural resources. As Al-Zubaidi (2007) mentioned, this includes the preservation of bio diversity, achieving atmosphere balance, productivity of soil and other natural environment that are not related to economic resources. Environmentalists are inclined to emphasis on environment borders in tackling sustainable development problems. Environmental dimensional sustainable system in very simple words is a system in which consuming of resources is not in the way that Mother Nature can't produce and replace them. Therefore, sustainability refers to the restriction of consumption, population growth and pollution, and the defective way of manufacture such as wasting waters, destroying forests or the soil erosion from environmental point of view. (Al-Zubaidi 2007, P.35)

Likewise, Environmental sustainability refers to a condition of stability, resilience, an interconnectedness that lets human society to fulfill its requirements while neither passing the capacity of its supporting ecosystems to keep on to regenerate the services essential to encounter those needs nor by our deeds diminishing biological variety. (Morelli, 2011, P.23) However, environmental sustainability dimensions can be covered in these areas: resource and energy efficiency, site and environment conservation, indoor air quality, water treatment, and waste management. Attaining environmental sustainability needs sensibly balancing social development deeds

while keeping a well-balanced environment that predictably and frequently provides resources (Melnick; McNeely; Navarro; Schmidt-Traub, & Sears, 2005, P.1)

Consequently, environmental concerns are one of the factors that are very important in sustainability. We need to understand the limits of our environments in sustainable point of view, since the amount of natural resources in our planet is limited, so we should minimize our consumption. (Vanegas, Dubose.1995, P.3). To achieve environmental sustainability, we need considerable changes in the way of societies and people, and the procedures of manufacture and consumption.

2.2.2 Social dimensions

Social sustainability inspect multifaceted and complicated concerns and benefits, such as quality of life, wellbeing, fairness, livability and existence, all of which are essential to the long-lasting sustainability of societies. A kind of society is called socially sustainable when it achieves social equality, eliminates poverty, and delivers social facilities such as education, health and other for all members of the society. The social dimension of sustainable development is founded on the concept that man creates a significant means of development and its main goal that should attempt to achieve this idea for both present and future generations. (Vanegas, Dubose.1995, P.3)

Equally, The components of the social sustainability include primary needs such as adequate income and housing that should be prepared before developing capacity. It's contained individual human capacity or opportunity for learning and self-development; and social or community capacity for the development of community organizations, networks that foster interaction. Four guiding principals are

supporting the above components, they are: equity, social inclusion and interaction, security, and adaptability. (Vancouver City Council, 2005, P.4)

In this respect, Trevor Hancock (1993) in his argument about social sustainability development, suggests social sustainability dimensions as follows:

- Meets basic needs for food, shelter, education, work, income and safe living and working conditions; is equitable, ensuring that the benefits of development are distributed fairly across society;
- Enhances, or at least does not impair, the physical, mental and social well-being of the population; promotes education, creativity and the development of human potential for the whole population;
- Preserves society cultural and biological heritage, thus strengthening its sense of connectedness to its history and environment;
- Promotes conviviality, with people living together harmoniously and in mutual support of each other;" (Hancock, 1993)

Therefore, the main goal of social sustainability is living in suitable environment. It is mainly related to quality of life of human beings, which preserves the cultural identity of each society and, delivering stability for physical and spiritual needs of inhabitants. Social sustainable community stimulates empowerment of people abilities inside a community that enjoys security and fairness for all people.

2.2.3 Economical dimension

Sustainability from the economical point of view means supplying economic wellbeing for present and future generation, at the same time as consider to the "natural capital". It means the basis of the economic system is the natural resources

of economic value, such as plant, soil, animal fish, and bioenvironmental system such as air and water cleansing. Therefore, Economic Sustainability can be described as the capability of an economic organization to create a incessant and effective growth of its economical indicators Particularly, the capacity to generate incomes and occupation due to sustain the populations. (Vanegas, Dubose.1995, P.4)

In addition, economics is important for sustainability because of its rule as a social science that describes the production, distribution, consumption and services not just for gross national product, exchange rates, inflation, profit, etc. since the environment is the ultimate source of row material inputs, and the warehouse for discarded goods. The exchange of goods and services has a significant impact on it. (Vanegas, Dubose, 1995, P.4) It should be identified that, instead of the common historical pattern, increased economic growth doesn't include increasing utilization of natural environment. Economic growth needs to be in conflict with social needs or environmental protection. Social fairness and healthy environment are reinforced by economic development, and this shows the interrelated connection for these dimensions. (Oktay B, 2005, P.98)

In summary, environmental sustainability is related to energy efficiency and resource consumption, conservation of the environment, and waste management, in social point of view sustainability conflicts with preserving cultural identity and providing physical and emotional requirements of people in each society. Economically, sustainability is more connected with growth, development and declining resources' input and output. Since, the sustainability is an extensive theory, for clarifying the subject, the study will provide an explanation of the concept and

dimensions of sustainability in the built environment and its relation with traditional architecture and reuse of old buildings in following parts.

2.3 Sustainability in the built environment

Sustainability in the built environment mainly deals with about energy efficient buildings and reducing their damage on the environment. To reach these goals industries, homes, offices in each community must work with each other to become more sustainable. By protecting and restoring ecological systems and improving the welfare of people, sustainable development can improve the economic efficiency.

In the same way, Sarkis, Meade and Presley (2008) explained sustainability in the built environment as; "the built environment includes all buildings and living spaces that are created, or modified, by people. In addition to the buildings and spaces themselves, it also includes the infrastructural elements such as waste management, transportation and utility transmission systems put in place to serve this building space. When evaluating the built environment, it is important to take a broad view incorporating broader stakeholders and communities, beyond immediate investors or building users. The intergenerational aspect of sustainability is even more pertinent in the built environment since the structures are typically influencing the needs and requirements of future generations." (Sarkis, Meade, Presley 2008, P, 2)

Therefore as Edwards (2005) mentioned for achieving sustainability in this way the societies need to adopt a policy, which creates enhancement to living condition without damage the environment since the world's environments are under the big stress. Quality of life can be sustained, but only through the acceptance of the four R's- reduce, reuse, recycle, and recover. Ecologists have long supported the three

R’s, but the fourth one, “recover”, was added more lately because so much of the individual’s habitat needs to be recovered and repaired from contamination. (Edwards, 2005,P.135) In this respect, in the recent periods, “sustainable architecture” has arisen as a movement in architectural design towards the sustainability of the built environment.

2.3.1 Sustainability in architectural design

The concept of sustainability in architecture is related to a worldwide movement in direction of sustainability in all facets of life. The concept of sustainability in architecture is the act of constructing that helps the existence of humanity without damaging its environmental and cultural background. In general, it is a posture, a mental outlook, and acting reliably towards the context of existence. It is a concept that presents the social and cultural movement in the world order, forms and styles of living, a new way of thinking and looking at the world. (Mahgoub, 1997)

In other words, Eco-housing, sustainable design environmentally has many names and definition, but the Rocky Mountain Institute, in its "Primer on Sustainable Building", flexibly defines this new type of architecture as "taking less from the Earth and giving more to people. It can vary from energy efficiency and using harmless interior surfaces to being built of recycled materials and totally powered by sun. (Anthony.1999). Therefore, it can be clarified as an approach to architectural design, which can decrease resource consumption, use of natural energy, moderate environmental damages, and enhance human wellbeing.

In this respect, for achieving sustainability and conserving environment and resources, the Earth Pledge states about the critical role of architecture;

“Architecture presents a unique challenge in the field of sustainability. Construction projects typically consume large amounts of materials, produce tons of waste, and often involve weighing the preservation of buildings that have historical significance against the desire for the development of newer, more modern designs."(Al-Zubaidi, 2007,P.40) On the other hand, the Rocky Mountain Institute asserts sustainability in architecture as a conceptual component not just an architectural design or building shape, “Sustainable design is more of a philosophy of building than a prescriptive building style. Sustainable buildings do not have any particular look or style” (Sam C 2002, Available: http//www.arch.hku.hk/ research/BEER/sustain Last accessed: 20th March 2012)

For better understanding the concept of sustainability in architecture it is necessary to give a description a bout the definition and principals of sustainable architecture.

2.3.2 Meaning and goals of sustainable architecture

Architecture, which considers sustainability principles, defines the fact that we can only exist and generate with the accessibility of natural resources. As Kremers (1995) described, those resources are the basis of our world. It announces this fact to the world and, celebrates creation and availability of these resources. Therefore, environmentally, Sustainable architecture is defended as "the design and liable management of a healthy built environment founded on energy efficiency and environmental principles. Thus, sustainability aims to design buildings that have less impact on our environment, by using a minimum amount of energy and resources (Kermes, 1995.P.3).

Other definitions look to sustainable architecture within sustainability dimensions.

Sustainable architecture may be defined as “building practices, which strive for integral quality (including economic, social and environmental performance) in a very broad way. Thus, the rational use of natural resources and appropriate management of the building stock will contribute to save scarce resources, reducing energy consumption (energy conservation), and improving environmental quality”. (Sam C, 2002, Sustainable architecture, available at: http//www.arch.hku.hk/ research/BEER/sustain. Last accessed: 15th march 2012) Moreover, Sustainable architecture is a general term that defines environmentally conscious design methods in architecture. El feky defines the term sustainable architecture as: Sustainable architecture is bordered by the bigger discussion of sustainability and the pressing economic and political concerns of our world. In the comprehensive context, sustainable architecture pursues to minimize the negative environmental effect of buildings by enhancing efficiency and control in the use of materials, energy, and development space. (El feky, 2006, P.20)

Since sustainable architecture is frequently related to sustainable buildings, Due to the definition of Vittori "Sustainable buildings" are defined as: “those buildings that have minimum adverse impacts on the built and natural environment, in terms of the buildings themselves, their immediate surroundings and the broader regional and global setting. Sustainable design and building display the integration of materials and systems that, together, make the physical appearance of a building. The whole life cycle of building materials and products, as well as the building as a entire relative to its physical, ecological and human contexts on the local, regional and global scales, must be valued for environmental and health concerns.” (Vittori 2002,P.4)

In fact, the main goal of sustainable architecture is to make ideal connections between people and their environments. It purposes to find architectural solutions that guarantee the well-being and coexistence of human, built environment and natural environment (Kim & Rigdon, 1998, P.8). Particularly, Sustainable constructions should have the complete minimal effect on the local, regional, and global environments.

During existence of a building, it effects on the local and global environments through a set of interconnected human activities and natural procedures. To achieve the goal of sustainability design along building lifetime, three principles of sustainable architecture are suggested by Kim and Rigdon (1998):

Economy of Resources: is concerned with the reduction, reuse, and recycling of the natural resources that are input to a building.

Life Cycle Design: provides a methodology for analyzing the building process and its impact on the environment.

Human Design: focuses on the interactions between humans and the natural world.

(Kim and Rigdon 1998, P.9)

Kim (1998) explained these three principles as followings:

By economizing resources, the architect increases the use of renewable resources in the construction and process of buildings. There is a continuous movement of resources, natural and industrial, inside and outside of a building. This movement initiates with the production of building materials and lasts during the building's lifetime for creating an environment to sustain human well-being and activities.

After useful life of a building, it should recycle for other buildings. (Kim, 1998,P.9)

After that, life cycle design is the second principle of sustainable architecture. The formal model of the building life cycle is a straight procedure containing of four main phases: design, construction, operation and maintenance, and demolition**.** The problem is that: this model is defined narrowly: it does not express about environmental issues, which is related to the procurement and manufacturing of building materials or waste management that is a bout reuse and recycling of architectural resources. (Jong-Jin Kim, 1998,P.11)

Finally, the most important principle of sustainable architecture is human design. Whilst economy of resources and life cycle design conflict with efficiency and preservation, humane design is involve the livability of all components of the global environment. This principle results from having concern about improving the welfare and happiness for people and altruistic aim of regarding the life and dignity of fellow living organisms. Additional examination uncovers that this principle is intensely rooted in the need to preserve the chain elements of the environments that allow human survival. (Jong-Jin Kim, 1998,P.14)

Consequently, as it mentioned the main principals of sustainable architecture is mainly related to conservation and efficiency in the use of resources, recycling by recycle all waste, building from recycled and recyclable material. Rely principally on renewable resources, restoration by helping restore natural old inhabitant, create a home that is healthy for all with minimal impact on the environment. In this condition, it is necessary to conduct an investigation of sustainability and reuse,

conversion and recycle of excising sustainable structures.

2.3.3 Architectural reuse and sustainability

Architectural reuse processes cover adaptive reuse, conservative dismantling, and reusing saved materials. The process of altering a building's function to adapt the changing requirements of its users is called adaptive reuse. The three dimensions of sustainability: social, economic and environmental are all-integral to preservation, renewal and reuse of traditional buildings. Old structures conserve culture by respect to the people and occasions that built our communities. Their renewal creates opportunities for highly skilled occupations and job training thereby helping to our economy. In addition, their preservation saves tons of waste from the landfill making the reuse of an existing building the eventual form of recycling. Therefore, heritage conservation guarantees that our traditional buildings will be appreciated by future generations, and designing for future generations is what sustainability is all about.

There are other savings and financial returns with the reuse of old buildings. Due to the correlation between economical dimension of sustainable design and reuse Dunald Trump (2006) in his interview with preservation magazine mentioned: "I've always found that it's cheaper to use an existing structure. Now, doing so is more complicated, and you actually have to be a better builder to do that kind of work, but if you know what you're doing, it costs you less money." On the other hand, as cited it has social and environmental benefits. Culture and history are kept alive with preservation, and many methods and practices that can learn from those who came before us.

By changing the time, old buildings need to find new usages. In addition to the

considerable embodied energy in the material were used in construction of traditional buildings they are a part of our heritage. Furthermore, the energy that needs to refurbishment is noticeably less than that for replacement. So the principals of the sustainability such as reduce, reuse, recycle employs in the building and at the same time, every other aspect of resource's consumption is considered.

2.4 Traditional architecture

On of the primers conscious action of human being was building for sheltering. Pulhan (2002) defined traditional architecture, as the Basic structures without the important characteristic were the first built forms of human beings throughout the world. These settlements were built just to protect man from animals, climatic concerns and superstitious beliefs. The other consideration in primitive structure and building forms was the impact of natural environments. The lifestyle of people was different on that time through nomadic, agrarian and industrial societies and the function of places were varied for performing individual, social, and religious requirements and activities. (Pulhan, 2002, P.76)

As Rapoport (1969) stated, Traditional buildings that are mostly called primitive, vernacular, indigenous or anonymous are the artifacts of informal people traditions. Traditional houses clearly interpret the culture of assumed society; characterize their norms, ethics, images, routine and other facet of life. The characteristic features of Traditional dwelling are shaped by the socio-cultural environment, which covers worldview of the society shapes. The construction form of folk tradition remains as the manifestation of requirements and morals while it is reflecting the wish, thoughts and passion among the people. (Rapoport, 1969, P.2)

The purest definition of traditional or vernacular architecture is architecture without architect. It is the simple answer to specific people or society's buildings needs and it's achieved, since the individual and society it is in craft it. Poal Oliver (1997) in the encyclopedia of vernacular architecture defines the term as; vernacular architecture comprises the houses and all other buildings of the people that are usually built, by owner or community in respect with their environmental contexts by using available materials with traditional skills. Moreover, he adds that forms of this architecture are created to meet particular requirements. They contain the values, economies and the living condition of their culture. (Oliver, P 1997:xxii-xxiii)

Traditional architecture can be outlined as an architectural design technique concerning to a location that is formed by the ordinary people with locally available materials to address local requirements. Brunskill (2000) describes the traditional architecture as: "kind of building which is intentionally permanent rather than temporary, which is traditional rather than academic in its inspiration, which provides for the simple activities of ordinary people, their farms and their simple industrial enterprises, which is strongly related to place, especially through the use of local building materials, but which represents design and building with thought and feeling rather than in a base or strictly utilitarian manner" .(Brunskill 2000,P.22)

Lawrence (1987) points out that mercer states, Traditional houses are standard and reduplicated. They were formed according to the natural environment and modified to the geographical characteristic, topography and climate of the area and accessible material, physically and functionally. They also developed as a result of society's cultures, traditions, norms, beliefs, values, images, symbols, lifestyles, besides other

basic characteristic and environment aspects. (Mercer, 1975 in Lawrence 1987, P.16) As it is mentioned, Vernacular architecture tends to evolve over time in order to reflect the context of environment, cultural and historical context. It has often been dismissed as the crude and non-refined, but also has the promoters that highlight its importance in current design. As Croome (1990) mentioned, "the strength of vernacular architecture is that it blends buildings in to various setting so that there is a natural harmony between climate, architecture and people" (Croome, 1990)

One of the important characteristics of traditional architecture is; it is more functional than aesthetical. People created these buildings to fulfill their basic and fundamental requirements regarding to the availability of resources and climatic issues. As Oliver mentioned " the idea of vernacular has nothing to do with stylistics. It rather point to the universal ethos of constructing shelter under the scarcity of materials and operative constructional techniques" Similarly, Rapoport (1969) states that:" lack of theoretical or aesthetic; working with the site and micro climate; respect for the other people and their houses and hence for the total environment, man- made as well as natural; and working within an idiom with variations within a given order" (Rapoport, 1969, P.5).

