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THE SOCIO-CULTURAL ARCHITECTURAL FEATURES OF VERNACULAR AND CONTEMPORARY DWELLINGS FOR SUSTAINABLE DESERT DWELLINGS DESIGN IN SOUTHWEST LIBYA

ANWAR A YOUSSIF ELHASSI

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Dedication

This thesis is dedicated to my mother, Daraj Al Salhin Radwan Al orabi

Acknowledgements

First of all, in the name of Allah, the most merciful and praise to Allah, Lord of the worlds. Thanks and gratitude to my father, (may Allah have mercy on him); he is the man who inspired me and I learned from him a lot. And many thanks to my mother, that soulful woman without her support and prayers, this work would not have been achieved.

I extend my sincere appreciation to Professor Hisham Elkadi for the assistance he has given me through his guidance, support, and encouragement during my journey of studying my Ph.D. Indeed, I have been lucky to have the supportive supervisor, who understands the research conditions, findings, performance and personal development. I am really proud to have worked with him.

I would also like to express my thankfulness to all the local participants in this research, particularly the locals of Ghadames, Sabha and Ghat and, to the higher institutes in these towns that cooperated with me to complete the data collection. My gratitude extends to other institutions in Southwest Libya for their cooperation, help, and support during the fieldwork.

Finally, I sincerely thank my brothers and sisters, my wife, and my children, Abdelrazeg and Ayoub, for their understanding, and spiritual support during this journey.

Declaration

I declare that the research contained in this thesis was undertaken by me in accordance with the University of Salford requirements for the award of a PhD degree by research. Prior to submission some research findings were published in a report and as refereed conference paper (see Appendix 10).

No part(s) of this thesis has previously been submitted to the University of Salford or any other institution for the award of a diploma, degree or any other qualification.

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Anwar Elhassi

List of Abbreviations

AECO	Architecture, Engineering and Construction Offices
CDD	Contemporary Desert Dwellings
GNC	General National Congress
GUPC	General Urban planning Corporation
IIED	International Institute for Environment and Development
LBSPC	Libyan Bureau of Statistics and Population Census
LIG	Libyan interim government
MOH	Ministry of Housing
MP	Ministry of Planning
NCID	National Corporation for Information and Documentation
NTC	National Transitional Council
PBUH	Peace Be Upon Him
SHU	Secretariat of Housing and Utilities
SPSS	Statistical Package for the Social Sciences
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
VA	Vernacular Architecture
VDD	Vernacular Desert Dwellings
WCED	World Commission on Environment and Development

ABSTRACT

Southwest Libya is one of the most important desert regions in Libya with its significant historical oases and towns. This region is characterised by the unique design of vernacular desert dwellings, with a rich architectural heritage and a remarkable convergence of cultures from the locals in the region. The nature of these dwellings is founded on the harmonious blend between architecture and people, which has formed its architectural identity over centuries. However, in recent decades, the vernacular architecture of desert dwellings, which were sustainable for many centuries, is no longer able to keep up with the contemporary lifestyle for different generations. The vernacular architecture of desert dwellings and the architectural landscape in Southwest Libya face several serious challenges. These challenges include rapid changes to the building of contemporary dwellings with 'modern' trends for desert dwellings. Such trends have led to transformative patterns of socio-cultural life, which have recently resulted in the distortion of the architectural landscape of the region.

Southwest Libya has experienced defects in desert-dwelling designs in terms of the lack of compatibility of those dwellings with the socio-cultural needs of the locals, including a lack of harmony with the architectural identity and patterns of contemporary life. This is in addition to the distortion of the architectural landscape of historical towns, which is caused by the rapid intercalation of imported contemporary architectural trends into the socio-cultural features of the region. This condition is worsened by the fact that the current desert dwellings are, nevertheless, still designed and implemented as a result of the same trends, causing problems in meeting the requirements of socio-cultural sustainability for the locals.

Through the literary reviews it turned out that there is a great lack of consideration of aspects of social and cultural sustainability in Southwest Libya, and, in general, it is the aspect that is explored the least in the prevailing literature. This research highlights the absence of social and cultural sustainability considerations in the design of contemporary desert dwellings in southwest Libya. This research examined the levels of satisfaction of different generations, regarding both vernacular and contemporary desert-dwelling designs. Particular focus was placed on the views of the new generation with respect to architectural identity and contemporary lifestyle. In addition to, investigate the views of professionals and architects on the advantages and disadvantages of both vernacular and contemporary desert dwellings design as well as the socio-cultural features of sustainable desert dwellings design, including the issue of architectural identity and identity changes for young generations.

Data is collected through mixed-methods techniques: questionnaires and semi-structured interviews. Three historical towns Ghadames, Sabha and Ghat in Southwest Libya are selected which are distinguished by the unique vernacular architecture expressing the identity, diversity and cultural heritage of its people as the case study.

The findings of the questionnaire showed different levels of satisfaction of the respondents with respect to the social and cultural sustainability features for both vernacular and contemporary desert-dwelling designs, most of which refer to levels of satisfaction with vernacular dwelling designs in terms of traditional values and cultural heritage; the levels of satisfaction with contemporary dwelling designs were about features that relate to the contemporary lifestyle. The findings also showed the new generation's response levels for architectural identity, architectural heritage, and contemporary lifestyle, as well as the preferences and desires of the population. The findings of the interviews showed an in-depth understanding of the advantages and disadvantages of desert dwellings design. The features highlighted the socio-cultural sustainability of both vernacular and contemporary desert dwellings in Southern Libya, which integrated and synthesised later with the findings of the questionnaire.

A set of guidelines was then formulated, based on the integration of the findings of the questionnaire and interviews with the lessons learned from vernacular architecture and the advantages of contemporary desert dwellings, to represent the fundamental points towards socio-cultural sustainability in desert dwellings design in Southwest Libya to increase residents' satisfaction with the design of their dwellings which fulfil their social and cultural needs. In addition to the most important steps to be taken by the relevant authorities to promote cultural identity and preserve the architectural identity, especially for the younger generations.

CHAPTER ONE

INTRODUCTION

CHAPTER ONE: INTRODUCTION

1.1 Introduction

This chapter gives a detailed picture of this study, which is structured in the following order: firstly, context and rationale, statement of the problem and justification, followed by the research gap and contribution and scope of the research. Then, the research aim, objectives and research questions are described. This chapter also highlights on the structure of the thesis were presented.

This coordination shows in the Figure 1.1

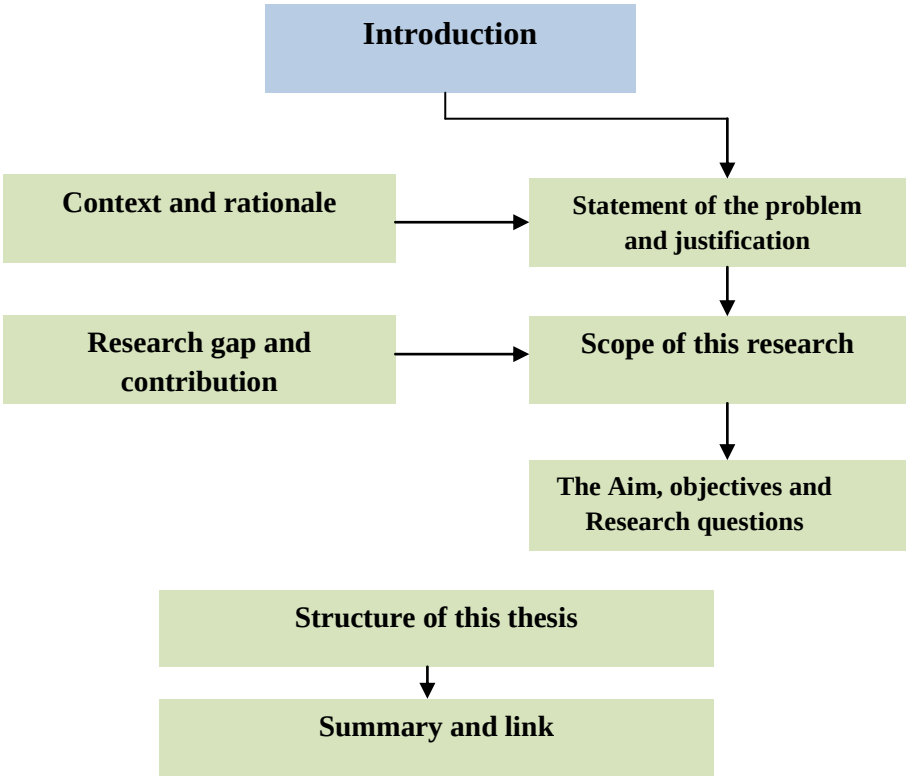


Figure 1.1: Structure of Chapter one: Introduction

1.2 Context and rationale

Nowadays, the design of sustainable dwellings is one of the most important issues in many developing societies, such as Arab countries, especially in light of the political and economic volatility in these countries. The theme of sustainable dwelling design has come to the attention of architectural researchers in order to meet the future needs of the population in a sustainable manner (GhaffarianHoseini *et al*., 2011).

The surrounding environment, including the natural, climatic, economic, and socio-cultural elements, affects several important aspects of dwelling design and urban environment for the population (Ani, *et al*., 2012). However, it is influenced by changes in contemporary developments and by both modern technology and economic growth. In this context, sustainable dwelling design employs modern technology along with ensuring compatibility with the environment in order to produce a design that both ensures comfort, and improves the quality of life and well-being of the dwellings inhabitants (GhaffarianHoseini *et al.*, 2013).

According to Ahmed, K. (2011), improving the quality and safety of human life is linked to interaction with the natural environment, the economy, and socio-cultural features. However, socio-cultural features are particularly important for dwelling design, especially features such as social values and cultural heritage that are inherited by different generations (Grant, 2006); socio-cultural features are perhaps the least explored within the prevailing development literature (Al-Jamea, 2014). The various human societies often carry different traditions and customs without any logical explanation and ultimately constitute the cultural heritage values of that society (Malkawi *et al.*, 2003). The adoption of sustainability rules and strategies has become vital in housing design and residential environments (Almansuri *et al.*, 2009).

Rapoport (1969) draws attention to the fact that the three foundations of sustainable architecture are social, economic, and environmental aspects. Sustainable dwellings are devoted to the principles of environmental protection and enhance people's quality of life (Faulconbridge, 2013). Socio-cultural feature experiments are often associated with measuring the level of satisfaction of a population (Makinde, 2015).

As Rapoport (1969) indicates, a society considers a dwelling to be not just a place to live, but also a place for social and cultural interactions. Rapoport (1980) also points out that uneven socio-cultural features should be equally important to dwelling design. The success of a sustainable dwelling needs to balance the environmental, economic, and socio-cultural aspects

of building sustainable dwellings (Alwaer *et al.*, 2010). According to Connelly (2007), economic development, social justice, and environmental protection are among the most important priorities of sustainable housing projects. Meanwhile, in some of the literature and previous studies in the context of dwellings, the importance of socio-cultural features, such as religious, emotional, and heritage values, has been ignored (Kaklauskas, 2015).

Sustainable dwellings are devoted to the principles of protecting the residential environment and enhancing the quality of life of the population, since these aspects are often linked to residents' satisfaction with the design of their dwelling (Makinde, 2015). The current situation in many historical towns in Southwest Libya, which have inherited centuries-old values and experiences that are threatened by new actors changing their built environment, is that the rapid entry of the contemporary design trends from government institutions and designers, and the impact of the contemporary international architecture trends that have come from foreign companies have contributed significantly to changes in the architectural environment. That has led to a disconnect in the relationship between the people and their vernacular built environment. This is in addition to the question of whether these contemporary trends in dwelling design can meet the cultural needs of the desert society.

Most of the previous research on towns in the chosen region focus on the environmental and climatic aspects, and ignore the aspects of socio-cultural sustainability, despite its importance and the need for it, especially as the problem continues to worsen. Nevertheless, Abufayed *et al* (2005) highlighted some aspects of environmental sustainability in the vernacular architecture of Ghadames and Aburounia (2007) deals with some of the trends in environmental and social sustainability in specific housing projects in Tripoli. Therefore, there is a deep lack of study of socio-cultural sustainability in the literature in this area. The need has arisen for a new design that creates a balance between the contemporary needs of the population, especially the new generations, and the protection of heritage and cultural identity. The contemporary desert-dwelling designs that have failed to meet the socio-cultural needs of the population and that have contributed greatly to the distortion of the architectural landscape of these historical towns should be reconsidered.

In light of this, it needs to be considered that the essence of a sustainable dwelling is that it must be appreciated in the context of human housing , and sustainable dwellings contribute to raising the standard of quality of life, preserve the residential environment, and enhance socio-cultural features. This should be achieved through an appropriate dwelling design that should not be based solely on emotional discourse but on a real relationship between the

dwellings and socio-cultural features. In this sense, the purpose of this research is, to formulate a set of guidelines based on the integration of the lessons learned from the features of vernacular architecture and the advantages of contemporary desert dwellings in terms of socio-cultural sustainability. It also aims to focus to the absence of socio-cultural sustainability considerations in the design of contemporary desert dwellings in southwest Libya in the three selected historical towns (Ghadames, Sabha, and Ghat) by measuring the satisfaction levels of different generations of the population regarding both vernacular and contemporary desert-dwelling design. Particular scrutiny will be given to the views of the new generation on architectural identity and contemporary lifestyle. The desert vernacular architecture: This term is used in the thesis to refer to ethnic, heritage architecture dwellings in hot climates and dry geographical environments. The specific focus of the thesis is desert vernacular architecture for dwellings in historical towns Southwest Libya such as those in Ghadames, Ghat and Sabha. In addition to the term of sustainable which use in this thesis to refer to sustainable dwelling that meet the needs of the present population alongside ensure that future generations will be able to have their needs met and aim to integrate social, cultural, and environmental features to achieve sustainable design and largely compatible with its surroundings, and limits the negative effects on the environment. It also adopts a consensual approach to resource consumption.

1.3 Statement of the problem and justification

Vernacular historical towns in Southwest Libya reflect man's response to the harsh desert environment, and the need to sustain social organisation, and respect social and cultural traditions (Elhassi, 2004). The current local population in desert towns and oases have a similarly strong desire to replicate the formation of such settlements and the characteristics of indigenous habitats. This has played an important part in shaping the character of vernacular desert towns in the Southwest Libya (Ealiwa, 2000). However, most of the contemporary dwellings schemes that have been built in desert towns and oases have been unable to meet these socio-cultural conditions (Gabril, 2014).

Several sectors of vernacular desert dwellings still remain (varying in size, and area) in many Southwest towns such as Sabha, Hoon, Ghadames, Murzuq and Ghat, although many of these dwellings have been neglected. However, they still represent the sustainability of vernacular architecture in Southwest Libya and are considered as good examples of desert dwellings that are suitable for occupation in terms of socio-cultural features and the surrounding environment (Amer, 2007, Almansuri, 2009). The nature of those dwellings is founded on the

harmonious blend between architecture and people, which has formed its architectural identity over many centuries (Eltrapolsi, 2016). Nevertheless, in recent decades the vernacular architecture of desert dwellings, which were sustainable for many centuries, is no longer able to keep up with contemporary lifestyle for different generations (Bilghit, 2007, Almansuri, 2009). Several studies indicate that the contemporary desert-dwelling designs fail to meet the socio-cultural sustainability needs, and they significantly contribute to the distortion of the architectural landscape and the loss of architectural identity (Shawesh, 1996, Atmansuri, 2009). This is in addition to the distortion of the architectural landscape of historical towns, which is caused by the rapid intercalation of imported contemporary architectural trends into the socio-cultural features of the region.

The contemporary desert dwellings may have addressed some housing needs, but they have failed to satisfy the socio-cultural values of the inhabitants and so have created a multitude of socio-cultural dwelling problems (Sharif*et al.*, 2010). According to Rapoport, (1981) modern technology has not fully satisfied the requirements for the living conditions and situations that can be used to develop and support the housing needs of desert communities. However, evidence reveals the importance of these socio-cultural aspects in the dwelling design process (Amer, 2007). In the same context Shawesh, (1996) notes that acceptable architecture takes into consideration the socio-cultural and environmental principles, as well as way-of-life systems, especially in vernacular desert towns.

Most of the desert-dwelling projects in Libya have been carried out through schemes accomplished by foreign companies, with consulting offices outside Libya. The dwellings are designed in an international style, using contemporary technologies (Amer, 2007). Furthermore, this condition is worsened by the fact that the contemporary dwellings are still being designed and implemented using a method that is remote to the socio-cultural needs and the identity of the historic region (Mezughi and Dawi, 2003, Bilghit, 2007, Jamal, 2008, Azlitni, 2009). Recently, some dwelling projects have been implemented in desert towns, such as Sabha, Ghadames, Ghat, and Hoon, but, similarly, they do not take into account the socio-cultural needs of the locals and the desert environment, or the importance of these historical towns and their unique vernacular architecture.

In other words, desert-dwelling design in Southwest Libya still experiences defects in terms of the lack of compatibility of those dwellings with the socio-cultural needs of the locals, including a lack of harmony with the architectural identity and patterns of contemporary life. From this comes the need to develop contemporary dwellings that carry the spirit of such

vernacular architecture. This can perhaps be achieved through dwelling designs that meet the needs of the population using current methods, and that realise the socio-cultural features and the contemporary-lifestyle needs of the population, combine the spirit of the vernacular architecture with the requirements of the contemporary lifestyle, create a balance between the present needs of different generations, and meet the socio-cultural needs of the population, all of which are needed in contemporary dwellings. Moreover, these dwelling designs need to preserve the spirit of cultural and architectural identity.

Over the past few decades, Southwest Libya has not gained attention in the field of housing, unlike other regions in the north of Libya. With the exception of some limited housing projects in Sabha, the Southwest capital, in the early 90s. The problem of desert dwellings has been exacerbated recently as a result of the increase in population, and the movement of people in due to several economic and political factors in Southwest Libya. Therefore, one of the purposes of this research is to shed light on desert-dwelling design to contribute to drawing the attention of the state and housing sector to improving dwelling designs in the region.

At several local conferences and seminars on*"desert environment and housing"* (Sabha, 2008), issues have been raised related to housing and spatial development in the Libyan desert, particularly in Southwest Libya. These issues have not received enough attention in the subsequent studies (Elgazeri, 2009) that discuss the problems experienced in the architecture for desert dwellings in Southwest Libya.

Nevertheless, there is a need to develop and provide more decent sustainable desert dwellings. The dwellings problem has become an urgent phenomenon that is increasing every day, as discussed at the first national conference on housing in Libya (Benghazi, 2012) that aimed to analyse that country's housing crisis. Asmida (2013) indicates, that there is an urgent need for sustainable, healthy, and adequate dwellings that meet the socio-cultural requirements for local inhabitants in the desert environment. This is in order to stabilise the population, and address and reduce the resulting social problems (Abdelkrim, 2011).

The goals of the new Libyan government after the conflict that took place in 2011 are to determine how to encourage the local inhabitants in Southwest Libya to remain in their towns and to promote sustainable spatial development. This research intends to offer advice on providing appropriate dwellings that meets this need, especially in the desert areas that have been neglected for many years, as the aim of the research is to determine how to increase the

satisfaction of different generations of residents with the design of their dwellings, which should fulfil their social and cultural needs.

This clearly underpins also justifies the perspective of this research is situated, that is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings in Southwest Libya for sustainable dwellings design. Furthermore, the following section presented the research gap and contribution and presentation of research scope then the aim, objectives and the questions of this research.

1.4 Research gap and contribution

Previous studies in the context of Libyan housing show the paucity of literature review and clear information on socio-cultural sustainability regarding the architectural design of dwellings, particularly in desert regions. Furthermore, there is a shortage of studies that relate to the ability to cope adequately with the demands for the provision of sustainable dwelling design that is aligned with the socio-cultural sustainability needs of the population, and that keeps up with socio-cultural transformations and the needs of the contemporary lifestyle of different generations. This reveals that no attention has been given to desert-dwelling design in terms of its evolution with respect to socio-cultural sustainability, which means that there is a lack of extensive and formal empirical research. Thus, there is a need to follow the evolution of the desert-dwelling design process for this particular aspect, which is the least explored within the known literary reviews for housing development in Southwest Libya.

Hence, there is a gap in the knowledge regarding the absence of architectural features relating to socio-cultural sustainability in the design of desert dwellings in historical towns in Southwest Libya. This research will contribute to the existing knowledge through formulating a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. This integration is considered to be vital for the development of sustainable desert-dwelling projects for different generations, with particular focus on the opinions of young people in this era of information and advanced technology, and its impact on both the architectural identity and contemporary lifestyle. Furthermore, the research aims to increase the level of population satisfaction with the design of their dwellings, improve the quality of life for locals, and seek to preserves the society's cultural identity. Additional discussion about the knowledge contribution will be presented in Section 8.4 in Chapter Eight.

The next section focuses on the scope of this research.

1.5 Scope of this research

This research focuses on the socio-cultural sustainable features for both vernacular and contemporary desert dwellings. Specifically, it focuses on the architectural features as an influential factor in the design of desert dwellings in Southwest Libya, and uses this to formulate a set of guidelines to improve the future desert-dwelling projects. However, this can only be achieved through studying a wide area of Southwest Libya, and polling the views of different generations of the local population and experts. This research explores the significance of the socio-cultural-sustainability features to the appropriate design of desert dwellings, which will meet the needs of the population, be compatible with the social and religious conditions, and meet all the cultural requirements. Data collection for the research was carried out in three historical towns in Southwest Libya, targeting three age groups of local population; this was in addition to conducting interviews with experts, architects, and professionals in the housing field. Based on the analysis of data and findings, a framework is presented for identifying the features that overlap and for promoting the integration of the socio-cultural-sustainability features of vernacular and contemporary architecture into the delivery of new dwellings in Southwest Libya.

The following section shows the research aim and objectives, and the research questions.

1.6 Aim, Objectives and Research Questions

1.6.1 The aim

The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya.

1.6.2 Research objectives

To achieve this aim, the following objectives have been set:

1. To define the features of vernacular and contemporary desert dwellings, and perceive the degree of satisfaction of different generations with the socio-cultural architectural features of vernacular and contemporary architecture in Southwest Libya;

2. To compare the vernacular and contemporary desert dwellings for synthesise the features of both vernacular and contemporary desert dwellings in terms of suitability for the socio-cultural sustainability features;

3. To investigate the standpoint of designers, architects and academic professionals concerning the advantages and disadvantages of vernacular and contemporary desert dwellings in terms of the socio-cultural sustainability of sustainable desert dwellings in Southwest Libya;

4. To formulate a set of guidelines to integrate the socio-cultural architecture features for vernacular and contemporary desert dwellings for sustainable desert dwellings in Southwest Libya;

5. To validate this proposed guidelines with housing experts in Libya;

1.6.3 Research questions

Sections 1.2 and 1.3 identified the context and statement of the problem and justification. Following that, Section 1.6.2 described the research objectives. According to research objectives, the research seeks to address the following questions to achieve the aim of the research (see Section 1.6.1):

1. How can the socio-cultural architectural features of vernacular and contemporary desert dwellings be integrated to synthesise a set of guidelines for the sustainable design of desert dwellings in Southwest Libya?

2. What are the difference between the features of vernacular and contemporary desert dwellings in terms of suitability for the socio-cultural sustainability features?

3. How can the lessons learned from the architecture of vernacular and contemporary desert dwellings support the integration of socio-cultural sustainability features for sustainable desert dwellings in Southwest Libya?

4. What are the socio-cultural architecture features of both vernacular and contemporary desert dwellings that can contribute to developing the sustainable desert dwellings design in Southwest Libya?

Table 1.1 Illustrates the linkages between aim and objectives of research and research questions, and the chapters in which they are presented.

Table 1.1: Linkages between aim and objectives of research and research questions in the thesis

The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya	
Research questions	**Research objectives**
1. How can the socio-cultural architectural features of vernacular and contemporary desert dwellings be integrated to synthesise a set of guidelines for the sustainable design of desert dwellings in Southwest Libya?	1. To define the features of vernacular and contemporary desert dwellings and perception the satisfaction degree of different generations about the socio-cultural architecture features for vernacular and contemporary architecture in Southwest Libya;
2. What are the difference between the features of vernacular and contemporary desert dwellings in terms of suitability for the socio-cultural sustainability features?	2. To compare the vernacular and contemporary desert dwellings for synthesise the characteristics and features of both vernacular and contemporary desert dwellings in terms of suitability for the socio-cultural sustainability features;
3. How can the lessons learned from the architecture of vernacular and contemporary desert dwellings support the integration of socio-cultural sustainability features for sustainable desert dwellings in Southwest Libya?	3. To investigate the standpoint of designers, architects and academic professionals concerning the advantages and disadvantages of vernacular and contemporary desert dwellings in terms of the socio-cultural sustainability of sustainable desert dwellings in Southwest Libya;
4. What are the socio-cultural architecture features of both vernacular and contemporary desert dwellings that can contribute to developing the sustainable desert dwellings design in Southwest Libya?	4. To formulate a set of guidelines to integrate the socio-cultural architecture features for vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya;
	5. To validate this proposed guidelines with housing experts in Libya;

1.7 Structure of the thesis

This research aims to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. This is studied from vernacular and contemporary desert dwellings in three different regions in Southwest Libya. For the purposes of this research, the structure of the thesis contains eight (8) chapters as shows in Figure 1.3. Subsequently, the chapters as described below:

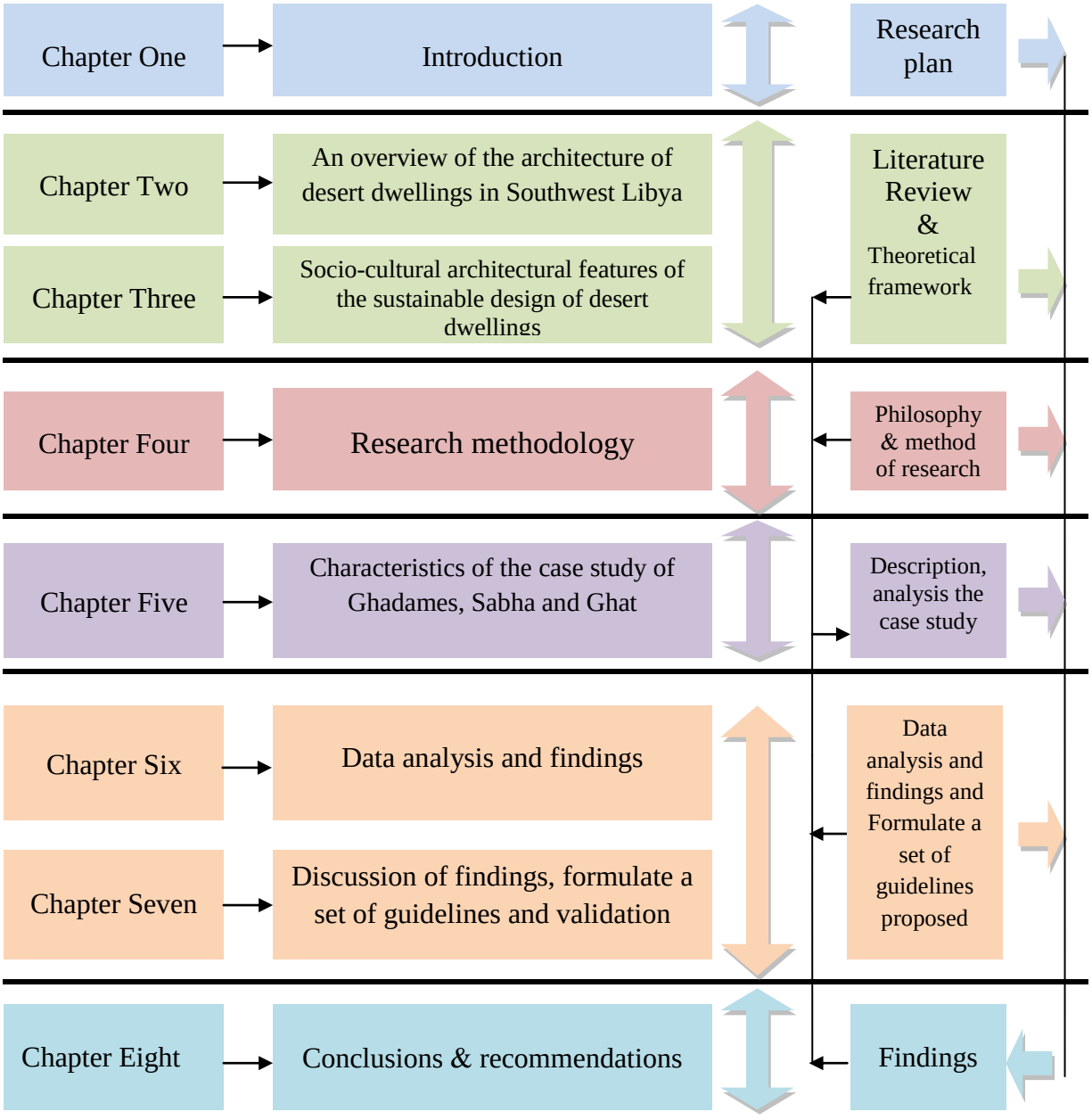


Figure 1.3: Overall structure of the thesis

1.7.1 Chapter One: Introduction

This chapter provides an introduction and a brief outline of the structure of this research. The context and rationale, statement of the problem. Research gap and contribution and scope of this research were presented. Further, the research aim, objectives and research questions have been provided. This chapter also presents the thesis roadmap;

1.7.2 Chapter Two: An overview of the architecture of desert dwellings in Southwest Libya

This chapter gives an overview of literature considerations for the architecture of desert dwellings in Southwest Libya. This chapter is considered as a documentation of the emergence of vernacular sustainable architecture of desert dwellings in the region and documents the stages of its development. Firstly provide a brief summary in the context of Southwest Libya, including discusses the location and natural environment of Southwest Libya, and will outline the topography, climatic environment, and economic activities of southwest Libya; the chapter includes a review of the historical development of desert dwellings in Southwest Libya beginning from ancient times and even includes the contemporary period. This is followed by detailing the vernacular architecture in Southwest Libya, including the most important socio-cultural features of the architectural elements, the building materials, and the types of desert dwellings in the Southwest Libya. Finally, it explains the most important lessons learned from this unique style of architecture.

1.7.3 Chapter Three: Socio-cultural architectural features of the sustainable design of desert dwellings

This chapter provides the review of the literature to develop a theoretical perspective, including a theoretical focus on socio-cultural sustainability features that influences on architecture for desert dwellings in Southwest Libya, to understand the role of socio-cultural features in the desert-dwelling design. Therefore this chapter first researches the concept of dwellings and reviews the different perspectives. Second, the chapter addresses the concept of sustainable development, sustainable architecture, the concept of socio-cultural sustainability, and the social and cultural features of sustainable dwellings which include the privacy, safety and security, shape and design of dwelling, and social considerations and religious beliefs including the regular and religious events and activities which contribute to the design of the

desert dwellings in the Southwest Libya. Followed by the importance of the identity and cultural heritage including the definition of identity and definition of cultural heritage and identity and cultural heritage aspects in this research also, the issue of the changes of perception of identities in younger generation, and the contemporary lifestyle was explored.

1.7.4 Chapter Four: Research methodology

This chapter describes the methodology adopted for the implementation of this research to achieve the aim and objectives set, and to meet the requirements to answer the research questions. The research is organised as follows. First, it presents the research model that was adopted and followed in this research (Saunder's research onion) and then the philosophical position of the research and research approaches and strategies. Followed by research choices and data collection and analysis techniques. Finally, the chapter presented validation of guidelines proposal and triangulation of research.

1.7.5 Chapter Five: Characteristics of the case study (Ghadames, Sabha and Ghat)

This chapter of this thesis presents characteristics of the three selected desert historical towns in Southwest Libya (Ghadames, Sabha and Ghat)as a case study. This begins by providing a brief of general characteristics including the location and historical background. The overall shape of the urban fabric of vernacular architecture and types and socio-cultural characteristics of vernacular desert dwellings in the each of the three towns were discussed. Then identify a summary of contemporary town and the contemporary dwellings. Finally, comparative between the vernacular dwellings and contemporary dwellings in Ghadames, Sabha, and Ghat in Southwest Libya are presented.

1.7.6 Chapter Six: Data analysis and findings

This chapter discusses the data analysis and the main findings that emerge from this research. First, it presents the data analysis for the questionnaire. Second, the data from the interviews with professionals is given, which are later compared and contextualised, and these are synthesised to achieve the aim of the research. The approach for the discussion is generally designed based on the research questions established in Section 1.6.3, and are explored further in Chapter Six.

1.7.7 Chapter Seven: Discussion of findings, formulate a set of guidelines and validation

The thorough nature of the discussion in this chapter seek the integration of socio-cultural architectural features of vernacular and contemporary desert dwellings to formulate a set of guidelines for the sustainable design of desert dwellings in Southwest Libya. Through the findings from the questionnaire and interviews with professionals, these features are privacy; and safety and security; shape and design of dwellings; social considerations and religious beliefs; in addition to, identity and cultural heritage; and contemporary lifestyle. These features of desert dwellings are synthesised to formulate a set of guidelines to be implemented. Finally, the housing experts in Libya validated the proposed set of guidelines, which is explored further in Chapter 7.

1.7.8 Chapter Eight: Conclusions and recommendations

This chapter concludes the research results, presents how the objectives have been addressed, and identifies the contribution to knowledge. The chapter, moreover, includes a generalisation of the findings and the limitations of the research. Appropriate recommendations for further research are provided.

1.8 Summary and link

This chapter presents the introduction, and the context of the research, giving an adequate statement of the research problem and justification for the research, the research gap, and the contribution and the scope of this research. It has also presented the aim and objectives, the research questions. The chapter, moreover, provides the structure of the thesis. The next chapter (Chapter two) presents an overview of architecture for desert dwellings in Southwest Libya as a first part of the literature review of this research.

CHAPTER TWO

AN OVERVIEW OF THE ARCHITECTURE OF DESERT DWELLINGS IN SOUTHWEST LIBYA

CHAPTER TWO

AN OVERVIEW OF ARCHITECTURE FOR DESERT DWELLINGS IN THE SOUTHWEST LIBYA

2.1 Introduction

This chapter outlines first, the natural environment of Southwest Libya including; the topography, climatic environment and economic activities of Southwest Libya, and socio-cultural background. The second section presents the historical development of desert dwellings in Southwest Libya beginning from ancient periods until the current architecture of vernacular desert dwellings in Southwest Libya, and its socio-cultural features, types. Finally, the lessons learned from that vernacular architecture for desert dwellings design as well as the contemporary period were presented. Figure 2.1 shown the structure of this Chapter.

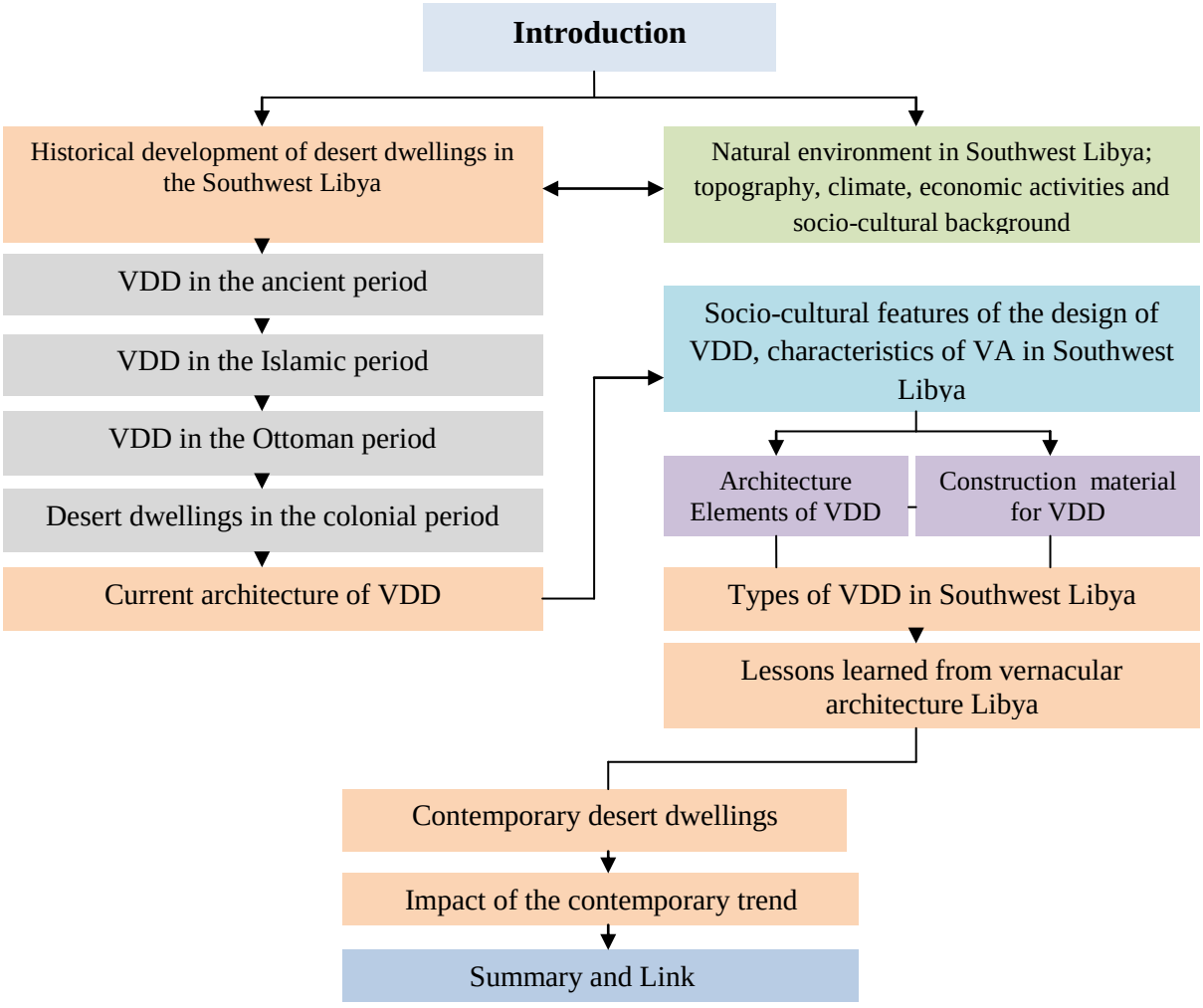


Figure 2.1: The structure of Chapter two

2.2 Natural environment of Southwest Libya

The desert in Southwest Libya is part of the Sahara Desert in North Africa. The vast Sahara Desert stretches from the western Nile River and even extends further to the outskirts of the coastal cities south of Morocco and Mauritania. It represents a large part of the territory of Maghreb (Figure 2.2).

The Sahara Desert has an exceptionally dry nature, and has the typical natural features and topography of a desert, including the specific characteristics of a desert in the Southwest Libya as presented later. The study area under investigation that shows in Figure 2.3 located between longitudes of 9° and 19° east, and latitudes of 23° and 31.5° north (Atlas of Libya, 1978).

Figure 2.2: The location of the Sahara desert
Source : http://www.satellite-sightseer.com

Figure 2.3: The study area Southwest Libya
Source :The researcher adapted from atlas of Libya

Based on the geographical location, the desert in Southwest Libya is considered to be a dividing barrier between areas in central Africa and the coastal areas in the north. The southern parts of Libya have been influenced directly by the region's historical events in ancient times, which have been important for the transit of trade, particularly for sub-Saharan countries in Africa, such as Niger and Chad (Al-Maazi, 2006). This represents the first nucleus of the emergence of urban settlements in the desert. In addition to these, the Southwest of Libya has a strategic location that forms a link between the eastern and western parts of the Arab world. For the aforementioned reasons, local, Arabic, and Islamic cultures and civilisations meet and blend in this region (Al-Maazi, 2006).

2.2.1 Topography of Southwest Libya

The topography of Libya in general consist of barren plains and low-lying plateaus in the north, and higher plateaus interspersed with depressions in the southern desert; the Southern mountain ranges (see Figure 2.4) are the most prominent natural features (Gabril, 2014).

In the Southwestern Libyan Sahara there are several diverse natural phenomena, resulting from the multiplicity of manifestations of topography. Regions include mountainous locations, such as the Acacus Mountains, and vast sand dunes with various shapes and multiple colours, such as Ubari Sands, Murzuq Sands, and the Great Sand Sea. The region also includes the land of the Al-Hamada Al-Hamra Stones, which consists of rocks, sand stones, and desert sand. The desert of Southwest Libya includes unique phenomena such as oases, sand dunes, lakes, volcanoes, scenic rock formations, and other natural phenomena (El-Tantawi, 2005). In addition, there are other natural raw materials, such as sands, mud, soils, stones, and palm trunks, which were used as the primary building materials for vernacular dwellings.

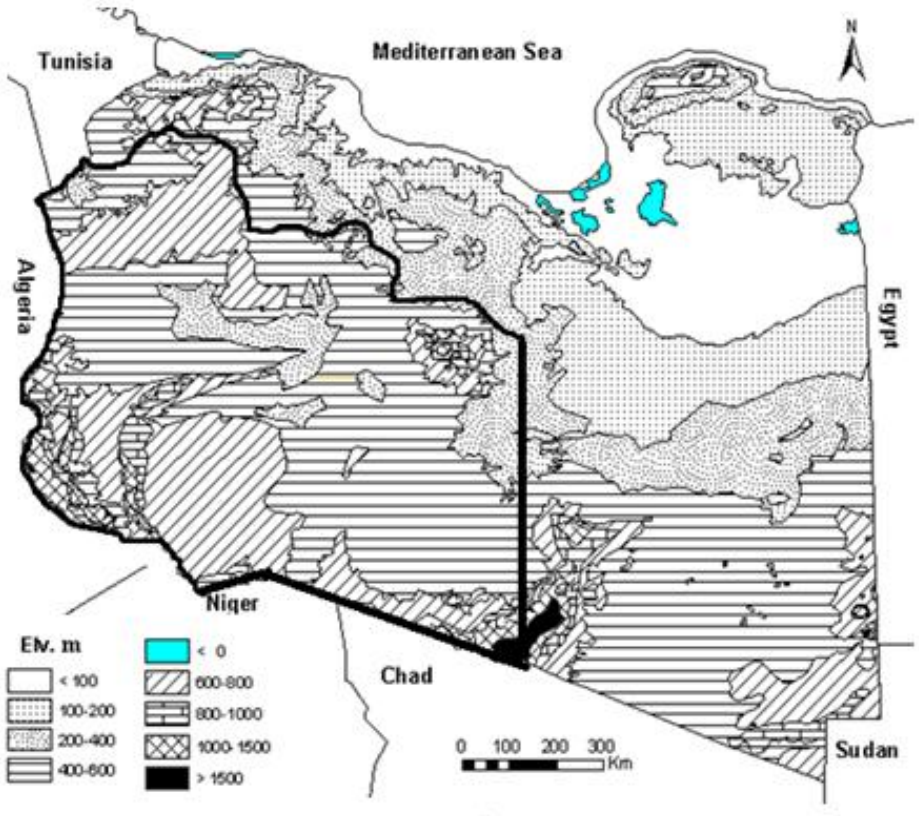


Figure 2.4: The topography of Southwest Libya
Source: Researchers adapted from MP, 2009

2.2.2 Climate of Southwest Libya

The geographical location of Southwest Libya plays a key role in the factors affecting the climate, as illustrated in the Köppen−Geiger climate classification world map in Figure 2.5 . It is known that the territory of south Libya extends into vast areas lying within the scope of the hot desert climate. The boundaries of the study area lie entirely within the scope of the desert climate. The location of the orbital and sub-orbital Libyan south does not cause a significant difference in temperatures from one region to another. The daily desert weather is typically similar: hot and dry during the day and mild at night during the summer and autumn; and moderately hot during the day and cold at night in spring and winter. The exception is the climate of elevated areas such as the Tasili and Acacus Mountains. where the night is cooler than other areas of the desert (MP, 2009). Towards the south, and away from the coastal influences, the temperature range changes between day and night, and summer and winter. The relative humidity is very low in desert areas because of the surface drought and the distance from the marine influences. With regard to the prevailing winds, north and north-east winds are prevalent throughout the year in most parts of south Libya (Gabril, 2014).

Temperatures rise in Southwest Libya in the summer. June is the hottest month, the maximum average temperature is 42°C (El-Agouri, 2004). The rapid temperature rises in Southwest Libya during the first months of summer is due to the high angle of inclination of solar radiation, which goes through a line of heat equal to 30°C, which is concentrated during this season in particular on the town of Ghat and the southeast of Algeria, where average the temperature is 37°C in summer, until August. Then the temperature drops gradually during autumn. This may explain the presence of the vernacular desert dwellings with inner courtyard to ease the temperature in historical town of Ghat. However, that the temperature drops in winter to an average of 13.5°C, and January has the lowest temperature of the year of about 7°C. In general, temperatures in winter are no more than 22.9°C during February. The annual temperature range has reached 20.8°C , which is relatively large since the region is located within the territory of desert climate (El-Tantawi, 2005). The harsh desert climate along with the socio-cultural features are the two most important factors in the formation of the vernacular architecture in general and in the design of desert dwellings in particular (Gabril, 2014).

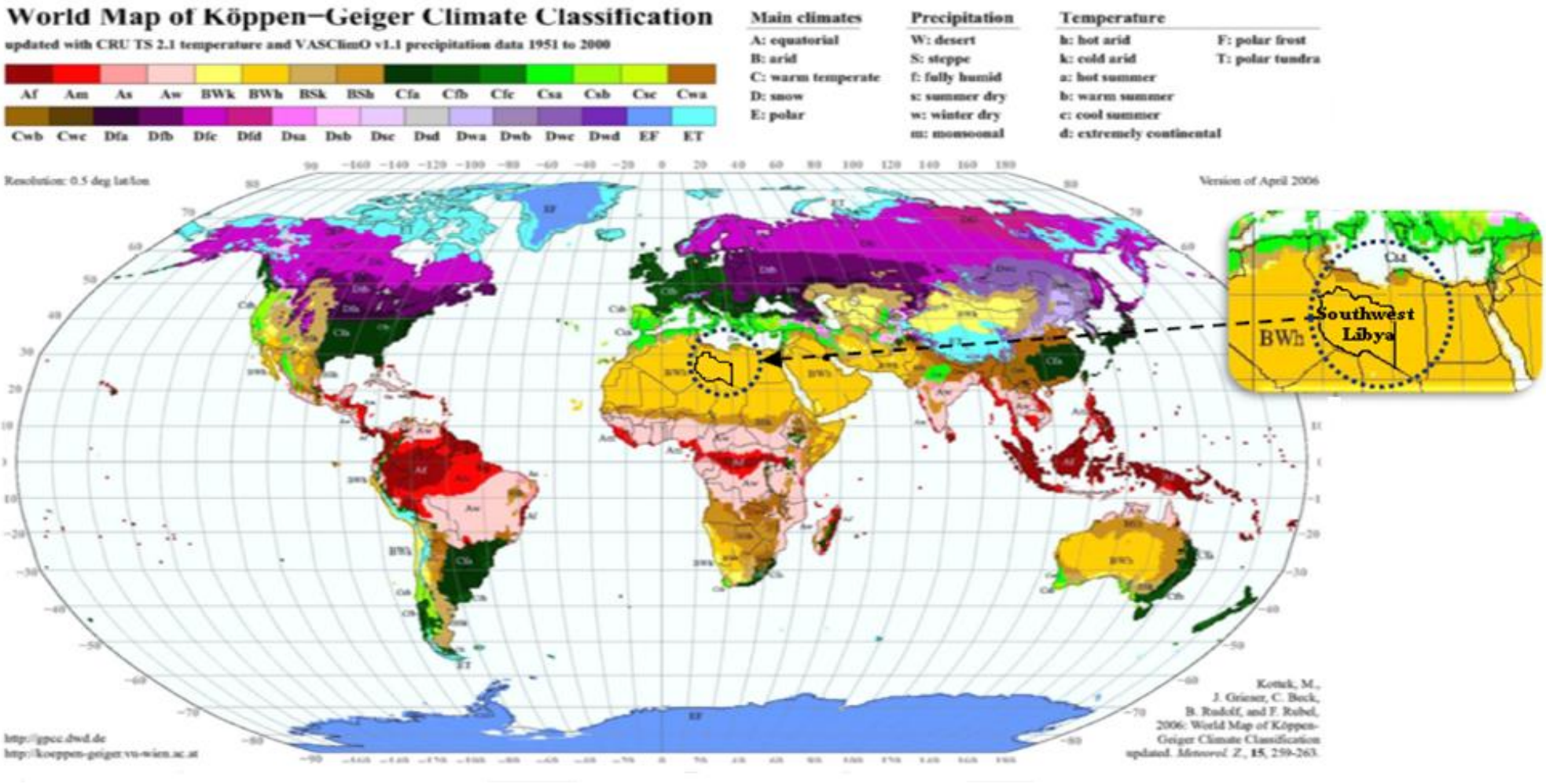


Figure 2.5: World map adapted from Köppen−Geiger climate classification. Source: Kottek *et al* (2006).

