A METHODOLOGY FOR SUSTAINABLE HOUSING POLICY IN LIBYA
CASE: CITY OF TRIPOLI

OMAR ALI ALAMEEN

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A METHODOLOGY FOR SUSTAINABLE HOUSING POLICY IN LIBYA
CASE: CITY OF TRIPOLI

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OMAR ALI ALAMEEN

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Title of the Thesis: **A Methodology for Sustainable Housing Policy in Libya, Case: City of Tripoli**

Submitted By **Omar Ali ALAMEEN**

Approval of the Graduate School of Natural and Applied Sciences, faculty of Architecture, Çankaya University.

Prof. Dr. Can ÇOĞUN
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of doctor of science, faculty of architecture.

Dr. Öğr. Üyesi Saadet AKBAY YENİGÜL
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of doctor of sciences in design program.

Prof. Dr. Mehmet TUNÇER	Prof. Dr. Gülser ÇELEBİ
Co - Supervisor	Supervisor

Examination Date: 07.02.2020

Examining Committee Members

Prof. Dr. Gülser ÇELEBİ	Çankaya University	
Prof. Zehra Gediz URAK	Çankaya University	G. URAK.
Prof. Dr. Zühal ÖZCAN	Çankaya University	
Prof. Dr. Nuray BAYRAKTAR	Başkent University	N. Bayraktar
Dr. Öğretim Üyesi Demet EROL	Gazi University	

STATEMENT OF NON-PLAGIARISM PAGE

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this thesis.

Name, Last Name: Omar Ali ALAMEEN
Signature:
Date: 15.02.2020

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ABSTRACT

A METHODOLOGY FOR
SUSTAINABLE HOUSING POLICY IN LIBYA
CASE: CITY OF TRIPOLI

Omar Ali ALAMEEN
PHD in design program. Faculty of Architecture. Interior Architecture Department. Supervisor: Prof. Dr. Gülser ÇELEBİ
Co - Supervisor: Prof. Dr. Mehmet TUNÇER
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This thesis deals with sustainable housing policy. The housing is one of the most important needs of the people. It is one of the basic needs confirmed by United Nations in its Universal Declaration of Human Rights, stating “everyone has the right to a standard of living adequate for the health and well-being of himself and of his family including food, clothing, housing and medical care and necessary social services” (UNHR, 2009). Also, Living and sheltering is one of the most fundamental rights of the people and the housing is considered as one of the most important indicators of the living standard of the population. Henilane (2015) states that it is a topical issues that housing have to be comfortable, economical and reasonably maintainable, as well as architectonically expressive and compliant with the environment. The sustainability of this fundamental right can only be achieved by producing "sustainable housing policies". Edwards (2000) states that housing is sustainable, if "everyone has the opportunity of access to a home that is decent; if it promotes social cohesion, well- being and self-dependence". Sustainable housing is defined as "housing that meets the needs of today’s people and does not compromise the ability of future generations to meet their needs". The main aim of the thesis to benefit from the results gathered from the case study “Sustainable housing policy in Libya: a case study city of Tripoli”

for the purpose of applying the principles of housing sustainability, especially in Tripoli and Libya in general.
Additionally the thesis aims to create a good background for the stakeholders, "professionals and users", about the concept of sustainability and its importance for developing serious solutions to the housing problem. Moreover, aims to evaluate the satisfaction of housing users according to the previous housing policies of successive Libyan governments, and to discover the characteristics that should be taken into account for the housing projects that will be implemented in the future. The data was collected through questionnaires covering the three sustainable housing dimensions "environmental, social and economic", perspectives of housing users, and their suitability for the Libyan family today and in the future. The thesis includes a case study of housing projects, which was implemented for the purpose of assessing user satisfaction about the projects to implement the principles of "sustainable housing". The study included four housing projects implemented in the city of Tripoli.

Keywords: أHousing Sustainable, Libya, Tripoli, Policy, Planning, Sustainability.

ÖZET

SÜRDÜRÜLEBİLİR KONUT POLİTİKASI ÜZERİNE BİR METODOLOJİ ÇALIŞMASI ÖRNEK: TRABLUS ŞEHRİ

Omar Ali ALAMEEN

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Tez Danışmanı: Prof. Dr. Gülser ÇELEBİ

Yardımcı Danışman: Prof. Dr.Mehmet TUNÇER

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Bu tez sürdürülebilir konut politikası ile ilgilidir. Konut en temel insani ihtiyaç olarak, insanların en önemli günlük gereksinimidir. Birleşmiş Milletlerin Evrensel İnsan Hakları Beyannamesinde belirtildiği gibi "Her birey ve aile sağlıkları ve refahları için gerekli yaşam standartlarına sahip olmalıdır ve bu standartlar gıda, giyim, konut, sağlık ve gerekli sosyal hizmetleri kapsar" (UNHR, 2009). Yaşam ve barınma hakkı insanların en temel ihtiyaçları arasındadır ve konut edinme toplumun yaşam standartının bir göstergesidir. Henilane'e (2015) göre bir konut rahat, ekonomik, bakımı yapılabilir, mimari yönden anlamlı ve çevreyle uyumlu olmalıdır. Bu temel hakkın devamlılığı ancak "Sürdürülebilir Konut Politikası" üretmekle sağlanabilir. Edwards'a (2000) göre herkesin uygun bir konuta ulaşma şansı olduğu takdirde ve bu sosyal kaynaşma, refah ve kişisel özgürlüğü sağlarsa, bir konut sürdürülebilir olarak kabul edilir. Sürdürülebilir konut "Bugünün insanlarının ihtiyaçlarını karşılayan ve gelecek nesillerin ihtiyaçlarını karşılamaları konusunda taviz vermeyen konut" olarak tanımlanır. Bu tezin amacı Libya'daki sürdürülebilir konut politikasının gerçekleştirilmesi ile ilgili çalışmaların sonuçlarından-özellikle Trablus ve Libya'nın geneli için konut sürdürülebilirliğinin ilkelerinin uygulanması amacı ile-yarar sağlamaktır.

İlave olarak bu tez paydaşlar “profesyoneller ve kullanıcılar” için sürdürülebilirlik kavramları ve bunların konut sorununa ciddi çözümler üretmek konusundaki önemleri hakkında iyi bir zemin hazırlamayı amaçlamaktadır. Ayrıca önceki Libya hükümetlerinin başarılı konut politikaları hakkında konut kullanıcılarının memnuniyetini değerlendirmektir. Anketlerde sağlanan bilgiler ile konunun üç önemli boyutu “çevresel, sosyal ve ekonomik yönleri” araştırılarak ve konutların bir Libya ailesinin nazarında şimdiki ve gelecekteki uygunluğu sorularak edinilmiştir. Gelecekteki konut projelerinin uygulanmasında dikkate alınması gereken karakteristik unsurlar da dahil edilmiştir. Aynı zamanda bu tez bir örnek olay incelemesini de konu alarak kullanıcı memnuniyetini ölçmeyi de içermektedir. Bu çalışma Trablus’da gerçekleştirilen dört konut projesini içermektedir.

Anahtar Kelimeler: Sürdürülebilir Konut, Libya, Trablus, Konut Politika, Planlama, Sürdürülebilirlik.

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DEDICATION

To

The spirits of my **mother and father** who left me when I still need them

My grand brother who always encourage me

My beloved **wife**

My **daughters**

My **sons**

Whom are supporting me all the times

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LIST OF ABBREVIATIONS

- KMO	Kaiser-Meyer-Olkin
- id	I dentifi cation number
- NFI	Normed fit index
- NNFI	Non-Normed Fit Index
- CFI	Comparative Fit Index
- RMSEA	Root mean square error of approximation
- TLI	Tucker–Lewis Index
- CFA	Confirmatory Factor Analytic
- ECOU	Engineering Consultancy Office for Utilities
- NCB	National Consulting Bureau
- UNHCR	The United Nations High Commissioner for Refugees
- UNHCR	United Nations High Commissioner for Human Rights
- WCED	World Commission on Environment and Development
- UNDP	United Nations Housing Development in Libya
- NCID	National Corporation for Information and Documentation

CHAPTER I

INTRODUCTION

In most communities, the concept of sustainability is considered as the cornerstones of the global dialogue about the future of humanity in all aspects of human life. However, it still remains a difficult concept for many to understand; locally or globally. What to do exactly and what is required? For example there are many questions that stakeholders cannot answer, which prevents them to play their role in sustainable housing. Although this concept was introduced decades ago, to what extent stakeholders are really aware of this concept, how it is applied and goals of Agenda 21 is unapparent. This aims to achieve the overall goal of human settlements to improve the social, economic and environmental quality of human settlements and high living standards for the working environments of all people. This thesis attempts to ensure sustainable housing policy development in the country. It studies the number of four housing projects in Tripoli as a case study by exploring the negative factors in housing projects implemented within the city and currently used by residents. Study has done through the field study (satisfaction assessment of housing users questionnaire), and also with the questionnaires for professionals and the ones who are interested in the housing sector and sustainability. The review will serve as a basis for further research about Libya and for the means needed to be taken about stakeholders. The study will, therefore, help to improve the guidelines for sustainable housing policy and provide a framework for designing a sustainable housing policy in Libya.

1. 1. General Overview

The doctoral dissertation on sustainable housing policy in Libya aims to find out solutions for the housing problems and housing policies in Libya with the use of a case study in Tripoli by applying the housing sustainability principles. It also aims to meet the sustainability principles and aspects according to the needs of the people at various levels of income and according to their wishes. The main objective of the thesis is to achieve sustainable housing by taking the advantages of all factors, harnessing them for the housing policy at the level of the settlements and using them for other levels (housing neighborhoods, housing districts city, region and national level).

1.1.1. Problem Statement

Housing plays a role in all development goals because of its effects on for health, education and the environmental sustainability and poverty alleviation. UN-Habitat published global estimates of slum dwellers in 2003 and identified it as one of the Millennium Development Goals, with the aim of significant improvement by 2020 in the lives of at least 100 million slum dwellers. The need was thoughtful policies with the aim of achieving different solutions for families with different income levels, land expansion and housing opportunities for all. The most important requirements of the era are emanating from the state of environmental and urban degradation and the accompanying population growth, and the deficiency of natural resources that affect the contemporary planning situation. The concept of sustainability contributes to addressing the housing problem and then forming a general perception of the concept and a methodology for application.

Libyan national natural long-term plan for the year 1981-2000 had uneven distribution pattern of urban and rural communities; it focused only on the main cities of Tripoli and Benghazi. There were disparities in living standards and the level of provision of communities' services between rural and urban communities. The reason was the rapid rise of urbanization rates in Libya, which have increased from 49 % in 1970 to more than 62% in 1975, and to 78 % in 2010; then to 80 % in 2015, and is expected to increase over 80 % in 2020 (Attwairi, A. 2017). So, the housing problems emerged in the early eighties due to these and several other factors.

Libyan governments have tried to overcome these problems, by relying on government efforts, and using foreign consultants companies for designing and implementing following the international standards and using modern construction materials. They have constructed a lot of housing projects, but success has not been achieved as the focus was on quantity of housing projects rather than the quality of production in housing, and they did not take the local social life characteristics, local climate characteristics and sustainability principles. Therefore, the housing problem in Libya has been effecting all segments of society for more than forty years. So, there is a need for scientific approach to this problem. Figure 1 explains the sustainable housing policy; Figure 2 shows the statement of housing problems in Libya, and Figure 3 explains the problem statement for the city of Tripoli as case study of the thesis.

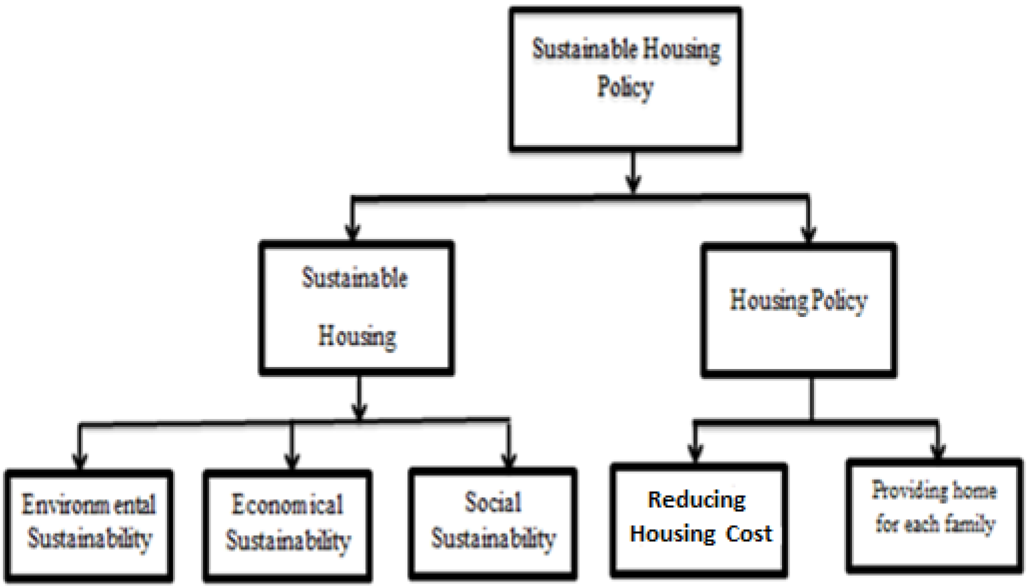

Figure 1: Problem Statement-Sustainable Housing Policy

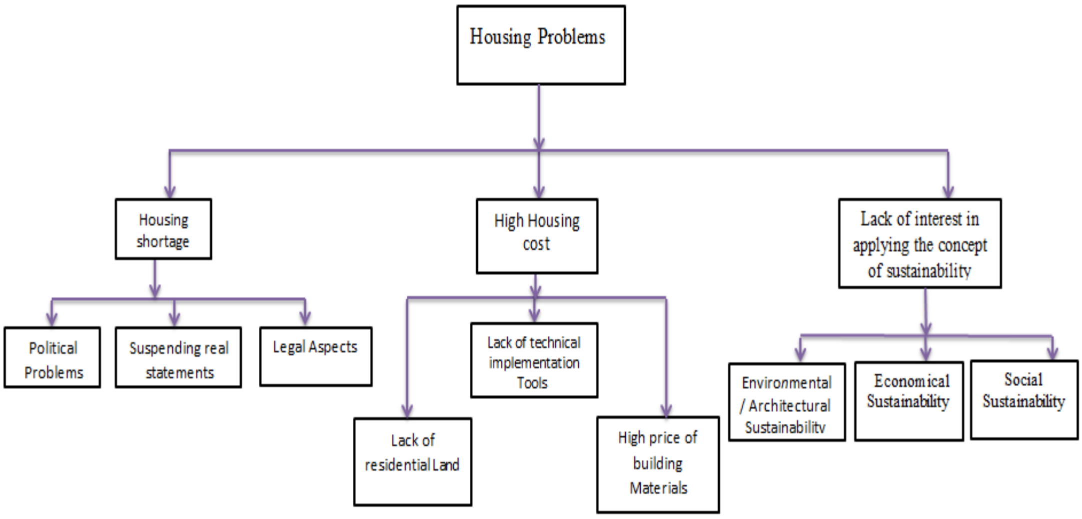

Figure 2: Problem Statement- Housing Problem

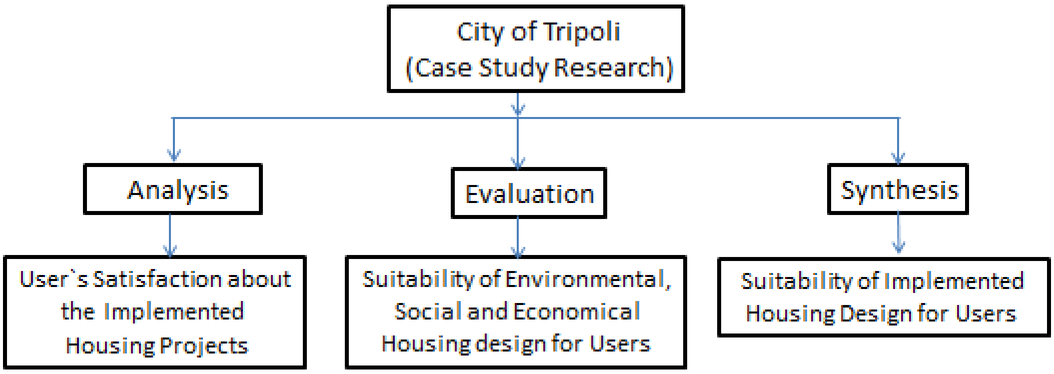

Figure 3: Problem Statement - City of Tripoli (Case Study Research

1.1.2. Aims and Objectives of the Thesis

The PhD thesis on sustainable housing policy aims to lay the foundation for the application of sustainable housing concepts, through the study of four selected residential sites in Tripoli Libya as a case study of the thesis.

The main objective is to lay the foundations of a sustainable housing policy to achieve sustainable housing principles by taking advantage of all the environmental, social and economic factors and harnessing them for the housing policy at the level of the settlements and using them for other levels (housing neighborhoods, housing districts city, region and national level). The following are the other objectives:

- To define sustainable housing policy objectives,

- To provide an environment conducive to building social relations among the residents of the region,

-To try to round up the work relationships of neighboring,

- To provide the needs of people such as work places, food, education, energy, care health, water sanitation services, in addition to providing a service center containing the main public facilities that constitute an urban focus for the neighboring population,

-To attempt to remove social barriers among the population of the region from an economic or cultural class,

-To determine the factors for the successful implementation of a sustainable housing policy,

-To highlight the results and expected through the implementation of sustainable housing policy,

-To demonstrate obstacles to the implementation of sustainable housing policy,

-To identify factors for evaluating the implementation of sustainable housing policy in the future,

-To measure the satisfaction of users of housing projects implemented within the previous housing policies, socially, environmentally and economically, and how it is suitable for the Libyan social life,

-To study the factors that negatively affects the implementation of previous housing policies.

1.1.3. The Importance of the Thesis Problem

Housing is one of the most important needs of people as it is a basic human need, which is confirmed by the United Nations in its Universal Declaration of Human Rights, stating that “everyone has the right to a standard of living adequate for the health and well-being of himself and of his family including food, clothing, housing, medical care and necessary social services” (UNHR, 2009). The scale of the living standard of residents is an interesting problem, as the housing has to be restful, cheap, reasonably sustainable, designer expressive and respecting to the environment. (Henilane, 2015). Moreover, housing is an important force in economic development of each country as it accounts for 10-20% of economic activity of countries and it’s one of the largest fixed asset among households (Inita, Henilane as cited from European Commission, 2005). Additionally there are weak sustainable housing practices in developing countries and there is a need of support to expand sustainable housing solutions. Thus, housing is considered one of the most important challenges of developing countries, including Libya. Additional to the general housing problem, we have the following factors:

-The importance of applying the principles of sustainable housing in its environmental, social and economic pillars to develop solutions to housing problems by developing a sustainable housing policy, with paying attention to the environmental characteristics of Libya and the social and economic conditions of the Libyan population.

-Land spared for housing represents between "30 % and 40%" of the total area of any city. The percentage of housing used as a master plan case study city of Tripoli for the year 2000 was 31%, and increased in 2006 up to 39% (National Commercial Bank, 2009).

-Many studies indicate the rapid growth of informal construction in developing countries due to the rapid urbanization of these countries. The importance of the subject to the Libyan state, especially during the recent Libyan political problems and civil war of the last nine years (from 2011 up to now), with its urgency to rebuild many housing buildings destroyed during that period of events.

-The administrative instability of the state and the abandonment of investments in housing projects.

-The Government delay adopting a new urban plan (urban planning researches for urban development areas) without responding to the demands of population growth and the continuing increase in demand for housing.

-The lack of an adequate legislative framework for decades, which was really the biggest obstacle for the growth in the housing sector, especially in the so-called in Libya under Law No. 4 of 1978.

-Difficulties in obtaining funding for the development of this sector.

-Increase in the cumulative need for housing, in addition to the population growth rate in Libya.

- Administrative and financial corruption.

With the review of problems, this study aims to develop radical solutions, including a sustainable housing policy that will raise the living standards for the Libyan people to catch up with the people of developed countries.

1.2. The hypothesis of the Thesis

The analysis of this thesis is based on the hypotheses trying to analyze the results by applying the principles for sustainable housing policy. So, the main hypotheses of this thesis propose the followings:

A. The lack of interest in institutions that take care of sustainability and sustainable housing has led to a lack of benefit of the application of its principles;

C. Lack of knowledge of professionals as one of the stakeholders about sustainable housing, due to not having this kind of studies in educational facilities.
Additional to that, this thesis is based on the following sub-assumptions:
1. Establishing specialized governmental institutions to;
A. Prepare the foundations for the implementation of the principles of sustainable housing, such as proposing laws and regulations to develop sustainable solutions to the housing problem in Libya;
B. Supervise and follow up the designing and implementation of the companies for sustainable housing projects;
C. Encourage the universities and scientific research centers to pay attention for studies related to sustainable housing and its development, and oblige the faculties of architecture in Libyan universities to teach sustainable housing and highlight its importance and development.
2. Applying the principles of sustainability in the housing sector to contribute to the development of solutions to reach;
A. Environmental Sustainability: Achieving a healthy and sustainable natural environment that preserves the natural resources of the country;
B. Social Sustainability: aims to reach the design of the appropriate housing for the needs of the family (socially, culturally and religiously) to achieve places where people want to live and work, now and in the future;
C. Economic Sustainability: aims to provide sustainable economic housing (construction and maintenance), especially for families with low and middle income. By encouraging the private sector to invest in the housing sector; that reduces the cost of implementing housing projects.
3. Developing expertise houses in the field of housing studies and national construction companies by merging with international companies.

1.3. Thesis Questions

The word sustainability means the ability of biological systems to remain healthy, diverse and productive over time. In the 1980s, sustainability was used as a more sustainable term in terms of human sustainability on Earth, and the concept of sustainability defined by the United Nations in 1987 Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Also, Sustainability can be defined as “the ability to meet the needs of today without compromising the ability of future generations to meet their needs". Sustainable housing is defined as "housing that meets the needs of today’s people and does not compromise the ability of future generations to meet their needs" by (Middleton, O'Keefe, and Moyo ,1993).

This Thesis seeks answers to research answers from stakeholders, professionals "architects, designers" and users, in Libya for the following questions:

Q1.Why a sustainable housing policy is important for developing appropriate solutions to housing problems?

Q2. What are the important objectives of the sustainable housing policy in Libya?

Q3. What are the success factors in implementing the sustainable housing policy in Libya?

Q4. What results are expected for the future of implementing the sustainable housing policy in Libya?

Q5.What is the assessment criteria for the sustainable housing policy in Libya?

Q 6. How can we evaluate the success or failure for the housing policy in Libya?

Q7. What are the impediments to successful sustainable housing policy in Libya?

Q8. What are the satisfaction levels for the housing users of the housing projects in Libya?

1.4. Methodology

Case study "Sustainable housing policy in Libya case: Tripoli city" will be gathering information from documentary sources and field survey according to the following:

- The four sites have been selected from housing projects implemented in Tripoli as the case of the study for the research.

Reviewing the case study projects and implementation forms, in addition to:

A. Survey interviews: gathering information and data through personal interviews and through open and informal discussions with some residents and a number of officials in the Libyan housing sector.
B. Gathering information directly from some of the stakeholders in the housing sector with two different types of the following of questionnaires:

1. Gathering information by specialist "professional's questionnaire" (architects planners, civil, electrics engineering, etc. and housing officials, professionals as well as experts).

2 .Collection of information by "user questionnaire" (residents)

C. The research methodology will focus on the analytical research and analysis of the questionnaire using "SPSS" version 25, with the following stages:

1. Historical studies of the technological stages of Libyan housing settlements and implementations in Tripoli.
2. Study of environmental impacts on the design of layout plans and architectural elements in residential settlements of the case study sites by using "SWOT" to explain the strengths, weaknesses, opportunities and threats of case study sites. The following Figure 4 illustrates the research process consist of:
    A. Literature Surveys;
    B. Qualitative and Quantitative research Methodology;
    C. Questionnaires stakeholders (Professionals and Users)
    D. Questionnaires analysis;
    E. Assessments

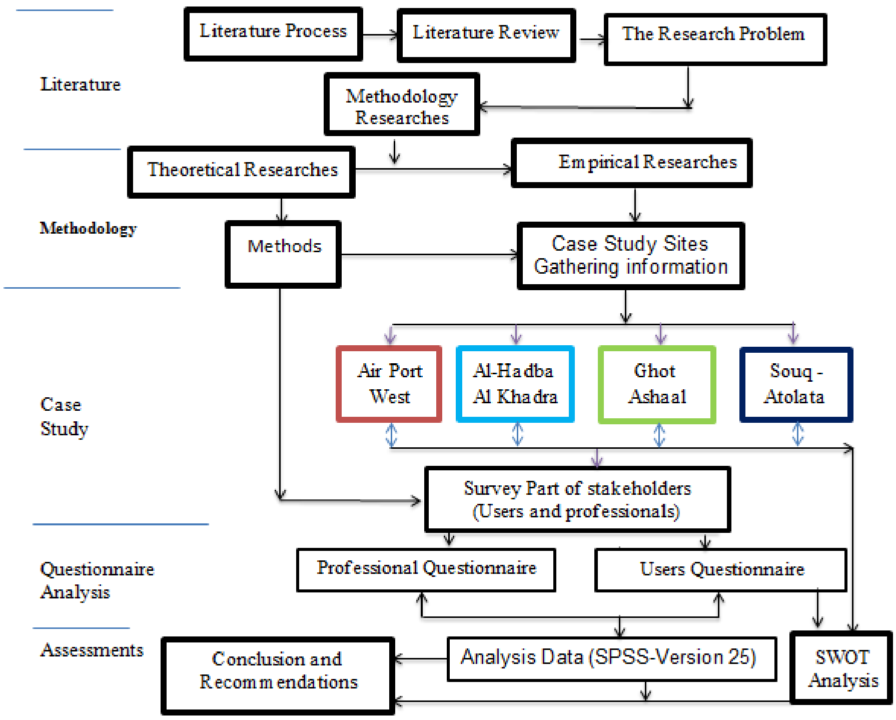

Figure 4: The Methodology Diagram Process of Research

1.5. Thesis Structure

The study of sustainable housing in Libya, the case of Tripoli is divided into seven chapters that cover the scientific framework of the thesis. The first chapter includes the introduction, through which the pure methodology is presented in all its aspects. The second chapter includes the definition of the three dimensions of sustainability (environmental, social and Economic). The third chapter includes the methodology; sustainable housing and policy, which consist of general information about the house and home, also sustainable architecture and housing policy. The fourth chapter is concentered on Libyan housing including the types of houses and housing policy in Libya. The fifth chapter deals with case study researches: the city of Tripoli questionnaires & case study researches. The chapter consists of the information gathered from the field survey including the quantitative questionnaire designed for the users and housing professionals, and also the analysis of these questionnaires, which concentrates on the application of principles housing sustainability in case study sites. The sixth chapter deals with analysis of the case study with results. Seventh chapter includes the evaluation and discussion of the thesis that is related to the results and proposals derived from data analysis. These can summarized as establishing specialized governmental institutions to prepare the foundations for the implementation of the principles of sustainable housing, proposing the rules and regulations to architects and planners to follow them in the design of the Libyan sustainable houses and settlements (residential, neighborhoods) of various types, depending on their social, and cultural requirements. In addition, it includes recommendations leading to the issuance of architectural and planning standards and regulations, which achieve sustainability to reach a housing policy that addresses the housing problem in Libya. Finally chapter eight, which includes the conclusion of the thesis, summarizes the major findings. Figure 5 shows the structure of the thesis.

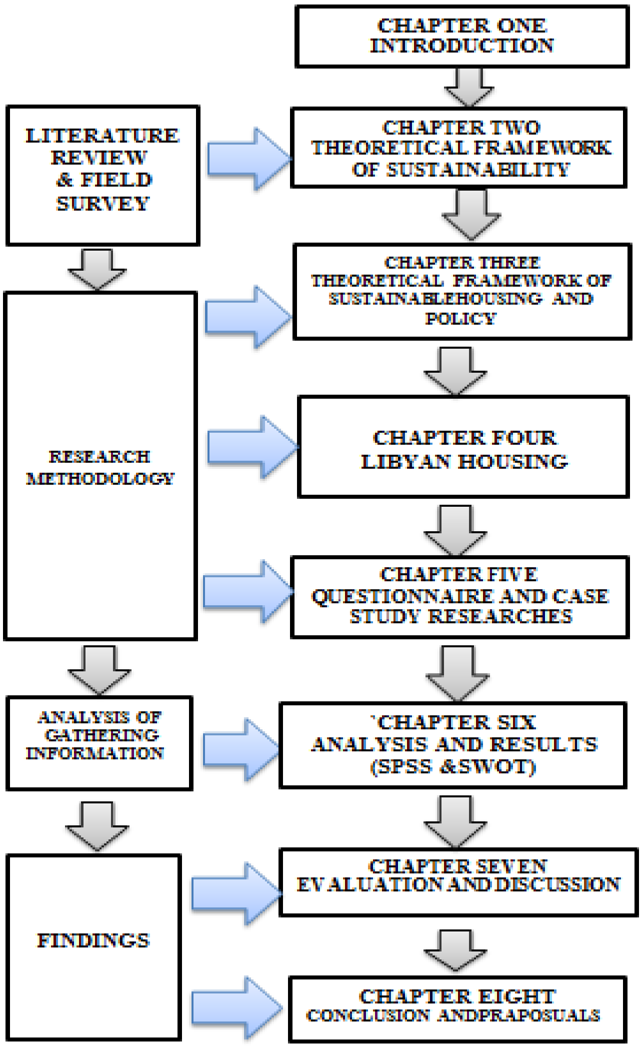

Figure 5: Thesis Structure

CHAPTER II

THEORETICAL FRAMEWORK OF SUSTAINABILITY

The concept of sustainability is not only central in environmental preservation, but also in consideration of the quality of development in human settlements (Tohy, 2006). The term sustainability had been defined in many different ways in the past. As a one example, in the history of humankind the concept of sustainability has been linked to the connected human-dominated ecological systems. In the 1980s, sustainability was used in terms of human sustainability on Earth (WCED, 1987). The literature review in this chapter covers the historical and main dimensions of sustainability. Housing and urban issues are linked to the concept of sustainability, which is based on environmental, social and economic sustainability dimensions, for the purpose of achieving principles of sustainability as a part of housing policy. This chapter provides a review of sustainable housing policy, including various sustainability concepts with a focus on the housing policy at different levels. Sustainability researchers are reviewed through the "UN" agenda documents and experiments done in some countries. The review covers the researches on sustainability and housing policy of the last four decades except the historical background studies and is concentrated on definitions, principles, aims, of the dimensions of sustainability.

2.1. Conceptual Approach to the Sustainability

The one who used the concept of sustainability first was the German Hans Carl Von Carlowitz (1717 BC) and British and French scientists in forestry used "Sustainable Yield Forestry". Since the recent emergence of the concept after World War II, when there was, an attempt to redefine the meaning of economic growth to be more interested in the strong relationship between economic development and quality of life. In the 1960s, the interest in sustainability concepts increased sharply with the emergence of books embracing the concept and environmental movements, such as Silent Spring by Rachel Carson written in 1962, and Sustainable Urban Planning written by Paul Ehrlich in 1968. In 1923, a group of European scientists and economists formed an organization called the "Club of Rome Limits to Growth” and they wrote a report, entitled Growth Limits Club of Rome, criticizing the existing patterns of the economy and predicting many problems that will be faced by the humanity in the future because of the depletion of land sources. The establishment of organizations followed this and institutions which seek to inform about the dangers of the rapidly growing population of the Earth extensive depletion of resources. The most important achievements of this club are as following (UNHR, 2009):

- The Committee published its report: Our common future and known as the report of the Commission 1987.
- The report represented the first global effort to address the issue of sustainable development.
- The report was also the first international document to address the interrelationship between the economy and the environment.
- The report considered that growth is the basis of all economic and environmental problems.
- The report also developed the famous definition of sustainable development: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

In 1987, the concept of sustainable development emerged in the report of the UN commission for the environment. This report refers to two fundamental issues in the Brundtland Report with its definition of sustainable development:

- Human needs, especially the needs of the poor and needy, must be a priority.
- The limitations imposed by technology and social organization on the ability to meet the needs of the present and the future.

- The committee's main objectives were:
    - Resuscitation of growth;
    - Changing the quality of growth;
    - Meeting the necessary humanitarian needs;
    - Maintaining a sustainable level of population;
    - Maintaining and improving the resource base;

- Technical reorientation with risk control and management;
- Integrating the environment and the economy into the decision-making process;
- Today's needs should not hinder the ability of future generations to meet their needs;
- There is a direct link between the economy and the environment;
- The needs of the poor must be met in all nations.
- In order to protect our environment, the economic conditions of the world's poor must be improved.
- Impact of all our activities on future generations should be cared;
- Resuscitation of growth;
- Changing the quality of growth;
- Meeting the necessary humanitarian needs;
- Maintaining a sustainable level of population;
- Maintaining and improving the resource base.
- Technical reorientation with risk control and management;
- Integrating the environment and the economy into the decision-making process;

- The Brundtland Commission's requirement for sustainable development was as the following:
    - A political system that ensures effective citizen involvement in the decision- making process;
    - An economic system which is capable of production and technical knowledge based on a sustainable base of self-confidence;
    - A social system capable of resolving tensions arising from heterogeneous development.
    - A production system that respects the commitment to maintain the environmental base for development;
    - A technical system that is constantly able to search for new solutions.
    - An international system that adopts sustainable patterns of trade and finance;
    - A flexible administrative system with the ability to self-correction;

Then the United Nations conference about environment and development came, which was held from 3rd to 4th of April in 1992 in Rio de Janeiro, Brazil, with 178 countries adopting a special agenda for the 21st century about the environmental development and sustainable management of forests, which was later known as Agenda (UNHR, 2009).

The 1995 world conference on social development also adopted the concepts of sustainability and sustainable development, and it was followed by the world conference on sustainable development in 2002, which set three aims for sustainable development:

- Fighting poverty;
- Protection of natural resources;
- Changing patterns of production and consumption;

- The conference reached to several results, the most important of which were:
  - Establishment of important organizations such as Sustainable Development Committee, whose responsibility is to promote development actions and policies for sustainable development throughout the world, Council of the Planet Earth, Labor Council For sustainable development and the International Council for Local Environmental Initiatives.
  - Agreement on twenty-seven principles for achieving global sustainability among industrialized countries and developing countries in order to apply more just environmental and economic conditions;
- The conference also advanced several principles, the most essential of which are:
  - Principle No. 2: Guaranteeing the right of States to use their own resources as long as they do not harm the environment in other parts of the world,
  - Principle No. 3: Ensuring the right of States to pursue their development;
  - Principle No. 4: In order for development to be sustainable, it must reduce production patterns and unsustainable consumption;
  - Principle No. 10: All citizens must be informing and sharing;
  - Principle No. 16: Every polluter must take responsibility for his actions;

Finally, the seven main objectives of the Rio Conference (UNHR, 2009) are:

- Adequate shelter for all persons;

- Improving basic living conditions;
- Adopting sustainable energy;
- Adoption of sustainable transport;
- Providing land for all families,
- Development of human resources,
- Reducing the impact of industrial and natural disasters;

2.2. Definitions

The word sustainable has many definitions depending on the context, which are summarized as the following:

2.2.1. Sustainability

English Oxford Dictionary defines sustainability as "conserving an ecological balance by avoiding depletion of natural resources”. Sustainable development in English is defined as "economic development that is conducted without depletion of natural resources", and "International policies should support sustainable development” (Online Cambridge Dictionary, 2018). Sustainability in a general sense can be defined as "the ability to meet the needs of today without compromising the ability of future generations to meet their needs” (Online Cambridge Dictionary, 2018). According to Anthony Yeong, an independent project management services researcher in Singapore, sustainability is an appropriate framework for intensified research seeking to reach a higher level of human life through economic and social development and environmental preservation efforts, and without natural drain sources (Yeong, 2013). Figure 6 illustrates the sustainability dimensions according to United Nations environmental program.

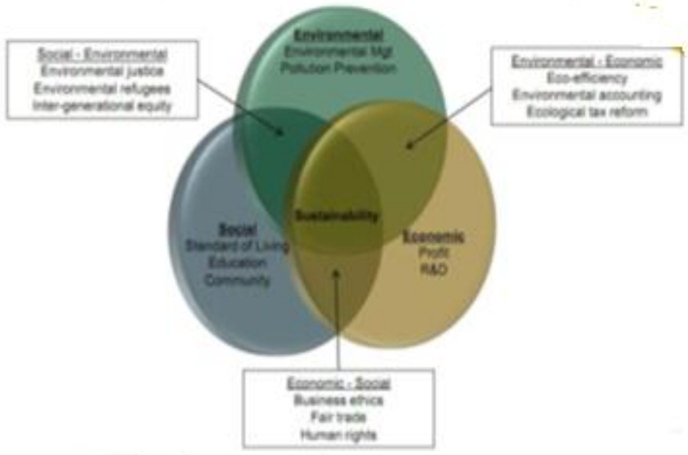

Figure 6: Sustainability
(Source: United Nations Environmental Programme, 2007)

2.2.2. Sustainable Development

Sustainable development is a development, which meets the needs of the present without compromising the ability of future generations to meet their own need (WCED, 1987). It contains two key concepts:

1. Concept of 'needs', particularly the essential needs of the world's poor, to which overriding priority should be given.

2. The idea of limitations, imposed by the state of technology and social organization, on the environment's ability to meet present and future needs. Fundamentally, sustainable development addresses three major areas:

a. People living today are entitled to justice and equal rights;

b. Environmental degeneration must be alleviated or eliminated;

c. Future generations must not be impoverished because of current actions (Redclift, 1987). Sustainable development is defined as a concern of attitudes and judgment to help ensure long-term ecological, social and economic growth in society (Ding, 2008). Also, sustainable development implies economic growth, and also with the protection of environmental quality they reinforce each other. The essence of this kind of development is a stable relationship between human activities and the natural world, which does not diminish the prospects for future generations to enjoy a quality of life at least as good as our own (Ding, 2008).

And according to Mohan Munasinghe (1993), the identification of sustainable development options requires the following:

- Good understanding of the physical, biological and social impacts of human activities;

-Better estimates of the economic value of damage to the environment that help to improve the design of policies, projects, and lead to environmentally sound investment decisions;

- Development of policy tools and strengthening of human resources and institutions to implement viable strategies and manage natural, resources on a sustainable basis;

2.2.3. Sustainable Housing

All definitions of sustainable housing were implemented in Principle of 15 of the United Nations Conference on human environment: "Planning should be applied to human settlements and urbanization in order to avoid adverse impacts on the environment and to maximize social, economic and environmental benefits for all" (UNDP, 1977). Sustainable housing is "housing that meets the needs of today's people and does not harm the ability of future generations to meet their needs" (Middleton et al., 1993), and the ability of future generations should not be compromised (WCED, 1987). Through all stages of housing (purchase of raw materials, construction, operation, renovation, and demolition), the goal is avoiding pollution, reducing the use of non-renewable resources, avoiding waste and meeting the changing needs of future generations. Sustainable housing can also be defined as housing practices striving to achieve integrated quality, including economic, social and environmental performance (John, et al, 2005).

Sustainable housing, in another definition, is housing that meets the needs of today's people and does not compromise the ability of future generations to meet their needs (Tuohy, 2006). In this aim, the architects have an important role in reducing the impact of buildings on the environment with their designs. They must consider energy-efficient designing strategies from the first stage and should not rely on simplified analyses. Modifications of the conditions inside the buildings can be achieved by using the characteristics of the coating of the building, building materials, cross ventilation (Almansuri, et al, 2010). Sustainable housing should be implemented by reducing the negative environmental impacts of the material usage, energy consumption and water consumption during the entire period of service of the building. It should involve practices, which strive for integral quality including economic, social, and environmental performance in a broad way (Morelli, 2011).

2.3. Principles of Environmental Sustainability

Sustainability is defined as a global process that tries to help create an enduring future where environmental and social factors are considered simultaneously with economic factors. (Newman, 2002) The term environmental sustainability refers to the systemic conditions where neither on a planetary nor on regional level do human activities disturbs the natural cycles more than planetary resilience allows, and not depriving the natural capital that has to be communal with future generations at the same time. These two limitations, based on a prevalently physical character, will be aligned with a third limitation, based on ethics: the principle of equity states that in a sustainable framework, every person, including those from future generations, has the right to the same environmental space, that is, the right to access the same amount of natural resources. (Vezzoli, Manzini, 2008) The general goal of environmental sustainability is to preserve the earth from degradation of activities of humans on earth. As construction consumes large amounts of materials and energy and produces tons of waste, sustainable construction "which could be defined as the creation and responsible management of the environment that is built based on resource efficiency and ecological principles" (Haddad, 2010). Additionally, the principle of the ecological sustainability involves:

A. Rates of the usage of renewable resources should not exceed the rate of regeneration.

B. Depletion rates of non-renewable resources should not exceed the rate at which renewable substitutes are invented and invested;

C. Rates of pollution should not exceed the assimilative capacity of the environment;

D. Waste emissions should not exceed the assimilative capacity of the local environment (Caldwell, 1998).

Morelli defined environmental sustainability in his paper as "meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them", and as "condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity". (Morelli, 2011)

The main goal of environmentally sustainable construction is to maintain a healthy environment around us with focusing on the following:

- Resource consumption: Reducing energy and natural resource depletion;
- Energy efficiency: Making sure that the design maintains as much energy as possible;
- Waste management and pollution prevention: Ensuring that construction and operation of buildings do not lead to destruction of the global environment, and ensuring that materials used do not emit toxic substances and gases in the atmosphere.
- Enhance the natural environment: Achieving effective and long-term design and protect and restore air, water, and local soil;

There are many factors influencing the environmental performance of a building. These factors include features of its architecture, its location, "the construction materials and processes that is used, opportunities for rainwater harvesting, recycling, and the presence of on-site renewable energy sources". (Wiesel, et al, 2012) Aim is to minimize the environmental impacts of material use, energy and water consumption throughout the lifecycle of the building. (Krajisnik, 2010) It focuses on maintaining the balance of society's need for a happy life and preserving the natural resources for future generations. Figure 7 illustrates this balance.

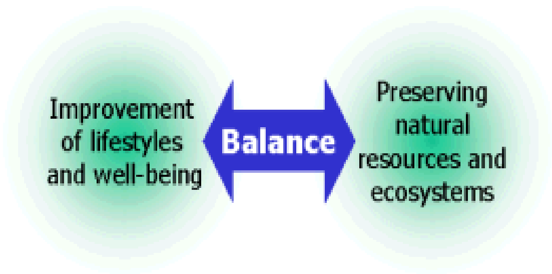

Figure 7: The balance of society's need and the natural resources for future generations (Source: Fedkin, 2015)

Ecological sustainability is “meeting human needs without compromising the health of ecosystems” (Morelli, 2011). In ecology, the word “sustainable” describes how biological systems to remain healthy, diverse and productive over time. For humans, it describes the potential for long-term maintenance of well-being, which in turn depends on the well-being of the natural world and the responsible use of natural resources (Martty**,** 2015). More specifically, the ecological sustainability of a development activity refers to ‘activity that acknowledges biophysical limits and the need to conserve essential ecological processes and life-support systems upon which all life depends’ (Caldwell, 1998). In economic terms, environmental or ecological sustainability requires maintaining natural capital as both a provider of economic inputs and an absorber of economic outputs, including wastes. Therefore, environmental sustainability requires planning that provides for ecological conservation in the formative stage of the development plan (Basiago, 1998).

2.3.1. Environmental Protection

Environmental protection can be seen as the sum of all of the activities which aims conserving important elements of the environment, undoing the negative environmental impacts of human activities in existing environments. These activities can either be forward looking or immediate day-to-day actions, which is called "follow-up” (Middle, and Middle, 2010). The activities that are part of environmental planning are the following:

-Approvals of development proposals that have environmental implications, including the environmental impact assessment and approvals required to clear native vegetation.

-Planning and policy-making where such plans have significant environmental implications, including planning and policy-making by environmental agencies;

- Planning for repairing and rehabilitation of degraded areas;

2.3.2. Environmental Planning

Environmental planning has become a separate discipline within planning, partly in response to the emergence of the environmental movement in 1960’s and 1970’s, also after recognizing the quality of the natural and human environment has declined significantly over the last 50 years. As a result, there was an urgent need to take action to stop further decline and, in some cases, to repair the damage done. According to Ellis, et al., “whilst environmental protection and management are separate disciplines, many environmental issues are best addressed through the land use planning system.” (Ellis, et al 2011) Environmental planning can be defined as “the planning process for the environmental pillar of sustainable development.” According Daniels, environmental planning reflects a broad view of the environment and defined as “the theory and practice of making good, interrelated decisions about the natural environment (natural resources, wildlife, and natural hazards), working landscapes (farms, forests, and lands from which minerals are extracted), public health (air and water pollution, toxins and waste disposal) and the built environment.” (Daniels, 2009) Environmental planning is a theory and practice of making good, interrelated decisions, about the largely unmodified environments, environments exploited for resources, environments receiving human-produced wastes and toxins, and aspects of the built environment which serve some environmental function. It’s a collection of decisions on activities, including the immediate ones in which the development proposals have significant environmental implications, strategic plans and policies for the future. Figure 8 illustrates the differences and inter-relationships between environmental protection, environmental planning, environmental management and follow-up. The activities in the environmental planning are shown in blue, the activities that are in environmental management are shown in green and follow-up is shown in purple. Activities shown in black are the historic events that had environmental impacts. (Lee, 2015).

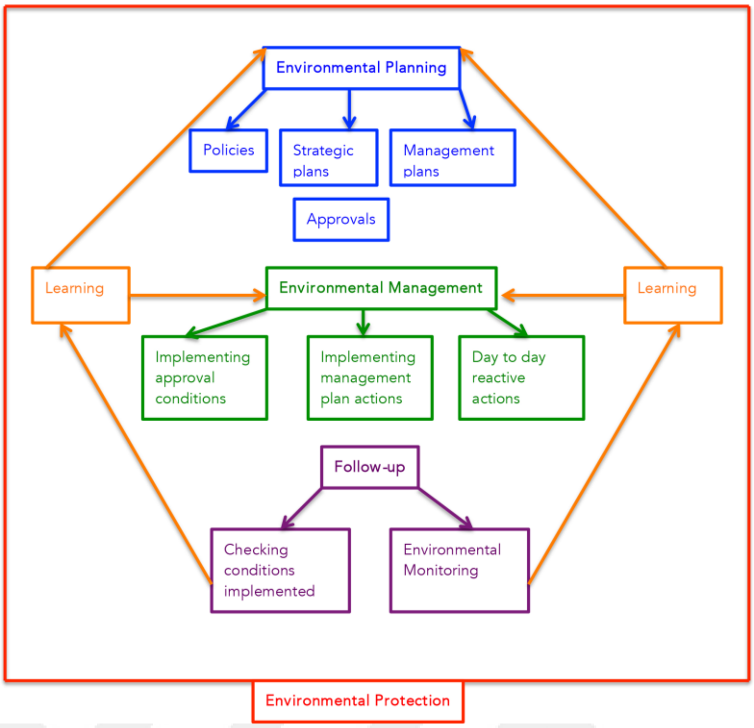

Figure 8: The Relationships Between Environmental Protection, Planning, Management and Follow-up (Source: Middle, 2015)

2.4. Principles of Social Sustainability

There are different definitions for social sustainability from different researchers in the literature. For example, Sachs states that the "strong definition of social sustainability must rest on the basic values of equity and democracy, the latter meant as the effective appropriation of all human rights - political, civil, economic, social and cultural by all people." (Sachs, 1999) Concerns over sustainability were often confined to environmental and economic aspects. “Social sustainability", a concept referring to the influence of the living space on the quality of human life, had often been neglected in the past. However, this dimension of sustainability has gained recognition as an essential element of sustainable development in recent years. It has started attracting the attention of scientific communities and has been receiving political and institutional support as a part of the agenda of sustainable societies and their integration into urban sustainability (Colantonio, 2013).

According to Amir, et al., future focus and process are the two most imperative attributes in preciseness and usefulness of urban social sustainability discussions.

(Amir, el al, 2013 as a cited from Partridge, 2005) Future focus refers to the improvement of a just society for current and future generations. Castillo, et al., with keeping future focus in mind, declare that “social sustainability can be defined as ensuring the well-being of current and future generations, by recognizing every person’s right to belong to and participate as a valued member of his or her community” (Castillo, et al. 2007).

Canadian Institute of Planners defines social sustainability as “a process of urban development, supported by policies and institutions that ensure harmonious social relations, enhance social integration and improve living conditions for all groups” (Castillo, et al. 2007).The UK Sustainable Communities document, which was approved in 2003, defines sustainable communities as “places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all." (Eizenberg, Jabareen, 2017) Young Foundation defines social sustainability as “a process for creating sustainable, successful places that promote wellbeing, by understanding what people need from the places where they live and work (Borowczyk, 2018).

Although the sustainable development agenda emphasizes the importance of “social” aspects of sustainability, there has been a little to none agreement on what it consists of. Polese and Stren suggest the following definition about social sustainability: "development (and/or growth) that is compatible with harmonious evolution of civil society, fostering an environment conducive to the compatible cohabitation of culturally and socially diverse groups while at the same time encouraging social integration, with improvements in the quality of life for all segments of the population;” (Polese, Stren, 2000) There are also many researchers who introduce more specific definitions for social sustainability. Sachs suggests that "strong definition of social sustainability must rest on the basic values of equity and democracy, the latter meant as the effective appropriation of all human rights - political, civil, economic, social and cultural by all people.” (Sachs, 1999) According to Littig and Griebler, "It signifies the nature-society relationships, mediated by work, as well as relationships within the society. Social sustainability is given if work within a society and the related institutional arrangements satisfy an extended set of human needs and are shaped in a way that nature and its reproductive capabilities are preserved over a long period of time and the normative claims of social justice, human dignity and participation are fulfilled". So, social sustainability requires planning that encourages people to cooperate and to not follow their competitive impulses. (Basiago, 1999)

2. 5. Principles of Economic Sustainability

Economic sustainability is about satisfying the current consumption demands without compromising the needs of the future generation in a system of production. It is concerned with the sustainability of the economic life itself. The notion of "economic sustainability" was originated by Hicks, in his classic work Value and Capital, in which he describes the notion of "income", as "the amount one can consume during a period and still be as well off at the end of the period". (Basiago, 1998 as cited in Hicks, 1939). In housing projects, a plan that is designed with aim of being economically sustainable decreases the possibility of the need of renovations in the future and reduces costs associated with energy usage. In implementation of the projects, local economies should strive to operate within natural system limits and to not damage the natural resources, which will serve as an asset for future economic development. The rate at which the waste is created should not be faster than the rate of decomposition. Moreover, the projects that are implemented should meet locally defined needs and aspirations. It should create a diverse housing to satisfy different needs, and infrastructure that enhances efficiency of local economic activities and life of the people in general. So, economic sustainability requires a planning which will make the city more "green", and, hence, more livable, for people (Berke, 2002).

2.6. Summary of the Chapter

Sustainable development as a concept and a movement became a very important factor in policy making in all areas. The concept of sustainability became a central factor not only in environmental preservation, but also in developing the human life, in all aspects. (Tohy, 2006)

The word "sustainable" has more than one definition and each of them characterizes the notion for different contexts it is used. Many of the problems that arise in housing and urban development are linked to sustainability, which is defined in environmental, social and economic contexts. The main objective of the thesis is to achieve housing sustainability by taking the advantages of all factors and harnessing them for the housing policy at the level of the settlements and through them can be applied to the other levels (housing neighborhoods, housing districts city, region and national level).

CHAPTER III

THEORETICAL FRAMEWORK OF SUSTAINABLE HOUSING AND POLICY

This chapter concerns sustainable housing, the first part provides a literature review on housing with social sustainability including the concepts, meaning, security, safety, the privacy of homes and indicators for a housing assessment. Also, it includes architecture of sustainable housing. The last part of the chapter concentrates on a sustainable housing policy literature review in general.

3.1. Sustainable Housing Architecture

The concept of sustainable housing architecture appeared more or less at the same time as the evolution of the concept of sustainable development (Almansuri. et al, 2010). Green and sustainable architecture refers to a building that is designed and constructed to minimize the impact on the environment and ensures that the building is resource-efficient "materials, energy, water, space" in its operation and maintenance. Moreover, it may define: Sustainable design or ecological design, "also referred to as green design or sustainable architecture" is a philosophy of designing buildings to comply with the principles of social, economic and ecological sustainability (Lehmann, et al, 2010). Sustainable architecture is an architecture that involves a set of aesthetic, environmental, social, political and moral values that reach through the use of imagination and technology to design a building that harmonizes with the environment. The architecture offers a unique challenge in sustainability, for example the construction typically consumes large quantities of materials and produces tons of waste. The challenge is to strike a balance between environmental considerations and constraints, economic and user needs (Mohamed, et al, 2008). Also, Al-Yafei (2005) state that sustainable architecture is an architecture that supports ecological balance by relying on ecological creation systems and reusable building materials to reduce the depletion of natural resources. It meets the needs of today's generation without compromising the ability to meet the needs and requirements of future generations. The first determinants of this architecture are its compatibility with its surrounding environment, and the preservation of natural, industrial or economic resources, with the blending of all this with a successful art form that encourages individuals and society to preserve, respect, and good use and maintenance. And among the most important architecture principles of sustainability are:

- Lack of consumption of non-renewable sources and the use of natural resources with high efficiency such as energy, water and land;
- Different healthy environment by creating low toxic resources;
- Lack of energy embodiment;
- Design of buildings that are more climate-friendly;
- Consistency with the environment and understanding of natural processes;
- Communication with nature;
- The trend towards waste removal, recycling and reuse;
- High quality of architecture, compact urban development, social diversity; economic development and ecology. High quality architecture is understood as innovative and up-to-date. It respects the heritage of the past and meets the needs of the present. Contemporary architecture should avoid all forms of pseudo-historical design" (Narvydas, 2014). Also, Rocky Mountain Institute has identified five elements of sustainable architectural design as:

-Planning and design should be comprehensive. Sustainable design is at the forefront when compared to traditional design. The first design decisions should have the greatest impact on energy efficiency and achievement air quality control, acoustic quality, visual quality, indoor air quality and indoor noise control.

- Sustainable design is more than just a constructive philosophy that follows a particular method of construction. Sustainable buildings do not have the style, but localized dyes prefer the location of design to reinforce cultural identity.
- Low cost of sustainable buildings which are less complex than the traditional ones;
- The integrated design which considers each component and is considered as part of the whole, vital to have a successful sustainable housing design.
- Reduce energy consumption and promote human health. By achieving energy

saving architecture conserving energy "buildings with energy efficiency, electrical systems, and plumbing".

3.1.1. Sustainable Housing

Cofaigh et al., describe a sustainable building as those buildings that have minimal detrimental effects on the natural environment, on their immediate surroundings and in the wider regional and global setting. Accordingly, sustainable architecture can be defined as an architecture that meets human needs and has minimum impact on the natural environment, and a planned effort at designing a built environment that is energy and ecologically considerate both internally and externally (Almansuri, as cited from Cofaigh, et al., 1996). Therefore, housing is sustainable if "everyone has the opportunity of access to a home that is decent; if it promotes social cohesion, well-being and self-dependence." (Edwards, 2000)

The definition of sustainable architecture involves a combination of values: aesthetic, environmental, social, political, and moral. It is about using one's imagination and technical knowledge to engage in a central aspect of the practice, to be our designing of buildings in harmony with our environment. The smart architect thinks rationally about a combination of issues including sustainability, durability, longevity, appropriate materials, and sense of place. The challenge is finding the balance between environmental considerations and economic constraints. Consideration must be given to the needs of our communities and the ecosystem that supports them (Haddad, 2010). In addition, in UN-Habitat sustainable houses are defined as those that are designed, built and managed under the below items:

- Healthy, durable, safe and secure;
- Affordable for the whole spectrum of incomes;
- Using ecological low-energy and affordable building materials and technology;
- Resilient to sustain potential natural disasters and climatic impacts;
- Connected to decent, safe and affordable energy, water, sanitation, and recycling facilities;
- Using energy and water most efficiently and equipped with certain on-site renewable energy generation and water recycling capabilities;
- Not polluting the environment and protect it from external pollutions;

-Well connected to jobs, shops, health- and child-care, education and other services;

- Properly integrated into the social, cultural and economic fabric of the local neighborhood and the wider urban areas;

- Properly run and maintained, timely renovated and retrofitted (UN-Habitat, 2012). Architecture offers a unique challenge in sustainability;

Construction buildings typically consume large quantities of materials and produce tons of waste. Also, the sustainable housing defined as "Sustainable housing is a form of affordable housing that also incorporates environmentally friendly and community based practices, to reduce the negative impact that homes can have on the environment through choosing better building materials and environmental designs (Almansuri, et al, 2010), the next Figure 9 shows the housing and its relationship with the three dimensions of sustainable housing.

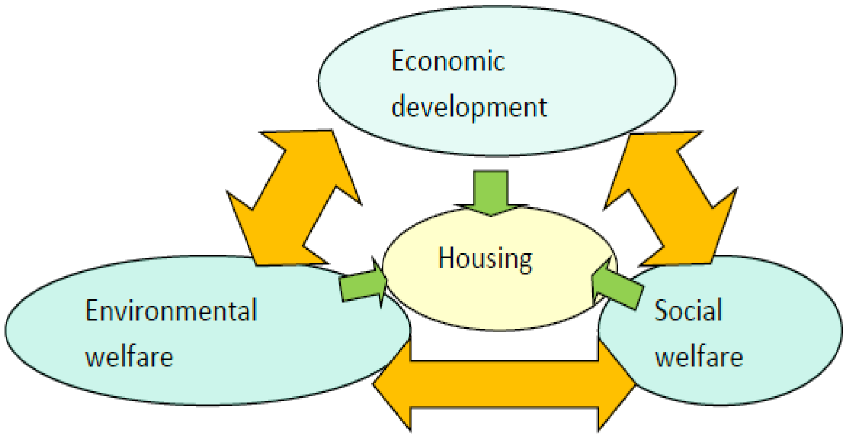

Figure 9: The Three Dimensions of Sustainable Housing

(Source: Almansuri, 2010)

3.1.1.1. Characteristics of Sustainable Housing

Important characteristics of sustainable housing include as sustainable land-use planning; resisting scattered settlements; housing close to employment and public transport; higher residential densities; sustainable construction; high standards of energy efficiency in use of dwellings; housing availability, affordability and quality; access to green spacing and a high-quality residential environment (Abu Bakar, et al, 2014 as a cited from Winston, 2007). While Abu Bakar, et al, (2014), stated that the success factors in sustainable housing are:

-Economically; they are cost-efficient over the lifespan of the dwelling;

-Environmental; they are resource-efficient in terms of materials, waste, water and energy;

- Social; they are safe, flexible and comfortable for people with varying abilities;

Also, that Edwards and Turrent in their book" Sustainable Housing Principles and Practice" added some features, that most architects and developers acknowledge that sustainable housing neighborhoods will need them as the following (Edwards and Turrent, 2000) :

- High density, mixed-use and diversified tenure;
- Integration of land use and transport planning with emphasis upon public means of transportation;
- The urban layout that creates shelter and safety;
- The exploitation of renewable energy supplies "wind, sun, etc."
- The capture of rainfall for certain water uses;
- Use of open space "streets, parks and squares" to facilitate social interaction and ecological wellbeing;
- Pollution and waste strategies;
- Creation of natural habitats integrated with the housing.

At the individual building level, sustainable housing will probably display a further list of features:

- Healthy comfortable, secure homes;
- Householder is able to adapt or extend space;
- Designed-in ability to upgrade;
- Low energy design exploiting renewable energy sources;
- Super-insulated homes;
- Low water consumption;
- Disabled access;
- Use of ‘smart technologies’ to enhance security;
- Spiritual design ;

- Ability to work from home;

3.1.2. Environmental Sustainable in Housing Design

The concept of the environment is a vital consideration in housing design, which surrounds and creates a suitable environment for occupants. In fact, the architects can be considered as a "facilitator of the environment", someone who translates the particular concerns and desires of the future the home occupants, and the wider community, into a structured form; of course the construction and operation of houses involve the use of resources, both on-site and off-site. The production, transportation, and use of building materials raise questions about pollution and depletion of resources. In addition, the energy sources used for domestic heating, cooling, water heating, ventilation, lighting and operation of the equipment have implications for their production and use. Therefore, there is a range of issues related to both environmental degradation and the depletion of resources associated with the housing. Most countries are trying to address this environmental problem by undertaking several studies aimed at addressing environmental issues in the area of housing (Bennetts, 2000). The next Figure 10 illustrates the elements of housing Sustainability.

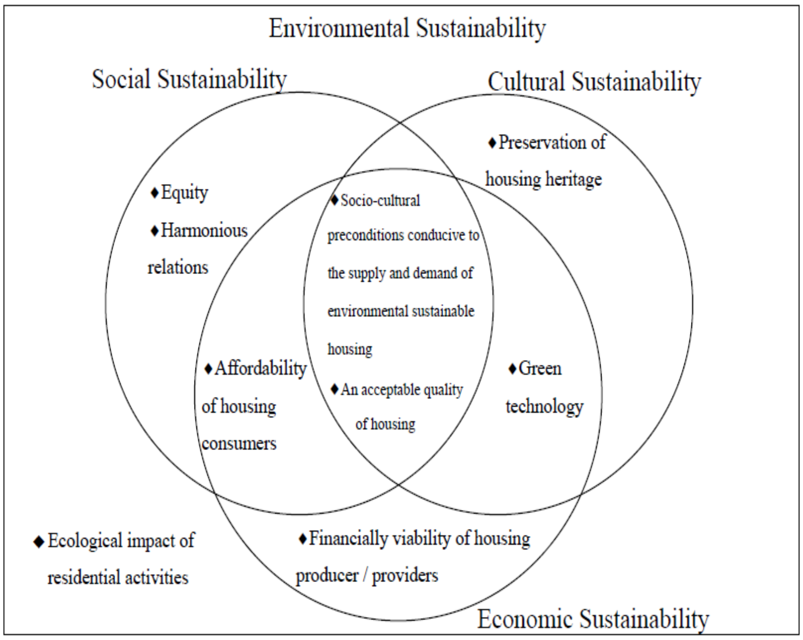

Figure 10: Elements of Sustainability in Housing (Source: Bennetts, 2000)

Because of some researches related to environmental sustainability in housing design was the houses that are designed to reduce greenhouse gas emissions, save water and energy and reduce waste during construction and the house's lifetime.