In addition, Constructors of traditional houses were not artist, designer or architect. They were expert craftsman work within an idiom with differences in an outline that is modified with social requirements in different ways. Both house form and materials are used in houses is known by the builder and the house owners. The form of buildings was simple and there was a direct answer to requirements and changes create the foundation of traditional structures (Pulhan, 2002,P.79). As Glassie (2000)

states that: “all architects are born in to architectural environments that condition their notion of beauty and bodily comfort and social propriety before they have been burdened with knowledge about architecture, their eyes have seen, their fingers have touched, their minds have inquired in to the wholeness of their scenes. They have begun collecting scraps of experience without regard to the segregation of facts by logical class. Released from the hug of pleasure and nature, they have toddled in to space, learning to dowel, to feel at home. Those first acts of occupation deposit a core of connection in the memory.”(Henry Glassie, 2000,P.17).

Accordingly, traditional architecture is a simple but practical architecture of common people that developed concerning to the nature, site, socio-cultural and economic aspects aligned to the existent technology. Due to these characteristics, traditional buildings seem inherently sustainable. Therefore, next part will illuminate the sustainable features of the issue.

2.4.1 Sustainability in traditional architecture

When human beings were living in caves and enjoying the welfare of stable temperature and natural ventilation with nothing-environmental effects, we have been refining our resources use for providing better shelter. This refinement has happened inside sustainable principals till very lately in human history, because it was reliant on available material and techniques. It means because of the limitation, solutions had to be; efficient, work with the nature, and available resources, rather than altering and influencing them (Battle& McCarthy, 2001,P.15).

Sustainability is obvious in traditional societies and in their lifestyles. Environment was the base of living, therefore precursors did not use sustainability as an attitude

for living; they accomplished the belief in their daily life. They lived, refined, ate, and built sustainably. Contact with local environment and using natural supplies were part of their existence on earth. Hassan Fethy considers architecture as the natural result of the daily life of the society that shaped it. He mentioned, "Traditional architecture is engaged with extinction due to the connotation that it is part of the old way of life*"* (Fethy, 1973,P.35). The envelope of the traditional structures is an effective obstacle against the worst climatic matters. It makes a filtering those altars the climate sufficiently for the interior environment to be more satisfactory. (Collier, 1995,P.52) The main purpose of the traditional building envelope is to prevent the transmission of heat, reflecting sun emission as much as possible, reduce the effect of heat and solar and make cool condition in interior spaces and decrease the extreme solar gain (Giovani, 1998,P.120).

Regarding to the social and environmental sustainability, traditional settlements nourished and expanded according to society needs and inhabitant's desires within available resources and ambient environment. Furthermore, they tasted the construction methods over time till their methods near the faultlessness and are fitted to the climatic, aesthetic, functional and sociocultural requirements. Because the structures are designed tend to the needs of the people will be using it and it was perfectly adapted to their needs and requests (Nickladd, 2003,P.1).

Traditional house design philosophy is founded on achieving two policies: privacy and protection. These two strategies affected the house layout, spatial organization, and architectural details Flexible and adoptable design is another characteristic of the traditional buildings. Building which delivers freedom of choice and is simply

adoptive to changing requirements and wishes of the folks over time is sustainable. One of other sustainable features of traditional houses is the passive cooling system. Traditional architecture used to create the comfortable indoor climate through evaporative cooling by natural ventilation. Traditional houses are positioned with respect to prevailing wind. Blank facades are placed to protection the outdoor living spaces from the warm winds while letting suitable winter daylight to enter the living areas. Wind motion and moisture also are two important things that should be considered concurrently with the direct and indirect effects of the sun. (Tommy Kleiven, 2003)

Other important issues that exist in traditional architecture are the simple methods that they used for creating the structures due to the users wants and building's location. As a matter of fact, this method seems unimportant today, but they are really effective since they tested over time to fulfill society's needs. These buildings are perfect because, they increase the local knowledge of how buildings can be efficiently planned as well as how to successfully use local materials and resources. (Nickladd, 2003,P.2) in this respect, Oliver states that; "Building materials selected from natural resources available to different cultures to build their houses can be examined as to the structural properties of materials selected, and the methods employed in using them for construction. They may also be considered in terms of their climatic suitability and performance, and means by which cultures have utilized their thermal properties, or have devised methods or structures to modify climate". (Oliver, 2003, P.133)

From economical point of view, historic buildings were usually designed to

maximize ventilation, heat efficiency, and natural lighting. Proper maintenance of existing systems and utilization of design features such as operable windows, awnings, and shutters, and it can help cut energy costs. Along the same manner, a building's orientation and surroundings, like trees and other structures, can have a dramatic effect on its heating and cooling needs, a concept that was not lost on yesterday's architects. (WBDG, 2010) Besides, the tradition of user participation in building process is socially and economically sustainable, since it offers motivation to the self-help labor and imposes and identify the energies and resources that already exist in the skill and determination of people, it can bring affordability and home ownership for the most of people.

According to Rappaport, the house has to fulfill social requirements (social sustainability), affordable to all people (economical sustainability), and provide livable indoor environment along building life cycle (environmental sustainability). If we apply these objectives to any house, we conclude that for the house to be successful it has to be a model of sustainability. In conclusion, the traditional buildings have many environmental, economical and social advantages. Therefore, we can consider it sustainable. Traditional architecture has achieved:

- Environmental sustainability, by employing natural and local materials, utilizing passive cooling & heating tactics using renewable energy and natural ventilation, flexible and adaptable design.
- Social sustainability, by designing and building structures adjusting to the user needs and satisfaction with owner participation.
- Economical sustainability, by energy efficiency, proper maintenances, natural heating and cooling that cut energy cost, affordability and job creating by owner

participation.

Consider to these characteristics of traditional houses and its flexibility to adapt to new requirements, desire and living conditions, it is vital to deliberate formulation to reuse them again.

2.4.2 Reuse of traditional buildings and sustainability

All traditional buildings, big or small, complex or simple, have an influence on quality of life by telling about past and adding visual concern to the environment. Old buildings have historical importance because they mirror the lives and achievements of our ancestors. Touchable elements that represent significance by association with particular events or persons, the interior and exterior both should be preserved as far as possible. Architectural reuse procedures involve adaptive reuse, conservative disassembly, and reusing recovered materials. This meaning is comprehensive and inclusive allowing many diverse analyses; but the fundamental objective is that architectural reuse is understood as an evolutionary method happening over time. (UMICH, 2007) Practically, destruction is not the real "time of death" for a building. Many of them happened because a building's aesthetic frailties are seen as barriers to shifting or renewing its function. It may look more environmental to develop from a fresh slate, without the difficulty of retrofitting if embodied energy is unnoticed.

As it mentioned before, traditional buildings are built from local materials that are hardly used in the majority of constructions created today. While political, social and economic history has influenced the plan, quality and layout of our built environment, the main difference between old buildings and new-build is consequent of the fact that labor was quite cheap in the past, and the transportation of materials

was difficult and expensive in comparison to today. Much of the practice of building in the past is now considered as craftsmanship experienced by relatively few professional contractors. With the exception of large commercial and public projects, contemporary building is generally standardized in its use of resources, which are usually shipped over long distances. Therefore, reuse of existing structure leads us to sustainability in all of aspects: environmental, social and economical.

Building reuse and historic preservation are exceptionally well-matched principles. They create sustainable, lively places to live, work and play when used together. Preservation-based community growth uses current historic resources– the older and traditional built environment at its principle– to enhance the quality of life for inhabitants of all income levels. By conserving traditional buildings, we forge links with past communities and strengthen our sense of community currently. Heritage conservation is a sustainable practice characteristically, and by conserving remaining buildings, we will support the communities of the future generation with the knowledge and experiences of past communities.

There are a number of advantages associated with the reuse of an old building. The benefits of reusing historic buildings instead of construction of new ones are often discussed in terms of environment, economic, culture, and design values. Reuse of these existing structures plays a significant role in sustainable architecture of each community. Maintain and reuse traditional buildings for the communities can attain long-term benefits.

From environmental and economical point of view, one of the main advantages of

reusing buildings is to maintain the original building's embodied energy. The CSIRO describes embodied energy as the consumed energy in all the processes related to the construction of a structure, from the gaining of natural resources to product transfer. The buildings embodied energy is preserved by reusing them, and ecologically; it is much more sustainable, versus building new structure. Once reusing materials, instead of making new goods from row materials, there are fewer burdens on the economy. Reuse is an economical way for people of all socio-economic loops to obtain the substances they need.

Considering the cultural values, building reuse can reestablish and keep the importance heritage of a building when done well, and help to guarantee its existence. Instead of falling into shabbiness through carelessness or being rendered unrecognizable, traditional buildings that are considerately recovered can continue to be used and respected. (Kerr, 2004) Besides, all old buildings, large or small, complex or simple, contribute to our quality of life by notifying us of our past and adding visual attraction to the place. Old buildings have historical significance since they reflect the living condition and achievements of our ancestors with touchable elements that represent importance of them by association with particular events or people. (Dennis Urquhart, 2007,P.15)

Therefore, one of the first steps in sustainable development is historic preservation. As it mentioned, benefits of reusing traditional buildings as the economic, cultural, and environmental are undeniable, and the expenses often are less than estimated. Besides of the notable decrease in building costs and waste and recycling existing structures, many of traditional buildings have energy saving features in their original

designs. Furthermore, they were built from inexpensive and durable material than the contemporary buildings. As Carl Elefante one of the well-known preservation architecture stated that: “we cannot build our way to sustainability; we must conserve our way to it” (WBDG, 2010)

Eventually, these Buildings can be used for many diverse tasks and are simply adaptable to be converted to many other uses or to be adjusted to current lifestyle. By using them again in contrast to demolishing and constructing new ones, we can put less pressure on the environmental and energy resources. Since the Cyprus is one of the historical countries with fine examples of traditional buildings it would be practical to investigate the traditional architecture of the island. In this respect, the study carries out an exploration of the region’s architecture and its sustainable characteristic, for the purpose of reusing them another time.

2.5 Traditional architecture and sustainability in Cyprus

Cyprus is the third largest island in the Mediterranean Sea. Cyprus is situated at the middle of three continents, Europe, Asia and Africa. Cyprus is approximately 100 kilometers west of Syria, 370 kilometers north of Egypt and 70 kilometers south of Turkey. The island has the mediterranean climate with warm and dry summers and mild wet winters. (Figure 2.2)

Figure 2.2: Location of the Cyprus in the Mediterranean Basin (URL1)

Cyprus has a long history as one of the oldest settlements for man. It contains two districts: The Girne mountain range and part of the Mesaoria valley that sweeps between Girne mountains in the north and the Trodos mountains in the southwest. The climate of the island is semi arid, with hot dry summers and cool wet winter. (Oliver 1997,P.1553)

Cyprus has unique identity for it's great culture. It located on historic junction of business, and culture routs in the eastern part of the Mediterranean Sea. The island

has special strategic importance and was the main controller of the region. The island has changed its leader several times, in the past. The most significant civilization that had the strong impact on the island is the Byzantines, Lusignans, Venetians, ottomans and British until 1974 war. After war, the island was separated into two parts; north Cyprus, that is Turkish part and south Cyprus, which is Greek part (Oktay, 2006). As Pulhan and Numan (2005) stated that "This cultural complexity can be identified in the islands natural and built environment. The island of palm, pine, orange, and wine yards, ancient olive and carob groves, are the reflections of an agricultural tradition whilst the tower of a gothic cathedral, minaret of an ottoman mosque and bastion of a venetian fortification are the outstanding artifacts of an architectural tradition."(Pulhan, Numan, 2005, P.162)

2.5.1 Traditional architecture of Cyprus

Multicultural character has the vital impact on traditional built environment of the island, especially in urban sectors. In addition to the inner dynamics, external factors played significant role in formation of the multicultural identity. The immigrants with diverse cultural backgrounds affect the creation of the multicultural foundation of the Cypriot culture. This attribute of the island have caused by cultural accumulation in certain time. Cultural supremacy of the dominating rulers and immigrants was exactly stated with the wide interchange in the built environment. Egyptian, Hellenistic, Roman, Islamic, Byzantine, Gothic, Renaissance, Ottoman Turkish and British colonial styles were the main influences that affected the architectural formation of the island. (Dinçyürek 2002)

Vernacular Cypriot architecture is hard to describe. It reflects the different way of living of its residents and the accessibility of the re- sources of each district. The

diversity of topography on the island reproduces a variety of requirements, building materials and building shape. Furthermore, the experienced local constructors and their loyalty to tradition, blended with the ability to obtain and adapt foreign cultural preferences are mirrored in the variation of dwellings shaped on the island. (Despina, 2010,P.30)

The variances is seen concerning house and gardens, the number of the floors, the height of the ceilings, the dimensions, sizes, and shape of the voids, the existence of semi-open living spaces on the first floor, the significance of the structure corners and decorations between rural and urban areas. As Pulhan (2002) mentioned: The definition and performance of architecture are different in urban and rural areas of Cyprus. In architectural development of the island rural and urban settlements were under the assorted impact of common rules and specific differentiation. Architectural structure of the rural and urban areas is developed separately through the history. Consequently, architecture of the island is studied in two areas rural and urban settlements. The geographical, topographical, climatic, parameters and accessibility of building's material is the same in both regions. The main difference is in the built form of both fields. (Pulhan, 2002,P.85)

AS The differences like; properties, relation between house and garden, the number of floors, the dimensions, formation of voids, the open spaces and semi-open spaces, exist between in urban and rural areas. Courtyards are located in back of the buildings in urban areas, but in rural district residences with front garden are seen. The height and number of floors of buildings, that is more in the urban areas than the village are one of the other differences. The formation of the semi-open living spaces

on the first floor of the buildings in town is much more important than rural areas. The bigger dimension of voids (door and windows) with the stone frame windows and foldable shutters is seen in urban areas than rural ones. The design emphasis on the corners of the houses, which smoothed or curved with aesthetical configuration, is the other considerable fact. The interior and exterior spaces and its decoration are different due to the religion, culture, tradition, social status and richness of the owner, especially in urban areas. . (Dinçyürek 2002,P.103-105)

The economic social and historical condition of different periods affected the architecture of the island. The social, economic and historical situations of the different period affect the both urban and rural architecture of the island. In this respect, the forms and shapes, sizes and dimensions, and also location and orientation of the building's units are shaped due to the environment, climate, and socio-cultural and economic features. (Dinçyürek 2002,P.106) As Dincyurek (2002) stated ”Rural vernacular forms were developed according to the response of the agrarian lifestyle, available local buildings materials and climatic conditions. In spite of religious, ethnical and regional (or local) differences, and agrarian way of life and economical production have been the primary determinates of shared rural traditions and consequent rural vernacular architecture of the island”. (Dinçyürek 2002,P.101)

Ateshin describes the residential architecture in the urban sectors of the island as: In urban quarters adobe and stone have always used together in the traditional buildings, they have used plaster for coating adobe internally as well as externally. Exterior walls were typically built totally in stone and the windows and doors usually lined with a molded stone frame. The external shutters directly were added to

stone frame windows, through the use of iron hinge fitting, and stonewalls were covered by plaster as well. Construction of the walls was different in external and internal spaces, in interior areas they have used mortar or smaller pieces of stone that would become due to the dressing of stones. In urban regions courtyards were comparatively small and located at the back of the house away from the road. A regional distinctive feature in Cyprus, as in Turkey, is the extension of the living space at the second floor level by an extending oriel in to the street. This usually had further treatment in the form of supporting timber bracket beams and woodwork shades to provide privacy for internal spaces. (Ateshin, 1997,P1554) Due to the Ateshin's opinion on the usage of stone and adobe in traditional architecture of the island, the use of timber in traditional architecture of urban areas can be seen.