2.2.3 Economic activities of Southwest Libya

Historically, the Southwest Libya regions served as a marketplace and meeting point of caravans coming from the interior of Africa carrying leather, and gold. Goods such as sugar, clothes, and cotton came to Fezzan from Europe via the Mediterranean Sea coast a shown in Figure 2.6. Hence, Southwest Libya became an important region that sustained the trans-Saharan trade. As a result of the fact that Southwest Libya is connected to many parts of northern Africa, including Chad, Tunisia, and Algeria, the natives were able to interact with many different cultures. This interaction resulted in the development that was seen in this region (Ahmida, 2009).

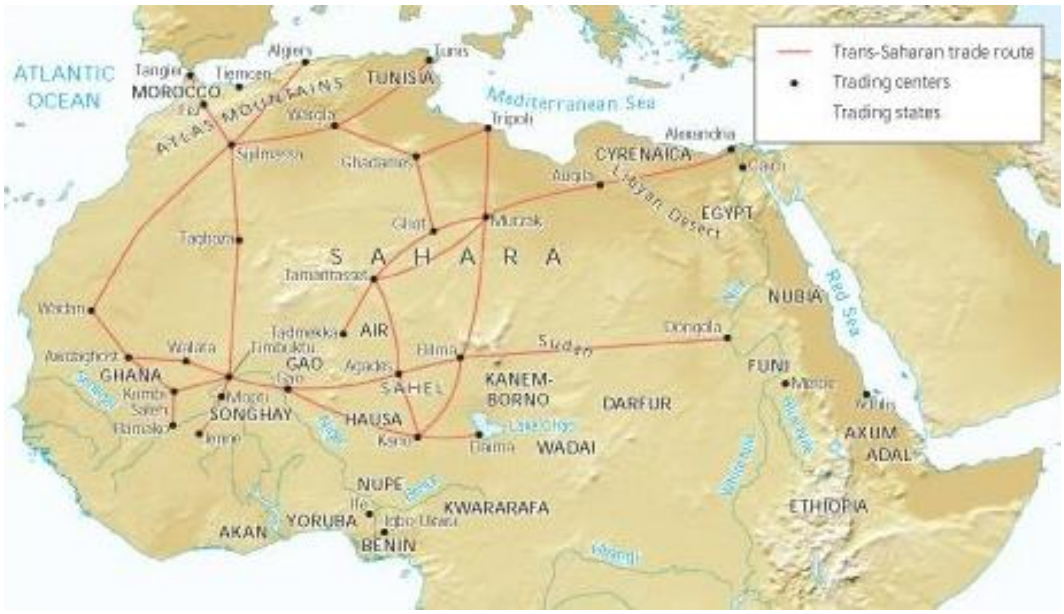


Figure 2.6: Trans Saharan trade routes in 19th and early 20th centuries. Source: Ahmida, 2009

The development of the architecture in this region is closely related to the caravan trade that led to important economic and cultural developments. After independence, and the discovery of oil, the caravan trade declined. The decline was also the result of changing political and economic factors. As such, 80% of the population resorted to agriculture as the main economic activity. However, the people did not gain much from agricultural activities because rainfall remained unreliable. After the discovery of oil, the country's economy has recovered. The society was transformed into oil-dependent economy. As a result, most towns within that regions were transformed economically. Similarly, the construction industry also began to thrive, with many housing projects in Southwest Libya which were built by foreign companies that were brought in specifically for these projects (Sheibain, 2008).

2.2.4 Socio-cultural background

Historians have extensively written about Libya, and all of them have come to the conclusion that the country has a unique architectural culture, with diverse historical riches. Libya's geographical location made it a strategic meeting point that involved many ancient civilisations. As such, the culture reflects Libya's earlier civilisations, which includes the Phoenicians, Romans, Greeks, Garamantes, Berbers, Arabs, and Ottomans, in addition to the Italians and the French. This is reflected in its society and architecture (Gabril, 2014).

Historically, Libya's population was distributed into three main provinces, which are Tripolitania, Fezzan, and Cyrenaica. These three provinces had diverse socio-cultural features and lifestyles. After the introduction of Islam, Libya's inhabitants became united by religion, although they still had different cultures. As Shawesh (1996) points out, Islam remains the strongest factor unifying the different cultures found in Libyan desert. Compared with contemporary socio-cultural life, communities of towns and oases in Southwest Libya are still the most conservative than other Libyan society in terms of privacy and social considerations which still the most important characteristics of vernacular desert dwellings in southwest Libya.

The social and cultural life of Southwest Libya is characterised by diversity. The current population consists of nomadic Arab tribes; local Tuareg, Amazigh, and Tabo tribes; as well as some African tribes, which has produced a homogenous mix of Arab, Islamic, local, and African cultures (Al-Maazi, 2006). This has been reflected in the vernacular architecture of the historical towns in southwest Libya, where many of the principles that have been rooted in the culture of the population came from beliefs, customs, and traditions, such as privacy and protection, which is one of the most important principles in the design of desert buildings.

The aim of this research to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya, which centred by residential settlements and population since ancient times, Therefore, the next section present morphology and historical development of desert dwellings in the Southwest Libya. To understand the nature of the area, the emergence of vernacular architecture, and the development of the historical towns in southwest Libya.

2.3 Historical development of desert dwellings in the Southwest Libya

Dwellings design have been affected by major developments within the political, historical, and economic perspectives. As well as, the geographical location and climate and socio-cultural features played an important role in development and design of dwellings. Thus, the vernacular architecture for desert dwellings in Southwest Libya has developed over time to adapt to a number of factors that include the topographical conditions, the local population's cultures, and customs, religious beliefs, social considerations. Currently, the changes of local populations' culture, emerging technologies, modern lifestyle, new building materials has resulted in change, reduced social and cultural features of such dwellings (Amer, 2007).

In order to understand the development of desert dwellings in the Southwest Libya, it is necessary to look at the historical development of the residential gatherings in Southwest. The ancient vernacular residential gatherings in the Sahara Desert originated near headwaters in the crossroads of the trade caravans, where the people could sow crops and graze cattle, and work in the trade as well. Those residential gatherings met their basic needs including shelter, to protect them from the hard environment in the desert. People always look for the place best suited to their residence. Previously, trade between those oases provided the economic prosperity and socio-cultural diversity. Over time, oases evolved, and over prolonged periods they became desert towns (see Figure 2.7).

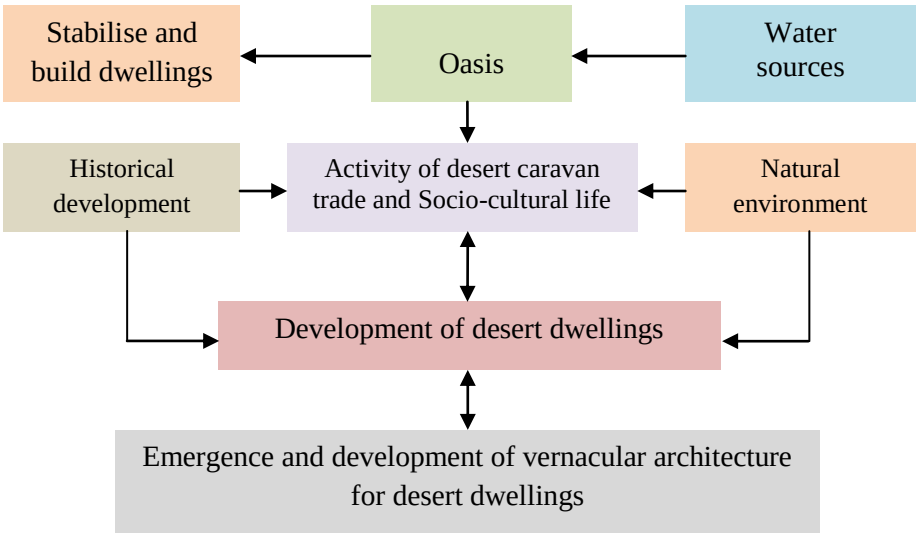


Figure 2.7: Emergence of vernacular architecture for desert dwellings. Source: the researcher

Moreover, most of the vernacular desert residential gatherings in Southwest Libya were formed in oases in the desert region were also settled traditionally. The typology of desert dwellings was influenced largely by socio-cultural features, ways of life, climatic conditions and historical development. The population of Southwest Libya during the aforementioned periods was divided into settled people, semi-nomads, and nomads. The nomads and semi-nomads lived in non- permanent settlements, using portable tents, and moved from location to location seasonally (Al-Maazi, 2006). The settled sector of the population lived in stable residential gatherings, such as desert towns or oases, which varied mainly in terms of size or building materials, according to the local inhabitants, climatic conditions, or geographical location. These factors affected the desert dwellings in terms of topology, space organisation, and characteristics from one period to another. On a historical level, one can identify five distinct stages of the development of desert dwellings that were present in southwest Libya during the ancient, Islamic, Ottoman, colonial, and contemporary periods. In the case of vernacular dwellings, there has been an amazing resistance to change the adapted and valid house form one period to another. The five historical stages are shown in following sections:

2.3.1 Vernaculardesert dwellings in the ancient period

Most of the historical studies (Al-Maazi, 2006, Elgazeri, 2009) indicate that more than one ancient groups of people settled in Southwest Libya. Therefore, the emergence of architecture for dwellings in Southwest Libya was very ancient. Traces of those ancient dwellings that built by these ancient human groups have been found, also the traces of sculptural art, inscriptions, and ancient graveyards. The three ancient groups that settled in the Southwest of Libya are namely; Al-Mtaknduc in the Acacus region, then Al-fzazna (Bushmen) in the Al-Ajaal valley and finally the Al-Garamants in the wide area around the Al-Ajaal valley (Al-Maazi, 2006), (see Figure 2.8). Acacus considered an ancient residential gathering and the largest gathering of inscriptions in North Africa (see Figure 2.9). The Al-Mtaknduc lived in the Acacus region. There were not any clear forms architecture for dwellings in that period. However, Al-Garamants are considered the most important of the ancient human groups who inhabited Southwest Libya from Herodotus until the Roman era (Al-Maazi, 2006). According to Shawesh (1996) Al-Garamants lived in portable dwellings resembling tents.

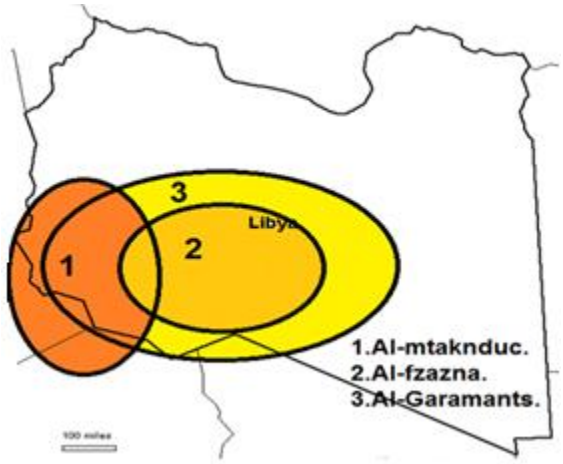


Figure 2.8: Oldest three places of settled in Libyan desert
Source: The researcher adapted from Al-Maazi, 2006.

Figure 2.9: Sculpture and inscriptions in Acacushuman groups
Source: : http://4dtours.com/eng/germa.htm

Table 2.1 shows the historical sequence of the desert residential gatherings since the onset of inhabitation in Southwest Libya. Also, the Table shows the name of the architectural historical period and the centre of residential gatherings or the capital, and the name of the state that ruled Fezzan (Southwest Libya) in that period. For example, Germa town (see Figure 2.10) considered most important desert town in the ancient period and it was the capital of Al-Garamants, while Zewailah was an important town in the Islamic period. This helps to understand the evolution of residential gatherings and gives a glance view of the historical events that related to evolution of desert towns. In that period, the permanent dwellings in Germa (see Figure 2.11) comprised of one or more rooms and their walls were plastered with gypsum. Old Germa had a good system for water supply and sanitation as revealed by the excavations in the region. Excavations have shown dwellings but without clear details about their type of architecture design (Shawesh, 1996).

Figure 2.10: An aerial view of Germa

Figure 2.11: Remains of ancient dwellings in Germa
Source: http://libyablog.org/2014/01/12

Table 2.1: Sequence of historical events for desert residential gatherings since the onset of inhabitation in Southwest Libya

Number	Name of the state that ruled Fezzan (Southwest Libya) and settled in it	The centre of residential gatherings or the Capital	The duration	The historical period		The name of architectural historical period for desert dwellings
				From	To	
1	Hunters period, Matkandush	Al-Ajaal valley	2000years	4500 BC	2500 BC	Primitive period of Almtaknduc
2	Pastorals period	Acacus in the West, Abu-derna town in the east	1500 years	2500 BC	1000 BC	Remnants of ancient dwellings
3	Al-Garamant	The ancient town of Germa.	1195years	800 BC	AD 395	Local ancient desert dwellings
4	The Roman campaign on Fezzan, Campaign of Kurniaius in 19 BC.	No completely dominate on the Germa town as well as Fezzan	Almost 2 year	19 BC	17 BC	Local ancient desert dwellings
5	Arrival of Al-Normand to Fezzan	The ancient town of Germa.	Almost 5 year	AD395	AD400	Local ancient desert dwellings
6	The recent state of Al-Garamants	The ancient town of Germa.	242years	AD400	AD642	Local ancient desert dwellings
7	Islamic conquest of Fezzan	Zwelaa town	365 years	AD642	AD1007	Mixing ancient and Islamic local desert dwellings
8	The State of Bani Al-katab	Zwelaa town	167 years	AD1007	AD1174	Local Islamic desert dwellings
9	Qaraqush Al- armeni rule of Fezzan	Waadan town	38 years	AD1174	AD1212	Local Islamic desert dwellings
10	The emergence of Kanem Kingdom	Tragn town	126 years	AD1218	AD 1344	Local Libyan African desert dwellings
11	State of Al-Korman	The ancient town of Germa.	206years	AD1344	AD1550	Local Libyan African desert dwellings
12	State of Awlad Emhemed Al-Fassi 1	Murzuq town	27years	AD1550	AD 1577	Vernacular local desert dwellings
13	The rule of the Ottomans 1	Murzuq town	5years	AD1577	AD1582	Vernacular local desert dwellings
14	State of Awlad Emhemed Al-Fassi 2	Murzuq town	17 years	AD1582	AD1599	Vernacular local desert dwellings
15	The rule of the Ottomans 2	Murzuq town	14 years	AD1599	AD1613	Vernacular local desert dwellings
16	State of Awlad Emhemed Al-Fassi 3	Murzuq town	198 years	AD1613	AD1811	Vernacular local desert dwellings
17	The rule of the Ottomans 3	Murzuq town	102 years	AD1811	AD 1913	Vernacular local desert dwellings
18	Italian colonization of Fezzan	Sabha town	30 years	AD1913	1943 AD	Vernacular local desert dwellings
19	French colonization of Fezzan	Sabha town	21 years	1943 AD	1964 AD	Vernacular desert dwellings
20	Independent Libyan state	Sabha town	Until now	1964 AD	2016 AD	Contemporary dwellings

Source: The researcher adapted from Al-Mazzi, 2006

2.3.2 Vernacular desert dwellings in the Islamic period

In general, there was no attention given to architecture or buildings any new buildings in the beginning of the Islamic period, when Arab Muslims arrived in Libya in 642 AD (Al-Mazzi, 2006). In some vernacular oases and desert towns, constructional developments continued due to a number local factors which have encouraged its growth. Most of the towns and communities in this period were the same as those that had existed before the arrival of the Arab Muslims, such as Ghadams, Ghat, Murzuq, Waddan, Zalah, Sabha, and Germa. There were no major changes, except for the renovation of some ancient defensive fortresses of Roman and Al-Garamant. Muslims used some of them as camps for the army. A few of these fortresses were in the oases of Waddan, Zalah and Murzuq (Al-Mazzi, 2006). Zewailah town (see Figure 2.12) became the most important desert town in Southwest Libya for Muslims. Zewailah considered as the capital of Fezzan in the Islamic period (Mattingly *et al.,* 2015).

As Saleh (2008) indicated that the architectural designs of desert dwellings in that period characterised by having a simple composition, which came spontaneously to meet its primary function, and therefore the antiquities of buildings from this period are primarily the most important buildings which are mosques. Some of them still exist now in southwest Libya; for example, the ancient mosque and Imran Mosque in Ghadames; and the old mosques in Ghat; Sabha; Barak; and Tombs and mausoleums of Bani Al-Khattab (see Figure 2.13). According to Al-Thni(2007), the impact of the Islamic influence in southwest Libya was limited to the religious architecture as a new form and a fresh function in the area. However, the religious teachings and principles of Islam were quickly disseminated to the local population and their behaviour and lifestyle, then had a vast and extensive impact on their economic and socio-cultural life, which extended this effect to vernacular dwelling design.

In addition, Arab Muslims spread into most parts of the Libyan desert, where they integrated into the local population. They managed, shortly after their arrival in Libya, to consolidate their rule by recovering the desert trade as well as improving the availability of factors of security and social stability , and these two factors helped with the growth of architecture for desert dwellings in those days (Al-Mazzi, 2006).

Towns of Zewailah, Waddan, Ghadames and Tragen considered the most important towns, desert towns, which has grown and evolved in Islamic period and prior to the Ottomans period. According to Al-Thni (2007) desert dwellings in those oases and desert towns were built by local mud, and it has had high walls and small entrances.

Furthermore, the desert society underwent significant change in that period, especially in its socio-cultural features. The whole country followed the new aspects of life, language, religion, privacy, and patterns of living which have characterised Southwest Libya ever since. The fundamental principles of Islamic law is drawn from the Quran, and involves issues of visual privacy, building heights and the location of doors and windows (including air rights), all of which are important factors, but the right to not be overlooked was the primary principle (Al-Thni, 2007). A clear distinction between public and private space is emphasised in the Libyan dwellings; this strong differentiation between the public, semi-public, private, and semi-private character of the dwelling designs for a residential neighbourhood is a reflection of the socio-cultural requirements for the separation of the sexes and security from those outside the group of one's kin . The socio-cultural features formed the vernacular desert dwellings, which displayed the same basic principles and consisted of the same basic elements throughout the desert.

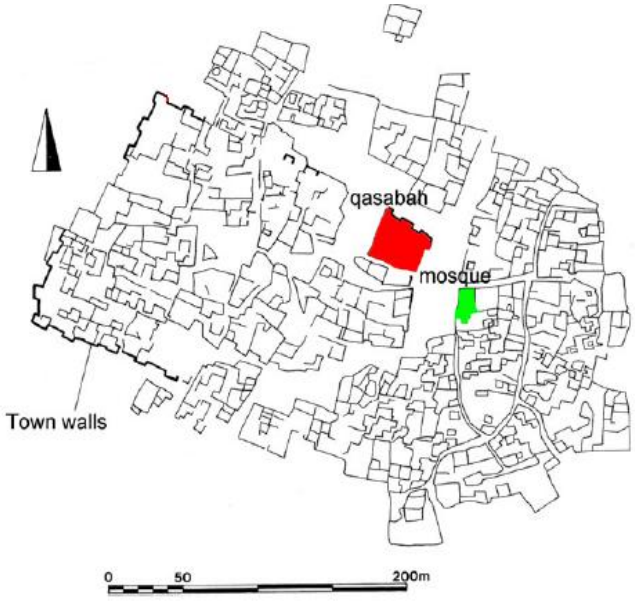


Figure 2.12: Vernacular town of Zewailah
Source: Mattingly, 2015

Figure 2.13: Mausoleums of Bani Al-Khattab
Source: http://fezzan24.blogspot.co.uk/search

The Arab-Muslims did not bring a new dwelling design to fit these new aspects of life but adapted the previous dwelling design with courtyard. As Shawesh (1996) point out that the *"dwelling design with courtyard is primarily a Mediterranean design, found also in Greek and Roman houses, and even in ancient Egyptian dwellings"*. The local-Muslims developed it to make it more suitable to their socio-cultural features and local desert environment conditions.

2.3.3 Vernacular desert dwellings in the Ottoman period

There is an overlap between most of the architectural monuments that remain from the Islamic period and the Ottoman period, including in the architectural features of desert dwellings. In addition, some buildings in Southwest Libya have evolved with the emergence of religious doctrines in the region. The most famous of these is the doctrine of Ibadi. As Al-Thni (2007) explains, the Ibadi doctrine came to the Libyan desert after the arrival of the Fatimids in Zewailah, and then spread to the rest of the Libyan oases. The vernacular architecture for desert dwellings in that period was distinctive in terms of its simplicity and functional space, especially in Zewailah and Ghadames.

According to Amer (2007), many people wrongly believe that the dwellings with courtyards that are found in the Libyan desert came from the Ottoman architecture (Turkish). The Ottomans occupied Libya in the 16th century, and many of those dwellings were built like the remains of vernacular dwellings. Therefore, many of these dwellings are irregular in shape.

The vernacular desert dwellings in southwest Libya in the Ottoman period developed in a similar way to most vernacular desert dwellings in Tunisia, Algeria, and other desert countries such as Egypt. The Tunisian and Algerian models are richer in ornamentation due to the presence of the crafts that had developed in those countries. Dwellings in the historical town of Murzuq (see Figure 2.14) are considered to be good examples of vernacular desert dwellings of that period. These dwellings have a rectangular or quadrangular plan, with one or two floors, and a courtyard in the middle that is surrounded by rooms that open onto the courtyard. Some of the desert dwellings of this type have a staircase in the courtyard that leads to the roof terrace or to the second floor (see Figure 2.15).

The interior design of such dwellings as these were organised depending largely on the social and cultural practices of the population, such as the social practices that were formed as a result of privacy, religion, neighbourly relations, environmental conditions, and security concerns. This influenced how much the interior and exterior parts of the dwelling depended on each other. The area frequented mostly by men included the living area, while the areas frequented by women included private rooms such as the kitchen and the bedrooms (Dabaieh, 2011).

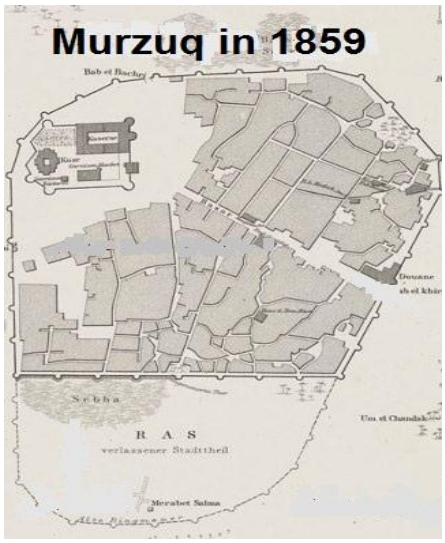


Figure 2.14: Vernacular town of Murzuq
Source:Nassear,1998

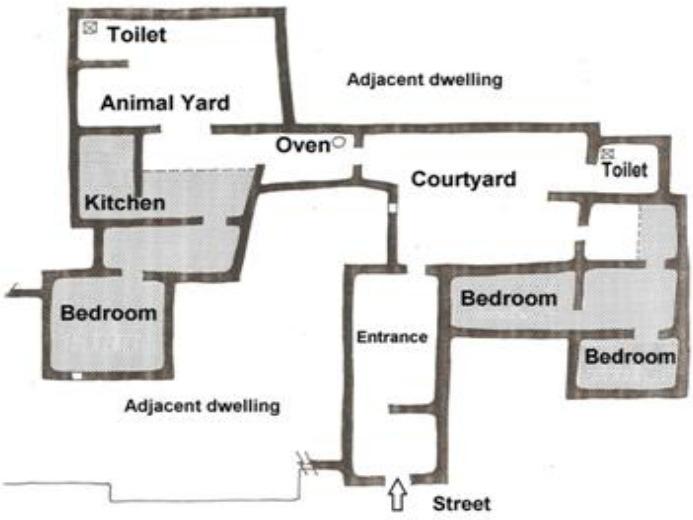


Figure 2.15: Dwelling in Ottoman period (Murzuq)
Source: The researcher adapted from Ali Abo-qilh, 1998

2.3.4 Desert dwellings in the colonial period

Throughout the centuries in which the Sahara was ruled by the Garamantes, locals, and lastly by Arab Muslims, there were few changes in the structure of the local desert dwellings (Amer, 2007). The local builders were adopted readily by every new conquering power, with changes made according to the socio-environmental and cultural shifts. Over the Italian invasion of Fezzan in 1913, an attempt was made to alter the local desert architecture by instilling some European styles, which are considered to be completely different, through the replanning that started happening in some desert dwellings, particularly in Sabha. In days of the Fascist regime, this created a dire situation for the locals, especially when virgin land was used to suit foreign aims, which was extraneous to the desert environment. During Fezzan's occupation by the Italians from 1913–1943 and the French from 1943–1951, some attempts were made by the Europeans to influence the desert society's socio-cultural infrastructure, to demonstrate the extent of their influence, both locally and internationally, and to show that they were powerful in all possible ways, including through architectural changes and urbanism. They attempted to change the local socio-cultural features. However, these attempts did not last long (Al-Maazi, 2006).

Desert dwellings in Southwest Libya slowly evolved in the colonial period, in two stages. The first was during the Italian occupation, which started in 1913 and went on until 1929 when the Fascist regime rose to power in Italy. The second period began in 1943 when the French conquered Fezzan and continued until the start of 1951, when Italy lost Libya during the Second World War.

In the first period, 1913–1929, just a few simple army lodgings were constructed, along with a few administration buildings needed to run the place. These were mostly located in Sabha and Hoon (see Figure 2.16). The Italians had some local feuds with desert dwellers during this time. To control the newly conquered areas, a strategy of cooperation with the local populace was adopted by the Italians (Al-Maazi, 2006). They did not intend to destroy local vernacular architectural monuments, as the French had done in Tunisia and Algeria. Instead, they worked on local vernacular architecture in southwest Libya by trying to give a new form to vernacular desert dwellings; they hoped to win the trust of the local population. They wanted to come over as rulers who embraced Libya's traditions and cared for them, instead of simply rejecting them (Fuller, 1992, Al-Maazi, 2006).

Figure 2.16: Vernacular desert dwelling in desert town of Hoon during Italian colonisation period, Source: https://libocolors.files.wordpress.com, 2008

However, during that period the vernacular desert dwellings and residential gatherings were disregarded. It has not been any development only by the locals themselves. Perhaps this due to economic and political conditions in that time. In terms of social life during the Italian period, modernisation in North Libya was intimately connected with European civilisation. For the first time Libyans were exposed to the new education system. The Italians built schools throughout the country, the main purpose of which was teaching the Italian language and culture, where many Libyan people opposed the idea of sending their children to their schools, fearing that they might lose their religious faith and their culture (Elbendak, 2008).

Despite these Italian attempts to alienate the local culture, there was generally not a direct effect from this in terms of changing the socio-cultural life of local residents in Southwest Libya. This was due to the concentration of Italians being in the coastal cities and the difficulty of their accessing the country's interior deep in the desert . This is in addition to the local population in Southwest Libya being more connected to their inherited socio-cultural aspects. Furthermore, this issue did not differ much in the second stage, during the French

occupation of Fezzan, perhaps due to the period being short and the start of the Second World War. After reviewing the sequence and evolution of the vernacular architecture that emerged, and the morphology and historical development of desert dwellings in the Southwest Libya. The next section deals with the current vernacular architecture of desert dwellings, followed by current situation of contemporary desert dwellings under investigation.

2.3.5 Vernacular architecture of desert dwellings in Southwest Libya

The vernacular architecture of desert-dwelling design philosophy is based on fulfilling two strategies relating to socio-cultural sustainability: privacy and protection. These two strategies have influenced the dwelling layout, spatial relations, and architectural elements details (Dabaieh *et al.*, 2014).

Many of the literature discussed the works of Arab architects who adopted the approach of developing the vernacular desert architecture, most notably Hassan Fathy architecture. Hassan Fathy, despite his knowledge of new architectural trends in the fifties, he preferred to focus on desert vernacular architecture in Egypt through authentic thoughts and approaches. With his statements Sayings that he assesses the heritage and it is connected to the present (Fathy, 1997). He focus on the Nuba area in Upper Egypt by virtue of its character and authenticity. On the other hand, this originality have been lost in major cities in the north and on its way to the desert regions of heritage value. One of the most important work of the new village of Qurna. Hassan Fathy believes that the architect must be familiar with all the values and cultural traditions of this community, he does not imagine that there is a separation between the architect and the man who builds it, the architect only helps in the architectural culture within the provided means (Moustafa, 2014).

Hassan Fathy felt that technology should be subservient to social values, and appropriate to popular needs. He found the truest expression of technology in vernacular architecture as he believed that it had solved the function problems with the available material and least energy consumption (Moustafa, 2014). Also the work of architect Rami El Dahan confirmed the important of development of the vocabulary of vernacular architecture that emanating from its environment, this is evident in his project " Kafr El Gouna", he is from the same school of Hassan Fathy's architecture. Furthermore, the Jordanian architect, Rasem Badran did not perceive history as a source of physical forms to be reinterpreted, but tried to adapt the process behind these forms and explore the social forces behind vernacular typologies. Badran‟s works shows the architect‟s confidence in handling the vernacular vocabulary in harmonious composition in his

elevations. Badran was also able to show the beauty of nature and the art of meditation by employing decorative of vernacular architecture (El-Shorbagy, 2010, Steele, 2005).

The evolution of features of vernacular architecture in southwest Libya is evident from the vernacular societies in terms of their principles and way of life. Locals used the principle of sustainability in their everyday life. Interaction with the local environment and utilising natural resources were part of their survival on earth. As Fathy (1973) indicates, architecture is a natural product of the everyday life of the society that produced it. Next section presents the important socio-cultural features of vernacular architecture in Southwest Libya.

2.3.5.1 Socio-cultural features of vernacular architecture of dwellings in Southwest Libya

The vernacular architecture of desert dwellings is a natural product of the interaction between environmental factors (site, geography, topography, and climate) and socio-cultural features (religion, traditions, norms, and cultural background). The socio-cultural features of the vernacular desert dwellings in southwest Libya as manmade products are not only about the installation of dwellings; they demonstrate the view of life from locals, builders, and professionals. The vernacular architecture expresses the society and culture of the previous generations (Al-Maazi, 2006). Therefore, it represents the experience of multiple generations over the years, uniting the concepts of existence and life. Based on the literature reviews, (Ahmed, 2011, Al-Jamea, 2014, Eltrapolsi, 2016) there are several insights that have been derived from vernacular desert dwellings, through the exploration of views about the socio-cultural sustainability of vernacular architecture for the design of desert dwellings, which can support the integration of socio-cultural-sustainability features into guidelines for new desert-dwelling designs. Most of these insights are summarised as follows points:

The first point, the vernacular urban fabric of vernacular town was not an external appearance of buildings, dwellings, and streets. Indeed, it was a manifestation of principals of the local social-cultural framework and ambient environment (Mortada, 2003). This is why the urban characteristics and conditions of most vernacular local towns in Southwest Libya share the general similarities (See Figure 2.18)

The second point is regarding the design of the main entrances of desert dwellings. They do not directly reveal the inside the dwelling (the living space is often on the first floor, or the entrance opens onto the storage space away from the living space) for the enhanced separation of public and private spaces within the dwellings, and to conserve and respect the local customs, traditions, and cultural heritage of the population in Southwest Libya.

The third point relates to the distribution of desert dwellings in vernacular oases and towns. They have followed certain techniques to maintain privacy, such as using roofs as a sleeping place for the family in the summertime, and the morphology of vernacular desert dwellings, particularly dwellings that face each other, has been developed to maintain the privacy of the family space. There is usually an inner courtyard and roof with walls of differing height, built around the courtyard. The inner courtyard provides an area that encourages social interaction among family members, and it can also be a gathering place for women at events involving neighbours and relatives (Al-Maazi, 2006).

The existence of an outdoor central space can provide a sitting area, called *"mastaba"*, encouraging social contact with the members of the community, such as those in Ghadames. The morphology of vernacular desert dwellings and the compact urban fabric provide a private indoor environment that reinforces security and safety, especially for the children in each neighbourhood. In addition to this, there are other examples that enhance the security and safety through the compact architectural compositions of vernacular architecture, such as the presence of gates and narrow entrances in residential neighbourhoods (Almansuri et al., 2009, Shawesh, 1996). Furthermore, people prefer their dwellings to be near their relatives in the same neighbourhood (see Figure 2.17).

Other points raised are that there are similarities in the shapes, sizes, and colours of vernacular desert dwellings, as well as the suitability of those dwellings on a human scale and their compatibility with the surrounding environment at oases, conferring a sense of place, identity, comfort, and tranquillity for the locals.

Figure 2.17: Urban fabric of vernacular dwellings in Ghadames.
Source: https://libocolors.files.wordpress.com, 2008

It is useful to look at the techniques for vernacular architecture that promote socio-cultural sustainability (Eltrapolsi, 2016). For example, the existence of upper corridors for women on

the roofs of dwellings in the traditional town of Ghadames provides privacy and supports social contact among neighbours away from prying eyes (see Figure 2.18).

Building materials of vernacular dwellings are obtained from the same environment, thus, the materials used were sustainable, renewable, and compatible with the nature of the place and man. Furthermore, interior design, decoration, colours, and the distribution of spaces in vernacular dwellings came from cultural heritage and values, customs, and traditions of locals, which have led to boosting the cultural and architectural identity of vernacular dwellings in southwest Libya. All the previous vernacular designs and techniques support achieving a socio-cultural sustainability in external and internal desert dwelling design (see Figure 2.19).

Figure 2.18: Corridors for women in Ghadames. **Figure 2.19:** Interior decoration in Ghadames.
Source: The researcher, field work, 2015

Furthermore, the topology of vernacular architectural expression is the most important socio-cultural and climatic features of the vernacular desert dwellings. It is different from the regular classical architecture, where the compositions for desert dwellings seem to be similar to sculptural formations. In the traditional urban fabric can see the group of adjacent dwellings compose the residential neighbourhood. This represents the basic cell of the vernacular desert town. This system is similar to the clan system which protects itself through cohesive dwellings and the closure of their areas using walls and gates, which ratifies all the curiosity and assault (Al-Hamale, 2009). Therefore, vernacular desert towns have the proportion from the high privacy, security, and safety (see Figure 2.18).

In addition to, features of the physical character of the desert dwellings are comparable in terms of structural building, where the vernacular dwellings in the vernacular town nearly have the same special architectural character. It simply reflects the environment and culture of

the local population in socio-cultural, economic levels, and expresses the depth of social relations. Occasionally, observe some simple contrast between vernacular dwellings in each town. However, they are still on the same level of social and economic conditions with respect to the spirit of belonging and collective human relations (Al-Maazi, 2006).

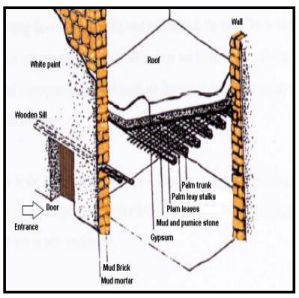
2.3.5.2 Architectural elements of the vernacular desert dwellings

The architectural elements of vernacular desert dwellings are characterised through the homogeneous method "spontaneous designing language", where these elements acquire the continuity to sustainability through unity of thought. However, the articles are ineffective and meaningless if there are no creative intellectual forces (Al-Hamale, 2009). Therefore, the thought is the element that has provided shape and configuration to the material, it also helps to create the design, activates article and gives it movement and meaning as well.

Local thought excelled in the formation of the vernacular desert dwelling, through the use of these architectural elements that help compatibility and harmony with the architectural configuration. The aim is to find a compatible element that is not contrived or adapted from another model The researcher also notes that the existence of adjacent dwellings is a result of socio-cultural behavior, and customs and traditions related to the local environment (Elhassi, 2004). The architectural design of the vernacular dwellings considered to be a conscious response to the needs of the population in their limited environment. Hence, there a semi-variance in their design and construction materials from one city to another. Despite the similarity of its main function, they come in accordance with the composition and refer to the unity of architectural elements used with some variation in size and colour, but close in style and method of construction.

Table 2.2 shows the most important main architectural elements that are used in conventional vernacular desert dwellings:

Table 2.2: Most important main architectural elements of the vernacular desert dwellings

Architectural element	The shape	The function	The location	Notes
Walls		It is the outer shell of the building (dwelling) which is considered to be the dividing line between the external environment and internal environment of the building (dwelling).	Walls are built to surround the buildings from the outside, and internally to divide the dwelling into different spaces.	Walls in vernacular dwellings are commonly built from stones, bricks, and mud.

Pillars		The pillars or supporting walls are used to support load-bearing walls at corners or in weak points in places of extra loads.	Found within the walls in the external interface .	Pillars in vernacular dwellings are commonly built from stones, brick, and mud.They are a thick wall and take the form of a sloping wall on the side of the dwelling walls.
Roofs		The roof is a main architectural and structural element in the building, where there is a separation between floors; is considered to be the ground for each floor; and holds the various loads of building.	The roofs form the separation between floors.	The roofs in vernacular dwelling commonly are built from beams from the trunks of palm, trees and cover with a layer of palm fronds and then end of layer from mud and straw.
Doors,	 	The main door size is commensurate with the scale of the average human, and interior doors are usually smaller than the main door of the dwelling.	Placed at internal and external interfaces.	Doors in desert areas are made from the local raw materials of wood from palm trunks.
Windows		The distribution of windows in elevations of vernacular dwellings came about on the foundation of simple, traditional ideas so as to serve purpose for ventilation, lighting, and privacy.	On internal and external interfaces.	Windows are not available in the front exterior elevation, but are inside the dwelling and open into the inside courtyard and used to cover openings that overlook the inner courtyard.
Openings		The distribution of openings in elevations of vernacular dwellings came on foundations of simple traditional ideas so as to serve their purpose in terms of ventilation, lighting and privacy.	Placed at internal and external interfaces.	Are of different sizes, and do not have a specific size or shape.
Staircases		Stairs are a means of access from one level to another, or from one floor to another floor in different buildings and dwellings and occur in vernacular dwellings that have more than floor.	Stairs are placed appropriately to provide a means of access from one level to another, or from one floor to another floor.	Built using stones and clay, and are painted with white lime. The height of one stair is between 20 cm and 30 cm, which is relatively high, but using such a height reduces the number of stairs in narrow spaces.

In addition to the complementary architectural elements which as a follows:

- ***Complementary architectural elements (Symbolic elements)***

The vernacular desert dwellings in Southwest Libya are characterised by some of the complementary architectural elements which have connotations and meanings in the architectural heritage, have a significant, and associated with the architectural identity of the historic towns of Southwest Libya (Al-Thni, 2007). In particular, those that are in the top of the roofs of buildings and dwellings, which give a sense of unified vision for urban fabric of the vernacular towns. For example, Al-Sharifaa is where a shape like a pyramid is usually built onto the edges of the roofs of buildings and dwellings (see Figure 2.20). This protects the edges of the building that are considered to be a weak area of the construction as they are subject to corrosion as a result of exposure to different environmental factors. This element is used in the oases of Toonen and Derj, and the vernacular towns of Ghadames, Ghat, and others in Southwest Libya (Al-Thni, 2007).

Figure 2.20: Al-Sharifaa

Figure 2.21: Al-Thaloth

Source: The researcher, the field work, 2015

In addition, Al-Thaloth, which is a triangle shape, is often found in opposite directions (see Figure 2.21). As Al-Thni (2007) points out, those elements probably came about as a symbol related to old ideological matters from the ancient African heritage, perhaps as a result of relations through trade caravans or migration in both directions. Therefore, this element has spread throughout many vernacular villages, oases, and towns in Southwest Libya. Furthermore, there is Al-Kawat, which is a cavity carved into interior walls that is used as somewhere to put pots, vases, or water jars. Some of these cavities are closed, with doors like on cupboards, and are used as storage in the walls. Al-Kawat has varied forms, such as rectangles and squares that end in a simple arch, and others that take the form of the arch of a

horseshoe. According to Al-Thni (2007) those cosmetic elements of the interior architecture for vernacular dwellings differ between most of the vernacular towns and oases. They vary from one town to another, and from one dwelling to another depending on the circumstances of the occupiers of each dwelling. For example, in luxury dwellings the Al-Kawat are adorned with brass utensils, mirrors, and some vernacular artifacts (see Figure 2.22).

Figure 2.22: Al-Kawaat and other decorations in the vernacular desert dwellings
Source: The researcher, the field work, 2015

In addition, there are other architectural elements, such as arches and sills, and the vernacular interior design elements of the dwelling include inscriptions, decorations, colours, antiques, and the movement of light and shadow that lends a nice atmosphere inside the dwelling (see Figure 2.23). Also, use the gypsum plaster as a finishing material. Furthermore, they have decorations, drawings on the walls, and copper pots that are of different colours, particularly red in various grades. This is in addition to the handicraft products that were sold to tourists up to this period.

A Sabha B Ghat C Ghadames

Figure 2.23 : Deferent types of arches that use in the vernacular desert dwellings
Source: The researcher, the field work, 2015

2.3.5.3 Construction material for vernacular desert dwellings

The vernacular desert dwellings are constructed of indigenous building materials that are appropriate to the ambient environment, whether in terms of physical or social properties, climatic conditions, or the construction techniques employed by the society that produced this architecture. Oliver (2003) asserts that by saying:

"Building materials selected from natural resources available to different cultures to build their houses can be examined as to the structural properties of materials selected, and the methods employed in using them for construction".

Vernacular building materials, such as brick, stone, palm trunks, and wood are usually natural, so they are generally low in terms of embodied energy and toxicity; therefore, they are environmentally friendly (Kim & Rigdon, 1998). Often, vernacular building materials are relevant to socio-cultural features, and are related to the internal finishing materials associated with customs, traditions, and colours that reflect the cultural heritage and identity; thus, they create a comfortable internal environment. As Eltrapolsi (2016) indicates that the local construction experts in Southwest Libya used building materials that were locally available, such as brick, stone, mud, lime, palm trunks, tamarisk trees, and fronds (see Figure 2.24).

Most of the construction methods were simple, based on cooperation between local experts and the population. Dwelling construction was one of the collective activities in which neighbours and friends participated, reflecting one of the forms of social solidarity in vernacular desert societies (Al-Thni, 2007).

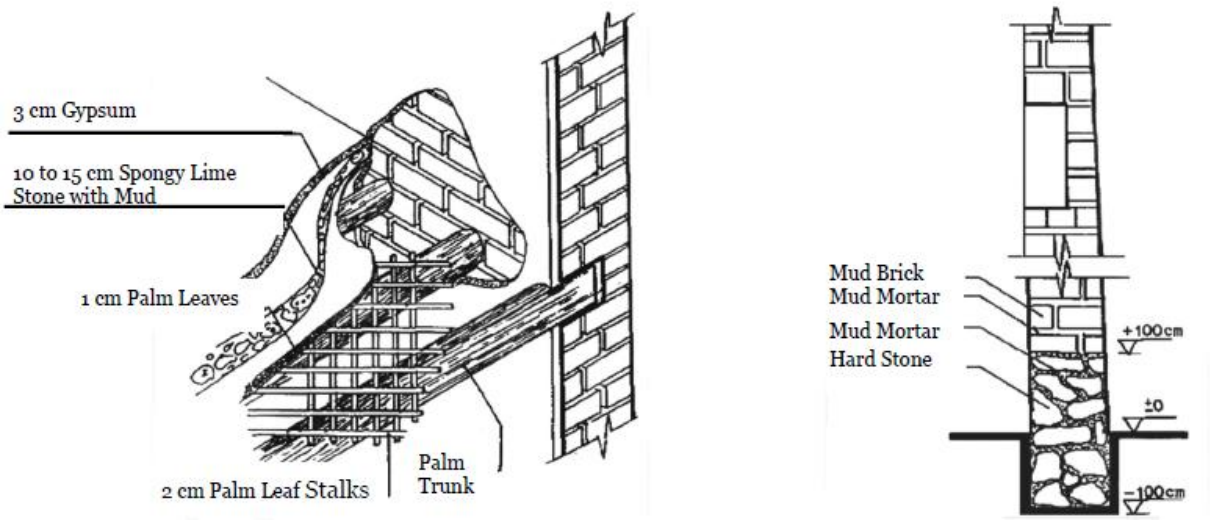


Figure 2.24 : Perspective section in roof and section in wall, foundation
Source: Ghadames website, 2009, Eltrapolsi, 2016

2.3.5.4 Types of vernacular desert dwellings in Southwest Libya

From the beginning of the 19th century and early 20th century, historians note that the local population in southwest Libya were divided into societies of nomads that lived in the Sahara Desert; they were in unstable groups, and also in an urban society that lived in the oases and vernacular towns. Usually, the nomads worked in grazing cattle and camels, and needed to look for water and grazing land. The vernacular urban society was settled in oases and desert towns, and worked in agriculture and in trade of desert caravans (Al-Maazi, 2006).

The tent is a primitive form of desert dwellings that was used until the beginning of the 20th century. Tents were mobile dwellings for the Tuareg nomads in the desert, who reside in the southwest of the Libyan desert. There were two types of tents. The first type was used in the winter; it was heavy, made of palm fronds and straw, covered with animal skins and straw, and had a door made of palm fronds (see Figure 2.25). The other type was lightweight, woven from wool and animal dander, and was usually used in summer (see Figure 2.26) (Despois, 1946). However, the Tuareg are now residents of the municipalities of Ubari and Ghat; they have privacy as one of their socio-cultural elements, which is also reflected in their current dwellings.

In order to understand the types of vernacular desert dwellings in Southwest Libya, it is necessary to look at the historical periods, as already presented in Section 2.3. These developments affected the desert dwellings in terms of typology, architectural spaces, and characteristics from one period to another. On the architectural level, one can identify the main two distinct types in the region.

Figure 2.25 : First type of tent that use as dwellings that used in early period by Touareg, Source: Despois, Jean, 1946

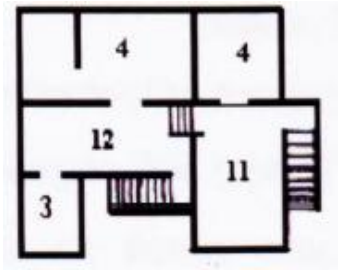
Figure 2.26: Second type of tent that use as dwellings that used in early period by Touareg, Source: Despois, Jean, 1946

These types of dwelling can be recognised in different architectural and archaeological areas in Southwest Libya. The following section presents the main two types of vernacular desert dwelling in relation to the socio-cultural aspects and form characteristics.