So, environmental sustainability in housing can be achieved by addressing resource limits of the environment through efficient consumption of non-renewable resources, minimizing the influence of waste materials and pollution by operating suitable technologies and making use of local labor forces. (Nair, et al, 2005).

3.1.3. Social Sustainability in Housing Design

Social sustainability refers to the maintenance and improvement of the well-being of current and future generations. A project is considered to be socially sustainable when it creates a harmonious living environment, reduces social inequality and cleavages, and improves the quality of life in general, according to (Edwin, et al, 2007 as cited from Enyedi, 2002). Also, social sustainability combines the design of the physical realm with the design of the social world infrastructure to support social and cultural life, social amenities, and systems for citizen engagement and space for people and places to evolve. (Woodcraft, 2018) Figure11 presents the design for social sustainability framework.

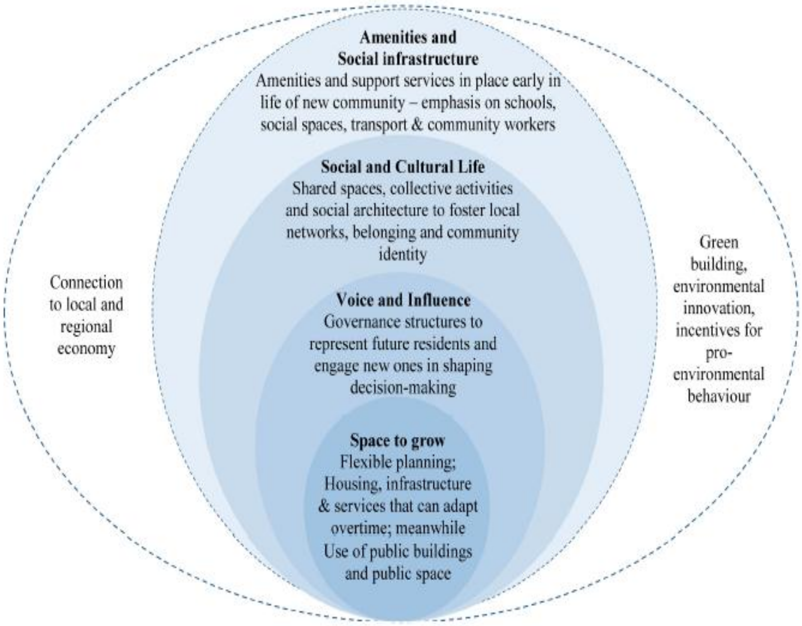

Figure 11: Design for Social Sustainability Framework, Young Foundation (Source: Woodcraft, 2018)

In practice, social sustainability has many dimensions with various strategies, for example (Colantonio, 2013 as a cited from Fairlie, 1996):

- The empowerment of poor communities;
- Inclusion of all groups in planning;

- Design and governance decisions;
- Building the skills of people; and
- Creating training and employment opportunities through construction processes;

The inclusion of low-income groups in housing strategies can increase security and decrease social tensions in cities. Particular urban forms and approaches such as mixed land use and density can promote social integration and equity. In addition, social sustainability has many dimensions; one of them is the empowerment of people from all income, age and ethnic groups, regardless of gender, to be a part of housing construction processes and the decision-making behind them. People should be involved in information gathering, planning, implementation, maintenance and monitoring processes related to housing. (Pullent, et al, 2010) Social sustainable house is the house that is designed to prevent injuries through built-in safety features. It has security elements to reduce crime and improve the occupants' sense of security. Features are also used to provide flexibility and comfort for people of varying abilities and at different life stages, including children and people with limited mobility[1]. Also, social houses are cheap and affordable. These homes are mostly small houses or apartment-type houses where the common sense of community is generated. However, advanced technologies are rarely used in the construction of these types (Narvydas, 2014).

3.1.4. Economical Sustainability in Housing Design

Economic sustainability requires planning for people, making the city more "greener" and therefore more livable, and a way to apply the theory of "economic sustainability" in a practical sense is to design a method of urban design that meets the needs of urban service for the general public, especially the urban poor, while promoting a natural urban environment(Basiago,1999).

The following subtitles regarding economic sustainability in housing design, to illustrate some principles of economic sustainability.

Components of the overarching sustainability principle adopt the three economic sustainability principles (Ministry of Environment Lithuania, 2002):

A. Costs affordable in the long run to central and local governments including implementation agencies;

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[1].Source: www.totalinsulationsolutions.co.uk – 25/11/2019

B. Cost affordable to each individual household on a month-by-month basis.

C. The program for existing housing optimizes the value of the existing housing stock.

In the application of the concepts above to housing, there are two pre-requisites for housing to be considered economically sustainable.

1. The advantages of housing providers and producers must at least be equal to the expenses of housing production given the housing demand levels;

2. The production and usage processes are in the environmental capacity to supply and absorb, given the mitigation technology.

The first has always supported the operation of the housing sector. It refers to the economic efficiency of private housing projects or the socio-political advantages against financial costs for economically supported housing projects. To afford an acceptable quality of housing depends on the ability of housing consumers. The second is a new topic and it refers to, on one hand, the identification of the environmental earnings and costs of housing activities; and on the other, the prevention of long-term adverse effect on the sustainability of the natural environment. In this manner, the development of technology, building materials and housing designs to decrease the environmental impact of housing activities, and their indications for the financial viability of housing projects, are important (ibid). According to "Agenda 21" as elaborated by Kahn 1995, the pattern of sustainable development in Economic Sustainability the criteria including (Basiago, 1999):

- Growth development
- Productivity
- Trickle-down

Also, Basiago, 1999, confirmed that the above criteria were used as substrates of economic sustainability in planning practice in Curitiba city, Brazil, by the following means:

1. Launch program to reduce automobile use;
2. Establish modern bus mass transportation scheme productivity;
3. Enhance bus system efficiency to draw riders trickle down;
4. Make bus transit fast, cheap and comfortable;
5. Place high-density living near major arterials;

6. Zone for mixed residential-commercial use;
7. Make downtown streets pedestrian malls;
8. Expand green zones to safeguard open space;
9. Enlarge the amount of per capita green space;
10. Enact regulations to protect every urban tree;
11. Allow the poor to swap their garbage for food;
12. Encourage residents to separate their garbage;
13Set up programs to recycle recyclables;
14. Produce civic theater to promote recycling;
15. Enlist the aid of children in recycling efforts;
16. Develop a low emissions industrial zone;
17. Enact policies to give the poor basic services;
18. Give poor people free medical and dental care;
19. Give poor people free childcare so they can work;
20. Nurture civic enthusiasm, brightness, and zest;

Additional to the following principles by John Morelli according to his paper titled "Environmental Sustainability: A definition for environmental professionals" like:

- Support local employment;
- Support fair trade;
- Review the environmental attributes of raw materials and make environmental sustainability a key requirement in the selection of ingredients for new products and services “Global Sustainability Principles”. So, the houses are considered economically sustainable if those houses are designed to save money during construction and over the lifetime of the house. Careful planning avoids the need for major future renovations and reduces costs associated regarding energy use, water use and maintenance. Also, economical houses are partially implemented with new technological improvements and that improves energy efficiency, the most advanced technologies are not used, because that would increase costs. The aesthetical expression is average. These housing buildings should not be mixed up with social homes. Economically sustainable homes are cheap detached houses, more appropriate for middle-class families (Pullent, et al, 2010). The economic sustainability of housing should be embedded in an economic development

strategy, which strengthens the economic self-reliance of household members. The poor often cannot afford public housing assistance due to the lack of economic sustainability of the housing (Nair, et al, 2005).

3.1.5. Environmental, Social and Economic Problems Resulting from Urban and Architectural Design

Development in the second half of the 20th century strained the issues related to the environment and sustainability. It has been calculated that the construction sector of the global economy every year consumes 50% of the total world energy resources and 21% of this volume is used in housing construction. Wines states that construction of housing consumes one-sixth of the world’s fresh water supply, one-quarter of its wood harvest, and two-fifths of its fossil fuels and industrial materials. As a result, architecture has become one of the primary goals of ecological reform (Narvydas, 2014).

According to Ismail and Salwa Bari, (2008), the environmental and economic problems resulting from architectural and architectural design surmised as:

-The client's virtual life has a long-term impact on the environment. The world's giant is consumed by any international organization working in the field of oil and gas "about 40% of the global economy".

- Economic growth consumes a great deal of the basic raw resources and raw materials.

- Separation of the development sectors, especially the architecture, from the environment sector, where it is first built on the ruins, from the negative impact of economic development on the environment is not nurtured.

- Lack of awareness of some investors about the impact of environmental and architectural growth on the environment, leads them to violate the rights of the environment and unfairness to achieve purely economic profits.

- Adapting to the ecosystem through non-environmentally friendly means, which is detrimental to the ecosystem and to humans.

- Reliance on nonrenewable energies that tend to be depleted;

- Pollution from non-renewable energies;

- Electricity is a clean energy when used, but the process of production of this energy may be followed by significant negative effects on the natural environment if the use of traditional sources of energy to generate such as petroleum and coal, with the use of emission of residues and other residues harmful to the environment.

- Waste and waste generated by architectural and architectural activity - during implementation or after use;
- Inputs to the ecosystem cannot deal with them, which is a burden on it and result in pollution.

Also,the important factors affecting the social sustainable concerning the provision of infrastructure as:

-Provisions of various public facilities such as schools and medical centers cater to the basic needs of the citizens, (Lee, and Chan, 2008 as cited from Rothenberg, 1969).

- Availability of job: opportunities to improve the feeling of the social well-being of the citizens.
- Accessibility: the citizens aspire to live, work and participate in leisure and cultural activities without traveling too far (Smith, 2000).

-Townscape design: visual images of street furniture and pavement, and interconnectivity of street layouts have impacts on the social sustainability of places.

- Preservation of local characteristics: local characteristics of an area should be respected and existing community relation has to be conserved.
- Ability to fulfill psychological needs: The public would like to know what is going on in the public areas around their dwellings and hence urban design that fails to keep the spaces under public surveillance reduces a sense of security of the citizens.

3.1.6. The Concepts of Home and House

Most people see their own homes as important. However, it is difficult to cope with the complexity inherent in this matter. The home is the most important place for family needs and as a part of a building; the person's identity is developed in the parental home. (Amer, 2007 as cited from Ali, 2005), Also the house, built as a shelter and security is accepted as one of the basic needs of people. Also Roaf, et al. (2003), describes the buildings as our third layer of our body. The first is our own skin, the second is our dresses and the third is the house. Concerning the house, in business dictionary housing is defined as building structure conforming to requirements of laws and regulations, and the place where the families live. According to Webster's dictionary, the concept of housing is the home for citizens. In Macmillan dictionary, housing is defined as houses for inhabitants to live in. The concept of “housing” has a parallel concept “house” described by Melnikas (1998), as physically, biologically and socially closed place where people can live their social live by receiving services, doing house chores and social activities. Researchers Grimes and Orville (1976) describe that in the early time the concept “housing” was connected with a physical phenomenon, and the policies of countries for its provision mostly are related to construction costs that may largely vary depending on the kind of construction material, various housing principles and construction. So, the housing can generally be characterized as a physical unit, a defined space for its residents, providing shelter and protection for domestic activities and concealment, and an entity-separating private from public domains. (Lawrence, 2002). And the house is a home when it shelters the body and comforts the soul. "Moreover, a house is a home; it is also the main building block of successful communities. (Edwards, 2005)

3.1.6.1. Home Identity and Culture

Due to the several cultures, it is hard to define “home”. The people themselves have formed the world of symbols that people live in. The objects they make, their artifacts, define their purposes and senses. They are commonly viewed as humankind's extreme and most tangible artifacts. (Amer, 2007 as cited from Lantz, 1996) .What does our homes and the equipment they contain actually mean to us? In answering this question, the connection between the home and identity is stressed by some academics. According to Lantz, the home is part of somewhat he calls the personal space. A home is, he/she feels, an extension of an individual's every personal needs. The inhabitants try to find three values in their zones, in their homes. These values are identity, privacy, and security. If the home is an integrated part of the individuals' identity-then, it "cannot be reduced to an apparatus for suiting a number of practical purposes. It is not a housing machine, but instead a complicated fabric of symbols, dreams, ideals, and aspirations". (Amer, 2007 as cited from Lantz, 1996).Housing protects and lets the individual and family to express their identity through the reforming of the internal environment (Amer, 2007 as cited from Svensson, et al. 2003).

When bearing in mind the relation between home and personality, it can be requested that the concept of home is highly ideologically and culturally charged. According to Amer, as cited from Lantz, "home is an ideological concept. It also has a personal existential charge", the personality's perception of the concept of a home is a social and cultural construction. (Amer, 2007 as cited from Gaunt & Lantz, 1996) Thus, culture and lifestyle are probably the two most important components in the creation of the concept of home. Moreover, Amer, as cited from Cooper, confirms, "building and settlement patterns are material expressions of the cultures that construct them". (Amer, 2007, as cited from Cooper, 2003) In certain eastern societies, especially traditional societies, some forms of living, as extended family, are more common. However, elderly immigrants from `developing countries' have experienced half-modern forms in their homeland. Since the middle of the 20th century in most non-western civilizations, important changes in traditional forms of living have taken place. During their childhood and young age they lived under more traditional conditions, characterized by extended families and a hierarchical family structure. Zulkeplee Othman, (2014), stated that in recent years many Muslims have established new homes in different places in recent years. In Islam, there are strong religious traditions that apply directly to the structure and organization of life within the home and its environment. Within the Islamic faith, a home is considered to be a microcosm of Islamic culture and civilization" that is of matchless delight". (Malik and Mujahid, 2017) Traditional Muslim homes are designed according to the guidelines from principles outlined in Islamic Sharia Law, derived from "the Quran revelations of Allah to Prophet Muhammad" as well as Sunnah (utterances and actions of Prophet Muhammad). Three main principles have emerged from these guidelines (Othman, le la, 2015):

a. Privacy, as a safe and private place for personal and family's sanctuary;

b. Modesty, a home with spaces for religious rituals and activities;

c. Hospitality, a dwelling with opportunities to extend hospitality to neighbors and enhance relationships with society;

3.1.6. 2.The Meaning of the Home

The concept of home has a number of meanings in different cultures. Taking a perspective on defining and categorizing the meaning of the home (Amer, 2007 as a cited from Lewin, 2000) based this categorization on several authors as, Sebba and Churchman, (19860; six Smith, (1986) and Despres, (1991) cited from several authors definitions and concluded the following aspects:

-The home as security and control;

-The home as a mirror of personal views and values;

-The home as an influence and place for a change

-The home as permanency and continuity;

-The home as a center for family relations;

-The home as a center of activity;

-The home as a retreat from the surrounding world;

-The home as a personal indicator;

-The home as a concrete structure;

-The home as a place to own;

3.1.6. 3.The Fundamentals in the Choice of Home

It is important in terms of design to give people the opportunity to choose the type of housing and location in which they would like to live. Thus, it is necessary to know and understand people's preferences for housing, neighborhoods, and settlements in order to build valid foundations and formulate appropriate policies for planning and zoning of the residential environment and provide housing that meets people's needs and wishes. With such knowledge, it is also possible to predict the future demand for housing types as it is believed that it is important for family cohesion that a child should feel a member of the household even when absent . The fact that people move to a new home does not mean that they are dissatisfied with the old (Amer, 2007 as cited from Madge, 1968).

3.1.6.4. House Security and Safety

House security is a vital element in the lives of people. Every nation regards the house as a sacred place and one cannot enter another's house without permission. People are deeply concerned with their dwelling because it reflects their security, personality, socio-cultural values, and dignity. Fences and walls are efficient territorial markers that make their houses more secure and personal. "The more barriers you place in front of a home (such as fences and locked doors and windows), the less attractive your home will be". (Amer, 2007 as cited from Burton, 1995) Moreover, the house acts as a filter between the external environment and the comfort needs of the user within. The function of a home is to provide a place where human activities can take place without distraction from others, both humans and animals (Amer, 2007 as cited from Porteous, 1977). Rapoport (1969) suggested that home-based security involves recognition of the sanctity of the threshold. The relationship between cultural norms, physical structure, and permeability of the home base, comparing the Moslem house, surrounded by high walls with few, small openings, with the British house with low walls or fences, and finally, the North American house that consists of a suburban plot, lacking fences and with large picture windows, as three different attitudes toward the transition from the private to the public, Figure 12 shows cultural variability in the sanctity of the threshold for different communities.

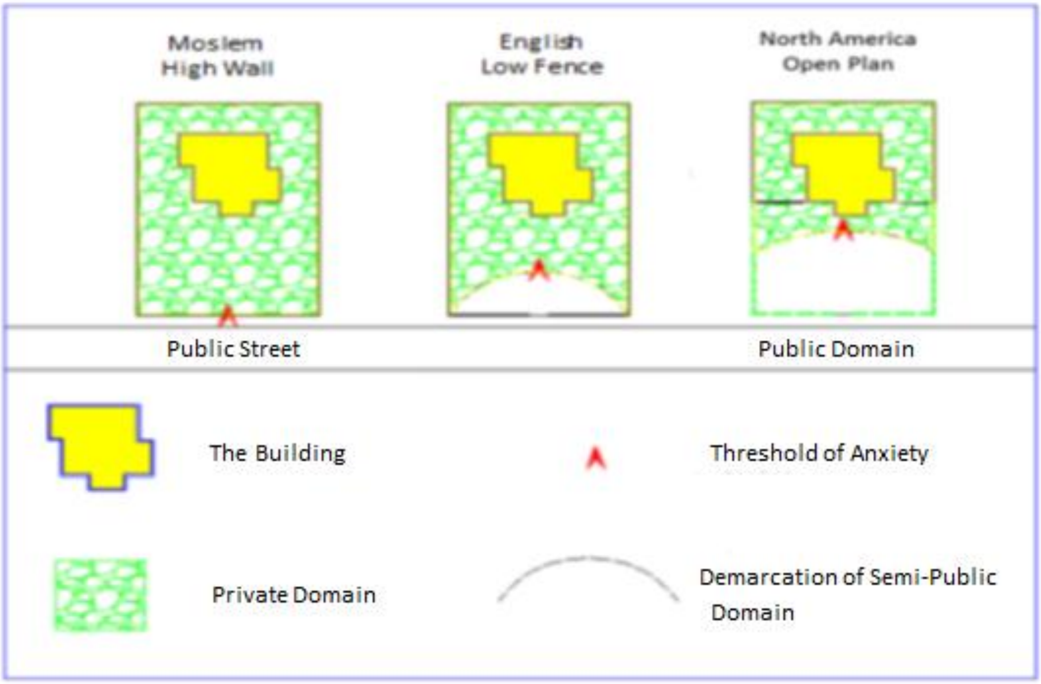


Figure 12: Cultural variability in the sanctity of the privacy

(Source: Shawesh 1996 and developed by research 2019)

3.1.6.5. Privacy and Design of Libyan Homes

There are guidelines in traditional Islamic teachings and traditions. These guidelines have direct applications in the domestic sphere. In the center of these guidelines the principles of privacy, modesty, and hospitality can be seen. On the design of Muslim homes, on the organization of space and domestic behaviors within each home the effects of each principle can also be seen. Although there are the shared guidelines for observing privacy, modesty, and hospitality within each home, Muslims living in different countries are influenced by cultural factors that prevail in their own country. These factors help to form the architectural styles and usage of space in Muslim homes in different ways. Awareness of the several natures of the influences on the Muslim perception of home and the usage of spacing is necessary for architects, building designers, engineers, and contractors to be properly equipped to satisfy the demands of the clients. Privacy and design of Muslim homes in a traditional Muslim home strictly follow the teachings from the Quran, Sunnah, and Hadiths to make sure that each homeowner or dweller and his / her family are allowed to unwind and rest from the negative effects of outside world. (Malik, et al, 2017) Keeping the privacy of home is very important in Islam to promote a tranquil and functional family live. In Muslim homes, privacy is the main factor that shapes how Muslim home dwellers "plan, build, perceive, and use their interior home spaces" (Malik, et al, 2017). Also, they suggested that privacy in traditional Islamic homes involves four main layers of privacy:

A .Privacy between neighbors' dwellings;

B. Privacy between males and females;

C. Privacy between family members inside a home;

D. Individual privacy;

Figure 13 presents privacy requirements are usually met through careful design by ensuring the safety of the family and separating the private life from public associations. The considerations of the design involve the control of visibility through visual privacy, noise transmission through acoustic privacy, and odor control through olfactory privacy (Memarian, 1998), and Table 1 presents types of privacy in traditional Muslim quality of life.

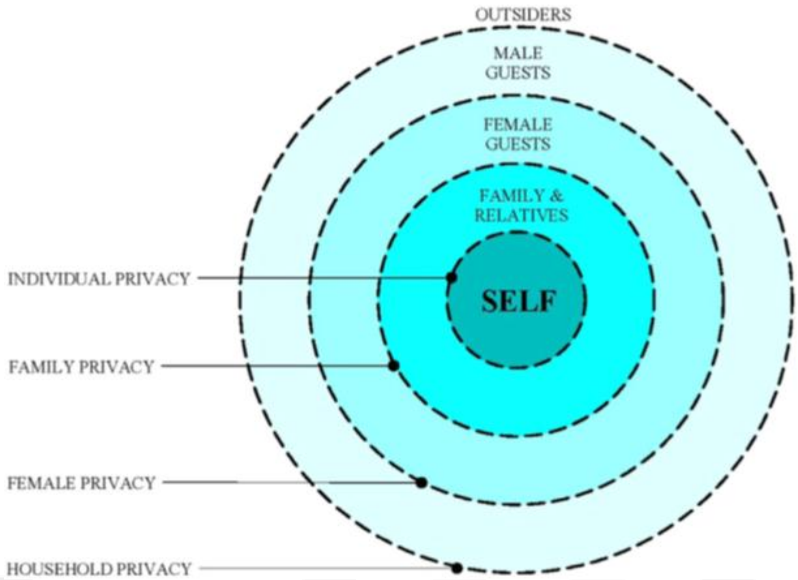


Figure 13: Layers of Privacy in Traditional Muslim's Home
(Source: Othman, Aird and Buys, 2015)

Table (1) Types of privacy in traditional Libyan quality of life

Type of privacy	Location	Design considerations
Visual	External	1. Doors: Entrance doors are placed away from the main street and not directly facing the opposite neighbors. 2.Windows: a. Above eye-level windows; (approximately 1.75m high) at lower floors with small openings; b. Higher-level windows with timber lattice screens (mashrabiya) 3.Building Heights: Similar building heights and windows are not directly facing opposite neighbors
	Internal	1. Courtyard: Providing microclimate and direct visibility into neighbors' internal home spaces 2.Gendered Spaces: Separation of male and female guest areas to maintain privacy and safety for women
Acoustical	External	Floors, walls and roofs should not allow penetrations of voices to neighborhood dwellings and streets, especially women.
	Internal	The thickness of walls and dense materials, such as mud bricks, stones and rocks are used Internal spaces are divided into three zones to achieve privacy: male, female and service (linked through courtyard).
Olfactory	External	1. Courtyard: Providing microclimate and direct visibility into neighbors' internal home spaces 2. Gendered Spaces: Separation of male and female guest areas to maintain privacy and safety for women.

Source: (Kissick, et al, 2006)

3.2. Housing Policies

According to policy paper 10: housing policies stand at the center of the new urban agenda. Expansion of housing opportunities will support the achievement of the sustainable development goals, especially sustainable development goal housing target. And housing policies are programs to help low-income and other disadvantaged individuals and households access decent and affordable housing. (Baird,et al, 2013) This part of this chapter including, hosing polices literature, objectives, measures for economically sustainable housing policy and indicators for a housing policy assessment.

3.2.1. Housing Policies in Global Perspective

Bruce Katz, et al in their book "Rethinking Local Affordable Housing Strategies: Lessons from 70 Years of Policy and Practice" for assisting state and local administration by studying the next three methods (Katz, et al, 2003):

I. To help rent affordable housing.

II. Assistance in buying housing;

III. Preparation of regulatory policies the effectiveness of each is assessed in seven objectives:

1. Facilitate access to existing housing at reasonable prices;
2. Expanding and maintaining good housing;
3. Enhancing the role of the family in obtaining housing;
4. Help families to increase income;
5. Emphasize balanced urban growth;
6. Link housing with public services;
7. Promoting social and economic diversity;

The governments and local administrations can also provide direct subsidies through tax incentives and use their powers to influence the availability of mortgages, follow-up of estate agents, and determine the type and quantity of housing that can be implemented in certain areas. Global housing targets can be identified by focusing on the following frameworks (Alex, 2006):

1. Comprehensive housing is an obligation to support the policy of equitable housing, especially special needs.

2. Integrated housing is the integration of housing into urban plans and investment plans at the national and local levels.
3. Adequate housing, which includes measures that provide for sustainability;
4. Affordable housing is based on policies to improve the affordability of housing; as well as a support policy to enable low-income families to own or rent suitable housing;
5. The development of informal settlements, known as "random buildings", which is the result of a number of social, economic and political conditions in society. To activate the five methods mentioned above, important to consider the following:
- Respect for the rule of law.
- Accountability and cooperation among all relevant parties;
- A balanced understanding of local conditions (United Nations, 2016);

Define policies and programs to help low-income and other disadvantaged individuals and households access decent and affordable housing (Baird-Zars, et al, 2013).In the absence of a clear and accepted definition of what constitutes housing policy (Angel, 2000) defines: The housing policy environment is the set of government interventions that have a critical and measurable effect on the performance of the housing sector. Therefore, the five major components of the housing policy environment are:

1. Property rights;
2. Housing finance;
3. Housing subsidies;
4. Residential infrastructure;
5. Laws and regulations;

The centrality of housing policy aligns with a long tradition of using housing to achieve larger socioeconomic goals. For this reason, the commitment by United Nations Member States to the right to housing, which many national constitutions explicitly recognize, and others suggest a general responsibility of the state for ensuring adequate housing and living conditions for all (United Nations, 2016).

It should be consented with the opinion of researcher Donner (2000) that the basic goal of housing policy is to prevent or to correct housing consumption by ensuring access for each family to the housing suitable in terms of size and quality for reasonable price (Donner, 2000). According to Reiss (2010), in the conclusion of his research first principles for an effective federal housing policy that are covering three major principles of housing policy are:

a. Allowing all to live in a safe, well-maintained and affordable housing unit;

b. Providing a specialized form of income redistribution that ensures the income transferred is consumed in increased housing;

c. Incentivizing people to take on economic self-sufficiency and jealous regard for one's liberty;

In addition, his conclusion included other sub principles as:

-Ending segregation and other racial inequities that is present in the housing market;

-Increasing socioeconomic diversity;

-Promoting green construction practices and energy efficiency;

-Promoting community and economic development;

-Preventing sprawl and promoting "environmentally contaminated property".

3.2.2. Objectives of Housing Policies

According to Choguill, (2007) stated that the housing policy for the future should include the following objectives:

1. The future policies must provide the basis for household improvement,
2. Empowerment of poor people,
3. Psychologically giving a lower segment of the urban society a feeling of self-worth,

Also, he added to achieve sustainability in the housing sector, certain policies in five areas must be devised and implemented as:

1**.** Involvement of the community,
2. Ensuring that those who build housing have access to good quality building materials at a cost they can afford,
3. Intervention on building standards by local and central governments finding a solution to a local housing problem,
4. Encourage housing finance sources for investment on the scale needed to meet the projected demand for urban infrastructure and housing,

5. The government must ensure the availability of adequate land for residential construction at a price that householders can afford.;

3.2.3. Measures for Economic Sustainable Housing Policy

Access or command over various resources is an important criterion for affordable housing. Strategies and housing policies should facilitate the provision of easy loans, subsidies and income-generating activities, which accelerate the repaying capacity of the households. Policies should be formulated to achieve the following objectives (Nair, et al, 2005):

a. Land ownership, accessibility to resources like materials, labor and infrastructure facilities like transportation, machinery, power etc. should be ensured.

b. Affordable housing should satisfy the minimum housing requirements;

c. Ensure to minimize operational and maintenance costs in the long term;

Economic factor has a significant influence on public housing project success. Economic factors constitute the economic environment that influences the flow of funds and affordability in financing. These include a stable macro-economic environment, availability of credit facilities, low-interest rates and long repayment periods. Failure of the housing financing system seriously affects the success of the housing sector (Gudienė, et al., 2013).

3.2.4. Housing Affordability

According to Wallbaum, et al (2012) an affordable house can be defined as a house that a family group can acquire within a given period, which generally ranges from15 to 30 years. This period is directly connected to the acquisition capacity of the group and the financial support that they can obtain in terms of loans, credits and subsidies (Wallbaum, et al 2012).

Also, these housing is affordable housing for those with average household income by country classification through a recognized housing price index. Most of the literature on affordable housing refers to a number of forms along a continuum - from emergency shelters to transitional housing, to non-market rent "also known as social housing or subsidized", to formal and informal leasing, and to affordable home ownership(Chepsiror, 2013). And determining the affordability of formal housing as "the ability of the family to purchase directly or qualify for a private mortgage for a house built using legal construction laws on legally divided and serviced land" (Bouillon, 2012). Also, affordable housing defined as" It is the relationship between housing and people. For some people, all housing is affordable, no matter how expensive it is, for others, no housing is affordable unless it is free" (Menshawy, et al, 2016 as cited in Stoned, 2006). Thus, an affordable and sustainable dwelling is:

1. A product where the rent or mortgage repayments do not exceed 30% of household incomes for the bottom 40% of income groups. And the concept of affordable housing becomes 'unaffordable' when costs rise above 30% of household income (Reiss, 2010),
2. A product that is appropriately located;
3. A product that is of a suitable size and quality for its occupants;
4. A product that does not increase the incidence of housing stress over the lifecycle of the house;
5. A product where individual and government financial obligations can be met on an ongoing basis without policy change;
6. A product that is socially acceptable;
7. A product that does not increase social exclusion or polarization;
8. A product that is located on a site that minimizes biodiversity losses,
9. A product that is located on a site that maximizes low-energy transportation options,
10. A product that encompasses the following environmental features. Energy efficiency; passive solar design; sun shading; water conservation;

Appropriate waste management during construction, occupation and deconstruction. Also, according to Wallbaum, et al, (2012) Affordable housing is defined in this paper as housing that costs less than 200 USD / m2 to produce, including the costs associated with construction and finishing details .And houses that are genuinely sustainable and affordable for all income levels (Wallbaum, et al, 2012).

3. 2.5. Public Housing

English dictionary defines as :

- Housing that is built, operated and owned by a government,
- Housing owned by a government that is rented at minimum rates to the needy,

-Housing that is built, owned and operated by the Government; selected for tenants to provide housing at a discounted cost (United Nations, 2016).

The main objective of public housing projects is to provide effective housing for low-income groups in terms of quantity and quality. Also, the concept of "social housing" is widely used in the literature of housing policy that is based not on economic criteria, but on housing policy criteria. According to Henilane, (2016) the concept "social housing" is used in the literature of housing policy that is based not on economic criteria, but on housing policy criteria. This concept lacks a clear, unified definition in European countries. Usually this definition includes both public and restricted profit rental housing. Sometimes the term is applicable to all subsidized housing. In some cases private rental housing is considered as "social housing", if the state intervenes in the market, by reducing rent fees below the market price for certain apartments. In these cases landowners are forced to accept lower profits, even losses, thereby subsidizing the tenants. Taking into account the social housing must comply with several conditions like (Henilane, 2016):

a. Construction costs are such that decrease the profit and parts are covered by public or private funds,

b. The price or rent that is being paid for social dwelling should be less than the market price, but not necessarily less than dwelling maintenance costs,

c. Subsidies are granted for households with low-income,

3.2.6.Indicators for a Housing Policy Assessment

The following represents a range of indicators that might be considered in developing a national housing assessment (United Nation, 2016):

- Social housing budget as a percentage of the total national government budget;
- Qualitative and quantitative housing deficit;
- The government has a neighborhood-upgrading program in low-income settlements;
- Spatial distribution of the national population;
- Current and projected rates of urban and rural population growth;
- Rates of poverty and slum growth in urban areas;
- Analysis of approving physical plans for urban expansion to accommodate the population;

- Regional estimates of investment requirements for urban services.
- The existence and enforcement of the national housing policy;
- Availability of secondary mortgage markets and microcredit for housing;
- Types of subsidies available;
-The degree to which exclusionary housing policies are prohibited;
- Price-to-income ratio of the housing;

3.3. Summary of the Chapter

Sustainable housing and policy literature review as the methodology of this thesis, including the concepts of social sustainability like the meaning, security, safety, privacy of homes and indicators for a sustainable housing assessment. Also sustainable housing architecture that supports ecological balance by relying on ecological creation systems and reusable building materials to reduce the depletion of natural resources. And among the most important architecture principles of sustainable are:

- Lack of consumption of non-renewable sources and the use of natural resources; with high efficiency such as energy, water and land;
- Different healthy environment by creating low toxic resources;
- Lack of energy embodiment;
- Design of buildings that are more climate-friendly;
- Consistency with the environment and understanding of natural processes;
- Communication with nature;
- The trend towards waste removal, recycling and reuse;

Also, UN-Habitat, (2012) defined, sustainable houses as those that are designed,

Built and managed under the below items:

- Healthy, durable, safe and secure,
- Affordable for the whole spectrum of incomes,
- Using ecological low-energy and affordable building materials and technology,
- Resilient to sustain potential natural disasters and climatic impacts,
- Connected to decent, safe and affordable energy, water, sanitation, and recycling facilities,
- Using energy and water most efficiently and equipped with certain on-site
- Not polluting the environment and protected from external pollutions,

- Well connected to jobs, shops, health- and child-care, education and other services,
- Properly integrated into, and enhancing, the social, cultural and economic fabric of the local neighborhood and the wider urban areas,
- Properly run and maintained, timely renovated and retrofitted (UN-Habitat, 2012). Architecture offers a unique challenge in sustainability must respect the heritage of the past and meets the needs of the present. Contemporary architecture should avoid all forms of pseudo-historical design.

Sustainable housing policy includes, housing policy, global perspective, and its objectives, measures for economically sustainable housing policy housing affordability, public housing and indicators for a housing policy assessment as a general.

CHAPTER IV

LIBYAN HOUSING

The Libyan house has been influenced by several environmental, social and economic factors that have determined the types of houses, and functions different spaces of the Libyan house, in addition to the concept, identity and meaning of the house for the Libyan family, as well as the role of the cultural level in choosing the quality and type of the house for the Libyan family. There are many researchers interested in this subject, could be summarized as a part of the literature review of this thesis.

4.1. Types of Libyan Houses

The types of houses show changes depending on the geographical and climatic areas. Among various countries, also within large country like Libya differences are clear. In archaeological excavations during 40's, the remains of house types in Libya from the Greece and Roman periods were discovered. Fortified houses belonging the Roman period in the Tripolitania region both in the olive-growing areas of the western mountain "Jabel Nufusa" and in pre-desert areas "Hamada Al-Hamara", the region south of the western mountain, were found (Reynolds, 1976).

Generally, these houses were built with large well-dressed masonry. According to its occupancy, it is obvious that more than one family always used those houses. This type of housing could have been affected by the two Arabic tribes of Bani Hilal and Bani Salim, who possibly emigrated from the Arabian Peninsula from south of Hijaz to north Africa before the rise of Islam. This possibility is deducted from the alikeness between those above-mentioned houses and the ancient architectural style of Yemen, where these two tribes came from. The other proof is the Arabic names given to these houses, Gasr, and Kilah (Bukamar, 1985). Depending on geographical and climatic characteristics, these types of houses were divided into three main regions. Each region has its own kind of traditional vernacular architecture; these can be characterized as shown in Figure 14.

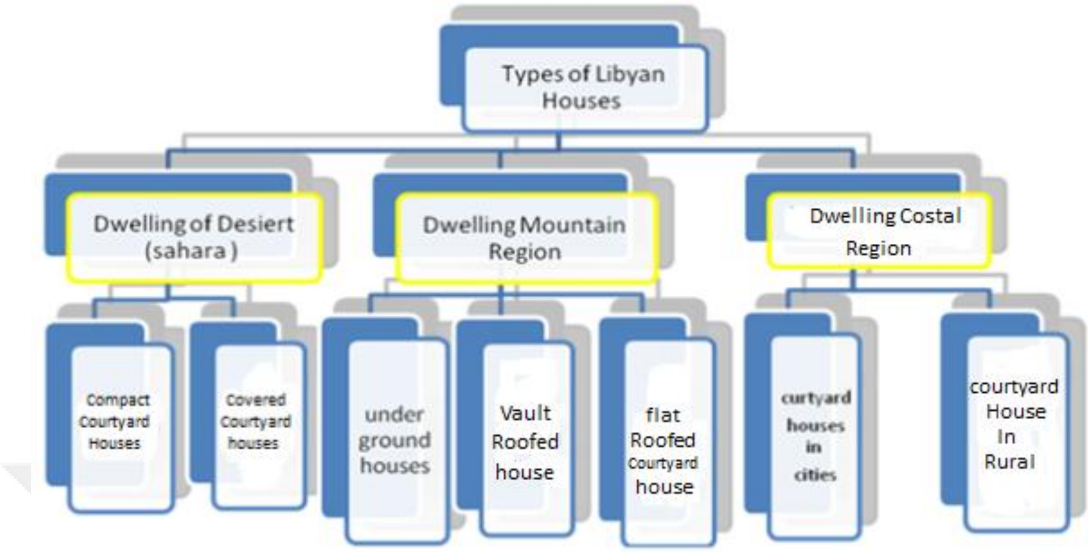


Figure 14: Types of Libyan Houses

(Source: Amer, 2007 and developed by Researcher. 2017)

4.1.1. Dwellings of Desert (Sahara)

In Libya, the desert region forms a major part of the Sahara desert. In the southern part of the country, this extends from the coastal strip along the Mediterranean Sea and North mountains, Jable Nafousa to the west and Jable El-Akhdar to the East. There are two regions, the Fezzan region in the southwest and the Kufra Region in the southeast, in this area, which is mostly flat, dry and rocky. It is also covered with sand with a few scattered oases, such as Sebha, Ghadames, Murzuk, Ghat, and Kufrah. The settlements on these oases can only be seen where water is available. In their planning's and methods of protection from the harsh climate, most of the desert towns show an urban type of unity and homogeneity. Generally, the houses in this region can be categorized into two types. They are:

- Courtyard houses in Fezzan and Murzuk,
- Covered houses (non-courtyard house) in the area of Ghadames,

4.1.1.1. Compact Courtyard Houses

These types of dwellings with urban characteristics can be found in Ghat, Murzuk, and Fezzan. They have one or more courtyards, and some are two floors with a terrace, which is used for sleeping during the summer season. The urban houses in the Fezzan area are organized in blocks and irregular-walled courtyard houses are joined to each other. The walls are built from mud, straw, stones and small blocks of salt-clay. This type of construction is called Darb al-Bab "wood forms", the walls are built completely layer-by-layer until the required height is reached. Most of these houses have the same height, and very few have more than one floor. However, some of them have roof-terraces added which contain a room for the women. There are also other styles of two-floor dwellings for the wealthy people in this area, who live in larger houses. This type of house is large, consisting of an entrance hall leading indirectly to the family zone, which contains several rooms and storage areas, which are well furnished and such housing also incorporates covered stables for animals, the kitchen is on the upper floor, and can be reached by a private staircase. In front of the main entrance is another staircase leading to the guest area on the first floor Figures 15and 16. There are many other housing types in the region, which are built by using different materials, styles, and attitudes, some of the most significant examples of these houses are in the old city of Ghadames.

Key plan			
No	Space name	No	Space name
1	Main entrance	7	Living room
2	Loopy	8	Winterroom
3	Toilet	9	Kitchen
4	Room	10	Open area
5	Guest rooms	11	Roof
6	Couryard	12	Al- sabat

Figure 15: Desert Courtyard House at Ghat and Two-Floored House in Al Qatrun (Source: Amer, 2007, as cited from Ministry of Planning and Development, Fezzan 1967)

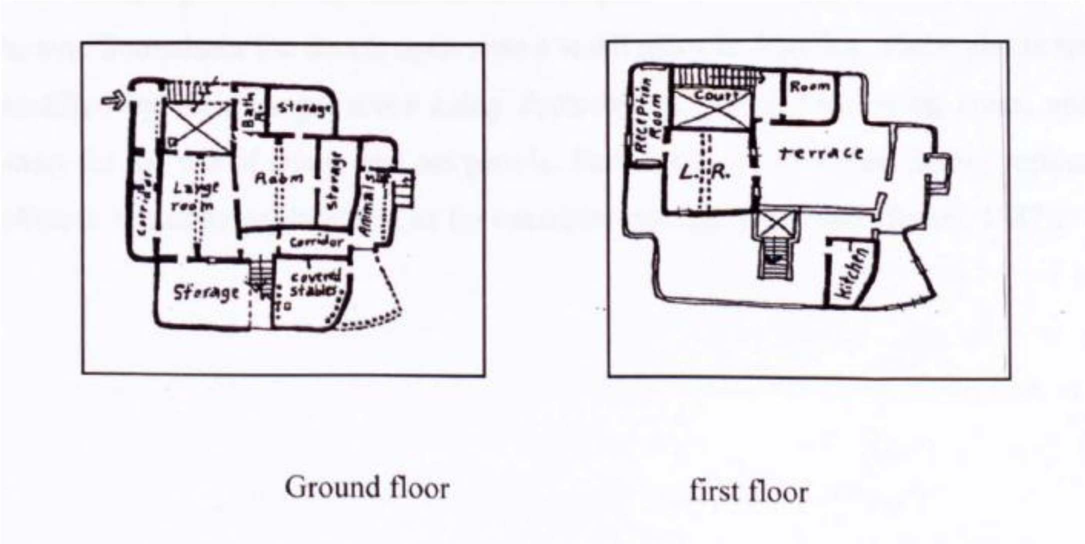


Figure 16: Two-Floored Traditional House in Sebha Dated Between 1870 -1950
(Source: Amer, 2007as cited from Bukamar, 1985)

4.1.1.2. Covered Courtyard House

Due to climatic and environmental factors, some regions have adopted different typology, as Ghadmes in Libya. Ghadames is a desert town, located 630 km away from southwest of Tripoli. It has one of the extreme climates in the country, ranging from the harsh cold in the winter to burning heat in the summer with almost no rainfall, and sandstorms, which are strong and frequent. Therefore, the houses must be suitable for these extreme conditions, using only local material, namely mud, lime, palm trunks, and fronds. Due to the nature of the desert, areas for construction around this town was scarce, and therefore, the living accommodation was tightly grouped together and constructed vertically rather than being designed to spread out horizontally (Ahmed, 1985). Figures 17 and 18.

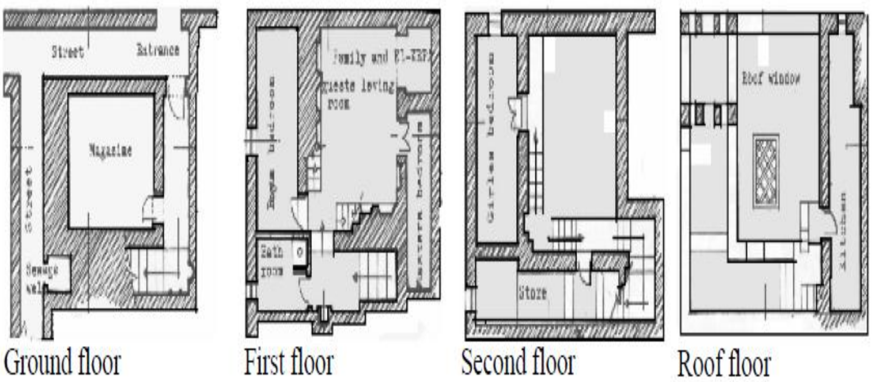
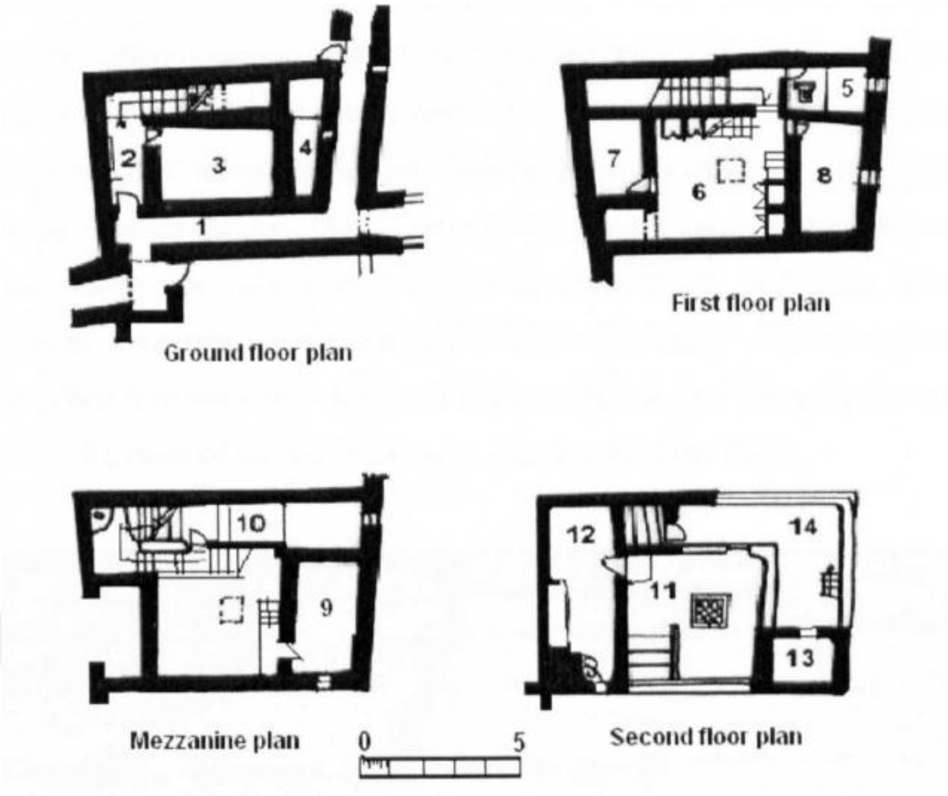


Figure 17: Plans of a Typical House in Ghadames- Libya
(Source: Almansuri, 2010 cited from Ahmed 1985)



Housing Plan Key					
1	Street	6	Guest room and living area	11	Roof terrace
2	Entrance corridor	7	Girls room	12	Kitchen
3	Store	8	Master room	13	Children's sleeping
4	Latrine Pit	9	Boys room	14	Steps leading to neighbor house
5	Latrine	10	Storeroom		

Figure 18: The Dwelling Unit Type in the Traditional Residential Desert Area (Source: Chojnacki 2003)

4.1.2. Dwellings in the Mountain Region

Libya has two mountainous areas. The mountains of Nafousa are located in the northwestern region of Libya extending from Tunisia in the west to Khoums in the east. This hilly area is irregular rising to 900 m from sea level in some places. The inhabitants are semi-nomadic farmers or shepherds, mainly growing barley, olives, and figs. In this mountainous area, the houses have rural characteristics and profiles and they are arranged in a compact grouping, Figures 19 and 20, which means that relatives usually live together, or live as near neighbors.

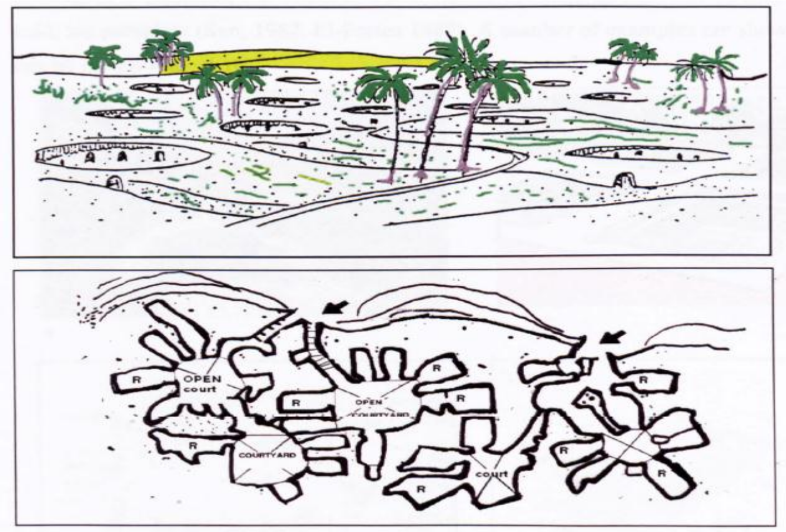


Figure 19: The Compact Grouping of Underground Houses
(Source: El-Dweb 1997)

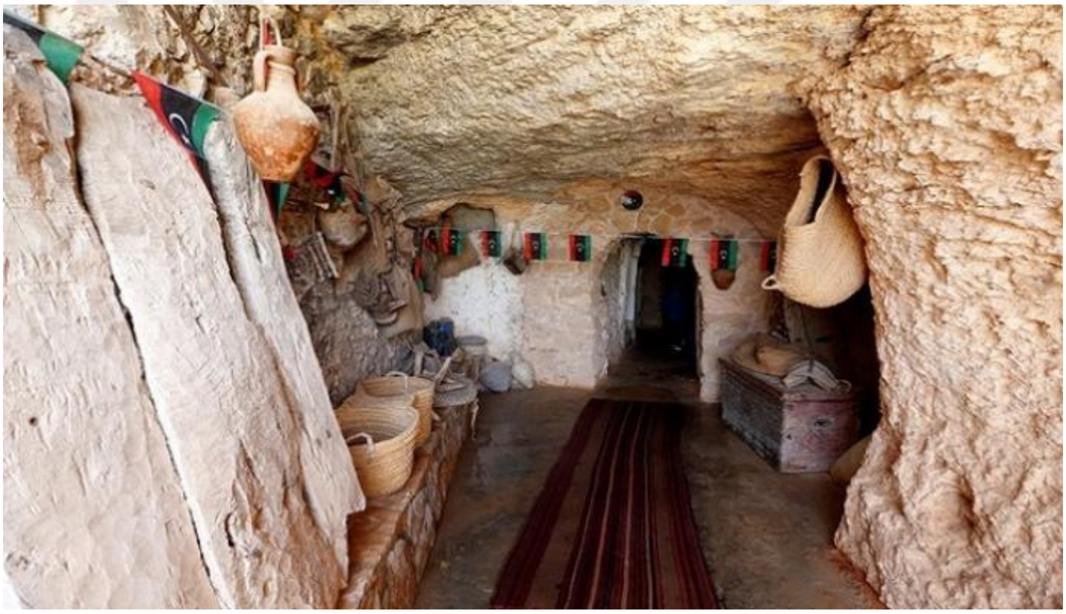


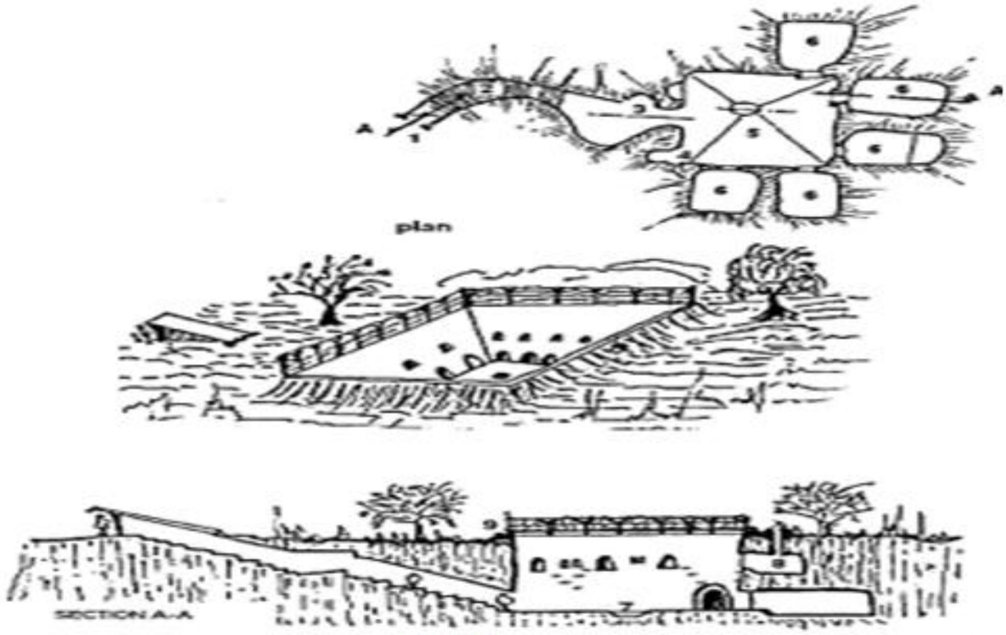
Figure 20: A Cave in the Mountainous Area of the Libyan City of Gharian
(Source : Skynewsarabia.com, 11th ,Dec.2018)

4.1.2.1. The Underground Houses

The underground houses are located in the western mountains for instance in the Gharian and Ufern area Figure 21. In the west region mountains, such troglodyte dwellings e. g. as found in Gharian, were the traditional dwellings because they were convenient for that climate, which were identified as high diurnal and annual temperature changes with little rainfall. As a result, these houses stay comfortable throughout the year (Amer, 2007 as cited from Rghei, A. S. 1987). Troglodyte dwellings can be categorized into three types:

- First type: (Aboskefa) this is underground without any elevation.
- Second type: (Al-Feseal) this is underground with some elevation.
- Third type: (Al-Mgara) is a "hanging" house i. e.; it is a cave-like excavation in a vertical cliff face.

-The First Type (Aboskefa)



Key plan			
No	Space name	No	Space name
1	Entrance	6	Bedrooms
2	Loopy	7	Cistern
3	Store	8	Upper level storage
4	Kitchen	9	Small wall
5	Courtyard		

Figure 21: The First Type of Underground House (Abskefa)
(Source: E1-Dweb 1997)

-The Aboskefa construction stages Figure 22:

1. The first stage after selecting the location is to dig the courtyard.
2. The second stage is to construct the entrance.
3. Finally, the Rooms are excavated.

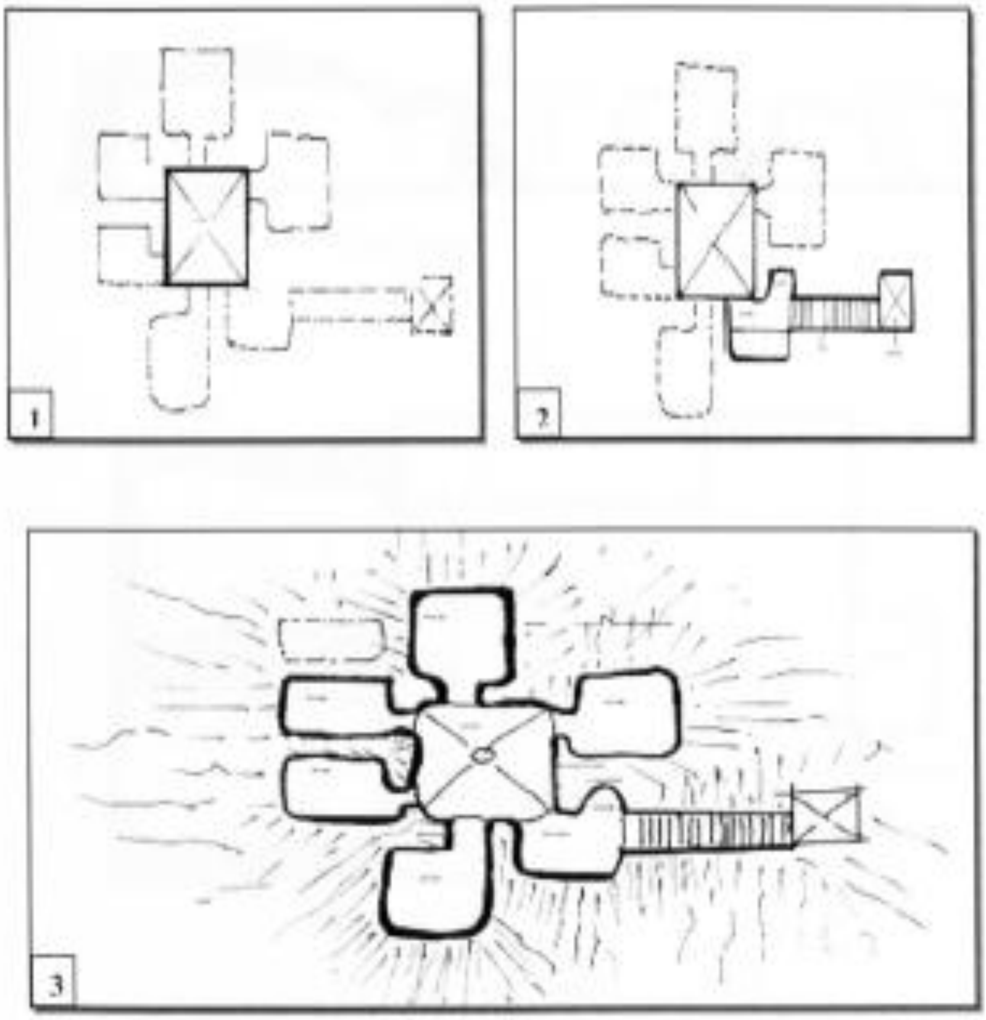


Figure 22: The Construction Stages of Underground Houses in the Mountain Area - (Source: Amer, 2007)

The following Figure 23 shows the ancient houses that were dug in the mountains, some dating back about 400 years ago since the 17th century. They were designed to keep the temperature between 12-23 ° C throughout the year. Its inhabitants do not suffer from the summer heat, as the temperature reaches 50 ° C and during the winter season when the temperature falls below zero.

Figure 23: Under Ground Caves Around the City of Gharian- Libyan
(Source:Skynewsarabia.com, 11th - Dec.2018)

-The Second Type (Al-Faseal)

Located in the foothills of the mountains on a steep slope. The building has some elevation above ground and consists of a courtyard, almost rectangular in shape, and rooms, which are dug in three sides, the fourth side being built from stone.

The light and air enter the rooms directly from the outside. This type may have had a terrace in front that acted as a courtyard, Figure 24.