In conclusion, as it stated different types of traditional building with disparate parameters due to the different location can be seen in Cyprus in urban and rural. However, all of houses are shaped according to the location, climate, locally available material, socio-cultural factors and economic features. Since the sustainability is mainly depended on physical environment's design, the following part is assigned to the details of sustainable features in Cypriot settlements to illustrate the importance of maintenance and reuse of the existing structures.

2.5.2 Sustainable Dimensions of Traditional Architecture of Cyprus

For centuries, the people of Cyprus have formed their living spaces consciously or unconsciously under the environmental factors, economical and socio-cultural concerns. Oliver states that; **"**The house became the center of Cypriot's life. In the house, all social activities took place. The people entertained each other from one house to another within a climate of social equality, which made the house not just a

shelter but a more vital space connecting and joining the Cypriot with his settlement"(Oliver, 1997,P.1554).

In Cyprus, construction procedure evolved naturally from the climatic circumstances, the family needs and the social structure. Therefore, environmental and cultural consideration has the important role in traditional architecture of Cyprus. Environmental features such as the wind movements, its directions, humidity, rain, sun path and resulting heat or cold play an important role in formation of architecture responding to its environment. In addition, there are the physical features and natural resources such as the site, topography, soil type, flora and fauna, and building materials available in the ambient environment. As it stated environmentally sustainable building has to take these factors in account: site conservation, resource efficiency, energy efficiency, environment conservation, and indoors air quality. As previously discussed in social sustainability includes several dimensions as quality of life, satiability, safety, equity, accessibility, and cultural identity.

Consider to the site planning, it was very important to integrate the building with its surrounding. All the conditions were respected includes; views, landscape, land, existing neighboring. Besides, the building's design has assisted to sustain and improve the existing building of the site. In addition, integration of all building spaces - enclosed spaces, semi-open spaces, and open spaces was important. Besides, the building orientation was very important for planning any site in a traditional in Cyprus. The position of the sun was determined as well as the direction of the prevailing winds. (Oktay, 2005)

Organic urban planning is characterized the traditional areas in the Cyprus. Privacy and ventilation were important influences in the layout of the houses. In order to understand the sustainable logic of Cypriot traditional architecture the series of spatial spaces includes closed semi-open and open spaces should be identified. Instead of semi-close space and open space, which used for all of the daily activities closed space were specifically utilized for specific requirements like privacy and protection from difficult environmental condition. There are vital architectural characteristics, and they display the natural approach of passive solar design that helped in the climatic formation of the Cypriot house.

Semi opens space or sundurme, which acts, as transitional space is one of main components of the traditional houses of Cyprus. Sundurme is a multi propose space using for a variety of domestic deeds. Sundurme typically described with the series of stone columns or arcades, which is structural elements, on the ground floor and with woodwork screens and timber columns at the upper floor. It is mainly; represent the mainstay of the spatial organization in both rural and urban houses of the island as it socially and environmentally implies the heart of family life. Furthermore, sundurme has the climatic advantages, which can control thermal comfort of the indoor spaces. It protects the interior spaces from rain, wind, and strong emissions of the sun. (Pulhan, Numan, 2005) Figure 2.3 shows the different types of sundurme.

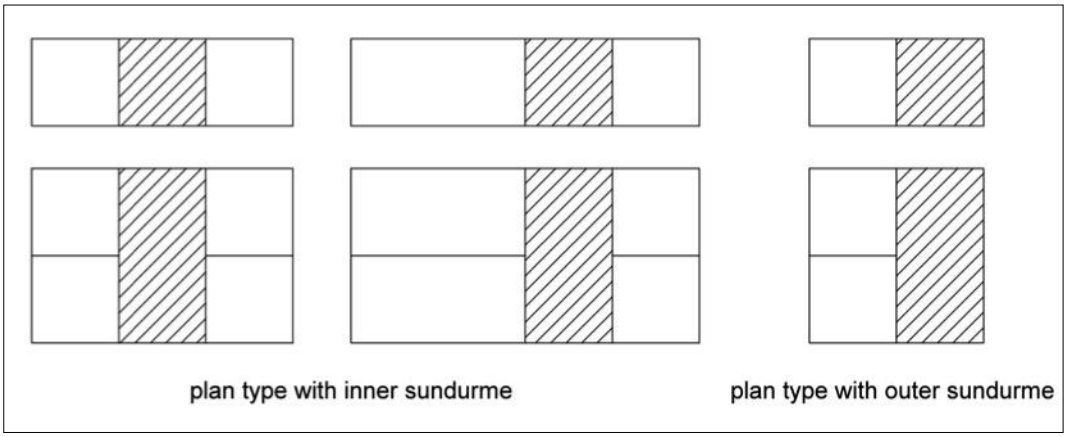


Figure 2.3: Different plan type with sundurme (Pulhan, 2002)

In the Mediterranean countries and the districts, which have hot climates, the sunlight is suitable in the winter while in the summertime, the cooling and ventilation is necessary. In this situation, the solarium and the courtyard are vital solar features of houses, distinctive elements of local architecture. Open space or havli (courtyard) is a large and private outdoor space bounded from all sides. Certain social and environmental factors played significant role in havli-oriented space organization. It was a place of gathering for the variety of social cases, besides most of the domestic actions was held in the courtyard, and the large area of the havli was kept for gardening. In addition, it was providing ventilation and lighting of the house, and gathering rainwater for its additional usage in the household, plant and fountains were regularly added to moderate the heat. (Pulhan 2008) In this respect, Oliver mentioned the agrarian base of the village economy entitled for a courtyard as part of the house design. This is also appropriate form for a hot dry climate. A transitional space was created to the north of the courtyard in form of arched veranda (Sundurme) between the yard and the house. This providing shade to the livable room in summer and enabled the penetration of sunshine in winter. (Oliver 1997 p.1554) Figure 2.4 shows climatic and spatial transition between outdoor and indoor

spaces.

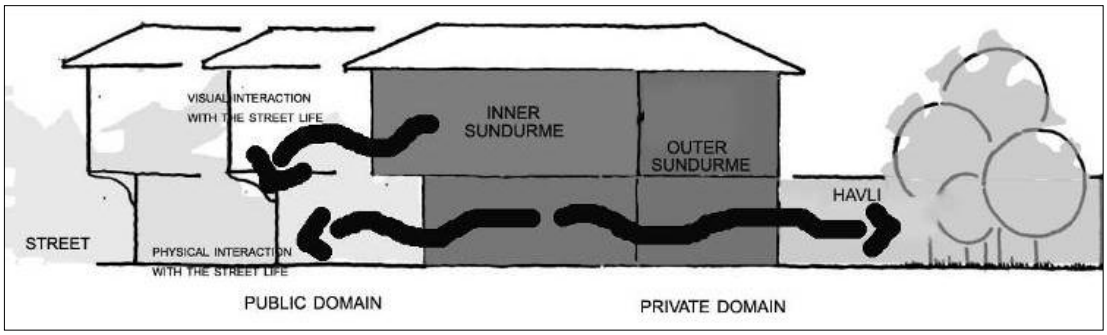


Figure2.4. (Pulhan, 2002)

Traditional houses in Cyprus were built of natural sustainable materials and renewable energy resources; they did not release any Carbon dioxide or pollutants. They were sustainable and friendly to environment because they were energy efficiency, which is an important feature in making a building material environmentally sustainable. As Dinçyürek mentioned, in most of the traditional buildings is much knowledge in the technique of building, and for the most sections, the keys discovered and employed are both creative and economic. Craftsman built traditional houses by using traditional techniques and systems and shared the same methods and values in each part of the building. Also, the reuse or addition to the existing buildings was usual in urban areas, and each building was expressed by distinctive characteristic. So it can be seen, the double purpose or the culturally amassed residence in harmony with surrounding. (Dinçyürek, 2002)

Simple construction methods were used to build traditional houses, easy to implement and manipulate; they were adhered to the needs of the society and climate. Stonewalls were thick with very low thermal conductivity. Walls average thickness was of 3o-40cm to get use of the time lag of a thick masonry wall. Time

lag for natural masonry materials is about 12 hours that delays the heat transference of maximum temperature of the outside air until the evening, when the outside temperature is low and comfortable and the outdoor spaces are adequate to be used. On the other, hand user participation was one of the sustainable things in traditional architecture of Cyprus, which, builders designed and constructed, in a particular organic method with the assistance of the owner and their craftsmen. Hand crafted building and the ornament was the other consideration in traditional dowelling, these special elements were simple, distinctive and beautiful helped to build a memorable structure with a local identity. Also, ornament was an essential part of a house, and its represented patterns from Cypriot life and environment. (Pontikis, 2000,139-141)

Consequently, the houses are designed and built to fully feet to the climatic conditions and are illustrated by:

- Considering the right orientation of the building to avoid direct emission of sun penetrating the building, or the opposite.
- Utilizing breeze for ventilation and cross ventilation in the interior spaces.
- The consciousness and use of the nature of vegetation and its use for useful functions.
- A suitable protection with walls (40-50cm width), and roofs, Small openings on the exterior walls for maximum insulation.

2.6 Findings and Discussions

This chapter first, has investigated sustainability as a concept through discussion of its definitions, dimensions, principles and its relation to historic preservation, reuse and conversion as following:

- Sustainability became the most common term used all over the world reflecting world's concerns about coming generations' future on Earth.
- Resources depletion, population growth, climate change, greenhouse gases, and environment pollution, economical growth, and human well-being are the main issues of sustainability
- Sustainable architecture may play a crucial role in achieving sustainability. Sustainability is not all about energy conservation, renewable resources, or building materials. Sustainability is a life style, a way of living and society cultural identity.
- The three dimensions of sustainability: social, economic and environmental are all-integral to the preserve, rehabilitation and reuse of old buildings.

Second, identified the traditional architecture, and its response to sustainability and environmental issued, and the advantages of reusing and recycling them as follows:

- On architectural design level, traditional architecture achieved environmental sustainability, through utilizing natural indigenous materials, depending on passive cooling & heating strategies using renewable energy and natural ventilation.
- These buildings can be used for many diverse tasks and are simply adaptable to be converted to many other uses or to be adjusted to current lifestyle.
- Using these building again in contrast to demolishing and constructing new ones, may put less pressure on the environmental and energy resources.

Finally, classified traditional architecture of Cyprus and sustainable characteristic of

Cypriot traditional building

- Traditional architecture of the island is the product of multi-cultural interaction. Different types of traditional building with desperate parameters due to the different location can be seen in Cyprus in urban and rural.
- Natural environment, available resources, and social & cultural values were the major conditioning factors in the formation of traditional architecture in the Cyprus.
- Traditional houses in Cyprus utilized natural resources to create comfortable indoor environment. Indoor environment was healthy depending on natural ventilation and sustainable building materials

Chapter 3

ANALYSIS OF THE ENVIRONMENTAL AND SOCIAL SUSTAINABILITY IN REUSED TRADITIONAL HOUSES IN WALLED CITY OF FAMAGUSTA

In this study, environmental and social sustainability are analyzed in reused traditional houses in walled city of Famagusta. This chapter is divided in to two parts. The first part provides materials about history and architecture of Famagusta, and in the second part five houses, which are caring traditional, characteristic and adapted to contemporary lifestyle are focused in order to illustrate the potential capacity of these houses to be sustainable and achieve the goals of sustainability.

3.1 The architecture of Famagusta

Famagusta is the second largest city in northern Cyprus and the third in Cyprus. The town is located at the eastern part of the Mesarya. The Turkish name of Famagusta is Gazimağusa, which means unconquered Magosa. The town of Famagusta date back to the 2000BC and its settlements has called Alasia. The others regions like Salamis, Arisone and Constantia were built later. Famagusta is the best example of the medieval architecture in the eastern mediterranean that was under influence of variety of cultures.

Seven particular periods does exist in the history of Famagusta:

1. The foundation of city (from 648 to 1192AD)
2. Lusignans (from 1192 to 1489)

3. Venetian (1489 to 1571)
4. Ottoman (1571 to 1878)
5. First and second British periods (1878 to 1960)
6. Republic of Cyprus (1960 to 1974)
7. After 1974

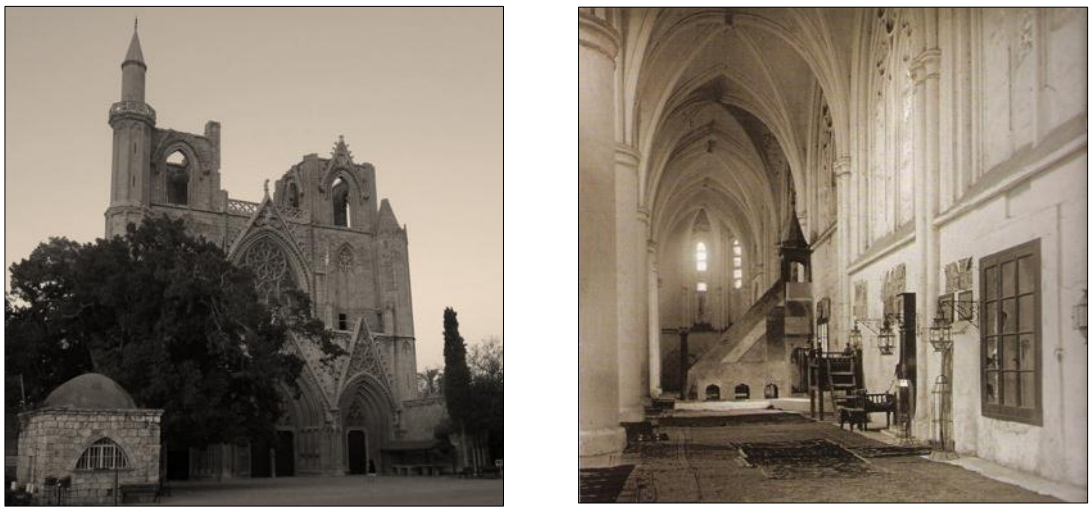


Figure 3.1. St. Nicholas (Lala Mustafa Pasha Mosque)(Fehmi Tuncel,2000)

Lusignan period (1192-1489): in this period the rich Lusignan family ruled Cyprus. During this period the population of the town started to increase and it developed as an independent town. On that time societies believed that the number of churches in one city could measure people's wealth. Therefore, they built verity of churches through this era. More than three hundred churches were constructed in Lusignan period however only some of them survived until today. The St Nicholas cathedral (Lala Mustafa Pasha Mosque) is the most important and largest medieval building, which has remained from 1300 AD until today. In addition it is the significant landmark of the town and is located in the main square. (Figur3.1)

Venetians (1489 to 1571): the capital of Cyprus transformed from Nicosia to Famagusta in this period. Venetian governed whole Cyprus from Famagusta for 82 years and it was unhappy time for Cyprus as well as Famagusta. Trade weakened, land owners abandoned their property, the schools closed and as a consequence the national wealth quickly reduced (Gunnies, 1973)

Figure 3.2. The façade of Venetian palace and Venetian house (Author, 2012)

Many of Venetian buildings were built from salamis ruins. They dragged many guarantee columns and parts of statue to decorate the houses of rich people in Famagusta. Only about three significant buildings of Venetian periods can be seen today in Famagusta. The Venetian place opposite the St Nicholas cathedral in the main square is one of them and just the grand façade of it is remain until these days. There are three roman style arches witch enhance by four columns. There are several cannon balls and pieces of a granite column inside the courtyard. The other one is the doorway of Venetian house. The stones arrangement in the arcs shows the renaissance style witch is seen in Florence and Italian city. (Figure3.2) The other important building is named Queen House, as they believed that the last queen of Cyprus "Caterina Cornaro" lived here in 1489. This house is one the few domestic building that has remained from Venetian period. (Figure3.3)

Figure 3.3. The Queen house (Author, 2012)

Ottoman (1571 to 1878): All Cyprus was under Turkish rule from 1571 until 1878. The Turkish name of Famagusta is Gazimağusa, which means unconquered Magosa because the Greeks never interned old town of Famagusta from 1571 until today. Only Turks and Jews were permitted to inhabit inside the walled city of Famagusta and the Greeks were lived in Varosha. In Ottoman Period, Famagusta lost its urban and financial importance and all commercial activities were shifted to Larnaca. Since non-Islamic populations were not allowed to inhibit inside the walled city, the town began to develop in other sides. Changes in social and cultural life had a major influence on the architectural and physical environment of the town. Due to the culture and traditions of new inhabitants existing buildings were changed.