- ***Vernacular desert dwellings with inner courtyard***

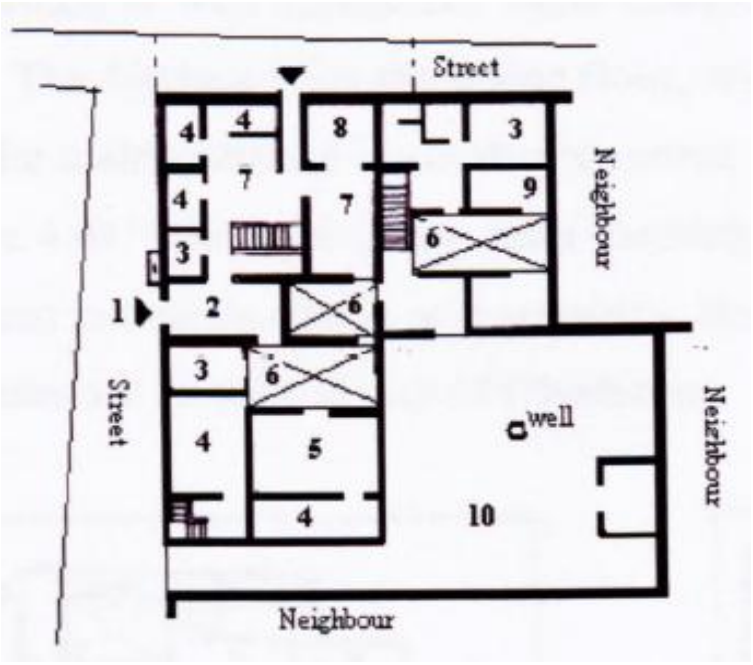
The inner courtyard is a constant feature of vernacular architecture in most of the local desert regions; it was, however, developed in different ways as influenced by existing local traditions, construction materials, and environmental factors (Alabidet al., 2017). According to Al-Zubaidi (2007), socially, a dwelling with an inner courtyard provides a perfect solution for male and female segregation in the local culture. Moreover, it preserves the family, gives privacy from intruders' eyes, and provides an open space for family and children to conduct their life freely. Houses with an inner courtyard are flexible, thus they can accommodate family growth and fit the requirements of extended families.

This type of desert dwelling with an inner courtyard can be found in many historical towns in Southwest Libya such as Ghat, Murzuq, Hoon, Waddan, and Sabha. There has been the presence of this type of desert dwelling in southwest Libya, in its current form, since the beginning of the second Ottoman period in around 1835. These dwellings have one or more inner courtyards; Figure 2.27 presents the plan for a dwelling with inner courtyards in the historical town of Murzuq as a model of this type of desert dwelling. Section 5.3.3 in Chapter Five presents more detail of the design of desert dwellings with courtyards.



Grand floor

Key Plan	
1. Entrance	7. Living room
2. Lobby	8. Winter room
3. Toilet	9. Kitchen
4. Room	10. Inner ourtyard
5. Guest room	11. Roof
6. Courtyard	12. Al-sabat



First floor

Figure 2.27: Vernacular desert dwellings with more one inner courtyard, Murzuq
Source: The researcher, Adapted from Amer (2007)

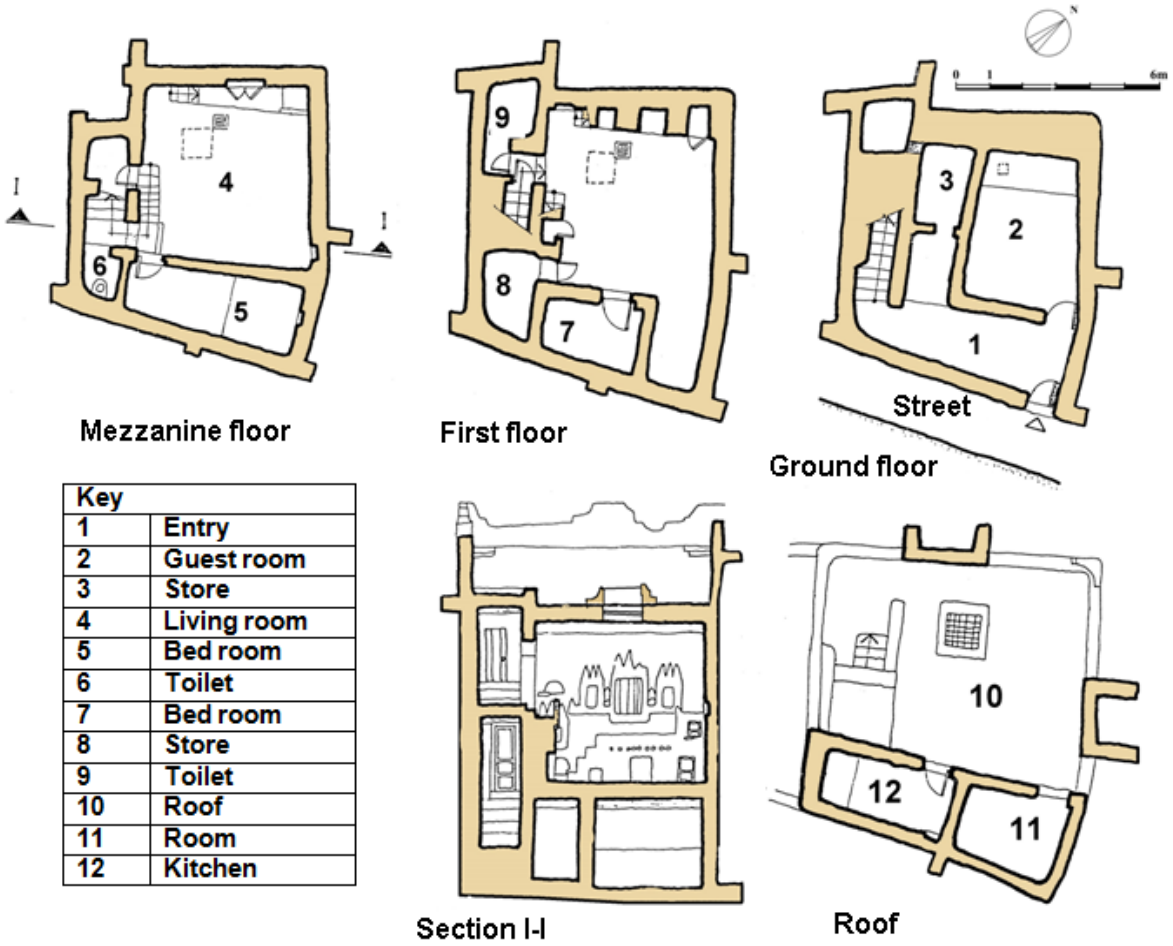
- ***Vernacular desert dwellings without inner courtyard (compact dwelling)***

The second type of vernacular dwelling in southwest Libya is a dwelling without an inner courtyard (a compact dwelling), which is built using different materials, styles, and attitudes. Some of the most significant examples of these dwellings are found in the vernacular towns of Ghadames, Derj, and Tonin , and some dwellings in vernacular town of Sokena.

This type of desert-dwelling has existed since the ancient period, but historians believe that the current existing dwellings of this type, especially in Ghadames, were built between 1835 and 1951. Although these dwellings have no inner courtyards, they do have a small unglazed window (see Figure 2.28) in the middle of the roof for lighting and ventilation (Al-Maazi, 2006). That small opening is usually covered with palm fronds, so as to allow air and sunlight to enter the centre of the dwellings The vernacular desert dwellings in Ghadames are considered to be the best examples of dwellings without an inner courtyard. Figure 2.29 presents the plan of a vernacular desert dwelling without an inner courtyard in the historical town of Ghadames, as a example of this type of desert dwelling. Section (5.2.3) in Chapter Five present more detail of the design of compact dwelling.

A **A1** **B**

Figure 2.28 : Small-unglazed window, Ghadames. A, A1 from inside, B from outside
Source: The researcher, the field work, 2015



Key	
1	Entry
2	Guest room
3	Store
4	Living room
5	Bed room
6	Toilet
7	Bed room
8	Store
9	Toilet
10	Roof
11	Room
12	Kitchen

Figure 2.29: Plans of vernacular desert dwellings without inner courtyard, Ghadames
Source: The researcher, the field work, 2015

2.3.5.5 Lessons learned from vernacular architecture for desert dwellings design

In fact, vernacular architecture depends on the practice of the knowledge of traditional techniques, and discloses a high estimate of professional and quality (Sundarraja *et al.*, 2009). This also represents the composition of socio-cultural features that show the strength of different aspects (cultural heritage, social contact, religion, identity, building techniques, etc.) where there is natural harmony in the simple mix between the architecture and the population. However, this is an expressive example for contemporary dwelling and much can be learned from their great history, and applied to dwelling design, planning, and the formation building of identity, as well as from construction techniques used in the past that promoting different aspects of sustainability (Ahmed, R., 2014, Nejadriahi, 2016).

The unity of thought, environmental solutions, and socio-cultural features that are used in vernacular local architecture have helped to form a positive overlap and integration among them. This gave a unified appearance to blocks of dwellings and buildings, in terms of either in shape, construction materials, and also created harmony between architectural elements. The following points are a summary of the most important lessons learned from advantages of vernacular architecture, in terms of socio-cultural features, through the literature review, and the field study of the desert dwellings in many towns in Southwest Libya:

1. The general shape and the urban fabric of the historical desert vernacular towns, with their narrow alleys and adjacent compositions forming a uniform body, enhances many social and cultural aspects, such as privacy, safety, security, and social interactions at the family and community levels.

2. The design of vernacular desert dwellings came about through the architectural ideas of local builders, where the design of the dwellings reflect the locals' traditions and their culture. Thus, it strengthens the links between the vernacular architecture, and people, the environment, identity, and cultural heritage.Furthermore, the method of distribution of the interior spaces in the vernacular dwellings is in line with the customs, traditions, and cultures; for example, the division of rooms between private spaces and public spaces. Although these customs and culture are renewed one way or another, they are still part of the important cultural heritage of the people of Southwest Libya, and are one of the cultural identity features that should not be neglected in contemporary dwelling design.

3. The inner courtyard space in the middle of the vernacular dwelling has the ability to be adapted to external conditions that meet the socio-cultural requirements, in addition to

meeting the social role of maintaining privacy. In addition, the merger between the idea of a vernacular dwelling with an inner courtyard and a vernacular dwelling without an inner courtyard, as in Ghadames, can be taken as meeting one of the main principles, which is to achieve and keep social privacy. For example, similar elements, such as the covered courtyard, in a contemporary desert dwelling can help to meet social needs and offers an indoor environment that also contributes to preserving the architectural identity of Southwest Libya.

4. The internal design is simple, and the facades of vernacular dwellings that lack motifs and patterns are spontaneous and reflect many cultural features.For example, the cultural heritage is reflected in vernacular architectural elements, such as using some of the ritual symbols that are related to beliefs, and some interior finishes, colours, and traditional handicrafts.

5. There is no doubt that the use of certain colours in paint is due to socio-cultural semantics, including those related to religion, as well as reflecting the behaviour of the inhabitants. For example, the use of white colour in vernacular dwellings reflects the nature of the socio-cultural features. This feature can be taken advantage of in contemporary dwellings.

6. The use of some vernacular complementary architectural elements, such as Al-Sherifaa, and interior design architectural elements such as inscriptions, internal or external decorations, and colours, in the contemporary dwellings in one way or another gives a general impression and it establishes the idea of the common format for the urban desert cities in southwest Libya. It creates a bridge between the present and the past, and confirms the architectural identity of the region.

7. Simulating some of the vernacular architectural ideas in contemporary dwellings, such as steering to external doors, openings, and internal doors, may support the maintenance of privacy and security.

It is also important to consider the value of the vernacular dwellings of the desert in terms of the value of the architectural identity and architectural heritage, and their association with the history of the region, and allow them to contribute to the consolidation of the values of originality and reversible to contemporary, as well as the architectural heritage values that are considered to be the way to develop the expertise to develop new construction methods. This lessons can be used in the fundamental guiding proposal for the design of socio-culturally sustainable dwellings in southwest Libya. This will be detailed further in Chapter Seven.

2.3.6 Contemporary desert dwellings

In the beginning, a historical summary of the emergence and development of contemporary desert dwellings in southwest Libya and the most important historical stations, which have changed their directions, were reviewed to understand the problems and the local population's dissatisfaction with it so far. Socio-cultural features are under threat from industrialisation and politics. The historical vernacular desert towns are deteriorating rapidly because of the rush to install contemporary technology in these regions. As an example, many people and foreign workers from different cultures have been moving into the suburbs of the desert towns in search of oil and newer industry (Ealiwa, 2000). Therefore, the vernacular residential neighbourhoods are quickly becoming slums instead of having a certain prestige for being assets to local socio-cultural heritage. Many of these residential neighbourhoods are still rich with historical artefacts and architecture.

After Libya became independent and oil was discovered in the region, a large variety of construction systems and building styles were imported from the industrialised nations. As a result, the vernacular local desert architectural techniques have been largely disregarded. The socio-cultural life of desert areas has been influenced as well.

Furthermore, there has not been enough interest from the local authorities or government. The construction of imported dwellings has been fast. However, the local population is feeling uncomfortable with this style of construction. Therefore, this research aims to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings into the design of suitable, sustainable desert dwellings for the population.

The first important attempt to improve housing conditions for the local population was made by the national government in 1964 (Amer, 2007). This happened when a Greek firm named Doxiadis Associates was asked to carry out research about housing problems in Libya and to suggest appropriate policies to define how to develop housing in Libya. In 1964, all housing offices and agencies were brought together under the Ministry of Housing, which was supposed to devise, formulate, and implement housing programmes (Amer, 2007).

Also in 1964, the Industrial and Real Estate Bank was given the authority to grant mortgages to people building houses themselves. Two years later, the government started the Idris housing project, which was supposed to build 100,000 dwellings in the country over a five-year period, with 20,000 units being built each year (Omar, 2003). A sum of 400 million

Libyan dinars was devoted to this endeavour (Omar, 2003). It can clearly be seen how international ideas have been completely accredited, through relying on foreign consultants, while vernacular local desert forms have critically been left out. Many newer features have almost entirely ignored the socio-cultural life in the Libyan desert. Many believe that these environments are a thing of the past, but they still exist and must be respected when dwellings are designed. Other factors such as climatic, geographic, and topographic variations must be taken into account as well.

The next five-year plan started in 1969, but was halted by the political change to the regime in Libya that took place in1969, when they were replaced by new plans. Omar (2003) states that, when the regime change took place, around 220,000 families in Libya needed houses on an emergency basis. Therefore, the government has taken on the responsibility of providing better housing, especially for the poor and lower-income groups, and in remote areas, including desert areas. They have done so by establishing housing and family allowances, through subsidies and by selling government lands at very low prices. It was planned that every Libyan family must possess at least an adequate dwelling. Therefore, in 1970, an urgent housing project was started to cover the emergency dwelling needs.

Foreign companies are still in charge of building desert dwellings and they are mostly multi-storied flats (see Figure 2.30). There is the shortage of vernacular dwellings experiences. Therefore, there is some difficulty to analyse vernacular desert dwellings activities. Architectural development has been fast-paced, without regard to studies and research on environment and in addition the poverty of socio-cultural sustainable research.

Figure 2.30: Contemporary dwelling in town of Sabha (Apartments, Thanawia neighbourhood)
Source: The researcher, 2015

In the period from 1989 to 1992, the Libyan government tried to support the efforts to develop housing projects in southwest Libya, but these efforts have been slow and did not emerge clearly. United Nation resolution No. 748 (1992) imposed sanctions on the Libyan state at that time. These sanctions extended until 2003. According to Ministry of Planning (MP) (2009), the implementation of sanctions had a tremendous impact, not only on the economy but also on the socio-culture and attitude of Libyans, including the construction and housing industry.As a result, the housing shortage rose. The housing and construction sector experienced a deep recession in Libya in general and especially in Southwest Libya.

From 2003 until the political events that took place in 2011 and changed the regime in Libya, there was some limited attention from the government, which developed some housing projects in the capital, Tripoli, and some northern cities such as Benghazi and Misrata. In return, there was no real development or evolution in the creation of suitable dwellings for locals in southwest Libya. This was except for some private dwellings, which were built by the locals as self-funded (see Figure 2.31), resulting in exacerbating the desert-dwelling problem in this region. Desert dwellings in southwest Libya today do not meet the socio-cultural sustainability needs of the inhabitants. This is because most of them are based on imported styles, which are in direct contradiction to local socio-cultural features, such as privacy, religious-belief considerations, safety and security, social considerations, and identity. People who benefit from these schemes usually add their own touches to the units they have been assigned. A few examples include crossed iron bars on ground floor windows, brick layers on the courtyard, and closing off balconies with brick walls for privacy. The interior designs have suffered too. Walls are opened or closed either for privacy or to turn two rooms into one (Al-Maazi, 2006).

Figure 2.31: Examples of private contemporary dwelling, built in outskirts of Sabha
Source: The researcher, 2015

2.3.6.1 Summary of the impact of the contemporary architectural trends of foreign companies on the architectural environment in Southwest Libya

As mentioned in the preceding section (Section 2.3.6), during the transition period of the 1970s and 1980s, Libya went through rapid economic, social, and political changes. These changes had broad repercussions, which came and went at great speed. The discovery of oil in Libya greatly influenced housing designs, as a result of the economic growth. At the same time, there was a need to fill the large housing shortage in some desert towns and remote oases. For economic and political reasons, the state at that time implemented a set of contracts that allowed the entry of some foreign companies, which used modern methods and trends in the design of housing that were previously unknown in the region, and ignored the socio-cultural features and architectural identity of those towns. This led to profound changes in the desert society, as well as changes in the general shape of the urban fabric of the historical towns. Therefore, foreign architects from such as the UK, Finland, Japan, Korea, and India designed most of the structures in the Libyan desert from this period. The contributions of local Libyan architects remained unnoticed (Shawesh,1996, Amer, 2007). Thus, there was no opportunity to develop local architecture. This resulted in a lack of architectural identity in Libya in comparison with other states, especially in Arabic areas (Shawesh,1996, Amer, 2007, Almansori, 2009).

These changes affected different aspects of local life, which have been reflected in the cultural transformation of the Libyan desert society. An expression of the changes can, for instance, be seen in the emerging model of life, and this in turn has triggered the inflow of fundamental changes into the existing residential environment. The trends usually follow the international style or echo it in the particular way it is perceived. This is the case for both individual houses and larger urban complexes.

The proportion of the total Libyan population in urban cities has increased from 25% in 1951 to 69% in 2003 registering a rise of 88% (Amer, 2007). The level of urbanisation in Libya at that time was one of the highest in Arabic countries (Abubrig, 2013).

Southwest Libya has witnessed an increased demand for new buildings and infrastructure projects. This demand is elevated in the central towns, such as Sabha, Hoon, and Ghadames, due to the impact of the intensive urbanisation process. This process was rampant in the mid-1990s and at the beginning of the 2000s, up to 2005 (Bilghit, 2007). Also, necessary changes have occurred in construction and housing projects and the physically built environment,

which still use the same international design methods without regard for the cultural and social background of the region, which has exacerbated the problem. In conclusion, urbanisation using international design methods has become one of the most significant driving forces of the change in social housing design in the Libyan desert, which has influenced housing design in terms of socio-cultural sustainability and has distorted the architectural landscape of historical towns.

2.4 Summary and Link

This chapter has shown firstly the natural environment of Southwest Libya includes location, topography, and climate, economic activities, and socio-cultural background. then presented the morphology and historical development of desert dwellings in the Southwest Libya and how to emergence the vernacular residential gatherings, desert dwellings in desert regions and the historical development during the ancient period "Garamantes", and the Muslims period. Although, Southwest Libya was occupied twice, by the Italians and the French, the dominant style remained the vernacular desert dwellings, with only a few changes in the structure in order to make them more suitable for that period. The chapter also highlighted on main socio-cultural features of vernacular desert dwellings, and the architectural elements and the building material. As well as the main two types of vernacular dwellings. The inner courtyard of desert dwellings is the dominant characteristic in some regions of Southwest Libya. For example in Sabha, Murzuq, Ubari, Ghat and most of the historical towns in that regions. The vernacular desert dwellings without inner courtyard are the dominant characteristic in some other regions of Southwest Libya. For example in Ghadames, Derj, Tonin. This dwelling design has flourished for a long time in Southwest Libya and is a reflection of the social-cultural behaviour and climatic conditions. Furthermore, those types of vernacular design displays a wealth of experience in the skillful use of local materials which came from the abundance and enrich the social-cultural features.

Through the lessons learned from the advantages of vernacular architecture for desert-dwelling design, many important aspects can be found that reflect the significance of the socio-cultural features in the vernacular desert dwellings, such as the unity of thought , environmental solutions that are used in vernacular local architecture that have helped to create a positive overlap and integration among them , and the pattern of design. In addition, the distribution of the internal spaces are in accordance with the customs, traditions, cultural heritage, and religious beliefs. The cultural heritage is reflected in the dwellings in the

recruitment and use of local vernacular architectural elements, and in the use of some of the rituals and symbols that are related to beliefs. Finally, vernacular complementary architectural elements are used, such as Al-Sherifaa, Al-Thaloth, and Al-Kawat,which have created and established the architectural identity of the region throughout the long historical periods.

Finally, it is apt to state that a significant change to the vernacular desert dwellings in the Southwest Libya in the contemporary period occurred. Contemporary desert dwellings haven't even tried to stay true to vernacular dwelling and construction where the summary of the impact of the contemporary architectural trends of foreign companies on the architectural environment in Southwest Libya show the impact of foreign importer design has been adopted in many projects housing without any changes. Thus, they have greatly impacted of the socio-culture features in desert regions. Furthermore, there is still a lack of understanding of socio-culture features in desert regions.

The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. Therefore, the following chapter (Chapter Three) shows the socio-cultural architecture features for sustainable desert dwellings.

CHAPTER THREE

SOCIO-CULTURAL ARCHITECTURAL FEATURES FOR THE SUSTAINABLE DESIGN OF DESERT DWELLINGS

CHAPTER THREE

SOCIO-CULTURAL ARCHITECTURAL FEATURES FOR THE SUSTAINABLE DESIGN OF DESERT DWELLINGS

3.1 Introduction

This chapter deals with the socio-cultural architectural features for the sustainable design of desert dwellings. In order to understand what effect these architectural features have on desert dwellings, it is necessary to understand the nature of the social and cultural features, and their composition, reflection, and impact on socially and culturally sustainable dwelling designs. This chapter outlines the concept of dwellings from different perspectives, and reviews their importance in understanding the notion of dwellings in general, as well as vernacular and contemporary desert dwellings . Second, the chapter then researches sustainability definitions, social dimensions, and the idea of sustainable development, down to the sustainable architecture and socio-cultural sustainability. Third, it presents the socio-cultural architectural features for sustainable desert dwellings, which include the privacy of the dwelling, safety and security, the shape and design of dwellings, and the impacts of social considerations and religious beliefs.

In addition, it describes two important features, which are the identity and cultural heritage of dwellings. This details the definitions and concepts of cultural and architectural identity, as well as the changing identity of the new generation and contemporary lifestyle, including the changes in socio-cultural features, and their compatibility with the contemporary lifestyle and keeping up with modern technology, especially for young people. Finally, the chapter attempts to illustrate the theoretical background of the socio-cultural architectural features for the sustainable desert dwellings that are investigated in this research. This relates to the aim of this research, which is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. Figure 3.1 shows the structure of this chapter:

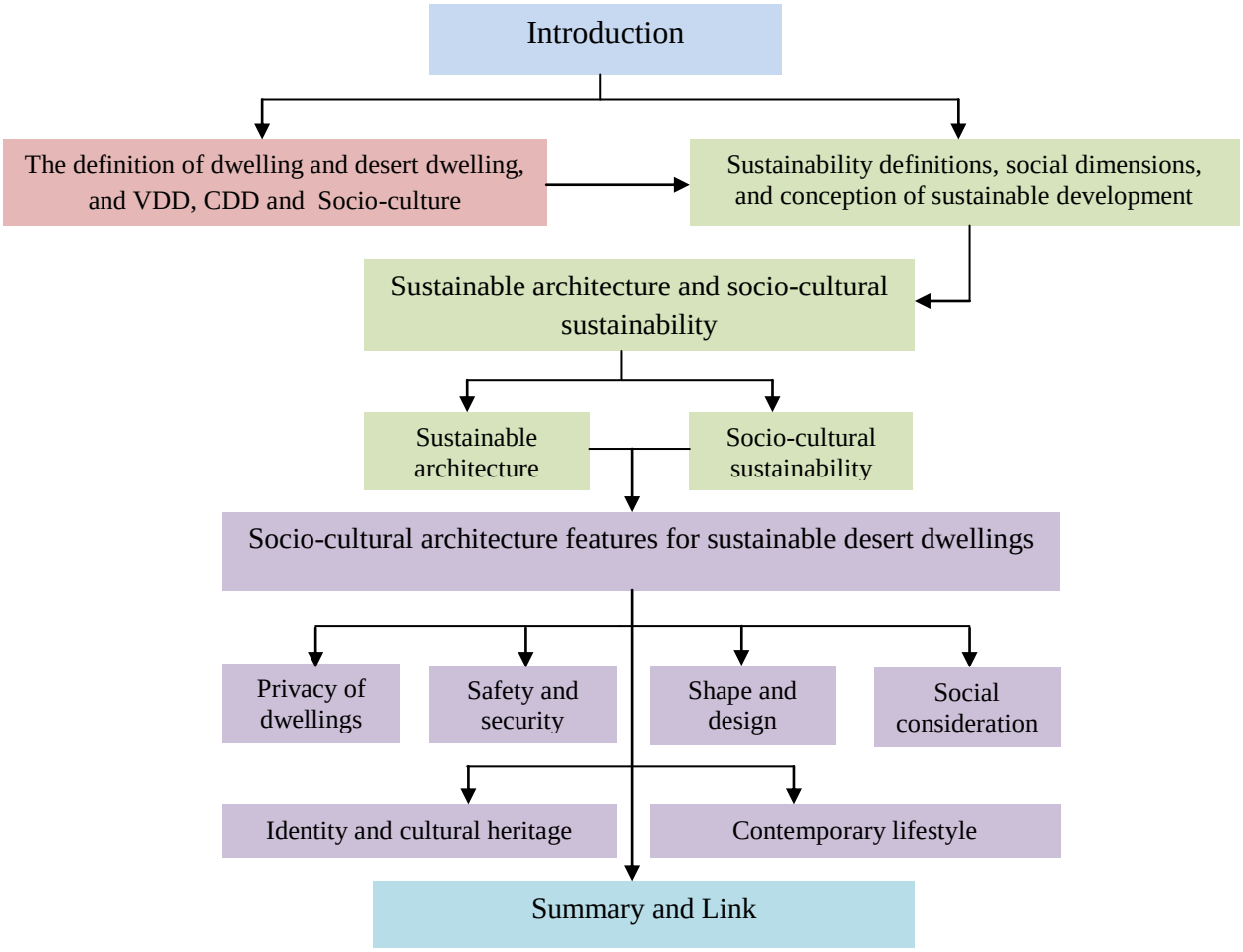


Figure 3.1: Structure of Chapter Three

3.2 Definition of dwelling and desert dwelling

3.2.1 Definition of dwelling

A dwelling is simply a shelter or a protective vacuum that shields the inhabitants from external factors and meets the necessary requirements (Porteous, 1977). Moreover, it acts as a filter between the external setting and the comfort desires of the inhabitants inside. Consequently, the function of a dwelling is to provide a place where human activities can take place without distraction from others, both human and animals.

Zami (2010) states that there is no single and universally accepted definition of a dwelling. However, several authors have agreed upon some characteristics that illustrate the nature and concept of dwellings or homes. It is necessary to outline and clarify these terms on an individual basis for this research. Table 3.1, as follows, contains various definitions of a dwelling or house.

Table 3.1: Definition of dwelling:

Author	Definition
Le Corbusier, (1923)	*"The house is a machine for living in"*
Alberti, (1955, p13)	*"All buildings in general, if you consider it well, owe its birth to necessity, was nursed by convenience, and embellished by use; pleasure was the last thing consulted in it, which is never truly obtained by things that are immoderate".*
Rapoport, (1969, p46)	*A house is an institution, not just a structure; created for a complex set of purposes. Because building a house is a cultural phenomenon, its form and organisation are greatly influenced by the cultural milieu to which it belongs.*
Norberg-Schulz, (1985)	*A dwelling "means to meet others for exchange of products, ideas and feelings, that is, to experience life as a multitude of possibilities."* *A dwelling is a "means to come to an agreement with others, that is, to accept a set of common values."* *A dwelling is being "oneself, in the sense of having a small chosen world of our own."*
Olweny, (1996, p20)	*"The term 'house' conjures several different meanings. Ordinarily, it is used to define a variety of aspects of the environment connected with a dwelling, from health to social structure and status".*

Source: Summarised by researcher adapted from (Zami, 2010).

Table 3.1 contains the commonly used dwelling definitions. However, to an extent they are inadequate, as they do not fully explain what housing is. The definitions do not represent all the functional aspects of housing. The Latin word 'domus' acknowledges that housing is more than just shelter. The rediscovery of the meaning of 'house' and 'housing' is a process that involves not only looking at housing in its physical form but also includes the investigation of the functional attributes of dwellings. These aspects include cultural, social, economic, and psychological factors, which have been investigated by a number of different disciplines (Olweny, 1996). Rapoport's (1969) definition ensures that 'dwelling' also reflects culture.

A dwelling is associated with a wide variety of forces; for example, social, cultural, economic, and physical issues. There is much in the architectural literature on the concept of the dwelling (Wolford, 2008). This thesis is primarily concerned with the socio-cultural-sustainability features related with desert dwellings.

Most of the definitions associated with the concept of housing and dwellings are also associated with the social aspects, especially the socio-cultural-sustainability features, hence the importance of the study of the socio-cultural-sustainability features, and their relationship with housing and dwellings. Therefore, the following points summarise the most important housing definitions that have social and cultural dimensions:

- According to Maslow(1987), there are five strata of basic wants for dwellings, which are referred to as the "needs of men". The five strata are the need for physiology, safety, social communication, respect, and self-fulfilment.
- According to Burns *et al*(1977) a shelter is the most pervasive form as dwellings offer different services, such as indoor cookery, hygiene, and storage facilities. Also, housing provides an assurance of privacy and rest. In addition, it provides space for recreation and children's education, which rely a great deal on financial gain, climate, and traditions.
- Correa (1999) notes that in a housing setting, there is a full system of spaces that the family utilises every day. The spaces include courtyards and terraces, which the family uses for either cooking or sleeping. Also, the family utilises the front doorstep as a playgrounds for children. The community utilises the principal open areas.
- Turner (1976) defines a dwelling as a stock of units in relation to that dwelling and the process of maintaining that stock. Furthermore, according to Turner (1976), a dwelling should describe the human and social values of housing actions and processes.
- WHO(1989). reported that *"Adequate housing helps people's social and psychological development and reduces to a minimum the psychological and social stresses connected with the housing environment".*
- Leckie (1992), for the International Institute for Environment and Development (IIED), states that adequate housing must meet the following criteria: it must give protection from the elements, be culturally acceptable, and guarantee the physical safety of the occupants.
- Majzub (1978), describes that *"To consider housing as shelter or the physical structure is evidently a very narrow view of housing. The concept of housing is more than a physical shell. Housing encompasses all the auxiliary services which are necessary to human well-being. Therefore community facilities, social amenities and services form an integral part of the housing concept. "*

According to the previous definitions, it is evident that the main underlying reason for the construction of a dwelling is for shelter from the external environment. For example, Correa (1999) portrays housing as a mixture of areas utilised by individuals, and explains that there is a hierarchy of these spaces and activities. Correa's definition relies on the spatial characteristics involved with the interrelations of activities in the housing space. This definition is important as it explains the relationship between social activities and the design of housing space. In addition, the definition of Leckie (1992) considers dwellings to provide inhabitants with the necessary support in terms of their social, cultural, economic, physical, and psychological needs.

Therefore, these definitions are some of the various definitions that countries and organisations have given in relation to the availability of housing, and recommend that housing should fulfil the population's desires and concerns on all accounts (Zami, 2010). Thus, in any housing project, the socio-cultural needs of the population should be considered. The concept of a dwelling is different from one place to another; what is considered essential in a specific place is not always considered necessary in other places. For example, the privacy requirement of desert dwellings in Southwest Libya is a result of many socio-cultural features, including customs, traditions, and religious beliefs.

3.2.2 Desert dwelling

3.2.2.1 Vernacular desert dwellings

Paul Oliver's *Dwelling: Encyclopaedia of the Vernacular Architecture of the World* (EVAW) points out that it is difficult to find an exact definition of vernacular architecture that is applicable to all buildings, places, systems, and traditions (Asquith and Vellinga, 2006). In Oliver's aforementioned book, he defines vernacular architecture as follows:

"...comprising the dwellings and all other buildings of the people. Related to their environmental contexts and available resources they are customarily owner or community built, utilising traditional technologies. All forms of vernacular architecture are built to meet specific needs, accommodating the values, economies and ways of life of the cultures that produce them." (Oliver, 1997, Asquith and Vellinga, 2006).

Based on Oliver's (1997) study, the vernacular-based environment is determined based on the reason for its existence. Therefore, the vernacular architecture consists of the people's buildings, which were produced on the basis of the people needs, and their actual culture and lifestyle. Thus, the vernacular architecture reflects the vernacular environment, people's real needs, their lifestyle, and their socio-cultural features. This theory is used in this study by focusing on the design of vernacular desert dwellings to understand the actual social and cultural needs of the population.

In this study, a vernacular desert dwelling is defined as a dwelling in the vernacular oases in the Southwest region of Libya, such as the vernacular towns of Ghadames (Figure 3.2), Ghat (Figure 3.3), and Sabha, which is built from mud and local building materials. These vernacular dwellings use local building techniques, and are based on the ideas of the local population and experts, which were derived from their basic needs (primarily their social and cultural needs), including the compatibility of these dwellings with their cultural heritage, beliefs, customs, and traditions. These dwellings have faced the march of the desert for many years to form part of the identity of the place and man, and have become part of his culture throughout history.

Figure 3.2: Vernacular dwellings in Ghadames
Source : mirathlibya.blogspot.co.uk, 2012

Figure 3.3: Vernacular dwellings in Ghat
Source : Researcher, 2015.

3.2.2.2 Contemporary desert dwelling

In this research, 'contemporary desert dwellings' means dwellings that are built with modern building materials, such as cement, iron, glass, etc. (see Figure 3.4), and that are built according to international patterns (Figure 3.5) Most of these dwellings in Southwest Libya were built after 1974 by foreign companies and foreign workers, and were designed in a way that is far from the environmental, social, and cultural nature of the region.

Figure 3.4: The contemporary dwellings in Hoon
Source : http://ar.meteocast.net/forecast/ly/hun/

Figure 3.5: Contemporary dwelling in Wadaan
Source : Source : Researcher, 2015.

3.3 Socio-culture definition

'Socio-cultural' is a composite word, derived from two words 'social' and 'culture'. 'Social' means a model that combines social relationships (Bahammam, 1995) and refers to relationships among people within society. 'Culture' is a term with broad meanings. More recently, United Nations Educational, Scientific, and Cultural Organisation (UNESCO) (2002) describes culture as follows: *"... culture should be regarded as the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs."* For anthropologists, the socially acquired lifestyle means a group of people and includes behavioural patterns, ways of thinking, feeling, and action (Eller, J.D., 2016).

3.4 Sustainability definitions

The term 'sustainable' evolves continuously; however, there are some subtle nuances of this in terms of the socio-cultural, political, economic, psychological climate from here and now, and this makes it vulnerable to becoming dated (Steele, 1997). Sustainability affirms the holistic nature of human activities, and thus demonstrates the importance of comprehensive planning that coordinates between different sectors and groups (Al-Zubaidi, 2007). Sustainability is a single word with more than 300 definitions, according to different trends and uses. In fact, this word has become popular to describe all kinds of situations, such that, when you write about sustainability, it needs to be defined (Al-Zubaidi , 2007).

There is no one specific and comprehensive definition of sustainability (Beatley, 1995). Therefore, it is defined in a way that is appropriate for each topic. The most important principle on which sustainability can be defined is to preserve the ability of future generations to use available resources and for future generations to do the same (Harrison, Wheeler and Whitehead, 2004). However, the concept of sustainability has been introduced to bring together the principles of caring for the well-being of the earth, and maintaining growth and human development (Al-Zubaidi, 2007).

It is worth mentioning that the most frequently quoted definition of sustainability in the literature reviews is the definition of the World Commission on Environment and Development (WCED) (1987), which defines sustainable development as *"Development that meets needs of the present or current generation, without compromising the ability of future generations to meet their needs and aspirations".*

Sustainability is a broad term and encompasses social, cultural, economic, and environmental aspects of development. Sustainability maintains a quality of life, and requires a change of mind, and the development of values and concepts towards less-consuming lifestyles (Carter, and Rogers, 2008).

3.5 Social dimensions

Sustainability consists of three dimensions (or fundamental pillars), socio-cultural sustainability, environmental sustainability, and economic sustainability, which are elements of sustainable development aimed at human well-being (Carter, and Rogers, 2008) (see Figure 3.6).

In order for a community to be able to work and sustain itself, it must work to meet the basic needs of this society. A socially sustainable society should have the potential to maintain its core resources and also have the capacity to address future problems. To build social sustainability there are two types of resources available: individual capacity and social (community) capacity. Thus, communities should be socially sustainable (Kemp *et al*., 2007).

Individual capacities, attributes, and resources contribute to the well-being of society as a whole. These resources include many aspects, such as education and health skills, and leadership values (Al-Zubaidi, 2007).

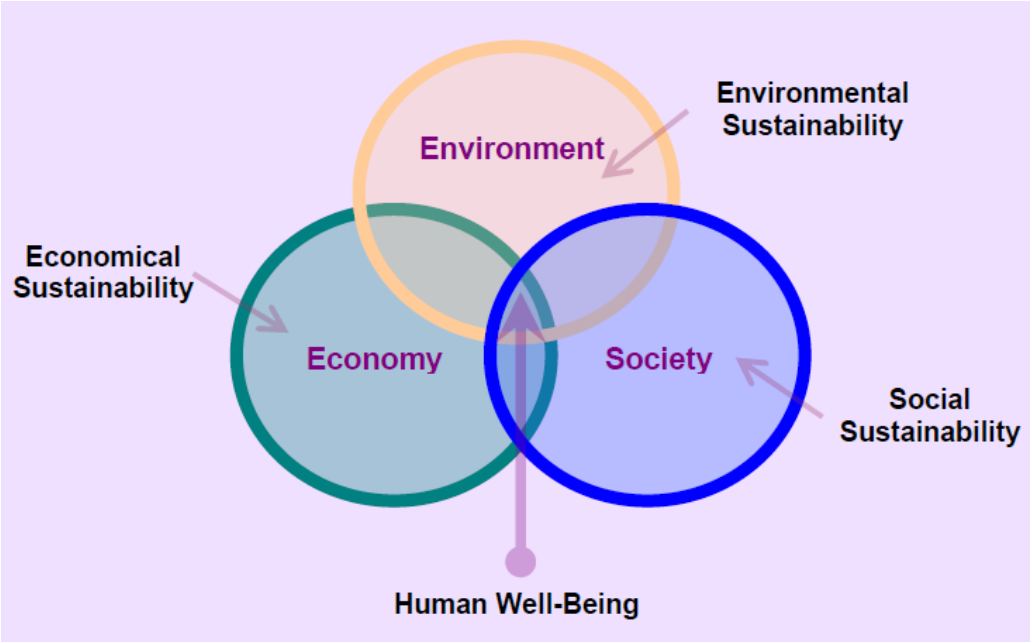


Figure 3.6: Three dimensions of sustainable development for human well-being
Source: the researcher adapted from (Al-Zubaidi, 2007 based on Herremans, 2002)

Social sustainability includes three important aspects: basic human needs, such as adequate dwellings and income; individual capacity, including equal learning opportunities and self-development; and, finally, social (community) capacity, which promotes community development and promotes social interaction (Al-Zubaidi, 2007).

In his discourse on the development of social sustainability, Weingaertner *et al* (2014) and Dempsey *et al* (2011) that, in addition to aspects of meeting basic needs such as dwellings, income, and security, the dimensions of social sustainability also include promoting social and mental well-being, preserving the cultural heritage of the community, and promoting interconnectivity between a place and history.

Furthermore, social and cultural sustainability is linked to the quality of life that preserves the 'cultural identity' of the community, which supports the provision of the psychological and physical needs of the population. A socially sustainable community encourages the members of society to bring about the empowerment of capabilities within a community, which enjoys safety and equity for all the population (Chiu, 2004).

3.6 Conception of sustainable development

The concept of sustainable development has emerged as a guiding principle for all development activities in the world (Jaeon and Bun, 2008, United Nations [UN], 2011). The UN supports sustainable development work programmes (Edum-Fotwe and Price, 2009). The Brundtland Commission, which is also known as the World Commission on Development and the Environment (1987), defines sustainable development as *"development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs"* (Akotia, 2014).

The Brundtland Commission formulated the Rio Declaration that was adopted by the UN (United Nations Conference on Environment and Development, 1992), which expanded on the concept of sustainable development through the formulation of Agenda 21, *"The Agenda for Environment Policy and Sustainable Development for 21st Century"* (Brandon and Lombardi, 2011, Pitt *et al.*, 2009). One of the most important achievements of the Rio Declaration is that it recommended a new way of investing for use in the future and opened the way for discussion of post-environmental issues (Li Ang and Wilkinson, 2008, Du Plessis, 2005), which had a significant impact on raising the awareness of the world. In addition, it has enhanced the integration of the three pillars of sustainable development (Akotia, 2014, Brandon and Lombardi, 2011, Carter and Rogers, 2008, Civil Engineering Contractor Association [CECA], 2007).

3.7 Sustainable architecture and socio-cultural sustainability

3.7.1 Sustainable architecture

The World Health Organization (WHO) describes a dwelling as a private environmental domain that gives the residents the physical structure of a dwelling with different facilities, services, and supplies, and all that is necessary to ensure their health, comfort, mental well-being, and social prosperity. The sustainable development of cities considers dwellings to be very important (Shehab *et al.*, 2016). Environmental efficiency at present requires further improvements and investments to develop sustainable dwellings so as to provide access to sustainable dwellings for all strata of society according to their social and cultural values, and economic potential (Varol *et al.*, 2011). Although the built environment meets a basic need for human beings, and is a cornerstone of development and sustenance, it is also part of the impediment to sustainable development at present because of the current unsustainable activities (Brandon and Lombardi, 2011). The continued application of traditional concepts of

sustainable development leads to the fragmentation of the natural and social environment, which is the basis of the welfare of societies (Akotia, 2014).

The emergence of sustainable architecture coincided almost perfectly with the development and spread of sustainable development concepts (Cofaigh *et al.*, 1996, Almansuri, 2008). According to the definition of McDonough (2000), sustainable building design is a concept that reflects the sense of the environment and is compatible with the evolving environmental system.

Roaf *et al*. (2009) point out that environmental dwellings are strongly related to the locations in which they are built and the environmental conditions, such as climatic, natural, and social conditions. Therefore, sustainable architecture is architecture that meets the needs of the population, is largely compatible with its surroundings, and limits the negative effects on the environment. It also adopts a consensual approach to resource consumption (Almansuri, 2009).

Sustainability deals in the long term with the relationship between humans and the natural environment (Almansuri, 2008). The essence of architectural sustainability is defined as an integrated approach to dealing with the environmental, economic, social, and cultural aspects of the design and construction of housing and buildings. The sustainable environment of any residential area is understood by looking at the diverse local features of that region as environmental and economic factors, and understanding its socio-cultural features (GhaffarianHoseini *et al.*, 2011). Therefore, the fundamental implicit criterion for sustainable architecture is the need to understand the local features of the surrounding environment (Guedes *et al.*, 2009).

Sustainable architecture aims to achieve a responsive architecture that is compatible with the environment and represents an ethical, social, and even political commitment. It is, therefore, an integrated system that seeks to produce biological stability at the global level (Bennetts *et al.*, 2003). The work of Pourjafar *et al* (2011) indicates that the efforts to achieve this compatibility and sustainability of responsive architecture have intensified in the last decades of the last century through a variety of different interpretations, most of which are based on environmental awareness and concepts of environmental sustainability. In fact, there is no comprehensive context for the concept of environmental awareness. However, there have been various efforts to improve the built environment. An example of this is the appearance of the term "green architecture", which is used in the context of eco-friendly architecture. That is, architecture that is suitable for the natural aspects of the environment, that has sufficient

facilities to achieve good efficiency, and that provides the necessary conditions to ensure the comfort and well-being of inhabitants (such as an appropriate internal environment), through different relationships with nature (Pourjafar *et al.*, 2011). Therefore, the concept of sustainable architecture is linked to the protection of the environment, especially from the adverse environmental impacts of industrial waste from construction and architecture. This coincides with the aggravation of the health and lives of people as a result of the impact of environmental problems. Sustainable architecture also focuses on the role of architecture in reducing the problems of environmental pollution (Izadpanahi and Elkadi, 2013). The development of sustainable architecture leads to a reduction in energy consumption, rational use of natural resources, harmony between the environment and people, and helps to improve the quality of life (John *et al.*, 2005).

Sustainability is as old a principle as architecture. However, environmental and ethical constructs are the foundation of modern sustainable architecture. This is achieved through working in a sustainable and stable society, where a sustainable society is an important continuum for sustainability. Stability can be achieved through the seamless coordination of the chain of sustainability. In order to achieve stable architecture, objectivity and authenticity must be followed because sustainability is biased towards the moral realm as part of the local culture and values. However, the change in lifestyle and attention to the local environment has become important, and sustainability has been created on the basis of knowledge, science, and techniques that achieve specific environmental objectives (Pourjafar *et al.*, 2011).

There is a scientific basis for sustainable architectural design that derives its strength from conscience and morals. The principle of sustainable design is based on three pillars: human design, resource abundance, and a determination to preserve the rights of future generations.

It is implemented in a manner that includes the design, implementation, operation, and maintenance, and on the basis of recycling and the use of available architectural resources. Therefore, specialists, professionals, and architects should take steps to implement this framework rather than any other solution (Pourjafar, *et al*., 2011).

According to Varol *et al.* (2011), the primary purpose of housing is to meet the fundamental needs of the population. In the context of sustainable development, it is not enough to ensure that all needs are met; the environmental aspects must be considered comprehensively to cover all aspects. Sustainable housing development can thus be defined as housing development that meets the needs of housing and the demands of the current generation without compromising the ability of future generations to have their needs and demands met.

In other words, a sustainable dwelling is not solely intended to meet the needs of the present population. It seeks to ensure that future generations will be able to have their needs met. Nevertheless, sustainable dwellings are defined on an environmental basis. Some studies focus on the socio-cultural aspects of dwellings, and most of them emphasise its importance in the design and planning of dwellings (Al-Jamea, 2014, Connelly, 2007). Hence, dwellings not only involve the requirements of the population but also include the development of critical socio-cultural features, and thus sustainable dwellings seek to integrate social, cultural, and environmental features to achieve sustainable design (Varol *et al.*, 2011).

3.7.2 Socio-cultural sustainability

Dwellings play an important role in various aspects of sustainable development as one of the most important constituents of the built environment (Mohammad and Amato, 2006). According to Reffat (2004), sustainable dwellings include interrelated environmental, economic, and socio-cultural aspects. Sustainable development is an integrated vision to create a balance between ecological needs and people's needs to provide a prosperous and equitable quality of life (Al-Jamea, 2014). Furthermore, Reffat stressed that dwelling sustainability is a multi-faceted issuenot only concerned with housing, but with the environmental characteristics of the location, including climatic conditions, geographical location, economic potential, and human and socio-cultural values (Reffat, 2004, Al-Jamea, 2014).