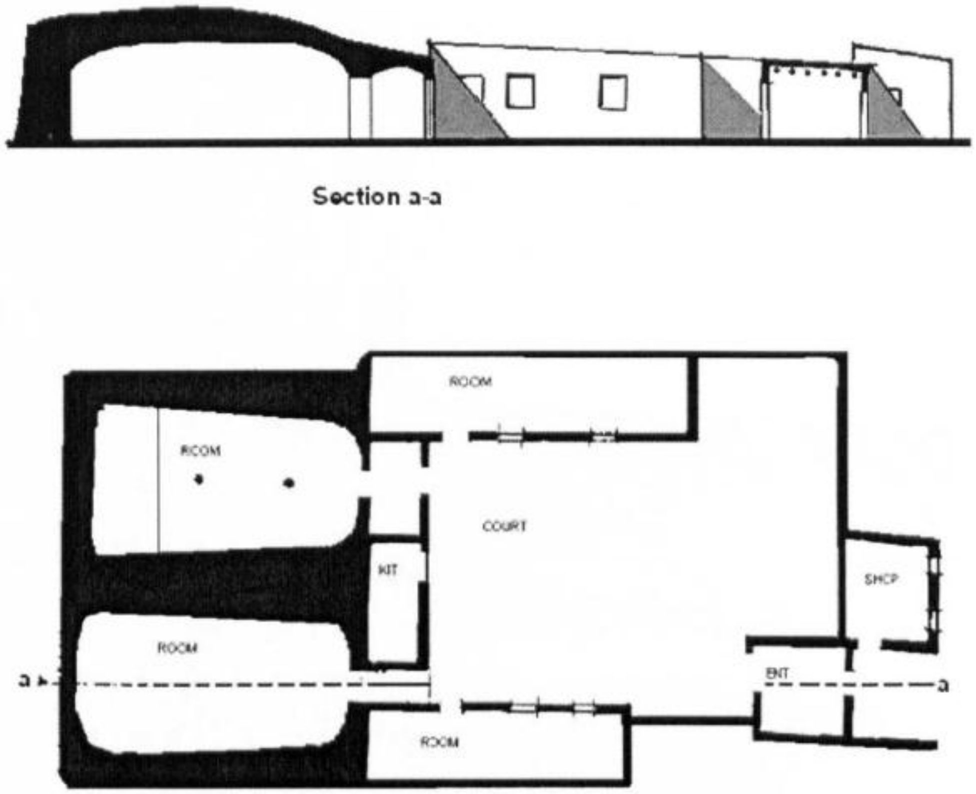


Figure 24: The Second Type Underground House (Alfasel)
(Source: Amer, 2007as cited from Doxiadis Associates 1964)

-The Third Type: Hanging House

This type is located on the sides of valleys and is known as a hanging house, and almost all of these particular types were built in the Roman period. The entrance faces directly the valley rising above the ground level by about 3 m or more, and the house was divided internally to provide many rooms. Hanging houses were used to offer a defense for their inhabitants in problematic regions, access to this type of house was made difficult because there was no fixed staircase. House entry was through a moveable staircase, made from natural plants called Alfa-Alfa that grow in this region. There were also some openings in the rooms which were used for observation, as well as openings in the ceiling, that were used for ventilation and to remove smoke from the rooms, Figure 25 (El-Dweb, 1995)

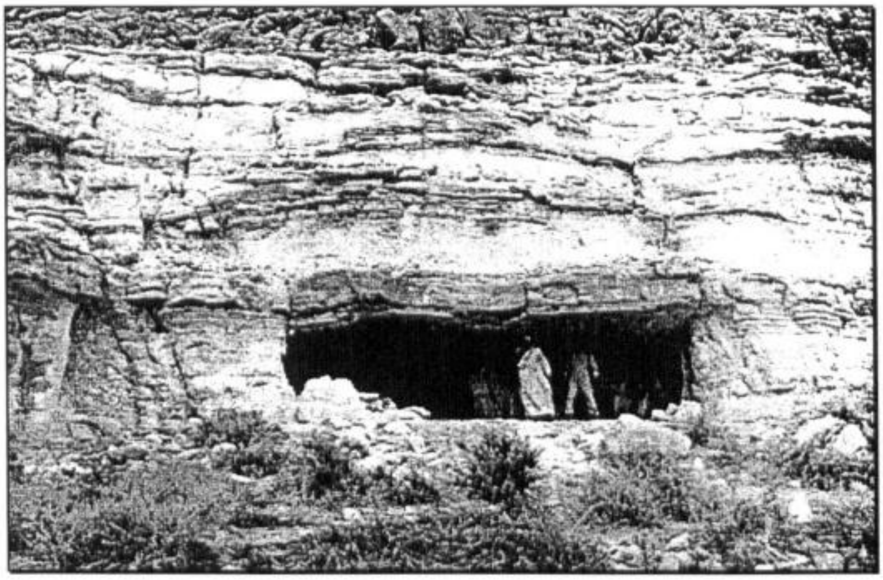
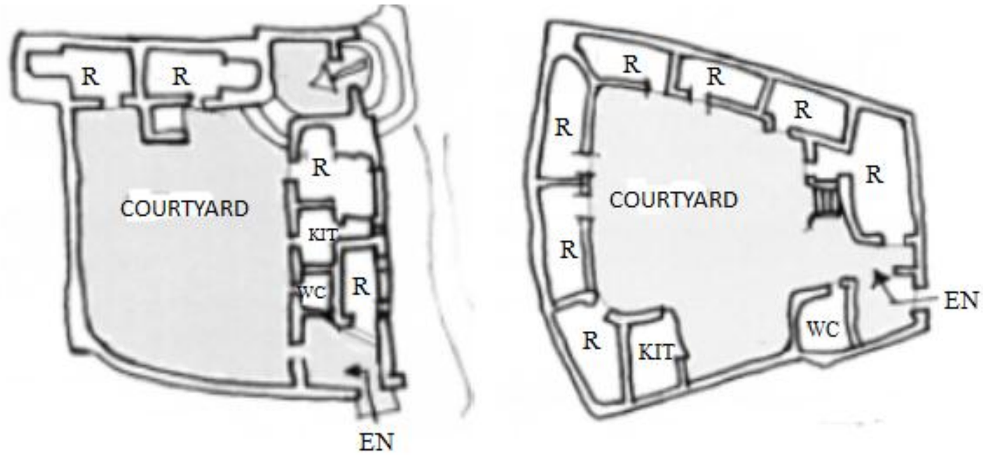


Figure 25: Hanging House - (Source: Daza 1982)

4.1.2.2. Flat-Roofed Courtyard Houses

This type of courtyard house is found in the mountainous area, and the form of this type of courtyard is similar to the ones in the coastal area, in terms of the location of the courtyard, which is placed in the center. However, the form and character of the courtyard and the rooms differ in that the shape and rectangular form of the court are not very clear and the corners, rather than having right-angled turns, with a curving approach. (Fortea, 1989) pointed out that, "The form is similar to houses in the coastal area but has a more rounded court thought to have been influenced by Berber traditions", Figure 26.



Housing Plan Key			
R	Room	WC	Toilet
KIT	Kitchen	EN	Entrance

Figure 26: Flat Roofed Courtyard Houses in the Mountain Area-Yefren Town (Source: Daza 1982)

4.1.2.3. Vaulted-Roofed Houses

These houses show great resemblance to the ones, which are more developed having a courtyard for animals with the storage rooms. When the enemy did not threaten them, people built their own small vaulted stores on top of the houses and then repeated the pattern of the Gasr in the house itself. The vaulted roof had strength such that the structure became stronger and could, therefore, bear a remarkable weight throughout a long period. Although it was more advanced than the flat roof dwellings, the building was still unrefined. (Daza, 1982), Figure 27.

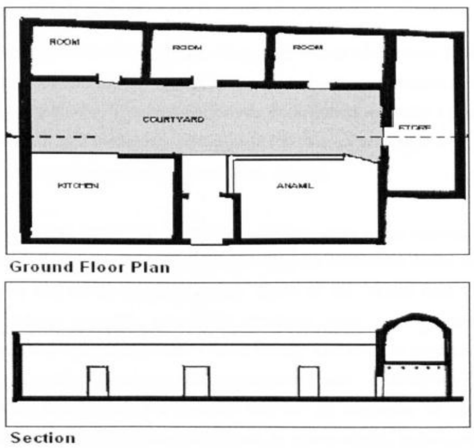


Figure 27: Vault Roofed House (Source: Daza, 1982)

4.1. 3. Dwellings of the Coastal Region

The coastal zone is located on the north border of Libya along the Mediterranean Sea and it extends from Egypt in the east, to Tunisia in the west. A part of the North African coast consists of mainly fertile agricultural flat land. On the coastal strip, there are some commercial centers of urban settlements and cities such as Tripoli, Benghazi, Misurata, Alzawia and Khuoms. These cities are similar to the other coastal cities such as al-Eskandrai in Egypt, and Tunis in Tunisia. One of the important traditional cities in the coastal area in Libya is old Tripoli. The courtyard house is widespread in Libya especially in coastal cities such as Tripoli, Khuoms and Misurata. However, with the entire coastal area, two-types of courtyard houses can be seen, one reflecting the needs of city dwellers, and the other being built in rural surroundings where there are different environmental and social influences (Rghei, 1987).

4.1.3.1. The Courtyard House in the Cities

The courtyard houses in the cities are usually constructed in rows and have only the front facing on to the narrow streets, whereas the other sides are connected to adjacent housing. The average area of these houses is 300 square meters, and the courtyard ranges in size from 70 to 100 square meters. The traditional house was mainly categorized into two types, those having one floor, and those having two floors, which are more popular in the cities for land limitation cases. Figures 28, 29 and 30 indicate that the shape of a courtyard house may be rectangular or square. (Zarrugh, 1976)

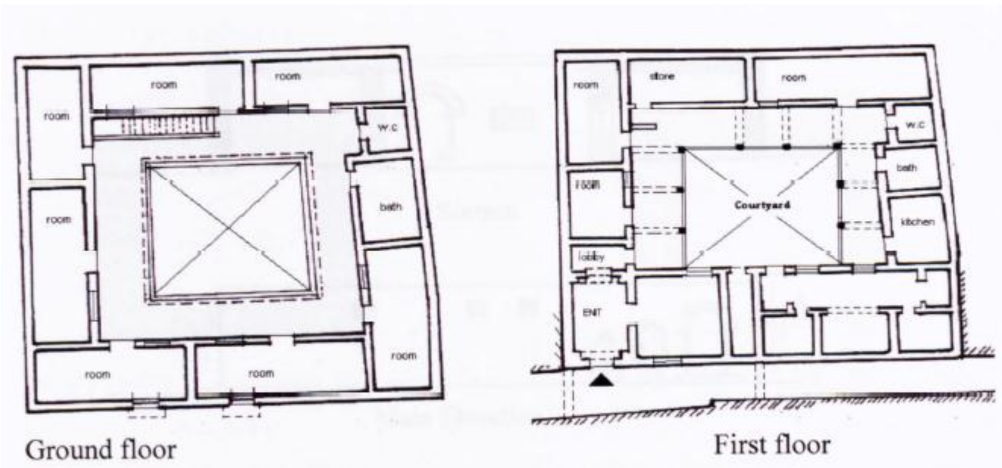


Figure 28: Two Floored - Libyan Courtyard House

(Source: Daza, 1982)

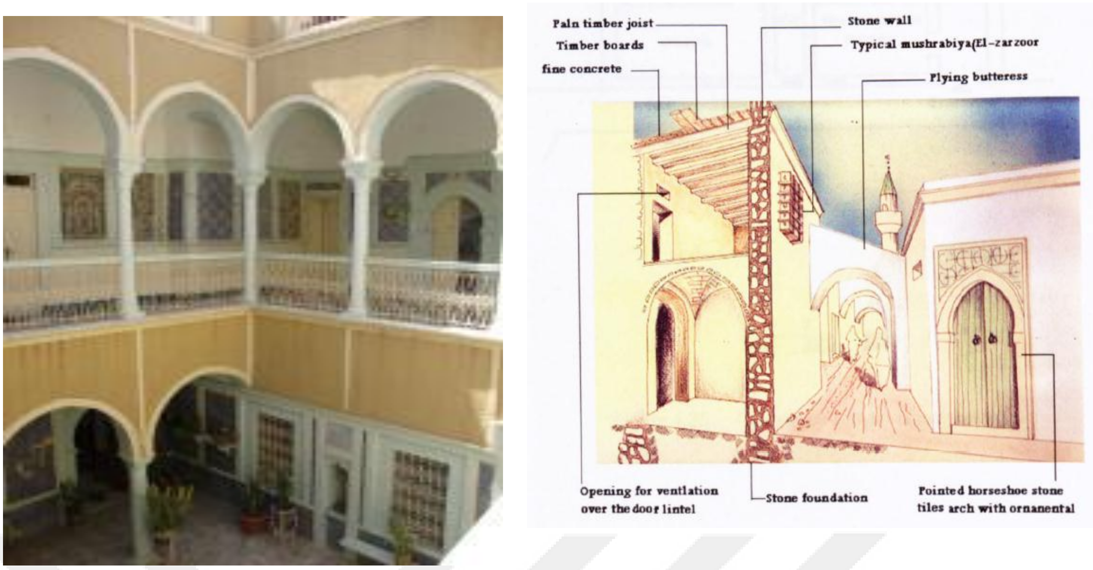


Figure 29: Two Floors- Libyan Courtyard House
(Source: Right, Amer, 2007, as cited from Daza 1982, and Left WordPress.com, 22nd, Dec. 2018)

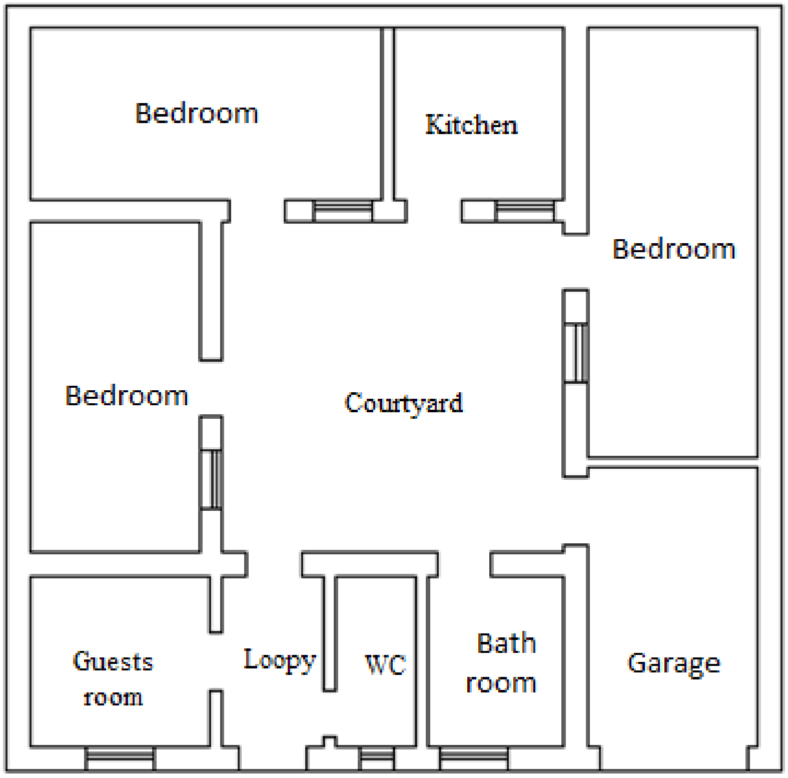


Figure 30: The Courtyard House in the Cities

4.1.3.2. The Courtyard House in Rural Areas

The concept of the courtyard house in the rural area is similar to the one in the cities, but the entrance to the guest room is separated from the main entrance of the house, and because of fewer land restrictions, houses in rural environments are usually single floor with a flat roof. The plan of the house is rectangular or square, the average area is more than 300 square meters. As with the urban courtyard houses, the design incorporates a courtyard surrounded by rooms, and the use of fig trees in the courtyard to offer shade during the summer. Usually, in these houses, there is a large storage room for agricultural tools and a storage room for crops. Most rural courtyards are not paved or tiled, unlike those in the cities. Figure 31 presents one - floor Libyan courtyard house

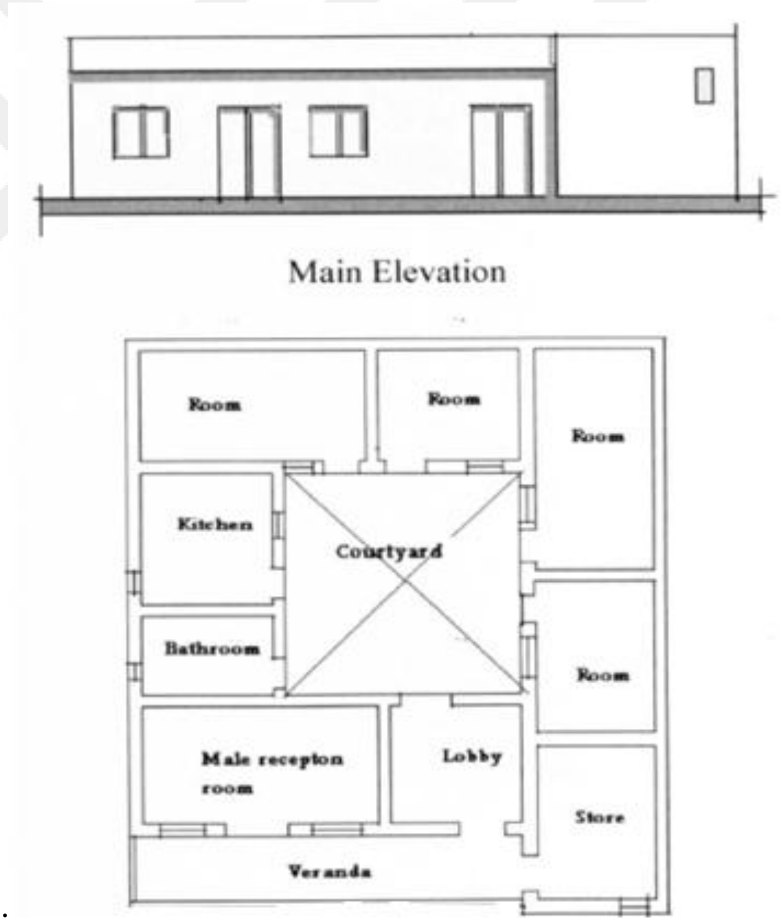


Figure 31: Single Floored Libyan Courtyard House (Source: Amir, 2007)

4.2. Patterns of Libyan Traditional Settlements

Historically, many old towns appeared in Libya, where many cities were established in different locations, centered at the forum of commercial caravans and seaports on the shores of the Mediterranean. In this thesis, the old city of Tripoli was chosen for the purpose of clarifying its most important characteristics and planning patterns as cities founded on ports and marine, and the city of Ghadames of the ancient desert cities according to the following:

4.2.1. Old City of Tripoli

The structure of Tripoli's "old city” conforms with the climate of the region to adjust to the difficult, weather conditions. In hot and dry regions, large and open spaces generate heated air during the day and cold air at night. They are not usually preferred in traditional Libyan cities, unless trees are planted there and they contain a body of water. Surrounded by tall walls, the narrow streets and curved alleyways can be seen which the mentioned walls were formed towards the wind and therefore very well shaded during the hot summer afternoon. These characteristics are created and adapted to make sure that humidity is kept, the daily temperature is decreased, inhabitants are protected against dust and harmful winds and that the streets are shaded and cool during the day, and warm at night (Madi, 2015). "The streets were planned in a hierarchical form, moving gradually from the public to private with different widths and increasingly tortuous routes. Almost all the houses were of the same height and were inward-looking around a courtyard with external walls which had a few high windows for privacy"(Madi, 2015), Figure 32 illustrate narrow streets and the shadow, also Figures 33 and 34 shows Tripoli old city location and settlement.   .

Figure 32: Narrow Twisted Streets and the Shadow
(Source: Madi, 2015)

Figure 33: (The Old City of Tripoli)
(Source: ECOU and ODAC 27-02-2020)

Figure34: Tripoli (The Old City)[1]

1. Source: https://www.oldmapsonline.org/en/Tataouine-Goverenorate , 27-02-2020

The spatial pattern of the old town is related directly to the traditional social organization. The requirements of private family and public activities played a great role in forming the urban spaces in the town. Consequently, the separation of spaces into a hierarchy from totally public to completely private can be seen clearly "(Madi, 2015), Figure 35 shows Layout of the traditional house.

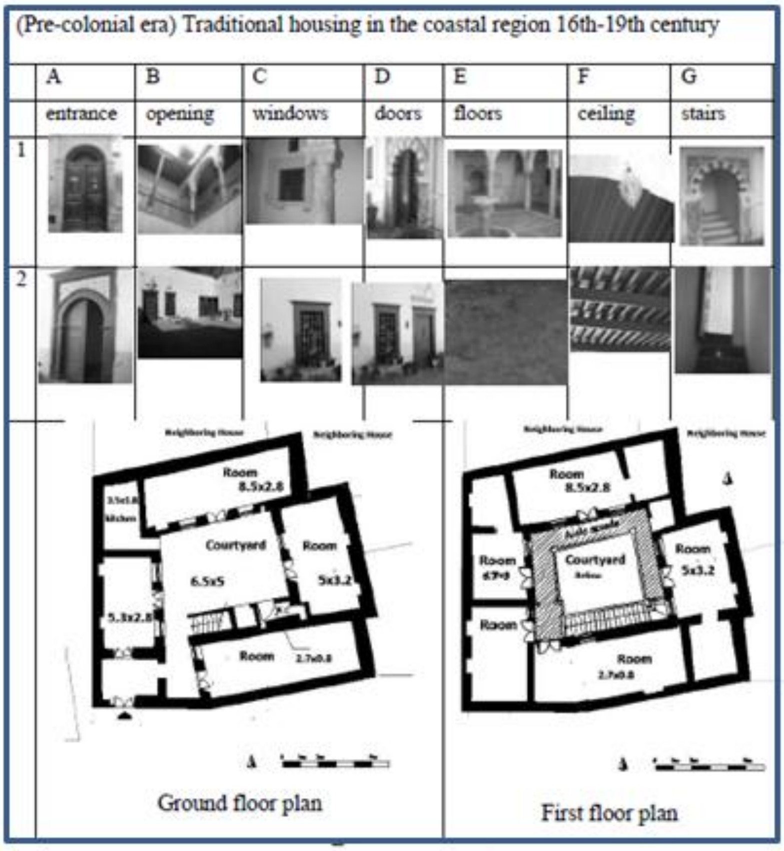


Figure 35: Layout of the Traditional House in Tripoli

(Source: El-Agouri, 2004)

4.2.2. Old City of Ghadames

Ghadames is located on the intersection of the 30.08 North and 09.30 East. This point is in the northern part of Grezaa Desert in the northern part of Africa. It is about 600 Km far from the Mediterranean Sea coast where there is Libya’s border with Tunisia and Algeria. The old settlement of Ghadames in Libya is considered as one of the unique human settlements of Libyan old settlements. This uniqueness is due to their important roles, which are historically a trade crossing point as well as a cultural center linking Mediterranean coast and Africa. Ghadames became a popular place among visitors, academicians, and experts.

Therefore, it was selected by the UNESCO, as World Heritage Center, and Center of Human Settlements "HABITAT" in 1986 as one of the world settlements having unique settlement form and global value in human heritage. Ghadames was inhabited 4,000 years ago. It is now an exciting settlement, which indicates the presence of several civilizations that had lived on the settlement's streets and paths. Excavators in Ghadames have also found Greek carvings in a region to the northeast of the settlement went back to Paleolithic and Neolithic times "about10. 000 years". In addition, the mixture in tile city of Roman and Garamantes arts and architecture were found (El-Agouri, 2004) Figures 36 shows old and present town of Ghadames city, and Figure 37 shows top eye view for the whole settlement. Also, Figure 38 illustrate the physical layout of the traditional house in Ghadames

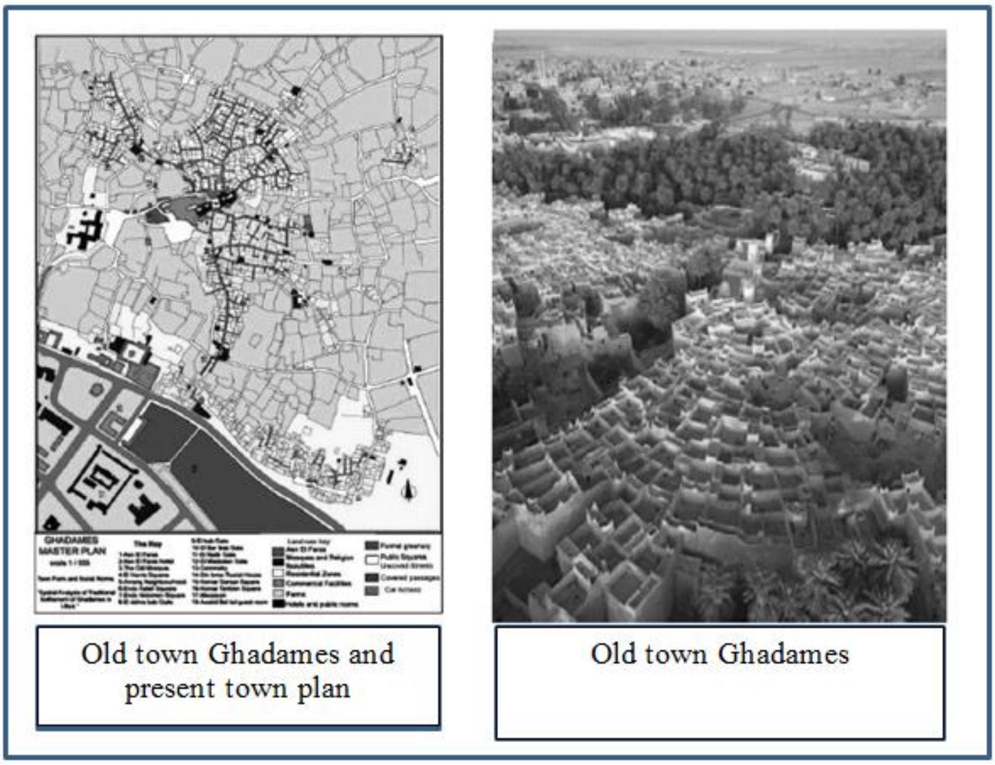


Figure 36: Ghadames Old Town (Source: Madi, 2015)

Figure 37: Ghadames city, Top Eye View for the Whole Settlement
(Source: El-Agouri, 2004)

Madi, (2015) described the design of the Ghadames traditional house like this: “There is a large area on the first floor as it has a projection over the street level, including a storeroom for agricultural tools and toilet, as it is shown in Figure 38. A flight of stairs leads to the upper floors, where a courtyard is located on the first floor with a double floor-to-ceiling height, which has a small sky window at the ceiling. This small opening at the ceiling of the courtyard, called an aperture, is to provide natural light and fresh air, when necessary, into the courtyard. The upper floor, where the floor is located, is used mainly by women, so that they are able to limit their activities, such as cooking and washing", There are some standard areas for the inside elements of the Ghadames traditional buildings:

• Living room (courtyard) 10 to 16m2
• Bedroom area 5 to 12 m2
• Storeroom 20 m2; and
• Bathroom 4 to 6 m2

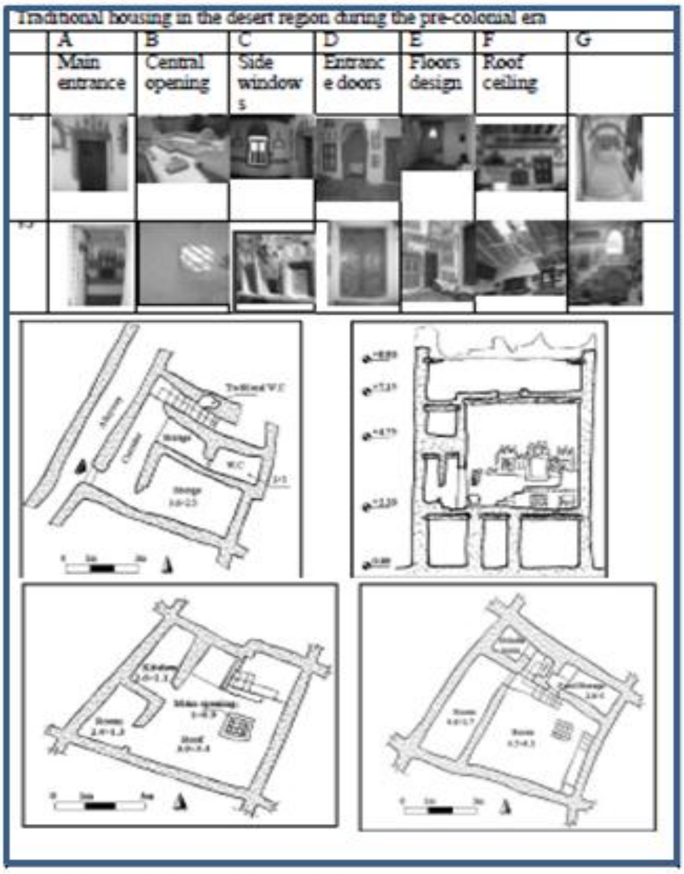


Figure 38: Physical Layout of the Traditional House in Ghadames

(Source: Madi, 2015)

4.3. Social Structure Principles

In Ghadames, as is the case in most Arab and Islamic regions, association relations remain strong as the structure of similarity is the fundamental principle of social organization and is reflected in the material environment, where all family members support each other physically, morally and economically. Likewise, there is the principle of separation between male and female and the aspect of social life in Ghadames. Therefore, the residents designed and built their town based on different areas for both males, females, as each neighborhood had its own individual characteristics, and each family had its own space. This means that each neighborhood is divided from public to semi-public, then to semi-private to private. Males participate mainly in commercial activities and crafts, while females participate in household activities within their homes. On a surface level, females usually meet and make traditional items such as food containers, floor mats from palm leaves and traditional women's dresses as well as food. But when a home needs maintenance, usually the whole family support each other to handle the problem. Moreover, it was found that residents in Ghadames built walls around their ancient town and each district has only one main entrance "for security reasons". They also created public squares within each area, connected to each other, for group meetings or social functions such as weddings or festivals (Ealiwa, 2000).

4.4. History of Housing Policies in Libya

A housing policy is a statement of what is (or is going) to be done to provide housing (Mumtaz, l995). Housing is an important issue in social and economic development plans in Libya as in most developing countries. Therefore, it has been a high priority of the Libyan governments since the country attained its political independence in 1951. As a result, more than (77%) of the physical built environment in Libya was residential buildings (NCID, 1995), and a series of strategies have been adopted in order to deal with housing issues. These are the concerns of public housing programs, slum clearance, the establishment of' new towns and cities, housing loan arrangements, public housing investment (World Bank, 1960; Doxiadis, 1964, Awotona, 1990). In the following subsections, housing policies will be briefly reviewed.

- **The First Post-Independence Period (1951-1962)**

The most important characteristics of this period (Abdulmagid, 2003):

- The quantitative housing deficit;
- Lack of proper maintenance of stocks of existing housing, although substandard;
- The high cost of urban land compared to per capita income or family "private capital deficiency";
- Lack of technical employees in the construction materials industry and implementation;
- The high rate of residential growth and migration from rural to urban and especially to major cities;
- The main objectives were included with the sixth national development plan "1952-1958".
- Reconstruction of war damage, utilities, and public facilities, housing;

Thus, this period "1952-1962" was characterized by a generally low level of housing construction in return for an increase in the housing deficit because of population growth and above reasons.

- **Second Period (1963 -1969)**

Although the oil was discovered in the late 1950 s and the economic situation improved, but most of the population lived in inadequate conditions or they were homeless. In 1964, 24% of all housing units in Tripoli and 17% in Benghazi were classified as poor, 41% of the population were living in tins and tents, and 3% in caves. The objectives of the 1963 plan, according to Amer, (2007as cited from Doxiadis Associates 1964) are as follows:

- Provide adequate housing with reasonably low rent "The plan was faced with the lack of skilled technicians, planners, and architects". Doxiadis was commissioned to conduct an integrated study of housing conditions and problems in Libya under the title of "Housing in Libya 1964", (Abdulmagid, 2003). According to these researches the objectives of the national policy were as follows:

- The elimination of poor housing increase in general;

- Reducing the average density of households from "3.71" families /dwellings to "1.1" families, according to standard provisions of public services;

- Housing policy and programs must meet the different needs of citizens in the state,

-Integration with the general development policy of the state;

- Supporting the participation of the private sector in investing in housing projects (Doxiadis, 1964);

-The plan included three comprehensive programs;

-The urban housing program includes individual projects to cover the most urgent housing needs in urban centers;

- The rural housing program aims to raise the standard of living and improve housing conditions to reduce migration to the cities;

- The Private housing program is designed to provide urgent housing both in urban and rural areas.

- Idris Housing Project

A program launched in August 1965 for promoting housing construction throughout the country. The program including implementation of "100,000" housing units over five years, "60%" of which are in rural areas to reduce migration to urban areas (Wedley, 1968). Also, the program consists of two types of projects:

I- Economic housing for low income;

II - Average housing for state employees,

During the period "1965-1969", 11553 units of type "I" and 3332 housing units of type "II" were implemented. The level of execution and design was not good, especially the first type having "two rooms and a few three rooms", was considered a poor revival after one year of their use, while the second type is considered reasonable but the number of dwellings was limited and the size was small, also distributed to non-beneficiaries (Sharnana, 1976).

- **Third Period: Housing Policy (1970 - 1975)**

The main objective was to improve the living conditions of the poor and to provide housing for low-income groups by "renting, buying or building", encouraging the private sector and contributing to solving the problem of housing by granting loans, a goal that was contrary to the principles of the socialist government. (Awotona, 1990) In the early 1970s, the Government adopted several housing programs as:

- Public Housing Program

The Libyan Ministry of Housing, in cooperation with the Public Housing Establishment, has prepared the program to provide low-income housing, especially in urban areas, where the local administration "housing control", construction follow-up, and distribution have been determined according to specific priorities. The total number of housing units completed by the General Establishment for Housing from its establishment until the end of 1980 was 104,791 housing units in different cities (Abdulmagid, 2003).

- Low-Interest Program

Among the actions which were taken by the government in 1971, Libyan commercial banks granted mortgages to Libyan citizens and they were of two types:

A. Mortgage loans for medium-income "more than 100 LD" at an annual interest "4%"and the loan amount of "6500 LD" unless the value of land purchase "2000 DL" is added to the loan in case of purchase. The loan amount is "8500 LD". This loan amount to" 10,000 and 20,000 LD". This kind of loan has been halted due to the financial problems of the government because of the embargo on Libyan oil (Abdulmagid, 2003).

B. Mortgage loans for the development of construction: These loans were implemented in accordance with the building development law issued in 1972. This program includes granting loans to all citizens who have suitable lands for residential development. They do not have the necessary funds for construction and have been given preference for their religion. They wish to build large buildings consisting of more than four apartments, which were designed to occupy more than four families were mainly for rent. In addition, the annual interest rate "5.5%". The plan was suspended despite its importance in solving the housing problem in 1974. Unfortunately, the confiscations of all the rented housing units that were built with loans under this program and approved in accordance with the controversial law "Law No. 4/1978", (Abdulmagid, 2003).

- **The Five-Year National Plan (1976 – 1980)**

Prior to the enactment of the law of "04/1978", specifically in 1975, about 41% of the investments were belonging to private sector in real estate. Therefore, housing was the hardest hit by the decline in private investment, as it usually met the housing objective. The public sector failed to reach this goal despite government efforts where the housing market in Libya continues to suffer from a severe shortage of housing (Kshedan, 1984). As a result, the five-year National Plan of transition "1976-1980" included a government policy to develop the housing sector, including:

- Every family has the right to reach the adequate housing:

-Providing the necessary land for the construction of affordable housing,

-Achieving physical integration between housing projects and the requirements of public services (schools, health care, gardens... etc.).

- The design of houses should be consistent with the living system and local environmental conditions to enable the use of local building materials. The plan aims to implement 150,000 housing units as part of total needs up to 1990, estimated at "562,000 housing units" (UNDP, 1977).

- Housing Policy During 1980

The aim of the government is to provide suitable and decent housing for each family. During this plan, the Ministry of Housing provided free housing to families who are financially unable to build their own housing. In addition, the Ministry of Agriculture built housing for agricultural projects. The plan aims to implement 206,152 housing units. According to this plan the state would realize the investment and employ the workers from abroad. The plan also emphasized the role of the private sector in order to contribute to the building of their homes (Essayed, 1981). The plan covered the following basic principles:

- The Social Security Fund and the Social Solidarity Fund shall undertake residential investment for leasing to the foreign labor force,
- The State provides free housing for low-income families,
- Loans are provided for the construction of housing institutions of citizens after providing a percentage of the amount by the citizen as a contribution to the construction of his home,
- The local authorities shall provide the land intended for housing, and the State shall pay for it, in addition to the provision of public services.

- **Plan Programs (1981-1985)**

The responsibility for implementing the plan was distributed as follows:

- The task of the Ministry of Housing participates only in the direct implementation of housing units for certain categories, as well as public utilities.
- National Banks shall carry out investment housing projects only;
- The task of housing cooperatives to implement housing projects for its members;
- The bank of savings and real estate investment to grant housing loans;

In 1985, the Ministry of Housing was abolished and its responsibilities were delegated to other bodies (the Public Authority for Housing), causing the country's housing policy to be completely disrupted (Mukhtar, 1997).

- **Long Term Plan (1986 -2011)**

The plan includes:

- Determination of urban plans to accommodate the expected growth during the period "2000 -2010" The needs were estimated at "65,000" housing units during the specified period and required land which is not less than "50,000 hectares".
- Identifying appropriate economic building materials at a reasonable cost, based; on locally available materials, taking into account environmental and climatic requirements;
- Simplifying the methods and systems of building construction to enable all citizens to build their homes, and the role of the state is limited to supervision only (Mukhtar, 1997).

- Short-Term Plan

The role of the government has changed from a guarantor of the housing to an enabling factor in the provision of housing during the "1994-1996" development plans. All sectors of the housing sector have allowed participation and contribution through the supply and provision of building materials for solving the housing problem. The objectives of this plan are (Abdulmagid, 2003):

- The role of the state is limited to housing construction for low income only;
- Construction of residential units targeted by citizens (public and private sector);
- Developing a plan to enable citizens to build their own homes;
- Reducing the cost of housing construction by controlling the prices of building materials;
- Developing the implementation sector in cooperation with foreign implementing companies;
- Retrieving the amounts of mortgage loans granted during previous plans and benefit from granting loans to citizens;
- Reorganization of housing cooperatives to contribute to the housing program;

The program of housing during the period, the implementation of 60,000 housing units distributed as follows:

- Completing 6000 housing units, according to previous contracts;
- Completing 4000 housing units by selling them to joint-stock companies;
- Construction of 3500 housing units by public institutions;

- Implementation of 30,000 housing units, of national investment companies;
- The implementation of 14100 housing units by real estate loans from commercial banks;
- The implementation of 2400 housing units through the savings of citizens;

Relying on the government through the evaluation period policies always failed. Targets in all plans were not achieved. Therefore, it is important to search for new policies to solve the shortage of housing in Libya (Sheibanil, 2005).

Since this program and other programs were not implemented because of the lack of will of the state and the difficulty of implementing it, with an unstable local administration, the housing shortage became more serious, and the problem was exacerbated by the replaced of existing housing that needs to be developed.

- **Current Housing Policy (2011 - up to date)**

Since the year 2011 up to now and due to the absence of the formal state, the country has not experienced any political stability throughout this period and thus chaos has spread all over the sectors particularly in the housing and planning sector, where many haphazard construction waves of abuse took place in and out **-**

-The Main Inadequacy in Developing and Implementing Libyan Housing Policy

According to Omar, (2003) and Mukhtar, (1997), the main inadequacy in developing and implementing a housing policy and program were as follows:

- Lack of responsiveness to housing needs in terms of social life, cultural and environmental factors. Because of this, most of the public housing has used foreign concepts in planning and designing projects.

- Deficiency of local specialists, technical personnel, and building materials to complete the objectives of the housing sector. The result is a dependence on importing them from abroad. Consequently, the design and execution of most houses is highly dependent on foreign skill and labor as well as imported materials;

-The absence of private house renting system caused some deficit in housing supply;

-Public housing projects have not always included the necessary services. In most projects, the social infrastructure and services such as the schools, roads, and other civil services, were not constructed at the same time. The housing policy in Libya mostly concentrates on quantity, not quality and unsuitability for occupants' usage and the Libyan environment.

4.5. Summary of the Chapter

The Libyan house has been influenced by several environmental, social and economic factors, determining the types of houses. Every geographical and climatic area has its own special kinds of houses, that meet the requirements of the people, and the differences are apparent among many countries and also within a large country like Libya (Amer, 2007). In Libya there are three main types of house dwellings being in the desert region, in the mountain region and in the coastal region. Each type has its own different characteristics, shapes and designs. The designs of the houses have main determinants like socio-cultural and religious values, additional to the climatic conditions.

Including the summary, this chapter which is about the patterns of Libyan traditional settlements, concentrates on the two old towns "Tripoli old city and Ghadames old town". The summary gives the history of the old towns and the patterns of street and path planning is of the settlements and the main characteristics of the old traditional housing design.

Housing is an important issue in social and economic development plans in Libya as in most developing countries. Therefore, it has been a high priority of the Libyan governments since the country attained its political independence in 1951. As a result, more than 77% of the construction works were realized as residential buildings in Libya (NCID, 1995), and a series of strategies have been adopted in order to deal with housing issues. The Libyan housing consists of the following plans:

- The first post-independence period (1951-1962);
- Second period (1963 -1969);
- Third period: housing policy (1970 - 1975);
- The five-year national plan (1976 – 1980);
- Plan programs (1981-1985);
- Long term plan (1986 -2011);
- Period housing policy (2011 - up to date).

Main inadequacies in developing and implementing Libyan housing policy are:

- Lack of responsiveness to housing needs in terms of social life, cultural and environmental factors;
- Deficiency of local specialists, technical personnel, and building materials;
- The absence of private rented housing caused some deficit in housing supply;
- Public housing projects have not always included the necessary services.

CHAPTER V

QUESTIONNAIRES AND CASE STUDY RESEARCH

This chapter explains the final objectives of the field survey for the purpose of providing information on the implementation of the sustainable housing policy in Libya, by following the research methods to study this thesis by selecting a number of housing sites implemented in Tripoli and exploited by the population as a case study. In addition by using questionnaires to gather information from users and housing professionals.

5.1. Research Design

The context of this type of study has been followed by many type of academic research to achieve the objectives of this thesis Through a review of the research problem and its hypotheses, the research method was divided into two types; the first type is theoretical, including the literature review studies of the subject of the thesis in this field. The second type is empirical research, including a case study of four implemented housing site projects in the city of Tripoli.

5.1.1. Case Study

Case study allows conversion of tacit knowledge explicit knowledge. It is useful for practitioners to derive knowledge about the performance of a business. It's a favorable method for individual researchers as well, as one aspect of the problem of the interest can be examined in a in a limited time scale. (Elaiab, .2014 as cited from Bell, 1993). According to Sekeran, "case studies involve in-depth contextual analysis of similar situations in other organizations, where the nature and definition of the problem happens to him the same as experienced in the current situation" (Sekaran, 2003). Case study is defined by Remenyi, et. al, 1998 as "investigation of the context and processes that affect a phenomenon within organizations", also by Yin (1994) "an empirical investigation into contemporary phenomenon operating in a real-life context" and he states the case study is the preferred strategy when "how" or "why" questions are being posted".

Case study provides researcher a deep understanding of the context and a record of structural relationships, motivations, decisions and reasons. Depending on the purpose of research, there are 3 types (Yin, 1994) as:

- Exploratory: prelude of social research in some cases
- Explanatory: can be used for casual examinations
- Descriptive: descriptive theory is developed before the study

In addition, a sample questionnaire was for the occupier of the selected sites for the purpose of satisfaction assessment of users, also for the purpose of determining the applicability of the concept of sustainable housing.

5.1.2. Questionnaires Design

Categorization of questions into sections that is logically coherent will make it easier for respondents to understand questions, and the questionnaire will be easier to monitor and more readable. Moreover, it will be easier for respondent to complete it. There are also things to be considered in arrangements of questions. There should be smooth transition between questions. Starting the questionnaire with questions that are more specific and difficult may cause a decrease in response rate, thus the arrangement of questions from easy to difficult should be preferred. Also, closed questions would be more suitable for respondents to fill, rather than open-ended questions. These considerations were taken into account in the design of the questionnaires. There are two types of questionnaires designed for the case study, for professionals and users.

5.1.2.1. Professionals Questionnaire

Consists of introduction, researcher information and aims of the survey, and includes six main axes with the main heading, which are distributed as follows:

- The extent that sustainable housing will achieve objectives,
- Factors to help implement sustainable housing in Libya,
- The results expecting of sustainable housing in Libya,
- Implementation assessment of previous housing policies,
- Factors have negatively affected the success of previous Libyan housing policies,
- Factors can be used in the evaluation of sustainable housing policies.

5.1.2.2. Users Questionnaire

Consists of introduction, researcher information and aims of the survey, and includes five main axes with the main heading which are distributed as follows:

- Users satisfaction,
- Suitability of user house,
- Using the user for some spaces in his/her house,
- Future prefer house for the user in terms of the type of house which likes to live in;
- The extent to which the user's house needs modifications of the design to suit his needs;.

5.1.2.3. Translation of Questionnaire into the Arabic Language

The translation of questionnaires was an important issue for this case study. Questionnaires were prepared in English language, but the implementation would be in Libya where the native language is Arabic. First the questionnaire in English language was prepared and approved by the supervisors in design and wording, and then it was translated into Arabic language. Main consideration in translation was that the original (English Version) and translated (Arabic) questionnaires will have questions ask the same thing, but it is expected that there may be differences in understanding of respondents due to differences in language structures.

5.1.2.4. Questionnaires Measurement Tools

According to the research methodology of this thesis illustrated in Chapter I, measurement consists of the analysis of the information by using SPSS (Statistical Package for the Social Sciences), and evaluation of the statistical data. The following questionnaire measurements tools were Confirmatory Factor Analysis (CFA) indexes sources used:

a. Factor Analysis

Factor analysis provides more manageable scale items or set of variables when they are large in size by condensing them into smaller number dimensions or factors. This is achieved by detecting groups of items that are closely related, or clumps, and summarizing the patterns of correlation. Factor analysis is frequently used in development of measure and scales for identification of the structure. Researchers use this technique when developing and evaluating questionnaires. For factor analysis, suitability of the data set must be verified first. Kaiser-Meyer-

Olkin Measure of Sampling Adequacy (KMO) must have a value .06 or above, and Bartlett's Test of Sphericity must have a significant value, which is .05 or smaller (Pallant, 2010). In the case study of this thesis, the questionnaire for professionals have KMO value .773 and Bartlett's test is significant with p=.001, Table 2.

Table (2) Factor Analysis

Pattern Matrix [af]						
	Components					
	1	2	3	4	5	6
31- Social habits and traditions:						-.708
29- Lack of local implementation tools:						-.543
9-Reduction of health service expenses?						.482
10- Reduce consumption of natural resources?						.476
28- Implementation prices offered by foreign companies						-.374
30- The local environmental policies:						-.341
Explained Variance (%)	19.305	7.965	6.836	5.565	4.462	4.077
Total Explained Variance (%)	48.211					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.773					
Bartlett's Test of Sphericity: $\chi 2$ (703) =2038.770, p >.001						
Extraction Method: Principal Component Analysis.						

These coefficients can only have values in the range of -1 to +1. The sign implies if there is a positive correlation, meaning an increase in one variable increases the others. Larger absolute value implies stronger relationship. When there is a perfect correlation with 1 or -1, we can determine the value of a variable with another variable which we know its value.

b. Pearson Correlation Coefficients (r) :

It can only take on values from –1 to +1. The sign out the front indicates whether there is a positive correlation (as one variable increases, so too do the other) or a negative correlation (as one variable increases, the other decreases).

The size of the absolute value (ignoring the sign) provides an indication of the strength of the relationship. A perfect correlation of 1 or –1 indicates that the value of one variable can be determined exactly by knowing the value of the other variable.

c. The Absolute Close-fit Index

In this analysis the root mean square error of approximation is calculated (RMSEA); (Rigdon, 1996). Smaller absolute close-fit index values indicate a progressively better fitting model, with values approximating .08 to .06 or less indicative of an acceptable level of model fit. (Hooper, et al 2008)

d. The Incremental Close-fit Indexes

In this analysis the normed fit index is calculated (NFI); (Bentler & Bonnett, 1980), the Tucker–Lewis Index (TLI); (Takahashi, & Nasser, 1996) and the Comparative Fit Index (CFI); (Bentler, 1990). Larger incremental close-fit index values are indicative of a progressively better fitting model, with values approximating .950 or larger indicative of an acceptable level of model fit (Marsh, et al 2004).

e. Pearson Correlation or Spearman Correlation

According to information technology services ITS, (2016) this kind of analysis used when you want to explore the strength of the relationship between two continuous variables. This gives you an indication of both the direction (positive or negative) and the strength of the relationship. A positive correlation indicates that as one variable increases, so does the other. A negative correlation indicates that as one variable increases, the other decreases. Pearson correlation coefficients (r) can only take on values from –1 to +1. A perfect correlation of 1 or –1 indicates that the value of one variable can be determined exactly by knowing the value of the other variable. On the other hand, a correlation of 0 indicates no relationship between the two variables.

f. **Descriptive Statistics;** Describe the characteristics of the sample, and using for summarizing data frequency or measure of central tendency (mean, median, and mode).

g. **Frequency Analysis;** is a descriptive statistical method that shows the number of occurrences of each response chosen by respondents. And also, calculate the mean, median, and mode to help user's analysis the results and draw conclusions.

h. The One-Sample t-Test is Commonly Used to Test the Following

This test is used when data from one sample are available, such as this study, and we would like to know whether the average population that was withdrawn from the sample has the same assumed mean value. Also, one-sample statistics provides basic information about the selected variable, height, including the valid (non-missing) sample size (n), mean, standard deviation, and standard error. Statistical difference between a sample mean and a known or hypothesized value of the mean in the population

• Statistical difference between the sample mean and the sample midpoint of the test variable

• Statistical difference between the samples mean of the test variable and chance.

In Table 3 as example, the mean height of the sample is 68.03 Inches, which is based on 408 non-missing observations.

Table (3) As an Example of one Sample Statistics Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Height	408	68.0318	5.32566	.26366

One-Sample Test

	Test Value = 66.5 A					
	B t	C df	D Sig. (2-tailed)	E Mean Difference	95% Confidence Interval of the Difference F	
					Lower	Upper
Height	5.810	407	.000	1.53176	1.0135	2.0501

A Test Value: The number we entered as the test value in the One-Sample T-Test window.

B t Statistic: The test statistic of the one-sample t-test, denoted t. In this example, t = 5.810. Note that t is calculated by dividing the mean difference (E) by the standard error mean (from the one-sample statistics box).

C df: The degrees of freedom for the test. For a one-sample t-test, df = n - 1; so here, df = 408 - 1 = 407. 27

D Sig. (2-tailed): The two-tailed p-value corresponding to the test statistic.

E Mean difference: The difference between the "observed" sample mean (from the one-sample statistics box) and the "expected" mean (the specified test value (A). The sign of the mean difference corresponds to the sign of the t value (B). The positive t value in this example indicates that the mean height of the sample is greater than the hypothesized value (66.5).

F Confidence interval for the difference: The confidence interval for the difference between the specified test value and the sample mean.

i. ANOVA (Analysis of Variance)

The factorial analysis of variance (ANOVA) is an inferential statistical test that allows the researcher to test if each of several independent variables has an effect on the dependent variable (called the main effects). It also allows determining if the main effects are independent of each other (i.e., it allows to determine if two more independent variables interact with each other.) It assumes that the dependent variable has an interval or ratio scale, but it is often also used with ordinal scaled data, Table (4) shows ANOVA (Analysis of Variance).

Table (4) ANOVA (Analysis of Variance)

ANOVA						
Source		Sum of Squares	df	Mean Square	F	Sig.
Social Satisfaction	Between Groups	2.929	3	.976	3.826	.012
	Within Groups	32.667	128	.255		
	Total	35.596	131			
Social Suitability	Between Groups	2.081	3	.694	2.878	.039
	Within Groups	30.849	128	.241		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.184	3	.395	.923	.432
	Within Groups	54.737	128	.428		
	Total	55.922	131			
Payment Suitability	Between Groups	.721	3	.240	.996	.397
	Within Groups	30.878	128	.241		
	Total	31.599	131			

The tests of between-subjects effects output give us the analysis of variance summary table. As in the one-way ANOVA summary above table, there are six columns in the output table 5:

Table (5) Description ANOVA (Analysis of Variance)

Column	Description
Source	The first column describes each row of the ANOVA summary table. In this example there are four rows that we are primarily interested in.
Sum of Squares	The sum of squares column gives the sum of squares for each of the estimates of variance. The sum of squares corresponds to the numerator of the variance ratio.
df	The third column gives the degrees of freedom for each estimate of variance.
Mean Square	The fourth column gives the estimates of variance (the mean squares.) Each mean square is calculated by dividing the sum of square by its degrees of freedom.
F	The fifth column gives the F ratios. They are calculated by dividing the appropriate mean square between-groups by mean square within groups.
Sig.	The final column gives the significance of the F ratios. These are the p values. If a p-value is less than or equal α level, ($p < .05$). If $p < .05$ for the main effect of a particular factor, then there is a significant effect on that factor. All we have to do is examine the marginal means for the levels of the factor to determine which group is significantly higher (or lower) than the other.

j. Eta Squared

Eta squared is interpreted as the proportion of the total variability that the dependent variable consists which is explained by variation in independent variable. It is the ratio of the between-groups sum of squares to the total sum of squares (italics added). Eta squared (the ratio of sum of squares for an effect to the total sum of squares). Proposed by Cohen, 1988, the guidelines for interpreting the value Eta squared is .01= small effect, .06 = moderate effect, .14 = large effect. Given that eta squared has the value .05, it can be concluded that there exist a large effect and there was a difference before and after the intervention in the scores of Fear of Statistics Test (Pallant, 2010).

k. Correlation Matrix

When we do (bivariate) correlation in SPSS, the program produces an output called a correlation matrix. This is essentially a table that presents the correlation coefficients for the relationships between each pair of variables in the analysis. That is, each variable is correlated with every other variable and the resulting correlation coefficients are arranged in a tabular format allowing us to see the strength and direction of relationship between each pair of variables.

5.2. Research Area

The information regarding the study area is of great importance. It gives an overview of Libya in general as a research area and concentrates on Tripoli city as a case study of this thesis. Thesis research methodology consists of the practical and theoretical framework, also contains historical background, in addition to geographical, population and housing information for the case study sites, and involves a literature review on sustainable housing policy, and main principles of housing sustainability.

5.2.1. Historical Background

The appearance of the name of Libya and its circulation in the ancient Egyptian inscriptions to show clearly the Libyan tribes that lived in"Mount Burqa", and the western Sahara in Egypt was mentioned on the plate of "King Mernptah", and also in the temple of "EL-Karnak". From the historical point of view seems to be derived from the old Egyptian word "Ribo" or "Libo" and corresponded in Greek" Libus" Arabic Libya. The name "Libo or Libya" was mentioned in an Egyptian inscription, dating back to the reign of "Ramesses II" (1289-1232) BC. It was called one of the military teams that worked in the Egyptian army at the time and participated in the campaigns against Palestine and Syria (Najem, 2004). The Romans took the name of Libya from the Greeks without definition with the rationing of the geographical area so that it became indicative. They have landed on the western side of Egypt from Barqa to Tripoli, and they called the name of Libya Upper Egypt, which is the area extending from the western city of Derna present to the east of the city of Sirte and the region of eastern Derna, near the valley of Mell., knew they have the name of Lower Libya or "Marmariday", which was known to the Arabs as "Maraqia (Najem, 2004). When the Arabs came to the Muslims, Luba was the name of the two" Koretan" mentioned in Western Egypt where " Abd al-Hakam son" mentions Lubya and Korak is mentioned in Western Egypt and knew what they drink from the sky, and Nbala Nile and recall in the state of "Hassan bin Nu'man" Antapels and Lubia and mark to the limits of Agdidiya of the works of Hassan did not specify the name of Libya a specific geographical significance only at the turn of the century (Najem, 2004). Due to its strategic location, since 1551, until the beginning of the 20th century, Libya was subjected to foreign military invasion for more than 2500 years and was subjected to the rule of the Greeks, Byzantines, Carthaginians, Phoenicians, Romans, Ottomans and Arabs. Italian, British, and French (Shawesh, ,1996), and had an impact on social and cultural values, especially Arabs and Ottoman Turks in terms of lifestyles, "the Arabs had brought with them little more than their religion, the language, and their influence on the people offered faith and with it a social system and culture that they could completely absorb". (Warfelli, 1976) During this century, the roots of Islam was established quickly in the area. According to Amer, Islamic religion influence was in most of the cities and villiages. Islam is not only a religion, but it’s a way of life and a rich culture, Amer, A., (2007 as cited from Wright, A. 1969). In 1911, Italian forces invaded Libya (1911-1943), (Ronald, 2006). After local resistance was defeated by Italians and they achieve their colonial goals (Ahmeda, 1994), Libya was adopted as the official name of the colony, from the Cyrenaica, derives its name from Cyrene, which founded in 631 BC as the first Greek city in North Africa, Tripoli, and Fezzan (Ronald, 2006). The Italian rule has ended During the Second World War, the rule of Italy has ended as the country was divided. The part Fezzan was controlled by French, part of Cyrenaica and Tripolitania (Tripoli) were under the administration of Great Britain. (1943-1950). In 1951, the United Nations resolution declared Libya an independent state and agreed to form a federation as a constitutional monarchy, called the United Kingdom of Libya, consisting these parts (Ronald, 2006). In 1960 s, oil was discovered, which helped transform it into a national state (Fisher, 1978). In 1969 the name of the State was renamed as the Libyan Arab Republic (Ronald, 2006).

- In 1977 the official names the Socialist People's Libyan Arab Jamahiriya.
- In early 2011, the revolution took place (17/02/2011). The name of the country changed to "State of Libya", and so far.

5.2.2. Location

Libya is situated in North Africa with about 1,760,000 square kilometers of area. It comes as fourth in Africa in terms of its size and as fifteenth in the world, among countries (Fisher, 1978). Figure 39 shows the boundary location of Libya, It is bounded by:

- The North: Mediterranean coast about 1,900 km.
- The South: Chad 1,055 km, Niger 354 km, and Sudan 383 km.
- The East: Egypt 1,115 km.

-The West: Algeria 982 km and Tunisia 459 km.

Figure 39: Location of Libya

(Source: Google Earth, access date: 10th, Jun 2016)

- **Regional Division of Libya.**

The main regions of Libya are, Tripoli (Tripolitania), Benghazi (Cyrenaica) and Sabha (Fezzan) which occupy about 360,000, 855,000, and 550,000 square kilometers, Figure 40 show the regional division of Libya.

Figure 40: Regional Division of Libya

(Source: Libyan Urban Planning Association, 2017)

5.2.3. Case Study Researches: City of Tripoli

According to the research methodology of this thesis, the method of study of the thesis will be divided into two parts; the theoretical part represented the literature review of previous studies as theoretical frameworks. The practical part is the selection of the city of Tripoli as a case study, and representing a selection of four sites for a housing project has been implemented and now exploited by the population, have been selected sites with using the following factors:

- Residential and population density;
- Number of housing units;
- Technical status;
- Characteristics of the project site in the city of Tripoli;

5.2.3.1. Historical Back Ground

The origin of Tripoli as a city came during the settlement of the Phoenicians (In the 7th century BC) on the west coast of Libya and the establishment of three major commercial centers of Oia (Tripoli), Subrata and Leptis Magna about 800 B.C. Some historians believe that the Phoenicians came from the eastern coast of the Mediterranean Sea. Other historians claimed that Oia (Tripoli) was founded by Sicilians who would have been Phoenicians already abroad, not native Sicilians (Kshedan, 1984). Later formed the eastern province of the Carthaginian state and account for the late Roman name Tripolitania "Three Cities". (Figure41) illustrates the Phoenician Colonies on the Libyan coast.

Figure 41: Phoenician Colonies on the Libyan Coast
(Source: Betchart Expeditions - Africa, "betchartexpeditions.com" 11th Dec.2018)

The strategic location of the city of Tripoli, which links the continent of Africa with other continents, especially the continent of Europe, has made it a harbinger of the colonial powers that swept the city through its various phases of development in terms of the architectural identity of buildings and the organization of streets. The development of the city can be summed up historically to:

- **Pre - Colonial Stage "Seventh Century Bc -1911 Ad"**

Tripoli was formed in 17th century BC during Phoenician era. It was a settlement around patterns of trade of ancient time. The Phoenicians had picked it to build a new center of trade on the southern bank of the Mediterranean Sea, but they were more interested in the city of Carthage, now Tunisia, and for the cities around they imposed limiting policies. Because of that, the growth of city of Tripoli, with its role as a trade center, was limited. Under the Roman rule around 100BC, it was one of the important cities with of southern bank of the Mediterranean Sea, including two other. The city faced many changes as The Romans built residential quarters, market places and public paths. At the time, Roman cities were designed commonly in pentagonal form and Tripoli were redesigned to fit that shape. It became part of African Tripoli and the name of the city changed to “Oea”. During the Muslim Arabs occupied the city of Tripoli in 642 under the leadership of Amer EbN Al-A'ass. Because of the defensive power of the city, Ebn Al-Aa'ss had to wait one month to occupy the city. During the Muslim Arab occupation of about eight centuries (642-1510), the city of Tripoli experienced both urban development and population growth. These urban developments were indicated by the increased number of houses, shops, mosques, baths, and (markets). The population of the city had increased from 5,000 during the eighth century to 10,000 in the sixteenth century (Elfarnouk, 2009). Throughout the Islamic eras and under the rule of Ottoman Empire the city kept growing, and it became known as Medina, meaning walled city. There were several armed conflicts in the city during the Ottoman rule, between Arabs and Spanish forces, destroying the many parts of city. (Micara, 2008) It was also under Ottoman Empire that the city as a capital of the territory Tripolitania seen its highest development, during nineteenth century and first part of the twentieth century. Most of the developments were seen especially between 1835 and 1911, during the rule of Karamanli dynasty, as there were many reforms occurred, causing social and economic changes. During that time, the dynasty built residential and administrative places along the south part of the sea, outside of the old Medina. (Kshedan, 1984)

• **The Colonial Phase (1911 - 1951)**

Libya was invaded by Italy in 1911 and stayed as their colony until their independence in 1941. It became an important part of the Italian territory and was considered as fourth beach for Italy. After they occupy the lands, in the east and west parts of the county they built commercial banks and several settlements and Tripoli became a part of those settlements. (Fuller, 2007) An Italian plan for the city in 1914 was changed later in 1934 by some upgrades especially for the areas in the center. The changes made by Italian architects and planners left marks in the area, in terms of patterns of architecture and planning (Elfarnouk, 2009).

• **The Post - Colonial Stage from 1951 and Onward**

The Italian rule ended in 1951 and the state became independent. First Libyan governance was established as King Idris Al-Sanusi became the ruler. After the independence the city was developed faster with new city planning and architectural designs, but still the city remained to be reflecting the interests of the foreign societies until the coup in 1969. After the coup, as a result of high oil prices during the 1970s the Libyan economy developed. The natural population growth, also the population from the migration of neighboring settlements southern cities were increased, the governments implemented some projects, particularly in the housing sector, with the assistance of foreign expertise "advisory and operational". At the same time the period of second-generation plans (1980-2000) was prepared, but because of several political factors that led to the failure to use these studies in accordance with the time frame. The government tried to develop solutions by the third generation (2000-2025), but the same factors did not obligate the government to complete studies thus the same problem continued by suffering the citizens, especially regarding the housing sector until 2011, Figure 42 illustrates city of Tripoli existing land use pattern 2006.