The urban pattern of venation period was kept but some additional parts and changes made in order to their cultural needs and desire. In addition the cathedral was changed to a Mosque named Lala Mustafa Pasha, the bazaar and market place were developed, baths and fountains were built due to people's daily needs. There were a few two-story houses witch was belonged to wealthy people and the common houses were one story. They used traditional building methods with local available construction materials. The town was particularly low densely populated with vacant

areas and few kitchen gardens, date palms and fig trees. Turkish coffee shops, bazaar and market places surrounded the main square of the town. (Figure3.4)


Figure3.5. A view of the walled city and its main square (National Geographic, 1875)

British period (1878 to 1960): In this period Famagusta turned to important harbor town again. The urban environment of Famagusta was reshaped because of the rapid development of tourism. The impact of British Architecture in the form, detail and the material used. They did not in line with the traditional pattern of ottoman and Venetian periods. They build their buildings on the empty pilots or the place of demolished buildings due to the course the traditional street organization shows differences. They built detached houses except row ones. But the storage buildings that located near the harbor are important elements of British period and they still have great importance in urban pattern of the walled city. (Figure 3.4)


Figure3.6. The storage buildings and a British house (National Geographic, 1957)

Republic of Cyprus (1960 to 1974): In this period, Famagusta became one of the world's best towns in the world as an entertainment and tourist center. The architecture of the city was reflecting the characteristics of British Colonial's buildings as well as contemporary architecture. But the modern buildings were mainly outside the walled city and inhabited by Greeks. The architecture of town in this period has reflected a desire to merge history and modernism.

In 1974, the island was separated in two parts because of the conflict between communities. Turkish Cypriots occupied the northern regions and Greeks settled in southern parts. However the walled city still preserves its traditional characteristic but unfortunately the area faced with some problems of deterioration and decline. The new developments are not in harmony with traditional identity, form, scale and proportion and the lack of attention is seen in preserving the old buildings. (Figure3.7)

Figure 3.7. Walled city of Famagusta (Author, 2012)

The table below shows the development of the urban pattern of Famagusta during the ages.

Table 3.1.development of the urban pattern of Famagusta

Lusignan period	Many churches was built, construction of walls were in progress.
Venetians period	Construction of walls were completed, the considerable building was venetian palace, Venetian house and Biddulph's Gate.
Ottoman period	The urban patterns of the walled city influenced by Islamic culture, building constructed in order to fulfill desire of Islamic culture like medrese, bath, fountains, St. Nicholas church converted to the Mosque, Greeks were forbidden to live in walled city.
British Periods	The town became important again, the town was enlarged outside the walled city, storage buildings were built near the port, detached house with British style were built in vacant lots.
Republic of Cyprus	The town became one of the best entertainment centers in the world.
Today	The traditional characteristic was still preserved but some problems and declines are seen.

Accordingly, it can be argued that the walled town of Famagusta is a cultural heritage site of international importance that is survived through the history. People can pleasure in the streets lined with cafes, historical buildings, churches, and the Ottoman mosques and connect to nature and history at the same time by walking aligned the sea. Figure 3.2 shows the most important places, which left footprint in the history of the walled town. At the same time table 3.3 illustrate the architectural richness in the walled town by pointing out the important buildings with certain stylistic expressions.

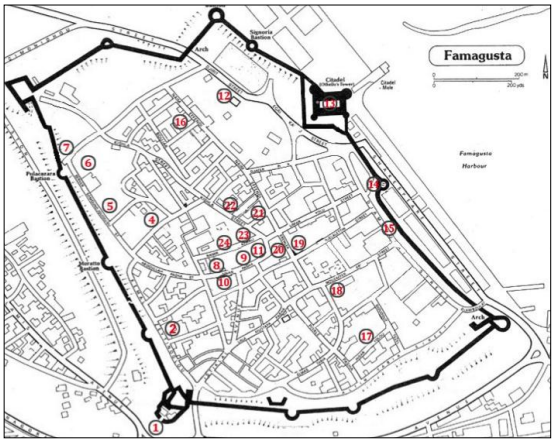
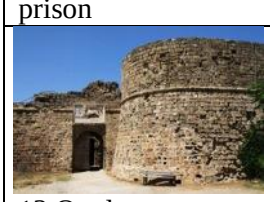
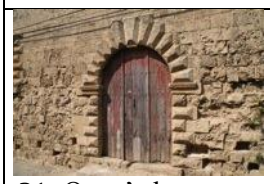


Figure 3.8. The location of significant places in walled town of Famagusta

Table 3.2 Architectural richness in the walled town of Famagusta

 1.landgate	 2.scarlet bath	 3.dry fountain	 4.nestorian church
 5.St. Anne church	 6.Tanners Mosque	 7.carmelite church	 8.Ventian palace
 9.Nmik Kemal prison	 10.St. Peter & Paol church	 11.cafar pasa funtain	 12.St. George church
 13.Ottelo tower	 14.sea gate	 15.St.Antony Hosp	 16.kertikli bath
 17. St. Zoni church	 18.St. Symeon church	 19. St. Nicholas church	 20.Namik Kemal square
 21. Qeen's hous	 22.Twin churches	 23.Cafer Pasa bath	 24.Fransican Church

3.1.1 Housing in the walled city of Famagusta

Residential district is mainly located on the south direction of the walled town. Residential buildings are dominated the district but there are some shops and offices as well. The street pattern and the urban fabric of walled city Famagusta define a high dense, organization of houses with similar characteristics. The urban pattern, narrow and irregularly organized streets are lined with houses of one or two story.

The plan organization of open, semi-open and closed spaces of the residential units together with their façade designs represent the social life-style of the residents due to climatic as well as cultural factors.

Housing in this district covers one or two stories houses mostly with direct access to the street. They typically have very small inner courtyards with a number of internal rooms, which open directly into the courtyard. In fact, there is no other private outdoor space in general, the street space is used as an extension to the houses and seen as public outdoor rooms. (Önal, Oktay, 1998)

3.2 Selected case studies in the walled city of Famagusta

The physical condition of the houses in walled city is generally poor, and they have poor facades in this area. However there are houses, which are considered as a cultural/historical heritage value, environmental comfort and sustainable materials. They are re-owned, re-paired and reuse with the new expectations of their users. The chosen case studies represent the most common design of traditional houses in Cyprus.

3.2.1 Selected cases and analysis methodology

As it is mentioned before, five houses of this kind of houses were chosen randomly. Objectives for choosing case studies depended on: condition, position, and sustainable features. All of cases are located near important historical buildings or the center of the walled city. These cases will analyze in the following parts with the illuminations of the issues discussed in the previous sections.

For this research, field survey and observation were essential in deciding objectives of choosing the cases studies and aspects of analysis. Direct observation, images,

measurements, sketches were crucial in conducting the spatial analysis for the chosen case studies, and interview with owners. A set of questions has been answered in these interviews such as: Which space's functions are changed after renovation? What kinds of spaces are added to the building with which purposes? Is there any use of contemporary material? As it is important to understand the level of cultural sustainability, the changes in the user profile also have been answered. It is thought that there might be certain indifferences between the buildings, which are inherited by the family members and the others.

The data analysis is divides in to following category for each house:

General information: includes location, house type, and construction date, identity and social status of the owner, and site layout.

Space organization: contain internal spaces zoning and areas; close spaces, semi close spaces and open spaces according to the privacy and advantages before and after renewal, addition and extensions.

Building materials and techniques: includes information about original and new materials.

Environmental control: covers information around the way of heating and cooling system (natural or artificial)

Finally, the comparative evaluation of the cases and different dimension of sustainability in them will be given in the end of this chapter.

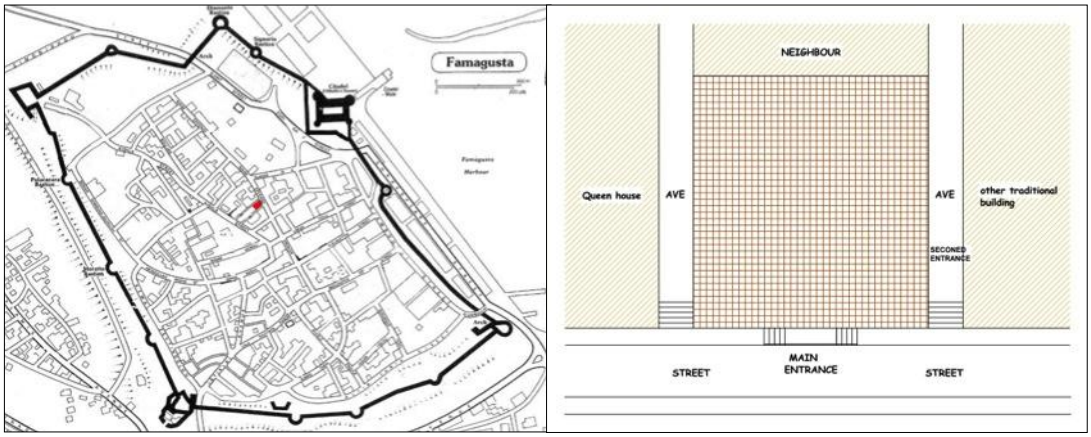
3.2.2 Study of the cases

3.2.2.1 Case No.1

Figure 3.9: Fehmi Tuncel house, Famagusta current and old situation (Fehmi Tuncel Archive, 1956)

General information:

Case one, which is named, as Fehmi Tuncel house is located in Nami Efendi Street in walled city of Famagusta. (Figure 3.10) The house was built over hundred years ago during ottoman periods. The current owners of the house are Fehmi Tuncel a Cypriot dentist and her daughter who is a psychologist. He has inherited the building from his family. He has three brothers, and he is the last one. Because he was interested in old stuff and loved his childhood house decided to buy others portion and bring the old house to the life again to keep his good memories alive. On the other hand, he has known neighborhood and people nearby finely, so it was a great opportunity to start his carrier in this place. Therefore, he renewed just two rooms initially. After years he renovated whole building and recently attached a new part for his daughter as her office to the building.



Location of the building Site plan (Author, 2012)

Figure 3.10. Location and site plan of the house

As it seen in site plan, three side of the building are open and it acts as a unique house, which is detached in a row of attached houses. The building has direct access from the street and the second one is situated on narrow alley by the building. (Figure3.11) Two narrow alleys have surrounded the house and prevent the building from direct sun emission during the day. All planning and design features were based upon sun protection and natural ventilation.

Figure3.11 The entrances of the house (Author, 2012)

As it is mentioned previously, a fine example of Lusignan building is called "queen's place", a house witch has Italian renaissance style is located in this street on the left side of the building. Many people believed that the last Lusignan queen of Cyprus Caterina Cornaro has lived in this place in 1489. In addition, an old vacant house in situated on the right side. (Figure 3.12)

Figure3.12. The Queen house and the old vacant building (Author, 2012)

In 1964 during renovation of the queen house three steps has found under ground, which showed all of the houses in this street had built on other structures. (Figure3.13) Therefore, they dug the entire street and three steps were added to all houses.

Figure 3.13.Digging process 1964 (National Geographic, 1964)

Space organization

The original plan of the house was consisting of; two rooms, one hall (sundurme), one kitchen, on bathroom and a big courtyard. The house has the plan type with inner sundurme and internal courtyard. (Figure 3.15) Privacy and natural ventilation had important influences in the layout of these kinds of houses. As it mentioned before a properly planned courtyard house offers best answer to meet most of the house standards environmentally and socially as well as climatically and functionally. The hall (sundurme) performed as a transitional covered semi open space between the completely open sunny courtyard and the closed inner spaces moderating the transition from very bright to dark.it also acted as a transition between individual living units and the courtyard. The sundurme protected the internal spaces from hot summer sun, and yet maintain the inner spaces warmth during the winter. In addition, it has used for several daily domestic activities. The following picture (Figure 3.14) shows the mother of the owner who has been a tailor is working in sundurme.

Figure 3.14.The owner's mother in sundurme(Fehmi Tuncel,1970)

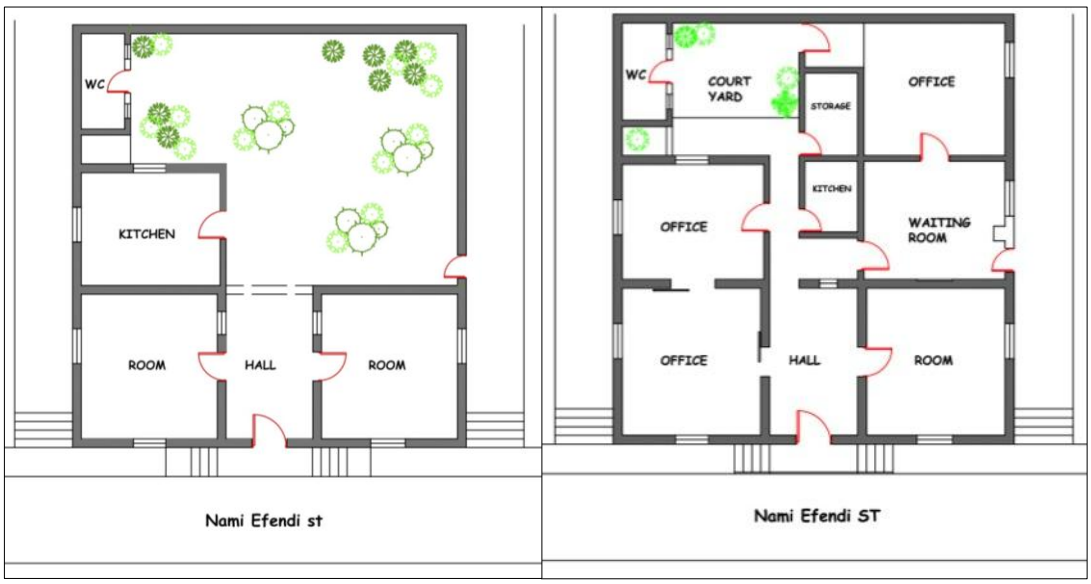


Figure 3.15. The original and adapted plan of the house (Author, 2012)

After renewal some parts were added to the original plan due to the owner's desire and requirements. The function of the other sections have completely changed and adapted to contemporary needs.one of the rooms and the kitchen have changed in to the office, and the hall (sundurme) is used as the dentist waiting room today. In addition, recently the owner has added another part to the main structure for his daughter that is newly graduated in psychology for the office purpose. The addition sector is attached to the building from right side instead of a part of courtyard. Since the house has second access from the courtyard it was simply adaptable to built two diverse offices with separate entrances. The small kitchen and storage were built for both workplaces as well.