Local social considerations are often shaped by cultural characteristics such as customs, beliefs, attitudes, and philosophies that are inherited via different generations (Chiu, 2002, Shehab *et al*., 2016). These traditions can be considered as motivations that drive communitymembers as part of their culture and patterns of social behaviour. Thus, traditions can be described as informal rules. Physical products, such as components of technology, and other non-material products, such as customs, traditions, and others, are all born of human culture. It is therefore important to understand the interactive relationship between social aspects, culture, and population (Chiu, 2002, Shehab *et al*., 2016).

Socio-cultural features are important factors in shaping an environment. Altman *et al*., (1980) mentioned that there are four different characteristics that connect man, environment, and culture. Altman *et al* (1980) classifies these as follows: first, the cultural background of beliefs, customs, traditions, and social behaviour; second, knowledge and its association with the behaviour of the group; third, how these beliefs are inherited among the different

generations; and, finally, the current culture of the society, reflecting its features in the architecture of dwellings or other buildings (Shehab *et al*., 2016).

In the same context, Rapoport (2005) similarly describes the different aspects of the relationship between man, the environment, and culture, where he first described culture on the basis that it represents a lifestyle for a group of people. Secondly, he argued that culture is in fact symbolic meanings and a cognitive framework system. Thirdly, he points out that culture is a manifestation of the adaptation of a society to the resources available in its environment. Furthermore, culture is also classified as a set of expressions of behaviour, and is a process that moves from abstract to concrete (Shehab *et al*., 2016).

As a result of continuous changes and the evolution of the concept of culture, it has not yet been defined accurately (Elkadi, 2008). Eliot has described it as a group of activities carried out by people, and although this description is reasonable to some extent (Howells 2003), it has encountered criticism in terms of the principles of the definition of the people, and also, this definition does not refer to the dimensions of morality, religion, and politics (Elkadi, 2008).

The sustainability of socio-cultural architecture is linked to the preservation of the cultural heritage of the population. The adaptation of people to the nature of their place of residence and modern technological developments reflect the physical framework of a dwelling. The physical framework is, therefore, part of cultural expression. The interior design of the spaces in a dwelling is the outcome of the interactions of the socio-cultural features of customs, traditions, and so forth. In contrast, the exterior design of the house is a result of the availability of certain types of building material, the climatic conditions surrounding the dwelling, the individual capabilities of the owners of the dwelling, and the aesthetic style prevailing in the community at the time and also customs and traditions (Chiu, 2004).

In the same context, Chiu points out that meeting people's needs is the primary concern of the sustainable development of housing, and not only to preserve the resources of the surrounding environment. However, the main concern for sustainable housing should not be to meet basic needs, but rather to improve the internal and external conditions of the living environment (Chiu, 2004). As Ahmed (2011) indicated, most of the needs of the population are changeable and can be developed; thus, the design of a dwelling should be adaptable. It is therefore important to envisage adaptation as one of the essential elements of socio-cultural compatibility.

In addition, Chiu also indicated that there are wide overlaps between cultural and social sustainability, where many elements and attributes are linked and are sometimes difficult to separate. Furthermore, cultural and social sustainability can be different at a given time, and there are features that are difficult to measure, such as social considerations and inter-social relations that vary from place to place. On the other hand, cultural dimensions such as art, music, literature, and even religion are perhaps more tangible. (Chiu, 2004).

In general, the concept of dwelling design in terms of socio-cultural sustainability is a dwelling design that meets the social and cultural needs of the population and also preserves the right of future generations to use the environment. However, these needs vary from one society to another and cannot be uniform at a global level. Therefore, the best way to achieve the aim of socio-cultural sustainability is to investigate the needs of society and find appropriate solutions for dwelling design in that society (Chiu, 2004, Al-Jamea, 2014).The following section discusses the most important socio-cultural features of sustainable desert dwellings for subsequent verification.

3.8 Socio-cultural architecture features for sustainable desert dwellings

There is a limited amount of literature regarding the socio-cultural sustainability of dwellings, especially desert dwellings, according to literature reviews and similar earlier studies in some desert areas, such as the Arabian Gulf region (Mahgoub, 1997, Asfour *et al.,* 1998, Ahmed, 2011, Al-Jamea, 2014, Shehab *et al.,* 2016). This is partly due to the specificity of the Saharan community in southwest Libya; there are some limited studies that touch on the Ghadames Oasis that refer to some social and cultural factors (Bilghit, 2007). This study proposes four basic features (privacy, safety and security, shape and design, and social and religious considerations), each of which generates a set of sub-items with which to measure the levels of satisfaction of different generations of the population with respect to both vernacular and contemporary desert-dwelling designs. Two other main features (architectural identity, cultural heritage and contemporary lifestyle) are included, along with another set of sub-items. The socio-cultural dimension of sustainability is primarily related to people and the quality of their lifestyles, which protects the cultural identity of the community, provides stability, and meets the moral and material needs of the population. A sustainable society seeks to motivate the members of the society to enjoy safety and equity for all persons (Al-Zubaidi, 2007, Rogers *et al.,* 2012). These two features are only investigated with respect to the youth because older age groups are perhaps more in touch with their cultural and

architectural identity. This highlights the problem of changing the identity of young people, and also shows that young people face rapid changes and developments in their contemporary lifestyle; this contributes significantly to the disintegration of cultural identity and weakens the sense of national identity, which is an important basis for people's civilisation and their history (Al-Eid, 2014). These last couple of features have a greater correlation with this younger age group in creating a balance between the requirements of the modern lifestyle, the cultural identity of young people, and preserving the cultural heritage and architectural identity of the historical towns of Southwest Libya.

3.8.1 Privacy

There are many definitions and arguments regarding the concept of privacy that are derived from several different principles. This indicates that privacy involves a unique set of organizational mechanisms by different communities and people's lives (Wahid and Khozaei, 2009). According to Bahammam (2006) the define privacy: the desire for privacy is a significant social-cultural factor influencing housing design in almost every society. The form of privacy is translated into reality in many built forms and public actions. Hisham and Rahim (2010) indicated that *"Privacy is a two way process involving the permeability of boundaries between oneself and the others"*. Margulis,(2003) point out that privacy is a process designed to regulate transactions between people with the aim of promoting self while minimising vulnerability. Altman (1977) claims that *"Privacy differs among cultures in term of the behavioural mechanisms used to regulate desired levels of privacy"* (Wahid and Khozaei, 2009).

From this, one can conclude that public and private spheres are not equal in all societies, where the meaning of privacy varies from community to community. According to the perspective of Muslim societies, the Holy Quran and the tradition of the Prophet (Sunna) are inspiring sources for guiding people's lifestyles and socio-cultural organisation. The community should be in harmony with these directives (Mortada, 2003). Respect for the rights of others and their privacy, and the prevention of infringement of these rights is one of the most important concepts and pieces of guidance from the Islamic perspective (Abu-Ghazzeh, 1997, Al Surf *et al*., 2012).

In this regard, the Holy Quran refers to the following guiding principle:

"Oh you who believe! Do not enter houses other than your own, until you have asked permission and greeted those in them: that is best for you, in order that you may remember. If

you find no one in the house, enter not until permission is given to you, if you are asked to go back, go back, that makes for greater purity for yourselves, and God knows well all that you do. It is no fault on your part to enter buildings not used for living, which serve some (other) use for you, and God has knowledge of what you reveal and what you conceal" (Al Nour 24: 27-29).

These verses emphasise the respect for privacy in the place of residence. It reveals the boundaries between the public sphere and the protected privacy required in Islam (Mortada, 2003).

From the previous outline definitions, it is very evident that privacy is the control of access, communication, and cultural interaction. Another concept of privacy is the control of information, which also contains socio-cultural features. The concept of privacy seems to include both the ideas that are mentioned earlier, which are the nearest definitions to the concept of privacy that relates to socio-cultural-sustainability features (Amer, 2007).

The provision of privacy is of great importance in socially and culturally sustainable dwelling design, especially visual privacy. Al Kodmany (1999) defines visual privacy *as "the ability to carry out everyday activities hidden from the eye of outsiders or without fear of being observed by them"*. He emphasises that the design, planning, orientation, and location of dwellings; the architectural treatment of their exterior facades; and the rise and proximity of housing can affect residential visual privacy (Wahid and Khozaei, 2009).

Carmona (2010) expresses a similar definition that supports this idea; his study confirms that *"visual privacy is related to physical and visual permeability between public and private realms".*

Facades represent the envelope of dwellings, which is an important part of the dwelling located between the inside and outside . At the same time, they present the shape of the dwellings to the public, and provide the physical and psychological boundaries of the population. This element is considered the most sensitive place for achieving visual privacy.

In addition, the front of the dwelling determines how much foreigners are able to display from within the dwelling. Therefore, dwelling design, in general, and dwelling fronts, in particular, have an important role to play in providing privacy that affects the transparency of dwelling boundaries. Designers should, therefore, be instrumental in providing visual privacy through thoughtful architectural design. They can also control the level of privacy required. Since this thesis on the socio-cultural-sustainability features of desert dwellings within a conservative

local Islamic environment, it is important to match the visual privacy of dwellings with the satisfaction of the population, and with the real social and cultural needs of the population.

In the same context, acoustic privacy is as important as visual privacy. Therefore, it must be preserved and there must be a buffer (walls, roofs/ceilings, and floors) for the voices of the population from outside, and especially neighbours and the street.This principle is in line with the local Islamic cultural guidelines (Wahid and Khozael, 2009). Acoustic privacy can be achieved through the design of dwellings and the distribution of spaces into three areas, general (male), semi-public (service), and private (female and family), which may be connected from a central area or through the courtyard. This can also be achieved through architectural treatments such as insulation materials and buffer zones that promote acoustic privacy.

Furthermore, privacy around the dwelling must be provided, which is an important aspect of privacy and is intended to take into consideration the privacy aspects of the dwelling block, such as maintaining the privacy of the dwelling's garden and external side openings, and privacy from the height of the external fences and the back of the dwelling. Several architects endeavour to solve the problem of maintaining privacy around the dwelling, and avoiding neighbours being able to see into their dwellings from the street or neighbouring dwellings (Sergison, 2015). Hakim's (1986) study about the vernacular Arab Islamic town in Tunisia indicates that the location of doors and windows, which provide air and light , is an important factor for privacy that cannot be overlooked as it is one of the main requirements. O'Meara (2010) expresses a similar view, as he stresses the importance of privacy in Muslim communities. Amer (2007) points out in his study that external walls in vernacular dwellings in Islamic towns are high to ensure that the domestic interior could not be overlooked. These solutions are based on Islamic principles, and reveal the socio-cultural need for compatibility between Islamic principles and the architectural environment (El-Shorbagy, 2010).

Family privacy is also an important aspect of privacy, especially in conservative Muslim communities. It includes privacy among family members, visitors, and others. The design of the contemporary dwellings should contain the elements to support providing this type of privacy, in the private and external areas. This peculiarity is visible in the vernacular architecture of dwellings, where the interior of the building provides a large part of this privacy and social contact is also considered (Ghasemi, 2015).

Another significant element of the socio-cultural features of dwelling design, in relation to privacy in social life, is the segregation of brothers and sisters in sleeping spaces. In the local

societies studied, Islam requires privacy for brothers and sisters when they reach a certain age, which must be achieved in the families' sleeping arrangements; as a minimum, partitions or curtains should be used if it is not possible to offer sufficient separate spaces (Mortada, 2003). Furthermore, privacy is important in terms of the interior organisation of spaces, particularly regarding the location of kitchen with respect to the living room, bathroom with respect to the bedrooms, and the bathroom with respect to the guest room.

3.8.1.1 Privacy controllers

The research of Johnson (1974), Shawesh (1996), and Bilghit (2007) reveal that the construct of 'personal control' is used with respect to privacy. They suggest there are four aspects of personal control used in privacy regulation. First is the 'outcome choice' control, which states the level of privacy that is aimed at. The second is the 'behaviour selection' control, which refers to the ability to choose one's behaviour to achieve a designed outcome. The third is the 'outcome realisation' control, which points to the degree of effectiveness in achieving the designed level of privacy. The fourth is the 'outcome realisation' control, which points to the standard of efficiency in realising of the desired level of privacy.

Excessive information and undesirable social interaction can be controlled by physical barriers (Rapoport, 1980). Six primary mechanisms used to control unwanted interaction (Rapoport, 1980): the first mechanism is disciplines, manners, and avoidance; the second is behavioural cues; the third is psychological means; the fourth is scheduling the time of activities, so that particular individuals and groups do not meet; the fifth is spatial separation; and the sixth is physical devices (doors, courtyards, curtains, and so on).

According to Hillier (2005) the spatial organisation of a human settlement in itself is one of the mechanisms that controls the amount of information and interaction. For people, as well as for animals, social and spatial organisation and structure are closely related.

The aforementioned tools can help to control information and undesirable interaction in the dwellings . These controllers involve socio-cultural tools, psychological means, space, social rules, and physical barriers, such as walls, doors, and curtains. Architects should consider these tools to achieve the required level of privacy. There are lessons that can be learned from the vernacular architecture; it includes the measures that are used to control social contact and interaction. For example, advantage can be taken of some of the architectural ideas used in vernacular desert dwellings that promote the achievement of the desired level of privacy (see Figure 3.7).

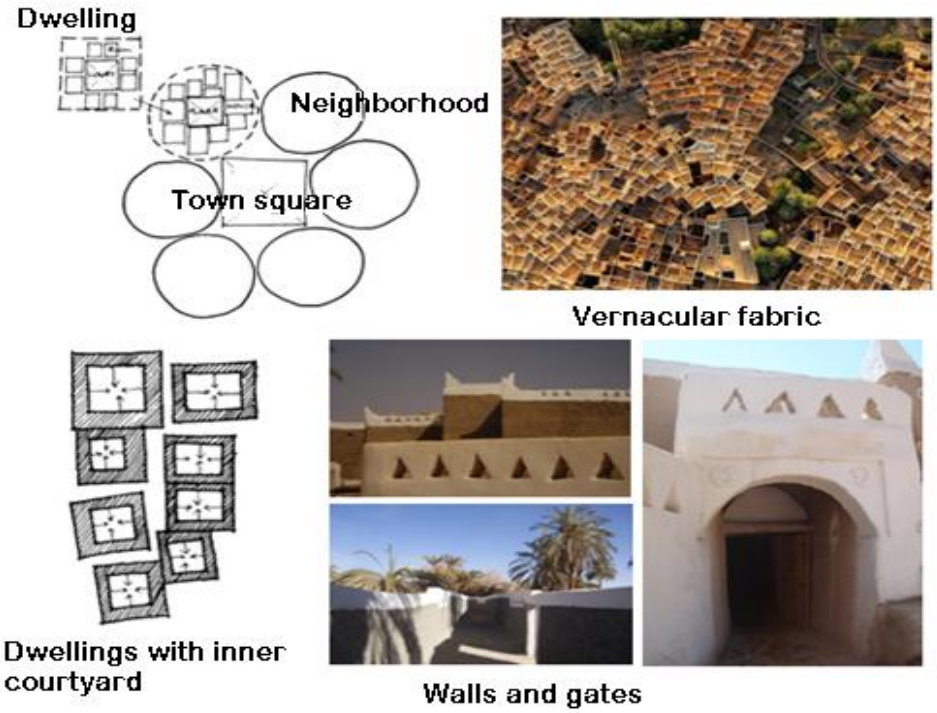


Figure 3.7: Use of physical barriers, space organisation and mass.
Source: Researcher adapted from Rapoport (1977)

3.8.1.2 Privacy of local population in Sahara

According to Lewin's (2001) research, the Sahara Desert forms a social family and kin-oriented relationship. Here, units of people unite in the social identification and one's standing in the community as kin (Hivernel, 1996). In his ethnographic study, Hivernel (1996) confirms that the desert oases contain social organisations that were founded on blood relations. These relations played a central role in the site *"selection, configuration, grouping and location of dwellings within towns and villages"* (Hivernel, 1996). These desert societies have a strong architectural base that is evidence of the community's strength through their organisation of habitable space. (Dabaieh *et al*., 2014).

People in the desert cherish esteem for elders, generosity, privacy, and care for children. These behaviours are socially inherited norms in the desert cities and oases (Hivernel, 1996). This respect ensures that cultural and traditional artefacts are maintained, as well as the ways of producing them. They are segregated from the impact of religion, norms, and daily practices of the people. For example, the concept of privacy in those desert towns is based on a combination of both spiritual and cultural customs. Therefore, it is very important that socially and culturally sustainable housing achieves the basic principles of privacy, such as visual privacy, audio privacy, etc (Dabaieh *et al*., 2014).

3.8.2 Safety and security

Safety and security, in the broadest sense of that term, is quite new, both in academia and politics (Lango et al., 2011). The concept covers terms such as 'domestic security', 'civil defence', 'homeland security', and 'societal security' (Lango *et al.,* 2011). The term 'security' is a rather broad concept, is linked with safety, and does not differentiate between safety and security (Burgess and Mouhleg, 2007). According to Olsen et al. (2007), a viable definition of the concept of 'social security' could be *"The society's ability to maintain social functions, to protect the life and health of the citizens and to meet the citizens' basic requirements in a variety of stress situations."* This includes protection from all unwanted events or circumstances, either in the internal or external environment (Lango *et al.,* 2011). Safety and security is an important aspect of social and cultural sustainability in dwelling design (Al-Jamea, 2014).

Inadequate safety measures in some architectural environments have motivated some researchers to study the relationship between architecture and the human need for security . According to Crowe (2000), a defensible space promotes the idea that the design of interior and exterior spaces has an important role in ensuring security and safety by enhancing the inhabitants' ability to control their area. Leckie (1992) also states that adequate housing must meet the criteria of giving protection from the elements, being culturally acceptable, and guaranteeing the security and safety of the occupants, where security in the shelter can be defined based on the idea of a "dwelling", which implies personalisation and safety at the same time. However, for these concepts to be pertinent to the present discussion, they must be studied further with respect to the dwellings' security and safety.

3.8.2.1 Dwelling safety and security

According to Burton (1995), dwelling security is an important element in the lives of the population. Most cultures and peoples consider the dwelling to be a sacred place; a person needs permission to enter another's house. The population are always concerned about their dwellings because they reflects their personality, security, and socio-cultural features. Fences and walls are efficient markers that make their dwelling more secure and personal. The more barriers you place in front of a dwelling (such as fences, and locked doors and windows), the more secure it becomes. For example, security is provided by the presence of fences surrounding the vernacular desert towns in Southwest Libya, and the high walls in the dwellings, especially those that are located next to farms. Moreover, a dwelling acts as a filter between the external environment and the comfort needs of the population (see Figure 3.7).

A dwelling's function is to provide a place where human activities can take place. As Porteous (1977) describes "It is a refuge that we defend against the world." The same idea is suggested in "A man's house is his castle". Moreover, his study points out that "home is where the heart is" and "there's no place like home"; it is the symbolic hearth and source of our being.

Enhancing safety and security is one of the most important foundations of the present discourse for the life and cultural sustainability of cities (Freire and Stren, 2001, Wakely and You, 2001). Therefore, habitable communities must have an environment, Free from the inconvenience, overcrowding, noise, and pollution, to provide the comfort and luxury to the population. Safety has an impact on the quality of daily life in cities (Yuen, 2004).

An important aspect of safety and security is that the safety around the dwelling includes the safety of the roads leading to the dwelling, such as safety from the movement of motor vehicles, and the safety of the roads for pedestrians, especially children, the elderly, and the disabled. The increase in the crime rate in most contemporary areas is a direct result of the neglect of security factors in the residential planning of these areas. This layout can be described as open, which means that any strangers can pass through the residential area without any restrictions (Heller, 2005). Most residents do not know each other; therefore, society is weaker, and this has led to insecurity and a lack of safety in some contemporary residential areas. The layout of these residential areas is a network-oriented and vehicle-oriented pattern that encourages vehicle traffic by providing straight and wide streets, which has resulted in an increased number of car accidents within the residential area. The planners of the contemporary residential areas were more interested in providing housing than looking at the external area (Amer, 2007), and the observation in the field reveals evidence that the population is strengthening doors and windows, and adding metal doors, especially those living in flats.

Another important aspect of safety and security is the family's safety inside the dwelling, which includes safety from fire , where it is recommended to use modern technologies such as early warning systems for fire, as well as burglar alarms, surveillance cameras, and appropriate designs for stairs, especially to ensure the safety of children, the elderly, and the disabled (Al-Jamea, 2014). In addition to addressing the safety of the location, which includes safety relating to fast traffic and road barriers, it is also necessary to provide safe conditions in open areas and children's playgrounds, and provide adequate night lighting as well (Shawesh, 1996, Amer, 2007). Therefore, considering the importance of safety and security in the design

of sustainable dwellings, measures must be taken to ensure the safety and security of the population.

3.8.3 Shape and design of dwelling

People are deeply concerned with the shape and design of their dwelling, whether they are poor or rich, in terms of the dwelling's form, as they think it reflects their social position and the respect they receive from others . There are several indications of prestige in a dwelling, which may be shown in such features as the type of building materials, cleanliness, dwelling comfort in terms of climate, amount of space, aesthetics, plants, the dwelling location, neighbours, and neighbourhood types (Inclán, 2013). These dwelling elements make the inhabitants very contented and able to live happily in their community. The shape and design of dwellings seems to generate a sense of beauty. This is particularly where the householders use vegetation, plants, arches, and decoration. They consider that which is prestigious to also be beautiful. All these elements are rated relatively highly and play a part in increasing security, contributing to the efficient functioning of the dwelling, and can also be recreational. Furthermore, there are many indications of prestige in the dwellings which may be shown in such important features as the type of building materials, cleanliness, comfort, aesthetics, and location where dwellings represent a symbol of prestige and identity construction (Lane, 2007, Inclán, 2013).

The area of the dwelling should be suitable for the size of the family and its future growth, so the spaces of the house should be sufficient for all the activities of the inhabitants, and the rooms of the house should be proportional to the number of family members of both sexes, so as to maintain their privacy and ensure their comfort. The design of the house should be flexible enough to accommodate any further expansions (Shawesh, 1996, Amer, 2007).

Furthermore, the location of the dwelling should also provide stability and compatibility with social and cultural requirements. Unterman and Small (1977) state that people are naturally concerned about the location of their dwelling and dwelling places. They spend much of their time within the confines of the dwelling. These dwellings represents the socio-cultural and economic status of the individual in the eyes of their society. Moreover, they are also concerned about the neighbourhood and the settlement in which they live, and where they prefer to live. The residential zone can be varied in its social and physical characteristics, such as population density, the kinds of people who live there, housing conditions, available community facilities, cleanliness, and maintenance levels. To feel a part of a neighbourhood, a resident needs to know his or her neighbours and interact with them (Unterman and Small,

1977, Easthope, 2004). There is a great deal of logistical evidence to confirm this point, as indicated in the popular Libyan proverb *"Ask about your neighbour before you build your dwelling."* In the cultural heritage in other Arab countries, you should put your "neighbour before dwelling". The particular residential area that is chosen by a new family has significant consequences for family relationships. Thus, members of a family place prime importance on the types of the neighbourhood and the settlement in which they live.

Shawesh (1996) indicated that the foundation that identifies the link among the socio-cultural characteristics, behaviour, and attitudes of people with the dwelling. This link also includes neighbourhoods and other aspects of the physical environment that are important to people. Understanding the linkage shows why families move. In his study of some traditional social-cultural values in Ghadames, Shawesh (1996) emphasises the important of link between individual households and their housing and neighbourhood characteristics. Also shows that the most important determinant of residential (space, location, and cost) or neighbourhood dissatisfaction is the choice of a particular dwelling unit.As well as indicates that dwelling size, design, and community location are the most important aspects. People should be given the opportunity to choose the type and location of the dwelling when moving, based on their preferences and their comfort, with respect to the environmental and psychological aspects. Therefore, it is essential to know and understand people's inclinations regarding dwellings, neighbourhoods, and settlements to create valid foundations, formulate appropriate planning, build a suitable residential environment, and provide the form of dwellings that meet the population's desires and needs. Their needs can be used to determine the demand for dwelling types in the future (Shawesh, 1996).

According to Ghaffarian Hoseini *et al* (2011), the internal functional spaces of a dwelling are important, as most family members spend a long time in the dwelling. Since socio-cultural sustainability seeks the well-being of the population, the materials used for the interior finishes must be of the highest quality to meet the needs of the inhabitants. For example, the quality of the doors and windows, their size, shape, materials, industry, and suitability to the environment of the dwelling itself all support the welfare and well-being of the population.

In addition, attention must be paid to the external finishes, and the shape and beauty of the exterior facades, which may represent the aesthetic of the interior dwelling. The facades of the vernacular dwellings in many desert oases reflect the identity and architectural character of these oases through their architectural elements and symmetrical structures (Shawesh, 1996).

In summary, a dwelling, with its exterior and interior components, has its own symbolism, and the exterior of the house is a form of display. Among the physical aspects that communicate something about it are its size, form, materials, colour, and texture, as well as the crafts used in the various parts of the house that contribute to the prestige value. In contrast, many contemporary mass-produced housing projects lack such a sense of prestige (Drakakis, 2012). The design of contemporary desert dwellings in southwest Libya is not flexible enough for them to fulfil their residents' individual and group needs for prestige. For that reason, the shape and design of a dwelling are also important features, and help us to understand the process of change in the dwelling. It plays a significant role in shaping sustainable dwellings to ensure the welfare and quality of life of the inhabitants, which is one of the goals of socio-cultural sustainability.

3.8.4 Social considerations and religious beliefs

The design of sustainable dwellings is related to social considerations, social order, and the interaction between nearby neighbourhood residents. One of the priorities of sustainable societies is the ability to maintain the functioning of the society and its social system (Rapoport, 2000, Shehab *et al.,* 2016).

The social and cultural considerations that affect dwelling designs include several important aspects and vary according to their importance from one society to another. Through a literature review in this context, especially in the Islamic and Arab developing countries (Shawesh, 1996, Mahgoub, 1997, Amer, 2007, Al-Zubaidi, 2007, Al-Jamea, 2014, Shehab *et al.,* 2016), it is found that the family relationships, relationships with neighbours, social relations at the level of residential neighbourhoods, and consideration of religious beliefs (including the relationships with religious places) are among the most important aspects of the social and religious considerations for housing design. This is in addition to other features such as lifestyle, cultural heritage, and identity. These components complement each other and are described later in this section. In the same context, taking into account all the important environmental aspects of housing design, social considerations are one of the most important aspects of the design of the space within the dwelling (Ghaffarian Hoseini *et al.,* 2014).

Family relations develop within a larger social and cultural group, based on the cultural and social orientation of society as a whole (DeVos, 1993, Shehab *et al.,* 2016). Early socialisation and child-rearing make individuals independent or dependent. Altman (1980)

points out that family housing meets the needs of its residents with respect to the personal identity of the family as it relates to society and culture. Family relationships often arise from an individual or collective social culture. Individuality tends to limit the relationships of the family, while the collective depends on the extensive interrelated relations in a collective manner. Most of the family relationships in the Arab Islamic countries are socially interconnected with extended family relations, which reinforce the social, cultural, and historical values of society, and therefore the design of their dwellings reflects their values and the nature of their social relations (Ozaki, 2002).

Based on the Islamic culture, the relationships among family members is important; the relationships are permanent, not temporary, and the family members make serious and sustainable efforts to live with each other. This shows the importance of the role of the family in society (Al-Zubaidi, 2007). Therefore, extended families are common in traditional local and Muslim communities, where respect for family members who are the elderly, children, and people with special needs are managed within family relationships. For example, new families are part of the family housing group. Thus, the extended family dwellings are close to each other within the same neighbourhood, and are based on family, social, and tribal relations in many oases and historical towns in Southwest Libya. This gives a feeling of security for the family (Al-Rostomani, 1991, Al-Zubaidi, 2007). Family relations and family activities are reflected in the interior design of a dwelling. Families distribute the spaces for activities such as preparing and eating food, general living, and watching television. The design of contemporary sustainable dwelling must, therefore, be in line with family relationships at the individual and collective level (Hardoy *et al.*, 1995, Shehab *et al.*, 2016).

With respect to relationships with neighbours, Islamic culture views these relations as of exceptional importance and considers the neighbourhood to be the backbone of the nation. One of the principles of Islam is respect for neighbours and the development of good relations between people based on good-neighbourliness, which embodies Islamic values regardless of any radicalism (Mortada, 2003, Al-Zubaidi, 2007). This is further demonstrated by the set of moral principles that represent obligations that strengthen the relations governing and controlling the neighbourhood. These principles emphasise two important aspects: strong social relations between neighbours without compromising privacy, and preserving the rights of neighbours.

Religious directives and local traditions motivate the population to socialise, so that everyone can rely on it. The planning and design of housing and residential neighbourhoods in

vernacular towns were the product of sophisticated social and cultural relations, where the organic pattern provides different spaces, and public and private spaces that must be respected. Residential neighbourhoods have been expanded, allowing each tribe or clan to expand its territory as needed. Therefore, one finds that most families of the same tribe live next to someone who gives them social power and influence in their region (Mahgoub, 1997, Al-Zubaidi, 2007).

In terms of social relations, different cultures, including Islamic culture, recognise that humanity cannot live without social contact or social relations. Therefore, social relations limit the isolation of people and strongly encourage social life on a wider scale (Mortada, 2003, Al-Zubaidi, 2007). The organic fabric and residential neighbourhoods in the local towns are designed to promote social interaction and strong relationships between residents and neighbourhoods. (Mortada, 2003). For example, public spaces, markets, cultural places, cafes, and social forums in most of the vernacular towns in southwest Libya are divided into several neighbourhoods, and each of these neighbourhoods has a place for the elderly to gather, for the youth to gather, playgrounds for children, and popular cafes; all of these places contribute to strengthening social relations among the population of the neighbourhood and at a town-wide level.

Most research emphasises that human behaviour and place determine religious beliefs in different societies. However, the religious form of the dwelling is not considered to be important in contemporary societies, and most religious rituals are administered in externally designated places (Altman *et al.,* 1980, Shehab *et al.,* 2016). In some traditional societies, space is taken to perform rituals or rituals of worship indoors, such as in some traditional residences in China and India. Religious beliefs are, therefore, an important component of social considerations and beliefs regarding housing. In Islamic societies, there are some aspects that should be respected, such as directing some spaces . However, the main acts of worship and daily prayers are held in mosques, which are independent buildings. There are also Quranic schools, which are often attached to mosques. Therefore, residential communities, whether vernacular or contemporary, are keen to have a relationship with these mosques and Quran schools because they represent a daily religious, social, and cultural relationship. It is, therefore, useful to accommodate socially and culturally sustainable housing in Muslim communities with places of worship.

In the context of the local desert society, it depends to a large extent on the religious factor in order to maintain social order. The heavenly instructions that are in the Quran and the local

Islamic culture are the initial pivotal factors in the formation of an indoor unit. For example, the family is the central unit, which represents the nucleus of society. This begins with the husband, his wife, and their children, and goes down to the family in the broad sense, which includes grandparents, uncles, aunts, and their children. The latter is a known part of the tribes in the Libyan desert society, locally called 'Al-Biet' (Amer, 2007). The Islamic religion encourages this to continue to support family bonding to achieve the basic social units. Rghei (1987) and Shawesh (1996) explain the important relationship between the two partners of the primary unit. Social organisation is a control mechanism for individual behaviour. The centre of the social system in the Islamic world is kinship.

3.8.4.1 Social and religious events in Southwest Libya

In the desert society in Southwest Libya there are many community events and regular religious activities; these have significance for the local population because they represent an important aspect of their socio-cultural lives. They have also been an aspect of the customs, traditions, and norms prevailing in Southwest Libya society since ancient times and even today, despite some different manifestations at present.

Weddings are one of the most important of these activities. Traditionally, and still done in some parts, the first step towards marriage is for the mother or grandmother of a young man to enquire after marriageable girls in the local area, visiting homes and talking about the arrangements. Following the agreement to marry, the groom's dwelling is painted white as a sign of the forthcoming event. Much visiting to give congratulations follows, including different types of traditional foods. The bridal procession to take her from her family home to her new dwelling is a grand affair (Al-Maazi, 2006). This event has socio-cultural importance, but also of importance is the need for more housing, and thought must be put into this to cover the housing needs of local population when the founding of new families.

The month of Ramadan is also a religious event. In Islamic communities this is repeated every year, and throughout that holy month there is continual activity, including visiting and celebrating. The last three days of the month are particularly busy to mark the end of fasting. This is called 'Eid Al-Fitr', and is followed two months and ten days later by 'Eid Al-Adha', which is another religious celebration marked by the slaughter of animals, plus the activity of visiting friends, neighbours, and relatives, and sharing food.

The Prophet's birthday (Peace Be upon Him [PBUH]) is a distinctive occasion in the desert community, where the Sufi doctrine is common in southwest Libya. Lamps are lit in dwellings, sweets are distributed to children, and the elderly meet in mosques to recite the Quran and Canticles (Al-Maazi, 2006). 'Al-Hajj' is the occasion of a person going on holy pilgrimage to Mecca, and is a time for family and friends to gather and celebrate for the weeks of their absence. All gather to give thanks and greet the pilgrim on their return. Previously, this event was very important, especially in the towns of Ghadames and Ghat. The dwelling of the person who has travelled to perform Hajj is painted white and a white flag is placed above it until the person returns from travelling (Al-Maazi, 2006).

Figure 3.8: Annual Festival in Ghat
Source : mirathlibya.blogspot.co.uk, 2012

Figure 3.9: The Weddings in Ghatin Ghat
Source : https://MhrjanGhatAlsyahyADlwly/, 2013.

In addition, there are some other activities, such as a tribal meetings and forums, which usually occur once or twice a year. These celebrations are held outside the dwellings in an open desert areas close to the towns. A group of tents is built, and decorated with colourful fabrics and traditional textiles; these tents are commonly used to rest, eat food, or listen to poetry and singing (see Figure 3.8 and 3.9). All of these important events and socio-cultural activities have an additional influence on the formation of dwellings and residential neighbourhoods in terms of the provision of extra space. Furthermore, they are an important part of the region's cultural identity.

3.8.5 Identity and cultural heritage

3.8.5.1 Definition of identity

The definition of identity in deep-seated research is a thorny one, and the reason is that the researcher seeks to translate the phenomenon of the intangible (abstract) to other tangible material (concrete), and the findings of the questionnaire for this research (given later), may promote the concept of identity based on the perspective of different generations of the local population.

The issue of 'identity' is complex and has many aspects; it is considered to be one of the most important topics in modern sociology, psychology, philosophy, and architecture, and all these sciences provide multiple definitions of the concept of identity. Identity is generally a statement that distinguishes between individuals, groups, and communities. In this context identities are the models that define people for others. (Shawesh, E.M., 2000). Twigger-Rosset *et al* (2003) and Breakwell (1983) points out *"The term identity, self, character, and personality are all used as labels for that uniqueness which differentiates one individual from the next"*.

Moreover, identity is always undergoing development and change. It is a dynamic concept of construction. Agnew (1981) indicates that *"Identity is a dynamic phenomenon and when expressed in everyday life, as for instance through action premised upon a meaning given to home ownership, it should not be seen as a static property of individuals but as product of intentionality in a given and changing social context. "* Hall (1990) expresses a similar view, *"Identity is a production which is never complete, always in process, and always constituted within, outsider representation."*Identity is a source of history. This is a temporal feature of the continuity and evolution of identity.

As Morley (2002) notes that the house is a part of the 'personal sphere'. It is explained that a house is an extension of an individual's very person. A look at the house reveals the mind-set of the owner. Redvall (1987) expresses a similar view that shows how people seek three values in their regions or homes, which are *"identity, privacy and security"*. From this perspective, a dwelling is viewed as a combination of the inhabitants' identities . With this comprehension, the home is then understood to be *" a complex weave of symbols, ideologies, goals and aspirations"* (Edensor, 2002). Housing that is secure allows the individual and household to express their identity through the reshaping of the domestic environment (Thorns, 2004).

In desert society, the vernacular dwellings in towns express a large amount of the symbols, ideologies, and aspirations of the local populations; they represent their history and identity. From this point on, architectural identity can be defined based on different destinations. Most agree that architectural identity is the architectural movement that reflects its own method of designing and shaping buildings and spaces, and includes the social life that they constitute (Nooraddin, 2012). For example, the architectural identity of a particular local culture expresses the living landscape, with the sense of the place being produced through the accumulated experience of the community, which has formed over time and contains the

meanings, lifestyle, and culture that together form the national architectural identity.Therefore, each community has its own identity, which represents its culture and architecture (Nooraddin, 2012).

In general, identity is a broad concept that is difficult to define precisely, as initially stated. However, this research considers identity to be one aspect of the socio-cultural sustainability needed to achieve sustainable desert housing. In this context, it is necessary to understand socio-cultural sustainability in this comprehensive framework, which seeks to employ a set of principles, including identity and cultural heritage, and reconcile them to create a harmonious and harmonious residential environment with its surroundings. For example, identity can be seen as a continuation of the physical characteristics of the residential environment or it may also mean the continuity of the collective memory of the population (Al-Naim, 2012).

3.8.5.2 Definition of cultural heritage

In the last decades of the 20th century, the term 'heritage' was characterised by semantic transport, which led to the universality of its use and is often used to denote a historical thing related to cultural property. The concept of heritage has a large dimension and includes several social aspects. It is currently used in political and administrative circles, and refers to artistic property, fine arts, and architecture. It is an extensive part of the cultural dimension of the expression of art. Oliver notes that heritage is a general concept associated with the concept of historical monuments (Vecco, 2010)

For further explanation, the next paragraph presents separately the concepts of the two words that make up the term *'cultural heritage'* and begin by defining the concept of culture:

Culture refers to the lifestyle of a particular group of people. They are ways of behaving, beliefs, customs, values, etc.; decor and folklore; relationships with others; and other personal symbols. Culture transforms from generation to generation. Culture is changing and conceals useless things over time. The culture is considered to be the *"way of life for a whole society"*. It include codes of ethics, dress, language, religion, rituals, and codes of conduct, such as law, ethics, and belief systems (http://www.sahistory.org.za, 2005).

UNESCO (2002) describes culture as follows: *"…culture should be considered as a set of spiritual, material, intellectual and emotional characteristics characteristic of society or social group, and includes, in addition to art and literature, live together, value systems, traditions and beliefs."*Culture cannot be dismantled and reshaped: culture means life. Culture

is an entity made up of facts, beliefs, history, current physical realities, and psychological state. They change unconsciously and cannot be manipulated from outside (Pallasmaa, 2007).

Heritage is formed through the practices, traditions, customs, and behaviours that are passed from the generation of parents to the generation of sons. Heritage is what is passed from family and tribe to society and place. Cultural heritage consists of those things or expressions that show the creativity of the people. These special items, such as architecture, sculpture, painting, or anything important, can have artistic, architectural, or historical value (sahistory.org.za, 2005). Cultural heritage includes different cultural traditions and cultural dynamics (Dempsey *et al.,* 2009, Baines and Morgan 2004). It is, therefore, an important aspect of social and cultural sustainability (Weingaertner *et al.,* 2014).

3.8.5.3 Identity and cultural heritage aspects in this research

There are several aspects of identity and the cultural heritage associated with the Arab and Libyan context that are contained in many literature reviews, as Shawesh (2000) points it. For example, identity and self-expression, cultural identity, links with the collective memory of the place, and compatibility with customs and traditions, which is related to the socio-cultural sustainability of dwelling design (Mahgoub, 1997, Asfour *et al.*, 1998, Ahmed, 2011). One of the most important aspects is the identity and self-expression, for which Maslow (1970) explains that the concept of self-expression symbolises a person's desire to individualise their life. It is the desire for self-realisation or self-identity. There are different ways to refer to self-identity; for example, a person may want to have a high level of education or be a wealthy businessman.

Self-shaping can be improved and developed through maintenance over time (Lalli, 1992, Shawesh, 2000). Sadalla *et al* (1987) points out that giving a person his opinion about some things is a kind of conservation development that is self-defined. Personality is related to the origin, so the link between past and present is important.

Self-expression can be considered to be a form of ordering the physical environment and personal needs (Altman, 1975, Shawesh, 2000). Fathy (1973) indicates the following::

> *" certain shapes take a people's fancy and that they make use of them in a great variety of contexts, but evolving a colourful and emphatic visual language of their own that suits perfectly their character and their homeland".*

Altman *et al* (1980) indicate that self-identity in a dwelling is highlighted by two aspects: the environment appropriate to the dwelling and the reference to land. Individuals within the community work positively towards their security and their territory. In addition, Rapoport (1969) argues that the desire and need for the region is the desire for self-identity, as the dwelling represents the region and the expression of self-identity.

Thus, the value of personalisation demonstrates the importance of differences among individuals in the expression of architecture. However, these differences may appear in some inconsistent or harmonious architectural styles. Thus, this is a review of self-expression in the designs and patterns of desert housing for verification and to determine the relevance to the architectural identity of the historical towns of Southwest Libya within the framework of sustainable desert dwellings.

In terms of cultural identity, the issue of expression of cultural identity in architecture has been evident since the beginning of the 21st century, which is characterised by increasing globalisation in many societies around the world. Individual identity is opposed to homogeneous communities after the expansion of the international style in architecture in the second half of the 20th century . As a result, globalisation has expanded as a dominant phenomenon. Hence, the phenomenon of expressing local cultural identities has emerged as a reaction to the dominance of globalisation trends in architecture (Mahgoub, 2007). As Castells (2004) points out *"Cultural identity is the process by which social actors construct their own meaning according to cultural characteristics"* .

In recent years, the issue of cultural identity in contemporary architecture has become important for accentuating local identity and making it compete with the environment of globalisation. Therefore, most developing countries have taken measures to preserve their cultural values, identity, and principles (Mahgoub, 2007).

Many researchers are still looking at whether architecture should reflect cultural identity. Gospodini (2004) indicates that *"in the process of economic and cultural globalisation, European integration and the blur of national identities in Europe, place-identity emerges as a central concern of both scholars and other people."* For example, Singapore's architects have adopted a sophisticated tradition to reflect contemporary realities such as fast lifestyles. Another example is the adoption, after the Second World War, by architects in the Philippines, of a direct copy from the traditional form in an attempt to illustrate the characteristics of the Philippines architectural identity style (Ogura *et al.*, 2002, Mahgoub, 2007).

The vernacular architecture of the historical towns of southwest Libya has undergone radical changes in recent years as a result of economic and political changes in Libya, particularly from the discovery of oil during the 1960s and 1970s to the beginning of investment it in the 1990s. The state began, at the time, to implement several housing projects in Southwest Libya through with foreign companies contracted to implement those projects. These projects followed the international methods of design and implementation, ignoring the rich cultural heritage of the region and the unique architectural style of the vernacular architecture of these towns. The rapid transformation of architectural trends from vernacular to contemporary dwellings has caused a shortage when it comes to meeting many important socio-cultural aspects as well as contributing to distorting the architectural landscape of those towns. This study seeks to investigate the socio-cultural-sustainability features of the desert dwellings in the region to move towards an expression of cultural identity in an attempt to restore balance and preserve the architectural identity of these towns. This is because it is important to preserve the nation's heritage for present and future generations.

In terms of the link with the collective memory of a place, the aesthetics of architecture cannot be separated from the values and definitions of the culture. Therefore, the population, the surrounding environment, and the cultural sphere are the basis of the identity of the place. Korpela (1989) points out that *"place identity is part of an individual's emotion - self-regulation and self-sense"*. Proshansky *et al*. (1987) also note that social identity is highly intertwined with the identity of the place (Elkadi, 2008).

Furthermore, related to the collective memory of the place, several views point out that the contemporary phenomenon leads to negative aspects as a result of the loss of cultural roots. Thus an uncontrollable change in the physical environment is a reflection of the loss of the reaction as a result of the loss of continuity (Speller, 1988). Conscious thinking is a field in which a place develops by enhancing memories and making local experiences understandable. The imbalance in continuity leads to placelessness. It is, therefore, important to emphasise the nature of dynamic space and spatial relationships, and the changes in the architectural space in which local activities occur. Rapid transfer from one field to another and interference with the space structure leads to the loss of local identity and local cultures, which can be reshaped by strong social actors and a strong economy (Elkadi, 2008).

Therefore, the identity of a place should be enhanced by highlighting local activities that promote identity and stimulate memory, especially for the new generation in the historical towns of Southwest Libya. Memory not only relates to the past but contributes to the

discovery of the present and the future. Identity means collective memory. Therefore, losing the collective memory adversely affects the architectural identity and continuity of meaning. Identity has a dynamic nature that is not fixed and can survive to continue.

As Lowenthal (2015) indicate that history is the foundation for the beginning of architectural identity, and a tool for its maintenance and reconstruction. Lowenthal also adds the follows argument:

> *"The past is everywhere. All around us lie features which, like ourselves and our thoughts, have more or less recognisable antecedents. Relics, histories, memories suffuse human experience. Each particular trace of the past ultimately perishes, but collectively they are immortal. Whether it is celebrated or rejected, attended to or ignored, the past is omnipresent"*

Continuity in architecture means simultaneous stability with change, controlling the pace of change in the stages of evolution, and seeks compatibility between these stages and with the surrounding environment.

Another important aspect of identity and cultural heritage, as one of the important features of sustainable housing, is the compatibility of the design of these dwellings with the customs, traditions, and culture of the population. People in the southwest Libyan desert cherish esteem for elders, generosity, privacy, and care for children. These behaviours are socially inherited norms in the desert cities and oases (Hivernel, 1996). This respect ensures that cultural and traditional artefacts are maintained, as well as the ways of producing them. They are segregated from the impact of the religion, norms, and daily practices of people. For example, the concept of privacy in those desert towns is based on a combination of both spiritual and cultural customs, and privacy is highly represented in the design of dwellings in desert historical towns. The ladder of urban spaces permits and reflects privacy in diverse social events. Therefore, it is important that the sustainable design of desert dwellings in these towns is consistent with the traditions, customs, and cultures of the people of Southwest Libya. This is particularly important for the new generation, which helps them to preserve their cultural heritage without losing the cultural and architectural aspects of the historical towns in which they live that are affected by the contemporary trends of cultural globalisation.

As can be observed in the previous review, the problem of change in identity arises, especially for the new generation, which is one of the most important issues that comes about in the context of cultural identity and heritage, which is highlighted in the next section.

3.8.5.4 Changes of perception of identities in younger generation

At present, the perception of architectural identity has changed in the younger generation to a great extent. The youngsters' perception of architecture is based on the particular meanings and interpretations of the buildings and environment, which are limited and shaped by various factors. These factors include the personal, social, and cultural setting of the younger generation, along with their past encounters and experiences, their knowhow of the acknowledge practices, and the ideas and conditions that prevail among their background settings. In other words, the perception of the younger generation of their identity changes when it is affected by cultural, social, and familiar ideas within a particular context, and their specific experiences with the architecture (Czumalo, 2012).

The personal image of the younger generation is transformed when it is situated within a particular region. The youngsters are subject to and adjust their identities to the factors that resist their image. In other words, the architectural identity of the younger generation changes as per their external environment, and the fixed relations they sustain with the surrounding architecture. The perception of the possessive change that occurs when the architectural image pervades through their oconsciousness slows down and then controls the evolution of the perception (Pallasmaa, 2012).

Little research exists on the relationship between the identities of the younger generation and the architecture. For instance, a study conducted by McPhillips and Russell (2011) investigated the perception of the young people about their identity and their interpretation of the architecture of their religious buildings. The findings show that the ideas and perceptions of the younger generation are based on their developed artwork, the abstract architectural configuration of places, and spatial experiences.