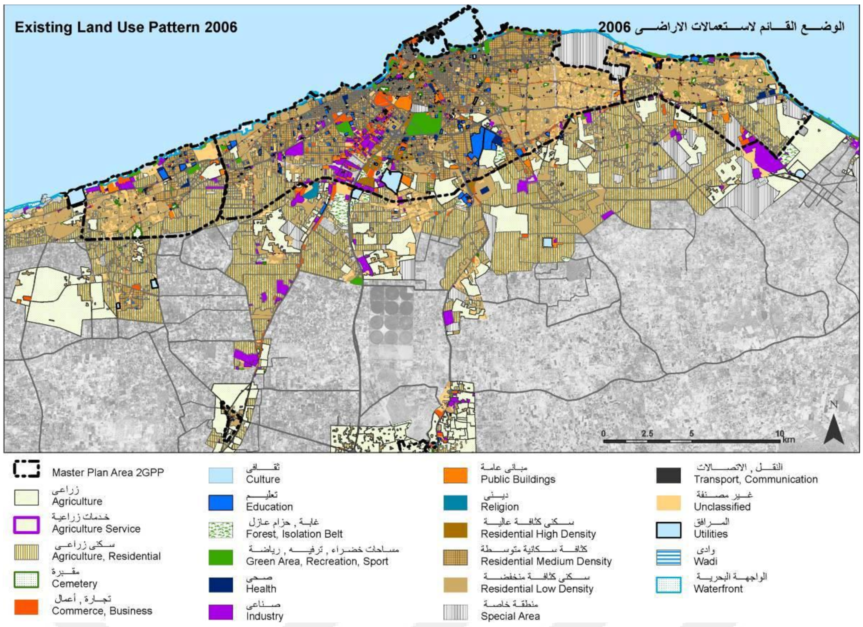


Figure 42: City of Tripoli Existing Land Use Pattern 2006
(Source: NCB (National Consulting Bureau) 2009)

5.2.3.2. Tripoli Site Location

Tripoli is the central city of the region Tripoli, which is located in the middle part of "Sahel-EL-Jafara". With respect to the geography it’s situated in the north of Equator and east of Greenwich with longitude 32.56 degrees and latitude of 13.15 degrees as shown in Figures 43, and Regional Location, Figure 44. The region Tripoli is considered as the most significant of the Libyan provinces since, it’s the most populated region. Its surface area is about 12.8% of the total area of the Libya, reaching to 225,282 km square. (Amer, 2007).

Figure 43: Tripoli Geographical Location
(Source: Libya Map and Libya Satellite Images - Jun 2018)

Figure 44: Tripoli Regional Location
(Source: http://www.libya.climatemps.com - Jun, 2018)

5.2.3. 3. Tripoli Climate Condition

The city is located within the influence zone of the Mediterranean. The climatic data is characterized by long periods of sunlight and warmth, with a short, temperate and wet winter season, with northwest winds. The hot dry summer brings the southern (Algabli) winds bearing dust. Spring and autumn seasons are distinguished by more temperate heat with northeast winds (Amer, A., 2007).

The next graph Figure 45 shows the climate in Tripoli, Libya in metric units. The climate graphs depict monthly average temperatures, precipitation, wet days, sunlight hours, relative humidity and wind speed.

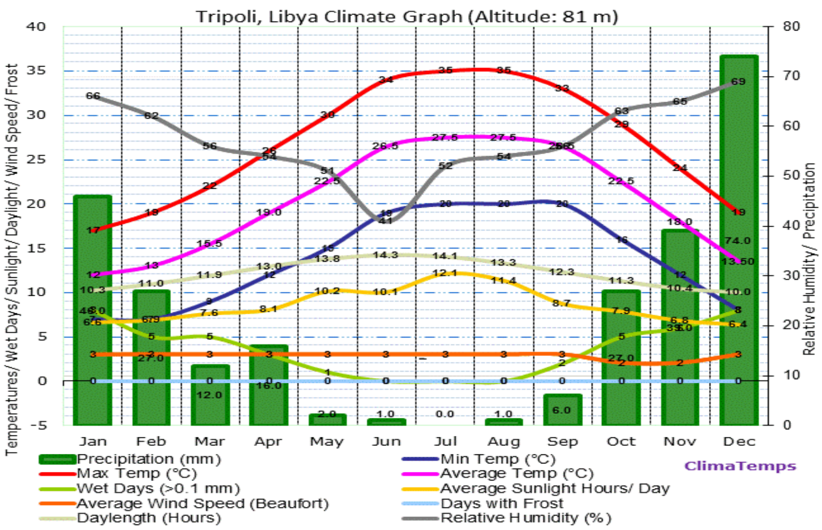


Figure 45: The Climate in Tripoli
(Source: http://www.libya.climatemps.com- Jun 2018)

- **Average Temperatures in Tripoli**

-The annual average temperature in Tripoli, Libya is warm at 20.3 degrees Celsius (68.6 degrees Fahrenheit).

-There is a variation of mean monthly temperatures of 15.5 °C (27.9°F) which is a slightly low range.

-The mean daily temperature variation/ range are 13.2 °C (23.7 °F).

-The hottest month July is hot with an average temperature of 27.5 degrees Celsius (81.5 degrees Fahrenheit).

-The coldest month January is quite mild having a mean temperature of 12 degrees Celsius (53.6 degrees Fahrenheit).

Table (6) Average Temperatures for Tripoli

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max Temperature °C (°F)	17 (62.6)	19 (66.2)	22 (71.6)	26 (78.8)	30 (86)	34 (93.2)	35 (95)	35 (95)	33 (91.4)	29 (84.2)	24 (75.2)	19 (66.2)	26.9 (80.5)
Average Temperature °C (°F)	12 (53.6)	13 (55.4)	15.5 (59.9)	19 (66.2)	22.5 (72.5)	26.5 (79.7)	27.5 (81.5)	27.5 (81.5)	26.5 (79.7)	22.5 (72.5)	18 (64.4)	13.5 (56.3)	20.3 (68.6)
Average Min Temperature °C (°F)	7 (44.6)	7 (44.6)	9 (48.2)	12 (53.6)	15 (59)	19 (66.2)	20 (68)	20 (68)	20 (68)	16 (60.8)	12 (53.6)	8 (46.4)	13.8 (56.8)

(Source: http://www.libya.climatemps.com- Jun, 2018)

- **Rainfall and Precipitation in Tripoli**

The following Table 7 summarizes rainfall and precipitation:

Tripoli is entrusted with an average of 251 mm (9.9 in) of rainfall per year, or 20.9 mm (0.8 in) per month.

- On average, there are 43 days per year with more than 0.1 mm (0.004 in) of rainfall (precipitation) or 3.6 days with a quantity of rain, sleet, snow, etc. per month.
- The driest weather is in July when an average of 0 mm (0 in) of rainfall (precipitation) occurs.

The wettest weather is in December when an average of 74 mm (2.9 in) of rainfall (precipitation) occurs.

Table (7) Precipitation for Tripoli

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Precipitation mm (in)	46 (1.81)	27 (1.1)	12 (0.5)	16 (0.6)	2 (0.1)	1 (0)	0 (0)	1 (0)	6 (0.2)	27 (1.1)	39 (1.5)	74 (2.9)	251 (9.9)
Precipitation Litres/m² (Gallons/ft²)	46 (1.13)	27 (0.66)	12 (0.29)	16 (0.39)	2 (0.05)	1 (0.02)	0 (0)	1 (0.02)	6 (0.15)	27 (0.66)	39 (0.96)	74 (1.82)	251 (6.16)
Number of Wet Days (probability of rain on a day)	8 (26%)	5 (18%)	5 (16%)	3 (10%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	2 (7%)	5 (16%)	6 (20%)	8 (26%)	43 (12%)
Percentage of Sunny (Cloudy) Daylight Hours	66 (34)	64 (36)	65 (35)	63 (37)	74 (26)	71 (29)	87 (13)	86 (14)	72 (28)	71 (29)	66 (34)	65 (35)	73 (27)

(Source: http://www.libya.climatemps.com- Jun, 2018)

- **Sunshine & Daylight Hours in Tripoli**
  - Average hours of sunlight in Tripoli range from 6:23 for each day in December to 12:07 daily in July
  - The longest day of the year is 14:09 long and the shortest day is 9:50 long.
  - The longest day is 4:18 longer than the shortest day.
  - There is an average of 3187 hours of sunlight per year (of a possible 4383) with an average of 8:43 of sunlight per day.
  - It is sunny 72.7% of daylight hours. The remaining 27.3% of daylight hours are likely cloudy or with shade, haze or low sun intensity.
- At midday, the sun is on average 57.7° above the horizon at Tripoli; Table (8) shows more information.

Table (8) Sunshine & Daylight Hours in Tripoli

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Sunlight Hours/ Day	06:38	07:34	07:38	08:20	10:09	10:24	12:07	11:21	09:02	07:52	07:04	06:23	08:43
Average Daylight Hours & Minutes/ Day	10:15	10:57	11:55	12:57	13:49	14:15	14:03	13:19	12:19	11:18	10:26	10:01	12:00
Sunny & (Cloudy) Daylight Hours (%)	66 (34)	70 (30)	65 (35)	65 (35)	74 (26)	74 (26)	87 (13)	86 (14)	74 (26)	71 (29)	69 (31)	65 (35)	73 (27)
Sun altitude at solar noon on the 21st day (°).	37.4	46.7	57.6	69.3	77.5	80.8	77.7	69.4	57.9	46.4	37.3	33.9	57.7

(Source: http://www.libya.climatemps.com- Jun 2018)

5.2.3. 4.Relative Humidity in Tripoli

The average annual relative humidity is 57.4% and average monthly relative humidity ranges from 41% in June to 69% in December, Table (9) detail information about relative humidity.

Table (9) Relative Humidity in Tripoli

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Relative Humidity (%)	66	62	56	54	51	41	52	54	56	63	65	69	57.4
Average Dew Point Temperature ºC (ºF)	5.9 (42.5)	5.9 (42.6)	6.8 (44.2)	9.5 (49.1)	11.9 (53.4)	12.2 (53.9)	16.8 (62.2)	17.4 (63.3)	17 (62.6)	15.1 (59.2)	11.3 (52.4)	7.9 (46.3)	11.5 (52.6)
Interpretation	A bit dry	A bit dry	A bit dry	A bit dry	Very comfort-able	Comfort-able	Ok	Ok	Ok	Comfort-able	Very comfort-able	A bit dry	Very comfort-able

(Source: http://www.libya.climatemps.com- Jun 2018)

5.2.4. Field Survey of Sites:

Through the collection of the information about field in the city of Tripoli during the period (from 17th, Mar. 2018 to 03rd, Apr. 2018), includes the following governmental institutions:

- Housing & Infrastructure Board;
- Urban Planning Agency;
- Savings & Real Estate Investment Bank;
- Management of Social Security Fund Projects;
- Organization for Development of Administration Centers (ODAC);
- The Former General Authority for Housing (project implementation of 2870 housing units in the city of Tripoli), currently belonging to the Housing and Infrastructure Board;
-Management of Social Solidarity Fund Projects;

The information has been collected for (6) sites of housing projects occupied by the population, as summarized in the following Table 10 and Figure 45:

Table (10) Summary of site data collection

No	Project Name	Dwelling Numbers	Population Numbers	Remarks
1	Souq- Atolata (North)	240	1224	6 multi- storey buildings consist of 12 floors
2	Souq- Atolata (south)	308	1632	8 multi- storey buildings consist of 12 floors
3	Ghot Ash - Ahaal	100	510	14 multi-storey buildings consist of 4 floors, including ground floor as shops some apartments
4	Al- Hadba Khdra	1088	5550	49 multi-storey buildings consist of 10 floors
5	Airport- East	224	1254	16 multi-storey buildings consist of 7&8 floors including ground floor as shops some apartments,
6	Air Port- West	592	3019	28 multi- Storey buildings consist of 7&8 floors including ground floor as shops for some apartments

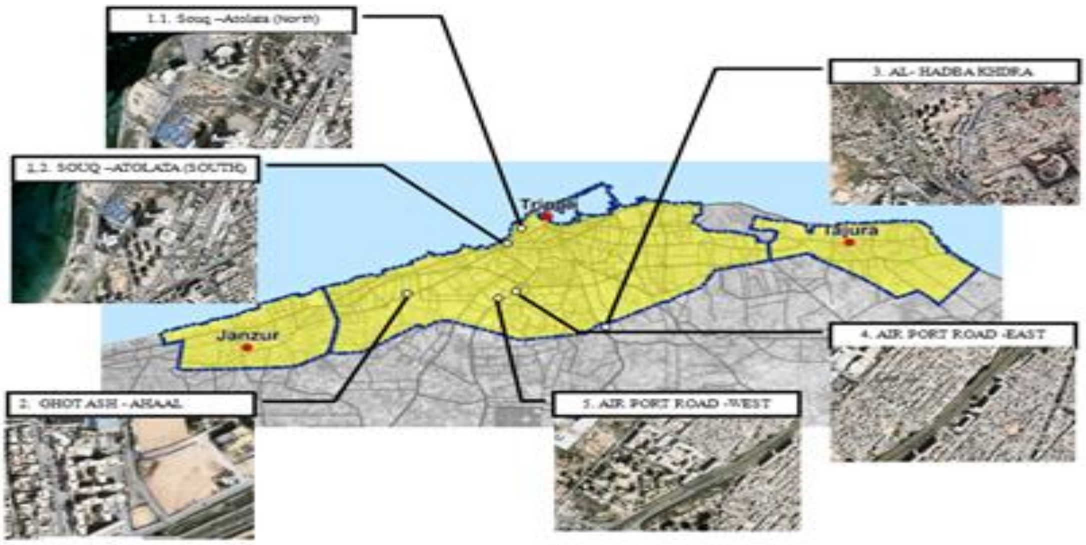


Figure 46: Case Study Field Survey (Sites Distribution in the City of Tripoli)

(Source: NCB (National Consulting Bureau) 2009)[1]

[1] . The sites are distributed by the researcher 2018.

5.2.5. Criteria for Selecting Study Sites

Through the fieldwork survey, the information was collected for the following sites:

1 . Souq- Atolata (South),

2. Souq- Atolata (North),

3. Ghot Ash - Ahaal,

4. AL- Hadba Khdra,

5. Air Port-East,

6. Air Port-West,

The information was collected through documentary sources and field survey, which was about housing projects implemented in Tripoli Libya was collected which occupied by the population. The sample of sites of case study was selected according to the following reasons and criteria:

1. Availability of a lot of information about the selected sites,
2. The construction of the housing projects were completed and occupied by users,
3. The sample for the thesis was chosen from houses of different types, different areas of city of Tripoli. Additional to the following:

-Residential and population density;

-Number of housing units;

-Technical status;

- Characteristics of the project site in the city of Tripoli;

And by applying the criteria specified above, the sites shown in the following table were selected and adopted by thesis jury members. Table (11) shows the main information about the sites selected.

Table (11) Selecting Case Study Sites

NO	Site Project	Number of housing unites	Number of inhabitants
1	Air Port-East	592	3315
2	AL- Hadba Khdra	1088	6093
3	Ghot Ash - Ahaal	100	560
4	Souq - Atolata (North)	224	1344

5.2.6. Selected Sites Information

By displaying all the information collected during the field work and making a trade-off between the sites, the following sites were selected:

5.2.6.1. AirPort East Housing Project

The site consist of (224 housing units) distributed on (16 multistory buildings), some building consists of (8) floors, including ground floor as a shops and others part of buildings consist of (7) floors. The number of inhabitants =224 x5.6 =1254 Resident. Figures 47 and 48 shows the layout plan for AirPort housing east housing project.

Figure 47: Site Location Plan AirPort Housing Project
(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

Figure 48: Satellite Image: Site Location Plan

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

Some changes in the ground floor was neglecting for the site environment of apartment buildings done by residents users Figure 49.

Figure 49: Some Photos for the Site AirPort Housing Project

Failure to apply technical regulations related to the separation of housing apartment's buildings, especially with private residential surrounding areas Figure 49.

Figure 50 Some Photos for the Site of AirPort

5.2.6 .2. Al - Hadba Khdra Housing Project

The site consists of (1088 housing units) distributed on (49 multistory buildings) each building consists of (9 and 10) floors, including ground floor as shops in some buildings, the number of inhabitants: 1088 × 5.6 = 6098 Resident, Figures 51 and 52 shows the layout plan for Al - Hadba Khdra housing project. Also, Figure 53 shows typical housing units plan Al- Hadba Khdra housing project. Also, Figure 54 shows the incomplete environment "garden, pathways and access streets" for the site project.

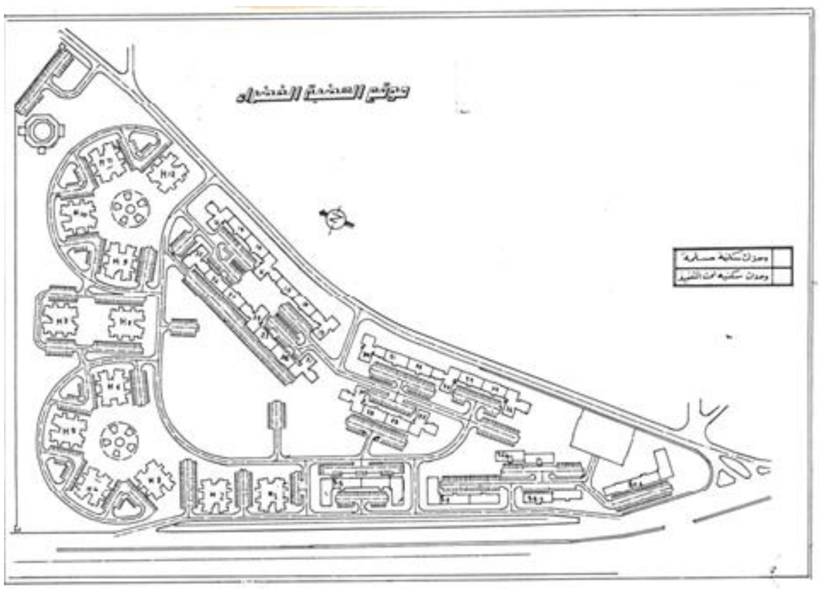


Figure 51: Layout Site Plan Al - Hadba Khdra Housing Project
(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

Figure 52: Satellite Image: Al- Hadba Khdra Housing Project
(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

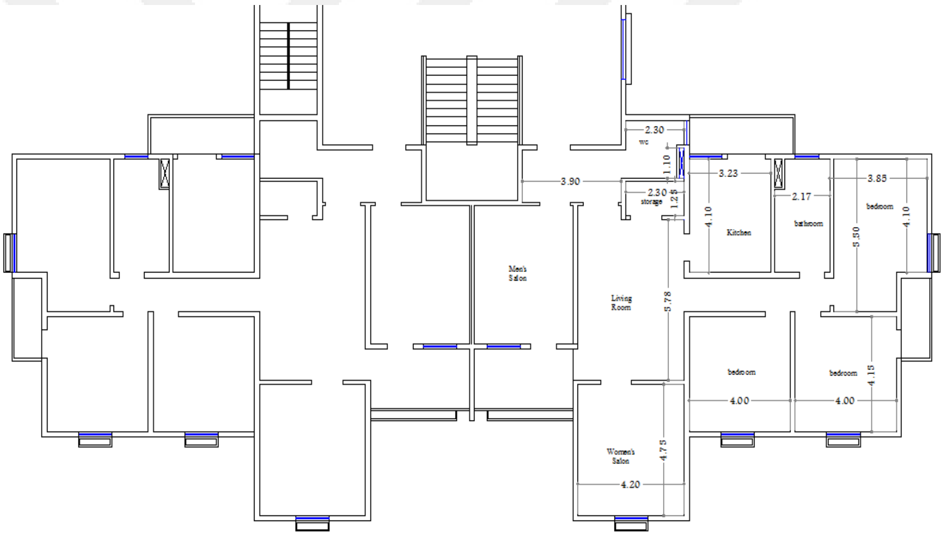


Figure 53: Typical Housing Units Plan Al- Hadba Khdra Housing Project

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

Figure 54: Incomplete Environment (Garden, Pathways & Access Streets)

5.2.6.3. Ghot Ash - Ahaal Housing Project

The project is located in the area of Ghout al-Shaal in the south-western part of the city of Tripoli, near the tobacco factory south of the highway. The Chinese company Ching Yan Construction and Engineering Co., Ltd. on an area of 14077 m2 implemented the project in 2010. The project consists of 14 residential buildings distributed as follows:

- The number of (8) buildings (ground floor + 3 floors frequent) consist of 64 housing units.

- The number of (2) buildings (ground floor shops + 3 floors frequent) consist of 12 housing units.

- The number of (4) buildings (ground floor + ground floor shops + 3 floors frequent) consist of 24 housing units.

Whereas the site consists of (100 housing units) distributed on (14 multistory buildings) each building consisting of '4' floors, including ground floor as a shop of some buildings, the number of inhabitants = 100 x 5.6 = 560 Resident, Figures 55 and 56 showing the layout plan for Ghot Ash - Ahaal Housing Project, and the Figures 57 and 58 showing typical project plans, also the Figure 58 including some photos of the project.

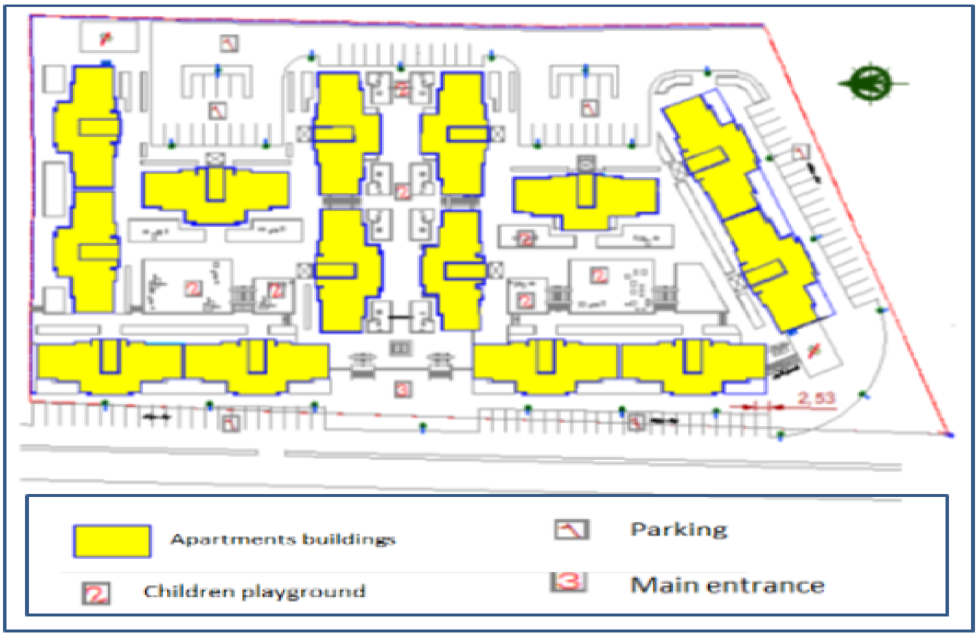


Figure 55: Layout Plan, Ghot Ash - Ahaal Housing Project

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

Figure 56: Satellite Image Ghot Ash - Ahaal Housing Project

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

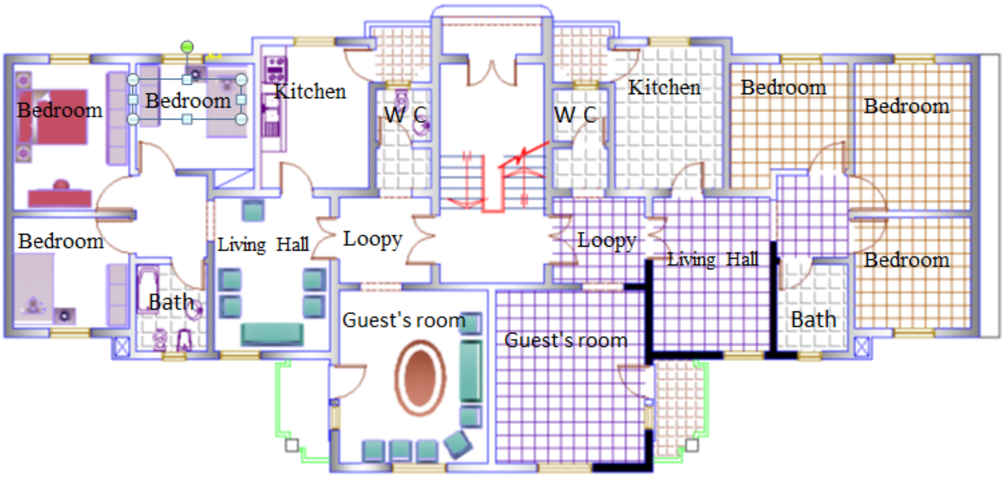


Figure 57: Ground Floor Plan for Buildings No (5, 6, 7,8,9,10,13 and 14

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

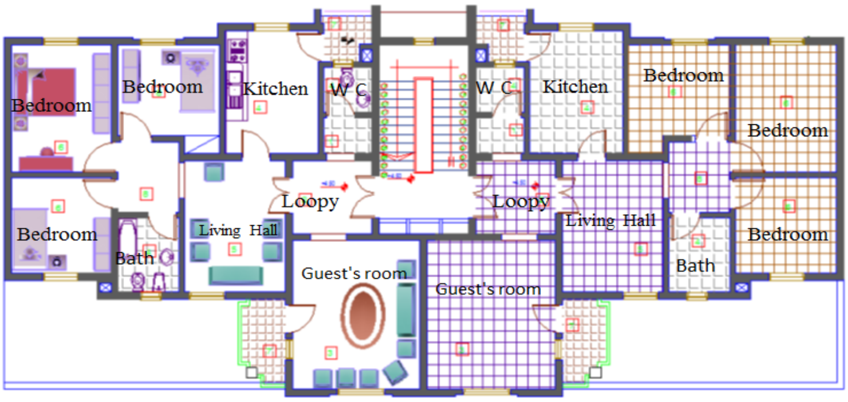


Figure 58: First Floor Plan for all Buildings

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

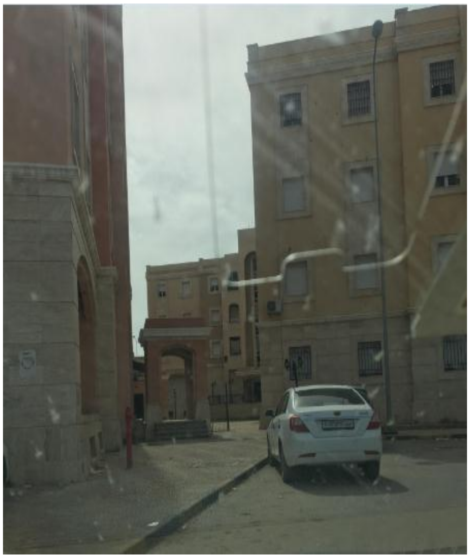





Figure 59: Some Photos of the Project- Ghot Ash - Ahaal Housing Project

5.2.6.4. Souq - Atolata (North)

The site consists of 240 housing units and distributed on 6 multistory buildings, and each building consists of 12 floors and ground floor. The number of inhabitants = 240×5.6 = 1344 Habitant. Figure 60 shows the layout plan for Souq - Atolata (North) Housing Project, and the Figures 61 and 62 shows site satellite image including important landmarks 03/2018, also the Figures 63 and 64 include some photos of the project.

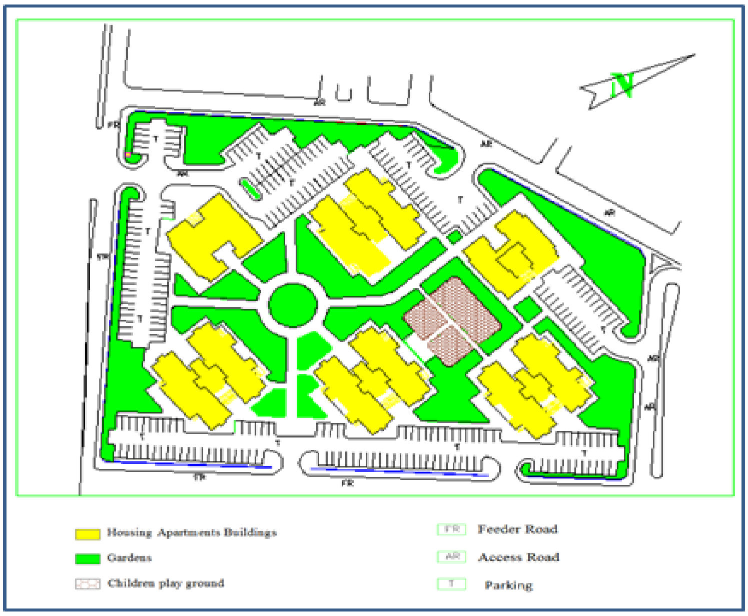


Figure 60 Layout Plan Souq - Atolata (North) Housing Project (Source: ODAC - 2018) and redrawing by Researcher, 2019)

Figure 61: Site Satellite Image Including Important landmarks 03/2018

Figure 62: Site Satellite Image - Souq Atolata (North) 03/2018

Figure 63: Site Environment of Souq - Atolata (North)
(A good environment with park and access streets is very suitable for users, regarding their daily needs and the safety of children and the elderly)

Figure 64: Some Photos of Souq - Atolata (North) Housing Project
(A good environment with park and access streets is very suitable for users, regarding their daily needs and the safety of children and the elderly)

CHAPTER VI
A NALYSIS AND RESULTS

This chapter includes the analysis of the information collected through the field survey, which consists of four mass housing area and utilized by the population in Tripoli as a case study. The analysis of the information gathered by the questionnaires, which consist of two types, the professional's questionnaires, the user questionnaires, and the statistical "SPSS" program was used to analyze and evaluate the information for each of them, "Statistical Package for the Social Sciences", due to SPSS is the best guide, easy to use both for novices and more experienced users (Pallant, 2010). Also, consider as most important statistic programs for this kind of researches, and more analysis details concerning the results of the researches. It also, includes the "SWAT "Strengths, Weaknesses, Opportunities and Threats" that was used to analyze the existing situation through observations recorded in the field survey and analysis results of the user's questionnaire.

6.1. Analysis Results of Questionnaires

In accordance with the research methods selected for this thesis by the thesis supervisors and the advisory members, two questionnaires were designed and approved. It also was approved by the scientific committee of the University on 11th, Jul. 2018. Sample size of the thesis is acceptable according to MacCallum, Widaman, Zhang, and Hong (1999), which shows that samples in the range of "100-200" are acceptable with well-determined factors (i.e., most factors defined by many indicators, i.e., marker variables with loadings 7.80) and commonalities "squared multiple correlations among variables" in the range of 0.5. (Barbara, et al, 2013,) The results, which were analyzed by using “SPSS”, are as follows:

6.1.1. Professionals Questionnaires

The questions of the questionnaire for the professional’s sample including “Architects, planners and execution engineers", are chosen according to experiences, education levels and career statuses in the governmental agencies of the respondents. The questionnaires were distributed to respondents on 10.10.2018, at the headquarters of their works for the following government agencies:

- Housing & Infrastructure Board,
- Urban Planning Agency,
- Engineering Consulting Office for Utilities(ECOU),
- Savings & Real Estate Investment Bank,
- Management of social security fund projects,
- Organization for Development of Administration Centers (ODAC),
- The former General Authority for Housing "project implementation of 2870 housing units in the city of Tripoli", currently belonging to the Housing & Infrastructure Board;

The following Table (12) explains the number of professional's questionnaires that were distributed to the government agencies during the field survey, the number of received questionnaires, and the percent of questionnaires received/distributed.

Table (12) Questionnaires Professionals Distributed and Received

NO	Government Agencies Name	Number of Questionnaires Distributed	Questionnaires Excluded	Number of Questionnaires Received	Percent of Questionnaires received / Distributed
1	Urban Planning Agency	35	2	25	%71
2	Savings & Real Estate Investment Bank	40	4	20	%50
3	Management of Social Security Fund Projects	40	7	17	%43
4	Organization for Development of Administration Centers (ODAC)	5	2	-	%0
5	The former General Authority for Housing (Project Implementation of 2870 Housing Units in the city of Tripoli), Currently Belonging to Housing and Infrastructure Board	14	-	2	%14
6	Housing & Infrastructure Board	61	6	20	%33
7	Engineering Consulting Office for Utilities	25	3	15	%60
8	Google Forms Questionnaires[1].	-	-	54	-
Total		220	24	15	%69.5

6.1.1.1. Scale Validity and Reliability

A principal components factor analysis was conducted on the 38 items. Sampling adequacy for the analysis was verified by The Kaiser-Meyer-Olkin measure, which is KMO=.773. (Kaiser, 1974) 48.211% of the variance was explained by six factors. For the factor analysis to be considered appropriate, Bartlett's Test of sphericity must be conducted and checked for the significance ($p<.05$). The suggested minimum value for a good factor analysis is .6 according to the KMO index ranges from 0 to 1. (Pallant, 2010 as cited from Tabachnick & Fidell 2007) See appendix Tables (B1-B6) to see the factor loadings after rotation.

[1]. **Note** / Procurement of field survey, it is noted that it was difficult for the respondent to attend their work regularly, Due to the critical security conditions in the city of Tripoli, Internet forms questionnaire was prepared for the same questionnaire and distributed to the social media groups after coordination with the respondent individually by telephone.

6.1. 1.2.Reliability of Statistics

Table (13) shows the reliability analysis for the sustainable housing policy scale. The scale had good reliability," Cronbach's α = .843". Results indicate that the scale can be used in the measurement of the indicated variable.

Table (13) Reliability Statistics		
Cronbach's Alpha[1]	Cronbach's Alpha Based on Standardized Items	N of Items
.843	.861	38

6.1.1.3. Statistical Analysis

- One-Sample t-Tests[2]

A one-sample t-test evaluates whether the mean on a test variable is significantly different from a constant, which is called the test value. The test is used here to evaluate whether the mean of ranking items of a factor varies significantly. The test value used is namely the midpoint of a four-point scale (2.5).

6.1.1.4. Objectives of Sustainable Housing

One sample t-test of the level of importance is used in ranking the objectives in sustainable housing in Libya. Benefit from rainwater had the highest mean difference meaning that it was found as the most important objective with 1.072, while the reduction of health service expenses had the lowest mean difference, meaning that it was found as the least important objective with .375 (see appendix B, Table B7).

Mean differences are significant at $p > .001$ for objectives of sustainable housing. Figure 65 represents these mean differences. The results support the conclusion that there are differences in the level of importance in ranking, and benefit from rainwater was the objective with the highest importance in sustainable housing policy in Libya while the reduction of health service expenses had the lowest importance objective.

[1]. Cronbach's alpha is an easy and generally acceptable estimate of reliability ؛One of the most commonly used indicators of internal consistency, the Cronbach alpha coefficient of a scale should be above .7.

[2] The One Sample t Test is a parametric test, is also known as: Single Sample t Test. The variable used in this test is known as: Test variable

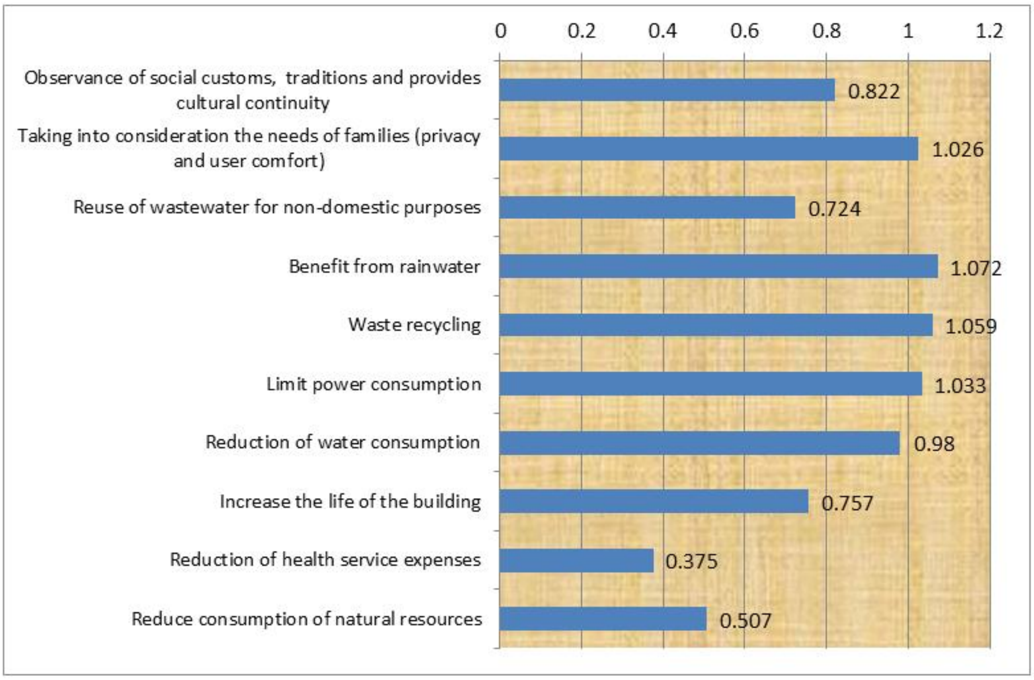


Figure 65: Importance of Objectives in Sustainable Housing

6.1.1.5. Success Factors in Implementing Sustainable Housing

One sample t-test of the level of importance is used in ranking the success factors in implementation of sustainable housing in Libya. Administrative and political stability had the highest mean difference 1.211, meaning that it is the most important success factor. Usefulness to real estate investors had the lowest mean difference .954, meaning that it is the least important success factor. Mean differences are significant at p >.001 for success factors in sustainable housing (See appendix B Table B.9).

Figure 66 represents the mean differences for success factors, and the results support the conclusion that there are differences in the ranking of level of importance, and the most important of the success factors in implementing sustainable housing in Libya is administrative and political stability while the usefulness to real estate investors factor had the lowest success.

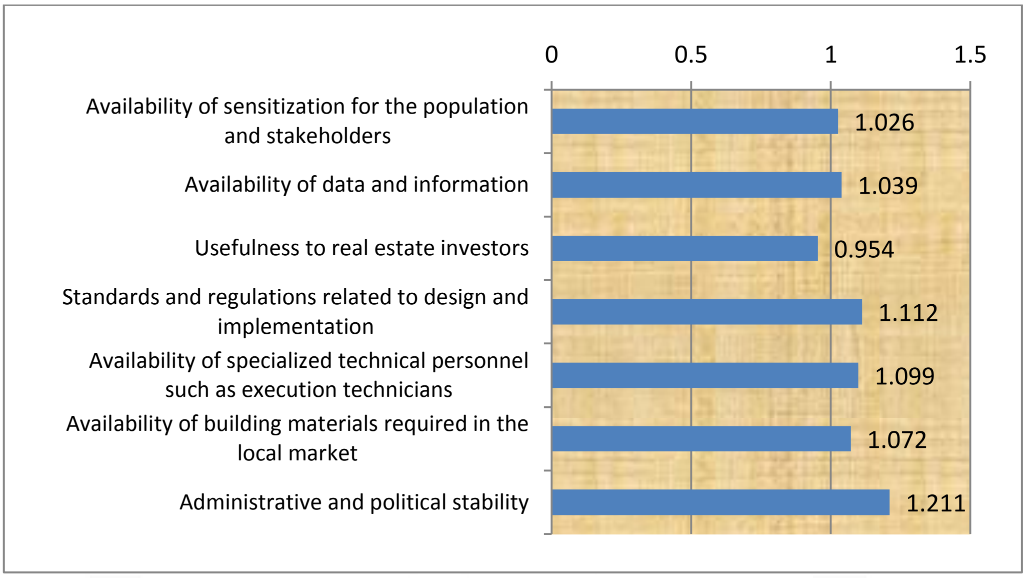


Figure 66: Success Factors in Sustainable Housing Mean differences

6.1.1.6. Expected Results in Implementing Sustainable Housing

According to a one-sample t-test for the ranking of the level of importance of expected results in implementation of sustainable housing in Libya. Contribution to the protection of the environment was found to be the most important having the highest mean difference 1.112, while contribution to the development of solutions to social problems had the lowest mean difference 0.858, which implies it was found as the least important expected result with .858. Mean differences are significant at p >.001 for expected results in implementation of sustainable housing (See appendix B table B.9).

Figure 67 represents these mean differences for expected results. The results support the conclusion that there are differences in the ranking of level of importance. The figure shows that the contribution to the protection of the environment was found to be the most important expected result, and the contribution to the development of solutions to social problems was found to be the least important expected result.

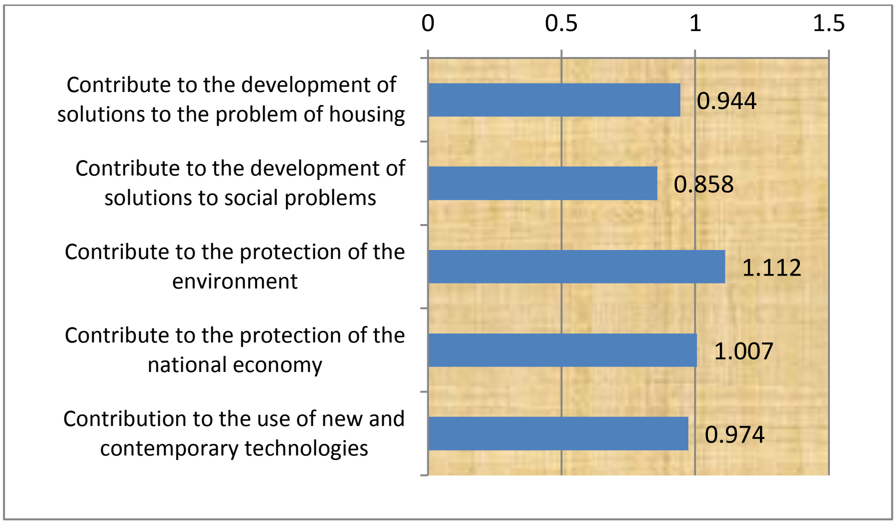


Figure 67: Expected Results in Implementing
Sustainable Housing Mean Differences

Table 14 shows the results of the analysis of expected results in implementation of sustainable housing of professional's questionnaires. Concerning the contribution to the development of solutions to the problem of housing, the results showing that 48.1% of professional respondents agreed, but there were 52.0% of professional respondents who did not agree that there is a relationship between implementation of sustainable housing and contribution to the development of solutions to the problem of housing. The professional respondents expected that implementation of sustainable housing will contribute to the development of solutions to the social problems, as 95.4% of them agreed. While 98.1% of professional respondents agreed that the implementation will contribute to the protection of the environment. The results of the analysis confirmed that the implementation is expected to contribute to the protection of the national economy, as 97.4% of respondents agreed. Also, concerning the use of new and contemporary technologies, 96.8% of respondents said that they expect contribution of implementation of sustainable housing.

Table (14) Percentage Expected Results in Implementing Sustainable Housing

	Contribute to the development of solutions to the problem of housing	Contribute to the development of solutions to social problems	Contribute to the protection of the environment	Contribute the protection of the national economy	the contribution to the use of new and contemporary technologies
Highly dis agree	3.3	00	00	00	00
Disagree	48.7	3.9	2.0	2.6	3.3
Agree	47.4	55.9	34.9	44.1	46.1
Highly agree	0.7	39.5	63.2	53.3	50.7

6.1.1.7. Assessment of Previous Housing Policies

One sample t-test for the level of assessment of the previous housing policies in Libya showed that administrative and financial corruption in the state had the highest mean positive difference with .605 which means it is the most eminent while the distribution of housing projects between cities had the lowest negative mean difference with -.303 which means it is the least eminent in the assessment of previous housing policies. Mean differences are significant at p >.001 for assessment of previous housing policies (See appendix B Table B.10). Figure 68 represents these mean differences. The results support the conclusion that there are differences in the level of ranking, the most effective being the administrative and financial corruption in the state during the assessment of previous housing policies in Libya, while the distribution of housing projects between cities was the least effective with the lowest rank.

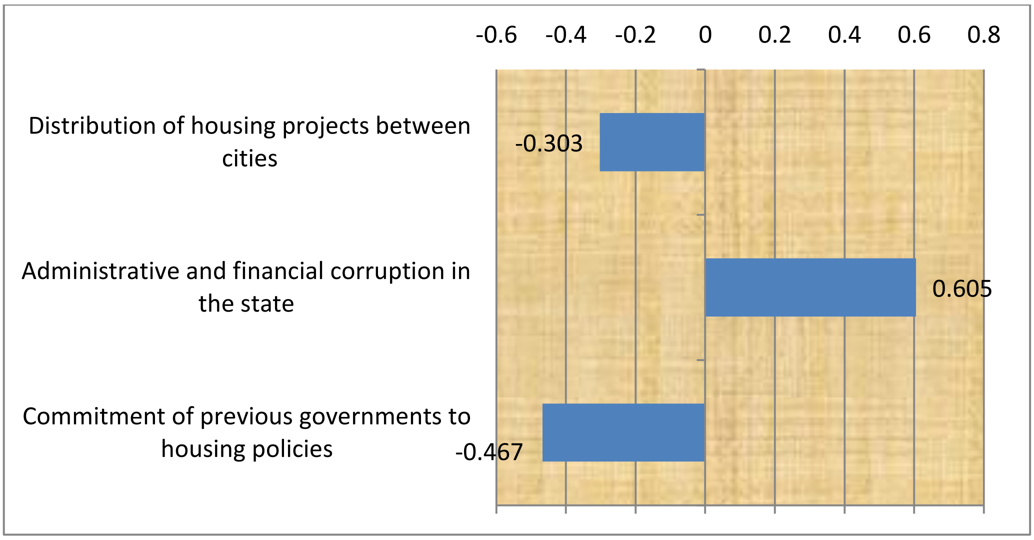


Figure 68: Assessment of Previous Housing Policies

6.1.1.8. Impediments in Implementing Sustainable Housing

One sample t-test for the level of impediments in implementing sustainable housing in Libya showed that studies and adoption of urban plans had the highest mean difference with .763, which implies it is the most eminent impediment while social habits and traditions had the lowest negative mean difference .283, lowest rank among the impediments. Mean differences are significant at p> .001 for impediments in implementation of sustainable housing (See appendix B Table B.11).

Figure 69 represents the mean differences for the impediments. The results support the conclusion that there are differences in the level of rankings of impediments in implementation of sustainable housing in Libya. The next figure illustrates that the studies and adoption of urban plans had the high ranking among impediments in implementation while the social habits and traditions had the lowest ranking.

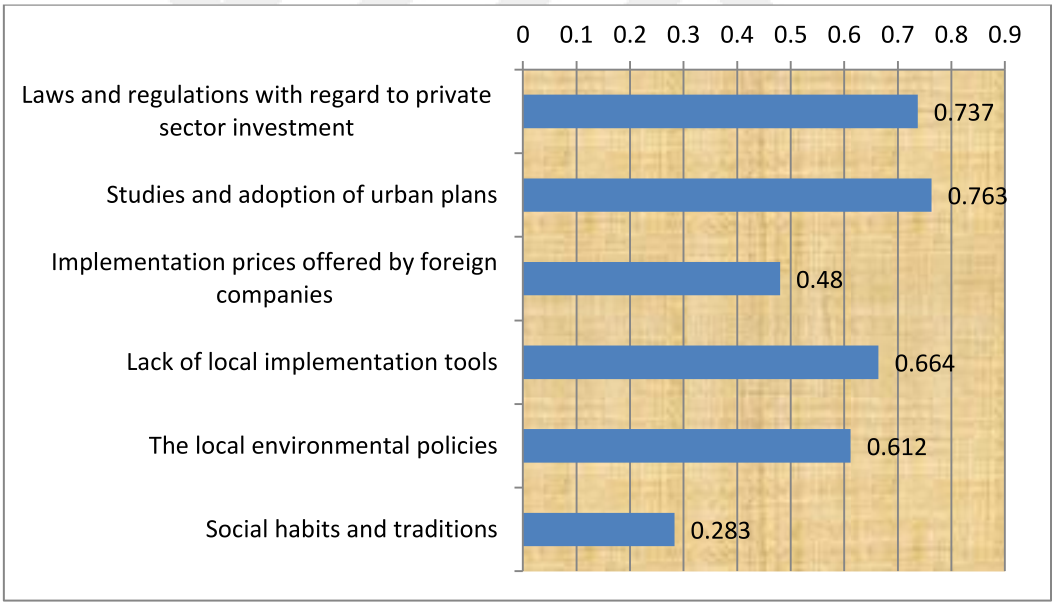


Figure 69: Impediments in Implementing Sustainable Housing

6.1.1.9. Evaluation Factors of Future Sustainable Housing Implementation

One sample t-test for ranking evaluation factors of future sustainable housing implementation in Libya. Institution to develop and support the performance of the Urban Planning Authority[1] and the Housing and Utilities Implementation Authority[2] had the highest mean difference 1.224 while establishment of an institution to develop and follow-up the participation of the private sector in the field of investment in the housing had the lowest negative mean difference .967 in the ranking. Mean differences are significant at p >.001 for evaluation factors of future sustainable housing implementation (See appendix B Table B.12).

Figure 70 represents these mean differences. The results support the conclusion that there are differences in the level of rankings, institution to develop and support the performance of the Urban Planning Authority and the General Authority for Housing was the highest-ranking of evaluation as factors of future sustainable housing implementation in Libya. While the establishment of an institution to develop and follow-up the participation of the private sector in the field of investment in the housing had the lowest ranking.

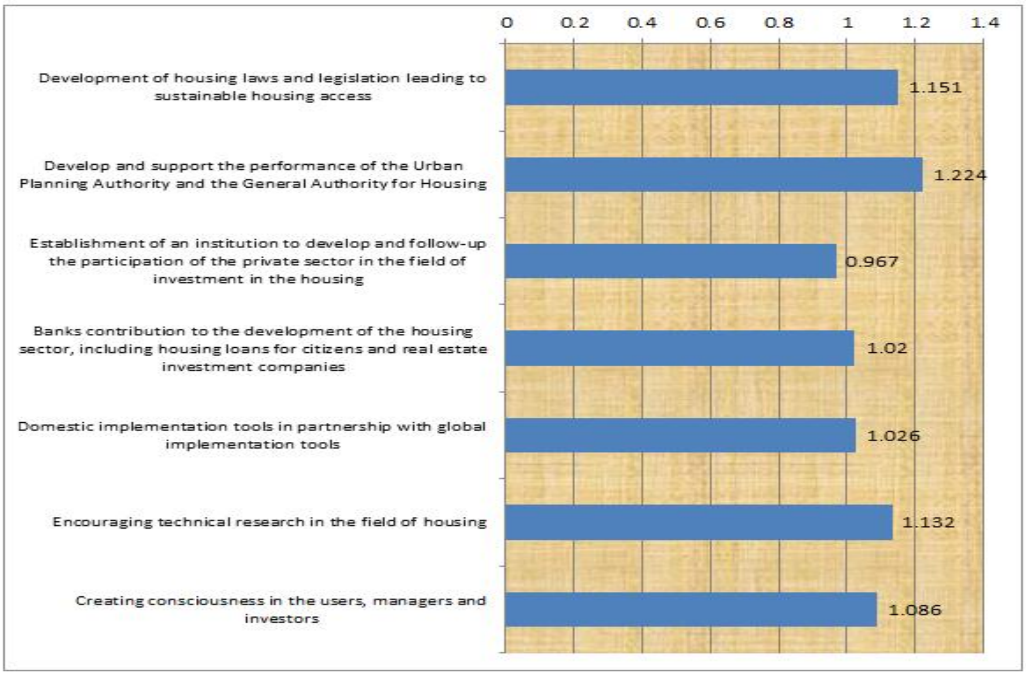


Figure 70: Evaluation Factors of Future Sustainable Housing Implementation

1 . A government Authority specialized in the preparation of urban plans at all levels (national long-term natural plan, regional and sub-regional plans, urban plans) Such as granting some codes and approving architectural projects.

2 . The Housing and Utilities Implementation Authority is a government Authority that supervises and follows up the design and implementation of housing projects in Libya.

6.1.2. Users Questionnaires

The sample of the user's questionnaire was randomly selected and distributed among the four selected sites (as stated in chapter V). A distribution team was formed to distribute the target number 240 questionnaires started on 10.10.2018. Unfortunately, after the distribution of the questionnaires was completed, the team was unable to gather back the questionnaires, due to the outbreak of violence in the southern part of Tripoli. This negatively impacted the total number of questionnaires received back. Table 15 explains the number of questionnaires that were distributed to the housing sites during the field survey, the number of questionnaires received back, and the percentage of questionnaires received/distributed.

Table (15) User Questionnaires Distributed and Received

NO	Housing Site Name	No. of Questionnaires Distributed	Questionnaires Excluded	Percent of Questionnaires are Excluded	Number of Questionnaires Received	Percent of Questionnaires Received / Distributed
1	AL-Hadba Khdra	100	10	%10	58	%58
2	Air Port-East	60	8	%13	18	%30
3	Ghot Ash - Ahaal	40	2	%05	38	%95
4	Souq-Atolata (North)	40	6	%15	18	%40
	Total	240	26	%11	132	%55

6.1.2.1. Satisfaction Scale Validity with the Convenient House in Some Terms and Services

A principal components factor analysis was conducted on 11 items. The Kaiser– Meyer–Olkin[1] measure verified the sampling adequacy for the analysis, KMO = .687. Two factors in combination explained 42.125% of the variance. Item 1.11 (Availability and using common spaces: staircases, elevators) was excluded from the analysis as it had low factor loading .344 (see Table 16).

[1] . Kaiser attributed this MSA to work he was doing at the time with Professors Meyer at Loyola (Chicago) and Olkin at Stanford. It is now commonly referred to as the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-MSA). It is calculated routinely, for example, in the heavily-used SPSS and SAS factor analysis programs (Kaiser, H. F. 1974).

Pattern matrix shows the factor loadings after rotation. After these results, it can be stated that the scale developed for measuring satisfaction in this study is valid.

Analysis of Model fit indicators shows the results and ideal values for the model fit indicators. The incremental close-fit indexes were NFI[1]=.801, TLI=.789, and CFI=.878.The absolute close-fit index was RMSEA[2] =.0890. CFA[3] Model fit of satisfaction scale (after deleting item 1.11).

Table (16) Model Fit Indicators

Test	Result	Ideal value
Normed fit Index (NFI[4])	0.801	.95
Tucker–Lewis Index TLI[5] (Non-Normed Fit Index -NNFI)	0.789	.95
Comparative Fit Index (CFI[6])	0.878	.95
Root Mean Square Error of Approximation (RMSEA)	0.0890	.06 - .08

Reliability of the satisfaction scale and reliability analysis for the satisfaction scale can be seen in Table 17. The scale had good reliability, Cronbach's[7] α = .720. Subscales service availability satisfaction and social satisfaction had Cronbach's α = .739 and .587 respectively. Although social satisfaction sub-scale has shown reliability value below .7, it was found that Inter-Item Correlations = .230. Such low Cronbach values (e.g. 5) are found commonly

[1] . This statistic assesses the model by comparing the χ2 value of the model to the χ2 of the null model. Values for this statistic range between 0 and 1 with Bentler and Bonnet (1980) recommending values greater than 0.90 indicating a good fit Daire Hooper,(Joseph Coughlan & Others, 2008).

[2]. The RMSEA tells us how well the model, with unknown but optimally chosen parameter estimates would fit the population's covariance matrix (Byrne, 1998).

[3] . This statistic assesses the model by comparing the χ2 value of the model to the χ2 of the null model. Values for this statistic range between 0 and 1 with Bentler and Bonnet (1980) recommending values greater than 0.90 indicating a good fit Daire Hooper,(Joseph Coughlan & Others, 2008).

[4] . This statistic assesses the model by comparing the χ2 value of the model to the χ2 of the null model. Values for this statistic range between 0 and 1 with Bentler and Bonnet (1980) recommending values greater than 0.90 indicating a good fit Daire Hooper,(Joseph Coughlan & Others, 2008).

[5] . The Tucker-Lewis Index (TLI) is an incremental fit index .Non-Normed Fit Index (NNFI) which is also known as TLI was developed against the disadvantage of Normed Fit Index regarding being affected by sample size(Chen, 2007as cited in Sengul Cangur & Ilker Ercan, 2015).

[6] . The Comparative Fit Index (CFI) is an incremental fit index. CFI is a corrected version of relative non-centrality index, The CFI produces values between 0 to1 and high values are the indicators of good fit, (Chen, 2007as cited in Sengul Cangur & Ilker Ercan, 2015).

[7]. Cronbach's alpha is an easy and generally acceptable estimate of reliability. One of the most commonly used indicators of internal consistency, the Cronbach alpha coefficient of a scale should be above .7.

with short scales like scales with less than then items. To check the mean inter-item correlation for the items, Briggs and Cheek showed that .2-.4 is the optimal range for inter-item correlation. (Briggs, Cheek, 1986) The results indicate that the scale and its sub-scales can be used in the measurement of the indicated variable. Figure 71 illustrates the user's survey on the frequency and percentage rates of opinions in terms of strengthening social relationships. It shows that 75% of the respondents were among not satisfied and highly dissatisfied, while the remaining percentage represented the satisfied and highly satisfied.

Table (17) Reliability of Satisfaction Scale

	Reliability Statistics		
Scale and subscales	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Satisfaction scale	.720	.716	10
Service availability satisfaction	.739	.738	5
Social satisfaction	.587	.599	5

Figure 70 illustrates the users' survey on the frequency and percentage rates of opinions of users' houses in terms of strengthening social relationships. It shows that 99 respondents (75%) were not satisfied and highly dissatisfied, while the remaining respondents were satisfied and highly satisfied.

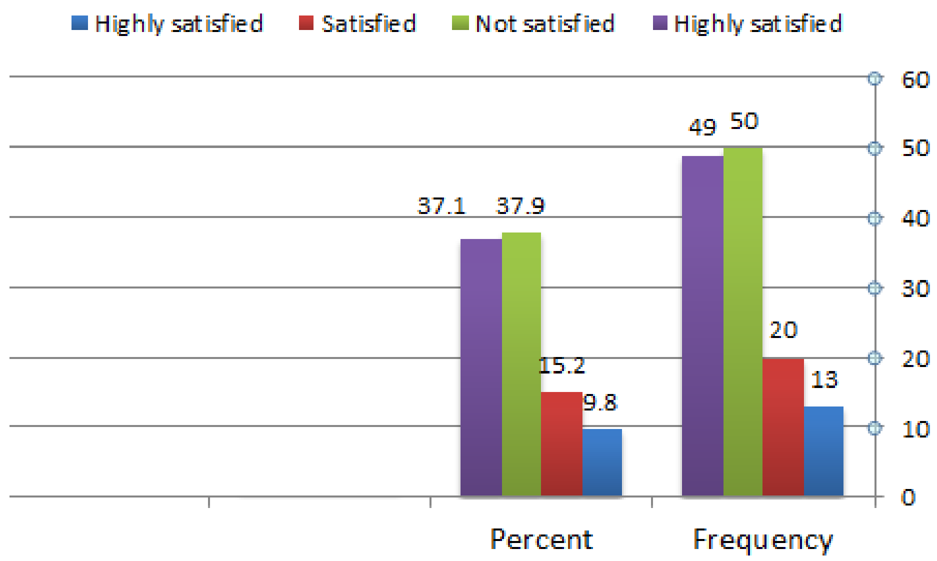


Figure 71: Frequency and Percentage of Opinions Houses Users for Strengthening Social Relationships

6.1.2.2. Suitability Scale Validity with Convenient the House in Some Events

A principal components factor analysis was conducted on 15 items. The Kaiser– Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = .751. Two factors in combination explained 49.114% of the variance. Item 2.5 (Internal temperature for house rooms during the summer) was excluded from analysis due to cross-loading. After these results, it can be stated that the scale developed for measuring suitability in this study is valid. Table 18 for model fit indicators shows the results and ideal values. The incremental close-fit indexes were NFI= .810, TLI= .849, and CFI=.913. The absolute close-fit index was RMSEA =.0655. CFA Model fit of suitability scale (after deleting item 2.5).

Table (18) Model Fit Indicators

Test	Result	Ideal value
NFI	0.810	.95
TLI (NNFI)	0.849	.95
CFI	0.913	.95
RMSEA	0.0655	.06-.08

6.1.2.3. Suitability Scale Reliability for Environmental Suitability and Payment Suitability

Table 19 shows the suitability scale reliability analysis for the suitability scale. The scale had good reliability with Cronbach's α= .754. Sub-scales social suitability, environmental suitability and payment suitability had Cronbach's α= .615, .749 and .705 respectively. Although the social suitability sub-scale has shown reliability value below .7, it was found that Inter-Item Correlations = .248. In such cases with short scales like scales with fever than ten items, quite low Cronbach values (e.g. .5) is founded commonly. To check the mean inter-item correlation for the items, Briggs and Cheek showed that .2-.4 is the optimal range for inter-item correlation. (Briggs, Cheek, 1986) The results indicate that the scale and its sub-scales can be used in the measurement of the indicated variable.

Table (19) Suitability Scale Reliability

	Reliability Statistics		
	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Suitability	.754	.757	14
Social Suitability	.615	.623	5
Environmental Suitability	.749	.750	6
Payment Suitability	.705	.707	3

6.1.2.4. Scales Descriptive Statistics for Public Service Availability Satisfaction

Table 20 shows descriptive statistics of service availability satisfaction sub-scale (M=2.36 and SD = .68606). Item (1.8 Availability of commercial services) has recorded the highest mean value 2.77 while item (1.10 availability of parks and children`s playgrounds) has recorded the lowest mean value 1.73. Figure 72 demonstrates the site plan according to results of user's survey on the availability of services.

Table (20) Descriptive Statistics[1] of Service Availability Satisfaction

	N	Mean	Std. Deviation
Service Availability Satisfaction	132	2.36	.68606
1.6Availability of public services	132	2.54	.976
1.7 Availability of public utilities	132	2.45	.999
1.8 Availability of commercial services	132	2.77	.921
1.9 Availability of public transportation	132	2.30	1.132
1.10 Availability of parks and children`s playgrounds	132	1.73	.855
Valid N (listwise)	132		

[1]. Provide the Mean scores, STD deviations and N for each subgroup. Check that these values are correct. Inspecting the pattern of these values will also give you an indication of the impact of your independent variables (Pallant, 2013).

Figure 72: Lack of Parks and Children's Playgrounds

Figure 73 presents the user's survey on the availability of services for the users. Most of the respondents were among not satisfied (40.2%) and highly dissatisfied (13.6%). With regard to availability of using common spaces (staircases, elevators, etc.), 39.4% of the respondents were satisfied, but 24.2% were highly dissatisfied. The availability of public transportation ranked third with 31.8% of the respondents was highly dissatisfied and 27.3% were satisfied. The availability of public utilities ranked fourth with 35.6% of the respondents being dissatisfied and 18.9% being highly dissatisfied. Availability of commercial services ranked last, which shows that 7.6% of the respondents were highly dissatisfied and 33.3% were dissatisfied.