The old part of the house, which, belongs to the Fehmi Tuncel somehow kept its traditional sprit. The places were totally renovated but you can feel the traditional sense from its atmosphere yet; old pictures that are hanging in waiting room, several old stuff that have remained from the past. (Figure3.16)

figure 3.16. The waiting room (Author, 2012)

Moreover, he preserved the old pictures of family and their stuffs in the other room. This room was belonged to him and his brothers formerly. He remembers there were four beds and they have studied here together when he was a child and he has lots of memories here, so it's extremely precious for him. As it is mentioned before the right room and the kitchen are dedicated to the offices. These two rooms are joined each other with a door between them, but they also have the separate entrances. (Figure3.17)

The left room with old stuffs The office

Figure 3.17. The rooms in old part (Author, 2012)

The addition part is completely different from the old part. The entire space was built in modern way in order to request of the owner's daughter who is a young girl. This part is consisted of one office and one waiting room. (Figure3.18)

Several symbols are seen from the past in this area, which somehow connected these two parts to each other. For instance, the door of entrance, which has remained from previous structure and a part of the waiting room's, wall that shows the stonewall between old and new sections. (Figure3.19)

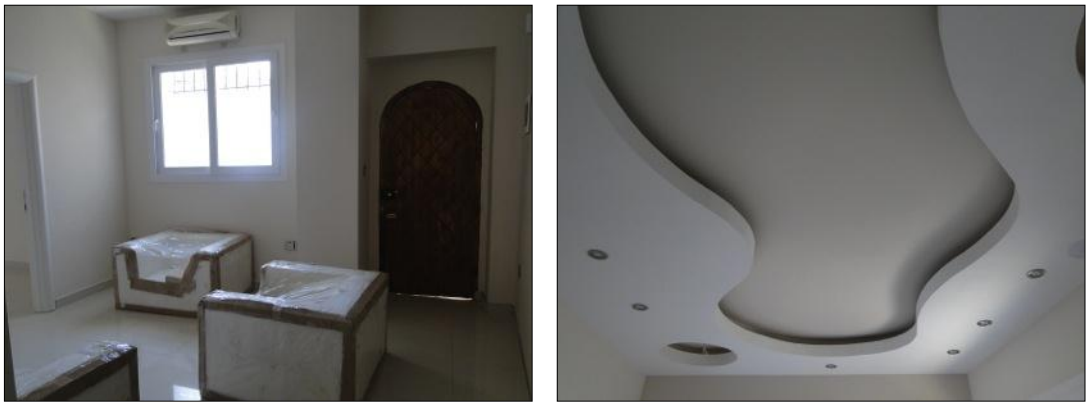


Figure 3.18. The waiting room and its ceiling (Author, 2012)

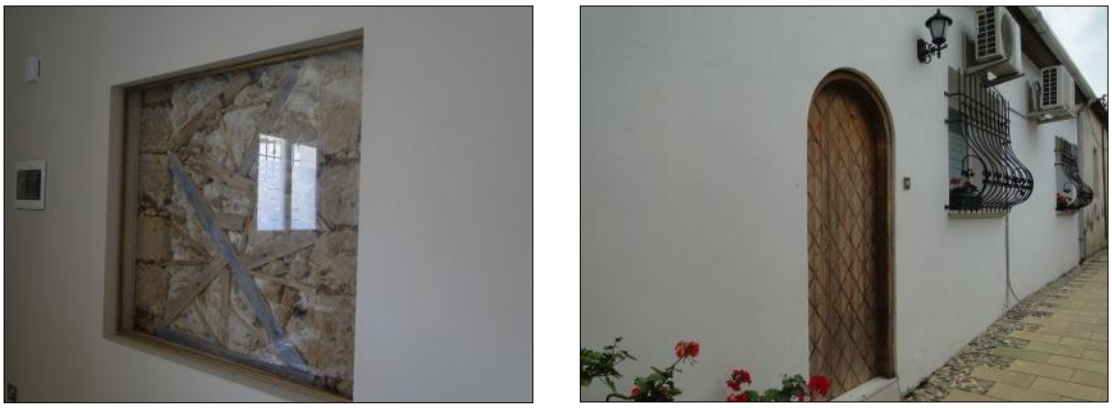


Figure 3.19. The old symbols (Author, 2012)

The courtyard of the house is situated on back of the building. It was bigger before and has been used for many activities like cooking, playing, gardening and etc. After renovation and constructing additional parts it became smaller and lost its main function. However, but of the offices have opening to the courtyard and providing better lightening and air quality for those spaces. The bathroom and storage are in this area as well. (Figure3.20)

Figure 3.20. Courtyard of the house (Author, 2012)

Building materials and techniques:

The owner of the house believes that this house was built from the stones, which had remained from Venetian ruins. Stone is the sustainable local material that has used in construction of this building and had covered with layer of lime in the past. The thickness of the wall is 30-40 Cms; therefore, thermal conductivity is reduced between outside and interior areas. The double layer roof was made of timber and has been acted as a great insulation during hot summer and cold winter. The openings (doors and windows) were wooden. The window shutters were constructed for controlling light and heat. (Figure 3.21)

Figure 3.21. The old material of the house (National Geographic, 1964)

After renewal, stonewalls were preserved, and the rehabilitation is done according to the original character. The masonry walls were covered with plaster, and the aluminum material replaced the original wooden windows. The roof of the building still is double layer and just the material was changed and its original shape is conserved without damaging the character of the building. The additional part was built of concrete with flat roof, but it is in harmony with the old structure. The new windows were built without shutter with irony bars. (Figure 3.22)

Figure 3.22: The new materials (Author, 2012)

Environmental control:

Natural ventilation was essential for the houses in Cyprus therefore the selected house like every traditional building in this area has been used only natural ventilation before renovation. Thick walls with small openings have protected the house against heat transferring. Likewise courtyard with its vegetation and sundurme as the thermal regulator has played an essential role in creating natural ventilation inside the house through different hours of the day. The owner remembers that the only heating source of the house was a small heater in the past.

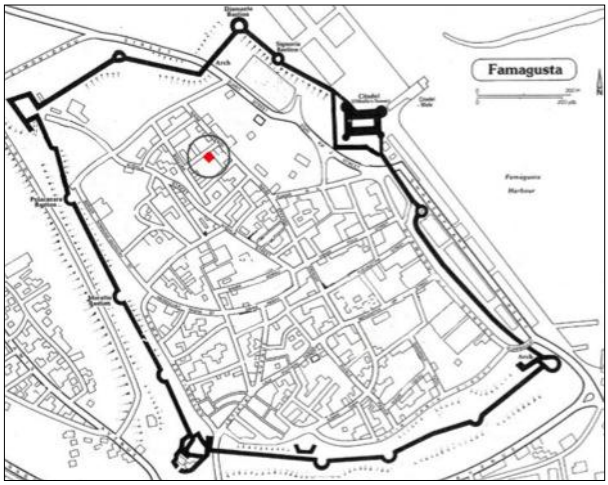
Three air conditioner machines were installed to increase climatic comfort in the building after revitalizing. Two of them are in the additional part and the other one is in the dentist office. The natural ventilation system is used in old part most of the time yet, because of the natural materials, thickness of the walls, construction system, and the courtyard.

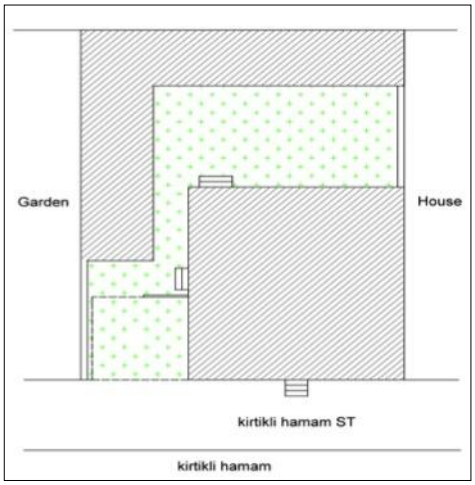
3.2.2.2 Case No.2

Figure 3.23: Helen Ferguson house, Famagusta current and old situation (Author, 2012, Ferguson, 2009)

General information:

The second house is located in “Kertikli Hamam” street in walled city of Famagusta. (Figure 3.24.) The owner of the building is Helen Ferguson a British former teacher; she used to teach art and language. She has been lived in Cyprus long time ago when she was young and had lots of good memories from those days. Then she went to the France for a job offer and was living there until four years ago, when she planed to come back to the Cyprus again. She loves old city of Famagusta, therefore, she decided to buy and old house in this neighborhood and design it her own way. Then she found the pointed house, which is situated in the calm area of the walled city and bought it.





Location of the building Site plan (Author, 2012)

Figure3.24. The location and site plan

As it is seen in the site plan, the building has direct access from the street. The house surrounded by other houses from north and west sides and a garden is situated in the east wing. In addition it is next to the Kertikli bath that is 16th century bathhouse, and was built by the ottomans on the foundation of medieval structure. It is a ruin now, but its six domes have still remained. (Figure 3.25)

She named the house “phoenix” that is the mythical scared firebird with the colorful plumage. It has a 500 to 1000 year life-cycle, near the end of which it builds itself a nest of twigs that then ignites; both nest and bird burn fiercely and are reduced to ashes, from which a new, young phoenix or phoenix egg arises, reborn anew to live again.in her idea, she has brought a precious old house from its ashes into life again. (Figure 3.26)

Figure 3.25. The Kertikli Bath

Figure3.26. The phoenix house (Author, 2012)

Space organization:

In the original plan of the house the main structure was consisted of a hall (sundurme) and two rooms like typical plan of traditional houses in Cyprus. The kitchen and bathroom was in the outside of the building in a corner of the courtyard. In addition there was the other room in the yard that seems had been a place for keeping animals before. The owner tells " when I bought this house it was a real disaster, but I could have imagined its image after revitalization. It was motivating since I intended to do this in appropriate way as much as possible." Figure 3.28 shows two views of the house before renewal.

Figure 3.28. The façade of the house from the courtyard and the stable (Author, 2012)

The following figure shows the original and adapted plan of the house.

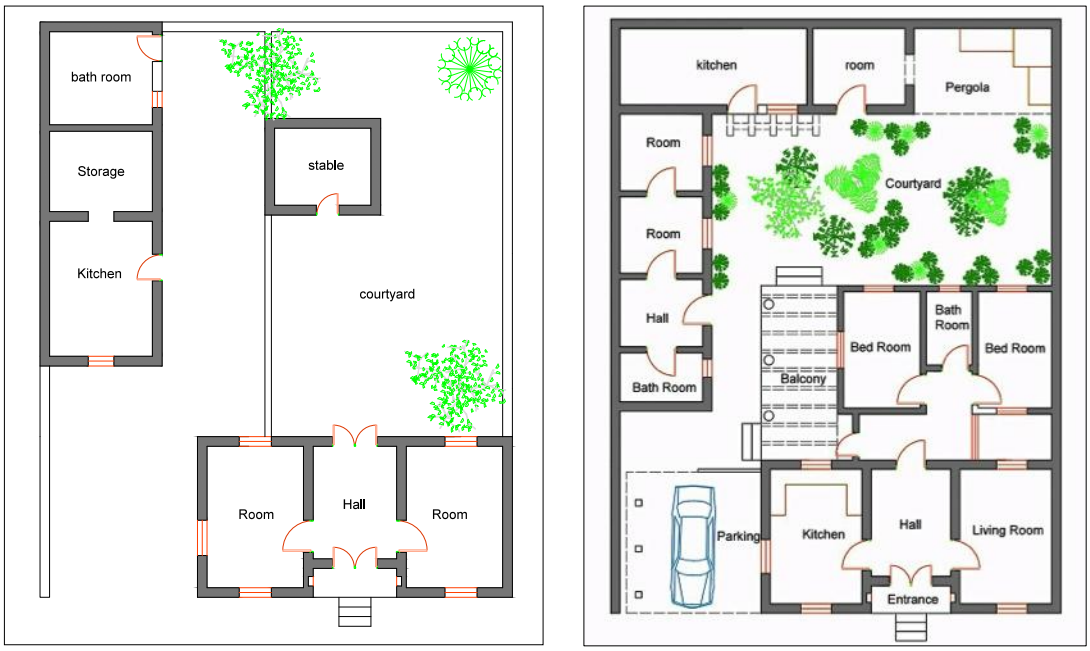


Figure3.29: Original and adapted plan of the house (Author, 2012)

She planed to keep the main structure as it was before and enhance it with some supplemental parts in order to adapt the house with her needs and desires. Therefore, the left room was converted to the kitchen (figure3.30), and the other one turned into the living room. A corridor was attached to the hall (sundurme) as a transitional space between main structure and additional parts. Two bedrooms and a bathroom were built around the additional corridor. (Figure31)

Figure 3.30. The kitchen before and after renewal (Author, 2012. Ferguson, 2009)

Figure 3.31: A view of corridor, bathroom and one bedroom (Author, 2012)

In addition, a big balcony was attached to the house from the left side and uses for variety of functions such as sitting, receiving guest and etc. Besides the balcony has a pleasant view to the green courtyard which has made it more enjoyable. (Figure 3.32)

Figure3.32: The balcony and its view to the courtyard (Author, 2012)

The courtyard of Ferguson house was and empty lot and completely had lost its original function and appearance before renovation with some damaged spaces around it. (Figure 3.33) Since the courtyard is a significant private open space in

traditional houses, therefore it is one of the important parts that need a proper consideration during revitalization.it is used for multiple purposes; such as assisting the natural ventilation, doing daily activities, relaxing and etc.

The old kitchen and bathroom inside the courtyard were changed in to the guesthouse beside the main structure. This house is consisted of a hall, a bathroom and two bedrooms, which are aligned through a line on the left side of the building. (Figure 3.34) In addition, another kitchen was built for the new construction parts in the left corner of the courtyard.

Figure 3.33, A view of the courtyard

Figure 3.34. The kitchen and bathroom in the yard before and after renewal (Fergusen, 2009)

The most interesting part of the house is a room like a pergola that is situated in right side of the courtyard in Ferguson house. The owner has designed as a relaxing area, which has a nice view to the courtyard. (Figure 3.35) Furthermore, sometimes she uses this place for painting. In addition, and storage was built by pergola for keeping outdoor stuffs.

The heart of the courtyard was covered by a garden with vegetation. It has truly designed in a proper way; the veggies the colors and all of the features have the sense of a traditional space in a modern way. (Figure 3.36)

Figure 3.35. The corner of the courtyard before and after renewal (Ferguson, 2009)

Figure 3.36. The courtyard after renewal (Author, 2012)

Building materials and techniques:

The main material of the original walls of the main structure is stone that had covered with the mixture of lime and water. The openings were wooden originally, and the flat roof was made of timber and reeds. Since the main structure has preserved the original stonewalls has remained and has covered with plaster. The windows and doors were replaced with new ones just the wooden door of the entrance was repaired and conserved. The front windows covered by exterior wooden shutters to prevent interior spaces from direct emission of the sun. (Figure 3.37) The additional spaces were built from concrete, which is a new and easy to use material.

Figure3.37: The old door, door of entrance and exterior shutter (Author, 2012)

Environmental control:

In Ferguson house as the other stone buildings, thick stonewall construction makes a level of protection with the exterior resulting in controlled and slow transfer of heat to the indoor spaces. Likewise the small size of the windows in main structure and multi layer roof contribute to the natural ventilation. Therefore the old part

completely ventilates naturally, and there is just one air conditioner in one bedroom in the additional part of the house. Besides, the courtyard with its vegetation has an important rule in circulations of the air inside the house.