As per the findings of Côté (2014), the lives of young people are based on the key developmental factor of their individual identity. The existence of this phenomenon leads to architectural intervention, which not only facilitates but also improves this whole process. For example, a study conducted by Audibert (2015) examines the perception of youngsters regarding architectural identity based on the streets of their current dwelling place. The study investigated the youngsters' perception of the time they spend on streets and tested their identity.

The research results reveal that changes in the perception of the younger generation regarding architectural identity leads to the development of new designs. This shows that the identity of youth affects architecture, such that it turns out to be advantageous for the development of

their identity. This also reflects that architecture must promote a positive response to the identity of the younger generation by reviving their old memories and experiences via improved and updated architecture (Pugh, 2014).

Youngsters tend to preserve their architectural identity by visiting heritage sites. A restored historic site is transferred to the contemporary era and languages, which legitimises the existing work of the site management, which, in turn, is also a source of architectural identity for the younger generation. However, at present, historic sites are reconstructed in order to earn income and profits. This somehow changes the perception of the younger generation when they witness the exploitation of the historic buildings (Côté, 2014).

In terms of changing the identity of the new generation in developing countries, especially Arab countries, many researchers have addressed this phenomenon, including Al-Eid (2014). The findings of Al-Eid's (2014) study also highlight the importance of developing the language and studying its cultural aspects, as well as identifying the role of the media in youth education. The results also confirm the importance of religious aspects, education, and training courses for youth, and raising their awareness of the importance of their cultural heritage. Maho (2013) studies young people in Iraqi society and the results support the cultural avenues and ideas among young people, especially those that call for preserving national identity with recognition, and the ability to deal positively with the reality of intellectual, cultural, political, and economic pluralism among the societies of the world because the preservation of national identity is not achieved by maintaining it as it is. This needs to be built into the framework of globalisation, scientific revolution, information technology, technology, and communication technology.

To summarise Al-Otaibi et al.'s (2008) study,*"Cultural globalization and its impact on the identity and values of Saudi youth"*, its results are regarding the need to activate the educational role of the family and the media, paying attention to Islamic education, developing teacher performance and cultural composition, adopting the concept of global education, and, finally, provide studies on national education for citizenship and the confirmation of cultural identity.

Ashraf (2017), in her study" Interactive and the cultural identity of Egyptian youth, analytical vision ", field study on Egyptian youth. Her results confirm that it is important to take care of young people, and to care for them in terms of their educational and economic aspects. There should be a focus on training courses and programmes to develop young people's awareness and understanding of global changes.

In summary, most of researchers stress the importance of educational and training aspects to increase the awareness of young people, as well as the role of universities and institutions, the government, and the media in supporting cultural identity.

3.8.6 Contemporary lifestyle

The lifestyle of local inhabitants has a great influence on the formation of the architecture of dwellings and this is also the case with the local Islamic culture. Sustainability of that lifestyle has always been the heart and soul of the local Islamic architecture. The placement of rooms is done in such a way that there is minimal exposure of women to the men coming from outside, and, for that reason, the internal placement of areas within dwelling places, and especially the guest areas, are well partitioned (Al-Nowaiser, 1987, Shawesh, 1996, Bilghit, 2007). Al-Nowaiser (1985) points out that activities are dependent on places, and sometimes the activities are designed in a way that they fit the place. This means that having listed activities, such as socialising, playing, and shopping, determines the location of the space. An activity may takes place in several different places, and the same place may be used for several other activities; for example, a place for learning for both children and adults.

The contemporary lifestyle has directly influenced many aspects of the daily lives of people, including the designs of their dwellings in consideration with the environmental value of the dwelling spaces when building sustainable dwellings (Bhatti, 1994, Ward *et al.,* 2011, Shehab *et al.,* 2016). This effect has grown as a result of the development of the modern technology, especially with regard to building methods, dwelling implementation, and the use of innovative materials and techniques that have changed many of the concepts that prevailed in the vernacular architecture. For example, the element of finishing materials has positively affected the quality of life for the population (Amer, 2007).

Lifestyle can be determined through the methods that people use in their dwelling spaces; it is the result of the habits of society and the nature of the use of different spaces, such as the living room and others (Shehab *et al.*, 2016). Communities have identified different spatial and behavioural patterns for the consumption of available spaces in the dwelling. These patterns depend on their spatial needs for socialisation, living, and multiple collective and family uses. To ensure that these needs are met, they need to be arranged according to behavioural patterns. These arrangements are renewable cultural variables for each generation, which affect the nature of the lifestyle within the dwelling and influences its external appearance as well (Shehab *et al.*, 2016). The most important factors that determine

behavioural patterns are the use of spaces; for example, the use of the kitchen, its arrangement, the arrangement of the living room, the quality of interior finishes, and the arrangement of furniture that the population deals with, taking into consideration their compatibility with customs and traditions. Thus, the interior and exterior design, including finishes and decorations of the dwelling, must create a balance between social lifestyle and contemporary style to create a match between spatial patterns, social behaviour, and keeping up with contemporary socio-cultural developments. Therefore, it is useful to have a contemporary lifestyle, especially for the new generation, that is consistent with the design of sustainable dwelling (Shehab *et al.*, 2016).

The socio-cultural evolution has led to the speeding up of life and modernity has presented humankind with completely new sets of requirements in order to lead a respectful and normal life in modern society. Communication and socialisation have also changed the ways in which people interact with each other and the extent to which they consider their mingling as healthy or otherwise (Castells, 2011). Therefore, it is important that the design of sustainable dwellings in line with the changes and developments that affect social and cultural aspects; in other words, to be keeping up with contemporary socio-cultural developments.

The study of Robles and Kim (2010) indicates that "smart home technology is the integration of technology and services through home networking for a better quality of living". Thus, maintaining the quality of life is an important task that takes into account a wide range of different factors, the most important of which is the quality of housing and its functional spaces (Glenn, 2004, Garcia *et al.*, 2005, Shehab *et al.*, 2016). The housing and functional spaces have a significant impact on improving the quality of life.

As Garcia et al. (2005) point out, the quality of the functional space inside the dwelling is vital to the welfare of the population, as people spend a long time in their dwelling. It is, therefore, clear that the quality of the dwelling, the quality of its construction materials, its finishes, and the suitability of its functional spaces are important for human well-being (Garcia et al., 2005).

According to Garcia *et al.* (2005), the quality of dwellings is one of the most important factors that improves the quality of lifestyle. The quality of the dwelling includes several aspects. As this study examines the design of socio-cultural sustainability dwellings in a specific environment, it includes the quality of the dwellings, their compatibility with development and socio-cultural changes, the quality of the interior and exterior finishes, and keeping pace with modern technological developments, especially for new generations. The essence of the

functional areas consists of the life experience of the inhabitants, resulting from the nature of their lifestyle, culture, and needs. The functional spaces of the dwelling as a physical environment are the product of the population's culture. Sustainable design must, therefore, be compatible with the realisation of contemporary requirements, where modern technology has become one of the necessities of contemporary life and the cultural background of the region's population. The culture of any region reflects the lifestyle of the population in that region.

Based on what is described in Section 3.8, the theoretical framework that is under investigation in this research can be visualised as shown in Figure 3.10:

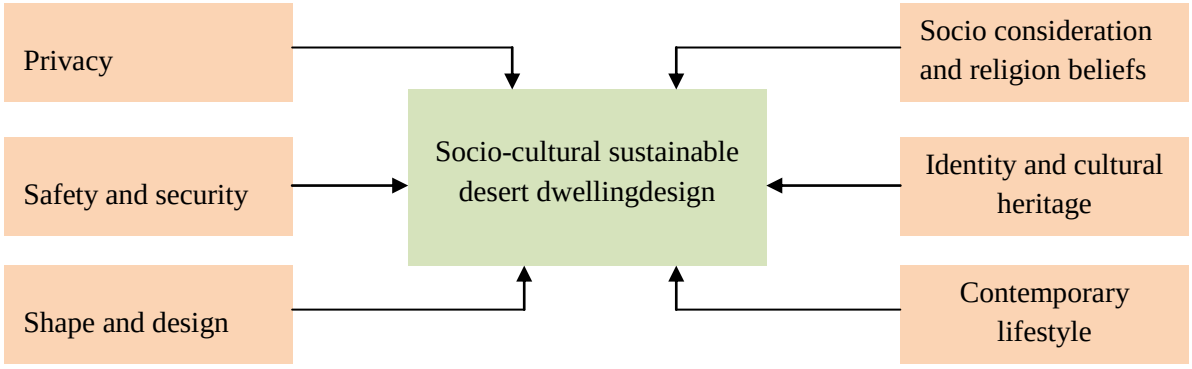


Figure 3.10: Theoretical framework for socio-cultural sustainable desert dwelling design in Southwest Libya in this study. Source: the researcher

In summary, sustainable societies, therefore, need to continue to invest in people in their neighbourhoods for long periods of time (Edwards, 2000). The socio-cultural sustainability of a dwelling is linked to the preservation of the cultural heritage of the population, the acceptance of the population, and the ability to adapt them to changes and developments in science and technology over time, which is reflected in the physical shape of the dwelling. However, the design of the dwelling gradually changes to move away from local culture. The design of the dwelling and its interior spaces are the result of the interaction among social and cultural characteristics, customs, and traditions. The external facets are a combination of cultural, environmental, and economic factors (Chiu, 2004). The transformation of the cultural identity of the place constitutes a change in the lifestyle of the population, in addition to the aesthetic and artistic dimensions of culture. The preservation of architecture for aesthetic and heritage values fosters the continuity of cultural identity (Gražulevičiūtė, 2006).

3.9 Summary and Link

The main purpose of this chapter was to review the literature relevant to socio-cultural-sustainability features and social activities. The chapter began with the definition of the concept of a dwelling, followed by the meanings of dwelling, desert dwelling, and vernacular and contemporary desert dwelling, in order to provide an understanding of these terms and meanings as used in this study. This was followed by the definitions of socio-culture, sustainability, social dimensions, and the concept of sustainable development.

This chapter has highlighted the sustainable architecture and socio-cultural sustainability has been presented and discussed in depth. Furthermore, socio-cultural architecture features for sustainable desert dwellings were presented which constitute the theoretical framework in which this research is investigated, where the six main social-cultural sustainable features have discussed which is the privacy in all its aspects, and safety and security, which is mainly concerned with the protection of population possessions from crime and to ensure the safety of family. In addition to the shape and design of dwelling which included the area of dwelling, location, windows, and doors and quality of external facades. Then the social considerations and religious beliefs with the social interaction and dwelling.

The chapter also dealt with the other two important sustainable features which are the Identity and cultural heritage in different its aspects and its importance in sustainable dwellings as well as the present of the changes of perception of identities in younger generation, and the last feature contemporary lifestyle from a quality-of-life perspective has presented. Finally, social and religious events in Southwest Libya dissected, for complement the theoretical conception of sustainable socio-cultural features that effectively contribute to the development of guidelines towards a socially and culturally sustainable contemporary design for desert dwellings in Southwest Libya.

The following chapter (Chapter Four) will explore the research methodology, including the research philosophy, methodology, strategy, research choices, data collection, and analysis methods for the investigation of the socio-cultural-sustainability features, based on the vision presented in the literature review, to achieve the main aim of this research.

CHAPTER FOUR

RESEARCH METHODOLOGY

CHAPTER FOUR
RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents and describes the research methodology that was adopted to meet the aim and objectives of this research. This provides the basis for the research design and data collection, and the analysis to answer the questions of this research. This chapter is structured as follows. First, the research model adopted for this research (the onion research model) is presented. This model encompasses research philosophies, research approaches, and research strategies. In addition, this chapter also provides an overview of the study area, the methods of selection for the samples of this research, and the justification for the choice of Ghadames, Sabha, and Ghat as a case study. It details the choices and methods for data collection, and the data analysis techniques that will be used in this thesis. This is then followed by a brief description of the validation processes and triangulation.

4.2 Research model

Grix (2001) explains that the research methodology is the discussion on how to undertake each part of the research and how the results will be understood . The research methodology includes all procedures and steps involved in the research (Collis and Hussey, 2013). The methodology is considered to be a guide to solving the research problem, and it gives a general perception of the focus of research. The research includes various elements, such as the order of stages, and the techniques and tools that are used. An appropriate methodology binds all these elements coherently (Sutrisna, 2012), and gives researchers the opportunity to plan and review the general pattern of the research (Robson, 1997).

The research methodology is important as it provides a roadmap for the researcher with respect to the necessary steps needed to achieve the objectives of the research (Kumar, 2005). Therefore, the choice of the overall strategy of the research that is made by any researcher should support achieving the research objectives. Therefore, it is important to further explore the comprehension of the research methodology used in any particular study through contemplating the alternative available choices that could be adopted.

The methodology for this research must be clearly interpreted. This research has adopted the onion model that suggested by Saunders *et al*. (2009). This is because the onion model stems from a clear and orderly method, and is easy to follow. This research process is presented in Figure 5.1.

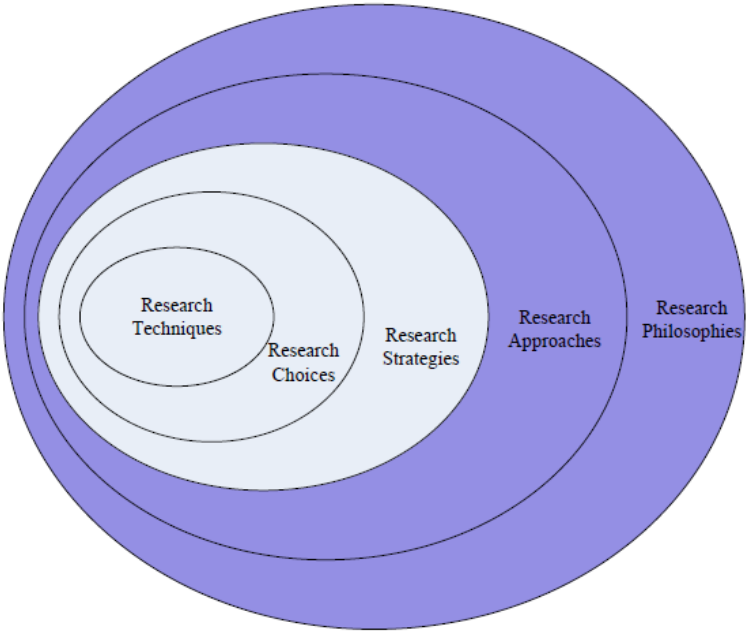


Figure 4.1: Onion model, adapted from Saunders *et al*. (2009)

The onion model is a clear tool used in the sequence of the research process, from the philosophical position to stage of data collection and analysis, which makes it easy to understand and apply the research, according to successive layers clearly, and it is supposed that each layer of the model refers to a specific research activity. However, some authors indicate that one disadvantage of this model is because its structure is inflexible and needs to be followed strictly. Following the research onion approach, the next sections explain the relevant research methodology areas, beginning from the outer layer.

4.3 Research philosophy

The argument in this section relates to the aim of this research, which is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya (see Section 1.6.1 in Chapter One). The theoretical basis of the philosophy of the research are discussed in Sections 4.3.1, 4.3.2, and 4.3.3. Saunders *et al.* (2009) indicate that the research philosophy is a comprehensive term that relates to increasing knowledge and the nature of

knowledge. Many authors argue that researchers should adequately understand the philosophy of research to apply it appropriately. The researcher has to address the research through the perspective of a specific research philosophy (Saunderset *al.*, 2012, Lewis and Thornhill, 2011). All research is based on a philosophy. For instance, the creation of knowledge and its nature are also linked to the research philosophy (Saunders *et al.*, 2012). There are generally three key advantages of defining a research philosophy. First, it explains and simplifies the research design. Thereafter, it rates the design on the basis of having a suitable implementation and choosing accordingly . Therefore, it assists the researcher to classify and generate designs that they have never experienced before (Easterby-Smith, 2008). The philosophical stand of the research is an aspect that needs several arguments and discussions between different viewpoints within the research. Therefore, any failure to think about the philosophical issues can negatively affect the quality of research results (Easterby-Smith *et al.*, 2002). With respect to the need to adequately and clearly understand philosophical viewpoints, the work of Saunders *et al*. (2009) reveals that research philosophies can be divided into three fundamental perspectives: ontology, epistemology, and axiology.

The following sections present an outline of the three philosophical perspectives of research. The summary of these sections aims to give a clear understanding of the philosophical stance of this research, which aims to formulate a set of guidelines of the socio-cultural architecture features for sustainable desert dwellings design in Southwest Libya (see Section 1.6.1 in Chapter One). The three philosophical characteristics of research, ontology, epistemology, and axiology, are discussed next; this is followed by the synthesis of the philosophies of research, which impact the whole research process.

4.3.1 Ontology

Ontology is based on the nature of existence and reality (Easterby-Smith *et al.*, 2012). It is controlled by two divergent positions, namely objectivism and subjectivism. It is important to understand both of these positions since they impact the investigation process of a researcher. The general hypothesis presented by the objectivist position is based on an external reality that occurs separately from the social actors. However, contrary to this, the subjectivist position negates this idea of an independent reality. A subjectivist perspective approves the creation of social phenomena using the insights and actions of social actors (Saunderset *et al.*, 2012). This important viewpoint differentiation affects the research. Subjectivism-based studies are centred on actions, institutions, and social phenomena. Furthermore, subjectivism-

based research is centred on the opinions, views, and actions of the social agents (Saunders *et al.*, 2012). Through the literature review, it was found that there are many human factors with implications for forming and designing desert dwellings, particularly in terms of aspects of social and cultural sustainability, whether for vernacular or contemporary desert dwellings. Therefore, a predominantly subjectivist approach, focusing on actors, is suitable in this case and will be the stance adopted for this research.

4.3.2 Epistemology

Epistemology is regarding what constitutes reasonable knowledge in the study field (Saunders *et al*., 2009). The work of Grikes (2001), indicates that epistemology, one of the fundamentals of the branches of philosophy, deals with the theory of knowledge, including the methods and the validity of gaining knowledge through social reality. Epistemology is opposed to ontology in such a way that the former is based on the nature of knowledge, whereas the latter is centred on the nature of reality. Epistemology explains the process of achieving and arriving at knowledge (Grikes, 2001). Epistemology facilitates the researcher to understand the nature of knowledge and the ways it can be achieved, and explains how the knowledge was arrived at and what is actually revealed. Moreover, it explains the process for the procurement of knowledge and uses it to compare reality with fiction. Epistemological philosophy is divided into positivism and interpretivism (Saunders *et al*, 2009). Positivism is basically the exploration of general laws, and explains the interconnections between source and outcome via rationality (see Table 4.1). This concept of positivism is based on the confirmed existence of the social world, which can be measured using impartial reasons, not prejudice. It embodies noticeable facts that are not only observable but also measureable by an observer (Fellows and Liu, 2009).

Within social and behavioural sciences' research processes, positivism is the widest and most used philosophical position. However, the interpretivist mentality is totally different, as shown in Table 5.1. It is posited on the interpretation of reality and the proposal of theories for describing new knowledge. In other words, interpretivism is a described series of distinct human actions that explains their unique understanding of the world (Saunders *et al.,* 2012). This researcher sought to obtain information by listening to professionals and housing experts in Libya to build a picture based on their views and ideas. This was achieved through entering into the details of the subject. The only method that helps the interpretative researcher to understand social and cultural phenomena is to look at those subjects from the inside

(Saunders et al., 2009, Myers, 2013). Table 4.1 shows the differences and applicability for the two extremes of the research philosophy.

Table 4.1: Comparison between positivism and interpretivism

Epistemology	Positivism	Interpretivism
The observer	Must be independent	Is part of what is being observed
Human interests	Should be irrelevant	Are the main drivers of science
Explanations	Must demonstrate causality	Aim to increase general understanding of the situation
Research progresses through	Hypotheses and dedications	Gathering rich data from which ideas are induced
Concepts	Need to be defined so that they can be measured	Should incorporate stakeholder perspective
Units of analysis	Should be reduced to the simplest form	May include the complexity of "whole" situations
Generalization through	Statistical probability	Theoretical abstraction
Sampling requires	Large numbers selected randomly	Small numbers of cases chosen for specific reasons

Source: (Saunders *et al*., 2009, p. 127)

4.3.3 Axiology

Axiology is the study of values, which plays a vital role in the research outcomes. Human opinions, understandings, and objective principles conclude with their value (Creswell, 2012). The nature of truth differs according to the varying views, experiences, and beliefs of the people. Generally, axiological philosophies are of one of two types: value-free of value-laden. Positivism research is logical, inclined to objectivity, and computable. Such research is conducted by firstly formulating the hypothesis, then proving it via empirical methods, which are based on a selected set of data; this is called value-free research (Lewis, 1994). On the contrary, interpretivism or social constructionism plans the research, which is driven by a value in such a way that the researched items are interlinked by the researcher. The determination of the real existence within the human and social world is based on human interpretation (Healy and Perry, 2000). Hence, value-free research is always determined by the criteria of objectivity. On the other hand, value-driven research is always determined by the criteria of subjectivity, human views, and experiences.

4.3.4 Justification for the research philosophies

Sections 4.3.1 to 4.3.3 describes the philosophical considerations of this research, which are aimed at aiding the researcher to make an informed decision with respect to selecting the appropriate research philosophy for this research. This research seeks to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. In this regard, positioning the study in the appropriate research philosophy can provide adequate grounds for eliciting the relevant information. With reference to this, the process of arriving at a suitable set of guidelines needs input from the indigenous inhabitants of Southwest Libya, and other stakeholders such as architects, housing experts, academics, and relevant state institutions. This process of engagement and interaction to gauge different perceptions is expected to lead to determining their subjective perceptions about the research area. Therefore, it can be identified that this research falls within the subjectivist stance in terms of the ontological philosophy. This is in line with the understanding drawn from the discussion in Section 4.3.1.

From the discussion in Section 4.3.2, the epistemology philosophy shows that knowledge is about positivism and interpretivism. As expressed in the aim of this research (see Section 1.6.1 in Chapter One), this research fits into the subjectivist stance as it relates to the understanding of the phenomena through the meaning informants assign to the issues under research. Furthermore, from the understanding deduced from the discussions of the research philosophies in Sections 4.3.1 to 4.3.3 in relation to the aim of this research , eliciting information of this nature from indigenous inhabitants, professionals, and state institutions, in terms of their perception and feelings about the features of socio-cultural sustainability and professional practices, best resides in a subjectivist stance for the ontology philosophy, while it fits into the interpretivist stance in the epistemology philosophy. It is important to also note that the interpretivist stance underscores the unique differences between human roles as social actors.

The third research philosophy that is also important for this research is its axiology. Axiology, as described in Section 4.3.3, deals with judgements about values. In this research, since the researcher's values will affect the research methods and analysis procedures, together with the interpretation of the results, it can, therefore, be concluded that this research is more inclined to be value-laden. As a result, this research is inclined towards subjectivism for the ontological stance, interpretivism for the epistemological stance, and value-laden for the

axiological stance. Figure 4.2 illustrates the research philosophy adopted for this research. The philosophical stances are shown in blue.

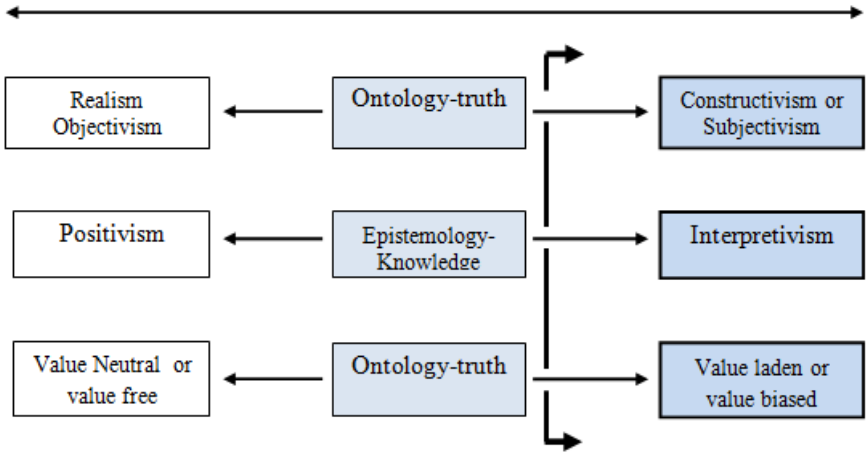


Figure 4.2: Philosophical stance of research adapted from Grix, (2001), and Saunders *et al.*, (2009)

4.4 Research approach

Research reasoning is categorised into deductive and inductive research (Easterby-Smith, 2003; Saunders *et al.*, 2012). According to Saunders (2012), different factors are used to determine the method to be chosen. These factors include the research objectives and questions, the scope of existing knowledge, the availability of time and other resources, and the logical philosophical foundation. One of the two research methodologies discussed by Yin (2003) includes inductive and deductive methodologies. Saunders *et al*. (2009) indicated that the deductive approach in research is often used in natural sciences, where laws are the interpreters of phenomena, allow prediction, and therefore, they are subject to constant censorship. Philosophical deductive research has an objective end according to the ontological tradition. Conversely, the inductive approach is the process that used by the researcher to collect data and develop its interpretation. The inductive approach provides the best understanding of the research problem. Philosophically, the inductive approach lies at the end of objectivity and fits with the interpretation of the cognitive position. Saunders *et al* (2012), advocated the application of combined inductive and deductive methodologies.

According to them, this is beneficial in terms of its possibility within the same research. In this research, a deductive and inductive mixed approach (Abductive) was used to deal with the research aim which is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya (see Section 1.6.1 in Chapter I). In the literary

review phase, the deductive approach was used and the inductive approach was used to form the basis for data collection for this research. Although the research tends toward the interpretive philosophical approach (see section 4.3.4), the data collection phase used both deductive and inductive approaches. According to Bryman (2012), the mixed approach is "integrating quantitative and qualitative research into a single project". This improves the quality of the research evidence (Stake, 2010). Thus, both inductive and deductive methodologies are used within this research (see Figure 4.3). Inductive approaches fulfils the research aim, whereas the deductive approach detects the influences of the socio-cultural sustainability for dwelling design in the literature review. Then the researcher again moves to deductive thinking and organisation of information to reach the conclusions.

4.5 Research strategy

Research strategy not only explains the research procedure but also presents its whole course (Remenyi, 2004). Three scenarios generally decide which research strategy should be selected. These include: the type of research questions; as shown in Table 4.2, is the examination of social events, or highlighted current and historical events (Yin, 2009). As shown in Table 4.2 Yin, (2009) provided five (5) research strategies as follows: experiment; survey; case study; history and. archival analysis; Each of these types basically collects the data (Collis and Hussey, 2013, Easterby Smith et al., 2012). From the alternative strategies, this study adopts the case study strategy as it appears to be the most suitable strategy that can support this research. The case study strategy fit appropriately into the first and third conditions set out by Yin (2009). As this research is designed to focus mainly on a contemporary socio-cultural issues of dwellings design in specific areas.

Table 4.2 : Research Strategies (Yin, 2014)

Research strategy	Forms of research question	Requires control of Behavioural Events	Focuses on Contemporary events
Experiment	How, Why?	Yes	Yes
Survey	Who, What, Where, How many, How much?	No	Yes
Archival analysis	Who, What, Where, How many, How much?	No	Yes/No
History	How, Why?	No	No
Case Study	How, Why?	No	Yes

Source: (Yin, 2003)

Figure 4.3 shown the research approach and strategy adopted for this research.

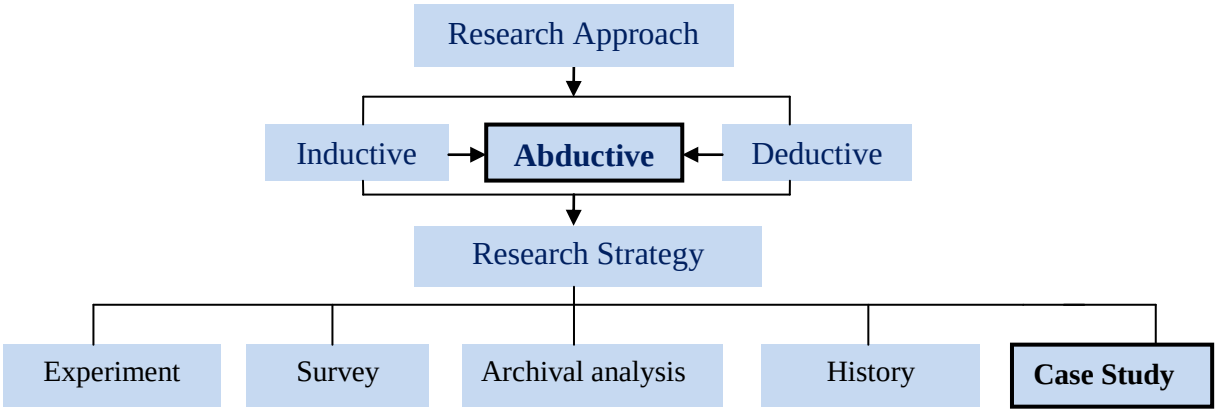


Figure 4.3: Research approach and strategy structure

4.5.1 Case study strategy

The use of Case Study is particularly appropriate for individual researchers; its gives the opportunity for one aspect of a problem to be studied in depth within a limited time scale (Bell, 2014). Yin defines the case study as "an empirical investigation into contemporary phenomenon operating in a real-life context" (Yin, 2003). Yin (2003) states that the case study is the preferred strategy when "how" or "why" questions are being posed. This allows the researcher to determine not only what happened but also why it happened. Case studies are not limited to qualitative evidence: They can contain a mix of quantitative and qualitative evidence (Kell and Draper, 2001).

A case-study method is appropriate when a researcher's concern is directed towards a set of issues in a single organisation or a single department within it. The work of Gray (2013) indicates that case studies explore subjects where relationships may be ambiguous or uncertain, and adds that the method is very useful where the researcher is trying to discover the connections between an occurrence and the environment in which it is occurring.

Yin, (2003) notes that, when focusing on contemporary phenomena, the case study method will emerge as the most suitable research strategy. In essence, a case study strategy is a flexible one as it allows multiple combinations of research techniques.

This research will adopt a case-study approach within which a questionnaire survey, semi-structured interviews, and partially archival documentation as research will be used as the research techniques for examining the opinions of the different generations of the population

in the dwellings in three historical desert towns in southwest Libya, which have been selected as the case-study units of analysis. The views of academics and professionals about these vernacular and contemporary desert dwellings, in terms of socio-cultural sustainability, will also be considered.

4.5.1.1 Justification for the case-study strategy

This research seeks to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. The results of this research will provide the means of improving the design of desert dwellings in terms of socio-cultural-sustainability features in Southwest Libya. This phenomenon is a contemporary one that requires the participation of stakeholders in Southwest Libya in a real-life context.

Furthermore, it requires an in-depth understanding of the socio-cultural-sustainability features as an important phenomenon for the architectural design of dwellings in the context of socio-cultural sustainability in Southwest Libya.

Therefore, this research seeks to use a case study to cover the contextual conditions as it is found to be pertinent to the phenomenon under research. As explained in Section 4.3.4, from a philosophical standpoint, this research is inclined towards interpretivism and subjectivism, is value-laden, and the research approach is abductive. These philosophical stances support the use of a case-study research strategy (Creswell, 2012). The case study is an appropriate research strategy for conducting this research as it permits the use of quantitative and qualitative data, and the combination of several methods for data-collection and analysis techniques. As mentioned earlier, the nature of this research requires the understanding and perceptions of the inhabitants of Southwest Libya and professionals. Therefore, it will require the researcher to adopt a mixture of research techniques utilising the research strategies provided in Table 4.2.

From the list of research strategies mentioned previously in Table 4.2, the technique of an experiment is not suitable for this study as the researcher does not have control over the phenomenon being researched. According to Saunders *et al* (2009), studies using experiments are undertaken in a highly controlled context, hence as this researcher does not have control over the phenomenon being studied, this technique is not applicable to this research. Saunders *et al.* (2009) explain that an archival research technique makes use of administrative records

and documents as the principal source of data. The word 'archival' may be misleading as it has historical connotations; however, it can refer to recent as well as historical documents (Saunders *et al.,* 2009). This research technique can be partially applied to this research as a case study utilises some document analysis as one of its data-collection techniques (Yin, 2009). With respect to the historical research technique, it is connected with past events when no relevant sources are available to give a report, even retrospectively.

In this research, both primary and secondary documents are used as sources of evidence (Yin, 2009). In addition to some archival research, this research also partly involves historical research as it seeks to relate to historical antecedents in order to understand the phenomenon in the real-life context relating to the socio-cultural sustainability of dwelling design in Southwest Libya. On the other hand, survey research techniques, which are applicable to this research as identified in earlier discussions, are associated with a deductive approach (Saunders *et al.,* 2009). From the previous discourse and the understanding that follows, a case-study research strategy is considered to be the most appropriate research strategy for this research.

4.5.2 Case-study design

Yin (2003) presents four types of case-study design based on a 2x2 matrix that comprises single and multiple case studies showing different design parameters. The following are the types of case-study design: (1) single-case holistic; (2) single-case embedded; (3) multiple-case holistic; and (4) multiple-case embedded. Here, Yin (2009) distinguishes between single, holistic, and embedded designs. According to Yin (2009), a holistic design takes a more detailed view of one main unit of analysis, while an embedded design is preferred when the case has more than one unit of analysis. This research will adopt a multiple-case holistic design as the research intends to undertake more detailed research utilising one unit of analysis. According to Saunders *et al*. (2009), a single case is often used where it represents a critical case, or, alternatively, an extreme or unique case. A single case may be selected because it is typical, or because it provides an opportunity to observe and analyse a phenomenon that few have considered before (Yin 2009). Yin (2009) also explains that an important aspect of using a single case is defining the actual case. This research focuses on revealing real sustainable socio-cultural architectural features of dwelling design that can be used to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings

design in Southwest Libya. Investigating this issue in a real-life context requires bringing together several key stakeholders within the Libyan dwellings sector. Research of this nature favours a case-study design in order to adequately investigate the phenomenon. Therefore, this research does fall under the conditions for case-study design as suggested by Saunders *et al.* (2009) and Yin (2009).

4.5.3 Unit of analysis

As shown in Section 4.5.2 the "case" can be defined as the vernacular and contemporary dwellings design in Southwest Libya whilst the "unit of analysis" can be identified to be the socio-cultural sustainable features and integration of vernacular and contemporary architecture in the selected three desert historical towns. The socio-cultural sustainable needs of this research have been identified according to theoretical literature which include the six socio-cultural sustainable features that are(privacy, safety and security, shape and design, and social and religious considerations and architectural identity, cultural heritage and contemporary lifestyle), each of which generates a set of sub-items. Therefore, this research will adopt a holistic case-study design. The justification for the selected case-study unit is presented in the following section.

4.5.4 Choosing the study samples (Case study)

4.5.4.1 Study area

The study area extends from the Southwest, where Algeria and Tunisia border Libya, to the Libyan border of the municipalities of Murzuq and Jufrah in the southeast. In addition, the study area stretches from the border of the municipalities of Ghadames, Mizdah, and Jufrah in the north to the Libyan-Niger-Chad borders in the far south . The study area under investigation extends between 9° west and 19° east, to 23° south, and 31.5° north (Atlas of Libya, 1978). The northern boundary of the study area is compatible with the borders of the desert climate, thus the entire study area is within the scope of the desert climate (See the map in Figure 4.4). Therefore, as can be seen, the region under study includes a significant part of the Libyan desert. The field work will cover the vernacular towns in the Southwest Libya in general, through the selected sample study sites. A comparison among the oases, desert cities, and villages has been chosen to encompass the most significant historical, geographical, architectural, and environmental factors of this study of the region, since vernacular architecture is a vital feature of this study.

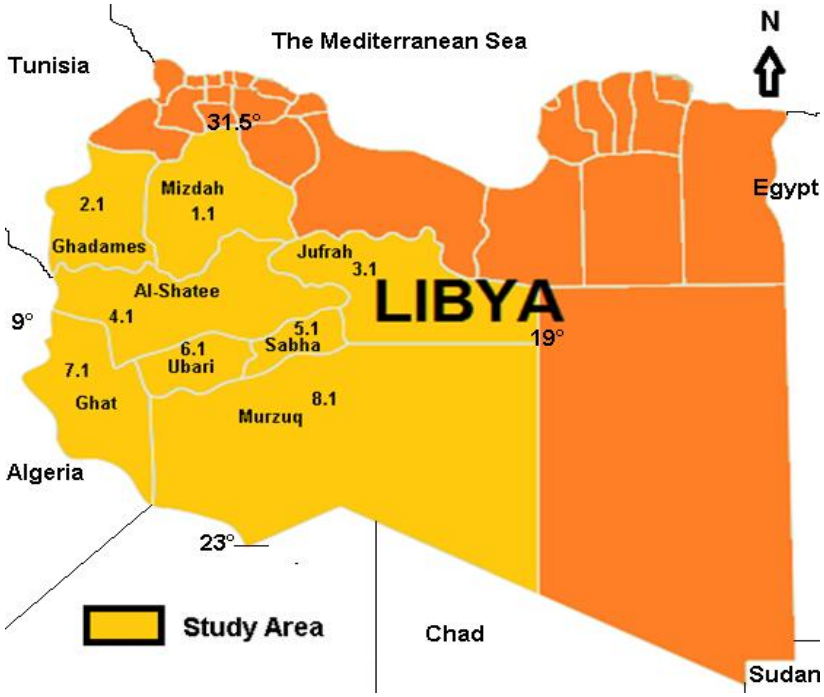


Figure 4.4: Study area in Southwest Libya
Source: Researcher, adapted from Atlas of Libya (1978)

Historically, the Southwest of Libya (the study area) was called Fezzan. In some history books and references, it was called the State of Fezzan or the Province of Fezzan during the period of the United Kingdom of Libya (1951–1969).

This name, Fezzan, has been used again in some Libyan and international media after the events in 2011. The study area covers the Southwest of Libya in the following eight municipalities shown in Table 4.3.

Table 4.3: Total area and the population of the study area, (2012)

Region Reference	Name of the municipality	Area / km2	Population
1.1	Municipality of Mizdah	72,180	12,472
2.1	Municipality of Ghadames	51,750	16,120
3.1	Municipality of Jufrah	117,410	64,092
4.1	Municipality of Al-Shatee	97,160	79,634
5.1	Municipality of Sabha	153,30	105,799
6.1	Municipality of Ubari	31,890	69,197
7.1	Municipality of Ghat	72,700	22,069
8.1	Municipality of Murzuq	349,790	78,412
	Total	808,210	447,795

Source : Bureau of statistics and census Libya,(2012)

4.5.4.2 Justification for the choice of the study area

Southwest Libya has been chosen as the study area to achieve an appropriate target for this thesis because of the following points:

1. Southwest Libya is one of the most important desert areas in Libya, with important historical oases and towns that are characterised by their unique vernacular architecture for dwellings, and a rich architectural heritage. There is remarkable convergence of a homogeneous blend of local, Arab, Amazigh, and African cultures. The nature of the construction of the dwellings in these towns is based on a harmonious mix between architecture and people, which has shaped this architectural identity over the centuries.
2. Locals in Southwest Libya are closely related to their customs, traditions, religious beliefs, and social and cultural features. These values are in line with local vernacular architecture, but are not fulfilled by today's contemporary dwelling designs. Therefore, this phenomenon in the southwest needs to be studied.
3. In many historical towns and oases in Southwest Libya, there is still a living bridge between the vernacular and contemporary desert dwellings in terms of conservative socio-cultural features, which is worthy of research.
4. The researcher has an interest and knowledge in the areas of Southwest Libya where he has worked as a researcher for several years at the University of Omar Mukhtar in Libya, department of architecture and collaborated with the Ministry of Housing in many housing projects in the desert. According to his experience and upon previous literature reviews of socio-cultural sustainability, he realized that the design of desert dwellings in historical towns needs studies and investigation for both vernacular and contemporary dwellings. The researcher also note that the many modifications by the residents of contemporary dwellings, which led to doubt the current design did not fully meet the needs of the local population in the region in terms of socio-cultural sustainability including the distortion of the architectural landscape of these historic towns and the issue of loss of identity.
5. The absence of studies on Southwest Libya, with the exception of Doxiadis (1964) for urban planning. However, analytical studies of architecture in Southwest Libya are rarely found, especially for the socio-cultural sustainability features of vernacular and contemporary desert dwellings which are nonexistent.

4.5.4.3 The selection of the case study samples

Previous Section 4.5.4.1 notes that the study area is vast, including most of the Libyan desert. It is extremely difficult to study all the towns, villages, and oases in one research project. Therefore, the researcher has chosen specific samples, which have common characteristics similar to most of the rest of the towns, villages, and oases in Southwest Libya. This will enable the results of the research to be generalised to the whole of the study area. Hence, as a first step, the following points show the main criteria used for the selection of the samples:

1. The samples needed to provide coverage of the whole area that is under investigation (Southwest Libya). The most important towns, villages, and oases in each municipality are identified in Table 4.4.
2. There must be specific compliance with the identified criteria for each potential case.
3. The case-study selection will be based on sample conforming to the aggregate criteria.

Table 4.4. Desert towns, villages and oases, within the border of the eight municipalities, in the study area in Southwest Libya

Region reference	Name of the municipality	Important desert towns, villages, and oases within the borders of each of the eight municipalities
1.1	Mizdah	Desert town of Mizdah. Villages of East El-gariat and West El-gariat
2.1	Ghadames	Desert town of Ghadames. Villages of Tonine and Derj
3.1	Jufrah	Desert town of Hoon. Villages of Waddan and Sokina and oasis of Zalaa.
4.1	Al-Shatee	Desert town of Brak. Villages of Agar, Bergen, and Wenzarik, and oasis of Idri.
5.1	Sabha	Desert town of Sabha. Villages of Godoa, Samno and El-Zegon.
6.1	Ubari	Desert town of Ubari. Villages of Germa. Al-Grifa and Al-Fjaij
7.1	Ghat	Desert town of Ghat, and oasis of El-Barkat.
8.1	Murzuq	Desert town of Murzuq. Villages of Tragon, Zewailah, Om-Elaranib and El-Gtron

Sources : Researcher, adapted from the Ministry of Planning (2007)

For the second step, the researcher has adopted the following compliance criteria for a trade-off in the selection of the samples:

Compliance criteria:

1. Historical and geographical significance.
2. Economic and political significance.
3. Socio-cultural significance.
4. The condition of the vernacular architecture for dwellings.
5. Clarity of the vernacular dwelling sectors.
6. Density of the sectors of vernacular and contemporary dwellings.

These criteria chosen by researcher give a clear picture of the desert towns, villages, and oases that have been selected. This study aims to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. Therefore, the sample selected must cover the conditions of the study. For example, the sample should include areas of important historical and geographical background to find out the origins and history of the architecture for each sample. Also, it is of geographical importance to understand the natural environment and other features that may contribute to the development of the architecture for sustainable dwelling designs (Greene and David, 1984, Dhouib, 2013).

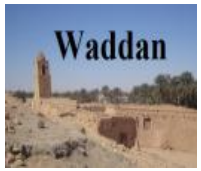
Likewise, it is of economic and political importance to find out the economic resources and various political conditions, their impact on the development of dwelling design, and the effects reflected in the socio-cultural conditions of the population. Furthermore, the socio-cultural significance is an essential axis of this study and is a key factor in the selection of samples; the nature of the local inhabitants, and their customs and traditions needs to be determined to comprehend the importance of these with respect to for sustainable dwelling design.

Other criteria, such as the condition of vernacular dwellings, and the clarity and density of vernacular and contemporary dwellings, need to be identified in order for the sample to be viable to study, and for the researcher be able to draw clear and accurate conclusions, to make the study logical and clear, and allow the results to be generalised for all Southwest Libya.

The measurements for the residential gatherings in Table 4.4, with respect to the aforementioned compliance criteria are given in Table 4.5, as follows. Table 4.5 presents the synthesis and evaluation of the compliance criteria. The shaded rows indicate the case studies that have been selected. The justification for each selection is presented later.

Table 4.5. Measurement conditions for residential gatherings in the study area that have been used to select the samples

R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
1.1		Located in the northern part of Southwest Libya. It is a small desert city. Constructed in the late 18th century, about 350 years ago (1).	Mizdah has been used for military defence purposes for the region. It is the capital city in the municipality of Mizdah (1).	Three tribes live together, their socio-cultural relations are a mix of Islamic and Arab cultures compatible with the harsh desert environment. Architectural heritage is limited.	Vernacular dwellings are almost extinct. Most remaining ones are degraded or ramshackle.	Most of the vernacular residential sectors need extensive maintenance and refurbishment.	There is insufficient density of vernacular dwellings when compared with contemporary dwellings.
1.2		Located in the eastern outskirts of Mizdah. Constructed many years after Mizdah. In the history of Fezzan, there is no great importance for this village.	No great economic or political significance in the past and now.	Three tribes lives together. Their socio-cultural relations are a mix of Islamic and Arab cultures compatible with the harsh desert environment.	Vernacular dwellings are almost extinct. Most remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient density of vernacular dwellings when compared with contemporary dwellings.
1.3		Located in western Mizdah. Constructed many years after Mizdah. In the history of Fezzan, this village has no great importance.	No great economic or political significance in the past and now.	Three tribes lives together. Their socio-cultural relations are a mix of Islamic and Arab cultures compatible with the harsh desert environment.	Vernacular dwellings almost extinct. Most remaining ones are degraded or ramshackle.	Vernacular dwellings almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
2.1		Located in the far of northern part of southwest Libya. According to UNESCO, it is considered to be one of the oldest five cities in the world (5).	It was the most important centre of the caravanserai trade that linked the Mediterranean Sea to Africa. It still has moderate economic significance (5).	Local inhabitants are a mix of Arabs and Berbers living side by side, in peace and harmony, bound together by their belief in Islam. Linked by the same heritage and culture, their social relations are distinctive.	Vernacular dwellings are still in a good condition, to a large extent, due to maintenance and conservation projects.	Most of the vernacular residential sectors are still in good condition in comparison with contemporary dwellings.	The density of vernacular dwellings is adequate compared with contemporary dwellings.

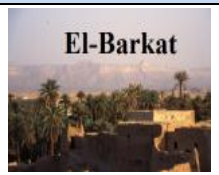
R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
2.2		Located 80Km to the Southwest of Ghadames. Constructed many years after Ghadames.	It was a small centre for caravanserai between Ghadames to Sabha (5).	Locals linked by a distinctive Socio-cultural relationship with Ghadames, because the locals in Derj originally from Ghadames.	A small part of the vernacular dwellings are still in a good condition.	Most of the vernacular residential sectorsneeds extensive maintenance.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
2.3		Located on the western outskirts of Ghadames. Constructed a few years after Ghadames	No great economic or political significance in the past and now.	Constructed on the basis of the Shrine of Marabout. Most of the locals in Tonine originally came from Ghadames.	A small part of the vernacular dwellings are still in a good condition.	The vernacular residential sectors are very simple abodes.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
3.1		Located in the middle of the Libyan desert.It has historical significance as the largest city in the basin of Jufrah. The city is believed to have been constructed about 600 years ago (1).	It was one of the important centres of the caravanserai due to it is location in the middle of the Libyan desert.	Locals in Hoon are a mix of Arabs and Berbers. They have a rich cultural and art heritage, which is reflected in the traditional and contemporary dwellings.	Some of the vernacular dwellings are still in a good condition, due to maintenance and conservation projects.	Some of vernacular residential sectors are still in a good condition for comparison with new dwellings.	There is little vernacular dwellings density when compared with contemporary dwellings.
3.2		Located to the north of Hoon. Its historical significance comes from historical buildings such as the old castle and a old mosque on Mount Toz. Constructed about 300 years ago (1).	No great economic or political significance. In the past Waddan was considered religious centre.	Locals in Waddan are Arabs with a conservative society like other desert communities. There are places and buildings of religious significance. The locals are originally from the Sharifs tribes.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.