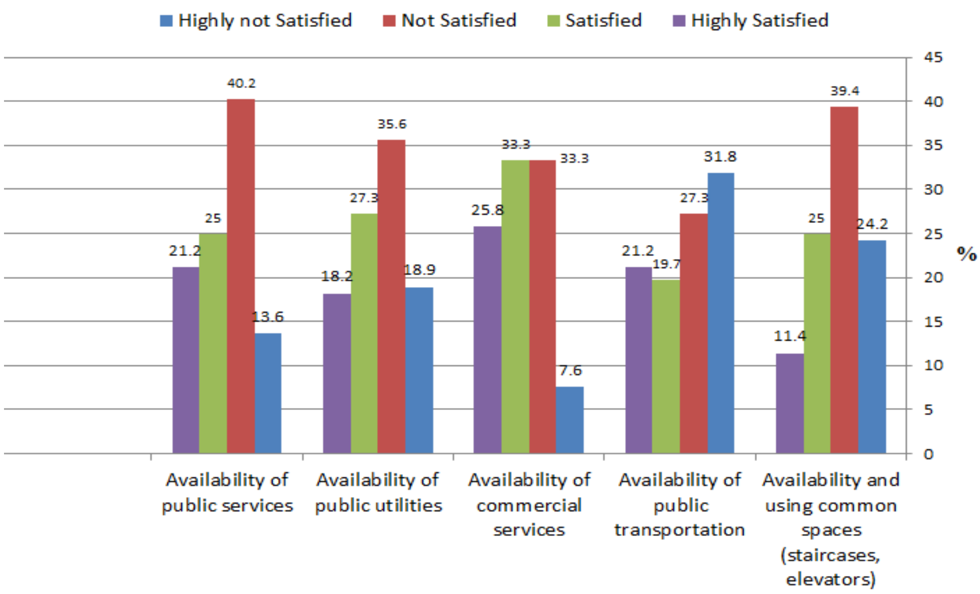


Figure 73: Availability of Services for Users

Figure 74 illustrates the frequency user's survey on the availability of services, and shows that the most of respondents were among highly not satisfied and not satisfied. 32 of respondents were highly not satisfied and 52 of respondents were not satisfied with availability of using common spaces (staircases, elevators). About the availability of public transportation, 42 were highly not satisfied and 36 were not satisfied, about the availability of public utilities, 25 were highly not satisfied and 47 were not satisfied. 10 were highly not satisfied and 44 were not satisfied about the availability of commercial services. Lastly, about the availability of public services 18 were highly not satisfied and 53 were not satisfied.

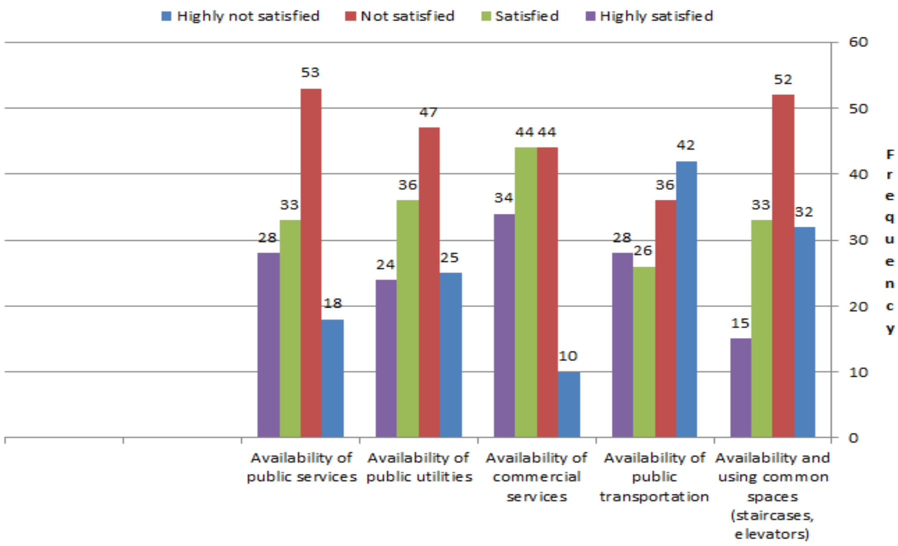


Figure 74: Frequency of Availability Services

6.1.2.5. Descriptive statistics of social satisfaction and suitability

Table 21 shows descriptive statistics of social satisfaction sub-scale with M=3.08 and SD = .52128. Item (1.4 family sizes) has recorded the highest mean value 3.32 while item (1.5 your economic situation) has recorded the lowest mean value 2.84.

Table (21) Descriptive Statistics of Social Satisfaction and Suitability

	N	Mean	Std. Deviation
Social Suitability	132	2.60	.49113
2.1. Please state suitability of your house with the followings: favorite house	132	2.54	.795
2.2.During religious and social events:	132	2.39	.717
2.3. Suitability of neighborhood relations:	132	2.91	.786
2.7.Privacy within the house:	132	2.90	.760
2.8. External noise within the house:	132	2.28	.850
Valid N (listwise)	132		

Figure 75 and figure 76 shows the frequencies and rates of the suitability of user's houses. It is shown that 72 of the respondents (ca. 54.5%) found that their houses were unsuitable during religious and social events and 9 respondents (ca. 6.8%) deemed their houses as being highly unsuitable. The factor ranking second was external noise within the houses, which had 63 respondents (47.7%) indicating unsuitability and 22 (ca. 16.7%) indicating high unsuitability. 56 respondents (42.4%) found their residences unsuitable and 10 respondents (7.6%) found them highly unsuitable. The privacy within the houses factor counted 67 respondents (50.8%) deeming their homes suitable, but 33 (ca. 25%) found this factor unsuitable. The factor of suitability of neighborhood relations had 65 people (40.2%) respond as it being suitable, while 32 (24.2%) responded to it as being unsuitable.

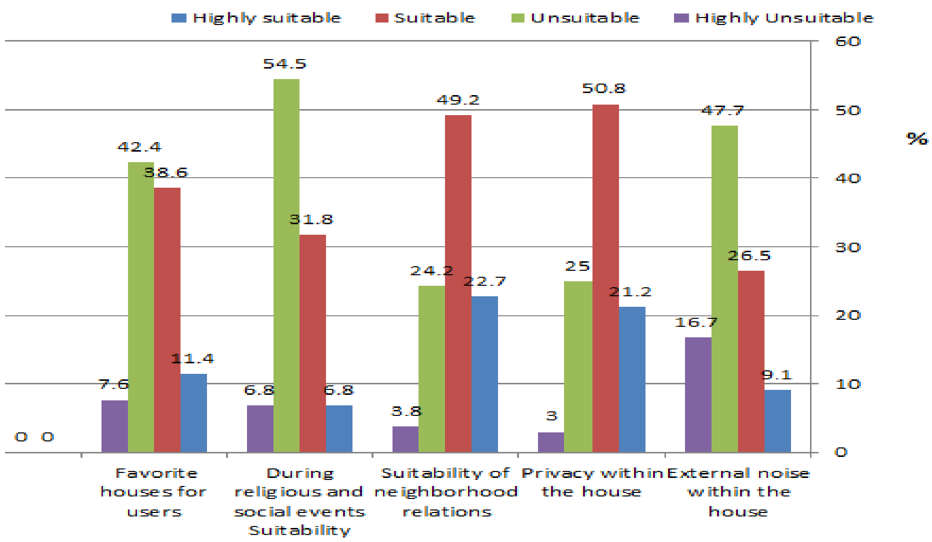


Figure 75: Houses Suitability

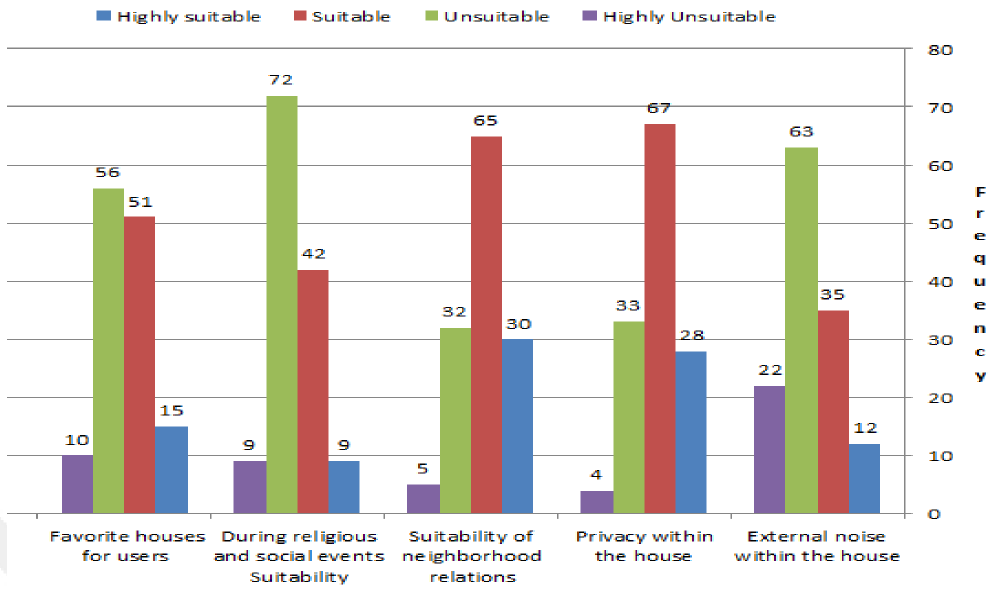


Figure 76: Frequency of Houses Suitability

6.1.2.6. Descriptive Statistics of Environmental Suitability

Table 22 shows descriptive statistics of environmental suitability sub-scale with M=2.91 and SD = .49658. Item (2.10 the ventilation and daylighting in your house) has recorded the highest mean value 3.16 while item (2.6 Internal temperature for house rooms during the winter (thermal comfort)) has recorded the lowest mean value 2.68.

Table (22) Descriptive Statistics of Environmental Suitability

	N	Mean	Std. Deviation
Environmental Suitability	132	2.91	.49658
2.4.Suitability to climate conditions:	132	2.73	.818
2.6. Internal temperature for house rooms during the winter (thermal comfort):	132	2.68	.713
2.9.Sunlight inside your house:	132	3.07	.701
2.10. The ventilation and daylighting in your house:	132	3.16	.729
2.11.The effect of means for cooling:	132	3.00	.762
2.12.The effect of means for heating:	132	2.83	.743
Valid N (listwise)	132		

From the Figures 77 and 78, it can be observed that most of the respondents (ca. 47% to 53.8%) deemed their houses unsuitable and 16.7% to 33.3% deemed their houses highly unsuitable. The effect of means for heating factor had 71 respondents (53.8%) deeming their houses unsuitable and 22 respondents (ca. 16.7%) indicating their homes as being highly unsuitable. In total, more than 70% of users were dissatisfied with their houses. The factor of sunlight inside user's houses had 70 respondents (ca. 53%) indicating unsuitability and 36 (27.3%) deeming their situation highly unsuitable. Suitability to climate conditions had 84 respondents (ca. 63.7%) deeming their situations unsuitable and highly unsuitable.

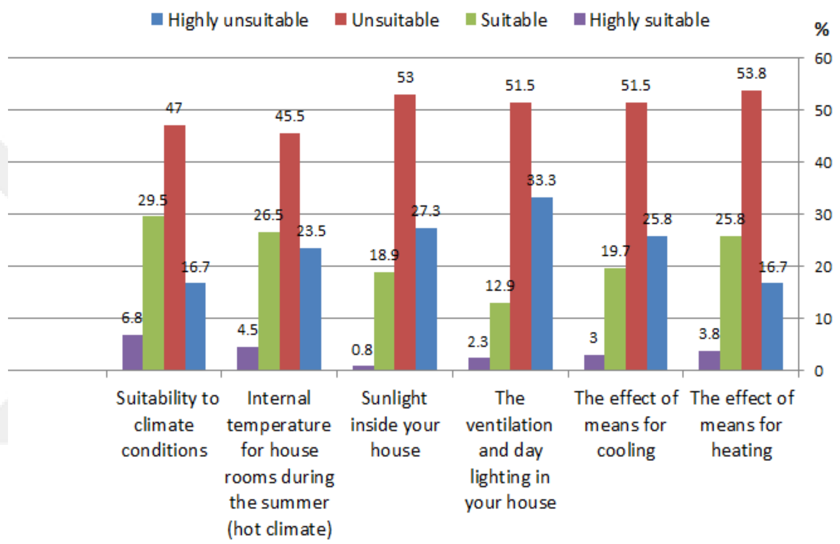


Figure 77: Environmental Suitability Houses

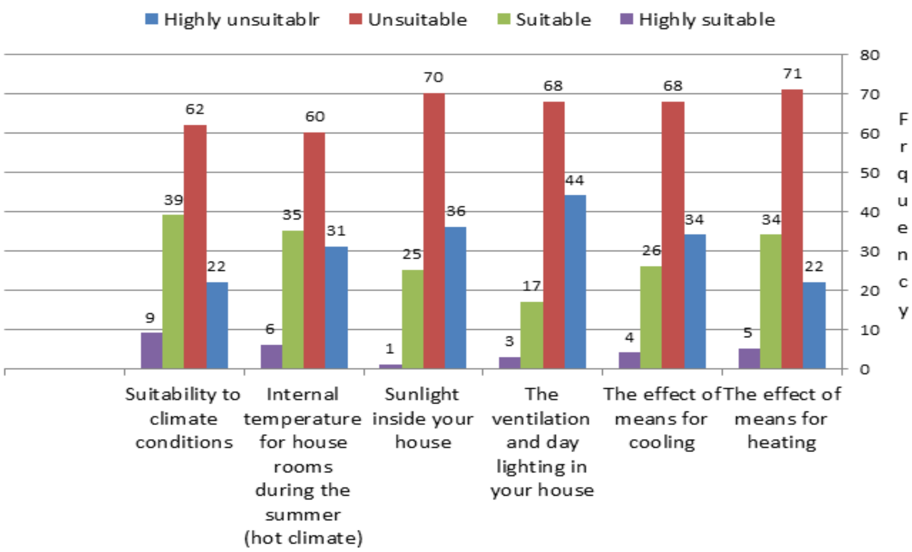


Figure 78: Environmental Suitability Houses

6.1.2.7. Descriptive Statistics of Payment Suitability

Table 23 shows descriptive statistics of payment suitability sub-scale M=2.30 and SD = .65336. Item (2.14The payment of water services bills) has recorded the highest mean value 2.77. While item (The payment of communication services bills) has recorded the lowest mean value 1.73.

Table (23) Descriptive Statistics of Payment Suitability

	N	Mean	Std. Deviation
Payment Suitability	132	2.30	.65336
2.13The payment of electricity services bills:	132	2.30	.769
2.14The payment of water services bills:	132	2.52	.786
2.15 The payment of communication services bills:	132	2.07	.910
Valid N (listwise)	132		

Figure 79 presents the results of the payment of bills suitability for user's houses and shows the suitability of electricity bill services as being the highest ranking with 48.5% of respondents deeming payment of electricity services unsuitable and 13.6% deeming it highly unsuitable, while 32.6% of respondents deemed payment of electricity bills suitable and 5.3% highly suitable. The payment of water and communication services bills had the same ranking of suitability such that 43.2% of respondents found the factors suitable and 38.6% found them unsuitable, while 9.1% found them highly unsuitable as well as 9.1% highly suitable.

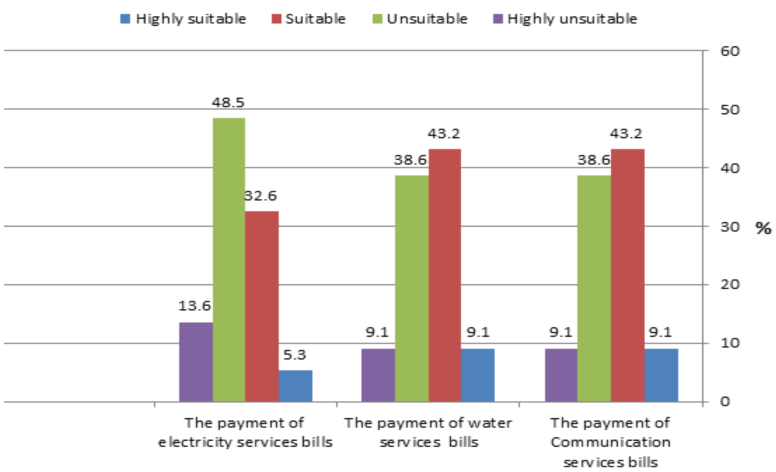


Figure 79: Suitability of Bills Payment

Figure 80 demonstrates the frequency results of the user's survey for the houses concerning the suitability of bills paid (electricity, water, and Communication). The figure shows the payment of electricity services bills as highest-ranking where unsuitable had 65 of respondent frequency, the lowest ranking frequency was the payment of water services bills, and the payment of communication services bills.

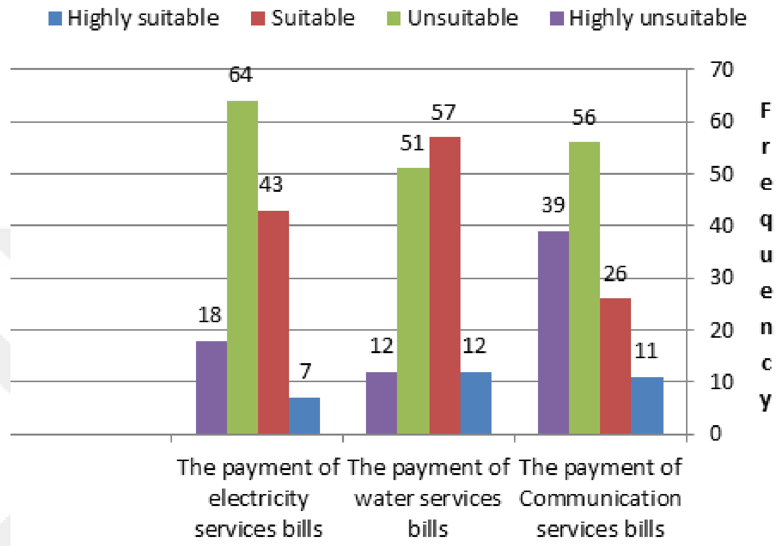


Figure 80: Suitability of Bills Payment Frequency

6.1.2.8 .Testing Approval of the Users to Participate in Designing Their Future Houses

One sample t-test shows the subjects' approval of the users about designing their future houses. Mean differences are significant at p> .001. Item 4.6 (Participate in the design process of their new houses) expressed the highest positive mean difference concerning the participation in future house design. The housing that meets the requirements of the Libyan family "economical cost and maintenance, environmentally friendly, provides privacy and conforms to social customs and traditions" in the sense of sustainable housing. The flat in an apartment building has a negative mean difference of -.447 (See the appendix B Table B.15).

6.1.2.9. Modifications of the Design to Suit Users' Needs

One sample t-test is used to test subjects' agreement with modifications of the design to suit their needs. The test value of 2.5 is used as it is the mid-value of a 4-

point scale. And shows a one-sample t-test of the subjects' agreement with modifications of the design to suit their needs. The mean difference is .742 and significant at p >.001 (See appendix B Table B.16).

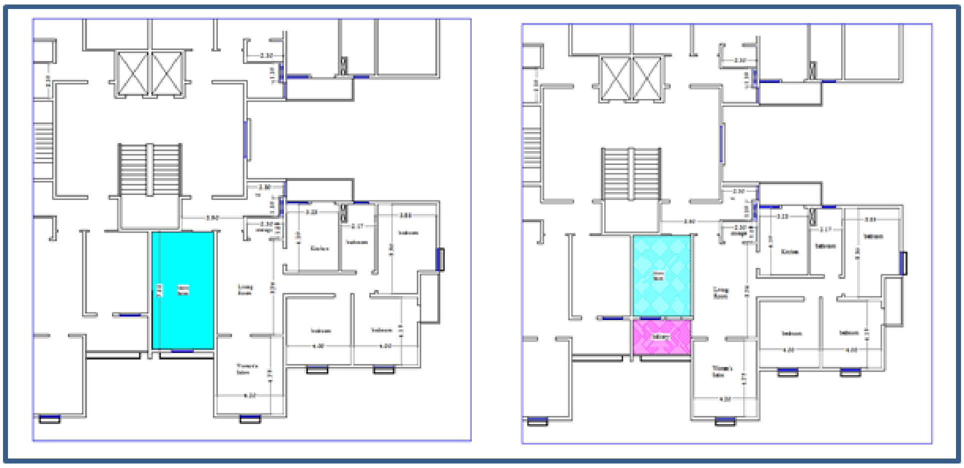
6.1.2.10. Modifications of the Current House

Table 24 shows frequencies of modifications made to the current house. 56.8% of subjects have made an additional area for some spaces to their current house.

Table (24) Modifications of the Current House

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other changes (Add area for some spaces)	75	56.8	56.8	56.8
	Removal changes	16	12.1	12.1	68.9
	Close windows	13	9.8	9.8	78.8
	Close balconies	28	21.2	21.2	100.0
	Total	132	100.0	100.0	

The next Figure 81 shows the modifications done by the users of their current house, in this example the user add the balcony area to the men's salon.



Modifications Plan Original Design Plan

Figure 81: The Modifications Done by the Users

6.1.2.11. The less Pleasing Part of the House

Table 25 shows frequencies of the less pleasing part of the house. 37.9% of subjects say that sleeping places are the less pleasing side of their house.

Table (25) Less Pleasing Part of the House

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other Spaces (kitchen, baths, balconies)	5	3.8	3.8	3.8
	Living spaces	36	27.3	27.3	31.1
	Sleeping spaces	50	37.9	37.9	68.9
	Guest spaces	41	31.1	31.1	100.0
	Total	132	100.0	100.0	

6.1.2.12. The Most Pleasing Part of the House

Table (26) shows the frequencies of the most pleasing part of the house. 44.7% of subjects say that living spaces are the most pleasing part of their house.

Table (26) Most Pleasing Part of the House

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Living spaces	59	44.7	44.7	44.7
	Sleeping spaces	50	37.9	37.9	82.6
	Guest spaces	23	17.4	17.4	100.0
	Total	132	100.0	100.0	

- **Testing the relationships between suitability and satisfaction sub-dimensions using (Pearson correlations[1])**

The correlations between suitability and satisfaction sub-dimensions. Environmental suitability has shown positive correlations with all other sub-variables, values ranged between .195 and .482, $p < .05$. (See the appendix B Table B.17).

[1]. A Pearson correlation is a number between -1 and 1 that indicates the extent to which two variables are linearly related.

- **Groups variance analysis (ANOVAS)**

One-way analysis of variance (ANOVAS[1]) was used to test differences in suitability and satisfaction according to habits in using the house. Significant results are shown below for each habit.

6.1.2.13. Using the Existing Balconies in the House by the Users during the Evening

Descriptive statistics of using the existing balconies during the evening. Mean and standard deviation are presented for each sub-variable according to the habit of use (See appendix Table B.18). Also, Table B.19 showing a one-way between-groups analysis of variance was conducted to explore the impact of using the existing balconies during the evening on levels of suitability and satisfaction. According to their frequency of use, participants were divided into four different groups (rarely, sometimes, often and always). In social satisfaction scores of the four groups, there was a statistical significance in levels at the $p<.05$ with $F(3, 131) = 3.826$ and $p=.012$. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .08 using eta squared.

Eta Square[2] = Square between Groups/ Sum of Squares total

= 2.929 /35.396 = 0.08

There was a statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F(3, 131) = 2.878$, $p = .039$. Despite reaching statistical significance, the actual difference in mean scores between the groups was a medium effect. The effect size, calculated using eta squared, was .06. And there was a statistically significant difference at the $p < .05$ level in environmental suitability scores for the four groups: $F(3, 131) = .923$, $p =.432$. Despite reaching statistical significance, the actual difference in mean scores

---

1. The ANOVA test is called one-factor ANOVAs. There is one treatment or grouping factor with k>2 levels (k: number of groups) and we wish to compare the means across the different categories of this factor. One-way ANOVA will tell you whether there are significant differences in the mean scores on the dependent variable across the three groups(Pallant, 2013).

2. Eta squared can range from 0 to 1 and represents the proportion of variance in the dependent variable that is explained by the independent (group) variable. The resulting eta squared value is .02, which in Cohen's (1988, pp. 284 –7) terms would be considered a small effect size. Cohen classifies .01 as a small effect, .06 as a medium effect and .14 as a large effect (Pallant, 2013).

between the groups was a medium effect. The effect size, calculated using eta squared, was .017.

Post-hoc comparisons using the Tukey HSD test, Table B.20, indicated that the mean score of social satisfaction for rarely group which were M = 3.27 and SD = .52080 was significantly different from the sometimes group with M = 2.91 and SD = .53492. Also, mean score of social suitability for sometimes group with M = 2.82 and SD = .43358 was significantly different from the always group with M = 3.21 and SD = .70368.

6.1.2.14. Using the Balconies of Users Houses during the Night

Descriptive statistics of using the existing balconies during the night. Mean and standard deviation are presented for each sub-variable according to the habit of use. Post-hoc comparisons using the Tukey HSD[1] test (See appendix B, Table B.21). Also, Table B.21 showing a one-way between-groups analysis of variance was conducted to explore the impact of using the existing balconies during the night on levels of suitability and satisfaction. According to their frequency of use, participants were divided into four different groups (rarely, sometimes, often and always). Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .078 using eta squared.

Eta Square = Square between Groups/ Sum of Total Squares

= 2.804/35.596 = 0.078.

There was a statistically significant difference at the $p < .05$ in levels of social suitability scores among four groups with $F (3, 131) = 4.705$, $p= .004$. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .014 using eta squared

Eta Square = Square between Groups / Sum of Total Squares

= 4.705/32.930 = 0.14.

[1] . Tukey's HSD was designed for a situation with equal sample sizes per group, but can be adapted to unequal sample sizes as well (the simplest adaptation uses the harmonic mean of n-sizes as n*). The asterisks exceed the HSD critical difference and are significant at p < .05. Note that two differences significant with LSD are now not significant (Pallant, 2013).

Also, even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .0099 using eta squared[1]

Eta Square = Square between Groups/ Sum of Squares Total

= 0.555/55.922 = 0.0099.

Post-hoc comparisons using the Tukey HSD test, (see appendix B, Table B.22), shows that the mean score of social suitability for rarely group with M = 3.0650 and SD = 0.44865 was different than the often group with M= 2.6250 and SD= 0.65269.

Figure 82 shows the results for the use of balconies at different times. Balconies always being used in the morning scored highest at 43.8% of respondents followed by balconies often being used in the morning at 28.8%. The figure illustrates that most users would rarely use their balconies during the night (60.6%) and 25% would sometimes. Use them at night. The use of balconies during the evening ranked third with users sometimes using their balconies (39.4%) and rarely using them, at 25.8%. Ranking last was the use of balconies during the afternoon during which time 37.1% of respondents sometimes and 34.8% rarely used their balconies.

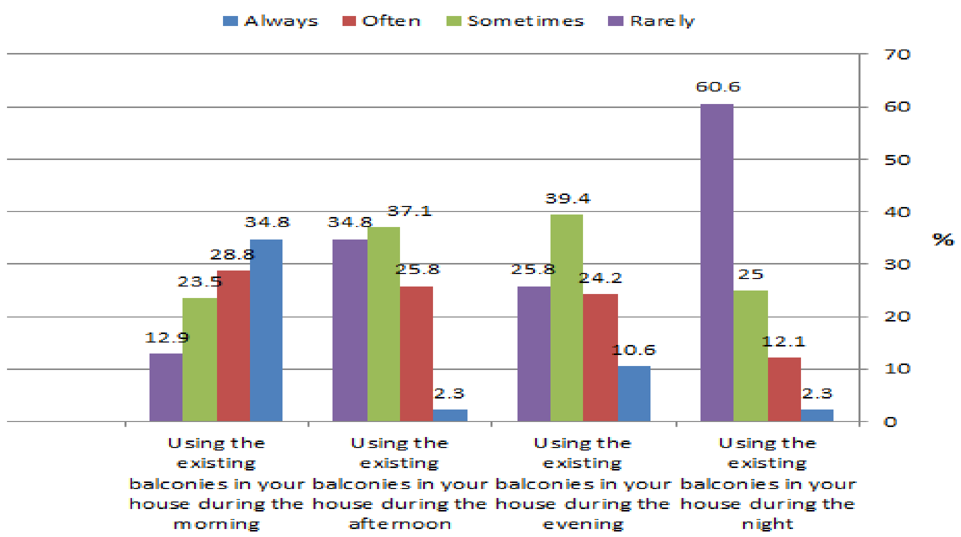


Figure 82: Using Balconies during Different Times of the Day

[1] . There was a statistically significant difference at the $p < .05$ level in environmental suitability scores for the four groups: $F (3, 131) = .555$, $p = .645$.

Figure 83 shows the frequency results of using the users' survey for the balconies in their houses during the night was always the highest frequency had 80 of total respondents, and sometimes had 33 of total respondents. The figure shows the second-ranking using the balconies during the evening whereas sometimes had 52 of total respondents. Using the balconies during the afternoon was sometimes 49 of total respondents, and rarely had 46 of total respondent. While using the balconies during the morning was the highest-ranking always 46 of total respondents and often had 38 of respondent.

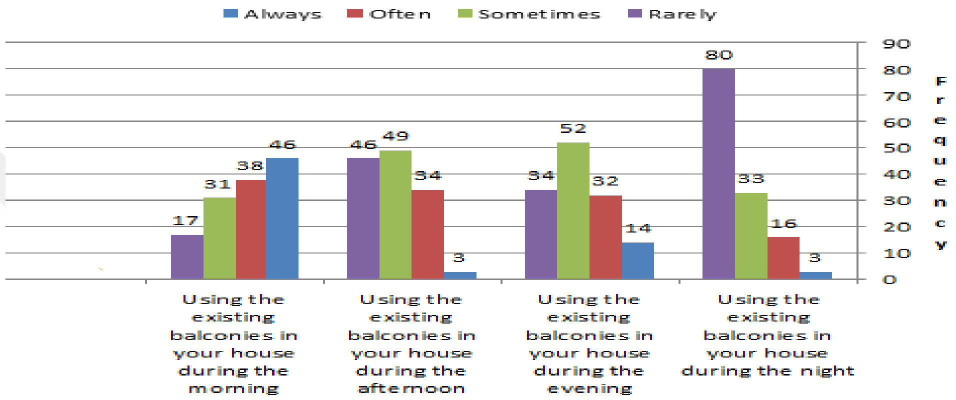


Figure 83: Frequency Using Balconies during Different Times of the Day

6.1.2.15. For What Purpose are the Users of the House Using the Balconies?

1. Use the balconies for rest and recreation

Descriptive statistics of using the balcony for rest and recreation. Mean and standard deviation are presented for each sub-variable according to the habit of use (See appendix B, Table B.23). And Table B.24 shows the one-way analysis of variance between groups which was conducted to explore the impact of the usage of existing balconies on levels of sustainability and satisfaction. According to their frequency of usage, participants were divided into four different groups (rarely, sometimes, often and always). At p<5 there was a statistical significance in levels of social satisfaction scores among groups. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .092 using eta squared.

$$= 3.279 / 35.596 = 0.078.$$

There was a statistically significant difference at the $p < .05$ in levels of social suitability scores among four groups with $F(3, 131) = 4.411$, $p = .005$. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .093 using eta squared. Also, there was a statistically significant difference at the $p < .05$ in levels of social suitability scores among four groups with $F(3, 131) = .816$, $p= .487$. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .0187 using eta squared. Moreover, there was a statistically significant difference at the $p < .05$ in levels of social suitability scores among four groups with $F(3, 131) = .265$, $p= .850$. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .0062 using eta squared. Post-hoc20 comparisons using the Tukey HSD test. Which indicated that the mean score of social satisfaction for rarely group with M = 3.2093 and SD = .46793. Was different significantly from the sometimes groups with M=3.1950 and SD=.43557 and often group with M=2.8914 and SD=.61805. Also, mean score of social suitability for rarely group with M = 3.1395 and SD = 45468 was different significantly than the often group with M= 2.7429 and SD=.51921 (see the appendix B Table B.25).

2. Use balconies for ventilation

Descriptive statistics of using the balcony for ventilation. Mean and standard deviation are presented for each sub-variable according to the habit of use. The analysis results shows the mean score of social satisfaction for rarely group with M= 3.0308 and SD=. 72040 was different significantly from sometimes group with M= 2.8167 and SD= .46286 and often with M=2.9846 and SD =.54427. And, the mean score of social suitability for rarely group with M=3.1077 and SD=.51391 was different significantly than the often group with M=2.7769 and SD=.45788 (See appendix B, Table B.27). This shows the one-way analysis of variance between groups which was conducted to explore the impact of using the existing balconies for ventilation on levels of suitability and satisfaction. Participants were divided into four into four different groups (rarely, sometimes, often and always). At $p<5$ there was a statistical significance in levels of social satisfaction scores among groups. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .078 using eta squared.

Eta square = square between groups / sum of squares total

= 2.809 /35.596 = 0.078.

At $p<5$ there was a statistical significance in levels of social satisfaction scores among groups with $F (3,131) = 3.907$ and $p=.010$. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .084 using eta squared.

Eta square = square between groups / sum of squares total

= 2.762 /32.930 = 0.084.

Post-hoc comparisons using the Tukey HSD test. Which indicated that the mean score of social satisfaction for rarely group with M = 3.0308 and SD = .72040 was different significantly from the sometimes group with M=2.8167 and SD=.46286 and often group with M=2.9846 and SD=.54427. Also, mean score of social suitability for rarely group with M = 3.1077 and SD = .51391was different significantly than the often group with M= 2.7769 and SD=.45788 (see the appendix B Table B.28).

3. Use balconies for other purposes (storage, child's play)

The descriptive statistics of using the balcony for other purposes "storage, child's play", shows mean and standard deviation are presented for each sub-variable according to the habit of use (See appendix B Table B.29). Also, Table 27 shows the one-way analysis of variance between groups which was conducted to explore the impact of the usage of existing balconies for other purposes "storage, child's play" on levels of suitability and satisfaction. According to their frequency of usage, participants were divided into four different groups (rarely, sometimes, often and always). At $p<5$ there was a statistical significance in levels of social satisfaction scores among groups. Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .078 using eta squared.

Eta square = square between groups / sum of squares total

= 4.334/35.596 = 0.122

Table (27) ANOVA[1], using the balcony for other purposes (storage, child's play)						
		Sum of Squares	df	Mean Square	F	Sig.
Social Satisfaction	Between Groups	4.334	3	1.445	5.916	.001
	Within Groups	31.262	128	.244		
	Total	35.596	131			
Social Suitability	Between Groups	1.908	3	.636	2.624	.053
	Within Groups	31.022	128	.242		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.558	3	.519	1.223	.304
	Within Groups	54.364	128	.425		
	Total	55.922	131			
Payment Suitability	Between Groups	1.225	3	.408	1.720	.166
	Within Groups	30.374	128	.237		
	Total	31.599	131			

Post-hoc comparisons using the Tukey HSD test. Which indicated that the mean score of social satisfaction for rarely group with M = 3.2742 and SD = .43190 was different significantly from the sometimes group with M=2.3211 and SD=.56480 and often group with M=2.9000 and SD=.45190. Also, mean score of social suitability for rarely group with M = 3.1077 and SD = .51391was different significantly than the often group with M= 2.7769 and SD=.45788 (See the appendix B Table B.30).

Figure 84 illustrates the questionnaire results for the factor of purposes of using balconies in houses. It can be observed that 65.2% of respondents would always use their balconies to dry laundry, and ranking second was 28.8% of respondents would often use their balconies for the same purpose. The figure shows that most users always used their balconies for ventilation at 41.7% and 39.4% often used balconies for ventilation. 32.6% rarely used their balconies for rest and recreation

[1]. The ANOVA technique applies when there are two or more than two independent groups (Pallant, 2013).

and 10.6% of respondents always did so. For the use of the balconies for other purposes (for storage, as children's' play areas, etc.), 47% rarely did so and 28.8% occasionally did so.

Figure 84 illustrates the results of the houses user's for the purposes using the balconies in their houses noted that always the highest frequency had 86 of total respondents users were using the balconies for drying laundry, and the second was often had 29 of total respondents, also the figure shows that most of respondents users were using balconies for ventilation had always 55, of total respondents and 52 often. Using the balconies for rest and recreation had rarely 43 of total respondents, and 40 of them sometimes. While the use the balconies for other purposes "storage, child's play" had rarely as high frequency 62 of total respondents, and sometimes 38 of total respondents.

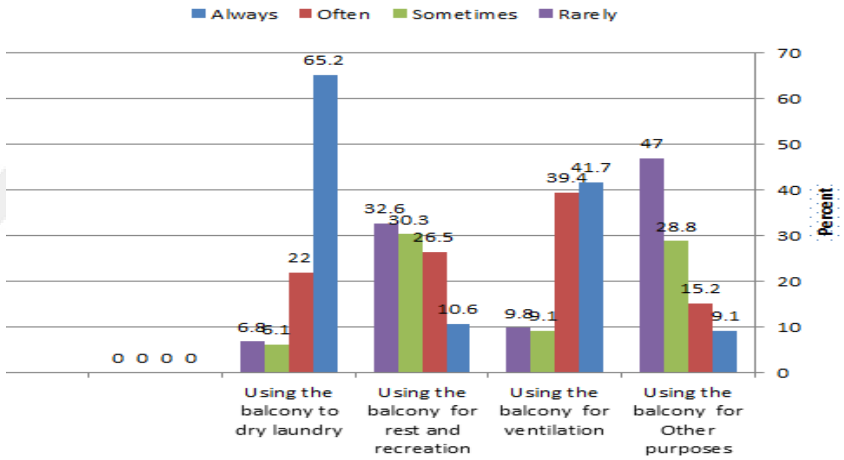


Figure 84: Using the Balcony for a Different Purpose

Next Figure 85 illustrates the results of the houses user's for the purposes using the balconies in their houses noted that always the highest frequency had 86 of total respondents users were using the balconies for drying laundry, and the second was often had 29 of total respondents, also the figure shows that most of respondents users were using balconies for ventilation had always 55, of total respondents and 52 often. Using the balconies for rest and recreation had rarely 43 of total respondents, and 40 of them sometimes. While the use the balconies for other purposes "storage, child's play" had rarely as high frequency 62 of total respondents, and sometimes 38 of total respondents.

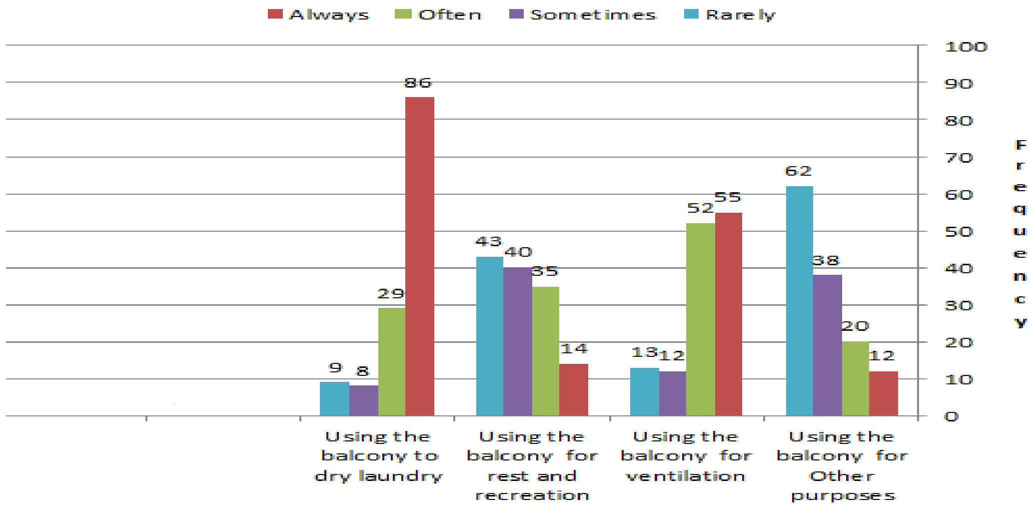


Figure 85: Frequency Using the Balconies for a Different Purpose

6.1.2.16. Use of Windows for Ventilation at Night

Descriptive statistics of using the windows for ventilation at night. Mean and standard deviation are presented for each sub-variable according to the habit of use (Table B.31).

One-way between-groups analysis to explore the impact of using the windows for ventilation at night on levels of suitability and satisfaction. Participants were (rarely, sometimes, often and always)[1]. Despite reaching statistical significance, difference was a medium effect. The effect size, calculated using eta squared, was 0.033 .

Eta square = square between groups / sum of squares total

= 1.174/35.596 = 0. 033

Moreover, even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .016 using eta squared[2]. Also, even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .016 using eta squared[3]

= 5.137/32.930 = 0. 16

[1] . There was a statistically significant difference at the $p < .05$ level in social satisfaction scores for the four groups: $F(3, 131) = 1.455$, $p = .230$.

[2] . there was a statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F(3, 131) = 7.885$, $p = .010$

[3] . there was a statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F(3, 131) = 7.885$, $p = .010$

Post-hoc comparisons using the Tukey HSD test. Which indicated that the mean score of social satisfaction for rarely group with M = 3.0629 and SD = .46475 was different significantly from the often group with M=2. 4545and SD=.26968 and always group with M=2.6000 and SD=.4714. (See appendix B Table B.33). Figure 86 shows the results for use of windows for ventilation. It can be observed that the use of windows for ventilation at night had the highest ranking at a rate of 67.4% for rare use by respondents, followed by windows always being used by 65.2% of users for ventilation in the morning. 36.4% of respondents rarely used windows for ventilation in the afternoon and 29.5% sometimes did so, and for evening use, 33.3% rarely did so and 31.8% sometimes did so.

Figure 87 illustrates the frequency of the houses user's for using windows in their houses for ventilation noted that the using windows for ventilation at night had the highest frequency 89 of the respondent's users were rarely, and the second was always had 6 of users using the windows for ventilation at morning. While the use of the windows for ventilation in the afternoon had 8 respondents were rarely and 39 of the respondents were sometimes, and using windows for ventilation at evening was rarely had 44 of respondents and 42 of respondents were sometimes.

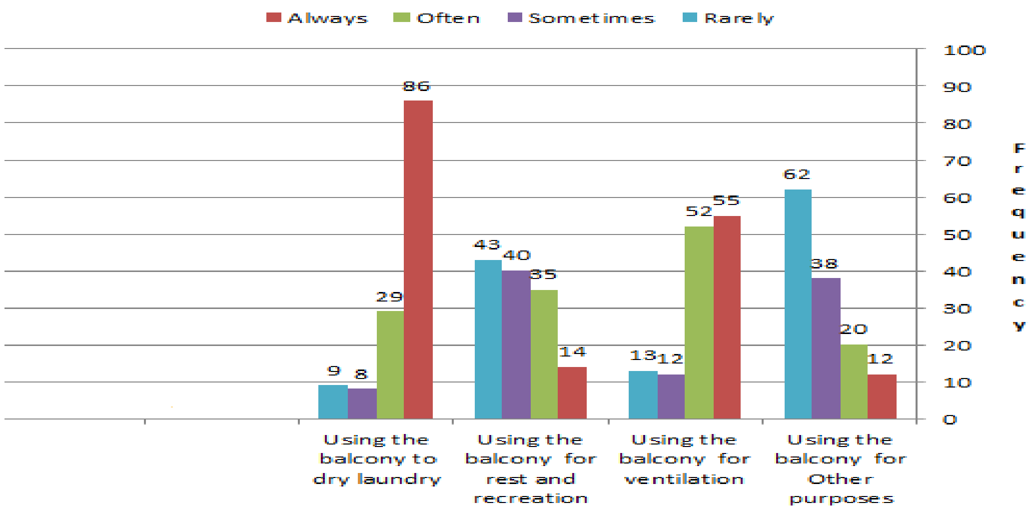


Figure 86: Using the Windows for Ventilation at Different Times of the Day

Figure 87 illustrates the frequency of the houses user's for using windows in their houses for ventilation noted that the using windows for ventilation at night had the highest frequency 89 of the respondent's users were rarely, and the second was always had 6 of users using the windows for ventilation at morning. While the use of the windows for ventilation in the afternoon had 8 respondents were rarely and 39 of the respondents were sometimes, and using windows for ventilation at evening was rarely had 44 of respondents and 42 of respondents were sometimes.

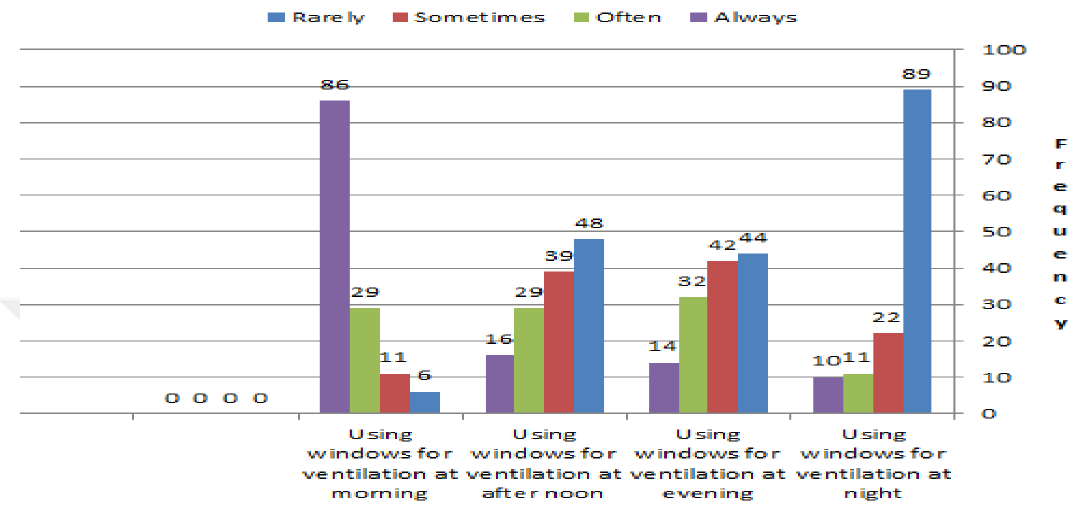


Figure 87: Frequency for Using the Windows

for Ventilation at Different Times of the Day

- **Means of cooling and heating in users' houses**

1. In Summer:

A. Natural ventilation (ventilation and cooling)

Descriptive statistics of using natural ventilation (ventilation and cooling). Mean and standard deviation are presented for each sub-variable according to the habit of use. The mean score of social satisfaction for rarely group with M=3.2765 and SD= .38143 was different significantly than sometimes group with M=3.2114 and SD= 0.44117 and always group with M=2.8634 and SD =0.60073). And, the mean score of social suitability for rarely group with M = 3.1294 and SD = 0.53458) was different significantly than often group with M=2.8049 and SD= 0.43772 and always group with M= 2.8634 and SD= 0.48060 (See appendix B Table B.34).

Table B.35 shows one-way analysis of variance which was conducted to explore the impact of using natural ventilation (ventilation and cooling), on levels of suitability and satisfaction. According to their frequency of usage, participants were divided into four different groups (rarely, sometimes, often and always). Even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .11 using eta squared.

Eta square = square between groups/sum of total squares total

$$4.052/35.596 = 0.11$$

Moreover, even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .09 using eta squared[1], was 0. 09.

$$= 3.009/32.930 = 0.\ 09$$

Also, even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .12 using eta squared[2],

= 3.916/31.599 = 0. 12

Post-hoc comparisons using the Turkey HSD test. Which indicated that the mean score of social satisfaction for rarely group with M = 3.2765 and SD = .38143 was different significantly from the sometimes group with M=3. 2114 and SD=.44177 and always group with M=2. 8634 and SD=.60073. The mean score of social suitability for rarely group with M=3.1294 and SD=0.53458 was different significantly than often group with M=2.8049 and SD=0.43772 and always group with M=2.8634 and SD =0.48060 (See appendix B Table B. 36)

B. In the summer: (ventilation and cooling) - fan

Descriptive statistics of using natural ventilation (ventilation and cooling) - fan. Mean and standard deviation is presented for each sub-variable according to the habit of use (See appendix B, and Table B.37). One-way analysis of variance between groups showed the impact of using a fan (ventilation and cooling), on levels of suitability and satisfaction. According to their frequency of usage, participants were divided into four different groups (rarely, sometimes, often and

[1] . Statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F(3, 131) = 4.291$, $p = .006$

[2]. Statistically significant difference at the $p < .05$ level in payment suitability scores for the four groups: $F(3, 131) = 6.036$, $p = .001$.

always)[1]. Even though the statistical significance was reached, the actual difference in mean scores of the groups was a medium effect, which was calculated as 0.072 using eta squared (See appendix B, Table B.38).

Eta square = square between groups/ sum of squares total

2.268/31.599 = 0.072

Post-hoc comparisons using the Tukey HSD test, indicated that the mean score of Social satisfaction for rarely group with M = 3.1078 and SD = .52200 was significantly different from often group with M = 2.4000 and SD = .28284 (See appendix B Table B.39) and Figure 88.

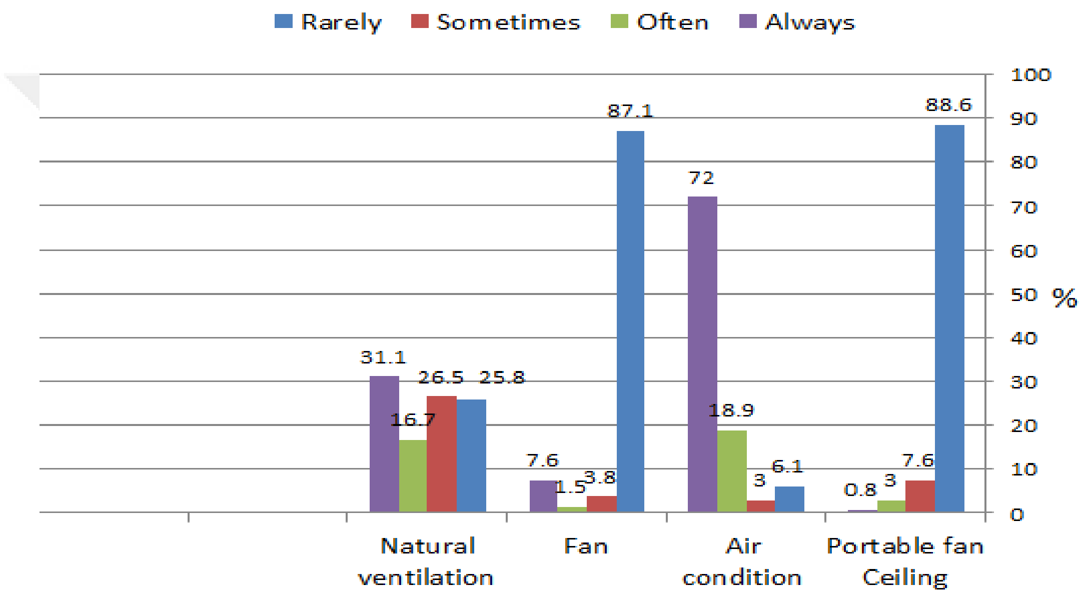


Figure 88: Means of Using Cooling in the Summer Time in the Houses

Figure 89 illustrates the results for the means of cooling of user's houses in the summer, showing that air-conditioning ranked highest at 72% of respondents who would always use the AC for cooling followed by natural ventilation often being used by 31.1%. The use of fans as a means of cooling ranked highest for its rarely being used by 88.6% of the respondents and 87.1% of the respondents using roof fans. Using for cooling of users houses in the summer noted that the AC air-conditioning was the highest-ranking had the 95 of the respondents users were always, and the second was natural ventilation had 41 of respondents users using

[1].There was a statistically significant difference at the $p < .05$ level in payment suitability scores for the four groups: $F(3, 131) = 3.299$, $p = .023$

were always. While the use of the fans means was the rarely highest ranking for portable fans had 117 of respondents and 115 of the respondents for roof fans.

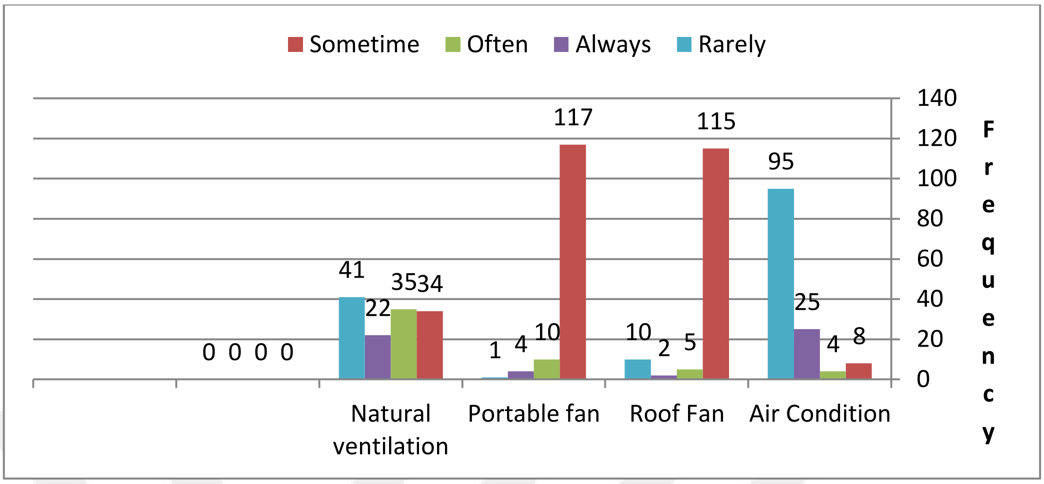


Figure 89: Frequency Means of Using Cooling in the Summer Time in the Houses

6.1.2.17. Use for Cooling and Heating in the House:

1. Heating in winter:

A. Use coal fire (wood)

Descriptive statistics of use for cooling and heating in the winter heating (use coal fire). Mean and standard deviation are presented for each sub-variable according to the habit of use (See appendix B Table B.40 and Table B, 41). Also, Table B.41 shows the one-way analysis of variance between groups which explores the impact of using in the winter, heating use coal fire "wood", on levels of suitability and satisfaction. According to their frequency of usage, participants were divided into four different groups (rarely, sometimes, often and always). Even though the statistical significance was reached, the actual difference in mean scores of the groups was a medium effect, which was calculated as 0.10 using eta squared.

Eta square = square between groups / sum of squares total

$$= 3.686/35.596 = 0.10$$

Post-hoc comparisons using the Tukey HSD test. Table 59 indicates that the mean score of social satisfaction for rarely group with M =3.1500 and SD = .47000 was significantly different from the sometime group with M = 2.5333 and SD = .58878.

B. Heating in the winter - gas fire:

Descriptive statistics of use for heating in the winter (gas and fire). Mean and standard deviation are presented for each sub-variable according to the habit of use (see Appendix B, Table B.43 and Table B.44), showing the one-way analysis of variance between groups which explores the impact of using in the winter heating-use a gas fire, on levels of suitability and satisfaction. According to their frequency of usage, participants were divided into four different groups (rarely, sometimes, often and always)[1]. Even though the statistical significance was reached, the actual difference in mean scores of the groups was a medium effect, which was calculated as 0.11 using eta squared[2].

Eta square = square between groups / sum of squares total

$$4.043/35.596 = 0.11$$

Moreover, even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .13 using eta squared[3].

$$= 4.134/32.930 = 0.13$$

Also, even though the statistical significance was reached, the actual differences in mean scores of the groups was a medium effect, which was calculated as .09 using eta squared.

$$= 2.798/31.599 = 0.09$$

Post-hoc comparisons using the Tukey HSD test. Which indicated that the mean score of social satisfaction for rarely group with M = 3. 1588 and SD = .47707was different significantly from the sometimes group with M=3.7091 and SD=.52432 significantly different from the often group with M=2.6727 and SD=.67096. The mean score of social suitability for rarely group with M=3.1294 and SD= 0.53458 was different significantly than often group with M=3.0373 and SD=0. 48806 and always group with M=2. 4727 and SD =0. 34955. The mean score of payment suitability for rarely group M = 2.6745 and SD = 0.49706) was different

[1] .Statistically significant difference at the $p < .05$ level in social satisfaction scores for the four groups: $F (3, 131) = 5.468$, $p = .001$.

[2]. Statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F (3, 131) = 6.126$, $p = .001$

[3] . Statistically significant difference at the $p < .05$ level in payment suitability scores for the four groups: $F (3, 131) = 4.145$, $p = .008$.

significantly than often group with M=3.0373 and SD=.48806 and always with M=2.2364 and SD = 0.32023.

C. Heating in the winter - A C

Descriptive statistics of use of AC in the winter. Mean and standard deviation are presented for each sub-variable according to the habit of use; (See Appendix B Table B.45). Also, in Table B.46 one-way analysis of variance was conducted to explore (use AC) on levels of suitability and satisfaction. Participants (rarely, sometimes, often and always)[1]. Despite statistical significance, the actual difference was a medium effect. The effect size, calculated using eta squared[2], was 0.12 . Eta square = square between groups/ sum of total squares total

3.860 /32.930 = 0.12

Post-hoc comparisons using the Tukey HSD test, indicated that the mean score of rarely group (M =3.1447, SD =0.49992) was significantly different always (M = 2.7091, SD =0.52432). And significantly different from the often (M = 2.7867, SD =0.46704, (Appendix B Table B.48). Figure 90 illustrates the results of the means of winter heating of users. It can be observed that 97% of the respondents always using kerosene and rarely at the same time, followed by the use of coal by 84.8% of the respondents. An electric fire was always used by 56.1% and 35.6% of them would use air conditioners.

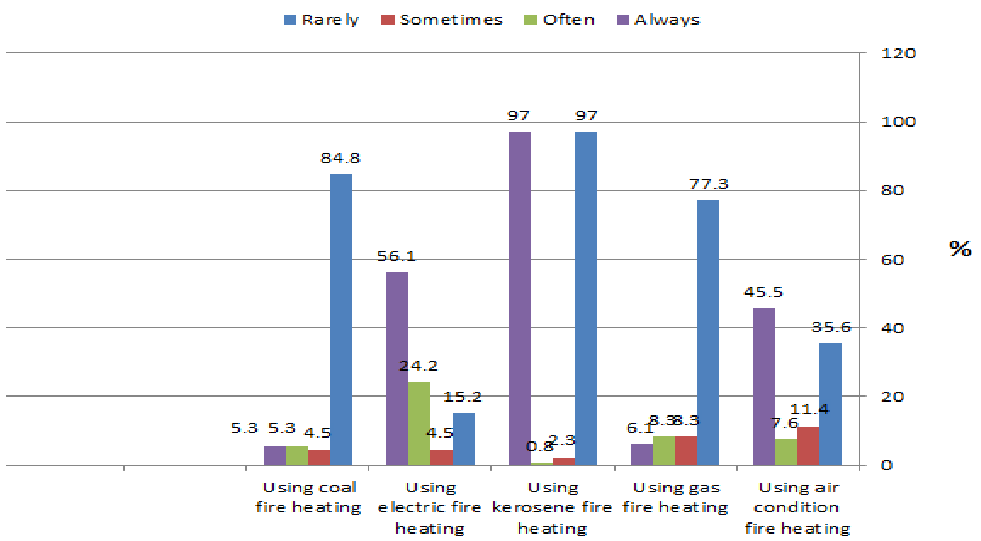


Figure 90: Means of Heating the Houses during Winter

[1]. Statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F (3, 131) = 5.666$, $p = 0.001$.

[2] .Statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F (3, 131) = 5.666$, $p = 0.001$.

Figure 91 illustrates the frequency results of the houses user's for means using for cooling and heating of users houses during winter time noted that using the kerosene for heating was the highest-ranking had 128 of the respondents users were always and rarely at the same time, the second rank used coal for heating had 112 of respondents users using were rarely for using coal heating. While using electric fire for heating was the always had74 of respondents and 47 of the respondents for using the air conditions (AC).

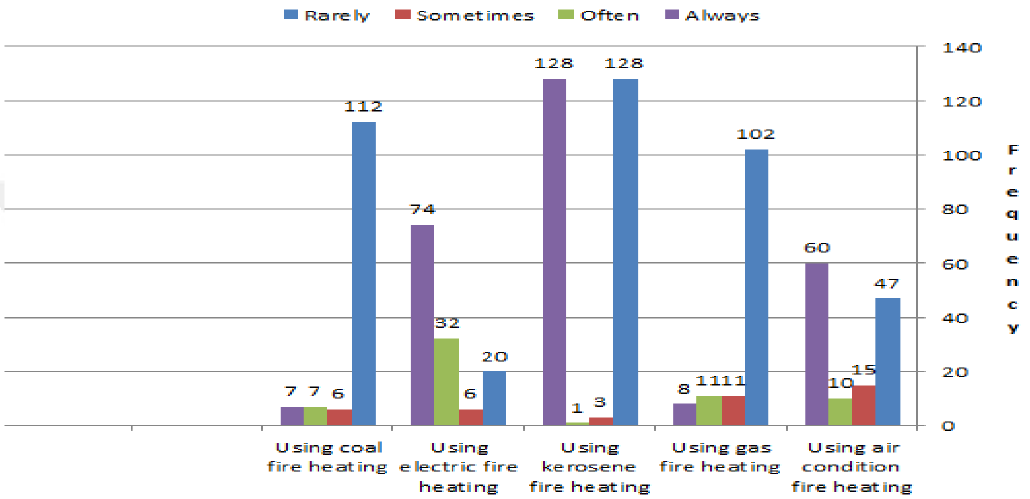


Figure 91: Frequency of the Means Using of Heating Houses During the Winter Time

Through the discussion of the previous analyzes we conclude that most users use "A C" units to cool their homes during the summer season and use electric heaters during the winter season, due to the following reasons:

-The effectiveness of the devices to reach the required thermal comfort using electricity because of its cheap prices;

- The inefficiency of the rest of the means to reach the desired thermal comfort;

- Using unsustainable building materials for implementing residential buildings are increasing the use of the cooling and heating means;

6.1.2.18. Precautions Taken by Users to Prevent Entry of Excessive Sunlight

1. Use curtains

Descriptive statistics of using the precautions using for excessive sunlight inside the house (use curtains). Mean and Standard deviation are presented for each sub-variable according to the habit of use; (Appendix B Table B.47).