3.2.2.3 Case No.3

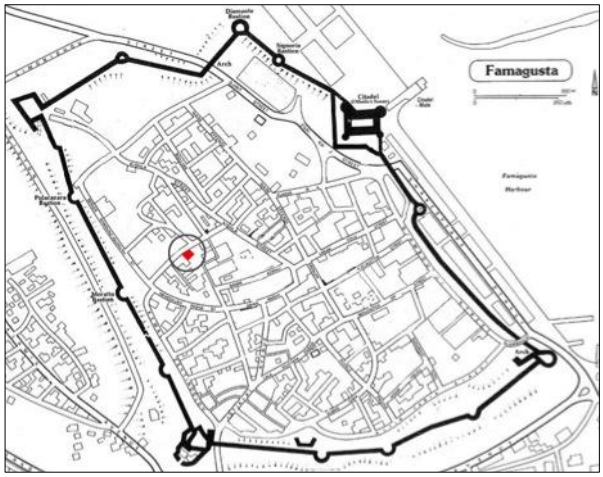

Figure 3.38: Bilgi house, walled city of Famagusta current location (Author, 2012)

General information:

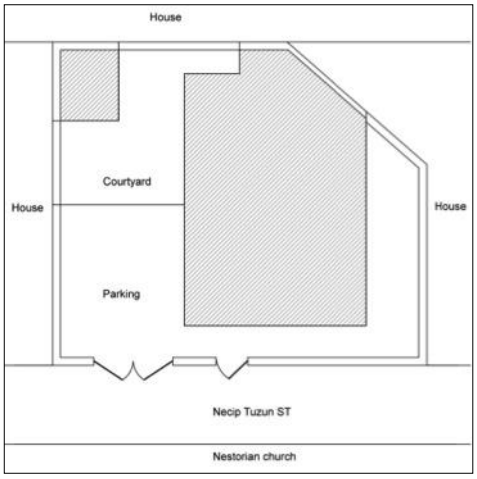
The Bilgi Fevzigulo house is situated in Necip Tuzun Street in walled city of Famagusta. This house belongs to Bilgi Fevzigulo, who is a young Turkish-Cypriot engineer. He has inherited the building from his grandmother that was living here around 70 years ago. It was an empty house until three years ago, when the owner chose it as his living place and decided to renovate the building. He used to lives in his parent's house. In his idea, it was much more resalable to renovate this aged structure instead of buying new one. On the other hand he is interested in woodwork and likes the old houses, and the pointed house was potent to be reused a gain. It is situated next to the Nestorian church, which was built in 14th century. (Figure 3.38)

Figure 3.39:Nestorian churches(Author, 2012)

Figure 3.40 shows the situation of the building in the walled city and the site plan of the house.



Location of the building



Site plan (Author, 2012)

Space organization:

It was a small house therefore the original plan of the house has had two rooms, one small kitchen (figure 3), and a toilet in a corner of the courtyard. It is a detached house, which is surrounded with a courtyard and has an indirect access through the front garden from the street. During renewal, the small kitchen converted to the office and a big one was attached to the back of the building. In addition, a bathroom was built inside the house. The old toilet was turned into the storage and a part of the courtyard was dedicated to the parking space to adapt to the current needs of the owner. (Figure 3.41)

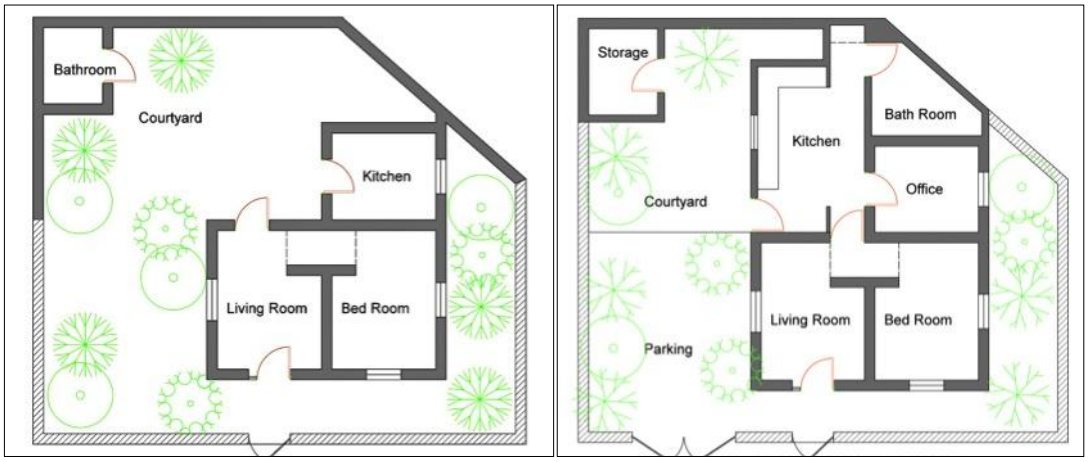
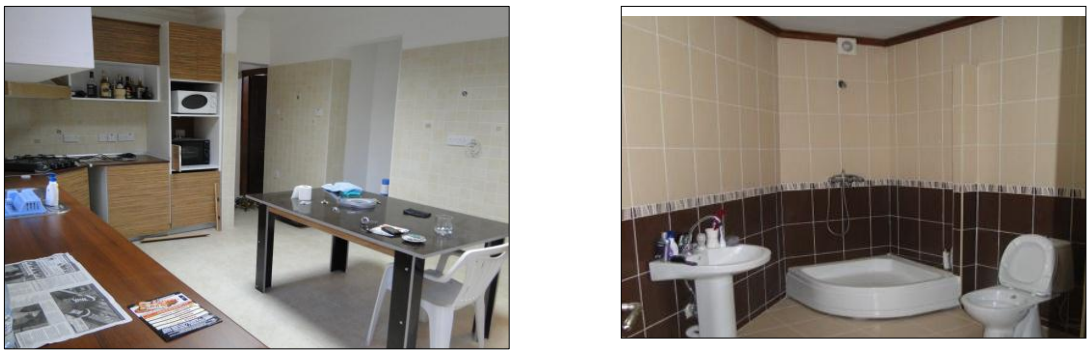


Figure 3.41: Original and adapted plan of the house (Author, 2012)

The new additions of the house were built in modern way but they are in harmony with the old parts. One of the rooms uses as the living area and the other one is a bedroom. (Figure 3.41) The extensions have joined to the house through a corridor between bedroom and living area.

Living room and the bedroom (Author, 2012)



New kitchen and bathroom (Author, 2012)

The courtyard of the house is very functional for the owner, not just an area for siting, relaxing and pleasuring, but also is used as the workshop for his wood works. He can easily put his working stuff in the storage that situated in a corner of the yard. (Figure3.44)

Figure3.44. A view of the courtyard and the storage (Author, 2012)

Building materials and techniques

The original structure was build of stone with timber roof similar previous cases. The doors and windows were wooden with stone frame (figure 3.45).

Figure3.4 5. The original door of the entrance and windows frame (Author, 2012)

The extensions were built from concrete with stone clad. Windows are replaced but the original wooden appearance is preserved. The roof was repaired and enhanced with isolation layers. Since the owner interested in woodworks, getting inspired by the old door of the entrance he made the new one. (Figure3.46)

Figure3.45. The new door (Author, 2012)

Environmental control:

The Bilgi house is completely ventilated naturally. The stone structure with thick walls, small size of the openings and the courtyard with its vegetation support the natural ventilation of the building. On the other hand, it is a detached house within a courtyard, and there is no building around the house the position of the openings creates a fine air circulation inside the house.

3.2.2.4 Case No.4

Figure 3.47: Ibrahim Isikel house, current situation, walled city in Famagusta. (Author, 2012)

General information

The case no4 is situated in Piale Pasha Street in walled city in Famagusta. The house belongs to Ibrahim Isikel and his wife who are the Cypriot couple. They inherited the building from the wife's family. They used to live in London until two years ago, when Ibrahim got retired and they decided to comeback to their country and live here for the rest of their lives. Since their daughter is an architect they asked her to renovate the building. In addition, they are a big family (three children and five grand children) and they spend many times together. However, the house did not have enough space, therefore they bought the neighbor's house, which was vacant and attached it to the main structure for their own convenience.

The building has two indirect entrances through the front garden from the street. The main access opens to the hall and the second one is the courtyard's entry. In fact, firstly there was one entrance the secondary was built after adding new part to the house. The house surrounded by other building from two sides, and there is an empty lot on the right wing. (Figure 3.48)

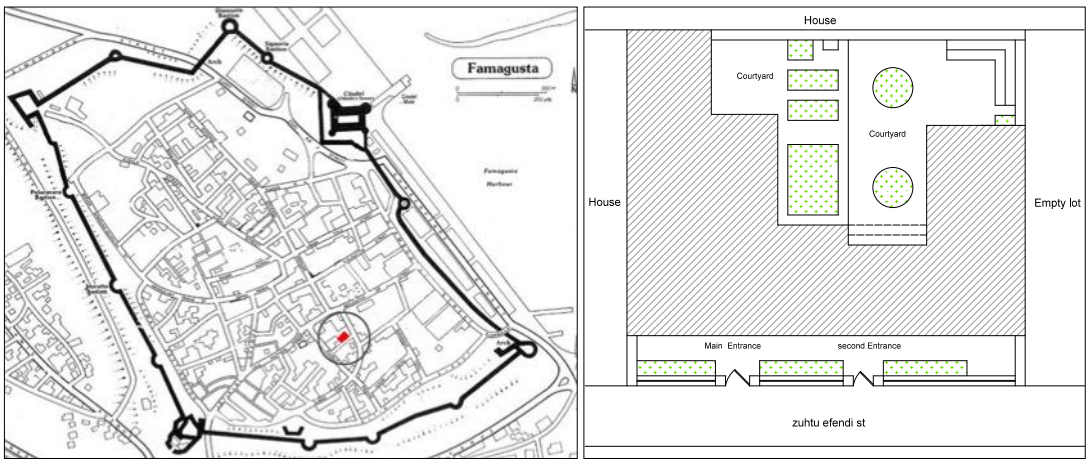


Figure 3.48. The location of the building Site plan (Author, 2012)

3.6.2. Space organization:

The house spaces originally were consisted of; two rooms with inner hall (sundurme), one kitchen, dinning room, a bathroom and a small courtyard. After renewal, the main structure is conserved and as it mentioned before the vacant house by the building is added to the original plan. Figure 3.49 shows the original and adapted plan of the house. The following parts will explain the changes in detail.

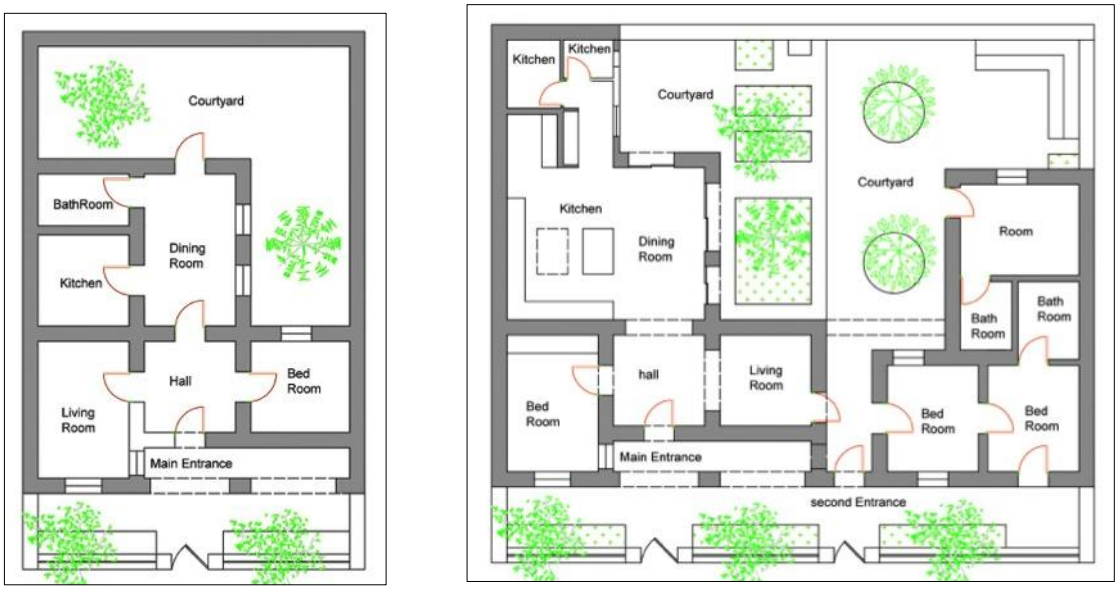


Figure 3.49. The original and adapted plan of the house (Author, 2012)

During renovation, the door of the bedroom was taken off and a fine arch was built instead. Besides, the bedroom was transformed to the lovely siting area.in addition this living room has the other door to a corridor of second entrance, which directly goes to the courtyard. On the other hand the old living area was altered to a big bedroom room with a appropriate closet space. (Figure 3.50)


Figure3.50 The living room and the bedroom (Author, 2012)

The hall (sundurme) is still has its function, but the door of the place similarly replace by the stone frame arch to the dining area. The walls of the kitchen were taken off and the old bathroom was destroyed and added to the kitchen. (Figure3.51) The new bathrooms and a laundry area were built beside kitchen in a part of the courtyard. In addition, the large railing glass doors replaced the old small windows. (Figure3.52)


Figure 3.51. The sundurme and dinning room (Author, 2012)

Figure 3.52. The kitchen and laundry area (Author, 2012)

The attached part to the house was devoted to the children. When they come to the Famagusta will stay in this part of the house for couple of days. This part is completely detached from the main building and has the separate entrance through the courtyard. This place contains two rooms and a bathroom. In addition they have built an individual room in the courtyard as the nanny room for keeping grandchildren. (Figure3.53)

The house has a beautiful courtyard with wonderful view of the St. Nicholas church (Lala Mustafa pasha mosque). As it stated before this church is one of the most beautiful architectural places that remained from the past. (Figure 3.54)

Figure 3.53. A view of attached house from the courtyard and a bedroom (Author, 2012)

Figure 3.54. The courtyard and its view to the church (Author, 2012)

On the other hand, this courtyard is very important and functional for all family members. There is a place for siting, relaxing, barbequing, drying, drying laundry and the best place for children to play. Figure3.55 shows the other views of the courtyard. Moreover, there is a nice arched porch in front of the building. It is used as the sitting area. On the other hand, the arcades create a shady area and it provides interior spaces from direct sun emission. (Figure 3.56)

Figure 3.55. A view of courtyard to the dinning room and barbeque place

Figure 3.56. The front porch and the entrance to the courtyard (Author, 2012)

Building materials and techniques:

The main material of the whole structure is stone. The house has heavy structure with thick stonewalls. The doors are wooden with stone frame. (Figure3.57) The windows were wooden before, but today just their appearance is wooden. The ground of the outdoor spaces is covered with a fine marble and the floor in interior spaces is wooden. The original roof was made of timber replaced with new multi layer rooftop for better isolation.

Figure3.57: The wooden doors with stone frames (Author, 2012)

Environmental control:

The ventilation system of the building is both natural and mechanical. But mainly it is natural because of the thickness of stonewalls, the proper size and situation of the openings and internal courtyard. These features can control inside's temperature most of the time. In addition, as it cited before, the arcade veranda has created shady area and it helps to control the sunlight and warmth during the day.