R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
3.3		Located to the south of Hoon. Archaeological Ottoman buildings show that Sokina was established prior to the first Ottoman period 1551 (1).	It was the small centre of caravanserai that came from Hoon to Sabha (6).	The locals are from Arab tribes. Their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh climate. The architectural heritage has no significance.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Most of the vernacular residential sector needs maintenance.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
3.4		Located 180 km to the east of Hoon. In the history of Fezzan, there is no great importance for this village (1).	It was a small station of caravanserai that comes from Awjila to Ghdames. No political significance in the past and now.	Locals are from Arab tribes. Their socio-cultural relations are mix of Islamic and Arabic cultures. The architectural heritage has no significance.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
4.1		Located 150 Km to west of Sabha. It is the largest town in the Municipality of Al-Shatee. It is believed to be constructed 600 years ago based on the age (1).	It has medium economic significance. It is considered to be the capital town in the municipality of Al-Shatee.	Locals in Brak are from Arab tribes. Their social habits, traditions and culture came from the Arab culture and the Islamic religion.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
4.2		Located to the west of Brak. Some historical references indicate that it was constructed many years after Brak	No great economic or political significance in the past and now.	Local inhabitants in Agar are from Arab tribes. Their social habits, traditions and culture came from the Arab culture and the Islamic religion.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.

R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
4.3		Located to the east of Agar It is a small village. In the history of Fezzan, There is no great importance for this village.	No great economic or political significance in the past and now.	Locals in Bergen are from Arab tribes. Their social habits, traditions and culture came from the Arab culture and the Islamic religion, which were compatible with desert area.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Most of the vernacular residential sector needs maintenance.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
4.4		Located 95 km to the west of Brak. It is a small village. In the history of Fezzan, there is no great importance for this village.	Wenzarik has palm plantations to produce dates. No political significance in the past and now.	Locals are from Arab tribes, their socio-cultural relations are a mix of Islamic and Arabic culture compatible with the desert area.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with new dwellings.
4.5		Located 125 km to the west of Brak. It is a small Oasis. In the history of Fezzan, there is no importance for this Oasis.	It was small centre of caravanserai that came from Ghadames to Sabha. Now, there is no great economic or political significance.	Locals are from Arab tribes. Their socio-cultural relations are mix of Islamic and Arabic cultures compatible with the harsh desert environment.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
5.1		Located in the middle of southwest Libya. It is the largest town in the Southwest of Libya. It is the capital town in municipality of Sabha. It is considered to be the capital of Fezzan (1).	It was the most important centre for the caravanserai linking Tripoli to Africa via Ghadames. Now, it still has strong economic and political significance (1).	Local inhabitants are linked by cultural heritage which made their distinctive social relations. Sabha is like any large town in North Africa, there are a mix of socio-culture traditions aspiration to be a modern town.	Some vernacular dwelling sectors considered be in a medium condition.	Some of the vernacular residential sectors are still in a medium condition for comparison with contemporary dwellings.	The density of the vernacular dwellings is adequate compared with contemporary dwellings.

R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
5.2		Located 65 Km to the north of Sabha. In the history of Fezzan, there is no great importance for this village.	No great economic or political significance in the past and now.	Locals are from Arab tribes, their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment. Nothing special about the architectural heritage.	Vernacular dwellings are almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct. Some of the contemporary residential sectors are in need of maintenance.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
5.3		Located 62 Km to the North of Sabha. In the history of Fezzan, there is no great importance for this village.	No great economic or political significance in the past and now.	Locals are from Arab tribes, their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment. Nothing special about the architectural heritage.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
5.4		Located 76 Km to the north of Sabha. In the history of Fezzan, there is no great importance for this village.	No great economic or political significance in the past and now.	Locals are from Arab tribes, their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
6.1		Located in the west of Sabha. It is the largest city in the Municipality of Ubari. In the history of Fezzan, there is no great importance for this town (6).	No great economic or political. Considered to be the capital city of the surrounding region.	Locals are a mix from Arab, Tuareg and Tabu tribes living side by side. Ubari has social cultural diversity to a certain extent. There is nothing special about the architectural or cultural heritage.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.

R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
6.2		Located 32 Km to east of Ubari,. It was the capital city of Fezzan in the Al-Garamant period (1).	It was great centre of caravanserai that came from the Mediterranean to Africa. Now has no great economic and political significance.	Locals are now Arab, their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment. There are special architectural traces for dwellings in the old Germa.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
6.3		Located 25 Km to east of Ubari,. In the history of Fezzan, there is no great importance for this village.	No great economic or political significance in the past and now.	Locals are from Arab tribes, their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment. Nothing special about the architectural heritage.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
6.4		Located 52 Km to east of Ubari,. In the history of Fezzan, there is no great importance for this village.	No great economic or political significance in the past and now.	Locals are Arab tribes, their socio-cultural relations are mix of Islamic, Arabic culture compatible with the harsh desert environment.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
7.1		Located in the far southern part of the southwest Libya, 600 km south of Ghadames. It is one of the oldest cities in the desert of North Africa (4).	It was great centre of caravanserai that came from Ghadames to Timbuctoo. Now, still has middle economic significance (4).	Local inhabitants are from the Tuareg tribes, bound together by their belief in Islam. They are linked by the same cultural heritage which has created their distinctive social relations.	Some vernacular dwellings are still in good condition.	Most of the vernacular residential sectors are still in good condition compared with contemporary dwellings.	The density of vernacular dwellings are adequate compared with contemporary dwellings.

R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
7.2		Located 9 Km from the west outskirts of Ghat. It is a small oasis. Constructed many years after Ghat.	No great economic or political significance in the past and now.	Locals are from Tuareg tribes, their socio-cultural relations are a mix of Islamic and African cultures compatible with the harsh desert environment.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
8.1		Located 150 km to the south of Sabha. It was the capital of Fezzan in the days of Aolad-Mohamed Al-Fasi,1690 (2).	It was great centre of caravanserai that came from Sabha to Africa. Now, economic, political significance is very low (2).	Locals are a mix of Arab and Tabu. Their socio-cultural relations are mix of Islamic and Arabic cultures compatible with the harsh desert environment. There are traces of Ottoman architecture in the castle.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
8.2		Constructed in the thirteenth century. It was controlled by the Sudanese State in that period until 1258. Located 55 km to the east of Murzuq. It was the capital of Fezzan in days of Alzgaween (4).	No great economic or political significance now .	Locals are from Arab tribes. Their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment. Nothing special about the architectural heritage.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Most of the remains vernacular residential sector needs maintenance.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
8.3		Located 85 km to the east of Murzuq. Constructed in 1174. It was the capital of Fezzan in the days of Bani Al-Khattab. It has great historical significance in the Islamic period (3).	Now there is no great economic or political significance.	Locals are Arab tribes, their socio-cultural relations are mix of Islamic and Arabic cultures compatible with the harsh desert environment. There are traces of Islamic architecture, palaces and tombs (3).	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Most of the vernacular residential sector needs maintenance.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.

R.R	Residential Gatherings	Measurement conditions					
		Historical and geographical significance	Economic and political significance	Socio-cultural significance	Condition of vernacular dwellings	Clarity of V residential sectors	Density of V and C dwellings
8.4		Located to the east of Tragon. It is a small desert village. In the history of Fezzan, there is no great importance for this village.	No great economic or political significance in the past and now.	Locals are from Arab tribes. Their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment. Nothing special about the architectural heritage.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.
8.5		Located in far southwest, near Niger border. In the history of Fezzan, this village has no great importance.	It was a small station of caravanserai that comes from Murzuq to Africa (6).	Locals mix Arab and Tabu tribes, their socio-cultural relations are a mix of Islamic and Arabic cultures compatible with the harsh desert environment. Nothing special about the architectural heritage.	Vernacular dwellings almost extinct. Most of the remaining ones are degraded or ramshackle.	Vernacular dwellings are almost extinct.	There is insufficient vernacular dwellings density when compared with contemporary dwellings.

As a result of the evaluation in Table 4.5, three samples were selected for the case study.

4.5.4.4 Justification for the choice of Ghadames, Sabha and Ghat as a case study.

The following discussions provide more detailed justification to the choice of Ghadames, Sabha and Ghat as case studies for this research:

The historical town of **Ghadames** is an important example of a Libyan desert town where there is a living bridge between vernacular and contemporary architecture for desert dwellings. A study is made of the desert twon of Ghadames in order to give a more complete picture of vernacular and contemporary architecture for desert dwellings in Southwest Libya (see Sections 5.2.2 and 5.2.4 in Chapter Five). It represents a unique, traditional human settlement and is considered to be one of the most interesting of the Libyan towns. The town has historical significance, and it has been established since before Islam (Yasha, 1973).

Ghadames is located on what were the most important trade routes, which connected central Africa with the Mediterranean Sea coast. Ghadames was inscribed on the world heritage list of historic monuments by UNESCO in 1987, and it also won the award for the best vernacular town at the Arab Media Forum in 2016.

The vernacular town was fortified by a wall and now consists of seven residential neighborhoods intertwined with each other and has the following; mosques, markets, and public spaces. The vernacular town of Ghadames is one of the oldest towns in Libya, and its vernacular dwellings remain well maintained. It also has contemporary dwellings.

The density of vernacular desert dwellings its density is sufficient (in terms of numbers) to an investigation when compared with contemporary dwellings. This provides the opportunity to investigate the vernacular and contemporary dwellings response to the socio-cultural sustainable features. Hence, Ghadames represents a suitable case study for investigating the socio-cultural sustainability for both vernacular and contemporary desert dwellings. Furthermore, the previous literature review in the area. provides background data including maps, charts, and some statistics.

The town of **Sabha** is another important example of Libyan desert architecture. It is the capital of the Fezzan region, it has the largest population density in Southwest Libya, and it is growing fast. Sabha's importance is due to it being the air and road transport hub of the

Southwest Libya region, it has a military base, and is the centre of a remarkable, agricultural industry in the desert.

The town also has historical significance: it has been the capital city of the Fezzan region since the second Ottoman period (Al-Maazi, 2006). The town of Sabha is located in the middle of southwest Libya. It is the capital of the municipality of Sabha. It is also located on one of the most important roads for desert caravans that link Africa with the Mediterranean Sea coast.

Sabha is the largest town in Southwest Libya. It has a mix of local inhabitants from Arab and local Libyan people. Some of them who are originally from Africa are linked by Islam. There is a mixture of socio-cultural traditions. The vernacular desert-dwellings sector is still in good condition compared with contemporary desert dwellings, especially in the Al-Gdeed area. The vernacular sector is partially fortified by a wall and consists of vernacular dwellings, mosques, and public spaces. The vernacular sector in Sabha is the oldest part of the town. The density of vernacular dwellings is adequate when compared with contemporary dwellings. This provides the opportunity to investigate vernacular and contemporary dwellings' responses to the socio-cultural sustainability for dwelling design.

A study of the desert town of Sabha is made in order to give a complete picture of vernacular and contemporary architecture for desert dwellings in Southwest Libya (see Sections 5.3.2 and 5.3.4 in Chapter Five). Hence, Sabha represents a suitable case study for investigating socio-cultural sustainability for both vernacular and contemporary dwellings.

The historical town of **Ghat** is the third important example of a Libyan desert towns where there is a living bridge between vernacular and contemporary architecture to some extent. A study of the desert city of Ghat is made in order to give a complete picture of the vernacular and contemporary architecture for desert dwellings in Southwest Libya (see Sections 5.4.2 and 5.4.4 in Chapter Five). The town has historical significance as it was established more than 900 years ago (Ziaaf, 1999). It is located in the far south of southwest Libya. It was a great centre for desert trade from Ghadames to Timbuctoo. Ghat still has medium economic significance due to commercial traffic with some desert cities in Algeria and Niger. The population of Ghat is from the Tuareg tribes, bound together by their belief in Islam. They have a distinctive culture and have close social relationships with each other.

The vernacular town is fortified by a wall and consists of ten residential neighbourhoods intertwined with mosques, markets, and public spaces. The vernacular town of Ghat and some

of the vernacular dwellings are well maintained, as are the contemporary dwellings. The density of vernacular dwellings is adequate when compared with contemporary dwellings. This provides the opportunity to investigate the vernacular and contemporary dwellings' responses to socio-cultural-sustainability features. Hence, Ghat represents a suitable case study for investigating the socio-cultural sustainability of both vernacular and contemporary dwellings.

In spite of the historical, geographical, and architectural significance for Ghat as one of the most important cities in Southwest Libya, there are not enough studies and research to highlight the importance of desert-dwelling problems in this town. Therefore, this study will be the first of its kind and could be used to develop future dwelling projects in Ghat.

4.5.5 Pilot study

The pilot study is an important part of any research. As indicated by van Teijlingen *et al.* (2001), "the pilot study refers to the mini version of a full-scale research as well as the specific pre-testing of a particular research instrument such as questionnaire or interview guidelines". De Vaus (2002) notes that good studies provide the right basis for the reliability of data-collection tools.Furthermore, it is an important step to improve the quality of the research, particularly for case-study-based research, by ensuring the adequacy of the research tools used for data collection.Yin (2009) also stresses that a pilot study contributes to the process of refining data collection and analysis.

Prior to the start of the data collection, a pilot study was conducted to improve the reliability of the data-collection tool and to determine its suitability for research. This was done by using a small group of respondents for the questionnaire and three professionals for interview questions. The pilot study showed some of the points that were to be avoided in the questionnaire questions, such as with respect to the length of the questions and the shortening of the answer methods by marking only, as well as identifying the important aspects of tracking the data-collection tools used in interviews. Consequently, the final research tools were designed to reflect what was obtained from the pilot study. The following section examines the research options for data collection and analysis in relation to this research, and presents the choices made for this research with respect to these elements.

4.6 Research choices

The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. Therefore, the appropriate research choice represents an important aspect of achieving the research aim. The research methodologies determine the approach for data collection with respect to the quantitative and qualitative research choices (Saunders *et al.*, 2009). Both choices are based on selecting the investigation measures.

In social sciences, qualitative research is of vital importance. It provides thorough information related to understanding the reasons governing human behaviour. It explains the different behavioural aspects by utilising reasoning techniques. In other words, it examines why a particular decision is made, how it is made, and why it relates to the what, where, and when of quantitative research (Saunders *et al*., 2009).

These methods help in deeply understanding the occurrences that have not been revealed much in the past. Moreover, even though large amounts of data exist related to an occurrence, it can still be used to find a new viewpoint regarding it, or used to take a more comprehensive look that otherwise would have been difficult to convey qualitatively (Collis, 2013). Qualitative data sources are predominantly used to fulfil this research strategy. However, within the case study, both qualitative and quantitative data are appropriate (Collis, 2013).

Quantitative research examines quantitative properties, occurrences, and their interactions, both methodically and logically. Both types of research data collection are adopted in natural and social sciences (Asthana, 2008). Quantitative research is defined as the investigation of a social issue by choosing some variables, testing the relative hypothesis, measuring it with numbers, and examining it by employing statistical tools and methods to determine the authenticity of the formulated hypothesis (Creswell, 1994).

The mixed-method approach combines both quantitative data collection, such as questionnaires, with quantitative data analysis and quantitative data collection, such as in-depth interviews. The process of data analysis either takes place simultaneously, or one takes place after the other and they are not combined together; this method supports the scientific foundations of knowledge (Creswell, 2014). The advantage of quantitative techniques compared to qualitative techniques is that the latter cannot be used for data collection.

Therefore, this study proposes the adoption of qualitative research supported with quantitative methods (mixed-method approach), such as questionnaires. This method will be used to obtain the views of the different generations of the local population in the three historical towns under study in Southwest Libya, and semi-structured interviews with professionals will be used to investigate the socio-cultural-sustainability features for both vernacular and contemporary desert dwellings for desert-dwelling design. Therefore, a mixed-method approach, which is a pragmatic philosophical choice, will be adopted for data collection because the holistic case study allows a variety of data-collection techniques.

Creswell & Plano Clark (2008) introduce a classification for mixed research methods from the following perspectives: sequential exploratory, sequential explanatory, sequential transformative, concurrent nested, concurrent transformative, and concurrent triangulation. Creswell (2014), however, criticises this classification, stating that it is excessively broad. Furthermore, this classification is based on the research for social and behavioural areas, such as socio-cultural aspects, which are characterised with overlaps of taxonomies. Rommet et al (2015) presents a critique of this approach, arguing that other mixed-method approaches also incorporate sequential exploratory, explanatory, and convergent research design components.

Creswell (2014) differentiates between two types of design for sequential mixed research methods: explanatory and exploratory. Explanatory sequential research design suggests collecting data first during the quantitative phase of the research, and then qualitative research analysis is undertaken based on the results of the quantitative phase. On the contrary, designing an exploratory sequential mixed research method suggests conducting a qualitative research phase first, followed by a quantitative phase.

An explanatory sequential mixed research method was used in this research; that is, the quantitative phases were followed by the qualitative phases. The quantitative research phase was conducted via a questionnaire and the qualitative phase was conducted by semi-structured interviews. The first phase of the research was administering the questionnaire and the final stage is the interviews.

The following section presents the research techniques used to collect and analyse the data using the methodology that has been adopted in this research.

4.7 Research techniques

Research techniques often come from a combination of techniques, through combining qualitative and quantitative inputs into the process of data generation (Collis, 2013). The purpose of research techniques is the logical use of a methodology to obtain data on the research subject under investigation. Research techniques can be applied to several research areas. Data can, therefore, be collected using questionnaires, structured or unstructured interviews, or any logical technique through which data can be collected (De Vaus, 2001). In the context of this research, which seeks to formulate a set of guidelines for the sustainable desert dwellings design in Southwest Libya by integrating the socio-cultural features of both vernacular and contemporary desert dwellings. Research techniques rely on a set of quantitative and qualitative documentation to collect and analyse data according to the techniques being used in data collection (Clifford *et al.*, 2016).

The following section discusses the methods of collecting data for this research.

4.7.1 Data collection

Yin (2003) explains, there are six sources of data collection commonly used in case-study-based research: archival records, documents, interviews, direct observation, participant observation, and physical artefacts. This research uses some of these techniques to collect data. Questionnaires have been used in this research to collect the relevant preliminary data about the design of vernacular and contemporary dwelling with respect to socio-cultural-sustainability features. The target participants were identified during previous visits, in August 2015 (see Appendixs 8 and 9, the official letters for allow to travel to collect data), to the study communities in the three historical Libyan desert towns in Southwest Libya, (Ghadames, Ghat, and Sabha). Participants from different generations in the three towns expressed their full readiness to contribute to the study since they are stakeholders and an important part of this study. The data was extracted qualitatively and analysed quantitatively. The questionnaires were distributed to the participants mainly through the researcher and with the help of some specialists in the local engineering offices, and supported by postal services. This was followed by semi-structured interviews with experienced and competent professionals, architects, and academics in Libya and abroad (see Figure 4.5). Yin (2003) notes that interviews are one of the most important research sources in a case study. Interviews provide knowledge of what the people are doing and what they are thinking,

depending on the situation. The research used semi-structured interview technology to collect qualitative data, which allowed the collection of relevant information from specific stakeholders on the design of both vernacular and contemporary dwellings in southwest Libya in terms of socio-cultural sustainability. Yin (2003) emphasises the importance of using multiple sources to collect data in case-study research, which contributes greatly to the quality of the research. Interviews have been triangulated with other data sources to improve the health and reliability of the research.

Furthermore, Yin (2003) points out that documents and records are sources of information that provide insights on some important questions, especially on field activities. In addition, historical documents provide information about specific locations. Documents, maps, photographs, the preparation of vernacular dwelling plans and access to contemporary dwelling plans in the three historical towns (case study) allows for the investigation of desert dwellings and will reveal the most important socio-cultural-sustainability features of these dwellings.

Figure 4.5 highlights the data-collection techniques and analysis adopted for this research:

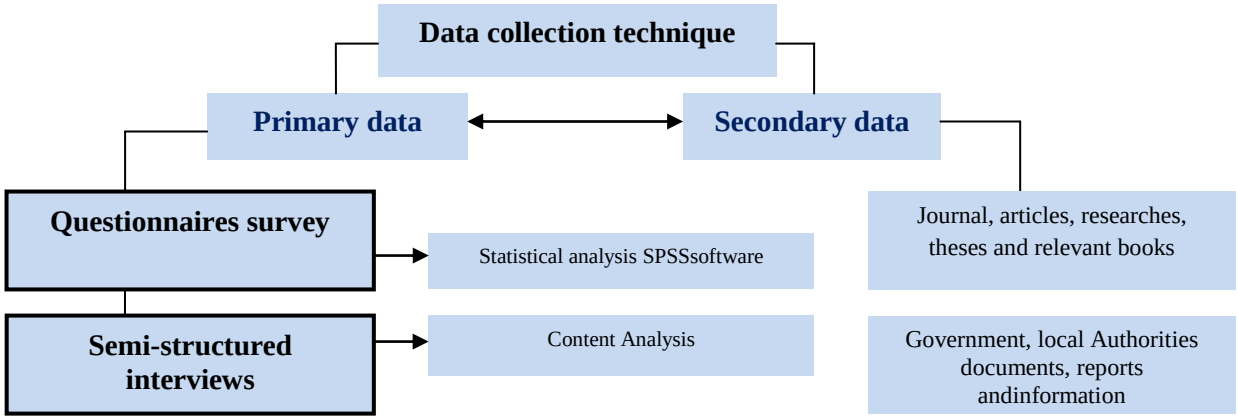


Figure 4.5: Research data-collection techniques

Sections 4.4, 4.5, 4.6, and 4.7 have previously discussed the methodology used. Figure 4.6 shows a summary of the stages and structure of methodology of this research:

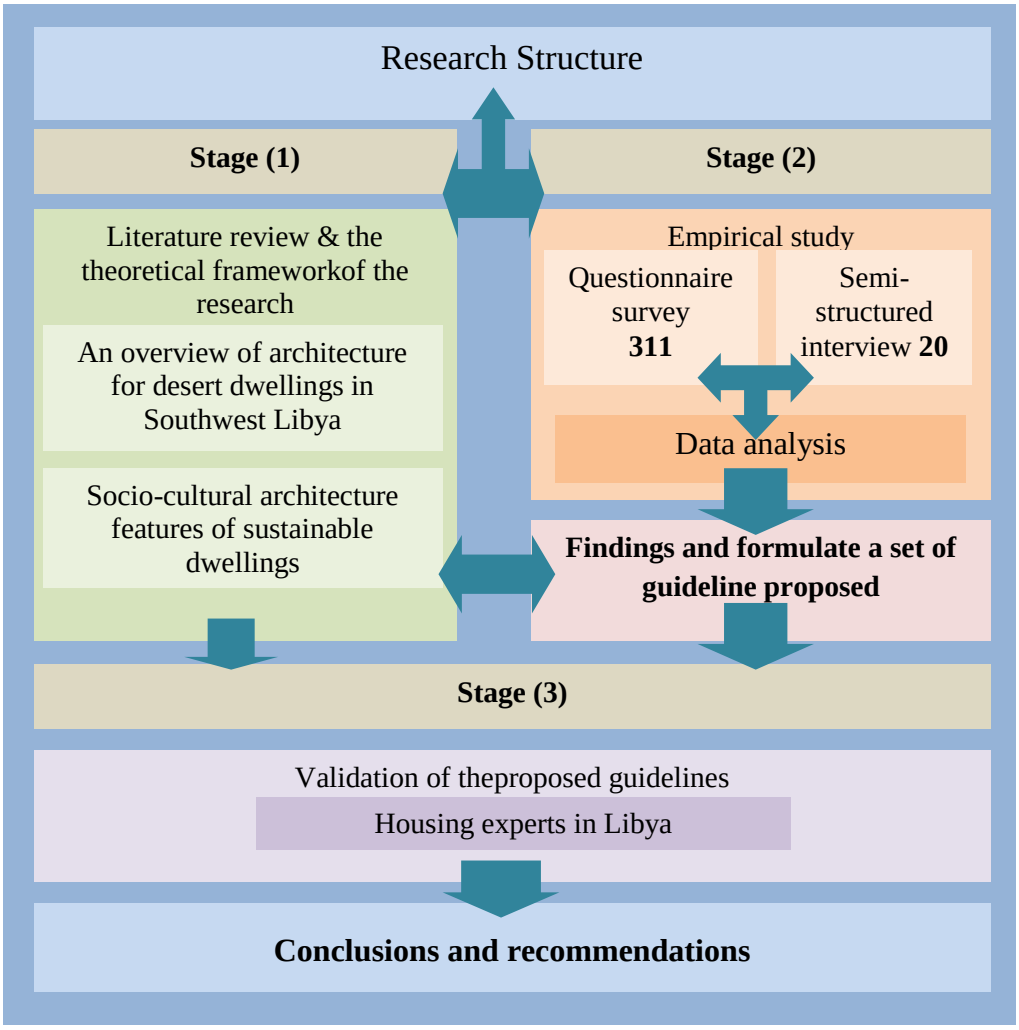


Figure 4.6: Structure of the thesis's research methodology

4.7.1.1 Questionnaire survey

There are two types of questionnaire, open and closed. Open questionnaires allow respondents to give complete answers to the questionnaire questions, while closed questionnaires depend on closed questions identified by the researcher. Research in social sciences requires considerable information and preliminary data. Questionnaires are used in social sciences to enrich the research subject and to verify views (Black, 1999).Many researchers use research techniques such as interviews and questionnaires to collect data and information in different research engagements (Tashakkori and Teddlie, 2003). A questionnaire is the most common research method used in social sciences (Bryman, 2012). Naoum (2013) indicates that reliable questionnaires provide relatively high and enable researchers to collect accurate data. De Vaus (2001) points out that the questionnaires provide important data and explanationsfor quantitative research,which are enough to perform an interpretation. In addition, it provides the foundation to measure and analyse the topic that is under investigation (Berge and Lune, 2012).

Questionnaires have been widely used as a method for collecting data in built environment research (Bryman, 2012). In the context of this research, a questionnaire was used as the main research method to identify and assess the opinions of different generations in southwest Libya on both vernacular and contemporary dwelling designs in terms of the socio-cultural-sustainability features of the different aspects, and to determine their preferences and desires (see Appendix 4). The questionnaire was designed from 6 sections after the pilot study. The six sections of the questionnaire are designed to answer the research questions and achieve the research objectives. The first section deals with respondents description, second and third respondents about the vernacular and contemporary desert dwellings section 4 was comparison and measurement of the level of population satisfaction for both vernacular and contemporary desert dwellings. Section 5 on significance of socio-cultural sustainability. Final section for the population's requests to design sustainable desert dwellings.

A total of 311 valid and complete questionnaires were collected from total 450 questionnaires (the percentage of valid and complete questionnaires is 69%), were distributed to respondents of different generations in the three historical towns in Southwest Libya which were selected as a case study (150 questionnaires for each towns). (see Sections 4.5.4.3 and 4.5.4.4, and Table 4.5). Most of them are young people from higher education institutes and universities in the three towns mentioned. The questionnaire questions came from literature review. The questionnaire was submitted to respondents in Arabic, which they understood as it is their mother tongue, and it is also the first language of the researcher. Then the questions on the questionnaire and the answers from the respondents were translated into English. The translation was verified by presenting it to English language specialists.

4.7.1.2 Reliability testing of questionnaire survey

A reliable questionnaire helps to get accurate findings . Therefore, checking the reliability of the quantitative data collected for the research removes the errors in that data (Sarantakos, 2013).Several methods are available to use to measure the reliability of the data froma questionnaire, such as factor analysis, test-retest reliability, retest reliability test, parallel forms, and Cronbach's alpha coefficient. Of these, Cronbach's alpha coefficient is the most commonly used to determine the reliability of questionnaires (Pallant, 2010). This test is usually used for questionnaires that include several Likert questions. When using Cronbach's alpha coefficient to test reliability, a result is obtained between 0 and 1, where 0 means that the result of the data is unreliable and 1 means it is completely reliable (Fellows and Liu, 2008).

As Pallant (2010) points out, a Cronbach's alpha coefficient of 0.70 is an acceptable level. Cronbach's alpha test was performed on the data collected for this questionnaire to determine its reliability. The result is shown in Table 4.6, which indicates that the value of Cronbach's alpha is 0.741, so the questionnaire has an acceptable internal consistency reliability.

Table 4.6: Reliability statistics

Cronbach's Alpha	N of Items
.741	24

4.7.1.3 Interviews

Interviews are one of the most important methods used to collect information, data, and opinions. Throughout the interview the researcher asks the interviewees questions in order to obtain answers related to the subject of the research (Naoum, 2013). As Zhang and Wildemuth (2008) indicate, interviews are the most common method used in qualitative research in particular, which is used to determine people's ideas, experiences, perceptions, and opinions on different subjects; their attitudes; and their sense of reality. According to Saunders *et al* (2009), using interviews to collect data helps the researcher to collect correct, reliable, and relevant data to answer the research questions directly. Blickie (2011) notes that interviews provide an in-depth diversity that explains social concepts, meanings, and the social interaction of the participants. Furthermore, Kvale (1983) confirms that *"technically the qualitative research-interview is semi-structured, it is neither a free conversation nor a highly structured questionnaire. It is carried through following an interview-guide, which rather than containing exact questions focuses on certain themes"*. However, the main goal of the interview is to understand the purposes and expressions of the person interviewed (Kvale, 1996). According to Clifford et al. (2010), there are three main types of interviews; the following points will explain these three types.

- **Structured interview**

The structured interview is characterised by a list of pre-prepared questions. In this type of interview, successive questions are asked in almost the same way and the same order. This type of interview is advantageous if there is a need to answer questions about literacy or numeracy issues (Gill *et al.*, 2008). Gill *et al* (2008) explain that structured interviews are not useful in cases of in-depth inquiries because they only allow limited participation for respondents.

- **Unstructured interview**

An unstructured interview, which is the opposite of a structured interview, is one where a real conversation is conducted with the interviewee rather than using pre-prepared questions. Unstructured interviews are useful for getting answers where there is a need for an in-depth understanding of a particular phenomenon, particularly in a cultural context (DiCicco-Bloom and Crabtree, 2006), such as for studies in the ethnographic field.

- **Semi-structured interview**

Clifford *et al* (2010) indicate that the semi-structured interview allows the researcher to prepare pre-defined questions that facilitate the interview and help to conduct the dialogue in a conversational way. This is a great opportunity for participants to explore and expand on issues that they feel are important. According to Noor (2008), semi-structured interviews are always focused on specific topics, but are performed in a conversational way; therefore, it is an appropriate means of learning about the motivations behind people's choices, preferences, behaviour, opinions, and beliefs. In addition, the researcher often finds unexpected valuable information through semi-structured interviews (Raworth *et al.,* 2012). Gill *et al* (2008) and Britten (1995) point out that semi-structured interviews comprise several key questions that help to define the areas to be explored, but moreover allow the interviewer or interviewee to diverge in order to pursue an idea the interviewee in more detail. Bryman (2004) maintains that semi-structured interviews offer a more flexible environment that enriches the interview with more questions and significant answers.

In the previous discussion the arguments focus on the importance of the semi-structured interview, especially in qualitative research. Accordingly, semi-structured-interview techniques are appropriate for this research because they facilitate the exploration of the relevant topic of research, and provide a flexible environment that contributes to further explanation and elaboration. In this regard, semi-structured interviews were adopted as the major method of data collection in this research (see Appendix 5). As Silverman (2011) observes, through using a semi-structured interview technique, the researcher can explore different issues that are related to the research in more detail by asking questions in a flexible environment, which allows clear answers that help to remove ambiguity from the topic. As this research seeks to explore various views on the sustainable design of desert dwellings, the semi-structured interview is considered to be an appropriate technique for

use within the time available to complete this research. Moreover, the participants can express their scientific views based on their experiences in dwelling design and architecture in Libya.

With regard to this research, which is to formulate a set of guidelines for integrating the social and cultural architectural characteristics of public and contemporary desert dwellings in order to design sustainable desert housing in Southwest Libya, semi-structured interviews were conducted in three selected historic towns in Southwest Libya (see Sections 4.5.4.3). The participating professionals and experts were selected based on their experience, knowledge, and knowledge of the nature of the built environment and the population in the area under study. Based on their responses to the participants' information sheet and the invitation letters addressed to them to participate in this research (see Appendices 1 and 2). Professionals and experts appointed to conduct interviews have been contacted through the invitation letter and the participants' information sheet, and thenthe researcher receives the consent form to the research participants as required by the research regulations at the University of Salford (see Appendix 3). Once a notice of participation was received, the appointment for the interview was set. Prior to the interview, the participation in the research was confirmed. All interviews were conducted in Arabic, which is the mother tongue of all professionals and experts. The researcher then translated it into English and confirmed the translation by presenting to specialists in English language, and then re-sent the verbatim translation of the contents to the interviewees to confirm the originality of the information supplied. Twenty interviews were conducted, due to the need for different views and perspectives to cover all aspects of research, in particular that the research about the socio-cultural sustainable dwellings design, which involves several socio-cultural features and multiple aspects that need to be explored and according to the argument that interviews for data collection depend on various factors related to the subject under discussion (Baker and Edwards, 2012). As Creswell, (2009) suggests that between 15-25 interviews are enough for an interpretive study. With regard to this research and due to the nature of the diversity of the subject, the number of 20 interviews is quite appropriate in combination with the use of the questionnaire. To further justify the appropriateness of using 20 interviews with a questionnaire for this research, Akotia (2014), for example, used 21 interviews in his PhD thesis on a subject that is similar to field of this research, which was using a mixed-methods approach to develop a framework on the benefits of social and economic sustainability to assess sustainability projects in the UK.

4.7.2 Data Analysis

4.7.2.1 Questionnaire analysis

Two types of analysis method, descriptive statistics and the Wilcoxon signed-rank test were used to analyse the questionnaire data. Initially, descriptive statistics were used to analyse the data collected. Pallant (2010) indicates that *"descriptive statistics describes the basic characteristics of the data in a study"*. Descriptive statistics provide a summary of the sample details through tables and graphs to simplify understanding. Descriptive statistics were used to illustrate the sample details, and describe the current situation for both vernacular and contemporary desert-dwelling designs. Second, respondents' opinions were obtained and their satisfaction levels were measured with respect to both vernacular and contemporary dwelling designs in terms of their socio-cultural sustainability; a five-point Likert scale was used to measure the respondents' levels of satisfaction.

As a result of the ordinal nature of the data we cannot use parametric techniques to analyse Likert type data. Since Likert type data is not numeric data (categorical data), normality assumption is not appropriate (Kvam, 2008), especially since the sample is relatively large. For two matched (related) samples using Likert scale, non-parametric methods should be used for the comparison of Likert question responses (Gregory, 2010). The Wilcoxon signed-rank test is a non-parametric statistical hypothesis test used when comparing two related samples in order to examine whether the mean ranks differ (Kvam, 2008). In respect of this research, the purpose is comparing the attitude of respondents towards both vernacular and contemporary desert-dwelling designs in terms of their socio-cultural-sustainability features. Namely, each participant was asked to identify his/her level of satisfaction towards the two types of dwellings. Median was used to define the attitude. Mean and standard deviation (SD) are used to rank the answers from a high opinion to a low opinion. The data analysis was performed using SPSS 22.

4.7.2.2 Interviews analysis

According to Bryman (2004), qualitative data is often analysed using the content-analysis method, which is an approach used to analyse documents and texts to measure the content that is determined methodically in advance. Silverman (2011) describes that a researcher can benefit from content analysis to create more analysis groups. The content-analysis technique was used by the researcher to gain an in-depth understanding of the views and perceptions of

the participants (i.e. the professionals, experts, and architects involved in the research)with respect to the design of vernacular and contemporary desert dwellings in terms of their socio-cultural-sustainability features, and to identify issues arising from the interviews. The recorded interviews were transcribed. The process of transcribing interviews that have been the recorded requires accuracy when presenting the words spoken during the interview as text. The process to analyse the qualitative data is an important stage; it took time and was carried out with precision to ensure the validity of the transcribed data. It is often considered to be an arduous task that requires accuracy in the case of large numbers of interviews. However, transcribing the interviews provides the researcher with the advantage of obtaining better clarity and greater knowledge of the interview data (Korden and Sainsbury, 2006). Therefore, based on the aforementioned advantages, the data was extracted from the interviews by transcribing the recorded interviews and presenting them as text so that the data can be easily read.

The analysis began by giving a specific code to each participant. This was followed by similar topics and data being unloaded and abstracted in tables. These topics were then narrowed down by combining them with some similar concepts, ideas, topics, phrases, and terms in the field of research to enhance the reliability of research. Open coding was adopted to examine the texts that were extracted from the interview transcripts sentence by sentence. The texts that contain relevant information have been manually coded to discover patterns and themes of topics based on their mutual relationships. Certain texts that have been identified for use as key themes are also encoded as quotations to highlight the salient topics that were identified through the analysis of interview results (Akotia, 2014). These processes have helped to organise the data and information, analyse its content, and interpret it as qualitative data. The process used to analyse the qualitative data for this research corresponds to the process for analysing qualitative data that is described by Creswell (2009).

4.7.3 Validation of guidelines proposal

According to Bryman (2015) the validation of research findings is the process performed by the researcher to present the findings to experts in the field of research and ask for their feedback on these findings. With respect to this research, the proposed guidelines for the design of socio-cultural sustainable desert dwellings in Southwest Libya was validated by a group of housing experts in Libya. In order to guarantee the credibility and validity of the guidelines, the researcher presented the proposed guidelines to sixteen experts in the field of

housing and architecture in Libya (professionals, academics, architects, and building developers). Their feedback and responses were included in the final formulation of the proposed guidelines.

4.8 Triangulation

According to Yin (2003) and Bryman (2004), triangulation is the use of more than one method or sources of data collection in research, especially in case-study research for the confirmation of the same truth. As Bryman (2004) indicated, triangulation provides the prospect of confidence enhancement affirms that one source of data collection may not be sufficient to address research questions from different views. In respect of this research, more than one source has been used to collect data as shown in Figure 4.5 and 4.6. This is compatible with the recommendation of Yin (2003), regarding the use of multiple sources of data to make the results of the research more accurate and convincing. In contrast, Denzen and Lincoln (2011) refer to four classifications for triangulation; theoretical triangulation, data triangulation, methodological triangulation, and investigator triangulation. In respect of this research triangulation was achieved as follows:

1. Data triangulation; the researcher used two methods for data collection used questionnaire survey and semi-structured interviews.
2. Theoretical triangulation; literature review in different aspects that are relevant to this research, such as different features of socio-cultural sustainability and desert dwellings design have been explored.
3. Methodological triangulation; though the research tends toward the interpretivism methodology, however, the questionnaire survey technique within the positivism stance was also used in this research.

4.9 Ethical approval issue

Based on the ethics policy adopted by the University of Salford, all postgraduate research students (PGRs) must obtain ethical approval before starting their research, whether with human beings, animals or human tissues. In line with the application guidelines provided by the University of Salford, the researcher applied for ethical approval from the Science & Technology Research Ethics Panel (CST). After scrutiny of the request, the panel approved the request (see reference number ETHICS APPLICATION ST15/57 in Appendix 7).

4.10 Summary and Link

This chapter presented the model adopted for this research (Saunders' research onion). The research methodology was discussed for this research, which provided the integral components of this research. Based on the approved model layers, include the philosophical stance of this research, research approaches, and research strategies, which include the study area and choice of study samples (case study), research choices, and research techniques. This was presented as the research strategy of this study, which is a case-study strategy.

The next chapter (Chapter Five) presents the characteristics of the case study for this research,relating to the three historical towns chosen (Ghadames, Sabha, andhat).

CHAPTER FIVE

CHARACTERISTICS OF
THE CASE STUDY
(GHADAMES, SABHA AND GHAT)

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CHARACTERISTICS OF THE CASE STUDY
(GHADAMES, SABHA AND GHAT)

5.1 Introduction

This chapter will focus on the three historical towns in Southwest Libya that have been selected as the case study for this research (see Section 4.7.8 in Chapter Four). The general characteristics of those regions will be presented, including the historical and natural background for each town, followed by a summary of the vernacular architecture for desert dwellings and their character, in order to facilitate a more detailed comprehension of the development of desert-dwelling designs in Ghadames, Sabha, and Ghat. Then the description and study of the types of vernacular desert dwellings. This chapter, moreover, highlights on the contemporary towns and dwellings in those towns and the architectural features of socio-cultural sustainable that influenced of desert dwellings design. Finally, a comparative summary of the vernacular and contemporary desert dwellings in Southwest Libya is presented. Figure 5.1 shows the structure of this chapter.

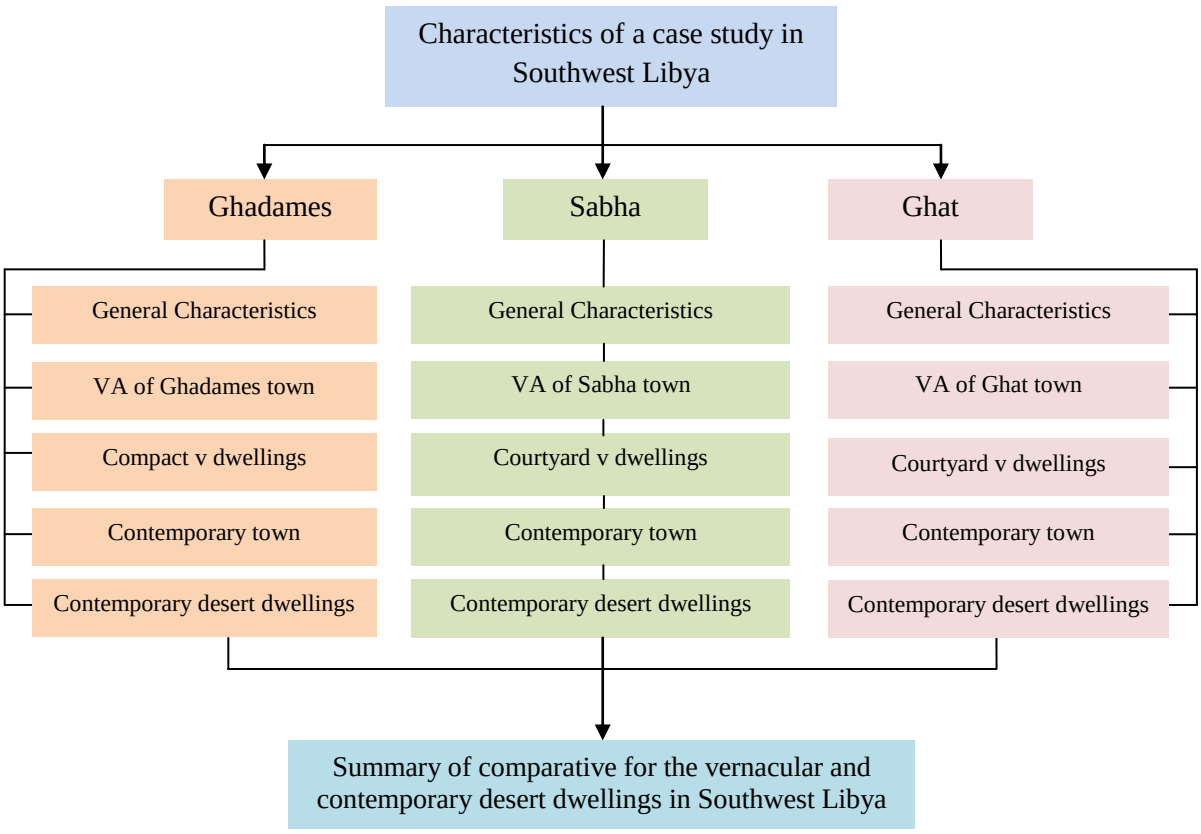


Figure 5.1: Structure of Chapter Five: case study

5.2 Ghadames (Sample 1)

5.2.1 General characteristics of Ghadames

The vernacular villages and towns in the desert of Southwest Libya are fundamentally found, throughout its long history, in the chains of oases and residential gatherings stretching throughout the Sahara Desert, such as Ghadames, Hoon, Sabha, Murzuq, and Ghat. Over time, these towns have evolved and grown economically, in the beginning through the desert caravan trade. Since the discovery of oil in the Libyan desert, these historical towns have grown at a faster pace and have developed rapidly, causing major changes in the dwelling environments, and the architectural landscapes for those towns. Ghadames is one of those towns that has a clear, significant difference between the sectors for vernacular desert dwellings and contemporary desert dwellings, which has led to several changes in dwelling designs and to the distortion of this scene.

5.2.1.1 Historical background

The emergence of urbanisation and architecture in the oasis of Ghadames was based around Ain Al Faraas (see Figure 5.2), which is a very ancient spring that was used for watering the land and other basic uses. On this basis, the oasis grew throughout many eras and later became a large desert town (Ealiwa, 2000). There are some authors who allege that Ghadames is an Arab town; however, much research indicates that Ghadames was known to the Romans as Cydamus a long time before the Arabs came to North Africa in the 7th century AD (El-Agouri, 2004).

Tools from the Palaeolithic era and modern times were discovered in the vicinity of Ghadames. In 19 BC it was colonised by the Romans and they called it Cydamus. The ruins of the ancient Roman castle still exists about 7 km north of the vernacular town of Ghadames, which is known locally as Timsudden (see Figure 5.3). In the Byzantine era there was a church and a bishop in Ghadames. Therefore, most historians and archaeologists believe that the creation and formation of the first nucleus of the oasis of Ghadames was in the period of the Al-Garamants, i.e. BC. The Arabs came with the Islamic conquest in AD 667, and then Islam became the religion of the people at the oasis. In addition, a mixture of Roman and Al-Garamantin arts and architecture have been found in the town (Dhouib, 2013).

Shawesh (1996) indicates that the Arab Muslims encouraged Ghadames to continue as a station for trade caravans in the desert because commercial activity was deeply rooted among the inhabitants of the desert, which led to increasing the importance of Ghadames. Regarding the Ottoman period, there is little historical information available on the first Ottoman period because Ghadames was not subject to the Ottoman Empire in Tripoli, but rather followed the Hafsid state in Tunisia. Ghadames became part of the Ottoman state of Tripoli in 1842. The Ottomans built a fortress in Ghadames, which was completed by the Italians, and another brick building in a place called Tiluan. In 1850, a consular branch was opened for Britain. In 1894, the consul was appointed as the official representative of French interests in Ghadames (Shawesh, 1996).

Figure 5.2: Ain Al Faraas (after the upkeep)

Figure 5.3: Ruins of the ancient Roman castle

Source: Researcher's fieldwork (2015)

In 1914, the Italians occupied Ghadames, and built several administrative buildings and a small hotel, which still exists nowadays. The Italians left in 1940, after which the French came later that year. However, the French also left in 1955 without leaving anything architectural behind (El-Agouri, 2004).

5.2.1.2 Location and natural characteristics of Ghadames

Ghadames is name of the oldest desert town in the southwest Libya, which gained its importance from having played a critical role in the history of the region as a trade station for the desert caravans that linked the Mediterranean Sea coast and central Africa. It is located about 630 km southwest of Tripoli, at an elevation of 360 m above sea level, and between 30°08' north (latitude) and 9°30' east (longitude) (Eltrapolsi, 2016).In addition, it is close to the triangular area that borders with Tunisia and Algeria, as shown in Figure 5.4.