Also, Table B.48 showing a one-way between-groups analysis of variance for the impact the precautions using for excessive sunlight inside your house (use curtains), on levels of suitability and satisfaction. Participants were divided into four groups according to their use frequency (rarely, sometimes, often and always)[1]. Despite reaching statistical significance, the actual difference in mean scores was a medium effect. The effect size was 0.12 .

Eta square = square between groups / sum of squares total

3.915/32.930 = 0.12

Post-hoc comparisons using the Tukey HSD test, the mean score of social suitability for rarely group (M =3.1379, SD = 51532) significantly different from often (M = 2.8240, SD = 0.46737), and significantly different from the always group (M = 2.7610, SD = 0.467, (Appendix B Table B.49).

2. Use insect screen

Descriptive statistics of using the precautions using for excessive sunlight inside the house (use insect screen). Mean and standard deviation are presented for each sub-variable according to the habit of use; (Appendix B Table B.50).

Also, Table B.51 showing a one-way analysis of variance for the impact the precautions using for excessive sunlight inside your house (use insect screen), on levels of suitability and satisfaction. Participants were (rarely, sometimes, often and always)[2]. Despite reaching statistical significance, the actual difference was a medium effect. The effect size was 0.07 .

Eta square = square between groups/ sum of squares total

2.474/35.596 = 0.07

Post-hoc comparisons using the Tukey HSD test, the mean score of social satisfaction for sometimes group (M =2.6889, SD = 0.68638) significantly different from always (M = 3.2500, SD = 0.43439), (Appendix B Table B.52).

3. Use horizontal blinds

Descriptive statistics the precautions using for excessive sunlight inside the house (use horizontal blinds). Mean and standard deviation are presented for each sub-variable according to the habit of using, (Appendix B Table B.53). Also,

---

[1]. Statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F(3, 131) = 5.757$, $p = 0.001$.

[2]. Statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F(3, 131) = 3.187$, p = 026.

Table B.54 showing a one-way analysis of variance for impacts the precautions using for excessive sunlight inside your house
(use horizontal blinds), on levels of suitability and satisfaction. Participants were (rarely, sometimes, often and always)[1]. Despite reaching statistical significance, the actual difference was a medium effect. The effect size was 0.13 .

Eta square = square between groups / sum of squares total

7.398/55.922 = 0.13

Post-hoc comparisons using the Tukey HSD test, the mean score of environmental suitability for rarely group (M =2.2278, SD = 0.61263) significantly different from always (M = 3.4167, SD = 0.68718, (Appendix B Table B.55).

Figures 92 and 93 shows the results of the precautions used by houses users to prevent entry excessive sunlight inside their houses were using window blinds had the highest-rank had 94 respondents (71.2%) of total respondents users were always and the using window curtains was the second-rank had 41 respondents and (31.1%) of total respondents users were always . While the highest ranking was rarely using the climbed plants had 122 respondents (92.4%) of total respondents.

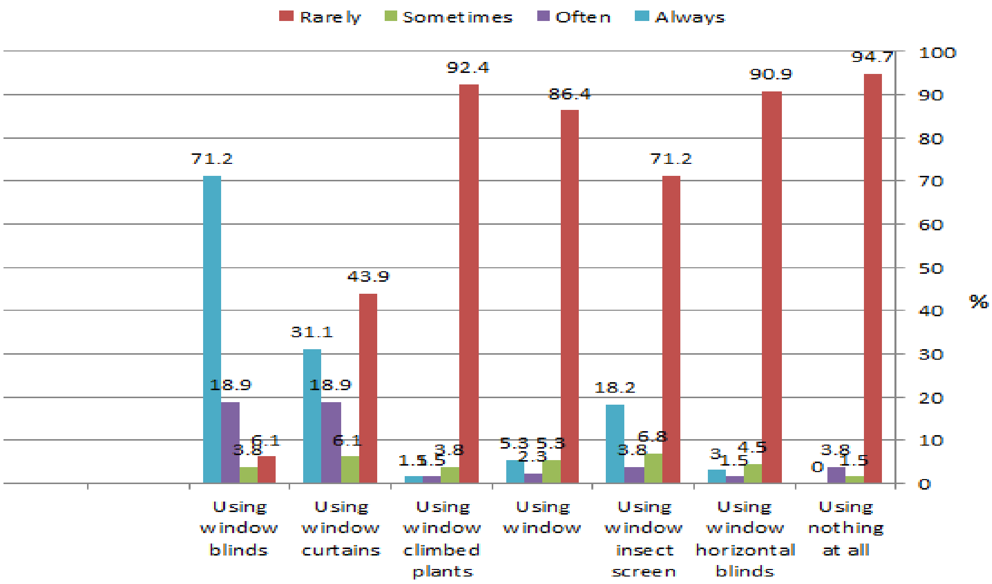


Figure 92: Using Different Window Blinds

[1] . Statistically significant difference at the $p < .05$ level in environmental suitability scores for the four groups: $F(3, 131) = 6.505$, $p = .000$.

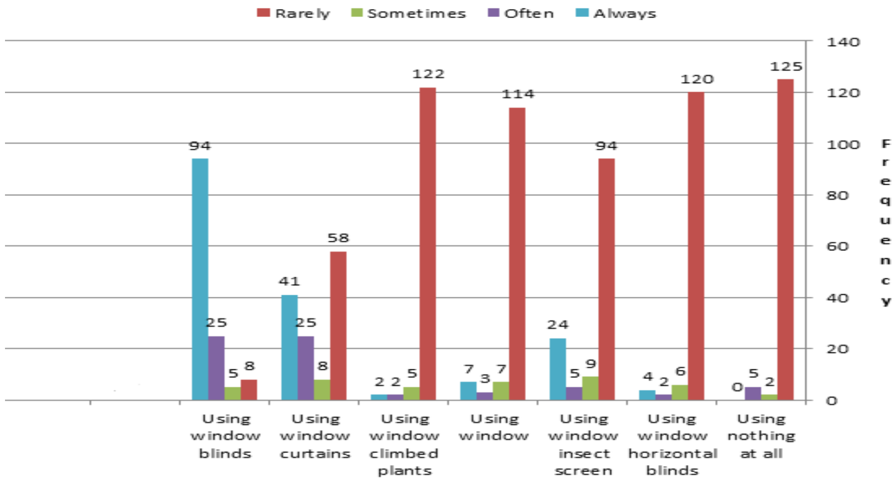


Figure 93: Frequency Using Different Window Blinds

6.1.2.19.The extent to which users agree to design their houses in the future in terms of the types of houses in which users prefer to live:

Descriptive statistics of the extent to which users agree to design their houses in the future in terms of the type houses which users prefer to live in (detached traditional courtyard house). Mean and standard deviation are presented for each sub-variable according to the needs of users, (Appendix B Table B.56). Also, Table B.57 showing a one-way analysis of variance to explore the impact the extent to which users agree to design their homes in the future in terms of the type of house the users prefer to live in (detached traditional courtyard house), on levels of suitability and satisfaction. Participants were divided into four groups (highly disagree, disagree, agree and highly agree)[1]. Despite statistical significance, the actual difference in mean scores was a medium effect. The effect size calculated was 0.064 .

Eta square = square between groups / sum of total squares

$$3.562/55.922 = 0.064$$

Post-hoc comparisons using the Tukey HSD test, the mean score of environmental suitability for highly disagree group (M =2.7143, SD = .87566) was significantly different from the disagree group (M = 2.1491, SD = .45650), (Appendix B Table B.58).

[1]. Statistically significant difference at the $p < .05$ level in environmental suitability scores for the four groups: $F\ (3, 131) = 2.902$, $p = 0.037$.

Descriptive statistics of the extent to which users agree to design their houses in the future, in terms of the type houses which users prefer to live in (flat in an apartment building). Mean and standard deviation are presented for each sub-variable according to the users prefer, see appendix B Table B.59. Also, Table B.60 showing analysis of variance which was conducted to explore the impact the extent to which users agree to design their homes in the future in terms of the type of house the users prefer to live in (flat in an apartment building), on levels of suitability and satisfaction. Participants were in four groups (highly disagree, disagree, agree and highly agree)[1]. Despite reaching statistical significance, the actual difference in mean scores was a medium effect. The effect size was 0.10 .

Eta square = square between groups/ sum of squares total

3.160/31.599 = 0.10

Post-hoc comparisons using the Tukey HSD test, indicated that the mean score of payment suitability for highly disagree group (M =2.5091, SD = .54564) significantly different from the disagree group (M = 2.5097, SD = 0.45039), and the agree group (M = 2.8647, SD = 0.44236), (Appendix B Table B.61).

Figures 87 and 88show the results of the types of houses in which users prefer to live. The modern villa was the highest-ranking with 77 respondents (58.3%) finding this type of house highly agreeable, followed by 52 respondents (39.4%) agreeing. 47 users (35.6%) highly agreed with preferring to live in detached traditional courtyard houses. 62 respondents (47%) highly agreed with a preference for apartments in an apartment building, and 33 (25%) disagreed. Additionally, 62 respondents (47%) highly disagreed about living in an apartment.

[1] .Statistically significant difference at the $p < .05$ level in payment suitability scores for the four groups: $F (3, 131) = 4.740$, $p = 0.004$.

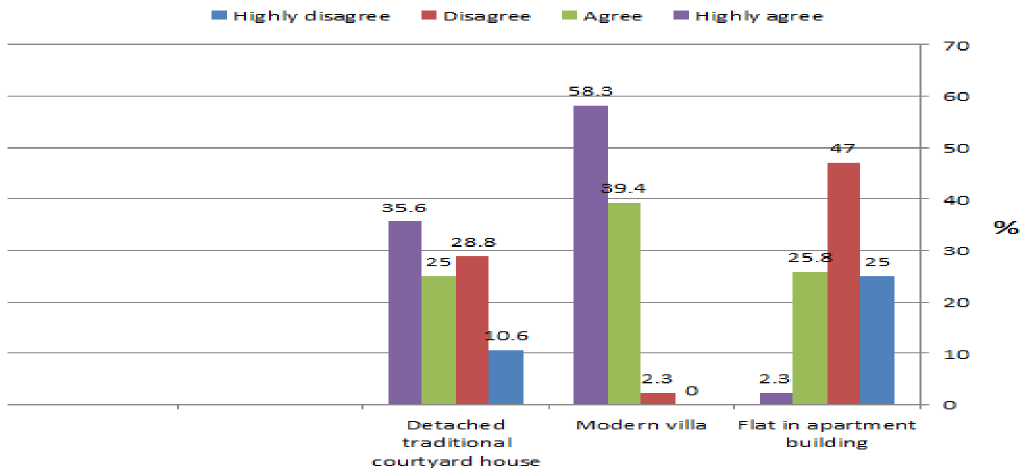


Figure 94: Type of House

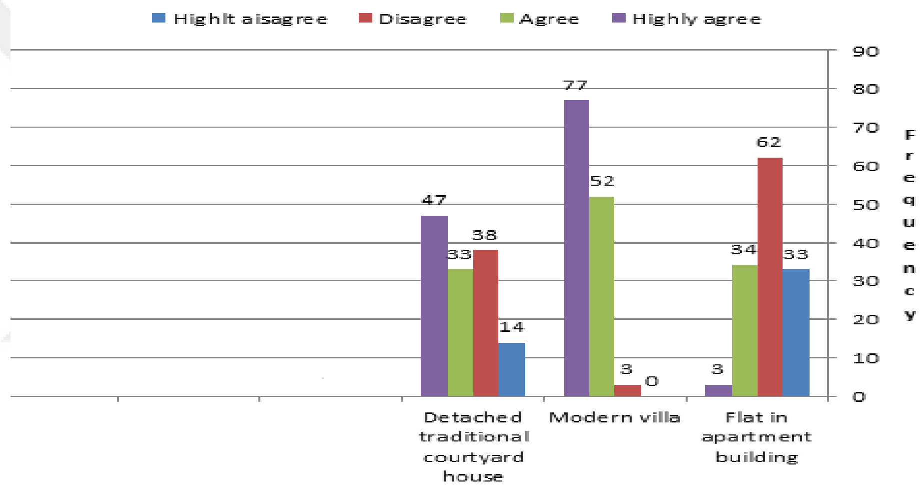


Figure 9: Frequency Type of Houses

According to the analysis results types of houses which the users prefer to live in, noted that the modern villa was the preferment type detached traditional courtyard house, while the hast type preferred was flat in an apartment building, Figure 95 shows a villa model under construction has been designed according to the owner's family needs and economic potential.

6.1.2.20. Participate Users in the Design Process of New Houses

Descriptive statistics of the participates wishing users in the design process of new houses. Mean and standard deviation are presented for each sub-variable according to the users prefers, Table B.62. Also, Table B.63 showing a one-way between-groups analysis of variance was conducted to explore the impact the participate users in the design process of new houses, on levels of suitability and satisfaction. Participants were divided into four groups according to their use frequency (highly disagree, disagree, agree and highly agree)[1]. Despite statistical significance, the actual difference was a medium effect. The effect size was 0.07 .

Eta square = square between groups / sum of squares total

2.352/31.599 = 0.07

Post-hoc comparisons using the Tukey HSD test, indicated that the mean score of payment suitability for agreeing on a group (M =2.4471, SD = 0.37649) was significantly different from the highly agree group (M = 2.7114, SD = 0.53084), (Appendix B Table B.64).

6.1.2.21. Extent Users Desire to Provide Separate Spaces for Female and Male Separately

Descriptive statistics of the participate users in the design process of new houses and extend the user's desire to provide separate spaces for females and males separately. Mean and standard deviation are presented for each sub-variable according to the users prefers, (Appendix B Table B.65). Also, Table B.66 showing a one-way between-groups analysis of variance was conducted to explore the impact the participate users in the design process of new houses and extend user's desire to provide separate spaces for females and males separately, on levels of suitability and satisfaction. Participants were divided according to their use frequency (highly disagree, disagree, agree and highly agree)[2]. Despite reaching statistical significance, the actual difference was a medium effect. The calculated effect size was 0.10 .

Eta square = square between groups / sum of total squares

3.047/31.599 = 0.10

Post-hoc comparisons using the Tukey HSD test, indicated that the mean score of payment suitability for agreeing with a group (M =2.4756, SD = 0.45184) was significantly different from the highly agree group (M = 2.7165, SD = 0.47782), (Appendix B Table B.67).

---

[1] . There was a statistically significant difference at the $p < .05$ level in payment suitability scores for the four groups: $F(3, 131) = 5.187$, $p = 0.007$.

[2] .There was a statistically significant difference at the $p < .05$ level in payment suitability scores for the four groups: $F(3, 131) = 4.553$, $p = 0.005$.

6.1.2.22. Reasons for Some Types of House Being Preferred by Users

Figures 96 and 97 show the reasons for users preferring particular type of houses. The highest-ranking reason for the suitability was Libyan family social life, which was deemed by 126 respondents (95.5%) as being suitable. The factor of being more comfortable for the Libyan climatic conditions had 117 respondents (88.6%) who agreed about it being more comfortable for Libyan climatic conditions. The factor of special separate spaces for female and male scored 79 respondents (59.8%) highly disagreeing.

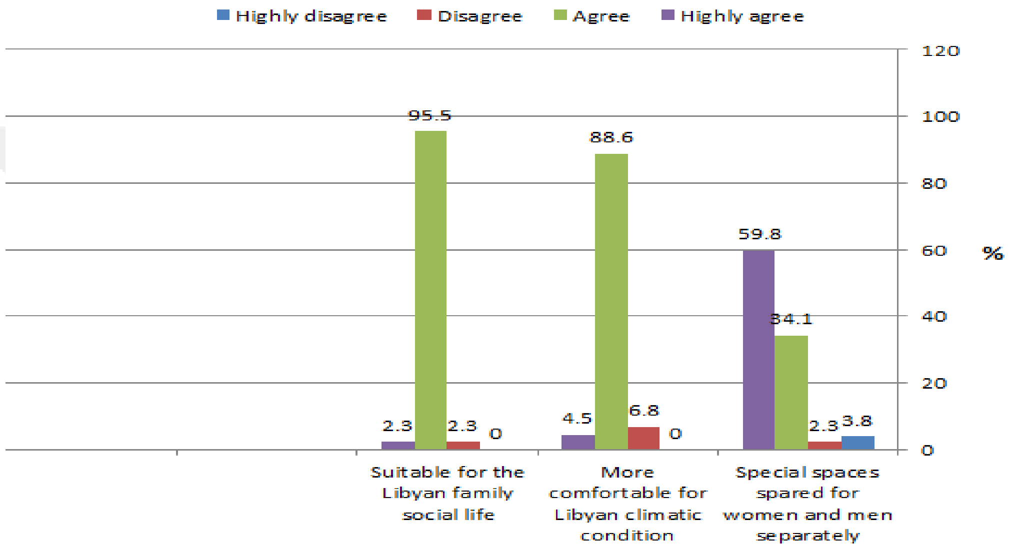


Figure 96: Why Users Prefer the Type of House

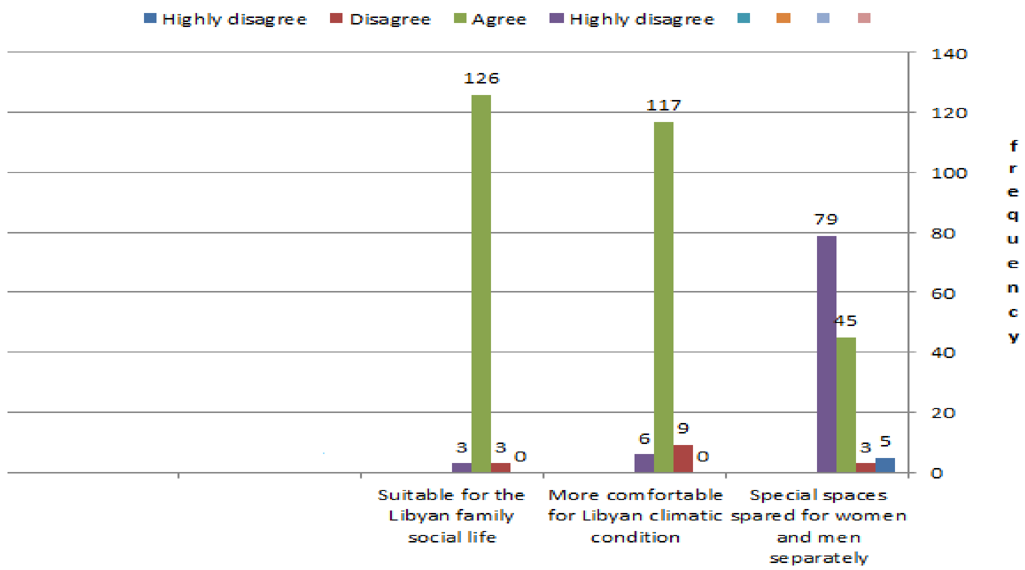


Figure 97: Frequency Why They Prefer the Type of House

6.1.2.23. The Extent the Users Agree That Their Houses Need Design Modifications to Suit Their Needs

Descriptive statistics of the extent the users agree that their houses need modifications of the design to suit their needs. Mean and standard deviation are presented for each sub-variable according to the users prefers (Appendix B Table B.67). Also, Table B.68 showing a one-way between-groups analysis of variance was conducted to explore the impact the participate users in the design process of new houses and extent users desire the users agree that their houses need modifications of the design to suit their needs, on levels of suitability and satisfaction. Participants were divided according to their use frequency (highly disagree, disagree, agree and highly agree)[1]. Despite statistical significance, the actual difference in mean scores was a medium effect. The effect calculated using eta squared, was 0.05 .

Eta square = square between groups / sum of total squares

1.722/35.596 = 0.05

And, there was a statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F (2, 131) = 5.039$, $p = 0.008$. Despite reaching statistical significance, the actual difference in mean scores between the groups was a medium effect. The effect size, calculated using eta squared, was 0. 07.

= 2.386/32.930 = 0. 07

Post-hoc comparisons using the Tukey HSD test, the mean score of social satisfaction for disagree group (M =3.3765, SD = .44656) significantly different from the agree group (M = 3.0246, SD = .53093). Concerning the mean score of social suitability for disagree (M = 3.2824, SD = 0.45858) was significantly different from the agree (M = 2.8615, SD = 0.49990) and highly agree (M=2.9480, SD = 0.47777), (Appendix B Table B.69).

6.1.2.24. The Modifications Are Done by the Users in Their Houses

Descriptive statistics of the extent modifications done by the users in their houses. Mean and standard deviation are presented for each sub-variable according to the users prefers, (Appendix B Table B.70). Also, Table B.71

[1] There was a statistically significant difference at the $p < .05$ level in social satisfaction scores for the four groups: $F (2, 131) = 3.279$, $p = 0.041$.

showing a one-way between-groups analysis of variance was conducted to explore the impact the modifications done by the users in their houses, on levels of suitability and satisfaction. Participants were divided according to their use frequency (other changes" add an area for some spaces", removal changes, close windows, close balconies)[1]. Despite reaching statistical significance, the actual difference in mean scores between the groups was a medium effect. The effect size was 0.096 . Eta square = square between groups/ sum of squares total

$$3.150/32.930 = 0.096$$

Post-hoc comparisons using the Tukey HSD test, indicated that the mean score of social suitability for other changes (add area for some spaces) group (M =3.0453, SD = .46449) significantly different from the close windows group (M = 2.5538, SD = 0.36655), (Appendix B Table B.72).

6.1.2.25. The Less Pleasing Side of the House According to Users Opinions

Descriptive statistics of the less pleasing side of the house according to the user's opinions. Mean and standard deviation are presented for each sub-variable according to the users prefers, (Appendix B Table B.73). Also, Table B.74 showing a one-way between-groups analysis of variance was conducted to explore the impact the modifications done by the users in their houses, on levels of suitability and satisfaction. Participants were divided according to their use frequency, into four groups (other spaces "kitchen, baths, balconies"), living spaces, sleeping spaces, guest spaces). Statistically significant difference was found at the $p < .05$ level in social satisfaction scores for groups: $F(3, 131) = 2.813$, $p = .042$. Despite statistical significance, the actual difference in mean scores was a medium effect. The effect size, calculated using eta squared, was 0.06 . Eta square = square between groups / sum of squares total

$$2.202/35.596 = 0.06$$

Post-hoc comparisons using the Tukey HSD test, indicated that the mean score of social satisfaction for other changes (add area for some spaces) group (M =3.6800, SD = 0.30332) significantly different from the guest spaces (M = 2.9854, SD = 0.53738), (Appendix B Table B.75).

[1] .There was a statistically significant difference at the $p < .05$ level in social suitability scores for the four groups: $F(3, 131) = 4.513$, $p = 0.005$.

6.1.2.26. The Modifications are Done by Users and Most / Less Pleasing Side of The House According to Users Opinions

Figures 98 and 99 show the results of modifications made by users in their houses. Ranking first was the addition of areas for some spaces, which had the highest ranking of 75 (56.8%), followed by changes made for guest spaces by 28 respondents (21.2%). The third rank is modifications made for living spaces, which were made by 16 respondents (12.2%), while ranking fourth was modifications made for sleeping spaces by 13 respondents (9.8%). The more pleasing side of the houses were the living spaces, which had the highest ranking of 59 respondents (44.7%), while the less pleasing sides of their houses were sleeping spaces, which were the highest-ranking at 50 respondents (37.9%).Also, Figure 100 illustrates the modifications made by users in sites.

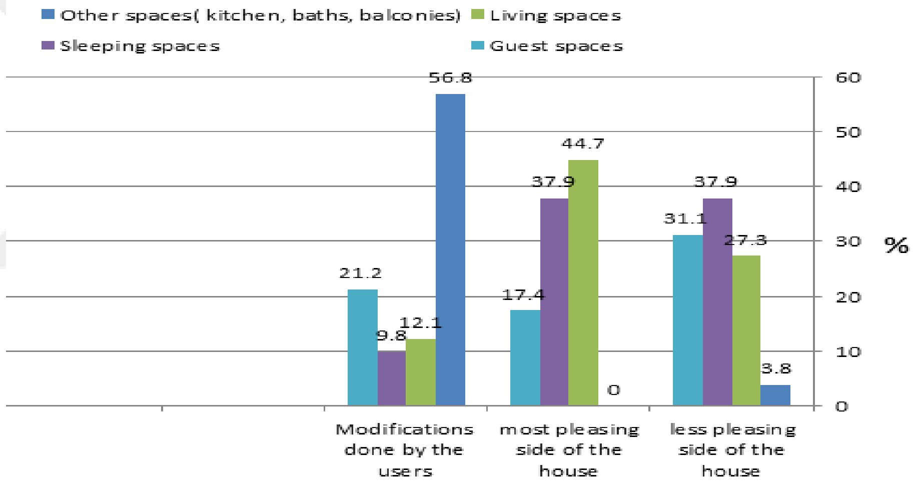


Figure 98: Modifications, Most and Less Pleasing

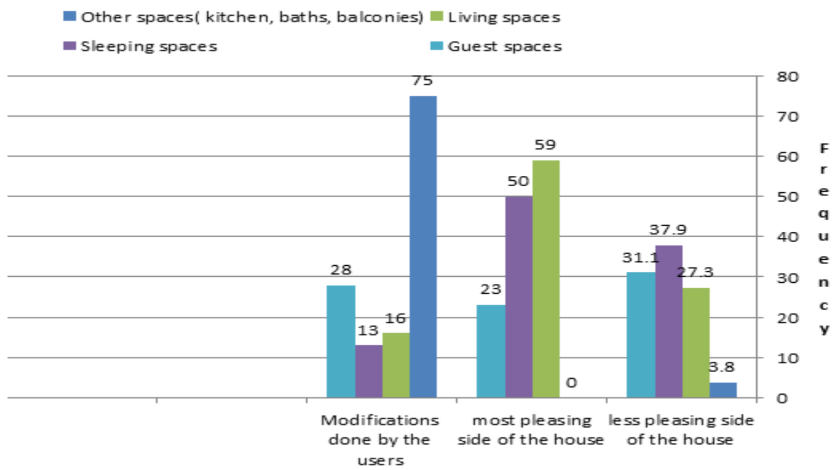


Figure 99: Frequency of Modifications, Most and Less Pleasing

Figure 100: Modifications Made by Users

6.2. SWOT Analysis

In order to determine the suitability of the selected locations for the study for residential use, the method of "SWOT", as one of the modern analysis programs in this field of housing planning. Therefore, in this thesis questionnaire survey and archival documentation were utilized as a source of data within the case studies, for the examination of the opinion of the users, as well as the professional, about implementation sustainable housing policy in Libya. The SWOT analysis is used to assess the existing situation of any housing area by examining the external factors surrounding the site as well as the internal factors affecting it. The SWOT is an abbreviation of four basic points to be analyzed, two at the external level and two at the internal level of the area to be analyzed. The four points are:

1. Strengths
2. Weaknesses

And are limited by internal factors

3. Opportunities

4. Threats, and are limited by the external factors.

6.2.1. SWOT Analysis of Existing Conditions for Case Study Sites

The following Table 28 and the Figure 102 expand (SWOT) analysis of AL-Hadba Khdra Site.

Table (28) AL- Hadba Khdra Site SWOT Analysis

NO	Site Name	SWOT Points
1	AL- Hadba Khdra	• Strength -Distribution of buildings and design of dwelling units -Security of the community
		•Weaknesses -Lack of public services like parks, children's playgrounds, and pedestrian paths, about 64% of respondents were not satisfied. -Lack of car parking -Indifference and lack of interest in the environment and management of residential buildings. -People with disabilities and the elders have difficulty accessing their place of residence - Planning and architectural inconsistency with adjacent buildings such as "high buildings, residential blocks"
		• Opportunities - Applying the regulations and laws governing the management of residential buildings such as Law (No. 19/1985) on the regulation of common ownership in buildings. - Provision public service "commercial, educational" which is not available on the site. - Completion of the external works of the site will provide cars parks, children's playgrounds, pedestrian paths as well as car parking
		•Threats -The existence of an old residential area around the site is socially and environmentally heterogeneous -Unsafe traffic to and from the site -Failure to complete the external works of the site and the consequent threats to the population, especially children, the elderly and the disabled people.

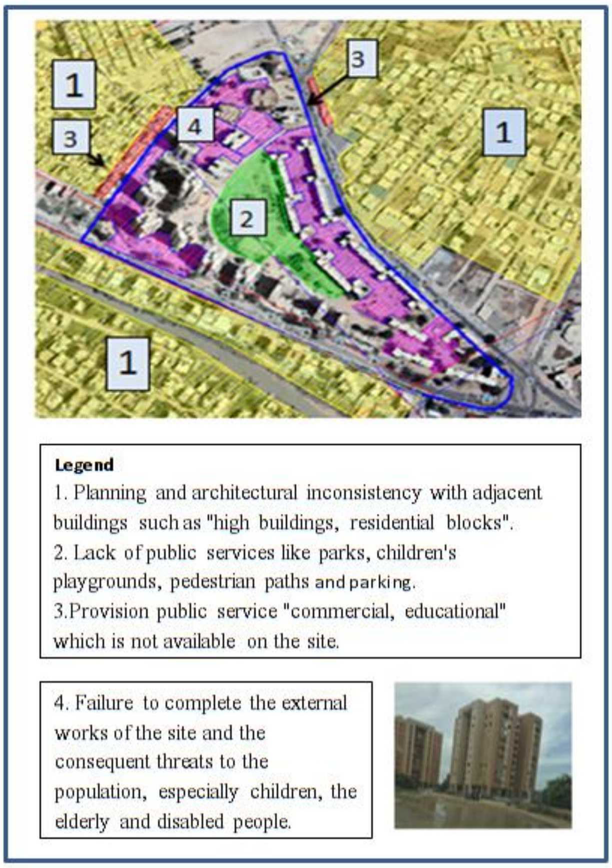


Figure 101: SWOT Analysis AL- Hadba Khdra Housing Project

The following Table 29 and the Figures 103 and104 expand (SWOT) analysis of AirPort Road East Site.

Table (29) AirPort Road East Site SWOT Analysis

NO	Site Name	SWOT Points
2	Airport Road East	•Strength -Distribution of buildings and design of dwelling units - Safety of the community
		•Weaknesses -Traffic risk by airport road -Traffic noise caused by traffic on the airport road -Lack of public parks, children's playgrounds, pedestrian paths and lack of car parking, about 64% of respondents were not satisfied. -Indifference and lack of interest in the environment and management of residential buildings -People with disabilities and the elders have difficulty accessing their place of residence -Schematic and architectural inconsistency with adjacent buildings such as "high buildings" in southern direction

		of the site.
		• Opportunities -The layout plan of the site can be redesigned, so that the study will integrate the site with the adjacent site from the south, an old residential area, in order to achieve the following objectives: -Change the entry and exit points of the site to ensure the safety of the population and avoid the risk of the road "Airport Road." -Reclassification of the area between the residential buildings and the airport road as "Green Belt" to reduce the noise caused by heavy traffic through the airport, in addition, to reduce the air pollution resulting from traffic movement. -Implementation of the regulations and laws governing the management of residential buildings such as Law No. "19/1985" on the regulation of common ownership for buildings. - Providing public services "commercial, educational, cultural and religious" which were not available currently.
		•Threats - The presence of the site adjacent to the airport road causes a direct danger to the lives of the population, especially with respect to: -Points of entry and exit to and from the site -Noise resulting from vehicle traffic -The existence of an old residential area south of the site is socially and environmentally heterogeneous -Failure to complete the external works of the site and the consequent threats to the population, especially children, the elderly and the disabled people.

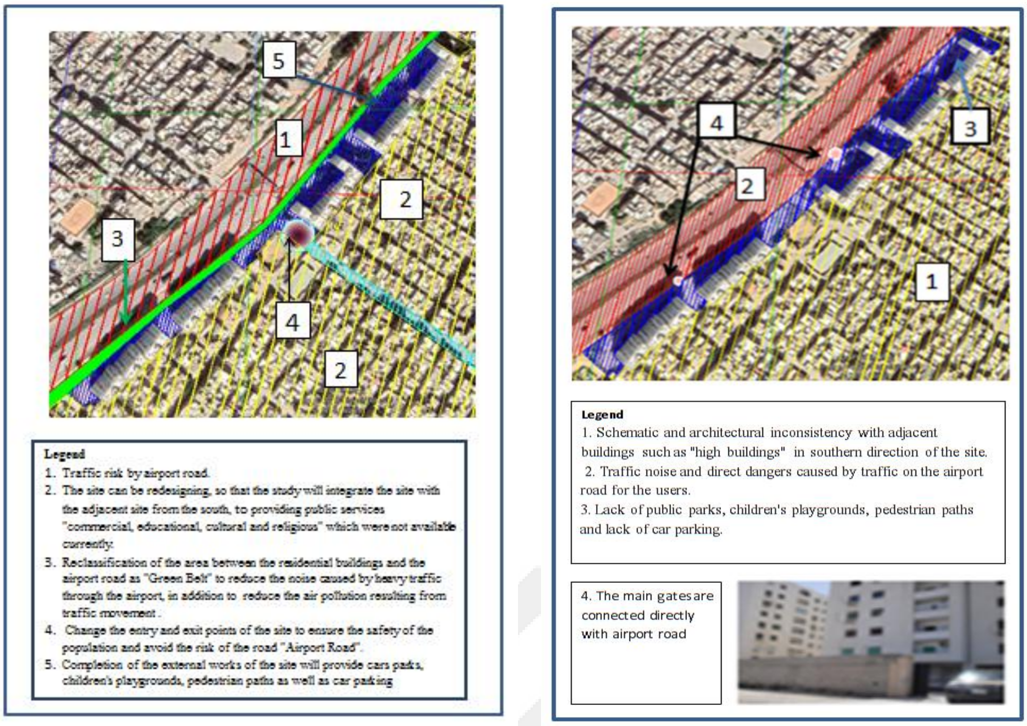


Figure 102: Air- Port Road - East Housing Project SWOT Analysis

The following Table 30 and the Figure 104 expand (SWOT) analysis of Ghot Ash - Ahaal Site.

Table (30) Ghot Ash - Ahaal Site SWOT Analysis

NO	Site Name	SWOT Points
3	Ghot Ash - Ahaal	• Strength -Distribution and harmony of buildings and design of dwelling units inside the site. - The security and privacy of the community. - Safety pedestrian paths inside the site
		• Weaknesses -Lack of car parking and children's playgrounds inside the site. - Lack of commercial services,(more than 40% were not satisfied). - People with disabilities and the elders have difficulty accessing their place of residence
		• Opportunities -Implementation of the regulations and laws governing the management of residential buildings such as Law No. 19/1985 on the regulation of common ownership buildings. -Providing public services "commercial, educational " not available on the site.
		•Threats -The existence of an old residential area around the site is socially and environmentally heterogeneous -Unsafe traffic to and from the site

Figure 103: Ghot Ash - Ahaal Site Housing Project SWOT Analysis

The following Table 31 and the Figure 105 expand (SWOT) analysis of Souq- Atolata (North) Site.

Table (31) Souq- Atolata (North) Site SWOT Analysis

NO	Site Name	SWOT Points
4	Souq- Atolata (North)	•Strength -Distribution and harmony of buildings and design of dwelling units inside the site. - The security and privacy of the community. - Safety pedestrian paths inside the site -Availability car parking, children's playgrounds. -Availability of commercial services in the site
		•Weaknesses -Lack of educational services near the site, more than 60% of respondents were not satisfied with public services. -Considering the location within the commercial center of the city of Tripoli, the cost of the dwelling unit is so high compared to other sites, so housing will not be available for medium and low-income people.
		•Opportunities -Implementation of the regulations and laws governing the management of residential buildings such as Law No. 19/1985 on the regulation of common ownership in buildings.
		•Threats -The existence of a commercial-residential area around the site is not homogeneous. - The movement of unsafe traffic to and from the site especially for children and the elderly.

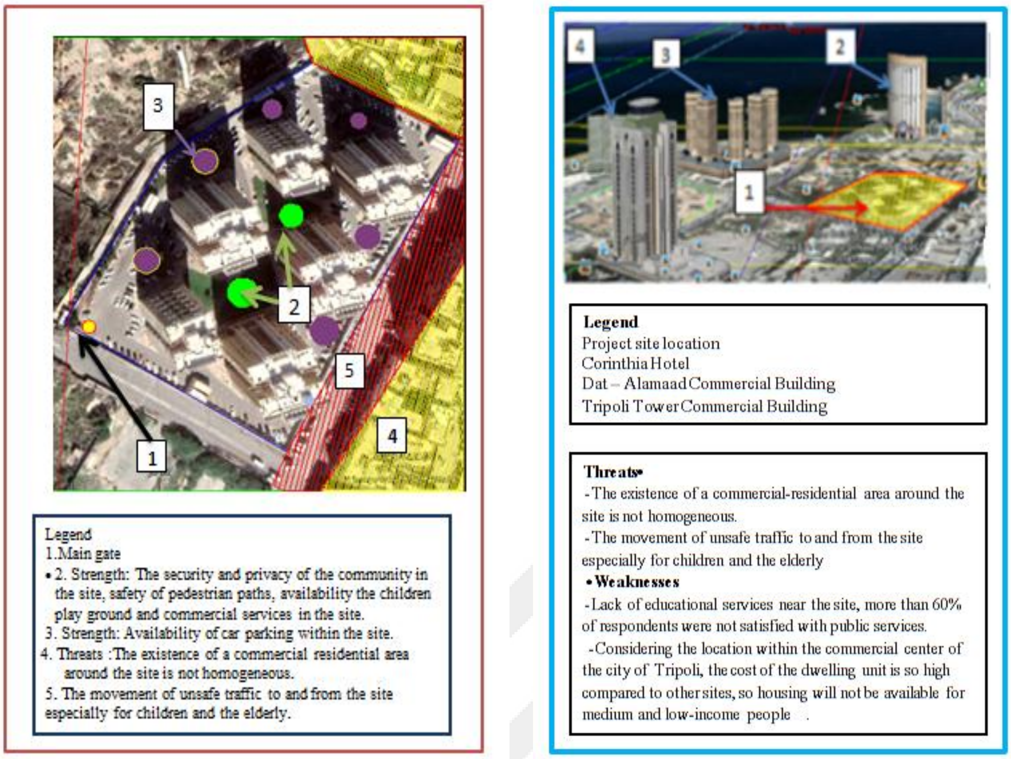


Figure 104: Souq- Atolata (North) Housing Project SWOT Analysis

CHAPTER VII

EVALUATION AND DISCUSSION

The major aim of this thesis is to assess the possibility of applying the principles of the sustainable housing policy in Tripoli as a case study in Libya. The methodology was used (See chapter V) including the field survey by using two types of questionnaires, one of them for professionals to examine their role and experience concerning the harmonious with the goals of sustainable development as protection of natural resources (Brundtland, 1987). Also, the economic design is required for achieving eco-efficiency and reducing whole-life construction costs in terms of size, management, and cost of energy, materials consumption, maintenance, and infrastructures. Such as urban transport, recreational facilities, and industrial zones for achieving sustainable housing (Oyebanji, et al 2017), for purpose of defining the sustainable housing policy in Tripoli, Libya. The other questionnaire for users of houses, including four implemented housing projects in the city of Tripoli as the thesis case study, also, for assessment of the satisfaction of the users of the housing projects. This could achieve the meaning of the sustainable house as cost-efficient over time, comfortable, cheap to maintain and complements our environment (Queensland Government, 2004). That is characterized by the minimization of the environmental impacts of material use, energy consumption and water consumption during the whole service life of the building. Also, implementing comfortable and healthy living environments (Alrimmawi, et al, 2007). The results of data analysis were evaluated and discussion and presented as the following:

7.1. The evaluation of the Professionals Questionnaires

The total number (153 questionnaires) were receive, about 70% of the total questionnaires (220) of professionals' questionnaires was distributed to the government agencies during the field survey, (see chapter VI 6.1.1), The questionnaires' analysing generated data shows that the reliability of the Likert

Scale used in data collection in this thesis achieved an acceptable internal consistency and reliability with a Cronbach‟s alpha coefficient of 0.843 for the 38 items important. The test value used is the midpoint of a four-point scale namely (2.5) See appendix B Table (B.10). After the data analysis of themes questionnaires, that including objectives in sustainable housing, success factors the in implementing sustainable housing, expected results in implementing sustainable housing, assessment of previous housing policies, impediments in implementing sustainable housing, evaluation factors of future sustainable housing implementation and the results was the discussed as follows:

7.1.1. Objectives of Sustainable Housing

This section aims to research those objectives that have the importance of the sustainable housing policy. The mean values range from 2.88 for the objective reduction of health service expenses to 3.57 for the objective benefit from rainwater. These results proved that all the respondents considered these 10 objectives to be important to sustainable housing policy. As for the ranks of the 10 objectives in all respondents had different knowledge. Through the results of the field survey and the analysis of the professional's questionnaire as the following:

a. The Utilization of Rainwater

-The utilization of rainwater, a proven prioritized rank among the goals of sustainable housing. That is congruent with results researches adopting the concept of sustainability and conservation of water resources, can help to cope with the global water shortage, see appendix B Table (B.11).

- And the rainwater harvesting system is one of the concepts that can be implemented to meet the water shortage problem. Also, the respondents of the study agree that rainwater harvesting can reduce the water bill.

b. The Recycle of Sewerage Treatment

-It is noticeable that the recycle of sewerage treatment,

-Solar energy was the least selected construction success factors. This can be due to the high cost of installing solar panels or water treatment and collection tanks as well as the high maintenance cost of such systems (Mohammed, et al, 2013).

c. Reducing the Expenditure of Health Services

While the respondents result in reducing the expenditure of health services, came in the least rank, the reason for this is that many professionals have no adequate knowledge about the objectives of sustainable housing. In addition, these objectives consider as part of the criteria measuring sustainable housing (Abu Bakar, et al, 2010).

7.1.2. Success Factors of Implementing Sustainable Housing

Professional questionnaire consists of some questions concerning the factors of implementing, impediments, and success, the following evaluation and discussion of success factors of implementing sustainable housing.

a. Political and Administrative Stability Factors

The success factors in implementing sustainable housing to research those factors that have the importance of sustainable housing. The mean values in a range from

3.45 for the success factor usefulness to real estate investors to 3.71 for the administrative and political stability factor, which consider one of a main factor for of reasons of the housing problem in Libya, see appendix B Table (B.12). These results proved that all the respondents considered these 7 factors to be a success in sustainable housing. As for the ranks of the 7 success factors in all respondents had different ranks and roles.

-The success of factor for administrative and political stability comes first rank and the standards and regulations related to design and implementation success factor stated as the second rank of success factors as important factors, these factors have some commonality between them confirmed with other conclusion researches. Also, the government support and participation are required in the form of implementing laws and regulations that can impose sustainable means, provide incentives for affordable sustainable housing. According to feedback from the participants of the questionnaire;

b. Availability of Specialized Technical Personnel

-The availability of specialized technical personnel such as execution technicians success factor comes in third rank success factor and the availability of building materials required in the local market in the fourth success factor, that is harmonious with our common future report of the commission (1987) a technical system that is constantly able to search for new solutions"(Brundtland, 1987).

The natural resources as a construction material are the most sustainable material for housing, not only in Libya but in most of the world. Also, more efficient use of materials, reducing waste and removing it responsibly, additional to that the sustainable housing is characterized by the minimization of the environmental impacts of material use, energy consumption, and water consumption during the whole service life of the building (Abu Bakar, et al, 2010 as cited from Hendriks, 2001).

c. The Availability of Data and Information Success Factors

The availability of data and information success factors is among the fifth place for success factors in sustainable housing. While the availability of sensitization for the population and stakeholders are among the top 6 ranked success in sustainable housing, concerning the lack of public awareness, Al Surf (2013) as cited from Salama, 2007, has stated in his paper this barrier will be the main obstacles in the way of developing the country in general and in the development of sustainable housing in specific. Additionally, public unawareness of the benefits and potential of smart technologies to achieve sustainability is again another hurdle in the way of sustainable housing construction. Also, stakeholders" participation by involving them in the development process and encourage community participation in decision- making activities (Oyebanji, et al, 2017). There is a need to educate the public on the benefit of sustainable housing and public awareness, the need to educate the public on the importance of sustainable housing. Government awareness and implications need to educate the government sector and push for regulations (Mohammed, et al 2013).

The outcome of the analysis of the usefulness for the success factor of the real estate investor was ranked seventh and the mean (3.55). Success factors have become barriers, according to the results of this thesis, the barriers to sustainable housing in Libya, such as expecting the high cost of sustainable housing, a long period of return on investment and low levels of investment in sustainable housing. In this thesis comes real estate investment in the last rank may be the reason for the lack of guarantees for the rights of housing investors over the past decades.

7.1.3. Expected Results of Implementing Sustainable Housing

The expected results of implementing sustainable housing according to the questionnaire analysis have shown that:

1. According to questionnaires results show that the highest mean positive difference in being the most eminent (1.12). This assures that the implementation of housing sustainable will contribute to the protection of the environment protection by implementing sustainable housing.

2. The second rank was the contribution to the protection of the national economy, the analysis results are confirmed that implementing sustainable housing expected to contribute to the protection of the national economy, results show that the mean positive difference in being eminent (1.007).

3. With regard to the use of modern and contemporary technologies, the results show that, also, the average positive difference (.974) is expected to contribute to the implementation of sustainable housing.

4. The results showing that the mean difference in being important expected results (.944) about implementing sustainable housing will contribute to the development of solutions to the problem of housing.

5. The professional respondents expected that implementing sustainable housing will contribute to the development of solutions to social problems, had the lowest mean difference in being the least important expected results (.858).

By discussing the above conclusions, it is clear that Libyan professionals are ready and able to implement sustainable housing. This is the starting point for starting the implementation of a sustainable housing policy in Libya.

7.1.4. Assessment of Previous Housing Policies

The results regarding assessment housing policies of previous governments can be included as follows:

- Administrative and financial corruption in the state had the highest mean positive difference in being the most eminent (.605).
- Distribution of housing projects between cities was the second rank, (-.303) eminent in the assessment of previous housing policies.
- Non-adherence of previous governments to housing policies was the last rank, had the lowest negative mean difference in being the least eminent in the assessment of previous housing policies (-.303).

The above conclusions confirmed that, the reasons for the unsuccessful housing policies of the previous governments and therefore should not be repeated in the future by:

- Emphasizing the political and administrative stability of the state;
- Emphasizing social justice in the formulation of housing policies;
- Fighting administrative and financial corruption by enacting legislation and applying it to all segments of society;

7.1.5. Impediments in Implementing Sustainable Housing

Regarding the impediments in implementing, sustainable housing can be included as follows results:

1. Studies and adoption of urban plans had the highest mean difference in being the most eminent impediment (.763).which has the strongest effecting impediments in implementing sustainable housing.
2. Laws and regulations with regard to private sector investment (.737) which has to import effecting impediments in implementing sustainable housing.
3. Lack of local implementation tools, the local environmental policies, and implementation prices offered by foreign companies had mean differences in being an eminent impediment (.664, .612, .480) which considered within impediments in implementing sustainable housing.
4. Social habits and traditions had the lowest negative mean difference in being the least eminent impediment (.283), which has the lowest effect as the impediments in implementing sustainable housing.

7.1.6. Evaluation Factors of Future Sustainable Housing Implementation

According to the analysis of the results the evaluation factors of future sustainable housing implementation conclude the following:

According to the analysis of questionnaires, results for evaluation factors the implementation of sustainable housing in the future conclude the following:

1. Develop and support the performance of the :

- Urban Planning Authority
- General Authority for Housing had the highest mean difference in being the most eminent evaluation factor (1.224).

2. The development of housing laws and legislation leading to sustainable housing access had the second mean difference rank in being the most eminent evaluation factor (1.151).
3. Encouraging technical research in the field of sustainable housing had the third mean difference rank in being the most important evaluation factor (1.132).
4. Encouraging technical research in the field of housing, domestic implementation tools in partnership with global implementation tools, and

Banks' contribution to the development of the housing sector, including housing loans for citizens and real estate investment companies in the field of sustainable housing had the same range of mean difference rank in being the least important evaluation factor (1.086, 1.026, and 1.020).

5. Establishment of an institutions to develop and follow-up the participation of the private sector in the field of investment in the housing had the lowest negative mean difference in being the least eminent evaluation factor (.967).

To discuss the previous conclusions (clauses 7.2.4 and 7.2.5), it is clear that most of the obstacles to the implementation of the sustainable housing policy are the result of a lack of specialized technical authorities with technical capacity with regard to the expertise and powers that enable them to fulfill their role and achieve their goals. The authorities are:

-Urban planning authorities and their most important tasks, the preparation of planning studies at various levels, in addition to the approval of development plans at the national and regional levels, including the competence to propose laws and legislation to ensure the performance of its work and achieve its objectives.

-The Public Authority for Housing and its main functions, preparing designs for sustainable housing projects, proposing laws and legislations to perform its tasks and objectives, in addition to supervising the implementation of housing projects in the country, in addition to encouraging the private sector to invest in the field of sustainable housing.

-The National Authority for Urban Development and Investment, one of the most important tasks of overseeing the implementation of urban plans in coordination with the relevant authorities in the field of sustainable housing;

Establishment of a new institution for the planning and construction of sustainable collective housing, the main competence of which is the preparation of regulations for the implementation of sustainable housing laws and direct supervision of the implementation of sustainable housing policy in Libya;

7. 2.The Evaluation of the User's Questionnaires

The evaluation of the user's questionnaire in this thesis is a result of the analyses of users questionnaire information, which consists of five main axes with the main heading are distributed as follows:

- Users satisfaction;
- Suitability of user house;
- Using the user for some spaces in his/her house;
- Future prefer house for the user in terms of the type of house which likes to live in;
- What extent the user's house needs modifications of the design to suit his needs? The conclusion of the user's questionnaire in this thesis is a result of the analyses of users questionnaire information, which consists of five main axes with the main heading are distributed as follows:

- Users satisfaction;
- Suitability of user house;
- Using the user for some spaces in his/her house
- Future prefer house for the user in terms of the type of house which likes to live in;
- What extent the user's house needs modifications of the design to suit his needs?

As results, the questionnaire covered the entire above axes for a sample of housing users from four sites of the case study, and the finding was divided into the following:

- **Environmental Results Evaluation**

- Availability of public utilities was the fourth-ranking with rate of 35.6% of total respondents were not satisfied and highly not satisfied rate of 18.9% of total respondents,
- External noise within the houses had 63 of total respondents, equal to (47.7%) were unsuitable and 22 of total respondents, about (16.7%) of respondents were highly unsuitable.
- Always using the windows for ventilation in the morning was of the rate 65.2% of users and 29.5 % of the respondents were sometimes. While using the windows for ventilation in the afternoon was in the rate of36.4% of

respondents were rarely. For this reason was the (AC) air-condition the highest-ranking had 72% of the respondents' users were always using AC for cooling.

- Using the kerosene for heating was the highest rank was at the rate of 97% was Always of the respondent's users. But using coal for heating was at the rate of 84.8% of respondents.

Using window blinds had the highest rank at the rate of (71.2%) of total respondents to prevent entry excessive sunlight.

- **Social Results Evaluation**

- The user's survey on the frequency and rate of percent' opinions of user's houses for strengthening social relationships in the case study rate of 75% of respondents were not satisfied and highly not satisfied, while the rest of the respondents 25% were satisfied and highly satisfied.
- Concerning favorite houses for users, rate (42.4%) of respondents were unsuitable and, about (7.6%) of respondents were highly unsuitable.
- The availability of services for users. Concerning the availability of public services that the most of respondents were not satisfied rate of 40.2 % of total respondents, and highly not satisfied rate of 13.6% of total respondents, While availability of using common spaces (staircases, elevators), were satisfied rate of 39.4 % of total respondents, and highly not satisfied, 24.2% of total respondents;
- The availability of public transportation was the third rankings were highly not satisfying rate of 31.8 % of total respondents, and not satisfied rate of 27.3 %.
- Availability of commercial services was the last ranking were rate of 7.6% of total respondents highly not satisfied, and rate of 33.3% of respondents were not satisfied.
- About (54.5%) of respondents were their houses unsuitable during religious and social events and about (6.8%) of respondents were highly unsuitable.
- Concerning the privacy within the houses had a rate (50.8%) suitable, but, about (25%) of respondents were unsuitable privacy within the houses.
- Suitability of neighborhood relations had (40.2%) were suitable, while the rate (24.2%) of respondents was unsuitable.
- The most respondents (about 47% to 53.8%) of respondents were their houses unsuitable and (16.7 % to 33.3 %) were their houses highly unsuitable with the

environmental suitability. For example, the effect of means for heating rate (53.8%) of respondents was unsuitable and, about (16.7 %) of users respondents were highly unsuitable, as a total of more than 70% of users were not satisfied about their houses.

- Use the balconies at different times by users. Where during the morning time was the always is the highest percent 43.8 % of the respondents users, and the second- ranking often used the balconies in during the morning 28.8%, also the most of respondents users were rarely had percent 60.6% of respondents using the balconies in their houses during the night, and 25% of respondents were sometimes. While using the balconies during the evening was the third-ranking.
- Using the balconies in houses, noted that 94 % of respondents were using the balconies for drying laundry. But rate 6% of respondents using balconies for. Also, using the balconies for rest and recreation had rarely used 32.6 %, and 10.6 % of respondents always. While the use of the balconies for other purposes (storage, child's play) had rarely as high percent 47% of the respondents, and sometimes 28.8%.
- Concerning the types of houses which users prefer to live in was the modern villa was the highest rank prefers of total respondents, at the rate of (97.7%) of the respondents, and the separate traditional courtyard house was second with an average of 60.6% of respondents. But the type of apartment in an apartment building was ranked third, with a rate (28.1%) of total respondents users. The reason was the suitability of the house type for the Libyan family social life.
- The modifications done by the users in their houses the first ranking was adding an area for some spaces at a rate of 56.8% of the respondent's users. And second ranking was done for guest spaces at the rate 21.2% of the respondent's users, while modifications were done for sleeping spaces.at a rate of 9.8% of the total respondent's users.

  - The more pleasing side of the house was the living spaces at the rate of 44.7 % of the respondents. While the less pleasing side of the house was sleeping spaces at the rate of 37.9% of the respondents.

- **Economical Results Evaluation**

- The results of the payment of bills suitability for users' houses, illustrates the suitability of bills electricity services as highest-ranking had 48.5% of respondents the payment of electricity services were unsuitable, and 13.6% of respondents the payment of electricity were highly unsuitable, while 32.6% of respondents the payment of electricity suitable and highly suitable were just 5.3 %.

7.2.1. Environmental Sustainability

The following summary of thesis research results concerning environmental sustainability:

1. The environmental suitability was a rate of (47% to 53.8%) of respondents was their houses unsuitable environmentally and (16.7 % to 33.3 %) were highly unsuitable environmentally.
2. The effect of means for heating had 93 of the total respondents, rate of 70.5% of respondents were unsuitable.
3. The sunlight inside the user's houses had 106 of total respondents; the rate of 80.3% of respondents was unsuitable. While suitability to climate conditions had 84of total respondents, about 63.7% of respondents were their answers to the unsuitable sunlight inside their houses.
4. The (AC) air-condition was the highest-ranking had a rate of 72% of the respondents,
5. Using windows for ventilation in the morning had the highest percent 65.2% of the respondents. And a rate of 67.4% of total respondents was rarely using the windows at night. And the second was the natural ventilation rate of 31.1% of total respondents.
6. Using the kerosene for heating was the highest-ranking had a rate of 97% of the respondents; the second was using coal for heating had 84.8% of total respondents.
7. The precautions used by houses users to prevent entry excessive sunlight inside their houses were using windows blinds had the highest-ranking had 94 of total respondents, rate of 71.2% of the respondents.
8. Protection of natural resources like;

- Conservation of water resources can help to cope with the global water shortage;
- Achieving Eco-efficiency and reducing whole-life construction costs in terms of; Cost of energy (solar energy),Materials consumption, Maintenance and infrastructures, The utilization of sewerage treatment;

9. As expected results of implementing sustainable housing will contribute to the protection of the environment;

7.2.2. Social Sustainability

The following summary of thesis research results concerning social sustainability:

1. The user's survey on the availability of services illustrates that most of the respondents were unsatisfied.
2. The availability of public transportation was unsatisfied.
3. The satisfied level availability of commercial services was the rate of 59.1% of total respondents, and unsatisfied level rate 41.1% of total respondents.
4. The suitability of houses for the users. It is shown that 72 of the total respondents, rate of 61.3% of respondents were their houses unsuitable during religious and social events, and a rate of 38.7% of total respondents were their houses suitable during religious and social events.
5. The external noise within the house was 85 of total respondents, a rate of (64.4 %) was unsuitable, and a rate of 35.6% of total respondents was the external noise within their house was suitable.
6. Concerning the privacy within the houses was 67 of total respondents about 50.8% of total respondents the privacy within the houses was suitable, but 33 of respondents, rate 25% of respondents was their answers unsuitable privacy within their houses.
7. The suitability of neighborhood relations, rate 71.9% of total respondents was their houses suitable for neighborhood relations, and 28.8% of respondents were their houses unsuitable for neighborhood relations.
8. The government prepares plans to raise awareness and educate the people about the importance of sustainable housing by:
   - Enact laws, and regulations governing the establishment of sustainable housing,
   - Supporting investors in the housing sector and giving them financial and moral incentives,
   - The introduction of sustainable housing within the curricula of the departments of architecture and urban planning in Libyan universities,
   - Utilization of rainwater harvesting can reduce the water bills,
9. Achieving the requirements and needs of families (privacy and user comfort),

10. As expected results of implementing sustainable housing will contribute to the development of solutions to the problem of housing,

11. As expected results of implementing sustainable housing will contribute to the development of solutions to social problems,

7.2.3. Economical Sustainability

The following summary of thesis research results concerning economic sustainability:

1. The payment suitability system of electricity services bills was unsuitable of rate 62.10 % of respondents, while the suitability of payment electricity services bills was 37.9% of respondents.
2. The payment of water services bills and the payment of communication services bills had the same ranking of suitability, where rate 52.3% of total respondents were suitable and rate 47.7% of total respondents the payment of water services bills were unsuitable.
3. As expected results of implementing sustainable housing will contribute to the protection of the national economy,
4. Utilization of rainwater harvesting can reduce the water bills,

7.3.Evaluation of SWAT analysis

The evaluation of SWAT analysis in this thesis provides the results of the analysis of field survey of case sites information, which consists of four main axes with the main heading are distributed as follows;

1. Strengths;
2. Weaknesses; and are limited by internal factors;
3. Opportunities;
4. Threats**,** and are limited by the external factors;

As general evaluation of the analysis summarized as follows:

- **Strengths**; all four sites as plans are distribution and harmony of buildings and design of dwelling units inside the sites;
- **Weaknesses**; except Souq- Atolata (North) Site, which lacks parking areas and children's playgrounds inside the site;
- Lack of commercial services, (more than 40% were not satisfied);
- People with disabilities and the elders have difficulty accessing their place of residence.

- Opportunities; most of sites have development possibility after details design to a achieve opportunities of the sites like:

-Most of sites have development possibility after redesign and details studies to a achieve opportunities of the sites like :

-Integrate the site with the adjacent site, as they are separated with the roads around the sites, and old residential area, in order to achieve the following objectives:

-Change the entry and exit points of the site to ensure the safety of the population and avoid the risk of the road , especially the airport road site.

-Reclassification of the area between the residential buildings and the main roads as "Green Belt" to reduce the noise caused by heavy traffic and also to reduce the air pollution resulting from traffic movement.

-Implementation of the regulations and laws governing the management of residential buildings such as Law No. "19/1985", a regulation for common ownership for buildings .

- Providing public services "commercial, educational, cultural and religious" which were not available currently for all sites;

-**Threats;** presence of the main roads nearby the sites causes a direct danger to the lives of the population, especially with respect to:

-Points of entry and exit to and from the sites؛

-Noise resulting from vehicle traffic؛

-The existence of an old residential area around the sites is socially and environmentally heterogeneous;

-Failure to complete the external works of the site (Airport road east and AL- hadba khdra site) and the consequent threats to the population, especially children, the elderly and the disabled people;

7.4. Suggestions and Results

According to analysis results of the questionnaires covered for a sample of housing users from four sites of the case study, and a sample of the professional's questionnaires, the findings were divided into the following:

7.4.1. Housing Sustainability

Sustainability architectural buildings and site planning as the following summary:

1. Using balconies during different times at the day, noted that the using balconies during the morning were the always is the highest percent had 34.8 % of total the respondents and the second has often a rate of 28.8% of total respondents.

And the rate of 37.10% of total respondents was sometimes using the balconies during the afternoon. While the rate of 60.6% of total respondents was rarely using the balconies at night;

2. Using the balconies for a different purpose in their houses noted that always the highest-ranking rate of 65.2 % of the respondent's users was using the balconies for drying laundry. And the rate of 43% of total respondents was rarely using balconies for rest and recreation, but the rate of 55% of total respondents was using the balconies for ventilation. While the rate of 62 % of total respondents was rarely using the balconies for other purposes (storage, child's play);
3. The types of houses in which users prefer to live in the modern villa were the highest-ranking had 77 of total respondents, a rate of 58.3% of the respondents. While the users prefer to live in detached traditional courtyard house was the highly agree had 47 of total respondents, a rate of 35.6% of the respondents.
4. Some types of houses prefer by users. The results were the type of houses more suitable for the Libyan family social life; the highest-ranking had 126 of total respondents, a rate of 95.5%of the total respondents.
5. Modifications done by the users in their houses were the highest-ranking had 75 of total respondents, a rate of 56.8% of the respondents were added an area for some spaces. And second ranking was guest spaces, a rate of 21.2% of respondents.
6. The more pleasing side of the house was the living spaces had the highest ranking of 59 of total respondents, a rate of 44.7% of the respondents. While the less pleasing side of the house was sleeping spaces the highest-ranking had 50 of total respondents, a rate of 37.9% of the respondents.
7. For the successful implementation of sustainable housing, the following factors need to be considered :

- Administrative and political stability,
- Standards and regulations related to design and `implementation,
- Availability of specialized technical personnel such as execution technicians,

-Availability of building materials required in the local market.