3.2.2.4 Case No.5

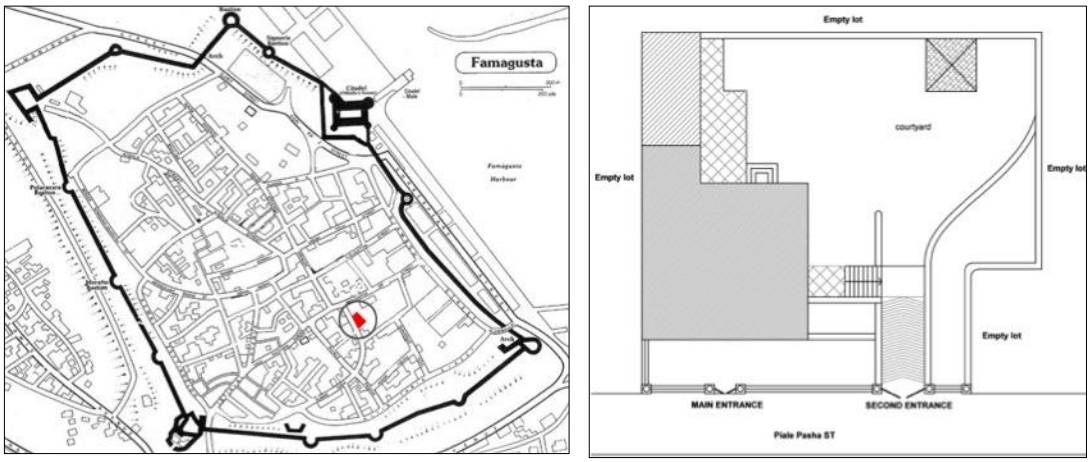
Figure3. 58. Hassan Cuma house, the current picture in walled city of Famagusta

General information:

The Hassan Cuma house is located in Piale Pasa in walled city of Famagusta. The house is situated near the church of St. George of Greeks that is a outstanding cathedral gives a rare sample in the east of an orthodox church built in Cypriot gothic style of the Lusignan. (Figure3.59) The owner of the house is Hassan Cuma who is a Turkish-Cypriot man and the holder of Ginko restaurant in the main square of the old town. He is a middle age man and interested in old places, his restaurant likewise is an old traditional place, which is renovated in good manner. He has bought this house from a Turkish-Cypriot man eleven years ago but the original owner of the house had been a Greek wealthy priest. It is a big two-story house with a large garden that was built over hundred years ago.

Figure 3.59: the S.t George of Greek Church

It is a detached house with no neighbors around .The building has two entrances. The main entrance has an indirect access through the front garden from the street, which is situated in upper floor. The secondary door opens to the back garden of the house that was the parking entrance before. Figure 3.60 shows the location and the site plan of the house.



Location of the building

Figure 3.60. The location and the sit plan of the house (Author, 2012)

Space organization:

The house has the plan type with inner sundurme.as it mentioned before the main entrance is situated on the first floor and there is a hall (sundurme) with a sitting area and three rooms. (Figure3.61)

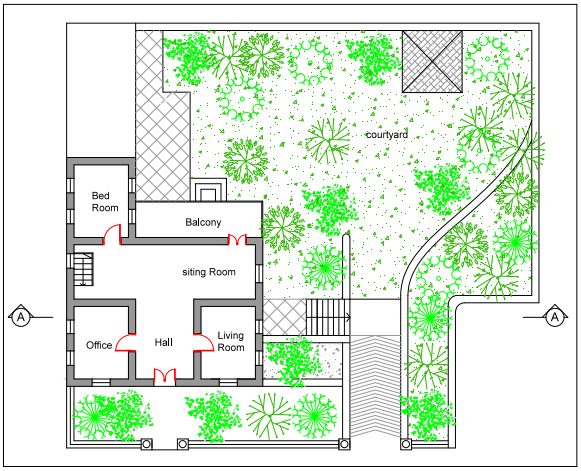


Figure 3.6 The first floor plan (Author, 2012)

The right room is used as the living area and the left room is the office of the owner. The other single room that is situated in a corner of the sitting area is the bedroom. (Figure 3.62)

Figure 3.62: The living room, hall (sundurme) and the office. (Author, 2012)

As it is seen in the plan, there is small staircase in front of the bedroom beside a wall of sitting area, which is goes downward to the ground floor. (Figure 3.63)

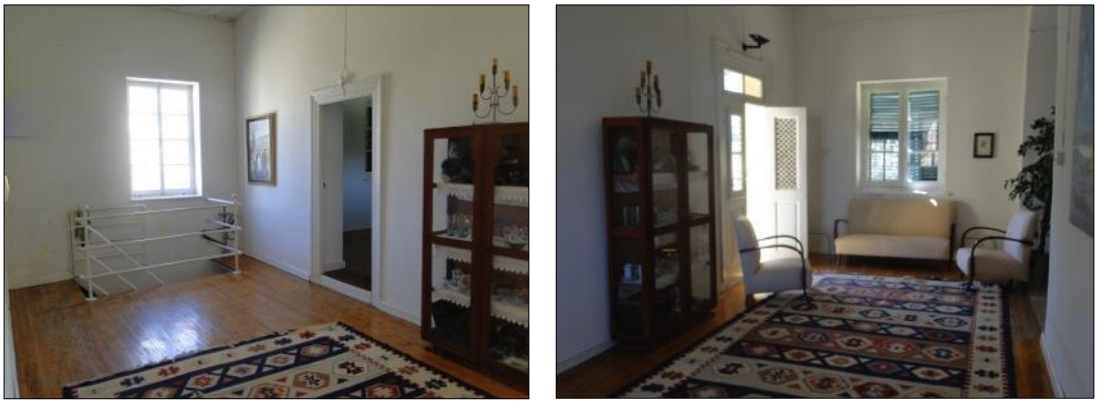


Figure 3.63: The staircase in sitting area (Author, 2012)

The ground floor contains; dinning area that is exactly located under sitting room, a hall, which is used as the music room with two rooms around, a kitchen and a bathroom. (Figure3.64)

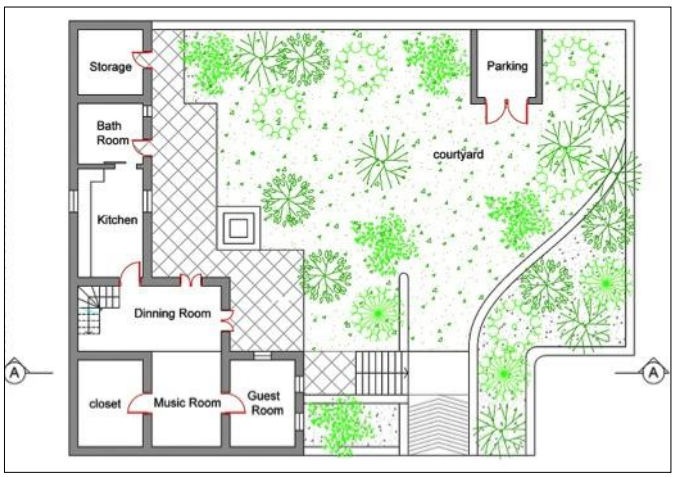


Figure 3.64: The grand floor of the house

The left room is used as the guest room and the other one is the closet. The dining area has two doors to the garden, which helps for better natural ventilation. Figure 5 shows the kitchen, dinning room and music area. (Figure 3.65)

Figure 3.65: The kitchen, dining room and music area. (Author, 2012)

In addition there is a sitting area in front of dinning room in the garden, which the food will serve here when the weather is suitable. It is a multi functional area for sitting, relaxing and eating while you are enjoying the magnificent view of garden. Besides, the fountain does exist in this area that has made this pace more pleasant. (Figure3.66)

Figure3.66: The sitting area and its view to the garden (Author, 2012)

The main door of the bathroom was in the courtyard before then the other access was added trough the kitchen later. There is a room by the bathroom that is only accessible from the yard it was used as the guest room before but it is storage these days. Figure 3.67 shows a view of bathroom and pervious gest room from the yard.

Figure3.67: A view of the bathroom and the pervious guestroom (Author, 2012)

As it noted, the house has the beautiful big garden, which has a separate entrance from the street. The entrance goes down whit a ramp it was the access of the access of the parking before but these days the parking space was transformed to the storage and the covered with the grasses. (Figure3.68)

Figure 5: The parking ramp and place (Author, 2012)

Figure 3.69 shows a section of the house.

Figure 3.69: Section A-A (Author, 2012)

Building's materials and construction:

The original construction material of the building is stone, and the stone surfaces were covered with plaster. The windows are wooden with shutter. The entrance original wooden door was repaired and reused.in addition, the floor of main hall (sundurme) is covered with a nice original marble. (Figure 3.70) the roof that is made from timber is repaired and utilized again.

Figure 3.70: The entrance door and floor's marble (Author, 2012)

Environmental control:

Just two air conditioner machines does exist in this big house one of them is in the living room and the other one has installed in the bedroom. The other areas are ventilated naturally. The orientation of the building, the proper size and situation of the openings, the thick stonewalls supports the natural ventilation of the house. On the other hand the multi layer timber roof and the big garden of the house are the other features for cooling system of the building.

3.2.3 Comparative analysis of the cases

To clarify these research findings has been compared with the pervious studies to show the level of sustainability environmentally as well as culturally in reused traditional hoses in walled city of Famagusta. Table 3.4 shows the comparative result of analyzing the cases.

		Case No.1	Case No.2	Case No.3	Case No.4	Case No.5
Materials	Original	Stone Wood Lime	Stone Wood	Stone Wood	Stone Wood	Stone Wood Lime
	Adapted	Concrete Aluminum Ceramic Plaster	Concrete Aluminum Plaster	Concrete Aluminum Ceramic	Stone Wood Aluminum	Stone Wood Plaster
Addition/extensions		Two rooms An small kitchen Courtyard became smaller	Two rooms A bathroom A balcony Courtyard became smaller	One kitchen One bathroom	Another house has been attached (Three bedrooms and two bathrooms)	Just repaired
Environmental Control	After renovation	Naturally And artificial Two air conditioners has been installed	Naturally And Artificial One air conditioner has been installed	Naturally	Naturally And Artificial One air conditioner has been installed	Naturally And Artificial two air conditioner has been installed
	Before renovation	Naturally	Naturally	Naturally	Naturally	Naturally

Table 3.4 Comparative analyses of the cases (Author, 2012)

As it is seen in the case number one after renovation the owner has changed the function of spaces and added some parts due to his requirements. As the extension parts were built in the corner of the courtyard it became smaller. The courtyard some how lost its original function, but it still helps the natural ventilation and considering to the owner's words this place ventilated naturally most of the times. Likewise, it happens for the case number two Ferguson house but as it sited before only one air conditioner does exist in this house, and the courtyard is still functional. In the case number three, despite of changing the size of the courtyard, the house completely ventilated naturally, and there is not any air conditioner in this building. In the case number four, the yard became bigger after joining to the neighbor's house, and its function is preserved. In the last case, the big size of the garden provides fine ventilation and lightening for the entire house, and just two air conditioners does exit in such a big building.

In all of houses, the proper size of openings and their situation provides privacy and thermal comfort for residence. As it is seen, most of them have a sort of plan with inner sundurme, and after changes, the sundurme is still functional. The owner of case number one is living in another house with modern open plan that he built it about ten years ago. He said, " If I wanted to build another house, I would prefer to have a type with close plan, because you can easily manage the heating and cooling of the building".

Simple construction methods were used to build traditional houses, easy to implement and manipulate. In all of houses, the owners could change the function of the spaces consider to their needs, and add some places if it was necessary. It is

socially and economically sustainable. Furthermore, as it sited before, the considerable embodied energy in the material were used in construction of traditional buildings. In this process, in all of cases the huge amount of materials are saved and preserved that helps the sustainability of natural resources

3.3 Findings and Discussions

This is the study not judging or evaluating the quality or the appropriate of the changes in the cases according certain values and regulations. However it aims to illustrate how people can adapt their traditional houses, which are sustainable with contemporary living conditions instead of building new one.

The following part provides an explanation a bout the relation between findings from the case studies and sustainability dimensions in terms environment, traditional values and cultural heritage.

Environmental sustainability

As it is mentioned in theoretical chapter the building is called environmentally sustainable which has these factors in its nature: site conservation, resource efficiency, energy efficiency, environment conservation, indoor air quality, and waste management. Therefore, it is important to consider these features in selected houses.

Space organization: as it is seen in cases organic urban planning characterized the traditional houses in walled city of Famagusta. Privacy and ventilation were important effects in the layout of the houses. The courtyards as private open spaces and sundurme as transition semi closed space offer the best answers to encounter most of the house standards environmentally as well as socially. An appropriately planned courtyard house offers the best solution to meet most of the house criteria environmentally and socially.

On the other hand, the users of such historically buildings don't have to change the originality of their houses. Since, these kinds of buildings are easily adaptable to the contemporary life style as it is seen in the case studies with the addition of extra spaces.

Building materials and techniques:

As it stated, Traditional buildings were built of different natural available material and the se are determine how which part of the house will act against heat transference and adjust the indoor environment of the buildings in response to the outside climate. On the other hand they are long lasting and renewable by a tiny touch. As it is seen in all of the cases the huge part of the materials were preserved and reused again. Almost in all of them the main structure of the house was remained. In some of them similar case no number one the materials were reused and reused a gain. It is energy saving and helps economy of resources that is a one of the principles of sustainability which is concerned with the reduction, reuse, and recycling of the natural resources and materials.

Environmental control:

Houses are built for variety of functions, however one of the most significant is to make living conditions suitable to their occupant, mainly in relation to the prevailing climates. Ventilation cooling system is the best method in traditional house for suitable indoor environment. The air conditioner machine still is not extremely used in all of the cases. Users prefer to ventilate their houses naturally most of the times. Actually, the natural materials, thickness of the walls help the natural ventilation as well. Besides climatic conditions, traditions and social values were of great effect on size, numbers, and location of openings in building external treatments. In fact the air condition air machines are not in every rooms but mostly were installed in

additional parts of the houses. All these strategies utilized natural renewable energy resources, which make the traditional house sustainable from energy standpoint.

Social sustainability:

As it is stated before, Socially sustainability conflicts with preserving cultural identity and providing physical and emotional requirements of people in each society. Researching a bout user's profiles shows the kind of people prefer to live in these buildings who know the value of kind of houses. Those who inherited the house from their family have their own memories in them. Some who bought them have some connection because of their interest in culture. On the other hand, these buildings and their proper size are suitable for any ages and condition. As we seen in the case number three, which, the owner was, the bachelor young boy and the case number four that was belonged to the big family. The users of the cases can simply adapted their places whit their requirements and duo to their desires by little changes and additions. And as it mentioned in each case the owners know the value of their tradition and don't want to change its originality as much as possible all of them are happy with their places and proud of what they have done.

CONCLUSION

Fast developments in diverse fields have changed the balance of natural environment in recent decades and have threatened human health on the earth. All These concerns brought us to debates on sustainability. Therefore, sustainability as a concept has became important these days. On the other hand for centuries the human lived depending on available natural resources in line with environments. The traditional houses in different regions are the manifestation of sustainability. Figure3.5 shows the relationship between sustainability and traditional architecture.

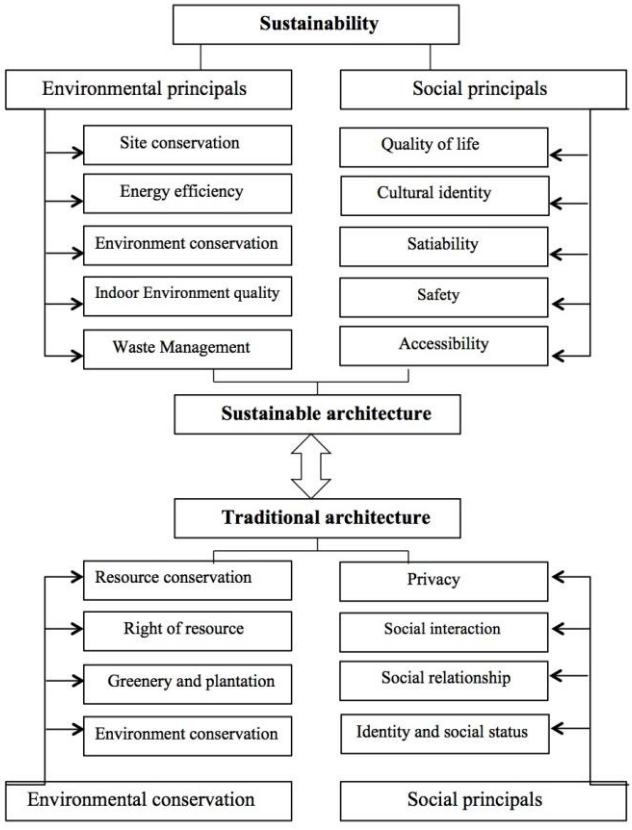


Figure 3.71 Sustainability and traditional architecture (Author, 2012)

The island of Cyprus with distinctive architectural characteristic that has changed through the history has valuable example of traditional houses. But, unfortunately by rapid modernization in the island traditional way constructing has been changed and replaced by the modern building material and techniques. These developments based on modern form of the buildings in the world without considering the environmental and social context. Therefore we cannot consider them sustainable. In new forms of the buildings lack of identity, inadequately and absence of cultural value can be seen.