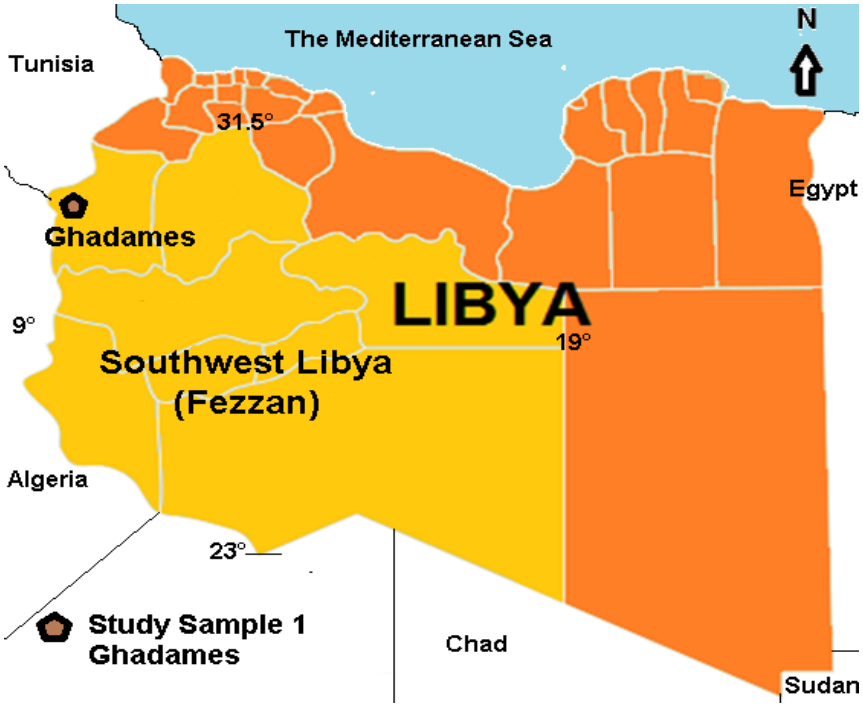


Figure 5.4: Location of Ghadames and neighbours

Most of the local population in Ghadames are of Amazigh (Berber) origin, along with a mix of other people of Arab, Tuareg, and African origin. They speak Arabic as well as the local Ghadamesi language; this may be the secret of the rich socio-cultural diversity in Ghadames. Most of the inhabitants of Ghadames worked in the desert caravan trade across the Sahara Desert (see Section 2.3.3 in Chapter Two), as well as in agriculture and salt production. Most historical references point out that cross-desert trade was the primary activity of the population of Ghadames (Shawesh, 1996). This economic activity, in addition to the availability of water, is the main factor in the development of the vernacular architecture in the oasis and also in the development of the present town.

There is a lack of information on the historical background and characteristics of social life in Ghadames before Islam. Most of the material written about Ghadames comes from foreign travellers who have sometimes relied on literary and mythological stories. The social relations of people remain strong, and the family supports its members morally and economically. The social structure is based on tribes, with the tribes divided into clans and branches. However, the family is the most important unit of this social structure. Ghadames maintains sustainable social measures aimed at keeping families strong. The influence of the family on the design of public housing can be seen, especially in the organisation of spaces. The social life in Ghadames is more conservative. Each neighbourhood has its own individual characteristics

and each family has its own space. People in Ghadames have built squares within each neighbourhood in the town for meetings, festivals, weddings, and other social activities. Social and cultural activities are an important part of the daily lifestyle of the people of Ghadames, and they contribute to the creation of a strong community spirit (Shawesh , 1996).

The vernacular town of Ghadames was inhabited by three major tribes. Each tribe is divided into a number of families that form the tribe. However, all the streets of the town were named according to the name of the family who inhabited the street. These tribes are Ben Al-Walid and Ben-Wazit, and Tuareg. Ben Al-Walid and Ben Wazit are considered to be indigenous residents. While the Tuareg came later to Ghadames. Historians believe that the Ben Al-Walid originate from Arabs, and are divided into Tusku, Derar, Mazigh, and Aolad Bilal. While the Ben-Wazit include the Tangzin, Gersan, and Tefarefra (see Figure 5.7). The Tuaregs consist of the Awragen and Avogas, who lived in the vicinity of the vernacular town before the establishment of the present contemporary town of Ghadames. The average population of Ghadames is about 27,000 according to the 2006 census.

El-Agouri (2004) indicates that the natural location of Ghadames is within the limits of the Al-Hamadah Al-Hamra plateau. It is surrounded by salt lakes, and on the western side it is surrounded by sand dunes in the shape of a crescent, and there are rocky bumps to the east that are covered by sand.

As a result of being located within the desert climatic range, as mentioned in Chapter Two (see Section 2.3.2), Ghadames has harsh desert climatic conditions. As the temperature rises, the humidity decreases, the hours increase with solar radiation, and the amount of rain decreases with an increase in the number of sandstorms. Therefore, the weather is generally cold at night in the winter, and is hot in summer all day and evening. The temperature may sometimes rise to more than 42°C during the day (El-Agouri, 2004).

However, the desert dwellings in Ghadames were designed in response to the social, cultural, and climatic factors. There were treatments where the town was built as a single block. All the dwellings and streets have good ventilation, protecting their inhabitants from the sun and sandstorms, while providing a warm social life. Lessons can be drawn from the vernacular dwelling designs in Ghadames and the other oases of Southwest Libya. All of these towns prove their suitability to meet the inhabitants' social, cultural requirements, which is in contrast to the contemporary towns where several social problems have emerged (Shawesh, 1996). Therefore, the vernacular town of Ghadames is one of the most important vernacular desert towns, and was added to the World Heritage List by UNESCO in 1987.

5.2.2 Vernacular architecture of the town of Ghadames

The vernacular town of Ghadames was organised according to social, cultural, and climatic needs. This is clearly evident in the establishment of the social units in the town. Throughout the history of the ancient town, the features of the architectural landscape in Ghadames prove that the spatial pattern of the town is directly related to traditional social organisation, and the town has grown cumulatively (see Figure 5.5). The socio-cultural and climatic requirements have played a significant role in this growth. Thus, the spaces are organised hierarchically from the private to the public in general, to ensure privacy, which is one of the principles of sustainability. The general urban fabric of the oasis forms a single, large gathering of dwellings, including markets, mosques, and other public spaces.

The division of society according to social and blood ties has led to the development of the seven neighbourhoods which are Tusku, Derar, Mazigh, Tefarefra, Gersan, Tangzin, and Aolad Bilal (see Figure 5.6). Each neighbourhood has a central courtyard and a main mosque. About 23 mosques have been built in the town, and this has strengthened the relationship with the religious places (El-Agouri, 2004). The seven neighbourhoods within the oasis are relatively homogeneous in terms of their architectural features. It even looks like they were all built at the same time. However, the neighbourhood of Aolad Bilal appears to be more sophisticated because it was built later and most of its inhabitants are merchants of Arab origin (Elhassi, 2004).

The stunning architectural landscape in Ghadames (see Figure 5.6) comes from the environmental architectural formation, including white mud walls, alleyways, doorways made of palm trunks, a background with a mixture of green and natural colours , and densely packed dwellings with covered and winding corridors . In some places, alleyways have created dark tunnels in a hierarchy that provides privacy and safety. The main streets are no more than 3 m wide and lit through openings to the sky. The alleys more casually go in different directions allowing access to the dwellings (see Figure 5.8). Moreover, the dense fabric of the buildings creates a comfortable internal environment for the population within this fabric. The town had about ten gates, which were open in daylight and closed at night (El-Agouri, 2004). Although Ghadames was not an Arab town at the time of incorporation, it represents a good example of an Islamic desert town, as it consists of mosques, houses, and markets. It is surrounded by a wall and has several gates. Nevertheless, Ghadames maintains its unique architecture with sustainable social solidarity that promotes cultural and religious identity.

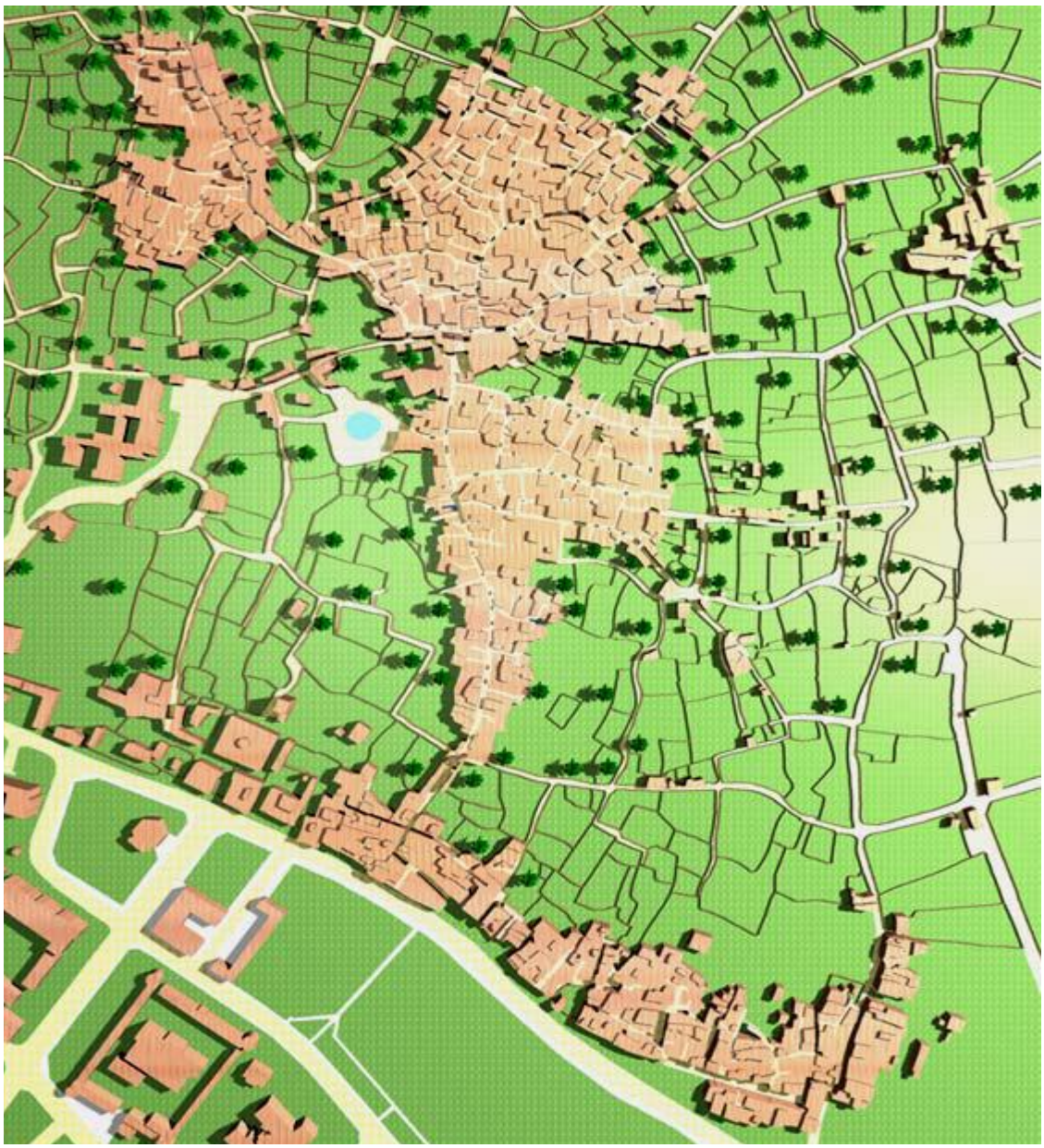


Figure 5.5: Plan of the vernacular town show the cumulative growth.
Source: Researcher, adapted from (EL- Agouri, 2004)

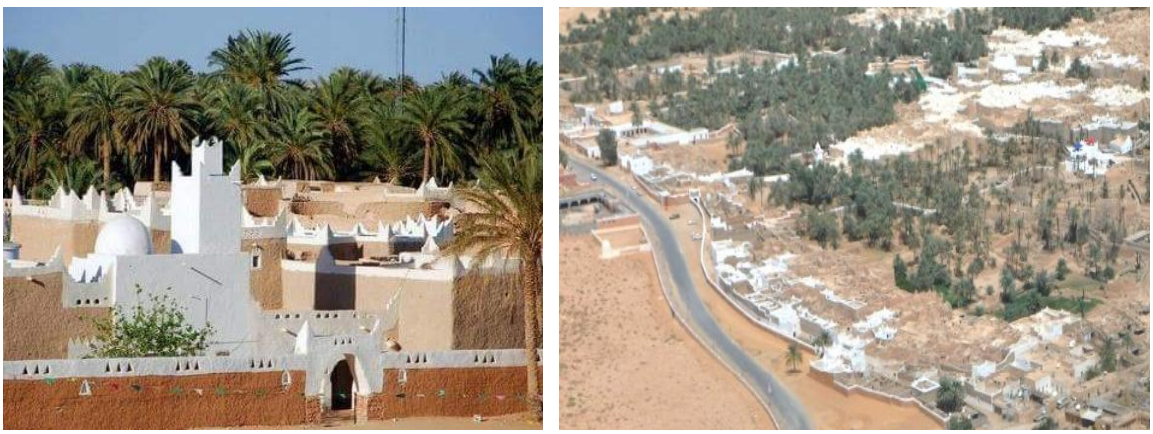


Figure 5.6: Panorama of the architectural landscape of Ghadames. Source Malik, and Google earth, (2014)

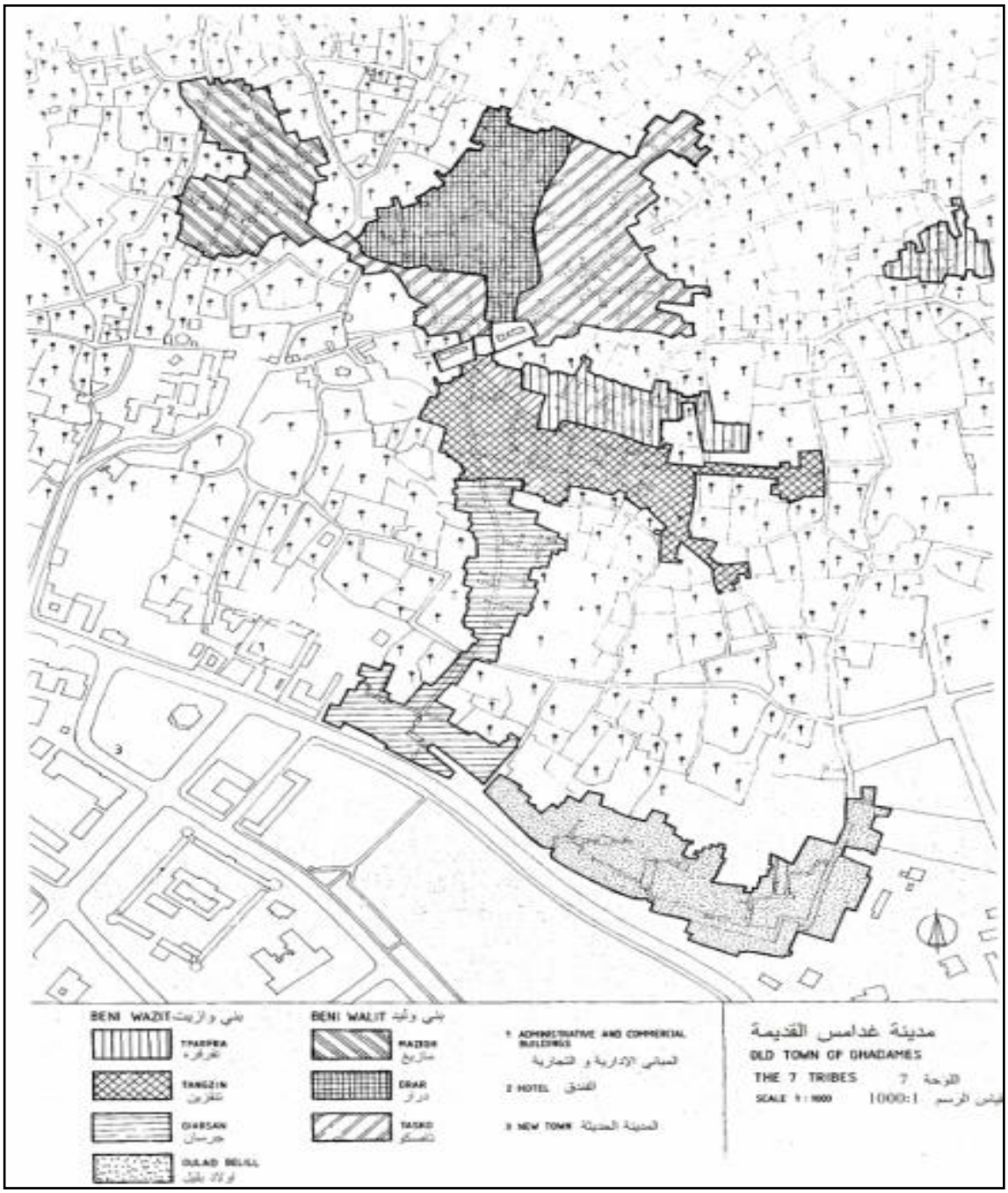


Figure 5.7: Seven neighbourhoods in Ghadames. Source: Researcher, adaptedadapted from (Dhouib, 2013)

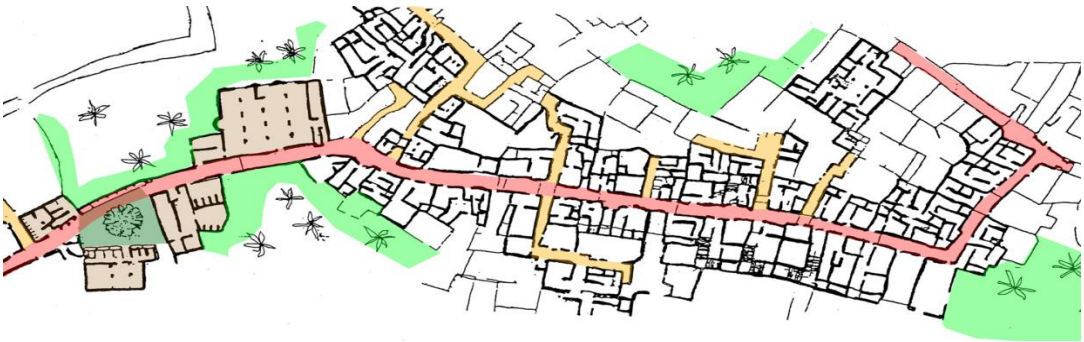


Figure 5.8: The alleys for access to the dwellings, neighbourhood of Mazigh (7). Source Researcher, adapted from Libyan Italian mission to study the architecture heritage, 1988

In summary, the architecture of Ghadames is a successful combination of history, geography, cultural heritage, religious beliefs, and local building materials and techniques. Cumulatively, this development has been acquired through an architectural pattern adapted to nature. Furthermore, the remarkable aesthetics of mud-brick construction compositions dominates the town skyline, which forms a painting between the surrounding landscape and the urban environment, and produces attractive architecture that is harmonious with the environment (Eltrapolsi, 2016).

5.2.3 Compact vernacular desert dwellings in Ghadames

Social, cultural, and climatic needs have contributed to the design of dwellings in Ghadames. Privacy, security, and proximity to water resources have been among the most important design considerations. This is in addition to the social considerations that have been reflected in the dwellings, by dividing the dwelling into two parts: a private family part protected from external factors and a semi-private part for visitors. It is worth mentioning that the vernacular dwellings in Ghadames have similar characteristics and semi-uniform patterns. The differences are often in size and interior decoration, and reflect the social life and standard of living of its owners. There are no open inner courtyards, which is a characteristic of desert dwellings in Ghadames and some of the neighbouring oases (Dhouib, 2013).

As Shawesh (1996) point outs, Ghadames' dwellings are very similar in size, space organisation, and component distribution. They have almost the same type of craftsmanship. There are some differences in the number of bedrooms or in the living room. The average size of the dwelling is between 70 and 90 m2. Bedroom sizes are between 8 and 12 m2, living rooms between 10 and 16 m2, bathrooms between 4 and 6 m2, and store room on the ground floor are about 20 m2 (see Figure 5.9).

In particular, dwellings were designed according to the wishes of their owners, which respond to socio-cultural needs and to internal activities. Therefore, this architectural structure represents a form with a few visual facades that rise to almost 10 m. The dwelling extends over three floors. The ground floor consists of an entrance to the dwelling that opens onto the alley. The entrance leads to the main staircase to the first floor, and there is a lobby open to the store room on the ground floor. The first floor is reached via a winding staircase. At the end of the staircase is the bathroom, which is isolated from the main living room (the centre of the dwelling). The living room is at the mezzanine level (Gabril, 2014). Other rooms are distributed around the living room on the second floor along with the upper storage room.

These rooms are higher than the living-room level and are accessed by another internal staircase, with the exception of the Kibbaa chamber, which is on the same level as the living room and it has particular importance in the dwelling related to the cultural heritage of Ghadames. This room is used by the wife on the first day of her marriage, at childbirth, and when her husband dies (see Figures 5.9, 5.10, and 5.11). This design is common in most of Ghadames' dwellings. In front of the bathroom there is a ladder to reach the top floor, which contains the kitchen and the storage room for food. There is also a balcony that leads to the upper corridors. Furthermore, the living room has a natural opening in its ceiling, which is a porthole for light and ventilation. In addition, the roof's surface provides freedom of movement for women and opportunities to meet each other for different social activities. All terraces are also connected to cover the lower streets. The roof's surface is surrounded by small walls to ensure privacy (Eltrapolsi, 2016).

The influence of socio-cultural features on the design of desert dwellings in Ghadames can be seen in the local construction techniques and materials. All dwellings were constructed from materials available in the local environment. The foundations were built with limestone and the walls were built with mud bricks. Gypsum, limestone, and mud were used in the plaster, and palm tree trunks were used for the ceilings and roofs. The structures of dwellings are integrated with each other in complex structures, making it difficult to distinguish each of them as a single body, in response to many environmental, social, and cultural requirements. Thus, the structures of the dwellings have been combined to create configurations that have social, cultural, and climatic connotations (Elhassi, 2004). It is noteworthy that the colloquial architecture of dwellings in Ghadames has the architectural formations that come in streamlined and irregular shapes, similar to the composition of sculptures, and are not like regular geometric shapes. This is one of the manifestations of harmonising the general architectural configuration with the natural environment, which has given Ghadames its aesthetic composition and distinctive architectural identity. The architectural pattern of Ghadames is unique and has not been influenced by colonial architecture patterns, whether Phoenician, Roman, Italian, or even Arab Islamic. It is therefore considered to be a local desert architectural pattern that has come about as a result of social and cultural interaction, and environmental responses over a long history (see Figure 5.10) (Elhassi, 2004).

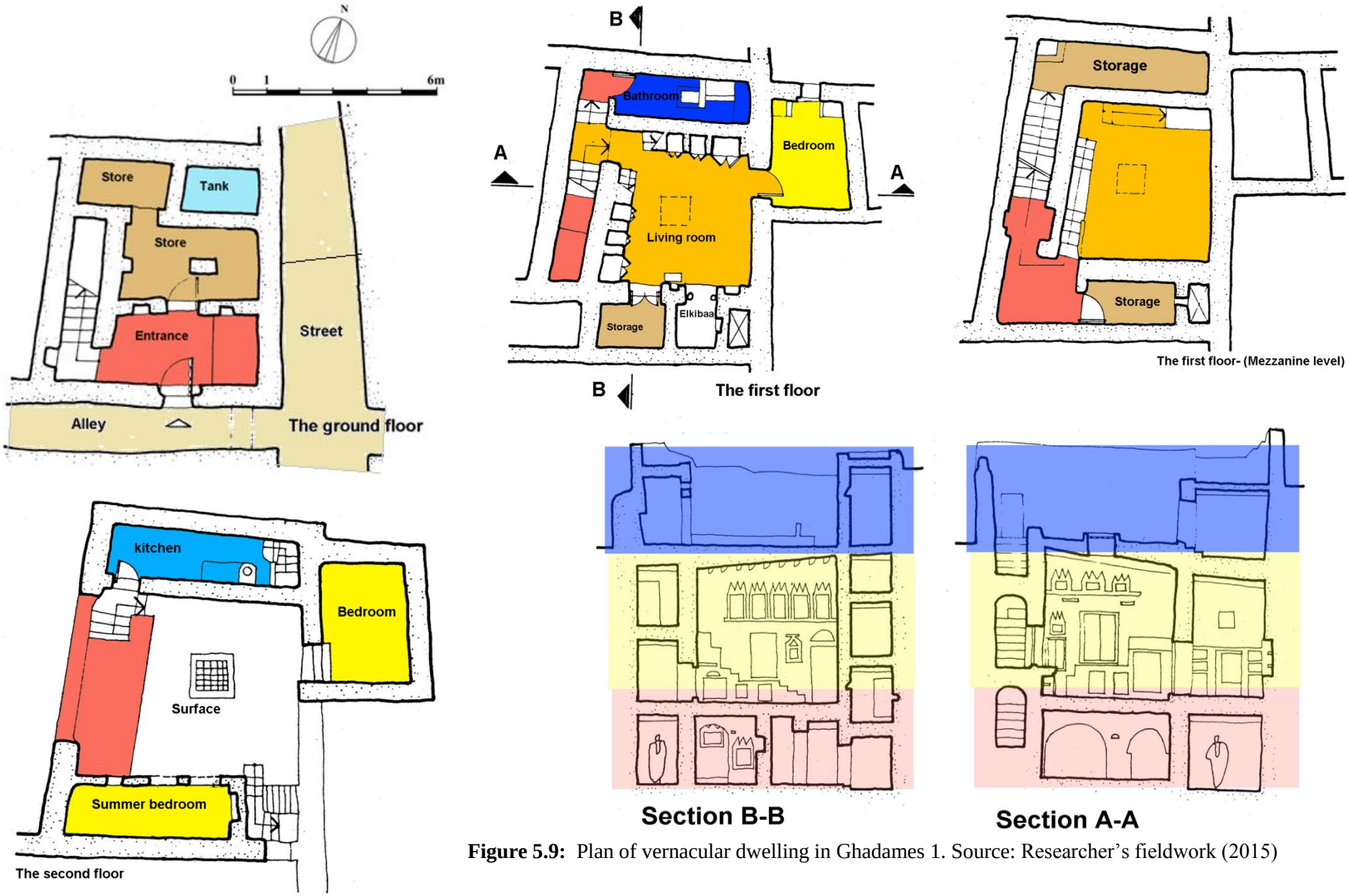


Figure 5.9: Plan of vernacular dwelling in Ghadames 1. Source: Researcher's fieldwork (2015)

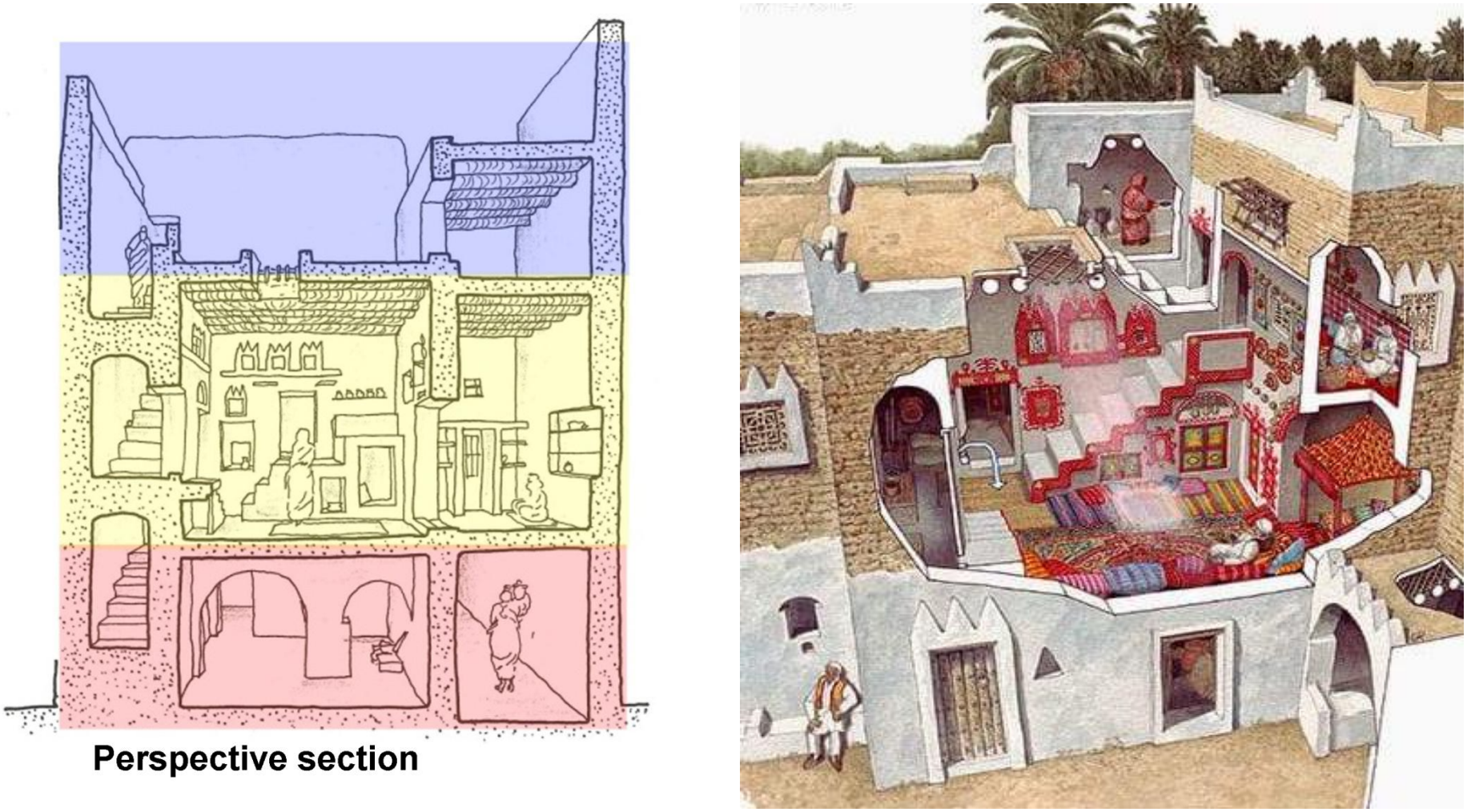


Figure 5.10: Cross-section perspective of vernacular dwelling in Ghadames. Source: Giorgio Pomella, 2008

Figure 5.11: Plan of vernacular dwelling in Ghadames 2

Source: Researcher's fieldwork (2015)

Architecturally, Ghadames is considered to be a place with unique aesthetic properties and rich techniques , which were developed by local builders to provide logical solutions for human comfort. Furthermore, there are patterns of interior decorative embellishment in the living room, which is a place with dominant figuratives, with colour inscriptions that have a cultural connotations, showing inspiration inherited from the cultural heritage through the use of many expressive materials, such as homemade paint, mirrors, copper, furniture, and souvenirs inherited from the caravan trade (see Figure 5.12).

Figure 5.12: Traditional interior decoration of living room in Ghadames dwellings
Source: Researcher's fieldwork (2015)

5.2.4 Contemporary town of Ghadames

The discovery of oil in the Libyan desert and economic growth have affected the social and cultural characteristics of Ghadames, and other historical cities and oases in Southwest Libya. There has been a rapid transformation from vernacular dwellings to contemporary dwellings in both the public and private sectors. The government began to develop plans and build housing projects, which were designed and implemented by foreign companies (Polish and Turkish), and turned Ghadames into a large town. In addition, dwelling loans were granted to citizens to build private contemporary dwellings instead of continuing to live in the vernacular that they had inhabited. Although this has led to a general improvement in the dwellings' environment through the use of modern construction technology, these plans and projects have ignored the socio-cultural and even environmental requirements of the population, and have not made any plans or recommendations to preserve the architectural identity and unique architectural heritage of Ghadames (Shawesh , 1996).

The contemporary town was planned and implemented to the south of the vernacular town, although there is no convincing reason for this. The contemporary town is surrounded to the north by the vernacular town, and to the east, south, and west by the desert (Eltrapolsi, 2016) (see Figure 5.13). The planning of the contemporary town of Ghadames has given prominence to contemporary models of development and infrastructure. Therefore, there is more interest in roads, business activities, and parking than the residential units, which were often randomly distributed. The contemporary town and neighbourhood configuration was planned with paved main streets and open spaces. This is in contrast to the urban fabric of the vernacular town. Although the contemporary planning provided more space than the compact design of vernacular town, it failed to provide the same conditions that led to the success of the town's vernacular architecture, such as the availability of privacy, safety, security, and a social atmosphere. The spread and disbursement of buildings contributed to poverty with respect to meeting these needs. The contemporary planning of the town did not take into account the importance of the oasis, or social cohesion at the level of family and tribe, which was the basis of the local lifestyle (Eltrapolsi, 2016). This led to social dissonance in the contemporary complexes, and, as a result, the social and cultural structure of the town was damaged. These dwellings were designed randomly by several foreign companies without circumventing any social and cultural considerations. Unfortunately, this type of dwelling design is still used due to the rapid population growth of Ghadames and the migration of people from neighbouring oases to live in it; has this distorted the architectural landscape (see Figure 5.15).

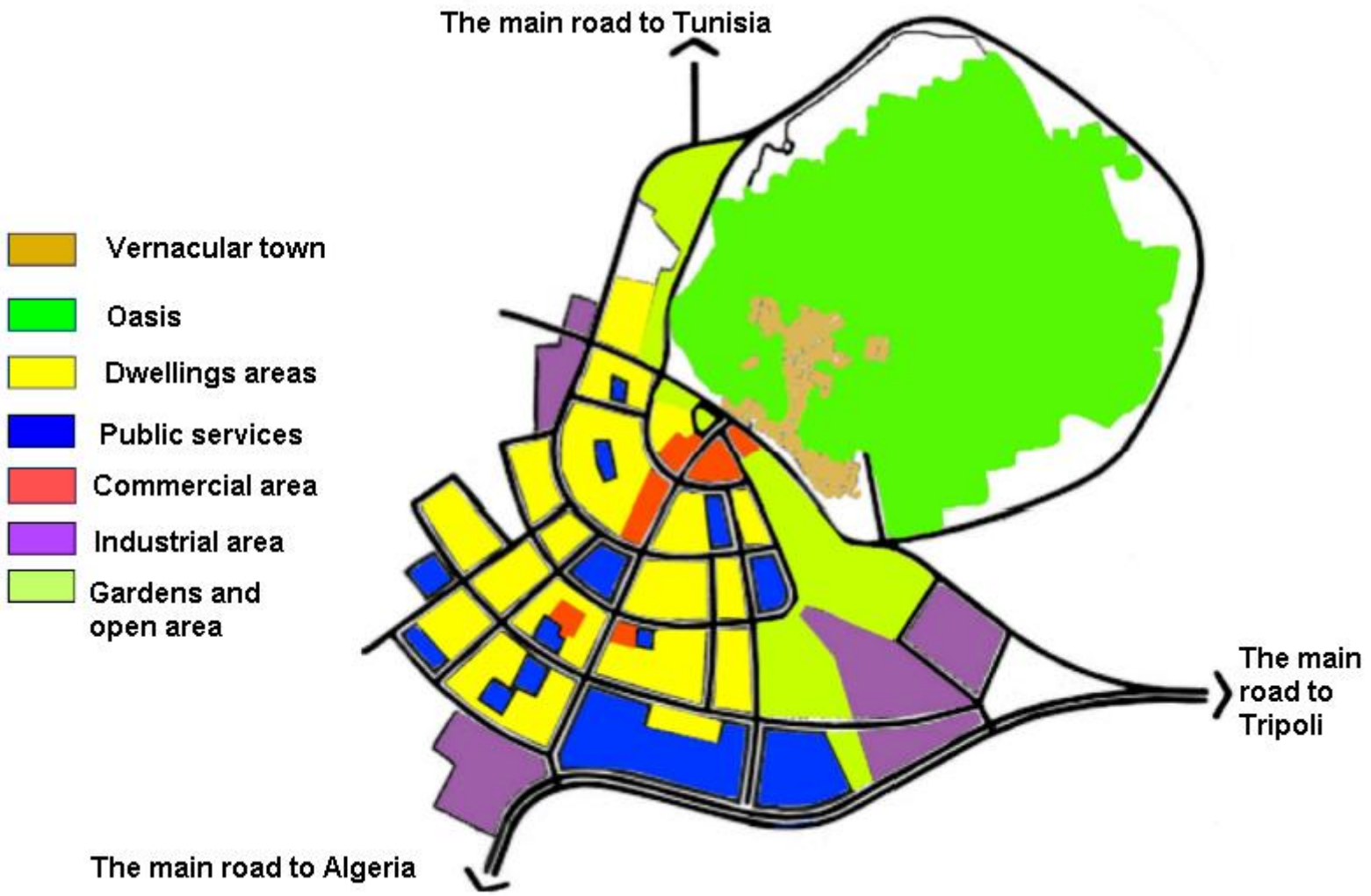


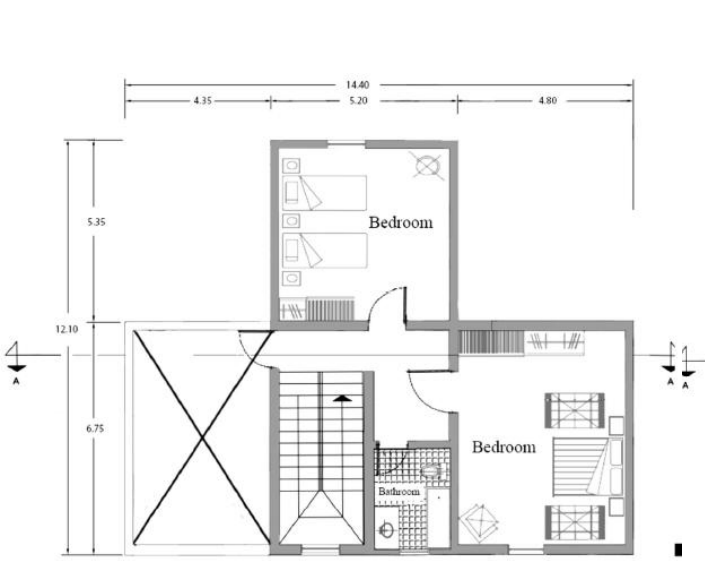
Figure 5.13: Master plan of the contemporary town of Ghadames,Municipality of Ghadames, adapted from (Eltrapolsi, 2016)

5.2.5 Contemporary desert dwellings in Ghadames

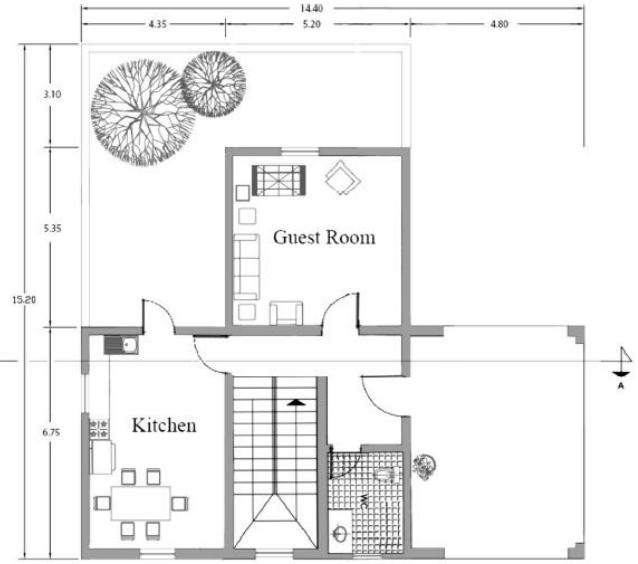
Most contemporary dwellings in Ghadames have separate architectural blocks. Sometimes a building is mixed residential and commercial. Most are composed of different levels, and are not similar in form, size, or distribution of architectural elements. They are open to the outside through a rather large windows. Contemporary dwellings vary from residential buildings (apartments) to villas and separate dwellings. However, this study focuses on two-storey residential buildings, which is the type most commonly found in the contemporary town of Ghadames that were built by the government (see Figure 5.14). The average dwelling size is from 130 to 240 m2. Each dwelling has a living room of about 16 m2; two bedrooms, each of about 25 m2; plus a bathroom of about 6 m2. In spite of this, those dwellings are considered to be suitable in terms of area, especially the size of bedrooms and guest rooms; however, there are no storage places (Gabril, 2014).

The contemporary dwellings in Ghadames were influenced by international architectural trends that changed the interior design for space and were completely different from what the people were accustomed. For example, there may be difficulty in accessing the dwelling when visitors are present. This is due to the fact that the dwellings were designed by architects who are not familiar with the nature of the people's lives, or their social and cultural needs. In addition, there was confusion regarding a lack of privacy and safety, indicated by the large, open windows directly overlooking the main streets, or overlooking the windows of neighbours and revealing their inner gardens. Also, having a kitchen near the guest room and bathroom reduces visual and audio privacy as well. The open balcony in some of the houses was often not used by the inhabitants; some of them they closed it off and used it as a store.

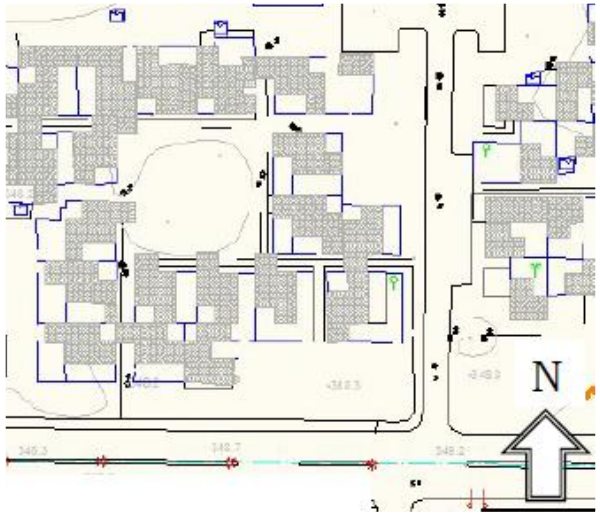
The structural system of contemporary dwellings is based on using reinforced concrete for columns, floors, and ceilings, using hollow cement bricks for walls, and using wood and marble for the stairs. Thresholds are often constructed from reinforced concrete. Windows and doors are constructed of wood or steel. The influence of contemporary international trends is evident in interior finishes and building materials in general, which has contributed to changing the architectural design of dwellings. Social, cultural, and even climatic features were not taken into account when these changes were made, nor was attention paid to social culture. Therefore, despite the improvements in architectural space in contemporary dwellings, contemporary dwelling designs and structures are not concerned with the local context of Ghadames; this is also common practice in most of the historical towns of Southwest Libya and is not popular among the population (see Figure 5.16)(Eltrapolsi, 2016).



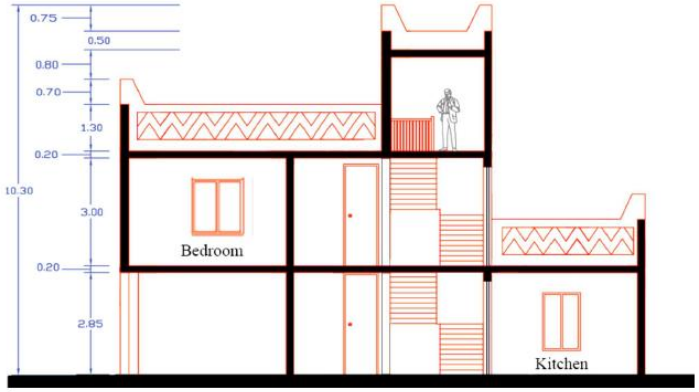
First floor



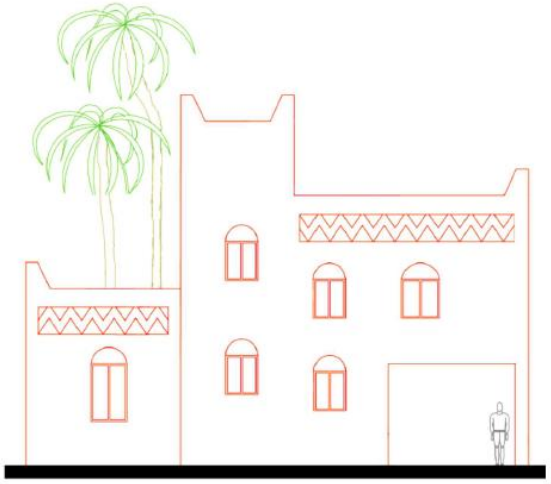
Ground floor



Part of plan of contemporary dwellings sector in Ghadames



Section



Main facade Figure

5.14: Plan of contemporary dwellings in Ghadames, Source: Eltrapolsi, 2016

Figure 5.15: Panorama of part of contemporary dwellings sectors in Ghadames. Source: Google earth (2014)

Figure 5.16: Facades of contemporary dwellings. Source: Ibrahim Malik, 2015.

5.3 Sabha (Sample 2)

5.3.1 General characteristics of Sabha

Sabha is the largest desert town in Southwest Libya and is one of the largest towns in the Sahara Desert. It is the capital of the province of Fezzan, the third largest city in Libya, and it was founded From several centuries(Al-Maazi, 2006). Sabha has two vernacular towns. The first is Ehjara, which is the oldest one, but most of its dwellings are vulnerable falling down , and a large part of the town has collapsed due to exposure to environmental factors and neglect.The second town is Al-Jadeed , in which most of the dwellings are still in good condition to some extent, and some of which are still inhabited. Al-Jadeed is located in the western part of Sabha. It has been selected to be one of the three vernacular towns under investigation in this study (Al-Maazi, 2006).

5.3.1.1 Historical background

There is a lack of references and literature written about the history of Sabha and Fezzan in general, especially regarding the architectural history and the stages of its development. However, Al-Maazi (2006) indicates that some of the historical references believe that the name of Sabha and the history of its establishment as a city came about as a result of the collapse of the Marib Dam in the kingdom of Sapa in Yemen . Some of the inhabitants of Sapa went into the desert of North Africa and established Sapa town in Southwest Libya, and the name that was later changed to Sabha. Sabha has been inhabited since before Christ . Its most important civilisation was the civilisation of Germa (known as the Al-Garamants civilisation), for which the ruins still exist 90 km to the west of the current city; this is *"the ancient town of Germa"* (see Figure 5.17) (Al-Maazi, 2006).

The population of Sabha is relatively large compared to other towns in the region, and it is rapidly growing. The importance of Sabha is due to the fact that it is the centre of air and road transport in southwest Libya, has a military base, and is a great agricultural industrial centre in the desert. One of the prominent architectural features of Sabha is El-Cahira castle (see Figure 5.18), which is a castle of historical and symbolic significance to Sabha's inhabitants. The castle was also known as Fort LeClair and was formerly known as Fortza Margherita, which was built during the Ottoman period. It was restored during the Italian rule and used by the French army as a major base during the reign of Fezzan (Al-Maazi, 2006).

Figure 5.17: Ancient town of Germa

Figure 5.18: Castle of El-Cahira, Sabha

5.3.1.2 Location and natural characteristics of Sabha

Sabha located in the middle of Southwest Libya. It gained its significance as the capital of Fezzan, and played an important role in the history of the region as a centre of government of the region, as well as an agricultural and economic centre as a result of the desert transit trade with African cities. It is bordered to the north by the Zalaaf desert region and the Al-Shatee valley. It located about 750 km south of Tripoli, has an elevation of 420 m above sea level, is between 27°03' north (latitude) and 14°42' east (longitude),and is almost in the middle of the Libyan desert (see Figure 5.19) (http://ly.toponavi.com).