7.4.2. The Evaluation of the Housing Policies Implementation

1. All the respondents considered the 10 objectives are important, but the following objectives to be most important to sustainable housing policy:

-Benefit from rainwater

-Waste recycling

-Limit power consumption

2. The following success factors of implementing sustainable housing that have the most effecting:

-Standards and regulations related to design and implementation;

-Availability of specialized technical personnel;

-The administrative and political stability;

3. The expected results of implementing sustainable housing could summaries as:

-Implementation of housing sustainable will contribute to the protection of the environment protection;

-Contribution to the protection of the national economy;

-Use of modern and contemporary technologies;

4. Regarding the results of assessment housing policies of previous governments can be included as follows:

-Administrative and financial corruption in the state;

-Distribution of housing projects between cities;

-Non-adherence of previous governments to housing policies;

The above conclusions confirm that, the reasons for the unsuccessful housing policies of the previous governments and therefore should not be repeated in the future by:

-Emphasizing the political and administrative stability of the state;

-Emphasizing social justice in the formulation of housing policies;

-Fighting administrative and financial corruption by enacting legislation and applying it to all segments of society;

5. Concerning the impediments in implementing sustainable housing can be included as follows most impediments results:

-Lack of interest and delayed studies and the adoption of urban plans

-Laws and regulations with regard to private sector investment

-Lack of local implementation tools

6. The results the evaluation factors of future sustainable housing implementation conclude the following:

-Develop and support the performance of the Urban Planning Authority and General Authority for Housing;

-Development of housing laws and legislation leading to sustainable housing access;

-Encouraging technical research in the field of sustainable housing;

-Encouraging technical research in the field of housing;

-Encouraging domestic implementation tools in partnership with global implementation tools;

-Requiring banks to contribute to the development of the housing sector, including housing loans to citizens and real estate investment companies;

-Establishment of an institutions to develop and follow-up the participation of the private sector in the field of investment in the housing;

7. To avoid repeating the unsuccessful housing policy mistakes of previous governments, it is necessary to emphasize:

-Emphasizing the political and administrative stability of the state,

-Social justice in the formulation of housing policies,

-Fighting administrative and financial corruption by enacting legislation and applying it to all segments of society;

CHAPTER VIII

CONCLUSION AND PROPOSALS

This thesis, which is about sustainable housing policy in Libya, has studied applying the principles of sustainable housing by using a case study in Tripoli. The thesis started with a review of the concept of sustainability, which is considered as the cornerstone of the global dialogue, in future in all aspects of human life. There are many questions that stakeholders cannot answer about their role in sustainable housing, to achieve the goals of Agenda 21. The aim was to achieve the overall goal of human settlements and to improve the social, economic and environmental quality of human settlements, as well as to create high living standards for the working environments of all people. Housing and urban issues are linked to the concept of sustainability, which is based on environmental, social and economic sustainability dimensions, for the purpose of achieving principles of sustainability as a part of housing policy. The main objective of the thesis is to achieve housing sustainability by taking the advantages of all factors and harnessing them for the policies at the level of the settlements, and through them it be applied to the other levels as well (housing neighborhoods, housing districts city, region and national level).

The Libyan houses had been influenced by several environmental, social and economic factors which have determined the types of houses and functions of different spaces in the houses. Identity and meaning of the house for the Libyan family and the culture had also shaped the quality and type of the house that a Libyan family find suitable. Housing policy is concerned with what is (or is going) to be done to provide housing (Mumtaz, l995), and it’s an important issue in social and economic development plans in Libya as it is in most developing countries. To achieve the objectives of the thesis, the structure followed the methods that had been followed in many academic research areas. Through a review of the thesis problem and its hypotheses, the research method was divided into two types; the first type is theoretical, including the literature review studies of the subject of the thesis in this field. The second type is empirical, which includes a case study of four implemented housing site projects in the city of Tripoli. The analysis of the information collected through the field survey, which consists of four mass housing area which were utilized by the population in

Tripoli as a case study. The analysis of the information gathered by the questionnaires, which consist of two types, the professional's questionnaires, the user questionnaires, and the statistical "SPSS" program was used to analyze and evaluate the information for each of them. The major objective of the thesis is to study the possibility of applying the principles of the sustainable housing policy in Tripoli. The methodology that was used (See chapter V) includes the field survey by using two different types of questionnaires, one of them for professionals to examine their role in implementation of sustainable housing and in defining the sustainable housing policy in Tripoli, Libya. The other questionnaire was for users of houses, including four implemented housing projects in the city of Tripoli, for the assessment of the satisfaction level of the users of the housing projects.

8.1. The Main Conclusion

This chapter presents the conclusion of the thesis as a model to implement the proposal principles of sustainable housing policy in Libya, Figure 105. The following conclusions are guidelines of the proposal for the most important authorities specialized in sustainable housing, and their most important objectives:

- Establishment of a new institution for the planning and construction of sustainable collective housing, the main competence of which is the preparation of regulations for the implementation of sustainable housing laws and direct supervision of the implementation of sustainable housing policy in Libya.
- Urban Planning Authority and their most important tasks, the preparation of planning studies at various levels, in addition to the approval of development plans at the national and regional levels, including the competence to propose laws and legislation to ensure the performance of its work and achieve its objectives.
- The Public Authority for Housing Welfare and its main functions, preparing designs for sustainable housing projects, proposing laws and legislations to perform its tasks and objectives, in addition to supervising the implementation of housing projects in the country, in addition to encouraging the private sector to invest in the field of sustainable housing.
- The National Authority for Sustainable Urban Development and Investment, one of the most important tasks of overseeing the implementation of urban

plans in coordination with the relevant authorities in the field of sustainable housing.

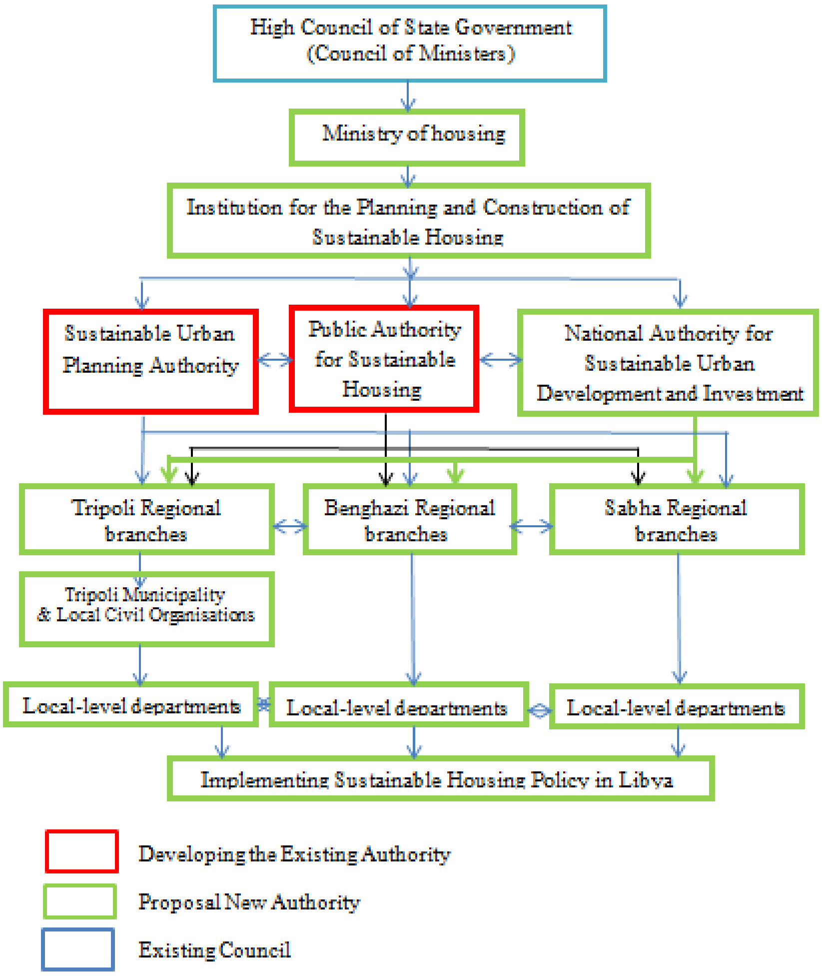


Figure 105: Model Proposed Administrative Organization for the Implementation of the Sustainable Housing Policy in Libya

8.2. Proposals and Further Studies

The recommendations of this thesis include a proposal for a mechanism of implementing and applying a sustainable housing policy for the purpose of solving the problem of housing in Libya, and the reconstruction of cities which were recently affected by the war in the country. I hope that the Libyan government would work to implement it to create a sustainable urban environment in all Libyan cities. The following is the summary of thesis recommendations:

8.2.1. General Proposals

- Implementing the proposed model related to the mechanism of implementing sustainable housing by issuing the legislation regulating to establishment and development of the Authorities that are specified in the model, figure (106).
- For the purpose of achieving user satisfaction and during the design phases of sustainable housing projects, the following are required:
- The designer should respect the heritage of the past and meets the needs of the present. Contemporary architecture should avoid all forms of pseudo-historical design, and the features of tradition old Libyan settlements "Ghadames old town and old city of Tripoli" should be considered during designing phase.
- The needs and desires of the users and their economic potential should be considered,
- Customs and social traditions of the Libyan family should be taken into account,
- Climatic conditions and availability of infrastructure "public services and transportation" during the selection of housing project sites should be considered,
- The importance of political and administrative stability of the state should be stressed, in addition to the importance of decentralization and granting wide powers to authorities on regional and local levels,
- Financial and administrative corruption in the state should be fought and the transparency of decision-making at all levels should be emphasized.
- Investment in the housing sector for both the public and private sectors, as well as private investment in the green buildings industry should be encouraged.
- Attention should be paid on technical cadres in the field of the implementation of sustainable residential buildings, and the scientific level in the field of residential sustainability for professionals and workers in the field of sustainable housing implementation should be raised.

8.2.2. Proposals for the Case Study Sites in City of Tripoli

According to the results of the analysis of questionnaires and SWOT analysis, the following are the summary of recommendations concerning the sites of the case study city of Tripoli.

8.2.2.1. General Proposals

1. Completion of infrastructure (local streets and sidewalks, parking, parks and children's playgrounds) for the sites of AL- Hadba Khdra and Airport Road east;

2. Coordinating the entrances and existing of housing sites, especially for the sites of AL- Hadba Khdra and Airport Road east, to ensure the safety of residents from the rapid traffic of the highway.

3. Implementation of rainwater drainage network to collect the rainwater as a benefit for irrigation of gardens in AL- Hadba Khdra and Airport Road east to achieve part of the principles of housing sustainability;

3. Maintenance of external sewage network for apartments;

4. Granting loans to the users of the dwellings for the purpose of maintaining their housing units according to their needs and requirements which do not have a negative effect on the basics of construction and design of the apartments.

5. Maintenance and development of external lighting network, including the development of lighting poles (use of solar panels technology to operate street and park lighting poles).

6. Activating and develop the Law No. (19/1989) regulating joint ownership of buildings.

7. Implementing the insulation materials for facades of the housing apartments to ensure access to thermal comfort within the housing units, for preventing the entry of sunlight into the residential units, in order to conserve natural energy sources and reduce the use of air conditioning units.

8.2.2.2. Airport Road Site Proposals

Additional to the general recommendation for case study sites, Airport site needs to redesign the layout plan to protect the residents from airport road, which is on the boundary of west side of the site location Figure106. A layout plan for the site which including ideas to develop environment with children playground and parking areas to control the traffic movements, and the site is need to be linked to the surrounding neighborhoods by pedestrian paths (pedestrian bridges or pedestrian tunnels) to facilitate access to some of the services available in these neighborhoods, especially with the airport highway side.

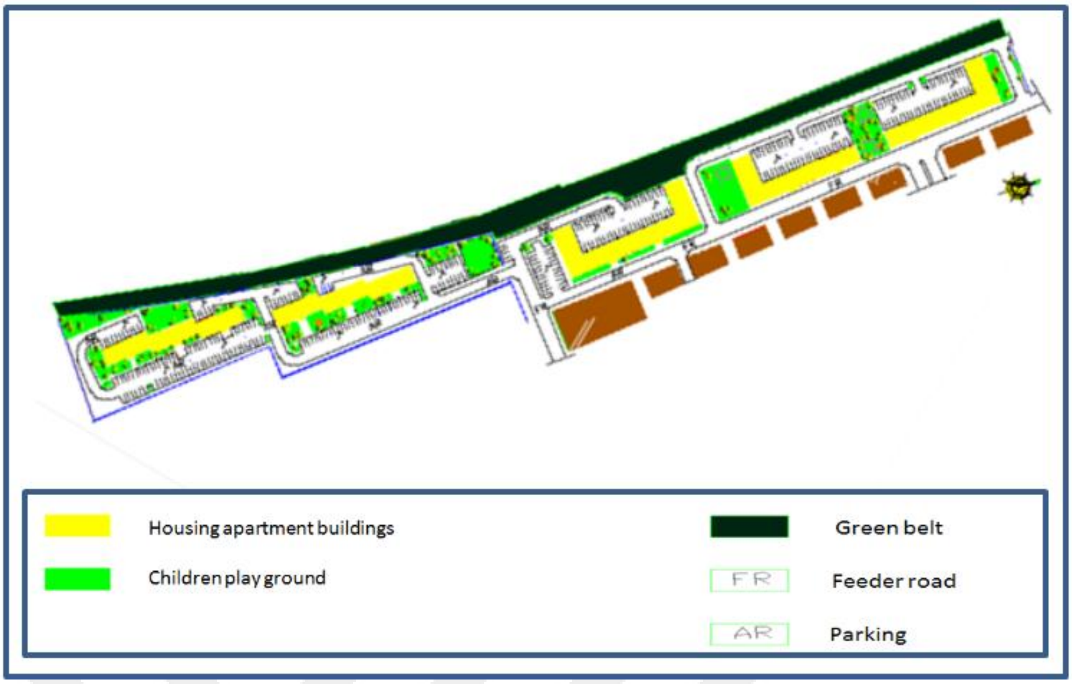


Figure 106: Airport Proposal Layout Plan- Source: Housing & Infrastructure Board, CMHP 2870 - 2018, Redesign by Researcher, 2019)

8.2.2.3. Hadba El Kadar Site Proposals

According to evaluation of SWOT analysis, and additional to the general recommendations, the main recommendations for Hadba Elkadra site are summarized as following:

- Completing the construction of the external works (infrastructure) of the site, and local streets, pedestrian paths, children playgrounds and parking. Figure 107 illustrates Hadba Elkadra site, the layout plan;
- Providing public services on site like parks, children's playgrounds, and pedestrian paths, which had the dissatisfaction of 64% of respondents;
- Encourage the investment with the environment and management of residential buildings.
- Create and implement ramps for the entrances of the housing buildings for disabled and elder users.
- Linking the site to the surrounding neighborhoods by pedestrian paths (pedestrian bridges or pedestrian tunnels) to facilitate access to some of the services available in these neighborhoods.

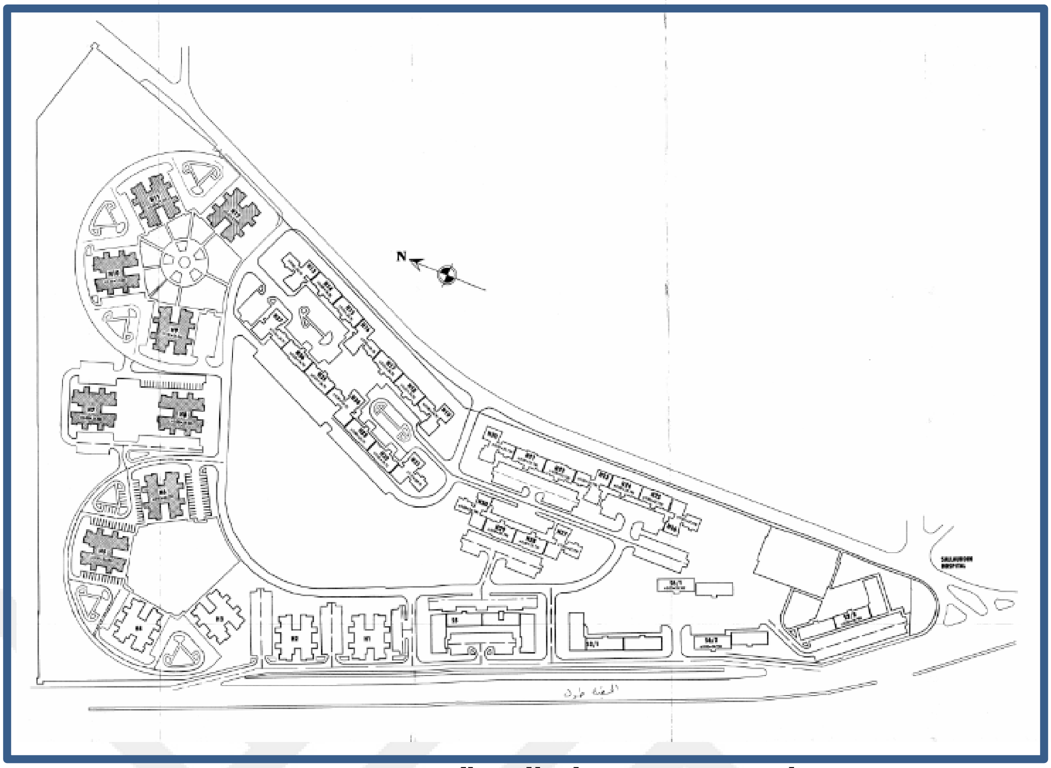


Figure 107: Hadba Elkadra Site Layout Plan

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

8.2.2.4. Ghot Ash - Ahaal Site Proposals

The site was almost completely constructed, except the main feeder streets. Additional to the general recommendations, the main recommendations for Ghot Ash - Ahaal site summarized as following:

- Completing the construction of the external works for feeder streets around the site Figure 108 shows the layout plan of the site.
- Provide parking and children's playgrounds, and commercial services.
- Create and implement ramps as at the entrances of the housing buildings for disabled and elder users.
- Linking the site to the surrounding neighborhoods by pedestrian paths, "pedestrian bridges or pedestrian tunnels", to facilitate access to some of the services available in these neighborhoods.

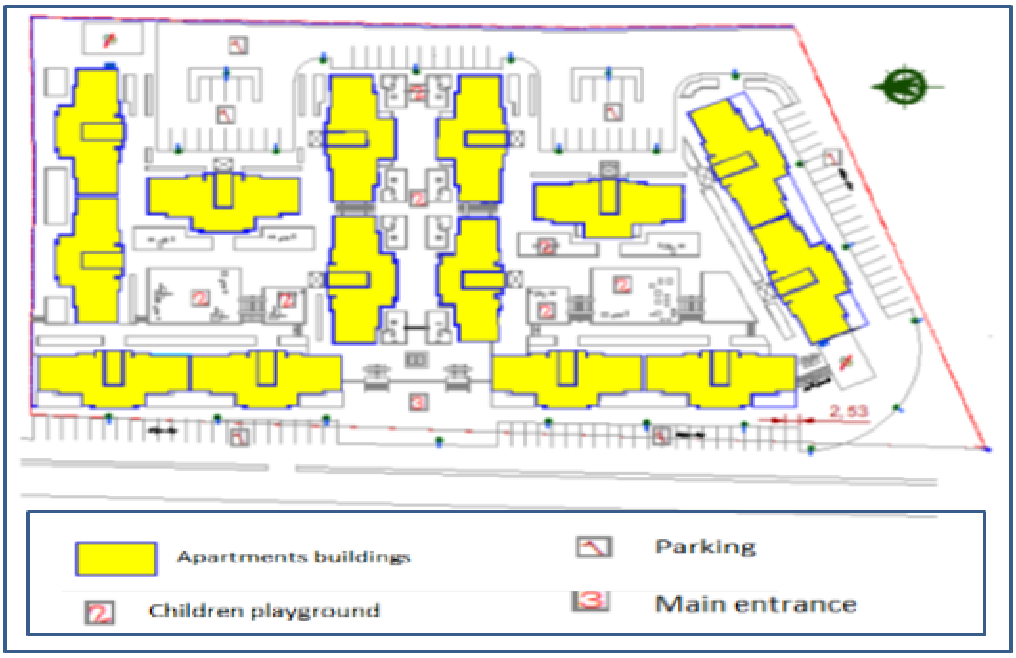


Figure 108: Ghot Ash - Ahaal Site Layout Plan

(Source: Administrative Centers Development Authority - 2018)

8.2.2.5. Souq - Atolata (North) Site Proposals

The site located in the center of Tripoli, and completely constructed as good condition of streets and parking. The site needs to take care of the gardens and provide adequate playground equipment for children. In addition to the general recommendations, Figure109 illustrates the layout plan of the project.

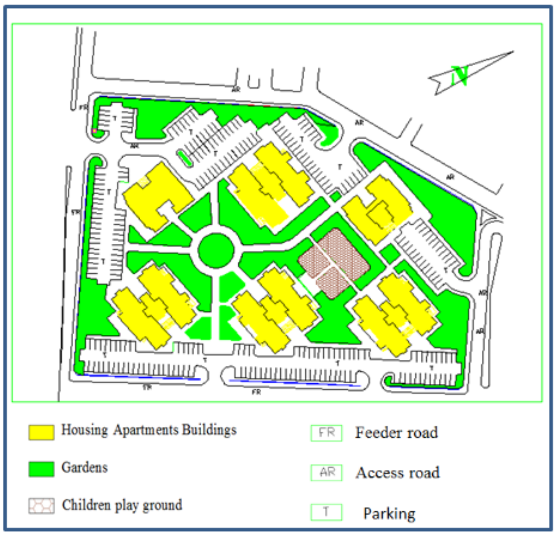


Figure 109: Souq - Atolata (North) Site Layout Plan

(Source: Housing & Infrastructure Board, CMHP 2870 - 2018)

and Redrawing byResearcher.,2019)

8.3. Further Studies

The results, as one of the aims of this thesis as mentioned earlier, indicate that the users mostly are not satisfied with the social, environmental and architectural design of the housing projects in Tripoli. Also, professionals have limited knowledge about housing sustainability due to the lack of guidelines for principles of sustainable housing. These results can be generalized to other countries, just to provide further insight into the influence of a specific country's characteristics.

Future research may focus on the features of old settlements and traditional housing design, compared with housing sustainable principles in terms of materials construction, social traditional style of family life. Therefore, further researchers are required to establish guidelines and guiding principles for designers in order to achieve the desires of the users according to the results of this thesis. Also, further research should pay attention to the possibility of implementing the principles of sustainable housing in Libya and other countries of the world.

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APENDIX A

QUESTIONNAIRES

Çankaya Üniversitesi - ÜNİVERSİTE ETİK KURULU
Tarih: 11.07.2018 09:49
Sayı: 80281877-050.99-E.00000015328

E.00000015328

ÇANKAYA ÜNİVERSİTESİ

REKTÖRLÜK

Sayı : 80281877-050.99
Konu : Etik Kurul Raporu

FEN BİLİMLERİ ENSTİTÜSÜ MÜDÜRLÜĞÜNE

İlgi : 13.06.2018 tarihli ve 58061159-050.03/00000013861 sayılı yazınız.

Enstitünüz İç Mimarlık Anabilim Dalı Tasarım Doktora Programı çalışması kapsamında Libya'nın Tripoli şehrinde uygulanmak istenen "Sustainable and Resilience Housing Policy in Libya: Case City of Tripoli" adlı anketin incelenerek Poje Onay Formu talebiniz, Üniversitemiz Bilimsel Araştırma ve Yayın Etiği Kurulu tarafından değerlendirilmiş ve uygun görülmüştür.

Bilgilerinizi ve ilgiliye bilgi verilmesini rica ederim.

e-imzalıdır
Prof. Dr. Hamdi MOLLAMAHMUTOĞLU
Rektör

Ek: 07.06.2018 tarih ve 137 sayılı Araştırma ve Yayın Etiği Kurulu Proje Onay Formu

Evrakın elektronik imzalı suretine https://e-belge.cankaya.edu.tr adresinden 87eef5f8-ba66-4158-b4ec-48347965bb2e kodu ile erişebilirsiniz.
Bu belge 5070 sayılı Elektronik İmza Kanunu'na uygun olarak Güvenli Elektronik İmza ile imzalanmıştır.

Merkez Kampüs: Yukarıyurtçu Mah. Mimar Sinan Cad. No:4 06790, Etimesgut-ANKARA / Balgat Kampüsü : Çukurambar Mah. Öğretmenler Cad. No: 14, 06530 - ANKARA Tel:0 (312) 233 10 00/1134 / 0 (312) 284 45 00 / 134 Faks:0 (312) 233

"**Sustainable and Resilience Housing Policy in Libya: Case Study Tripoli City**" adlı projesi değerlendirilmiştir.

Proje etik açıdan uygun bulunmuştur.	☒
Projenin etik açısından geliştirilmesi gerekmektedir.	☐
Proje etik açısından uygun bulunmamıştır.	☐

İmzalar:

Etik Kurul Başkanı
Prof. Dr. Nurettin BİLİCİ

Etik Kurul Başkan Yardımcısı
Prof. Dr. Sıtkı Kemal İDER

Etik Kurul Üyesi
Prof. Dr. Erdoğan DOĞDU

Etik Kurul Üyesi
Prof. Dr. Feriha Bilge TANRIBİLİR

Etik Kurul Üyesi
Prof. Dr. Şahap Armağan TARIM

Etik Kurul Üyesi
Prof. Dr. Mehmet TURHAN

Etik Kurul Üyesi
Prof. Dr. Haşmet TÜRKOĞLU

- **PROFESSIONALS QUESTIONNAIRES**

Gentlemen: Professionals and Researchers in the Field of Housing

Greetings and respect

This questionnaire has been prepared by researcher / Omar Ali Al-Ameen, a graduate student in the preparation of a PhD degree in Design Program (Chankaya University, Ankara, Republic of Turkey). The study of sustainable housing policy - case city of Tripoli, the study including four implemented housing projects in the city of Tripoli as a case study of this research. The objective of the study is to evaluate the housing in the projects mentioned and to know the extent of the possibility of benefiting from the application of the principles of sustainability through the social and cultural side in the field of housing for case study and Libya in general.

Your participation will have a great impact on the results of the study, the purpose of this questionnaire is scientific research and your contribution is considered as a success of the study. All information will be treated in full confidence that will be only used for scientific purposes.

Thank you for your kind attention and your response

QI. To what extent do you agree that sustainable housing will achieve the following objectives?

1- Observance of social customs and traditions and provides cultural continuity?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

2 -Taking into consideration the needs of families (privacy and user comfort)?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

3- Reuse of wastewater for non-domestic purposes?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

4 - Benefit from rainwater?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

5 -Waste recycling?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

6 – Limit power consumption?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

7 - Reduction of water consumption?

- Highly agree - Agree - Disagree - Highly disagree

8 -Increase the life of the building?

- Highly agree - Agree - Disagree - Highly disagree

9 -Reduction of health service expenses?

- Highly agree - Agree - Disagree - Highly disagree

10- Reduce consumption of natural resources?

- Highly agree - Agree - Disagree - Highly disagree

Q 2. According to your experience, what do you think about the following factors as factors to help implement sustainable housing in Libya?

11- Availability of sensitization for the population and stakeholders?

- Highly agree - Agree - Disagree - Highly disagree

12- Availability of data and information?

- Highly agree - Agree - Disagree - Highly disagree

13- Usefulness to real estate investors?

- Highly agree - Agree - Disagree - Highly disagree

14- Standards and regulations related to design and implementation?

- Highly agree - Agree - Disagree - Highly disagree

14- Availability of specialized technical personnel such as execution technicians?

- Highly agree - Agree - Disagree - Highly disagree

16- Availability of building materials required in the local market?

- Highly agree - Agree - Disagree - Highly disagree

17- Administrative and political stability?

- Highly agree - Agree - Disagree - Highly disagree

Q 3.To what extent do you agree that the following will be results of sustainable housing in Libya:

18 - Contribute to the development of solutions to the problem of housing**?**

- Highly agree - Agree - Disagree - Highly disagree

19- Contribute to the development of solutions to social problems?

- Highly agree - Agree - Disagree - Highly disagree

20- Contribute to the protection of the environment?

- Highly agree - Agree - Disagree - Highly disagree

21- Contribute to the protection of the national economy?

- Highly agree - Agree - Disagree - Highly disagree

22- Contribution to the use of new and contemporary technologies?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

Q4. What is your implementation assessment of previous housing policies regarding:

23-The commitment of previous governments to housing policies?

- Highly viable ☐ - Viable ☐ - futile ☐ - Highly futile ☐

24- Administrative and financial corruption in the state?

- Highly viable ☐ - Viable ☐ - futile ☐ - Highly futile ☐

25- The distribution of housing projects between cities:

- Highly viable ☐ - Viable ☐ - futile ☐ - Highly futile ☐

Q 5. To what extent do you think that the following factors have negatively affected the success of previous Libyan housing policies?

26- Laws and regulations with regard to private sector investment and ownership in the housing sector?

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

27- Studies and adoption of urban plans:

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

8- Implementation prices offered by foreign companies

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

29- Lack of local implementation tools:

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

30- The local environmental policies:

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

31- Social habits and traditions:

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

Q 6. To what extent do you agree that the following factors can be used in the evaluation of sustainable housing policies?

32-Development of housing laws and legislation leading to sustainable housing access:

- Highly agree ☐ - Agree ☐ - Disagree ☐ - Highly disagree ☐

33- Develop and support the performance of the Urban Planning Authority and the General Authority for Housing:

- Highly agree - Agree - Disagree - Highly disagree

34-Establishment of an institution to develop and follow-up the participation of the private sector in the field of investment in the housing:

- Highly agree - Agree - Disagree - Highly disagree

35- Banks contribution to the development of the housing sector, including housing loans for citizens and real estate investment companies:

- Highly agree - Agree - Disagree - Highly disagree

36- Domestic implementation tools in partnership with global implementation tools.

- Highly agree - Agree - Disagree - Highly disagree

37- Encouraging technical research in the field of housing:

- Highly agree - Agree - Disagree - Highly disagree

38- Creating consciousness in the users, managers and investors:

- Highly agree - Agree - Disagree - Highly disagree

Thank you for your precious time and for answering the questionnaire.

For any questions please call the researcher, and you are welcome to do so anytime:

E-mail……………………………………..…

Researches: Omar Ali Alameen

- **USERS QUESTIONNAIRES**

Gentlemen Citizens

Greetings and respect

This questionnaire has been prepared by researcher / Omar Ali Al-Ameen, a graduate student in the preparation of a PhD degree in Design Program (Chankaya University, Ankara, Republic of Turkey). The study of sustainable housing policy - case city of Tripoli, the study including four implemented housing projects in the city of Tripoli as a case study of this research. The objective of the study is to evaluate the housing in the projects mentioned satisfaction assessment of housing users and to know the extent of the possibility of benefiting from the application of the principles of sustainability through the social and cultural side in the field of housing for case study and Libya in general.

Your participation will have a great impact on the results of the study, the purpose of this questionnaire is scientific research and your contribution is considered as a success of the study. All information will be treated in full confidence that will be only used for scientific purposes.

Thank you for your kind attention and your response

Q1. Please state your satisfaction with the following:

-How convenient your house in terms of:

1 - Strengthening social relationships:

- Highly satisfied ☐ -Satisfied ☐
- Not satisfied ☐ - Highly dissatisfied ☐

2 - Maintaining family traditions:

- Highly satisfied ☐ -Satisfied ☐
- Not satisfied ☐ - Highly dissatisfied ☐

3 - Your social situation:

- Highly satisfied ☐ -Satisfied ☐
- Not satisfied ☐ - Highly dissatisfied ☐

4 - Your family size:

- Highly satisfied ☐ -Satisfied ☐

- Not satisfied - Highly dissatisfied

5 - Your economic situation:

- Highly satisfied -Satisfied
- Not satisfied - Highly dissatisfied

6 - Availability of public services:

- Highly satisfied -Satisfied
- Not satisfied - Highly dissatisfied

7 - Availability of public utilities:

- Highly satisfied -Satisfied
- Not satisfied - Highly not satisfied

8- Availability of commercial services:

- Highly satisfied -Satisfied
- Not satisfied - Highly dissatisfied

9 - Availability of public transportation:

- Highly satisfied -Satisfied
- Not satisfied - Highly dissatisfied

10 - Availability of parks and children`s playgrounds:

- Highly satisfied - Satisfied
- Not satisfied - Highly dissatisfied

11- Availability and using common spaces :(staircases, elevators)

- Highly satisfied - Satisfied
- Not satisfied - Highly dissatisfied

Q2. Please state suitability of your house with the followings:

12 - Your favorite house:

- Highly suitable - Suitable
- Unsuitable - Highly unsuitable

13- During religious and social events:

- Highly suitable - Suitable
- Unsuitable - Highly unsuitable

14- Suitability of neighborhood relations

- Highly suitable - Suitable
- Unsuitable - Highly unsuitable

15- Suitability to climate conditions:

- Highly suitable - Suitable

- Unsuitable ☐ - Highly unsuitable ☐

16- Internal temperature for house rooms during the summer (hot climate):

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

17- Internal temperature for house rooms during the winter (thermal comfort):

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

18- Privacy within the house:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

19 -External noise within the house:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

20 - Sunlight inside your house:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

21 - The ventilation and daylighting in your house:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

22 - The effect of means for cooling:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

23 - The effect of means for heating:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

24 - The payment of utility services bills Electricity:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

25 -Water:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

26 - Communication:

- Highly suitable ☐ - Suitable ☐
- Unsuitable ☐ - Highly unsuitable ☐

Q3. To what extent do you agree to use the following in your house?

Do you use the balconies?

- Always - Often - Sometimes - Rarely

27 - Using the existing balconies in your house during the morning?

- Always - Often - Sometimes - Rarely

28 **-** Using the existing balconies in your house during the afternoon?

- Always - Often - Sometimes - Rarely

29 **-** Using the existing balconies in your house during the evening?

- Always - Often - Sometimes - Rarely

30 **-** Using the existing balconies in your house during the night?

- Always - Often - Sometimes - Rarely

- **For what purpose do you use the balcony?**

31 - For rest and recreation:

- Always - Often - Sometimes - Rarely

32 - To dry laundry:

- Always - Often - Sometimes - Rarely

33 - Ventilation:

- Always - Often - Sometimes - Rarely

34- Other purposes:

- Always - Often - Sometimes - Rarely

- Do you use windows for ventilation?

35 - Morning:

- Always - Often -Sometimes - Rarely

36 - Afternoon:

- Always - Often -Sometimes - Rarely

37 - Evening:

- Always - Often -Sometimes - Rarely

38- Night**:**

- Always - Often -Sometimes - Rarely

- Using for cooling and heating in your house?

- In the summer: (Ventilation and Cooling)

39 - Natural ventilation:

- Always ☐ - Often ☐ -Sometimes ☐ - Rarely ☐

40 - Portable fan Ceiling:

- Always ☐ - Often ☐ -Sometimes ☐ - Rarely ☐

41- Fan:

- Always ☐ - Often ☐ -Sometimes ☐ - Rarely ☐

42 - A C:

- Always ☐ - Often ☐ -Sometimes ☐ - Rarely ☐

-In the winter: (Heating)

43 - Coal fireplace:

- Always ☐ - Often ☐ -Sometimes ☐ -Rarely ☐

44 - Elect. Fireplace:

- Always ☐ - Often ☐ -Sometimes ☐ -Rarely ☐

45 - Fireplace of Kerosene:

- Always ☐ - Often ☐ - Sometimes ☐ -Rarely ☐

46 - Gas fire:

- Always ☐ - Often ☐ - Sometimes ☐ -Rarely ☐

47 - A.C:

- Always ☐ - Often ☐ - Sometimes ☐ - Rarely ☐

- The precautions using for excessive sunlight inside your house?

48- Window blinds:

- Always ☐ - Often ☐ - Sometimes ☐ - Rarely ☐

49 - Curtains:

- Always ☐ - Often ☐ - Sometimes ☐ - Rarely ☐

50 - Climbed plants:

- Always ☐ - Often ☐ - Sometimes ☐ - Rarely ☐

51 - Vertical blinds:

- Always ☐ - Often ☐ - Sometimes ☐ - Rarely ☐

52 - Insect screen:

- Always - Often - Sometimes - Rarely

53- Horizontal blinds:

- Always - Often -Sometimes -Rarely

54- Nothing at all:

- Always - Often - Sometimes - Rarely

Q4. To what extent do you agree on a design for your future house in terms of?

- **Type of house would you prefer to live in**?

55 - Detached traditional Courtyard house:

-Highly agree -Agree - Disagree - Highly disagree

56 - Modern Villa?

-Highly agree -Agree - Disagree - Highly disagree

57- Flat in an apartment building?

-Highly agree -Agree - Disagree - Highly disagree

- Why they prefer it?

58 -Suitable for the Libyan family social life

59- More comfortable for Libyan climatic condition

60 -**Participate in the design process of your new house?**

-Highly agree -Agree - Disagree - Highly disagree

61- Special spaces spared for women and men separately?

-Highly agree -Agree - Disagree - Highly disagree

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62. Q5. To what extent do you agree that your house needs modifications to the design to suit your needs?

- Highly agree - Agree
- Disagree - Highly disagree

63 -What modifications have been made?

- Closed balconies:
- Closed windows:
- Removal of some interior walls:
- Others changes

64- What is the less pleasing side of the house?

- Guest spaces - sleeping spaces. - Living spaces
- Others spaces

65 -What is the most pleasing side of the house?

- Guest spaces ☐
- Sleeping spaces. ☐
- Living space ☐
- Others spaces ☐

Thank you for your precious time and for answering the questionnaire.

For any questions please call the researcher, and you are welcome to do so anytime:

E-mail………………………………….………...

Researches: Omar Ali Alameen

APPENDIX B

DATA ANALYSIS TABLES

- **Professionals Questionnaires Data Analysis Results Tables**

Table (B.1) Factors Analysis[1] of Sustainable Housing Policy Scale (Components – 1) Table (B.1) Factors Analysis[2] of Sustainable Housing Policy Scale (Components –1)

Pattern Matrix [af]						
	Components					
	1	2	3	4	5	6
5 -Waste recycling?	.790					
6 - Limit power consumption?	.785					
7- Reduction of water consumption?	.774					
3- Reuse of wastewater for non-domestic purposes?	.678					
8 -Increase the life of the building?	.639					
4- Benefit from rainwater?	.633					
25- The distribution of housing projects between cities	-.519					
2-Taking into consideration the needs of families?	.498					

Table (B. 2) Factor Analysis for Sustainable Housing Policies Scale (Components-2)

Pattern Matrix [af]						
	Components					
	1	2	3	4	5	6
36- Domestic implementation tools in partnership with global implementation tools.		.761				
35- Banks' contribution to the development of the housing sector.		.691				
37- Encouraging technical research in the field of housing:		.682				
38- Creating consciousness in users, managers, and investors:		.677				
34-Establishment of an institution to develop and follow-up the participation of the private sector in the field of investment in housing:		.507				
32- Development of housing laws and legislation leading to sustainable housing		.416				
33- Develop and support the performance of the Urban Planning Authority and the General Authority for Housing.		.369				

[1].A broad term representing a varying of statistical techniques that allow for estimating the population level, structure underlying the variations of observed variable and their interrelationships (Gorsuch, 1983 as cited in Masaki Matsunaga, 2010).

[2].A broad term representing a varying of statistical techniques that allow for estimating the population level, structure underlying the variations of observed variable and their interrelationships (Gorsuch, 1983 as cited in Masaki Matsunaga, 2010).

Table (B.3) Factor Analysis for Sustainable Housing Policies Scale (Components-3)

Pattern Matrix [af]						
	Components					
	1	2	3	4	5	6
13- Usefulness to real estate investors?			-.733			
12- Availability of data and information?			-.718			
15- Availability of specialized technical personnel such as execution technicians?			-.690			
14 - Standards and regulations related to design and implementation?			-.688			
17- Administrative and political stability?			-.630			
11- Availability of sensitization for the population and stakeholders?			-.579			
16 - Availability of building materials required in the local market?			-.499			

Table (B.4) Factor Analysis for Sustainable Housing Policies Scale (Components - 4)

Pattern Matrix [af]						
	Components					
	1	2	3	4	5	6
24 - Administrative and financial corruption in the state?				-.579		
26 - Laws and regulations with regard to private sector investment and ownership in the housing sector?				.538		
23 -The commitment of previous governments to housing policies?				.524		
27- Studies and adoption of urban plans:				.313		

Table (B. 5) Factor Analysis for Sustainable Housing Policies Scale

(Components -5)

Pattern Matrix af						
	Components					
	1	2	3	4	5	6
18- Contribute to the development of solutions to the problem of housing?					-.724	
19 - Contribute to the development of solutions to social problems?					-.670	
21- Contribute to the protection of the national economy?					-.562	
22- Contribution to the use of new and contemporary technologies?					-.547	
20- Contribute to the protection of the environment?					-.463	
1- Observance of social customs and traditions and provides cultural continuity?					-.334	

Table (B.6) Factor Analysis for Sustainable Housing Policies Scale

(Components - 6)

Pattern Matrix af						
	Components					
	1	2	3	4	5	6
31- Social habits and traditions:						-.708
29 - Lack of local implementation tools:						-.543
9-Reduction of health service expenses?						.482
10 - Reduce consumption of natural resources?						.476
28 - Implementation prices offered by foreign companies						-.374
30 - The local environmental policies:						-.341
Explained Variance (%)	19.305	7.965	6.836	5.565	4.462	4.077
Total Explained Variance (%)	48.211					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.773					
Bartlett's Test of Sphericity: $\chi 2$ (703) =2038.770, p >.001						
Extraction Method: Principal Component Analysis.						

Table (B.7) Order of objectives of sustainable housing

Objectives	One-Sample Test: Test Value = 2.5 — t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference — Lower	Upper	Mean	Std. Deviation	Mean Descending Order
Observance of social customs and traditions and provides cultural continuity	16.192	151	.000	.822	.72	.92	3.32	.626	6
Taking into consideration the needs of families (privacy and user comfort)	22.012	151	.000	1.026	.93	1.12	3.53	.575	4
Reuse of wastewater for non-domestic purposes	11.532	151	.000	.724	.60	.85	3.22	.774	8
Benefit from rainwater	19.253	151	.000	1.072	.96	1.18	3.57	.687	1
Waste recycling	19.536	151	.000	1.059	.95	1.17	3.56	.668	2
Limit power consumption	19.286	151	.000	1.033	.93	1.14	3.53	.660	3
Reduction of water consumption	18.870	151	.000	.980	.88	1.08	3.48	.640	5
Increase the life of the building	14.442	151	.000	.757	.65	.86	3.26	.646	**7**
Reduction of health service expenses	5.353	151	.000	.375	.24	.51	2.88	.864	10
Reduce consumption of natural resources	8.135	151	.000	.507	.38	.63	3.01	.768	9

Table (B.8) Objectives of sustainable housing

One-Sample Test							Mean	Std. Deviation	Mean Descending Order
Success Factors	Test Value = 2.5								
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference				
					Lower	Upper			
Availability of sensitization for the population and stakeholders	22.467	151	.000	1.026	.94	1.12	3.53	.563	6
Availability of data and information	20.720	151	.000	1.039	.94	1.14	3.54	.618	5
Usefulness to real estate investors	20.505	151	.000	.954	.86	1.05	3.45	.574	7
Standards and regulations related to design and `implementation	25.365	151	.000	1.112	1.03	1.20	3.61	.540	2
Availability of specialized technical personnel such as execution technicians	24.946	151	.000	1.099	1.01	1.19	3.60	.543	3
Availability of building materials required in the local market	22.704	151	.000	1.072	.98	1.17	3.57	.582	4
Administrative and political stability	26.129	151	.000	1.211	1.12	1.30	3.71	.571	1

Table (B.9) Expected Results in implementing Sustainable Housing

One-Sample Test							Mean	Std. Deviation	Mean Descending Order
Expected Results	Test Value = 2.5								
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference				
					Lower	Upper			
Contribute to the development of solutions to the problem of housing	20.657	150	.000	.944	.85	1.03	3.44	.561	4
Contribute to the development of solutions to social problems	18.890	150	.000	.858	.77	.95	3.36	.558	5
Contribute to the protection of the environment	25.961	151	.000	1.112	1.03	1.20	3.61	.528	1
Contribute to the protection of the national economy	22.486	151	.000	1.007	.92	1.10	3.51	.552	**2**
Contribution to the use of new and contemporary technologies	21.315	151	.000	.974	.88	1.06	3.47	.563	**3**

Table (B.10) Evaluation of Sustainable Housing Implementation policies

One-Sample Test							Mean	Std. Deviation	Mean Descending Order
Evaluation Factors	Test Value = 2.5								
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference				
					Lower	Upper			
Commitment of previous governments to housing policies	-7.267	151	.000	-.467	-.59	-.34	2.03	.792	**2**
Administrative and financial corruption in the state	8.291	151	.000	.605	.46	.75	3.11	.900	**1**
Distribution of housing projects between cities	-4.494	151	.000	-.303	-.44	-.17	2.20	.830	**3**

Table (B.11) impediments in implementing sustainable housing

One-Sample Test							Mean	Std. Deviation	Mean Descending Order
Impediments	Test Value = 2.5								
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference				
					Lower	Upper			
Laws and regulations with regard to private sector investment	12.218	151	.000	.737	.62	.86	3.24	.744	2
Studies and adoption of urban plans	12.969	151	.000	.763	.65	.88	3.26	.725	1
Implementation prices offered by foreign companies	7.895	151	.000	.480	.36	.60	2.98	.750	5
Lack of local implementation tools	11.480	151	.000	.664	.55	.78	3.16	.714	3
The local environmental policies	10.842	151	.000	.612	.50	.72	3.11	.696	4
Social habits and traditions	4.681	151	.000	.283	.16	.40	2.78	.745	6

Table (B.12) Evaluation factors of future sustainable housing

One-Sample Test							Mean	Std. Deviation	Mean Descending Order
Evaluation Factors	Test Value = 2.5								
	t	df	Sig. (2-tailed)	Mean Differenc	95% Confidence Interval of the Difference				
					Lower	Upper			
Development of housing laws and legislation leading to sustainable housing access	28.104	151	.000	1.151	1.07	1.23	3.65	.505	2
Develop and support the performance of the Urban Planning Authority and the General Authority for Housing	31.611	151	.000	1.224	1.15	1.30	3.72	.477	1
Establishment of an institution to develop and follow-up the participation of the private sector in the field of investment in the housing	19.266	151	.000	.967	.87	1.07	3.47	.619	7

Banks contribution to the development of the housing sector, including housing loans for citizens and real estate investment companies	19.025	151	.000	1.020	.91	1.13	3.52	.661	6
Domestic implementation tools in partnership with global implementation tools	20.797	151	.000	1.026	.93	1.12	3.53	.608	5
Encouraging technical research in the field of housing	28.826	151	.000	1.132	1.05	1.21	3.63	.484	3
Creating consciousness in the users, managers and investors	24.546	151	.000	1.086	1.00	1.17	3.59	.545	4

Users Questionnaires Data Analysis Results Tables

Table (B.13) Pattern Matrix shows the factor loadings after rotation Satisfaction Scale Validity with the Convenient the House in Some Terms and Services.

Table (17) Pattern Matrix [af]		
	Component	
	1	2
1.9Availability of public transportation:	.762	
1.7 Availability of public utilities:	.742	
1.8Availability of commercial services:	.698	
1.10 Availability of parks and children`s playgrounds:	.689	
1.6Availability of public services:	.506	.336
1.3 Your social situation:		.736
1.2 Maintaining family traditions:		.647
1.5Your economic situation:		.594
1.4 Your family size:		.575
1.1 Strengthening social relationships:		.418
1.11Availability and using common spaces: (staircases, elevators)		.344
Explained Variance (%)	**27.331**	**14.794**
Total Explained Variance (%)	**42.125**	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	**.687**	
Bartlett's Test of Sphericity: χ^2 (55) = 281.432, p < .001		
Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.		

Table (B.14) Suitability Scale Validity with the Convenient the House in Some Events

	Component		
	1	2	3
2.11The effect of means for cooling:	.807		-.311
2.12The effect of means for heating:	.689		-.340
2.6. Internal temperature for house rooms during the winter (thermal comfort):	.650		
2.10 The ventilation and daylighting in your house:	.582		
2.9Sunlight inside your house:	.581		
2.4Suitability to climate conditions:	.580		
2.5 Internal temperature for house rooms during the summer (hot climate):	.511		.404
2.13The payment of electricity services bills:		.811	
2.14The payment of water services bills:		.771	
2.15 The payment of Communication services bills:		.746	
2.7Privacy within the house:			.684
2.3. Suitability of neighborhood relations:			.596
2.2During religious and social events:			.585
2.8External noise within the house:			.509
2.1Please state suitability of your house with the followings: favorite house			.466
Explained Variance (%)	26.188	11.697	11.230
Total Explained Variance (%)	49.114		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.751		
Bartlett's Test of Sphericity: χ^2 (105) = 508.053, p < .001			
Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.			

Table (B.15) Testing approval of the users to participate in designing their future houses.

Table (B.15) One-Sample Test the design of future houses						
	Test Value = 2.5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
4.1 To what extent do you agree on a design for your future house in terms of : - Type of house would you prefer to live in- Detached traditional Courtyard house:	3.982	131	.000	.356	.18	.53
4.2 Type of house would you prefer to live in- Modern Villa?	22.473	131	.000	1.061	.97	1.15
4.3 Type of house would you prefer to live in- Flat in an apartment building?	-6.628	131	.000	-.447	-.58	-.31
4.4 Suitable for the Libyan family social life	26.842	131	.000	.500	.46	.54
4.5 Why they prefer it? - More comfortable for Libyan climatic condition	16.242	131	.000	.477	.42	.54
4.6 Participate in the design process of your new house?	21.084	131	.000	1.068	.97	1.17
4.7 Special spaces spared for women and men separately?	15.831	131	.000	1.000	.88	1.12

Table (B.16) Modifications of the design to suit users' needs

Table (B.16) One-Sample Test						
	Test Value = 2.5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q5. To what extent do you agree that your house needs modifications to the design to suit your needs?	12.375	131	.000	.742	.62	.86

Table (B.17) the relationships between suitability and satisfaction sub-dimensions using Pearson Correlations

Table (B.17) Correlations between suitability and satisfaction sub-dimensions -					
		Service availability satisfaction	Social satisfaction	Social suitability	Environmental Suitability
Social satisfaction	Pearson Correlation	.297**	1		
	Sig. (2-tailed)	.001			
	N	132	132		
Social suitability	Pearson Correlation	.234**	.271**	1	
	Sig. (2-tailed)	.007	.002		
	N	132	132	132	
Environmental Suitability	Pearson Correlation	.482**	.336**	.341**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	132	132	132	132
Payment Suitability	Pearson Correlation	.152	-.057	.219*	.195*
	Sig. (2-tailed)	.082	.519	.012	.025
	N	132	132	132	132
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed)					

Table (B.18) Descriptive statistics of using the existing balconies by the users during the evening									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	34	3.2706	.52080	.08932	3.0889	3.4523	1.60	3.80
	Sometimes	52	2.9115	.53492	.07418	2.7626	3.0605	1.40	3.80
	Often	32	3.1625	.43236	.07643	3.0066	3.3184	2.20	4.00
	Always	14	3.0714	.50601	.13524	2.7793	3.3636	2.20	3.80
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	34	3.0118	.45909	.07873	2.8516	3.1719	2.00	4.00
	Sometimes	52	2.8154	.43358	.06013	2.6947	2.9361	2.00	4.00
	Often	32	2.9813	.50382	.08906	2.7996	3.1629	2.20	4.00
	Always	14	3.2143	.70368	.18807	2.8080	3.6206	1.80	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	34	2.4216	.66822	.11460	2.1884	2.6547	1.33	4.00
	Sometimes	52	2.3077	.69497	.09638	2.1142	2.5012	1.00	4.00
	Often	32	2.1563	.61629	.10895	1.9341	2.3784	1.00	4.00
	Always	14	2.2619	.52589	.14055	1.9583	2.5655	1.67	3.67
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	34	2.5412	.45268	.07763	2.3832	2.6991	1.40	3.60
	Sometimes	52	2.5769	.51890	.07196	2.4325	2.7214	1.60	3.60
	Often	32	2.7313	.45892	.08113	2.5658	2.8967	2.00	3.60
	Always	14	2.5571	.54450	.14552	2.2428	2.8715	1.40	3.40
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.19) One-way between-groups analysis

Table (B.19) ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	2.929	3	.976	3.826	.012
	Within Groups	32.667	128	.255		
	Total	35.596	131			
Social suitability	Between Groups	2.081	3	.694	2.878	.039
	Within Groups	30.849	128	.241		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.184	3	.395	.923	.432
	Within Groups	54.737	128	.428		
	Total	55.922	131			
Payment Suitability	Between Groups	.721	3	.240	.996	.397
	Within Groups	30.878	128	.241		
	Total	31.599	131			

Table (B.20) Multiple Comparisons							
Tukey HSD							
Dependent Variable	(I) 3.3 Using the existing balconies in your house during the evening?	(J) 3.3 Using the existing balconies in your house during the evening?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Rarely	Sometimes	.35905*	.11142	.009	.0690	.6491
		Often	.10809	.12443	.821	-.2158	.4320
		Always	.19916	.16042	.602	-.2184	.6168
	Sometimes	Rarely	-.35905*	.11142	.009	-.6491	-.0690
		Often	-.25096	.11350	.126	-.5464	.0445
		Always	-.15989	.15211	.720	-.5558	.2361
	Often	Rarely	-.10809	.12443	.821	-.4320	.2158
		Sometimes	.25096	.11350	.126	-.0445	.5464
		Always	.09107	.16188	.943	-.3303	.5125
	Always	Rarely	-.19916	.16042	.602	-.6168	.2184
		Sometimes	.15989	.15211	.720	-.2361	.5558
		Often	-.09107	.16188	.943	-.5125	.3303
Social suitability	Rarely	Sometimes	.19638	.10827	.272	-.0855	.4782
		Often	.03051	.12091	.994	-.2842	.3453
		Always	-.20252	.15589	.565	-.6083	.2033
	Sometimes	Rarely	-.19638	.10827	.272	-.4782	.0855
		Often	-.16587	.11030	.438	-.4530	.1213
		Always	-.39890*	.14782	.039	-.7837	-.0141
	Often	Rarely	-.03051	.12091	.994	-.3453	.2842
		Sometimes	.16587	.11030	.438	-.1213	.4530
		Always	-.23304	.15731	.452	-.6425	.1765
	Always	Rarely	.20252	.15589	.565	-.2033	.6083
		Sometimes	.39890*	.14782	.039	.0141	.7837
		Often	.23304	.15731	.452	-.1765	.6425
*. The mean difference is significant at the 0.05 level.							

Table (B.21) Descriptive statistics of using the existing balconies during the evening

Table (B.21) Descriptives statistics of using the existing balconies during the evening		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	80	3.1800	.48845	.05461	3.0713	3.2887	1.60	3.80
	Sometime	33	2.9818	.43117	.07506	2.8289	3.1347	2.00	3.80
	Often	16	2.8375	.74911	.18728	2.4383	3.2367	1.40	4.00
	Always	3	2.8667	.30551	.17638	2.1078	3.6256	2.60	3.20
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	80	3.0650	.44865	.05016	2.9652	3.1648	2.00	4.00
	Sometime	33	2.8424	.46572	.08107	2.6773	3.0076	2.00	3.80
	Often	16	2.6250	.65269	.16317	2.2772	2.9728	1.80	4.00
	Always	3	2.7333	.46188	.26667	1.5860	3.8807	2.20	3.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	80	2.3000	.66371	.07420	2.1523	2.4477	1.00	4.00
	Sometime	33	2.2020	.58890	.10251	1.9932	2.4108	1.33	4.00
	Often	16	2.4583	.77817	.19454	2.0437	2.8730	1.67	4.00
	Always	3	2.3333	.33333	.19245	1.5053	3.1614	2.00	2.67
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	80	2.6100	.51988	.05812	2.4943	2.7257	1.40	3.60
	Sometime	33	2.6364	.42560	.07409	2.4855	2.7873	2.00	3.60
	Often	16	2.5500	.51381	.12845	2.2762	2.8238	1.60	3.60
	Always	3	2.3333	.30551	.17638	1.5744	3.0922	2.00	2.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.21) ANOVA analysis of variance was conducted to explore the impact of using the existing balconies during the night on levels of suitability and satisfaction.

Table (B.21) ANOVA, one-way between-groups analysis		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	2.195	3	.732	2.804	.042
	Within Groups	33.401	128	.261		
	Total	35.596	131			
Social suitability	Between Groups	3.270	3	1.090	4.705	.004
	Within Groups	29.659	128	.232		
	Total	32.930	131			
Environmental Suitability	Between Groups	.719	3	.240	.555	.645
	Within Groups	55.203	128	.431		
	Total	55.922	131			
Payment Suitability	Between Groups	.304	3	.101	.414	.743
	Within Groups	31.295	128	.244		
	Total	31.599	131			

Table (B.22) Post-hoc comparisons using the Tukey HSD test

Table (B.22) Multiple Comparisons Post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 3.4 Using the existing balconies in your house during the night?	(J) 3.4 Using the existing balconies in your house during the night?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social suitability	Rarely	Sometime	.22258	.09959	.119	-.0367	.4818
		Often	.44000*	.13183	.006	.0968	.7832
		Always	.33167	.28308	.646	-.4052	1.0686
	Sometime	Rarely	-.22258	.09959	.119	-.4818	.0367
		Often	.21742	.14664	.451	-.1643	.5991
		Always	.10909	.29027	.982	-.6465	.8647
	Often	Rarely	-.44000*	.13183	.006	-.7832	-.0968
		Sometime	-.21742	.14664	.451	-.5991	.1643
		Always	-.10833	.30285	.984	-.8967	.6800
	Always	Rarely	-.33167	.28308	.646	-1.0686	.4052
		Sometime	-.10909	.29027	.982	-.8647	.6465
		Often	.10833	.30285	.984	-.6800	.8967
*. The mean difference is significant at the 0.05 level.							

Table (B.23) Descriptive statistics of using the balcony for rest and recreation

Table (B.23) Descriptives Statistics of using the balcony for rest and recreation									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	43	3.2093	.46793	.07136	3.0653	3.3533	2.20	4.00
	Sometime	40	3.1950	.43557	.06887	3.0557	3.3343	2.00	3.80
	Often	35	2.8914	.61805	.10447	2.6791	3.1037	1.40	3.80
	Always	14	2.8429	.45862	.12257	2.5781	3.1077	2.20	3.60
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	43	3.1395	.45468	.06934	2.9996	3.2795	2.00	4.00
	Sometime	40	2.9400	.43489	.06876	2.8009	3.0791	2.00	4.00
	Often	35	2.7429	.51921	.08776	2.5645	2.9212	2.00	4.00
	Always	14	2.9000	.59614	.15933	2.5558	3.2442	1.80	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	43	2.2868	.69229	.10557	2.0738	2.4999	1.00	4.00
	Sometime	40	2.2083	.60240	.09525	2.0157	2.4010	1.00	4.00
	Often	35	2.3143	.69519	.11751	2.0755	2.5531	1.33	4.00
	Always	14	2.5238	.56560	.15116	2.1972	2.8504	1.67	3.67
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	43	2.5860	.50783	.07744	2.4298	2.7423	1.40	3.60
	Sometime	40	2.6600	.50677	.08013	2.4979	2.8221	2.00	3.60
	Often	35	2.5657	.46142	.07799	2.4072	2.7242	1.60	3.60
	Always	14	2.5857	.50514	.13500	2.2941	2.8774	1.80	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.24) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	3.279	3	1.093	4.330	.006
	Within Groups	32.317	128	.252		
	Total	35.596	131			
Social suitability	Between Groups	3.085	3	1.028	4.411	.005
	Within Groups	29.845	128	.233		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.049	3	.350	.816	.487
	Within Groups	54.872	128	.429		
	Total	55.922	131			
Payment Suitability	Between Groups	.195	3	.065	.265	.850
	Within Groups	31.404	128	.245		
	Total	31.599	131			

Table (B.25) Post-hoc comparisons using the Tukey HSD test

Table (B.25) Multiple comparisons post-hc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 3.5 For what purpose do you use the balcony? - For rest and recreation:	(J) 3.5 For what purpose do you use the balcony? - For rest and recreation:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Rarely	Sometime	.01430	.11038	.999	-.2730	.3016
		Often	.31787*	.11439	.031	.0201	.6156
		Always	.36645	.15461	.088	-.0360	.7689
	Sometime	Rarely	-.01430	.11038	.999	-.3016	.2730
		Often	.30357*	.11630	.049	.0008	.6063
		Always	.35214	.15603	.114	-.0540	.7583
	Often	Rarely	-.31787*	.11439	.031	-.6156	-.0201
		Sometime	-.30357*	.11630	.049	-.6063	-.0008
		Always	.04857	.15890	.990	-.3650	.4622
	Always	Rarely	-.36645	.15461	.088	-.7689	.0360
		Sometime	-.35214	.15603	.114	-.7583	.0540
		Often	-.04857	.15890	.990	-.4622	.3650
Social suitability	Rarely	Sometime	.19953	.10607	.241	-.0766	.4757
		Often	.39668*	.10993	.002	.1105	.6828
		Always	.23953	.14858	.375	-.1472	.6263
	Sometime	Rarely	-.19953	.10607	.241	-.4757	.0766
		Often	.19714	.11176	.296	-.0938	.4881
		Always	.04000	.14994	.993	-.3503	.4303
	Often	Rarely	-.39668*	.10993	.002	-.6828	-.1105
		Sometime	-.19714	.11176	.296	-.4881	.0938
		Always	-.15714	.15270	.733	-.5546	.2403
	Always	Rarely	-.23953	.14858	.375	-.6263	.1472
		Sometime	-.04000	.14994	.993	-.4303	.3503
		Often	.15714	.15270	.733	-.2403	.5546
*. The mean difference is significant at the 0.05 level.							