On the other hand, in traditional regions of the cities includes walled city of Famagusta still there is some sustainable valuable traditional houses that is renowned, renovated and reused by the users. The owners know a bout the value of such a houses and changed them due to their contemporary needs and desires. These houses are sustainable in their natures and easily adaptable to contemporary lifestyle. All of them were building of natural available materials, using natural ventilation and are environmentally, socially and economically sustainable.

As it seen in all of the case studies, Traditional architecture reached environmental and social sustainability, on urban planning and design level. Sustainability was accomplished on urban planning level by responding and adjusting climatic conditions, preservation privacy of residents inside the city and the neighborhoods. On design level, traditional architecture attained sustainability, over employing appropriate design solution, especially courtyard that was the most suitable design to deliver privacy and comfortable interior environment. Besides, Traditional house, in the Cyprus, represents a living witness passive energy building that corresponded to

the ambient environment, which incorporated the essence of sustainable architecture. Table 3.3 shows the relation between environmental sustainability and traditional architecture of Cyprus.

Table 3.3 Environmental sustainability and traditional architecture of Cyprus (Author, 2012)

Space organization	Site planning	Locating building to minimize environmental impact. Using plants to enhance shading and ventilation.
	Interior spaces	Designing Close plan with inner sundurme, and Courtyard for privacy and environmental controlling.
Resources	Building materials	Using locally available and sustainable building materials.
	Recycling and Reuse	Reuse of Building, land and infrastructure Flexible building design.
	Materials lifecycle	Choosing strong and long-life Materials.
Indoor Environment	Natural Ventilation	Taking advantage of climatic conditions Enhancing air movement and natural ventilation. Design openings for natural ventilation.

Therefore, traditional buildings in the Cyprus are already good examples of sustainability and can very often further adapted to meet more strident sustainable construction standards. It is possible to adapt or convert these buildings in a sustainable manner for new uses as it has seen in the case studies. Traditional building techniques are inherently sustainable. The age and stability of historic buildings proves the point. In the end it is vital to understand that historic buildings

are a finite resource and that in their existence there is not only embodied energy and carbon but also the spirit and identity of the country. It is critically important to know about potential of these buildings rather than consuming a lot of energy and new resources for constructing new ones when we have enormous housing stock in our hands.

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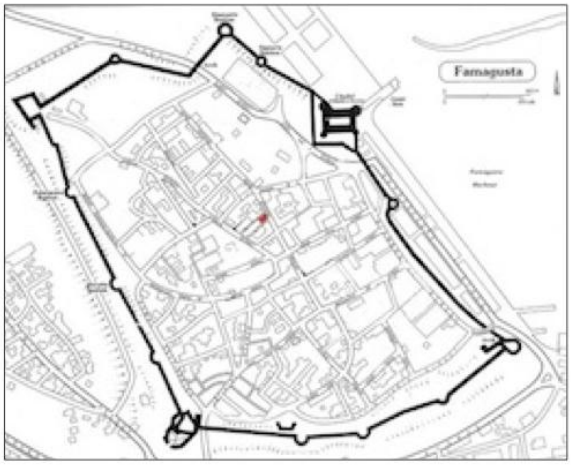
A research on Sustainability Through Reuse of Traditional Buildings: A Case Study of Famagusta, Northern Cyprus

Department Of Architecture by: Mehrnoosh Mosadeghi Date: May 2012

Case No.1

Building location: Nami Efendi ST

Period of construction: Ottoman



Owner's profile

Name: Fehmi Tuncel

Number of family members: 2

Nationality: Turkish-Cypriot

Type of ownership: Inherited

Educational level: Dentist

Period of habitation: 60 years

Building's characteristics

Original construction material: stone, wood

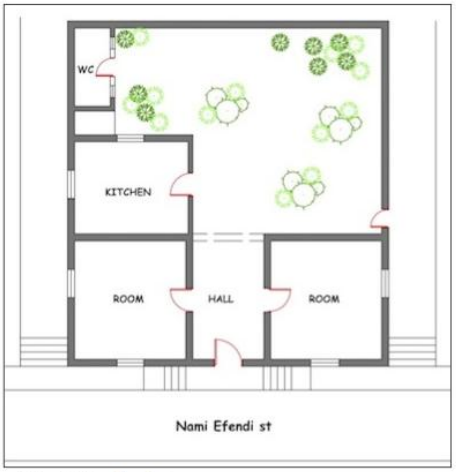
Adapted construction material: concrete, aluminum, ceramic

Finishing materials: plaster

Ventilation system: natural, artificial

Addition and extension parts: two rooms, the small kitchen

Architectural drawings



Original plan

Adapted plan

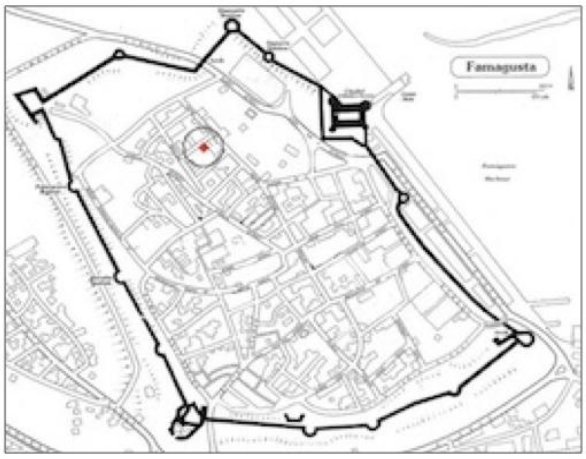
A research on Sustainability Through Reuse of Traditional Buildings: A Case Study of Famagusta, Northern Cyprus

Department of Architecture by: Mehrnoosh Mosadeghi Date: May 2012

Case No.2

Building location: Kertikli Hamam ST

Period of construction: British period



Owner's profile

Name: Helen Ferguson

Number of family members: 1

Nationality: British

Type of ownership: Bought

Educational level: Teacher

Period of habitation: Three years

Building's characteristics

Original construction material: stone, wood

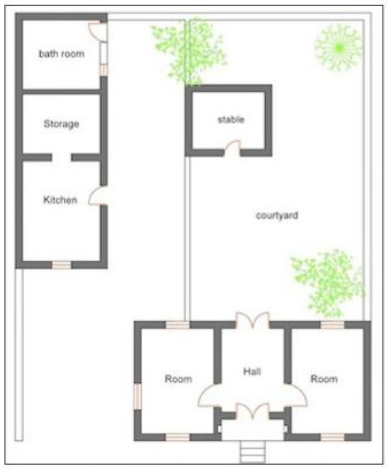
Adapted construction material: concrete

Finishing materials: plaster

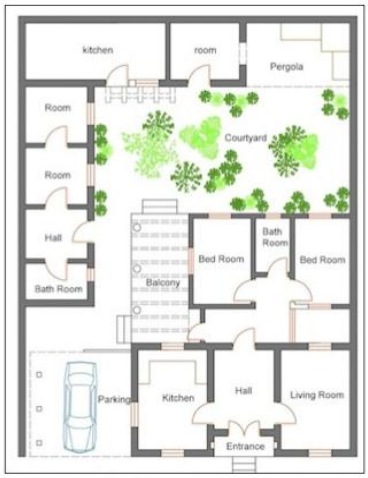
Ventilation system: natural, artificial

Addition and extension parts: 2 rooms, a bathroom.

Architectural drawings



Original plan



Adapted plan

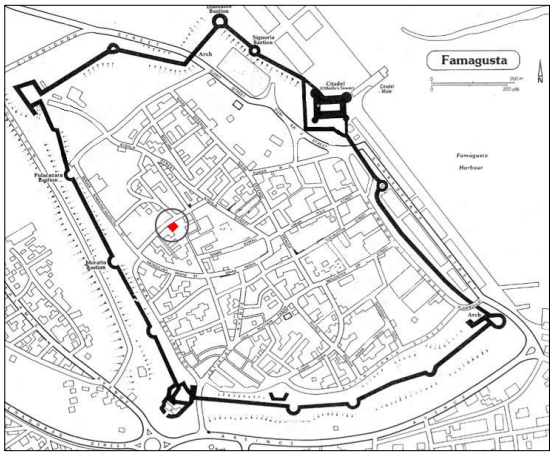
A research on Sustainability Through Reuse of Traditional Buildings: A Case Study of Famagusta, Northern Cyprus

Department Of Architecture by: Mehrnoosh Mosadeghi Date: May 2012

Case No.3

Building location: Necip Tuzun ST

Period of construction: British period



Owner's profile

Name: Bilgi Fevzigulo

Number of family members: 1

Nationality: Turkish- Cypriot

Type of ownership: Inherit

Educational level: Engineer

Period of habitation: 2 years

Building's characteristics

Original construction material: stone, wood

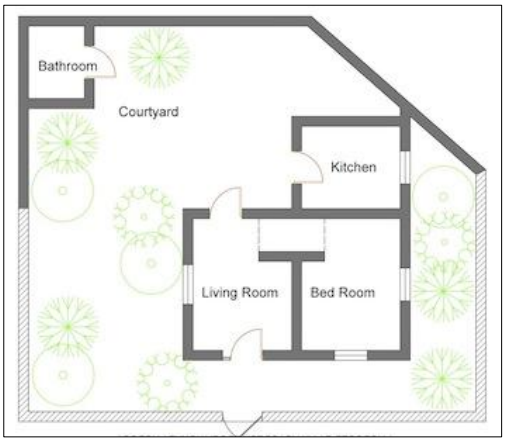
Adapted construction material: concrete

Finishing materials: stone

Ventilation system: natural

Addition and extension parts: one Kitchen and a bathroom.

Architectural drawings



Original plan

Adapted plan

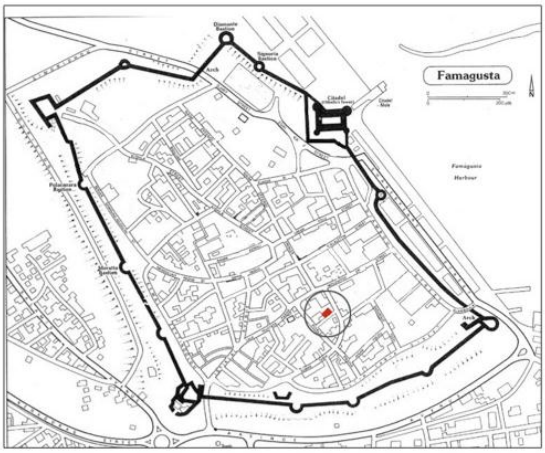
A research on Sustainability Through Reuse of Traditional Buildings: A Case Study of Famagusta, Northern Cyprus

Department of Architecture by: Mehrnoosh Mosadeghi Date: May 2012

Case No.4

Building location: Piale Pasha ST

Period of construction: British period



Owner's profile

Name: Ibrahim Isikel

Number of family members: 2+3

Nationality: Turkish- Cypriot

Type of ownership: Inherited

Educational level: retired

Period of habitation: 2 years

Building's characteristics

Original construction material: stone, wood

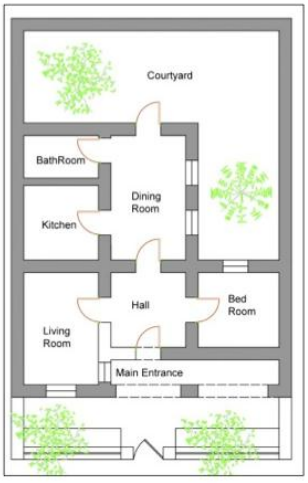
Adapted construction material: stone, wood

Finishing materials: stone

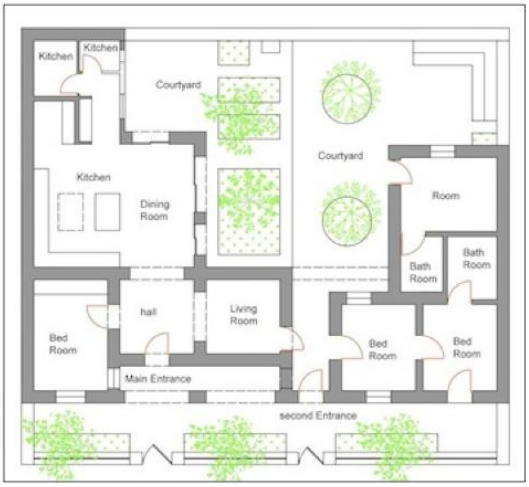
Ventilation system: natural, artificial

Addition and extension parts: another house was attached (three bedrooms, two bathrooms)

Architectural drawings



Original plan



Adapted plan

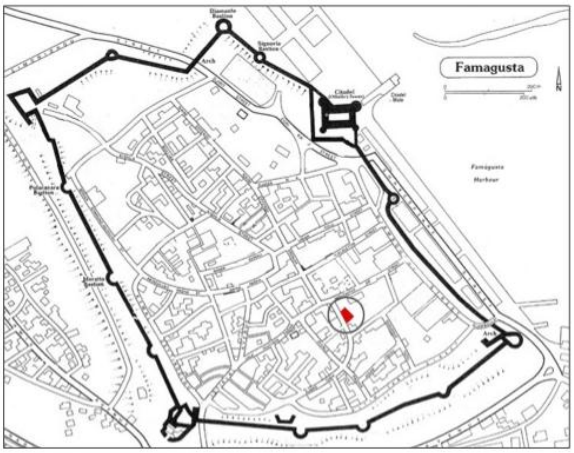
A research on Sustainability Through Reuse of Traditional Buildings: A Case Study of Famagusta, Northern Cyprus

Department Of Architecture by: Mehrnoosh Mosadeghi Date: May 2012

Case No.5

Building location: Piale Pasha ST

Period of construction: Ottoman period



Building's characteristics

Name: Hassan Juma

Number of family members: 2

Nationality: Turkish- Cypriot

Type of ownership: Bought

Educational level: Restaurant Owner

Period of habitation: 11 years

Owner's profile

Original construction material: stone, wood

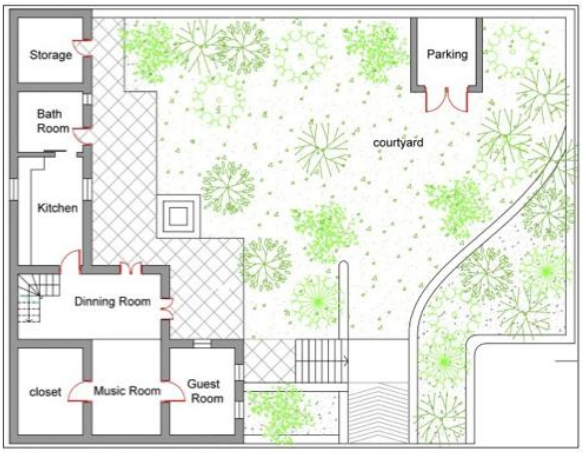
Adapted construction material: stone, wood

Finishing materials: plaster

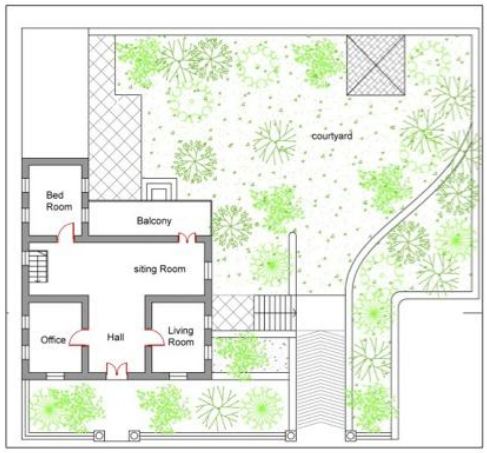
Ventilation system: natural, artificial

Addition and extension parts: the house just repaired.

Architectural drawings



Grand floor plan



First floor plan