Table (B.26) Descriptives use the balcony for ventilation

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	13	3.0308	.72040	.19980	2.5954	3.4661	1.60	3.80
	Sometime	12	2.8167	.46286	.13362	2.5226	3.1108	2.20	3.60
	Often	52	2.9846	.54427	.07548	2.8331	3.1361	1.40	3.80
	Always	55	3.2436	.41040	.05534	3.1327	3.3546	2.20	4.00
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	13	3.1077	.51391	.14253	2.7971	3.4182	2.20	4.00
	Sometime	12	2.9333	.44586	.12871	2.6500	3.2166	2.40	4.00
	Often	52	2.7769	.45788	.06350	2.6494	2.9044	1.80	3.80
	Always	55	3.0764	.51134	.06895	2.9381	3.2146	2.00	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	13	2.2564	.62589	.17359	1.8782	2.6346	1.33	3.00
	Sometime	12	2.4722	.62697	.18099	2.0739	2.8706	1.67	4.00
	Often	52	2.2244	.62176	.08622	2.0513	2.3975	1.00	4.00
	Always	55	2.3333	.69979	.09436	2.1442	2.5225	1.00	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	13	2.4308	.58791	.16306	2.0755	2.7860	1.40	3.40
	Sometime	12	2.7333	.47737	.13780	2.4300	3.0366	2.00	3.60
	Often	52	2.5962	.46271	.06417	2.4673	2.7250	1.60	3.60
	Always	55	2.6218	.49840	.06720	2.4871	2.7566	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.27) ANOVA, use the balconies for ventilation						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	2.809	3	.936	3.655	.014
	Within Groups	32.787	128	.256		
	Total	35.596	131			
Social suitability	Between Groups	2.762	3	.921	3.907	.010
	Within Groups	30.167	128	.236		
	Total	32.930	131			
Environmental Suitability	Between Groups	.737	3	.246	.569	.636
	Within Groups	55.185	128	.431		
	Total	55.922	131			
Payment Suitability	Between Groups	.611	3	.204	.842	.473
	Within Groups	30.987	128	.242		
	Total	31.599	131			

Table (B.28) Multiple Comparisons use the balconies for ventilation							
Tukey HSD							
Dependent Variable	(I) 3.7 For what purpose do you use the balcony? ventilation:	(J) 3.7 For what purpose do you use the balcony? Ventilation:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Rarely	Sometime	.21410	.20261	.716	-.3133	.7415
		Often	.04615	.15694	.991	-.3624	.4547
		Always	-.21287	.15608	.524	-.6192	.1934
	Sometime	Rarely	-.21410	.20261	.716	-.7415	.3133
		Often	-.16795	.16209	.729	-.5899	.2540
		Always	-.42697*	.16126	.045	-.8467	-.0072
	Often	Rarely	-.04615	.15694	.991	-.4547	.3624
		Sometime	.16795	.16209	.729	-.2540	.5899

		Always	-.25902*	.09789	.045	-.5138	-.0042
	Always	Rarely	.21287	.15608	.524	-.1934	.6192
		Sometime	.42697*	.16126	.045	.0072	.8467
		Often	.25902*	.09789	.045	.0042	.5138
Social suitability	Rarely	Sometime	.17436	.19434	.806	-.3315	.6803
		Often	.33077	.15054	.130	-.0611	.7226
		Always	.03133	.14972	.997	-.3584	.4211
	Sometime	Rarely	-.17436	.19434	.806	-.6803	.3315
		Often	.15641	.15548	.746	-.2483	.5611
		Always	-.14303	.15468	.792	-.5457	.2596
	Often	Rarely	-.33077	.15054	.130	-.7226	.0611
		Sometime	-.15641	.15548	.746	-.5611	.2483
		Always	-.29944*	.09390	.010	-.5439	-.0550
	Always	Rarely	-.03133	.14972	.997	-.4211	.3584
		Sometime	.14303	.15468	.792	-.2596	.5457
		Often	.29944*	.09390	.010	.0550	.5439

*. The mean difference is significant at the 0.05 level.

Table (B.29) Descriptive statistics of using the balcony for other purposes (storage, child's play)									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	62	3.2742	.43190	.05485	3.1645	3.3839	2.20	4.00
	Sometime	38	2.9211	.56480	.09162	2.7354	3.1067	1.40	3.80
	Often	20	2.9000	.45190	.10105	2.6885	3.1115	2.00	3.60
	Always	12	2.9000	.61791	.17838	2.5074	3.2926	1.60	3.60
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	62	3.0452	.48508	.06161	2.9220	3.1683	2.20	4.00
	Sometime	38	2.8158	.46121	.07482	2.6642	2.9674	1.80	4.00
	Often	20	2.8100	.52103	.11651	2.5661	3.0539	2.00	4.00
	Always	12	3.1000	.57525	.16606	2.7345	3.4655	2.00	3.80
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	62	2.2957	.61583	.07821	2.1393	2.4521	1.00	4.00
	Sometime	38	2.4298	.68842	.11168	2.2035	2.6561	1.33	4.00
	Often	20	2.1667	.47757	.10679	1.9432	2.3902	1.33	3.00
	Always	12	2.0833	.92250	.26630	1.4972	2.6695	1.00	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	62	2.6548	.52998	.06731	2.5202	2.7894	1.40	3.60
	Sometime	38	2.4842	.44267	.07181	2.3387	2.6297	1.60	3.60
	Often	20	2.5500	.46736	.10450	2.3313	2.7687	1.80	3.40
	Always	12	2.8000	.40899	.11807	2.5401	3.0599	2.20	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.30) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	4.334	3	1.445	5.916	.001
	Within Groups	31.262	128	.244		
	Total	35.596	131			
Social suitability	Between Groups	1.908	3	.636	2.624	.053
	Within Groups	31.022	128	.242		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.558	3	.519	1.223	.304
	Within Groups	54.364	128	.425		
	Total	55.922	131			
Payment Suitability	Between Groups	1.225	3	.408	1.720	.166
	Within Groups	30.374	128	.237		
	Total	31.599	131			

Table (B.31) multiple comparisons descriptive statistics of using the balcony for other purposes (storage, child's play)							
Tukey HSD							
Dependent Variable	(I) 3.8 For what purpose do you use the balcony? - Other purposes: (storage, Child's play)	(J) 3.8 For what purpose do you use the balcony? Other purposes: (storage, Child's play)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Rarely	Sometime	.35314*	.10182	.004	.0881	.6182
		Often	.37419*	.12709	.020	.0434	.7050
		Always	.37419	.15586	.082	-.0315	.7799
	Sometime	Rarely	-.35314*	.10182	.004	-.6182	-.0881
		Often	.02105	.13652	.999	-.3343	.3764
		Always	.02105	.16365	.999	-.4049	.4470
	Often	Rarely	-.37419*	.12709	.020	-.7050	-.0434
		Sometime	-.02105	.13652	.999	-.3764	.3343
		Always	.00000	.18046	1.000	-.4697	.4697
	Always	Rarely	-.37419	.15586	.082	-.7799	.0315
		Sometime	-.02105	.16365	.999	-.4470	.4049
		Often	.00000	.18046	1.000	-.4697	.4697
*. The mean difference is significant at the 0.05 level.							

Table (B.32) Descriptives using the windows for ventilation at night									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	89	3.1303	.49184	.05214	3.0267	3.2339	1.60	3.80
	Sometime	22	3.0364	.56782	.12106	2.7846	3.2881	2.00	4.00
	Often	11	3.0545	.53733	.16201	2.6936	3.4155	2.00	3.60
	Always	10	2.7800	.62147	.19653	2.3354	3.2246	1.40	3.40
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	89	3.0629	.46475	.04926	2.9650	3.1608	1.80	4.00
	Sometime	22	2.8909	.53711	.11451	2.6528	3.1290	2.00	4.00
	Often	11	2.4545	.26968	.08131	2.2734	2.6357	2.00	2.80
	Always	10	2.6000	.47140	.14907	2.2628	2.9372	2.00	3.20
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	89	2.3071	.66898	.07091	2.1662	2.4480	1.00	4.00
	Sometime	22	2.4545	.72408	.15437	2.1335	2.7756	1.33	4.00
	Often	11	1.8182	.34524	.10409	1.5862	2.0501	1.33	2.33
	Always	10	2.3667	.36683	.11600	2.1042	2.6291	1.67	3.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	89	2.6292	.49133	.05208	2.5257	2.7327	1.40	3.60
	Sometime	22	2.6545	.51707	.11024	2.4253	2.8838	1.80	3.60
	Often	11	2.4545	.36977	.11149	2.2061	2.7030	2.20	3.40
	Always	10	2.4200	.54528	.17243	2.0299	2.8101	1.60	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.33) ANOVA - (Source: Alameen A. O, 2019)						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.174	3	.391	1.455	.230
	Within Groups	34.422	128	.269		
	Total	35.596	131			
Social suitability	Between Groups	5.137	3	1.712	7.885	.000
	Within Groups	27.793	128	.217		
	Total	32.930	131			
Environmental Suitability	Between Groups	3.125	3	1.042	2.526	.060
	Within Groups	52.796	128	.412		
	Total	55.922	131			
Payment Suitability	Between Groups	.697	3	.232	.962	.413
	Within Groups	30.902	128	.241		
	Total	31.599	131			

Table (B.34)Multiple Comparisons							
Tukey HSD							
Dependent Variable	(I) 3.12 Do you use windows for ventilation at night?	(J) 3.12 Do you use windows for ventilation at night?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social suitability	Rarely	Sometime	.17201	.11095	.411	-.1168	.4608
		Often	.60838*	.14893	.000	.2207	.9960
		Always	.46292*	.15541	.018	.0584	.8675
	Sometime	Rarely	-.17201	.11095	.411	-.4608	.1168
		Often	.43636	.17207	.059	-.0116	.8843
		Always	.29091	.17772	.362	-.1717	.7535
	Often	Rarely	-.60838*	.14893	.000	-.9960	-.2207
		Sometime	-.43636	.17207	.059	-.8843	.0116
		Always	-.14545	.20360	.891	-.6754	.3845
	Always	Rarely	-.46292*	.15541	.018	-.8675	-.0584
		Sometime	-.29091	.17772	.362	-.7535	.1717
		Often	.14545	.20360	.891	-.3845	.6754
*. The mean difference is significant at the 0.05 level.							

Table (B.35) Descriptives Natural ventilation (Ventilation and Cooling)									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	34	3.2765	.38143	.06542	3.1434	3.4096	2.20	4.00
	Sometime	35	3.2114	.44177	.07467	3.0597	3.3632	2.40	3.80
	Often	22	2.9818	.51974	.11081	2.7514	3.2123	2.00	3.80
	Always	41	2.8634	.60073	.09382	2.6738	3.0530	1.40	3.80
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	34	3.1294	.53458	.09168	2.9429	3.3159	2.00	4.00
	Sometime	35	3.0514	.46105	.07793	2.8931	3.2098	2.20	4.00
	Often	22	2.7727	.43772	.09332	2.5787	2.9668	2.00	3.60
	Always	41	2.8049	.48060	.07506	2.6532	2.9566	1.80	3.60
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	34	2.2745	.68888	.11814	2.0341	2.5149	1.00	4.00
	Sometime	35	2.3238	.78585	.13283	2.0539	2.5938	1.00	4.00
	Often	22	2.1970	.72491	.15455	1.8756	2.5184	1.33	4.00
	Always	41	2.3415	.44402	.06934	2.2013	2.4816	1.67	3.67
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	34	2.6059	.48112	.08251	2.4380	2.7738	1.40	3.60
	Sometime	35	2.8629	.51053	.08629	2.6875	3.0382	1.80	3.60
	Often	22	2.5364	.44673	.09524	2.3383	2.7344	2.00	3.60
	Always	41	2.4146	.41807	.06529	2.2827	2.5466	1.40	3.40
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.36) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	4.052	3	1.351	5.481	.001
	Within Groups	31.544	128	.246		
	Total	35.596	131			
Social suitability	Between Groups	3.009	3	1.003	4.291	.006
	Within Groups	29.921	128	.234		
	Total	32.930	131			
Environmental Suitability	Between Groups	.343	3	.114	.263	.852
	Within Groups	55.578	128	.434		
	Total	55.922	131			
Payment Suitability	Between Groups	3.916	3	1.305	6.036	.001
	Within Groups	27.683	128	.216		
	Total	31.599	131			

Table (B.37) Multiple Comparisons							
Tukey HSD							
Dependent Variable	(I) 3.13Using for cooling and heating in your house? - In the summer: (Ventilation and Cooling) - Natural ventilation:	(J) 3.13Using for cooling and heating in your house? - In the summer: (Ventilation and Cooling) - Natural ventilation:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social Satisfaction	Rarely	Sometime	.06504	.11954	.948	-.2461	.3762
		Often	.29465	.13583	.137	-.0589	.6482
		Always	.41306*	.11515	.003	.1133	.7128
	Sometime	Rarely	-.06504	.11954	.948	-.3762	.2461
		Often	.22961	.13507	.328	-.1220	.5812
		Always	.34801*	.11425	.015	.0506	.6454
	Often	Rarely	-.29465	.13583	.137	-.6482	.0589
		Sometime	-.22961	.13507	.328	-.5812	.1220
		Always	.11840	.13120	.804	-.2231	.4599
	Always	Rarely	-.41306*	.11515	.003	-.7128	-.1133
		Sometime	-.34801*	.11425	.015	-.6454	-.0506
		Often	-.11840	.13120	.804	-.4599	.2231
Social Suitability	Rarely	Sometime	.07798	.11642	.908	-.2251	.3810
		Often	.35668*	.13229	.039	.0123	.7010
		Always	.32453*	.11215	.023	.0326	.6165
	Sometime	Rarely	-.07798	.11642	.908	-.3810	.2251
		Often	.27870	.13154	.153	-.0637	.6211

		Always	.24655	.11127	.124	-.0431	.5362
	Often	Rarely	-.35668*	.13229	.039	-.7010	-.0123
		Sometime	-.27870	.13154	.153	-.6211	.0637
		Always	-.03215	.12778	.994	-.3648	.3005
	Always	Rarely	-.32453*	.11215	.023	-.6165	-.0326
		Sometime	-.24655	.11127	.124	-.5362	.0431
		Often	.03215	.12778	.994	-.3005	.3648
Payment Suitability	Rarely	Sometime	-.25697	.11198	.105	-.5485	.0345
		Often	.06952	.12725	.947	-.2617	.4008
		Always	.19125	.10787	.291	-.0895	.4720
	Sometime	Rarely	.25697	.11198	.105	-.0345	.5485
		Often	.32649	.12653	.053	-.0029	.6559
		Always	.44822*	.10702	.000	.1696	.7268
	Often	Rarely	-.06952	.12725	.947	-.4008	.2617
		Sometime	-.32649	.12653	.053	-.6559	.0029
		Always	.12173	.12290	.755	-.1982	.4417
	Always	Rarely	-.19125	.10787	.291	-.4720	.0895
		Sometime	-.44822*	.10702	.000	-.7268	-.1696
		Often	-.12173	.12290	.755	-.4417	.1982

*. The mean difference is significant at the 0.05 level.

Table (B.38) Descriptives statistics of using natural ventilation

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	115	3.1078	.52200	.04868	3.0114	3.2043	1.40	4.00
	Sometime	5	2.9600	.32863	.14697	2.5519	3.3681	2.40	3.20
	Often	2	2.4000	.28284	.20000	-.1412	4.9412	2.20	2.60
	Always	10	2.9800	.56135	.17751	2.5784	3.3816	2.00	3.60
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	115	2.9791	.50497	.04709	2.8858	3.0724	2.00	4.00
	Sometime	5	2.8400	.51769	.23152	2.1972	3.4828	2.00	3.40
	Often	2	3.0000	.28284	.20000	.4588	5.5412	2.80	3.20
	Always	10	2.6400	.41952	.13266	2.3399	2.9401	1.80	3.40
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	115	2.3130	.68582	.06395	2.1864	2.4397	1.00	4.00
	Sometime	5	2.1333	.50553	.22608	1.5056	2.7610	1.33	2.67
	Often	2	2.0000	.00000	.00000	2.0000	2.0000	2.00	2.00
	Always	10	2.2333	.31623	.10000	2.0071	2.4595	1.67	2.67
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	115	2.5965	.47902	.04467	2.5080	2.6850	1.40	3.60
	Sometime	5	2.3200	.33466	.14967	1.9045	2.7355	1.80	2.60
	Often	2	2.0000	.28284	.20000	-.5412	4.5412	1.80	2.20
	Always	10	2.9400	.54201	.17140	2.5523	3.3277	2.20	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.39) ANOVA, statistics of using natural ventilation						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.185	3	.395	1.470	.226
	Within Groups	34.411	128	.269		
	Total	35.596	131			
Social suitability	Between Groups	1.124	3	.375	1.508	.216
	Within Groups	31.806	128	.248		
	Total	32.930	131			
Environmental Suitability	Between Groups	.380	3	.127	.292	.831
	Within Groups	55.542	128	.434		
	Total	55.922	131			
Payment Suitability	Between Groups	2.268	3	.756	3.299	.023
	Within Groups	29.331	128	.229		
	Total	31.599	131			

<table>
<tr><th colspan="8">Table (B.40)Multiple Comparisons Post-hoc comparisons using the Tukey HSD test</th></tr>
<tr><th colspan="8">Tukey HSD</th></tr>
<tr><th rowspan="2">Dependent Variable</th><th rowspan="2">(I) 3.15 Using for cooling and heating in your house? - In the summer: (Ventilation and Cooling) Fan:</th><th rowspan="2">(J) 3.15 Using for cooling and heating in your house? - In the summer: (Ventilation and Cooling) Fan:</th><th rowspan="2">Mean Difference (I-J)</th><th rowspan="2">Std. Error</th><th rowspan="2">Sig.</th><th colspan="2">95% Confidence Interval</th></tr>
<tr><th>Lower Bound</th><th>Upper Bound</th></tr>
<tr><td rowspan="12">Payment Suitability</td><td rowspan="3">Rarely</td><td>Sometime</td><td>.27652</td><td>.21868</td><td>.587</td><td>-.2927</td><td>.8458</td></tr>
<tr><td>Often</td><td>.59652</td><td>.34142</td><td>.304</td><td>-.2922</td><td>1.4853</td></tr>
<tr><td>Always</td><td>-.34348</td><td>.15782</td><td>.135</td><td>-.7543</td><td>.0673</td></tr>
<tr><td rowspan="3">Sometime</td><td>Rarely</td><td>-.27652</td><td>.21868</td><td>.587</td><td>-.8458</td><td>.2927</td></tr>
<tr><td>Often</td><td>.32000</td><td>.40050</td><td>.855</td><td>-.7225</td><td>1.3625</td></tr>
<tr><td>Always</td><td>-.62000</td><td>.26219</td><td>.089</td><td>-1.3025</td><td>.0625</td></tr>
<tr><td rowspan="3">Often</td><td>Rarely</td><td>-.59652</td><td>.34142</td><td>.304</td><td>-1.4853</td><td>.2922</td></tr>
<tr><td>Sometime</td><td>-.32000</td><td>.40050</td><td>.855</td><td>-1.3625</td><td>.7225</td></tr>
<tr><td>Always</td><td>-.94000</td><td>.37079</td><td>.059</td><td>-1.9052</td><td>.0252</td></tr>
<tr><td rowspan="3">Always</td><td>Rarely</td><td>.34348</td><td>.15782</td><td>.135</td><td>-.0673</td><td>.7543</td></tr>
<tr><td>Sometime</td><td>.62000</td><td>.26219</td><td>.089</td><td>-.0625</td><td>1.3025</td></tr>
<tr><td>Often</td><td>.94000</td><td>.37079</td><td>.059</td><td>-.0252</td><td>1.9052</td></tr>
</table>

Table (B.41) Descriptives statistics of use for cooling and heating in the winter heating (use coal fire)									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfactio	Rarely	112	3.1500	.47000	.04441	3.0620	3.2380	1.40	4.00
	Sometime	6	2.5333	.58878	.24037	1.9154	3.1512	2.00	3.60
	Often	7	2.8000	.54160	.20471	2.2991	3.3009	2.20	3.80
	Always	7	2.7429	.80593	.30461	1.9975	3.4882	1.60	3.60
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	112	2.9625	.50477	.04770	2.8680	3.0570	2.00	4.00
	Sometime	6	2.9000	.46904	.19149	2.4078	3.3922	2.20	3.60
	Often	7	2.6286	.63696	.24075	2.0395	3.2177	1.80	3.60
	Always	7	3.0857	.19518	.07377	2.9052	3.2662	2.80	3.40
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental	Rarely	112	2.3095	.65716	.06210	2.1865	2.4326	1.00	4.00
	Sometime	6	2.1667	.34960	.14272	1.7998	2.5336	1.67	2.67
	Often	7	2.3333	.94281	.35635	1.4614	3.2053	1.00	3.67
	Always	7	2.1429	.53945	.20389	1.6439	2.6418	1.33	3.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	112	2.6196	.49717	.04698	2.5266	2.7127	1.40	3.60
	Sometime	6	2.3667	.32042	.13081	2.0304	2.7029	2.00	2.80
	Often	7	2.7429	.41173	.15562	2.3621	3.1236	2.40	3.40
	Always	7	2.4000	.55377	.20931	1.8878	2.9122	1.80	3.20
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.42) ANOVA, one-way between-groups analysis of variance						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	3.686	3	1.229	4.928	.003
	Within Groups	31.910	128	.249		
	Total	35.596	131			
Social suitability	Between Groups	.884	3	.295	1.177	.321
	Within Groups	32.045	128	.250		
	Total	32.930	131			
Environmental Suitability	Between Groups	.295	3	.098	.226	.878
	Within Groups	55.627	128	.435		
	Total	55.922	131			
Payment Suitability	Between Groups	.792	3	.264	1.096	.353
	Within Groups	30.807	128	.241		
	Total	31.599	131			

Table (B.43) Multiple Comparisons, Post-hoc comparisons using the Tukey HSD test							
Dependent Variable	(I) 3.17 Using for cooling and heating in your house? - In the winter: Heating) - Coal fire:	(J) 3.17 Using for cooling and heating in your house? - In the winter: (Heating) - Coal fire:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Rarely	Sometime	.61667*	.20923	.020	.0720	1.1613
		Often	.35000	.19453	.278	-.1564	.8564
		Always	.40714	.19453	.161	-.0992	.9135
	Sometime	Rarely	-.61667*	.20923	.020	-1.1613	-.0720
		Often	-.26667	.27778	.772	-.9898	.4564
		Always	-.20952	.27778	.875	-.9326	.5136
	Often	Rarely	-.35000	.19453	.278	-.8564	.1564
		Sometime	.26667	.27778	.772	-.4564	.9898
		Always	.05714	.26689	.997	-.6376	.7519
	Always	Rarely	-.40714	.19453	.161	-.9135	.0992
		Sometime	.20952	.27778	.875	-.5136	.9326
		Often	-.05714	.26689	.997	-.7519	.6376

*. The mean difference is significant at the 0.05 level.

Table (B.44) statistics ofuse for heating in the winter heating (use gas fire)

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social Satisfaction	Rarely	102	3.1588	.47707	.04724	3.0651	3.2525	1.60	4.00
	Sometime	11	2.7091	.52432	.15809	2.3568	3.0613	2.20	3.60
	Often	11	2.6727	.67096	.20230	2.2220	3.1235	1.40	3.60
	Always	8	3.1750	.43342	.15324	2.8126	3.5374	2.60	3.80
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social Suitability	Rarely	102	3.0373	.48806	.04833	2.9414	3.1331	1.80	4.00
	Sometime	11	2.8000	.51381	.15492	2.4548	3.1452	2.20	4.00
	Often	11	2.4727	.34955	.10539	2.2379	2.7076	2.00	2.80
	Always	8	2.6750	.35355	.12500	2.3794	2.9706	2.20	3.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	102	2.3301	.68858	.06818	2.1948	2.4653	1.00	4.00
	Sometime	11	2.4545	.54309	.16375	2.0897	2.8194	1.67	3.67
	Often	11	2.0303	.45837	.13820	1.7224	2.3382	1.33	3.00
	Always	8	2.0000	.39841	.14086	1.6669	2.3331	1.33	2.67
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	102	2.6745	.49706	.04922	2.5769	2.7721	1.40	3.60
	Sometime	11	2.5273	.50812	.15320	2.1859	2.8686	1.80	3.40
	Often	11	2.2364	.32023	.09655	2.0212	2.4515	1.60	2.80
	Always	8	2.3000	.18516	.06547	2.1452	2.4548	2.00	2.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.45) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	4.043	3	1.348	5.468	.001
	Within Groups	31.553	128	.247		
	Total	35.596	131			
Social suitability	Between Groups	4.134	3	1.378	6.126	.001
	Within Groups	28.795	128	.225		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.872	3	.624	1.478	.224
	Within Groups	54.049	128	.422		
	Total	55.922	131			
Payment Suitability	Between Groups	2.798	3	.933	4.145	.008
	Within Groups	28.801	128	.225		
	Total	31.599	131			

Table (B.46)Multiple Comparisons, Post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 3.20 Using for cooling and heating in your house? - In the winter: (Heating) - Gas fire:	(J3.20 Using for cooling and heating in your house? - In the winter: (Heating) - Gas fire:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Rarely	Sometime	.44973*	.15756	.026	.0396	.8599
		Often	.48610*	.15756	.013	.0759	.8963
		Always	-.01618	.18229	1.000	-.4907	.4583
	Sometime	Rarely	-.44973*	.15756	.026	-.8599	-.0396
		Often	.03636	.21171	.998	-.5147	.5875
		Always	-.46591	.23070	.186	-1.0664	.1346
	Often	Rarely	-.48610*	.15756	.013	-.8963	-.0759
		Sometime	-.03636	.21171	.998	-.5875	.5147
		Always	-.50227	.23070	.135	-1.1028	.0983
	Always	Rarely	.01618	.18229	1.000	-.4583	.4907
		Sometime	.46591	.23070	.186	-.1346	1.0664

		Often	.50227	.23070	.135	-.0983	1.1028
Social suitability	Rarely	Sometime	.23725	.15052	.396	-.1546	.6291
		Often	.56453*	.15052	.002	.1727	.9564
		Always	.36225	.17414	.165	-.0911	.8156
	Sometime	Rarely	-.23725	.15052	.396	-.6291	.1546
		Often	.32727	.20224	.372	-.1992	.8537
		Always	.12500	.22039	.942	-.4487	.6987
	Often	Rarely	-.56453*	.15052	.002	-.9564	-.1727
		Sometime	-.32727	.20224	.372	-.8537	.1992
		Always	-.20227	.22039	.795	-.7760	.3714
	Always	Rarely	-.36225	.17414	.165	-.8156	.0911
		Sometime	-.12500	.22039	.942	-.6987	.4487
		Often	.20227	.22039	.795	-.3714	.7760
Payment Suitability	Rarely	Sometime	.14724	.15054	.762	-.2446	.5391
		Often	.43815*	.15054	.022	.0463	.8300
		Always	.37451	.17416	.143	-.0788	.8279
	Sometime	Rarely	-.14724	.15054	.762	-.5391	.2446
		Often	.29091	.20226	.478	-.2356	.8174
		Always	.22727	.22041	.732	-.3465	.8010
	Often	Rarely	-.43815*	.15054	.022	-.8300	-.0463
		Sometime	-.29091	.20226	.478	-.8174	.2356
		Always	-.06364	.22041	.992	-.6374	.5101
	Always	Rarely	-.37451	.17416	.143	-.8279	.0788
		Sometime	-.22727	.22041	.732	-.8010	.3465
		Often	.06364	.22041	.992	-.5101	.6374
*. The mean difference is significant at the 0.05 level.							

Table (B.47) Descriptives statistics of use for heating in the winter heating (use AC)

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	47	3.1830	.44688	.06518	3.0518	3.3142	2.20	3.80
	Sometime	15	3.1600	.46721	.12063	2.9013	3.4187	2.20	3.80
	Often	10	2.7600	.71056	.22470	2.2517	3.2683	2.00	4.00
	Always	60	3.0367	.53803	.06946	2.8977	3.1757	1.40	3.80
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	47	3.1447	.49992	.07292	2.9979	3.2915	1.80	4.00
	Sometime	15	3.0800	.40567	.10474	2.8553	3.3047	2.40	4.00
	Often	10	2.8000	.51640	.16330	2.4306	3.1694	2.20	4.00
	Always	60	2.7867	.46704	.06029	2.6660	2.9073	2.00	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
En	Rarely	47	2.4184	.68266	.09958	2.2180	2.6189	1.00	4.00

	Sometime	15	2.1778	.81520	.21048	1.7263	2.6292	1.00	4.00
	Often	10	2.4000	.81347	.25724	1.8181	2.9819	1.67	4.00
	Always	60	2.2111	.54881	.07085	2.0693	2.3529	1.33	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	47	2.6043	.38105	.05558	2.4924	2.7161	1.40	3.60
	Sometime	15	2.6800	.50029	.12917	2.4030	2.9570	2.00	3.60
	Often	10	2.6200	.55337	.17499	2.2241	3.0159	2.00	3.60
	Always	60	2.5800	.56051	.07236	2.4352	2.7248	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.48) ANOVA, one-way between-groups analysis

		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.731	3	.577	2.180	.094
	Within Groups	33.866	128	.265		
	Total	35.596	131			
Social suitability	Between Groups	3.860	3	1.287	5.666	.001
	Within Groups	29.070	128	.227		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.455	3	.485	1.140	.336
	Within Groups	54.467	128	.426		
	Total	55.922	131			
Payment Suitability	Between Groups	.124	3	.041	.168	.918
	Within Groups	31.475	128	.246		
	Total	31.599	131			

Table (B.49) Multiple Comparisons, Post-hoc comparisons using the Tukey HSD test

Tukey HSD

Dependent Variable	(I) 3.21 Using for cooling and heating in your house? - In the winter: (Heating) - AC	(J3.21 Using for cooling and heating in your house? - In the winter: (Heating) - AC	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Social suitability	Rarely	Sometime	.06468	.14132	.968	-.3032	.4326
		Often	.34468	.16596	.166	-.0873	.7767
		Always	.35801*	.09283	.001	.1164	.5997
	Sometime	Rarely	-.06468	.14132	.968	-.4326	.3032
		Often	.28000	.19455	.477	-.2264	.7864
		Always	.29333	.13757	.148	-.0648	.6514
	Often	Rarely	-.34468	.16596	.166	-.7767	.0873
		Sometime	-.28000	.19455	.477	-.7864	.2264
		Always	.01333	.16277	1.000	-.4104	.4371
	Always	Rarely	-.35801*	.09283	.001	-.5997	-.1164
		Sometime	-.29333	.13757	.148	-.6514	.0648
		Often	-.01333	.16277	1.000	-.4371	.4104

*. The mean difference is significant at the 0.05 level.

Table (B.50) Descriptives statistics use for heating in the winter heating (use AC)									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	58	3.1897	.43917	.05767	3.0742	3.3051	2.20	3.80
	Sometime	8	3.0500	.43753	.15469	2.6842	3.4158	2.20	3.80
	Often	25	3.0720	.51601	.10320	2.8590	3.2850	2.20	3.80
	Always	41	2.9415	.62007	.09684	2.7457	3.1372	1.40	4.00
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	58	3.1379	.51532	.06766	3.0024	3.2734	1.80	4.00
	Sometime	8	2.9250	.55485	.19617	2.4611	3.3889	2.20	4.00
	Often	25	2.8240	.35270	.07054	2.6784	2.9696	2.20	4.00
	Always	41	2.7610	.46737	.07299	2.6135	2.9085	2.00	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	58	2.2701	.60038	.07883	2.1123	2.4280	1.00	4.00
	Sometime	8	2.5000	.64242	.22713	1.9629	3.0371	1.00	3.00
	Often	25	2.2933	.64779	.12956	2.0259	2.5607	1.33	4.00
	Always	41	2.2927	.74235	.11594	2.0584	2.5270	1.33	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	58	2.6138	.47663	.06258	2.4885	2.7391	1.40	3.60
	Sometime	8	2.7000	.26186	.09258	2.4811	2.9189	2.40	3.20
	Often	25	2.6720	.57120	.11424	2.4362	2.9078	1.80	3.60
	Always	41	2.5268	.49751	.07770	2.3698	2.6839	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.51) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.493	3	.498	1.867	.138
	Within Groups	34.104	128	.266		
	Total	35.596	131			
Social suitability	Between Groups	3.915	3	1.305	5.757	.001
	Within Groups	29.015	128	.227		
	Total	32.930	131			
Environmental Suitability	Between Groups	.372	3	.124	.286	.835
	Within Groups	55.549	128	.434		
	Total	55.922	131			
Payment Suitability	Between Groups	.439	3	.146	.601	.615
	Within Groups	31.160	128	.243		
	Total	31.599	131			

Table (B.52) Multiple Comparisons, Post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 3.23 The precautions using for excessive sunlight inside your house? - Curtains	(J) 3.23 The precautions using for excessive sunlight inside your house? - Curtains	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social Suitability	Rarely	Sometime	.21293	.17956	.637	-.2545	.6804
		Often	.31393*	.11391	.034	.0174	.6104
		Always	.37696*	.09714	.001	.1241	.6298
	Sometime	Rarely	-.21293	.17956	.637	-.6804	.2545
		Often	.10100	.19340	.954	-.4024	.6044
		Always	.16402	.18402	.809	-.3150	.6430
	Often	Rarely	-.31393*	.11391	.034	-.6104	-.0174
		Sometime	-.10100	.19340	.954	-.6044	.4024
		Always	.06302	.12081	.954	-.2515	.3775
	Always	Rarely	-.37696*	.09714	.001	-.6298	-.1241
		Sometime	-.16402	.18402	.809	-.6430	.3150
		Often	-.06302	.12081	.954	-.3775	.2515

*. The mean difference is significant at the 0.05 level.

Table (B.53) Descriptives statistics of using the precautions using for excessive sunlight									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	58	3.1897	.43917	.05767	3.0742	3.3051	2.20	3.80
	Sometime	8	3.0500	.43753	.15469	2.6842	3.4158	2.20	3.80
	Often	25	3.0720	.51601	.10320	2.8590	3.2850	2.20	3.80
	Always	41	2.9415	.62007	.09684	2.7457	3.1372	1.40	4.00
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	58	3.1379	.51532	.06766	3.0024	3.2734	1.80	4.00
	Sometime	8	2.9250	.55485	.19617	2.4611	3.3889	2.20	4.00
	Often	25	2.8240	.35270	.07054	2.6784	2.9696	2.20	4.00
	Always	41	2.7610	.46737	.07299	2.6135	2.9085	2.00	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Rarely	58	2.2701	.60038	.07883	2.1123	2.4280	1.00	4.00
	Sometime	8	2.5000	.64242	.22713	1.9629	3.0371	1.00	3.00
	Often	25	2.2933	.64779	.12956	2.0259	2.5607	1.33	4.00
	Always	41	2.2927	.74235	.11594	2.0584	2.5270	1.33	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	58	2.6138	.47663	.06258	2.4885	2.7391	1.40	3.60
	Sometime	8	2.7000	.26186	.09258	2.4811	2.9189	2.40	3.20
	Often	25	2.6720	.57120	.11424	2.4362	2.9078	1.80	3.60
	Always	41	2.5268	.49751	.07770	2.3698	2.6839	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.54) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	2.474	3	.825	3.187	.026
	Within Groups	33.122	128	.259		
	Total	35.596	131			
Social suitability	Between Groups	.509	3	.170	.669	.572
	Within Groups	32.421	128	.253		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.092	3	.364	.850	.469
	Within Groups	54.829	128	.428		
	Total	55.922	131			
Payment Suitability	Between Groups	.448	3	.149	.614	.607
	Within Groups	31.150	128	.243		
	Total	31.599	131			

Table (B.55) Multiple Comparisons Post-hoc comparisons using the Tukey HSD test,							
Tukey HSD							
Dependent Variable	(I) 3.26 The precautions using for excessive sunlight inside your house? - Insect screen	(J) 3.26 The precautions using for excessive sunlight inside your house? - Insect screen	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Rarely	Sometime	.40260	.17750	.111	-.0594	.8646
		Often	.29149	.23347	.597	-.3162	.8992
		Always	-.15851	.11634	.525	-.4614	.1443
	Sometime	Rarely	-.40260	.17750	.111	-.8646	.0594
		Often	-.11111	.28373	.980	-.8497	.6275
		Always	-.56111*	.19883	.028	-1.0787	-.0435
	Often	Rarely	-.29149	.23347	.597	-.8992	.3162
		Sometime	.11111	.28373	.980	-.6275	.8497
		Always	-.45000	.25007	.278	-1.1010	.2010
	Always	Rarely	.15851	.11634	.525	-.1443	.4614
		Sometime	.56111*	.19883	.028	.0435	1.0787
		Often	.45000	.25007	.278	-.2010	1.1010
*. The mean difference is significant at the 0.05 level.							

Table (B.56) Descriptives statistics the precautions using for excessive sunlight									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Rarely	120	3.0967	.51399	.04692	3.0038	3.1896	1.40	4.00
	Sometime	6	2.8667	.74476	.30405	2.0851	3.6482	1.60	3.80
	Often	2	2.6000	.56569	.40000	-2.4825	7.6825	2.20	3.00
	Always	4	3.2000	.28284	.14142	2.7499	3.6501	3.00	3.60
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Rarely	120	2.9317	.49637	.04531	2.8419	3.0214	1.80	4.00
	Sometime	6	3.2000	.40000	.16330	2.7802	3.6198	2.60	3.60
	Often	2	2.6000	.56569	.40000	-2.4825	7.6825	2.20	3.00
	Always	4	3.2500	.70000	.35000	2.1361	4.3639	2.40	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00

Environmental Suitability	Rarely	120	2.2278	.61263	.05593	2.1170	2.3385	1.00	4.00
	Sometime	6	2.8333	.69121	.28219	2.1079	3.5587	2.00	4.00
	Often	2	2.5000	.23570	.16667	.3823	4.6177	2.33	2.67
	Always	4	3.4167	.68718	.34359	2.3232	4.5101	2.67	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Rarely	120	2.5717	.49215	.04493	2.4827	2.6606	1.40	3.60
	Sometime	6	2.8333	.32042	.13081	2.4971	3.1696	2.40	3.20
	Often	2	2.7000	.14142	.10000	1.4294	3.9706	2.60	2.80
	Always	4	3.1500	.44347	.22174	2.4443	3.8557	2.60	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.57) ANOVA, one-way between-groups analysis

		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	.824	3	.275	1.012	.390
	Within Groups	34.772	128	.272		
	Total	35.596	131			
Social suitability	Between Groups	1.020	3	.340	1.364	.257
	Within Groups	31.910	128	.249		
	Total	32.930	131			
Environmental Suitability	Between Groups	7.398	3	2.466	6.505	.000
	Within Groups	48.524	128	.379		
	Total	55.922	131			
Payment Suitability	Between Groups	1.652	3	.551	2.353	.075
	Within Groups	29.947	128	.234		
	Total	31.599	131			

Table (B.58) Multiple Comparisons ,Post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 3.27 The precautions using for excessive sunlight inside your house? - Horizontal Blinds	(J) 3.27 The precautions using for excessive sunlight inside your house? - Horizontal blinds:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Environmental Suitability	Rarely	Sometime	-.60556	.25757	.092	-1.2760	.0649
		Often	-.27222	.43898	.925	-1.4149	.8705
		Always	-1.18889*	.31294	.001	-2.0035	-.3743
	Sometime	Rarely	.60556	.25757	.092	-.0649	1.2760
		Often	.33333	.50272	.911	-.9753	1.6420
		Always	-.58333	.39744	.460	-1.6179	.4512
	Often	Rarely	.27222	.43898	.925	-.8705	1.4149
		Sometime	-.33333	.50272	.911	-1.6420	.9753
		Always	-.91667	.53322	.318	-2.3047	.4714
	Always	Rarely	1.18889*	.31294	.001	.3743	2.0035
		Sometime	.58333	.39744	.460	-.4512	1.6179
		Often	.91667	.53322	.318	-.4714	2.3047
*. The mean difference is significant at the 0.05 level.							

Table (B.59) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.610	3	.537	2.021	.114
	Within Groups	33.986	128	.266		
	Total	35.596	131			
Social suitability	Between Groups	.661	3	.220	.874	.457
	Within Groups	32.269	128	.252		
	Total	32.930	131			
Environmental Suitability	Between Groups	3.562	3	1.187	2.902	.037
	Within Groups	52.360	128	.409		
	Total	55.922	131			
Payment Suitability	Between Groups	1.487	3	.496	2.106	.103
	Within Groups	30.112	128	.235		
	Total	31.599	131			

Table (B.60) Multiple Comparisons, post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 4.1 To what extent do you agree on a design for your future house in terms o - Type of house would you prefer to live in? -Detached traditional Courtyard house:	(J) 4.1 To what extent do you agree on a design for your future house in terms of - Type of house would you prefer to live in? - Detached traditional Courtyard house:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Environmental Suitability	Highly disagree	Disagree	.56516*	.19996	.028	.0446	1.0857
		Agree	.35065	.20400	.318	-.1804	.8817
		Highly agree	.47315	.19474	.077	-.0338	.9801
	Disagree	Highly disagree	-.56516*	.19996	.028	-1.0857	-.0446
		Agree	-.21451	.15219	.496	-.6107	.1816
		Highly agree	-.09201	.13953	.912	-.4552	.2712
	Agree	Highly disagree	-.35065	.20400	.318	-.8817	.1804
		Disagree	.21451	.15219	.496	-.1816	.6107
		Highly agree	.12250	.14526	.834	-.2556	.5006
	Highly agree	Highly disagree	-.47315	.19474	.077	-.9801	.0338
		Disagree	.09201	.13953	.912	-.2712	.4552
		Agree	-.12250	.14526	.834	-.5006	.2556
		Disagree	.15050	.10581	.488	-.1249	.4259
		Agree	.23121	.11016	.159	-.0555	.5180
*. The mean difference is significant at the 0.05 level.							

Table (B.60) Descriptive statistics the precautions using for excessive sunlight									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Mini-mum	Maxi-mum
						Lower Bound	Upper Bound		
Social satisfaction	Highly disagree	33	3.1212	.57214	.09960	2.9183	3.3241	1.60	4.00
	Disagree	62	3.0355	.53411	.06783	2.8998	3.1711	1.40	3.80
	Agree	34	3.1824	.41302	.07083	3.0382	3.3265	2.20	3.80
	Highly agree	3	2.4667	.46188	.26667	1.3193	3.6140	2.20	3.00
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Highly disagree	33	3.0242	.47895	.08337	2.8544	3.1941	2.00	4.00
	Disagree	62	2.9419	.53640	.06812	2.8057	3.0782	2.00	4.00
	Agree	34	2.9529	.42085	.07217	2.8061	3.0998	2.20	4.00
	Highly agree	3	2.2000	.40000	.23094	1.2063	3.1937	1.80	2.60
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Highly disagree	33	2.4343	.77498	.13491	2.1595	2.7091	1.33	4.00
	Disagree	62	2.2366	.52752	.06700	2.1026	2.3705	1.00	4.00
	Agree	34	2.2647	.74209	.12727	2.0058	2.5236	1.00	4.00
	Highly agree	3	2.3333	.57735	.33333	.8991	3.7676	1.67	2.67
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Highly disagree	33	2.5091	.54564	.09498	2.3156	2.7026	1.40	3.60
	Disagree	62	2.5097	.45039	.05720	2.3953	2.6241	1.60	3.60
	Agree	34	2.8647	.44236	.07586	2.7104	3.0191	2.20	3.60
	Highly agree	3	2.6000	.20000	.11547	2.1032	3.0968	2.40	2.80
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.60) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.663	3	.554	2.091	.105
	Within Groups	33.933	128	.265		
	Total	35.596	131			
Social suitability	Between Groups	1.873	3	.624	2.574	.057
	Within Groups	31.056	128	.243		
	Total	32.930	131			
Environmental Suitability	Between Groups	.888	3	.296	.689	.561
	Within Groups	55.034	128	.430		
	Total	55.922	131			
Payment Suitability	Between Groups	3.160	3	1.053	4.740	.004
	Within Groups	28.439	128	.222		
	Total	31.599	131			

Table (B.61) Multiple Comparisons, Post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 4.3 Type of house would you prefer to live in? - Flat in an apartment building?	(J) 4.3 Type of house would you prefer to live in? - Flat in an apartment building?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Payment Suitability	Highly disagree	Disagree	-.00059	.10157	1.000	-.2650	.2638
		Agree	-.35561*	.11518	.013	-.6555	-.0558
		Highly agree	-.09091	.28424	.989	-.8308	.6490
	Disagree	Highly disagree	.00059	.10157	1.000	-.2638	.2650
		Agree	-.35503*	.10059	.003	-.6169	-.0932
		Highly agree	-.09032	.27865	.988	-.8157	.6350
	Agree	Highly disagree	.35561*	.11518	.013	.0558	.6555
		Disagree	.35503*	.10059	.003	.0932	.6169
		Highly agree	.26471	.28389	.788	-.4743	1.0037
	Highly agree	Highly disagree	.09091	.28424	.989	-.6490	.8308
		Disagree	.09032	.27865	.988	-.6350	.8157
		Agree	-.26471	.28389	.788	-1.0037	.4743

*. The mean difference is significant at the 0.05 level.

Table (B.62) Descriptives statistics of the participate users in the design process									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social Satisfaction	Highly disagree	2	2.6000	.56569	.40000	-2.4825	7.6825	2.20	3.00
	Agree	51	3.0118	.51600	.07225	2.8666	3.1569	1.40	3.80
	Highly agree	79	3.1392	.51873	.05836	3.0231	3.2554	1.60	4.00
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social Suitability	Highly disagree	2	2.6000	.28284	.20000	.0588	5.1412	2.40	2.80
	Agree	51	2.8667	.50859	.07122	2.7236	3.0097	2.00	4.00
	Highly agree	79	3.0101	.49396	.05558	2.8995	3.1208	1.80	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Highly disagree	2	3.0000	1.41421	1.00000	-9.7062	15.7062	2.00	4.00
	Agree	51	2.2745	.53627	.07509	2.1237	2.4253	1.33	4.00
	Highly agree	79	2.2911	.70280	.07907	2.1337	2.4486	1.00	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Highly disagree	2	2.3000	.42426	.30000	-1.5119	6.1119	2.00	2.60
	Agree	51	2.4471	.37649	.05272	2.3412	2.5529	1.60	3.60
	Highly agree	79	2.7114	.53084	.05972	2.5925	2.8303	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.63) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	.975	2	.488	1.817	.167
	Within Groups	34.621	129	.268		
	Total	35.596	131			
Social suitability	Between Groups	.884	2	.442	1.780	.173
	Within Groups	32.045	129	.248		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.017	2	.508	1.194	.306
	Within Groups	54.905	129	.426		
	Total	55.922	131			
Payment Suitability	Between Groups	2.352	2	1.176	5.187	.007
	Within Groups	29.247	129	.227		
	Total	31.599	131			

Table (B.64) Multiple comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) 4.6 Participate in the design process of your new house?	(J) 4.6 Participate in the design process of your new house?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Payment Suitability	Highly disagree	Agree	-.14706	.34323	.904	-.9609	.6668
		Highly agree	-.41139	.34092	.451	-1.2197	.3970
	Agree	Highly disagree	.14706	.34323	.904	-.6668	.9609
		Highly agree	-.26433*	.08553	.007	-.4671	-.0615
	Highly agree	Highly disagree	.41139	.34092	.451	-.3970	1.2197
		Agree	.26433*	.08553	.007	.0615	.4671

*. The mean difference is significant at the 0.05 level.

Table (B.65) Descriptives statistics of the participate users in the design process									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social Satisfaction	Highly disagree	2	2.6000	.56569	.40000	-2.4825	7.6825	2.20	3.00
	Agree	51	3.0118	.51600	.07225	2.8666	3.1569	1.40	3.80
	Highly agree	79	3.1392	.51873	.05836	3.0231	3.2554	1.60	4.00
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social Suitability	Highly disagree	2	2.6000	.28284	.20000	.0588	5.1412	2.40	2.80
	Agree	51	2.8667	.50859	.07122	2.7236	3.0097	2.00	4.00
	Highly agree	79	3.0101	.49396	.05558	2.8995	3.1208	1.80	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Highly disagree	2	3.0000	1.41421	1.00000	-9.7062	15.7062	2.00	4.00
	Agree	51	2.2745	.53627	.07509	2.1237	2.4253	1.33	4.00
	Highly agree	79	2.2911	.70280	.07907	2.1337	2.4486	1.00	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Highly disagree	2	2.3000	.42426	.30000	-1.5119	6.1119	2.00	2.60
	Agree	51	2.4471	.37649	.05272	2.3412	2.5529	1.60	3.60
	Highly agree	79	2.7114	.53084	.05972	2.5925	2.8303	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.66) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.817	3	.606	2.295	.081
	Within Groups	33.780	128	.264		
	Total	35.596	131			
Social suitability	Between Groups	1.560	3	.520	2.122	.101
	Within Groups	31.370	128	.245		
	Total	32.930	131			
Environmental Suitability	Between Groups	.065	3	.022	.049	.985
	Within Groups	55.857	128	.436		
	Total	55.922	131			
Payment Suitability	Between Groups	3.047	3	1.016	4.553	.005
	Within Groups	28.552	128	.223		
	Total	31.599	131			

Table (B.67) Multiple Comparisons Post-hoc comparisons using the Tukey HSD test Tukey HSD							
Dependent Variable	(I) 4.7 Special spaces spared for female male separately?	(J) 4.7 Special spaces spared for female and male separately?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Payment Suitability	Highly disagree	Disagree	.00000	.34491	1.000	-.8978	.8978
		Agree	-.27556	.22264	.604	-.8551	.3040
		Highly agree	-.51646	.21780	.088	-1.0834	.0505
	Disagree	Highly disagree	.00000	.34491	1.000	-.8978	.8978
		Agree	-.27556	.28162	.762	-1.0086	.4575
		Highly agree	-.51646	.27781	.251	-1.2396	.2067
	Agree	Highly disagree	.27556	.22264	.604	-.3040	.8551
		Disagree	.27556	.28162	.762	-.4575	1.0086
		Highly agree	-.24090*	.08821	.036	-.4705	-.0113
	Highly agree	Highly disagree	.51646	.21780	.088	-.0505	1.0834
		Disagree	.51646	.27781	.251	-.2067	1.2396
		Agree	.24090*	.08821	.036	.0113	.4705
*. The mean difference is significant at the 0.05 level.							

Table (B.68) Descriptives statistics of the extent the users agree that their houses need modifications									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Disagree	17	3.3765	.44656	.10831	3.1469	3.6061	2.60	3.80
	Agree	65	3.0246	.53093	.06585	2.8931	3.1562	1.40	4.00
	Highly agree	50	3.0560	.50796	.07184	2.9116	3.2004	1.60	3.80
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Disagree	17	3.2824	.45858	.11122	3.0466	3.5181	2.60	4.00
	Agree	65	2.8615	.49990	.06201	2.7377	2.9854	2.00	4.00
	Highly agree	50	2.9480	.47777	.06757	2.8122	3.0838	1.80	3.80
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Disagree	17	2.2745	.84356	.20459	1.8408	2.7082	1.00	4.00
	Agree	65	2.3026	.57350	.07113	2.1605	2.4447	1.33	4.00
	Highly agree	50	2.2933	.69217	.09789	2.0966	2.4900	1.00	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Disagree	17	2.6471	.45016	.10918	2.4156	2.8785	1.80	3.60
	Agree	65	2.6154	.47868	.05937	2.4968	2.7340	1.60	3.60
	Highly agree	50	2.5720	.52685	.07451	2.4223	2.7217	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.69) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	1.722	2	.861	3.279	.041
	Within Groups	33.874	129	.263		
	Total	35.596	131			
Social suitability	Between Groups	2.386	2	1.193	5.039	.008
	Within Groups	30.543	129	.237		
	Total	32.930	131			
Environmental Suitability	Between Groups	.011	2	.005	.013	.987
	Within Groups	55.911	129	.433		
	Total	55.922	131			
Payment Suitability	Between Groups	.091	2	.046	.186	.830
	Within Groups	31.508	129	.244		
	Total	31.599	131			

Table (B.70) Multiple Comparisons Post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) Q5. To what extent do you agree that your house needs modifications to the design to suit your needs?	(J) Q5. To what extent do you agree that your house needs modifications to the design to suit your needs?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Disagree	Agree	.35186*	.13959	.034	.0209	.6828
		Highly agree	.32047	.14387	.070	- .0207	.6616
	Agree	Disagree	- .35186*	.13959	.034	- .6828	- .0209
		Highly agree	-.03138	.09639	.943	- .2599	.1972
	Highly agree	Disagree	-.32047	.14387	.070	- .6616	.0207
		Agree	.03138	.09639	.943	- .1972	.2599
Social suitability	Disagree	Agree	.42081*	.13255	.005	.1065	.7351
		Highly agree	.33435*	.13661	.041	.0104	.6583
	Agree	Disagree	- .42081*	.13255	.005	- .7351	- .1065
		Highly agree	-.08646	.09153	.613	- .3035	.1306
	Highly agree	Disagree	- .33435*	.13661	.041	- .6583	- .0104
		Agree	.08646	.09153	.613	- .1306	.3035
*. The mean difference is significant at the 0.05 level.							

Table (71) Descriptives statistics of the extent the users agree that their houses need modifications									
		N	Mean	Std. Deviation		95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social Satisfaction	Other Changes	75	3.1733	.45718	.05279	3.0681	3.2785	1.60	3.80
	Removal changes	16	3.0500	.63875	.15969	2.7096	3.3904	2.00	4.00
	Close windows	13	2.7846	.65555	.18182	2.3885	3.1808	1.40	3.60
	Close balconies	28	2.9929	.50327	.09511	2.7977	3.1880	2.00	3.80
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social Suitability	Other Changes	75	3.0453	.46449	.05364	2.9385	3.1522	2.00	4.00
	Removal changes	16	3.0125	.59090	.14773	2.6976	3.3274	2.00	4.00
	Close windows	13	2.5538	.36655	.10166	2.3323	2.7754	2.00	3.20
	Close balconies	28	2.8357	.50787	.09598	2.6388	3.0326	1.80	3.60
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Other Changes	75	2.3067	.73472	.08484	2.1376	2.4757	1.00	4.00
	Removal changes	16	2.4167	.61464	.15366	2.0892	2.7442	1.67	4.00
	Close windows	13	2.0256	.41859	.11609	1.7727	2.2786	1.33	2.67
	Close balconies	28	2.3214	.50903	.09620	2.1240	2.5188	1.33	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Other Changes	75	2.6720	.48059	.05549	2.5614	2.7826	1.40	3.60
	Removal changes	16	2.6750	.60166	.15042	2.3544	2.9956	1.80	3.60
	Close windows	13	2.3692	.35446	.09831	2.1550	2.5834	1.60	2.80
	Close balconies	28	2.4857	.47275	.08934	2.3024	2.6690	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.72) ANOVA, one-way between-groups analysis						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	2.014	3	.671	2.559	.058
	Within Groups	33.582	128	.262		
	Total	35.596	131			
Social suitability	Between Groups	3.150	3	1.050	4.513	.005
	Within Groups	29.780	128	.233		
	Total	32.930	131			
Environmental Suitability	Between Groups	1.210	3	.403	.943	.422
	Within Groups	54.712	128	.427		
	Total	55.922	131			
Payment Suitability	Between Groups	1.536	3	.512	2.179	.094
	Within Groups	30.063	128	.235		
	Total	31.599	131			

Table (B.73) Multiple Comparisons Post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) Q6 Have you made any modifications?	(J) Q6 Have you made any modifications?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social suitability	Other Changes	Removal changes	.03283	.13283	.995	-.3129	.3786
		Close windows	.49149*	.14491	.005	.1143	.8687
		Close balconies	.20962	.10682	.208	-.0685	.4877
	Removal changes	Other Changes	-.03283	.13283	.995	-.3786	.3129
		Close windows	.45865	.18010	.058	-.0102	.9275
		Close balconies	.17679	.15116	.647	-.2167	.5703
	Close windows	Other Changes	-.49149*	.14491	.005	-.8687	-.1143
		Removal changes	-.45865	.18010	.058	-.9275	.0102
		Close balconies	-.28187	.16188	.307	-.7033	.1395
	Close balconies	Other Changes	-.20962	.10682	.208	-.4877	.0685
		Removal changes	-.17679	.15116	.647	-.5703	.2167
		Close windows	.28187	.16188	.307	-.1395	.7033
*. The mean difference is significant at the 0.05 level.							

Table (B.74) Descriptives statistics of the less pleasing side of the house									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Social satisfaction	Other Spaces	5	3.6800	.30332	.13565	3.3034	4.0566	3.20	4.00
	Living spaces	36	3.1111	.52251	.08708	2.9343	3.2879	2.00	3.80
	Sleeping spaces	50	3.0800	.49322	.06975	2.9398	3.2202	1.60	3.80
	Guest spaces	41	2.9854	.53738	.08393	2.8157	3.1550	1.40	3.80
	Total	132	3.0818	.52128	.04537	2.9921	3.1716	1.40	4.00
Social suitability	Other Spaces	5	3.4000	.56569	.25298	2.6976	4.1024	2.80	4.00
	Living spaces	36	2.9389	.51229	.08538	2.7656	3.1122	1.80	4.00
	Sleeping spaces	50	2.9240	.52042	.07360	2.7761	3.0719	2.00	4.00
	Guest spaces	41	2.9317	.45080	.07040	2.7894	3.0740	2.00	4.00
	Total	132	2.9485	.50137	.04364	2.8622	3.0348	1.80	4.00
Environmental Suitability	Other Spaces	5	2.9333	.92496	.41366	1.7848	4.0818	1.67	4.00
	Living spaces	36	2.2593	.57521	.09587	2.0646	2.4539	1.00	4.00
	Sleeping spaces	50	2.2267	.49688	.07027	2.0855	2.3679	1.33	4.00
	Guest spaces	41	2.3333	.81309	.12698	2.0767	2.5900	1.00	4.00
	Total	132	2.2955	.65336	.05687	2.1830	2.4080	1.00	4.00
Payment Suitability	Other Spaces	5	2.7600	.53666	.24000	2.0937	3.4263	2.20	3.60
	Living spaces	36	2.5389	.46061	.07677	2.3830	2.6947	1.40	3.60
	Sleeping spaces	50	2.6360	.46894	.06632	2.5027	2.7693	1.80	3.60
	Guest spaces	41	2.6000	.54589	.08525	2.4277	2.7723	1.40	3.60
	Total	132	2.6030	.49113	.04275	2.5185	2.6876	1.40	3.60

Table (B.75) ANOVA, statistics of the less pleasing side of the house						
		Sum of Squares	df	Mean Square	F	Sig.
Social satisfaction	Between Groups	2.202	3	.734	2.813	.042
	Within Groups	33.395	128	.261		
	Total	35.596	131			
Social suitability	Between Groups	1.064	3	.355	1.425	.239
	Within Groups	31.866	128	.249		
	Total	32.930	131			
Environmental Suitability	Between Groups	2.377	3	.792	1.894	.134
	Within Groups	53.545	128	.418		
	Total	55.922	131			
Payment Suitability	Between Groups	.326	3	.109	.445	.721
	Within Groups	31.273	128	.244		
	Total	31.599	131			

Table (B.76) Multiple comparisons post-hoc comparisons using the Tukey HSD test							
Tukey HSD							
Dependent Variable	(I) Q7 What is the less pleasing side of the house?	(J) Q7 What is the less pleasing side of the house?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social satisfaction	Other spaces	Living spaces	.56889	.24378	.096	-.0657	1.2035
		Sleeping spaces	.60000	.23958	.064	-.0236	1.2236
		Guest spaces	.69463*	.24196	.024	.0648	1.3245
	Living spaces	Other Spaces	-.56889	.24378	.096	-1.2035	.0657
		Sleeping spaces	.03111	.11165	.992	-.2595	.3217
		Guest spaces	.12575	.11666	.704	-.1779	.4294
	Sleeping spaces	Other Spaces	-.60000	.23958	.064	-1.2236	.0236
		Living spaces	-.03111	.11165	.992	-.3217	.2595
		Guest spaces	.09463	.10762	.816	-.1855	.3748
	Guest spaces	Other Spaces	-.69463*	.24196	.024	-1.3245	-.0648
		Living spaces	-.12575	.11666	.704	-.4294	.1779
		Sleeping spaces	-.09463	.10762	.816	-.3748	.1855
*. The mean difference is significant at the 0.05 level							

VITA

Omar Ali Alameen – Libya

Phone: 00218913228570 **-** 00905462961434

-The author completed bachelor of Urban Planning Engineering, Department of Urban Planning, Faculty of Engineering, University of Gar -Younis 1985, Benghazi-Libya.

-He completed Master of Architecture Engineering and Urban Planning, Department of Architecture and Urban Planning, Faculty of Engineering Al- Mergib University 2006, Al-Khums Libya.

-From 2008 to end 2014, he was a full-time faculty member with the degree of lecturer in the Department of Architecture and Urban Planning - Faculty of Engineering at Al-Mergib University Libya.

-He worked as a manager of Urban Planning Authority Al- Mergib branch, and private consultant designer for Architecture and urban planning projects (1986 - 2006).

-He is a PhD student from 2015, Çankaya University, Faculty of Architecture, Graduate School of Natural and Applied Sciences Balgat / Ankara / TURKEY.

Mobile: + 90 546 296 14 34 e-mail: omar3228570@gmail.com