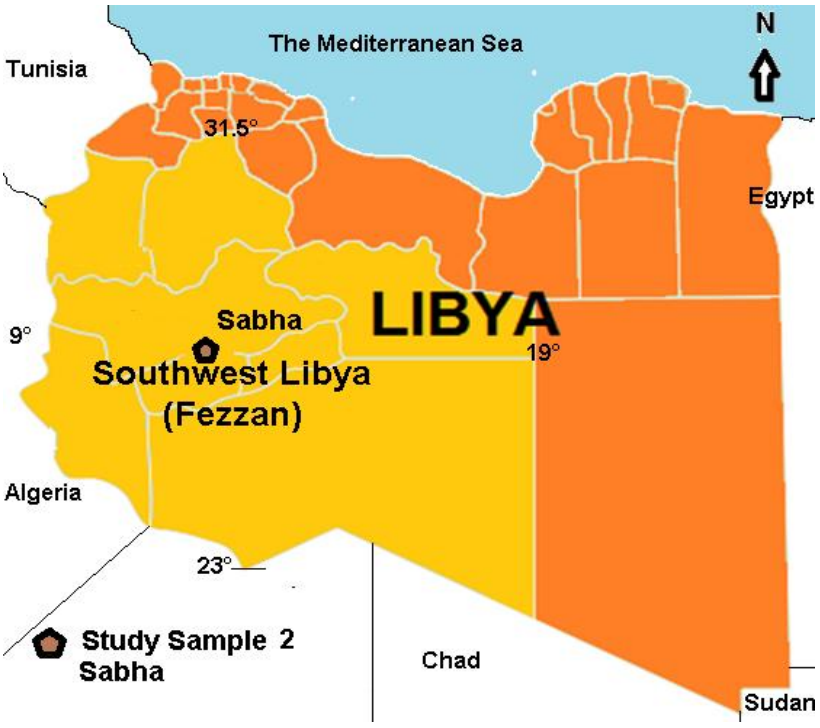


Figure 5.19: Location of Sabha

The ethnic origin of the population of Sabha is characterised by diversity and is primarily a mix of those of Bedouin Arab or African origin . The average population of the city, according to the 2006 census, is about 150,000. Most of population speak Arabic, and they mainly work in agriculture, especially grain farming, and commerce. Currently, most of them work in government jobs. Al-Maazi (2006) explains that there is a lack of historical and social background about Sabha, but, in general, it does not differ significantly, in terms of social and cultural nature, from the population of the other towns and oases of southwest Libya, where peaceful coexistence among its ethnic components prevails. Most of the residential neighbourhoods within the vernacular town of Al-Jadeed or even the contemporary city have been divided on a tribal and social basis. Therefore, the social relationships among the people in one neighbourhood are strong. Like other towns in Fezzan, the social structure is based on tribes and clans. As a result, the population maintains a good social life in Sabha. Each neighbourhood has a place for social gatherings and some cultural activities.

5.3.2 Vernacular architecture of the town of Sabha

It seems clear that the socio-cultural factors and the desert climate are reflected in the urban fabric of Al-Jadeed vernacular town (see Figure 5.19).The general structure of dwellings and public buildings were a response to the social and cultural background, and to provide protection from the town's hot weather.

The spatial pattern of the architecture of the vernacular town has been closely related to the tribal social organisation of Sabha, where most of local population of Al-Jadeed came from three tribes, namely Aolad Hother (the majority), Aolad Sahl, and Aolad Amhamed, although there are also as some families from Aolad Busif and Al-Hattman. The vernacular town grew in a cumulative manner(see Figure 6.19). Social, cultural, and climatic needs have contributed to its growth. It is also characterised by its adjacent dwellings, narrow streets, winding alleys (with widths of about 2.5–3 m), lanes, and small squares. The architectural landscape of Al-Jadeed features simple, environmentally appropriate architectural structures, with its mud walls and ancient mosque. The town has a main gate and three other gates spread along the old wall, which has been removed. Al-Jadeed is a local Arab vernacular town surrounded by a wall and has about four gates spread over the four directions, and still retains, to some extent, its ancient structure, which highlights its cultural identity (see Figure 5.20).

Figure 5.20: Plan of the vernacular town of Al-Jadeed (Sabha).
Source: Researcher, adapted from Google Maps (2014)

5.3.3 Courtyard vernacular desert dwellings in Sabha

The basis of the design and implementation of vernacular dwellings in Al-Jadeed was purposed to meet the basic social, cultural, and climatic needs, like for any other desert dwellings in the region. Safety, security, and privacy considerations were among the most important of these needs. Every tribe or large family lives within the boundaries of a particular neighbourhood, and thus fulfils its various social requirements. One of the most important characteristics of dwellings in Al-Jadeed is the inner courtyard, which creates a comfortable internal environment for the population and most spaces within the dwelling open onto the inner courtyard.

As Al-Maazi (2006) points out, the Al-Jadeed vernacular dwellings are characterised by their simplicity, and are similar in size and their distribution of space; some of them have two floors, but most of them consist of one floor, which is almost always in the same style. As shown in Figures 5.21 and 5.22, the average size of the dwellings is between 90 and 175 m2. The size of the bedrooms range from 10 to 16 m2, and the living space is relatively large, ranging from 12 to 22 m2. The bathroom is 6 to 8 m2. The average area of the storeroom is about 6 m2 and the poultry barn is about 12 m2.The main entrance leads to the penthouse lobby, where the guest room is located, then there is another door leading to the inner courtyard; the living room and the bedrooms open onto the inner courtyard. At the back of the dwelling is the kitchen, bathroom, store room, and poultry barn.

The socio-cultural architectural features are shown in the distribution of the spaces within vernacular dwellings. The front part of the dwelling houses the entrance, the guest room represents a private zone in the dwelling, and the interior zone represents the family space. Most of the spaces open onto the internal courtyard, where most of the daily activities of the family take place. The windows and openings mostly open onto the courtyard, and there is a small window in the room or guest room for light and air; this enhances privacy and safety. Al-Jadeed vernacular dwellings were constructed using local building techniques and materials, such as limestone, mud bricks, and palm tree (see Section 2.3.2 of Chapter Two). Dwelling structures are combined together, which allows them to function as one body, and they have social, cultural, and climatic connotations (Dhouib, 2013). It is worth mentioning that the architectural formations of the dwellings were simplified, being semi-square and irregular shapes, similar to the composition of sculptures in most of the dwellings in Southwest Libya; however, they are generally less complex than the vernacular dwellings in Ghadames in terms of both exterior shape and interior decoration (see Figure 5.23).

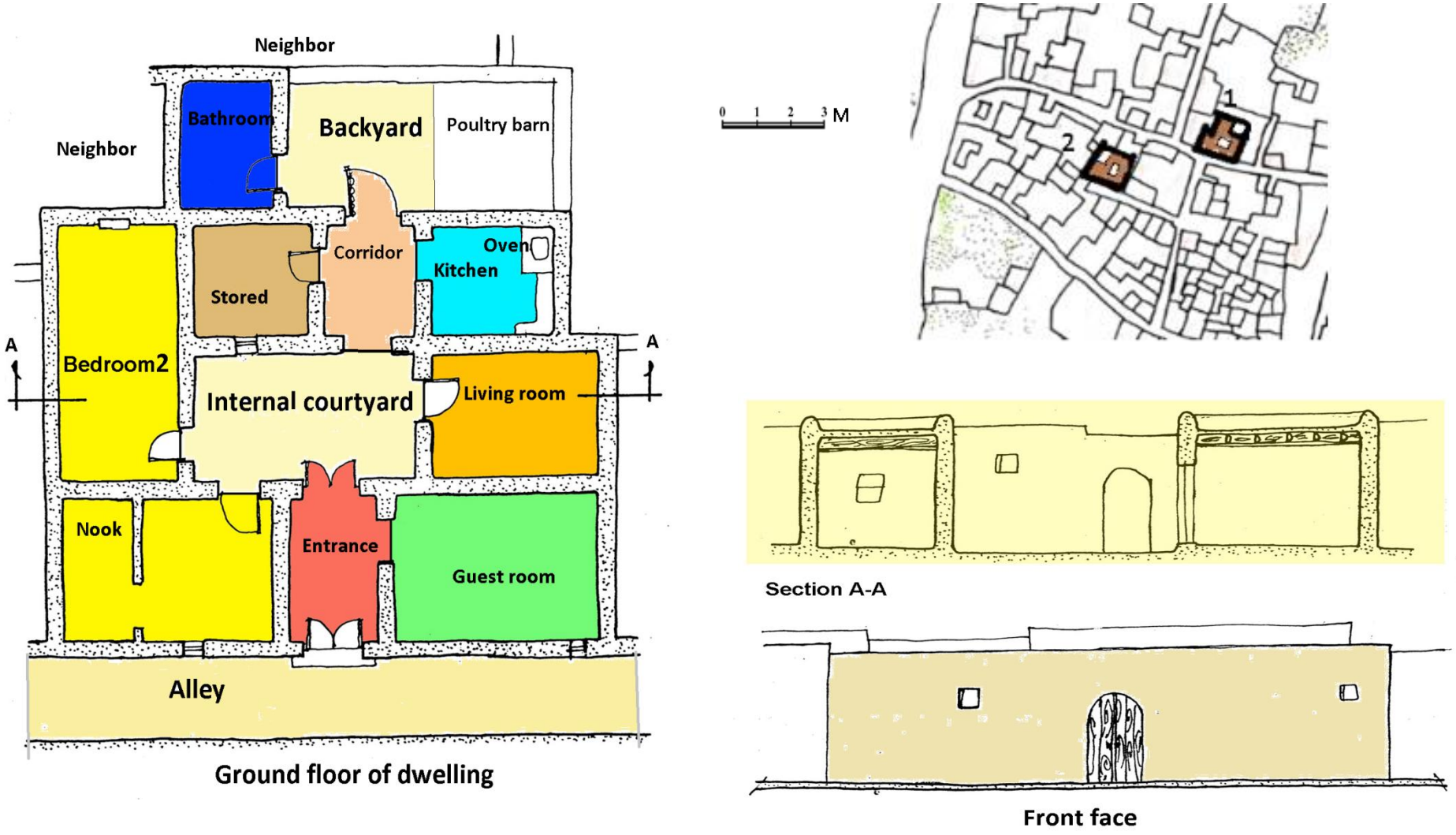


Figure 5.21: Plan of vernacular dwelling in Al-Jadeed -Sabha 1. Source: Researcher's fieldwork (2015)

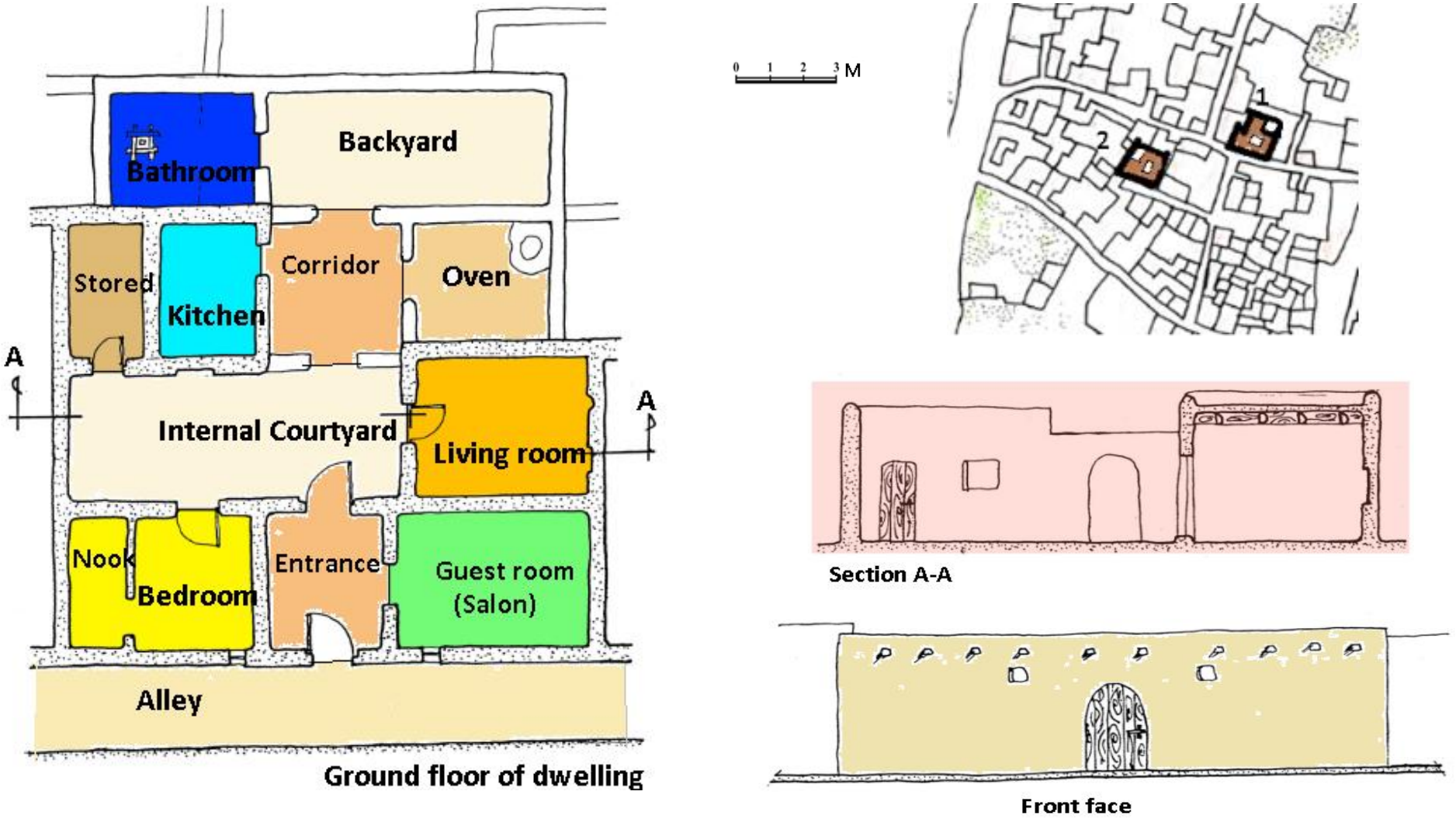


Figure 5.22: Plan of vernacular dwelling in Al-Jadeed -Sabha 2. Source: Researcher's fieldwork (2015)

Figure 5.23: Traditional interior decoration of bedroom in vernacular dwelling in Al-Jadeed -Sabha.
Source: Researcher's fieldwork (2015)

5.3.4 Contemporary town of Sabha

The contemporary town of Sabha developed considerably greatly in the mid-1980s, and the number of dwelling projects was increased due to two main reasons. Firstly, there had been a large increase in its population since the early 1980s, and an influx of many immigrants from several villages and neighbouring oases, as well as from African countries, who came to settle and live in Sabha. Secondly, it was because the Libyan state at that time was interested in the development of the town airport and trade through the transit of goods to the interior of Africa. In addition, there was the presence of many tribes who were influential in the Libyan state during that period. The general layout of the city of Sabha, as shown in Figure 5.24, is that of a semi-oval-shaped city. It is centred around the main central street that divides the city into almost equal halves. It has many main streets and public squares. As mentioned earlier, Sabha has two vernacular towns, which are considered to be the nucleus of the urban construction of the contemporary town. One of these vernacular towns is neglected and deserted, and is located in the south of town. The other is Al-Jadeed vernacular town in the north, which is now surrounded by contemporary dwellings. The contemporary city extends between these two towns.

There is diversity in the general design of contemporary dwellings in Sabha. For example, there is government housing, private residential buildings, and other private residences and villas. The government developed plans, built various housing projects that were designed and implemented by foreign companies, and gave residents loans for housing construction (Sheibani, 2005).

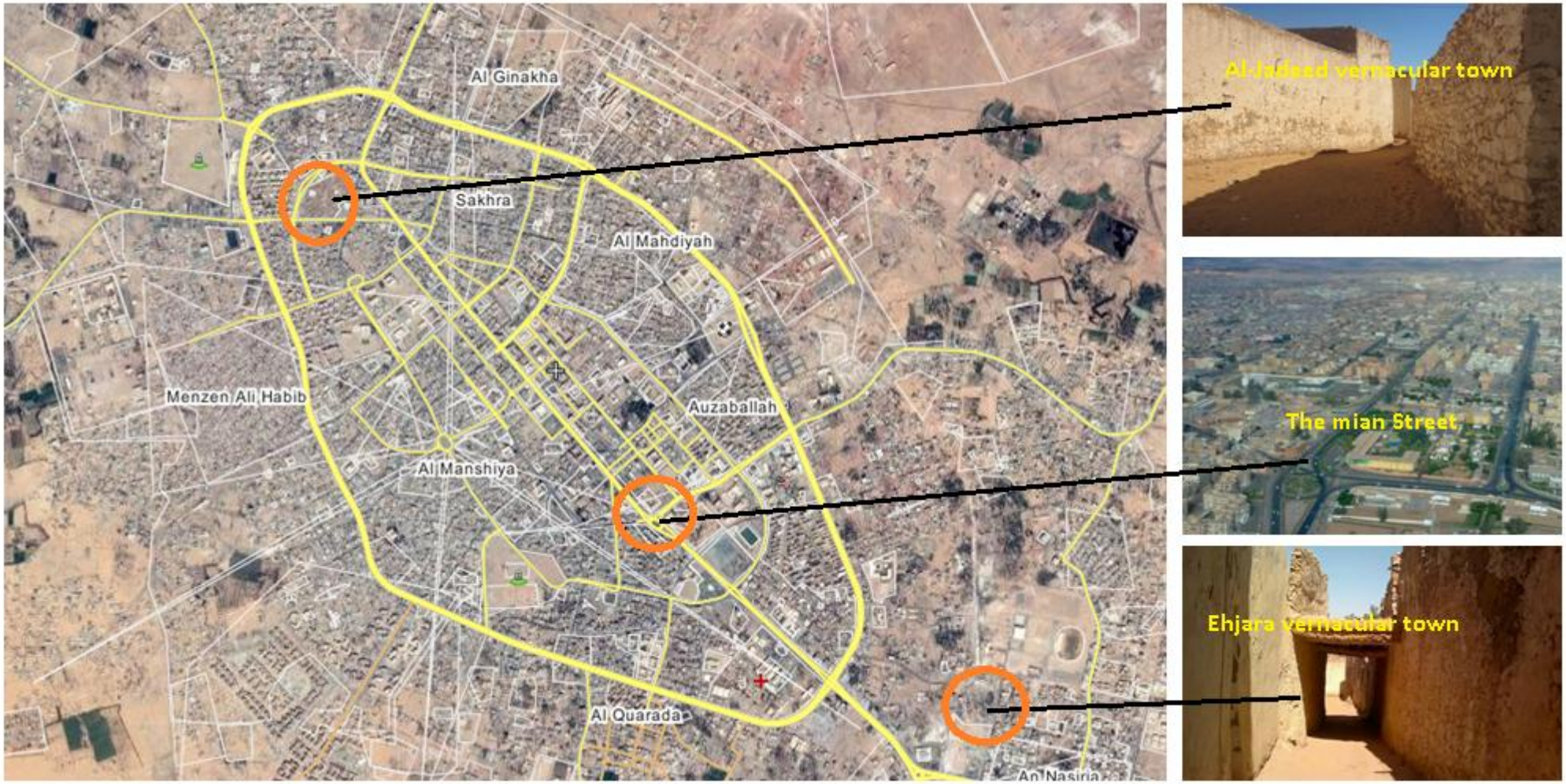


Figure 5.24: Plan of the contemporary town of Sabha.
Source: Researcher, adapted from http://sabha.wikim apia.org/map/

Figure 5.25: Panorama of part of contemporary dwellings sectors in Sabha.
Source: Researcher, adapted from Google image (2015)

However, this diversity of construction and planning was randomly dispersed without studying the historical features of the city, or its social, cultural, and even climatic characteristics; this has contributed to the distortion of the architectural landscape (see Figure 5.25). Even though this has led to a temporary solution to the problem of lack of housing and improved housing environment, it has ignored the social, cultural, and environmental requirements of the population, and has not done anything to preserve the architectural identity and architectural heritage of the town.

5.2.5 Contemporary desert dwellings in Sabha

Contemporary housing varies in Sabha. There are apartments built by the state, housing for citizens , and villas of medium and large sizes built by the state and private contractors, some of which are mixed residential and commercial. In general, all contemporary dwellings are of low density, are not similar in shape or size, and use different architectural elements in their facades. The study presents a model of residential buildings consisting of four floors, which are the most common type of government-built dwelling Sabha. The average size of the apartment is from 110 to 160 m2 and it has an average of three bedrooms (see Figure 5.26). Although modern housing-design and site-planning techniques respect internal privacy to some extent, they ignore external privacy. One can see the same dwellings design in many different locations on the site (see Figures 5.26 and 5.28).

The building structures are based on modern construction materials and the use of concrete, including concrete bricks for the construction of walls. Most of the designs, whether for apartments or private residences, are considered to be a replica of contemporary designs in other parts of northern Libya. In other words, these designs do not encompass anything related to the characteristics of desert cities, such as weather, or cultural and social aspects. Therefore, many residents have expressed dissatisfaction with these designs in survey. For example, there are open balconies and large windows in contemporary dwellings, which are unsuitable climatically and socially, and they reduce privacy and safety. On the other hand, interior finishes and building materials in general are based on exotic concepts of the region, which has led to a major change in the perception of interior decoration and also to cultural changes. Although contemporary dwellings in Sabha have contributed significantly to solving the problem of providing healthy contemporary dwellings, it has also contributed equally to the reduction of social values, and the loss of cultural identity in the city and in most historical towns in Southwest Libya (see Figure 5.27).

In this picture the changes made by the inhabitants can be seen, such as blocking balconies, minimising windows, and installing air conditioning.

Figure 5.27: Residential buildings in El-Mahdia neighbourhood of Sabha

1. Terrace
2. Market
3. Toilet
4. Store room
5. Passageway
6. Saloon
7. Living room
8. Kitchen
9. Bedroom
10. Balcony

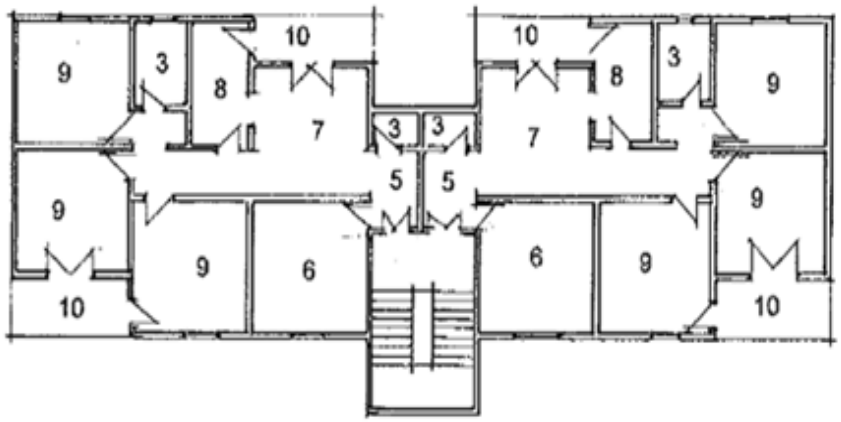


Figure 5.26: Plan of the models of one of government flats buildings in Sabha

Figure 5.28: Residential buildings in El-Thanwea neighbourhood of Sabha

5.4 Ghat (Sample 3)

5.4.1 General characteristics of Ghat

The vernacular town of Ghat is the second oldest vernacular desert town in Libya. Some historians call it as a twin of Ghadames. It was founded long before the arrival of Arab Muslims in Southwest Libya. Since the early 1980s, Ghat has been the major town in the municipality of Ghat, which includes a group of oases and small villages nearby. A major part of the vernacular town of Ghat is still in fairly in good condition (Jamal, 2008).

5.4.1.1 Historical background

In earlier historical periods, Ghat was an important terminal on the trans-Saharan trade route and a large administrative centre in Southwest Libya (Fezzan). It was the centre of a union of Tuareg tribes living in Southwest Libya, including Sabha, Ubari, and Ghadames, as well as Tuaregs living in southern Algeria (Djanit and Elise).

From the 5th century BC to the 5th century AD, the region was home to the empire of the Al-Garamants, which was a large state in Fezzan that ran the trans-Saharan trade routes between the Carthaginians in the north (Tunisia) and later the Roman Empire, and the west and central African states; Ghat was part of that empire. During the 13th and 14thcenturies, parts of Fezzan were part of the Kanem Empire in Africa, and the Ottoman rulers of North Africa confirmed their control of Ghat in the 17th century. Opinions about the origin of the name 'Ghat' are different. Some of the historians said that it is from 'Al-Ghaith', which means helping a traveller in the desert. Some other historians say that there was a cleric named Guth who lived in the vernacular town, and, when he died, his name was used as the name for the town. His tomb is still in Ghat. This is probably the most likely story of the naming of Ghat (Jamal, 2008).

Beginning in 1914, Italy occupied the town of Ghat. The Italians built a castle on top of the ruins of the ancient Ottoman castle on the highest of the Kokmen Mountains (see Figure 5.29), which dominates the town. This castle still exists nowadays. The castle is an architectural symbol and is a tourist attraction for the town. In addition, there are some old architectural monuments, such as the Taffaget ancient mosque (see Figure 5.30). During the Second World War, France occupied Ghat from 1943. There are no architectural structures reminiscent of the French era in the region. After the independence of Libya in 1952, Ghat became part of the province of Fezzan and later became an independent municipality (Al-Maazi, 2006, Jamal, 2008).

Figure 5.29: Castle of Ghat **Figure 5.30:** Taffaget mosque of Ghat
Source: Researcher's fieldwork (2015)

5.4.1.2 Location and natural characteristics of Ghat

Ghat is an important desert town as it was a trade station for desert caravans that linked Ghadames to central Africa. It is located in the outermost corner of Southwest Libya, about 582 km south of Ghadames, at an elevation of 692 m above sea level, between 10°17' north (latitude) and 24°96' east (longitude)(http://dz.toponavi.com/92539) , and close to the border with Algeria, as shown in Figure 5.31.

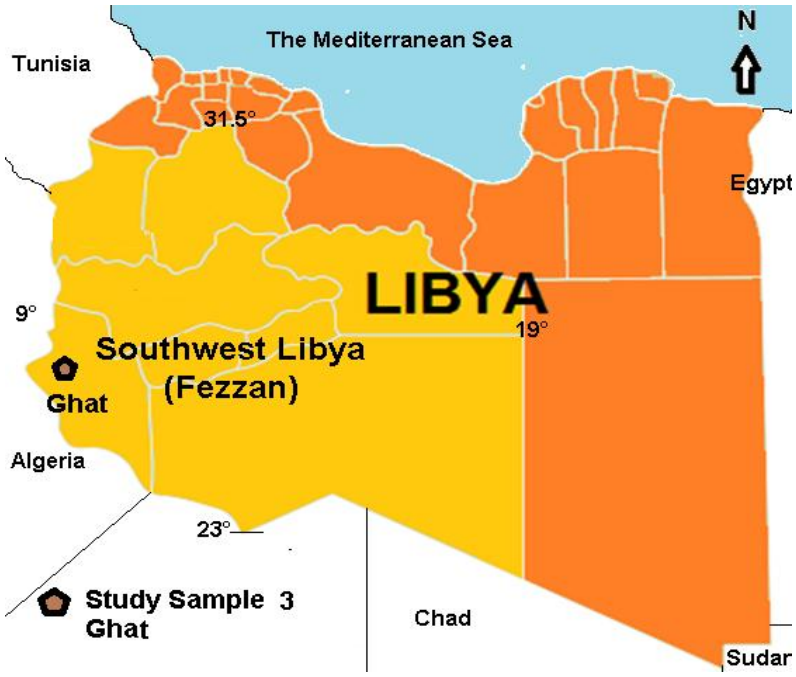


Figure 5.31: Location of Ghat

The ethnic origin of the majority of the population in Ghat is Tuareg, plus some Ghatins, and some from tribes originating in Africa. According to the 2006 census , the average population

of the town is currently about 12,000. Most of the population speaks the local Tuareg dialect, and they previously worked in grain farming and trade. Currently, most of them hold government jobs. Jamal (2008) notes that there is a rich historical and social background that is very similar to that of Ghadames. Ghat is characterised by a rich cultural heritage derived from the ancient Tuareg culture, which extends from Ubari to the Algerian border. Most of the residential neighbourhoods within the vernacular town and contemporary town have also been divided on a tribal and social basis. Therefore, the social relations among people in the neighbourhood are strong and cohesive. Ghat residents are trying to preserve the characteristics of their community, their cultural background, and their cultural identity. An annual festival is held in Ghat and focuses on highlighting the traditional cultural activities of the Tuareg.

5.4.2 Vernacular architecture of the town of Ghat

The town of Ghat was organised in accordance with social, cultural, and climatic conditions, similar to Ghadames. This is evident in the establishment of the social unit in Ghat. The spatial pattern in Ghat is associated with traditional social organisation, as evidenced by the architectural landscape and the cohesive fabric of the town, which has grown cumulatively (see Figure 5.32). Social, cultural, and climatic requirements have played an important role in this growth, as in Ghadames, where the town's urban fabric forms one large cluster of dwellings, including markets, mosques, and other public places.

The ten neighbourhoods in the vernacular town of Ghat have evolved based on social and blood ties. The ten neighbourhoods are Bab al-khair, Washren, Ehaf-Inken, Tifok-Nebrag, Kelala (see Figures 5.33 and 5.34), Ebing, Telmghat, Eshli, Tadermit, and Taffaget (see Figure 5.32). There are three major mosques in the town, reinforcing the relationship with religious places (Al-Maazi, 2006). The ten neighbourhoods within the town are relatively homogeneous in their architectural form and seem to have been built simultaneously (Jamal, 2008). The architectural landscape of Ghat (see Figure 5.35) is characterised by ecological architectural design, mud walls, narrow alleys, and dense dwellings with winding alleys. The main streets are usually only 3 m wide, and the alleys are of less width and go in different directions to allow access to the dwellings (see Figures 5.33 and 5.35).

Figure 5.32: Plan of the vernacular town of Ghat. Source the researcher adapted from Google Earth (2014)

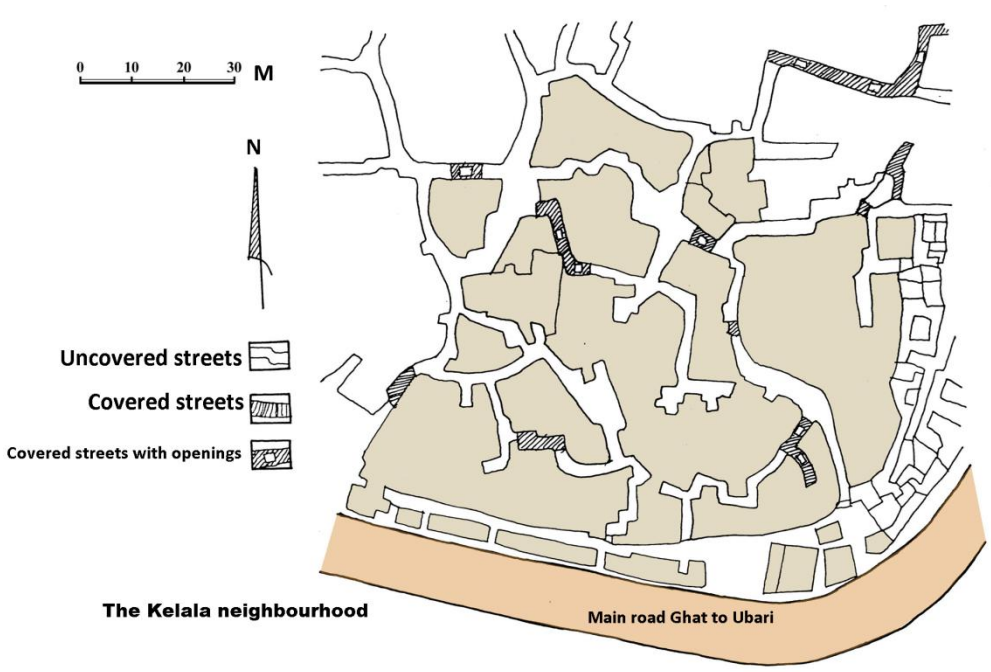


Figure 5.33: Plan of the Kelala neighbourhood in Ghat
Source: Researcher's fieldwork (2015)

Figure 5.34: Kelala neighbourhood in the vernacular town of Ghat.
Source: Researcher's fieldwork (2015)

Thus, the dense fabric of dwellings creates a comfortable environment, in terms of the climate and social environment, within this fabric. The vernacular town of Ghat has five main gates (Dhouib, 2013). Ghat has been the Tuaregs' town since it was established. However, it was later influenced by the Arab-Islamic desert architecture, and most of the components of an Arab desert town are found in Ghat, such as mosques, dwellings, and markets.

In summary, Ghat's vernacular architecture represents a successful mix of history, geography, and cultural heritage, using local building materials and techniques. This evolution was automatically incorporated into an architecture adapted to nature. Therefore, the vernacular town of Ghat has attractive architectural structures that are harmonious with the environment (Al-Maazi, 2006).

Figure 5.35: Scenes of vernacular town of Ghat.
Source: Researcher's fieldwork (2015)

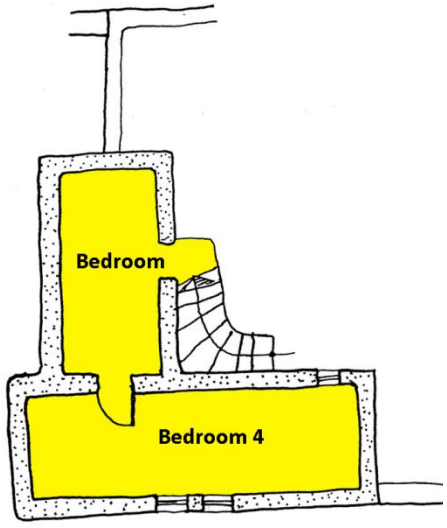
5.4.3 Courtyard vernacular desert dwellings in Ghat

The diverse socio-cultural characteristics and climate have also contributed to the formation and design of local dwellings in Ghat, which, although simple, meets the basic social, cultural, and climatic needs of the population. The most important of these needs are safety, security, privacy, and other social aspects related to the traditions and customs of the Tuareg people. Each tribe or large family lives within one of the ten neighbourhoods of the town. One of the most important features of vernacular dwellings in Ghat is the presence of the internal courtyard, which creates an internal environment for the inhabitants and can be used for organising the daily activities of the family.

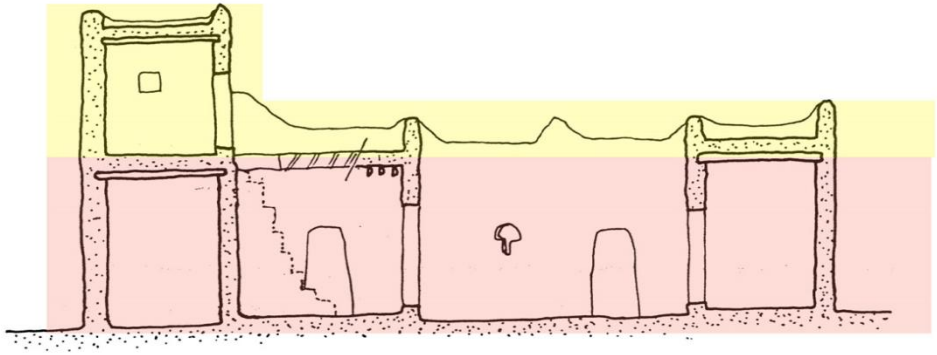
Jamal (2008) points out that most of Ghat's vernacular dwellings are very similar in size, form, and in the organisation of spaces within them, most of which opens out onto the inner courtyard. There are, of course, some differences, such as the number of bedrooms or in the living room. The size of dwellings is usually about 90 to 140 m2. The living room ranges from 8 to 14 m2, the living room is between 10 and 16 m2, and sometimes the internal courtyard is used as a family living room. The bathroom is 4 to 6 m2. The average storage room on the ground floor is about 8 m2 (see Figures 5.36 and 5.37).

The design of the dwellings in Ghat came about as response to the surrounding environment, including the social, cultural, and climatic needs. The dwelling also extends from the ground floor to a first floor, and sometimes has three floors. The ground floor is the main floor, consisting of an entrance to the dwelling that opens on the alley. The entrance opens to the inner courtyard, and the rooms and the rest of the spaces are distributed around it.

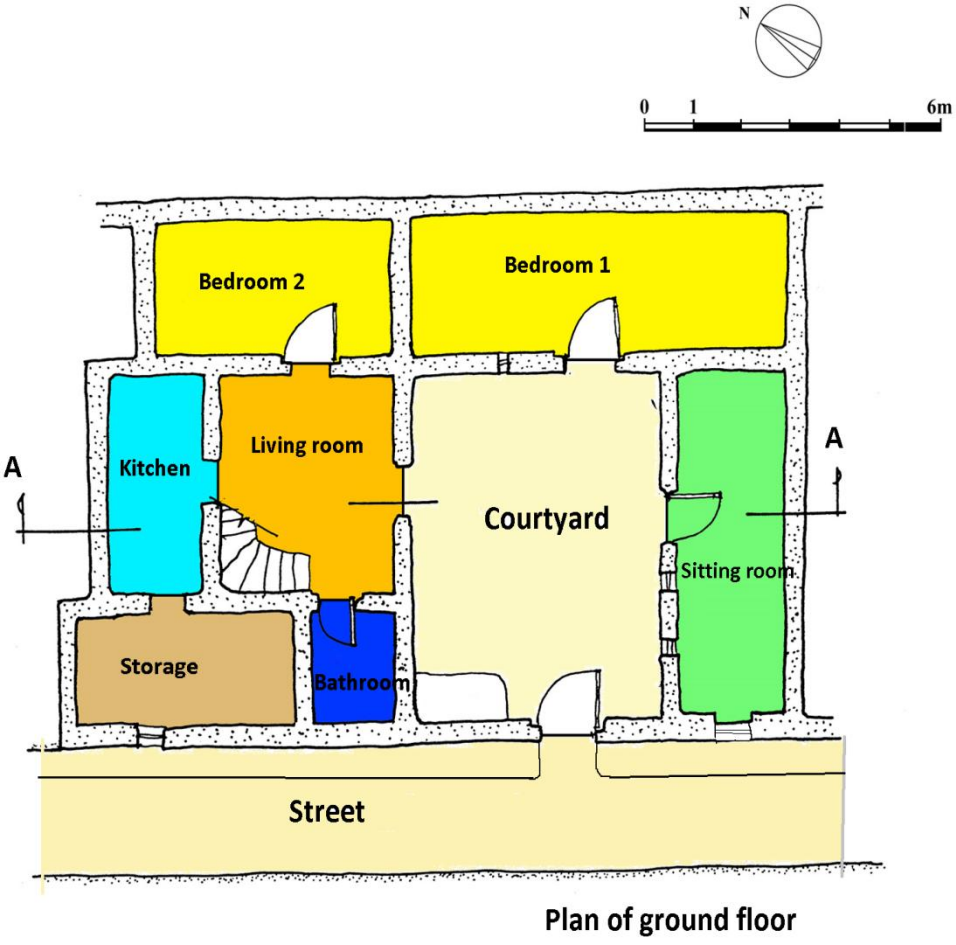
The impact of socio-cultural characteristics on the design of the desert dwellings in Ghat can be seen from several aspects. The first is the distribution or density of the dwellings within a neighbourhood within the town, as a result of the reflection of the social needs of the tribe and the family, as well as the safety and security of the population. In addition, they were constructed using local building techniques and materials, which simply express the spirit of the place as a result of the possibilities available. The housing structures are combined with each other into complex structures, making it difficult to distinguish each single one. This is based on the responses to many of the environmental, social, and cultural requirements. All dwellings have been built from materials available in the local environment, such as gypsum, limestone, and mud. The foundations of dwellings were built with limestone, the walls were built with mud bricks, and palm tree trunks were used in the roofs and ceilings.



The first floor

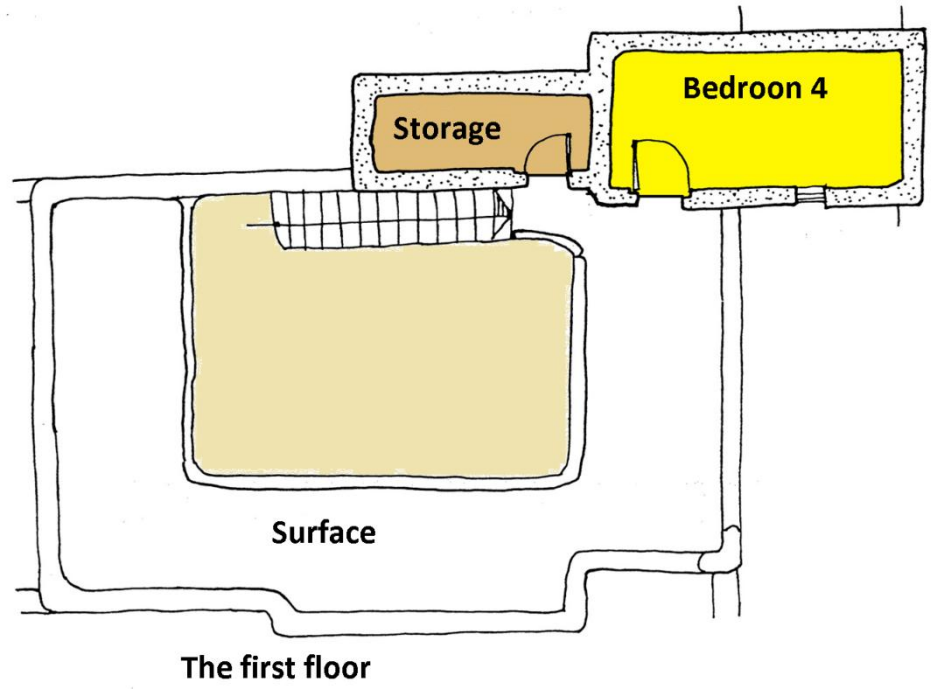


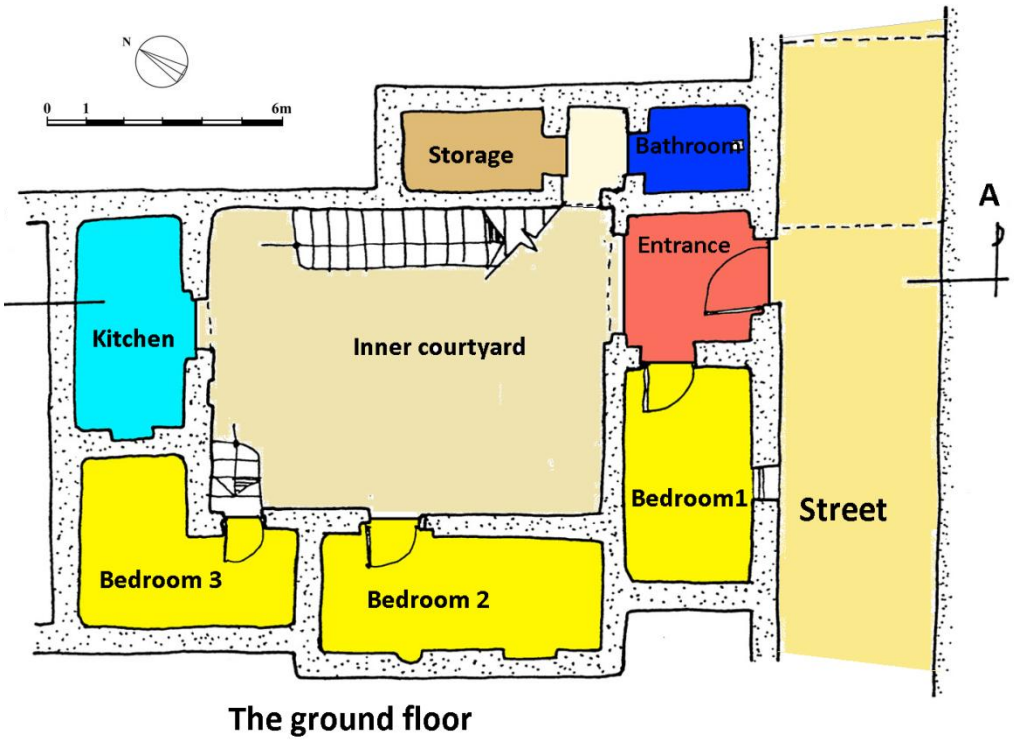
Section A-A



Plan of ground floor

Figure 5.36: Plan of the vernacular desert dwellings in Ghat 1.
Source: Researcher's fieldwork (2015)





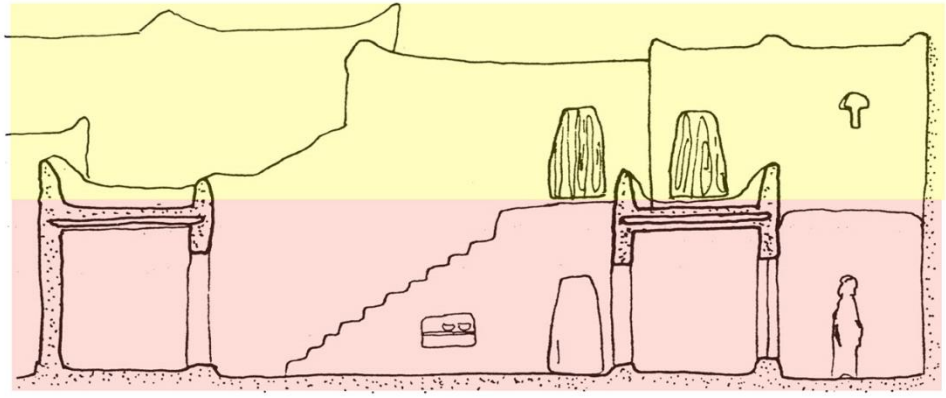


Figure 5.37: Plan of the vernacular desert dwellingsin Ghat 2.
Source: Researcher's fieldwork (2015)

Furthermore, the use of architectural elements that are significant in the cultural heritage of Ghat can be seen, as well as decorations and colours that express the identity of the people of Ghat. Thus, the architectural configurations of dwellings were combined to create configurations with social, cultural, and climatic connotations (see Figure 5.38). It is also worth mentioning that the vernacular architecture of the dwellings in Ghat, despite their simplicity compared to Ghadames, feature simple and irregular architectural formations, similar to the composition of sculptures. This is one of the manifestations of the harmony of the general architectural structure with the natural environment, which has created a distinctive architectural identity in Ghat.

Figure 5.38: Scenes of decoration of vernacular dwelling of Ghat.
Source: Researcher's fieldwork (2015)

5.4.4 Contemporary town of Ghat

Ghat, like the other historical towns and oases in Southwest Libya, was affected by the discovery of oil in the Libyan desert and its consequent economic growth, including changesto the lifestyle and the socio-cultural characteristics of the town. There has been a rapid transfer from vernacular dwellings to contemporary dwellings in both the public and private sectors. The government has implemented a series of housing projects in Ghat, similar to those in Ghadames and in other towns, even those in the north of the country, which were designed and implemented by foreign companies. This has contributed to the transformation of Ghat into a larger town than previously, in addition to granting citizens loans to build dwellings. The contemporary town has been expanded, and main and branch roads have been constructed (see Figure 5.39). Although this has led to an improved housing environment through the use of modern construction technology, it has ignored the social, cultural, and environmental requirements, as well as the cultural heritage and architectural identity of the town, which has contributed to the distortion of the architectural landscape in the contemporary town (see Figure 5.40).

The contemporary town was planned and implemented to the east and south of the vernacular town, due to natural obstacles in the north (Kokmain Mountain) (see Figure 6.39). As a result of the acceleration of the transformation of the contemporary town and the companies competing to build the dwellings at the time, the residential neighbourhoods were distributed almost randomly, despite the advance existence of a planning scheme. Therefore, interest in construction, commercial activities, and parking has increased more than interest in the design of dwelling units. The layout of the contemporary town is centred on three parallel main streets, one of which is the main road linking Ghat to Ubari and the border with Algeria.

Although contemporary planning has provided more space than the compact design of the vernacular town, it has failed to meet the same requirements that led to the success of local architecture in the town, such as the socio-cultural features of privacy, safety, security, and a social cohesion, where the spread of housing and its dispersion in the desert environment partly contributed to meeting these needs. The contemporary planning of the town did not take into account the importance of the vernacular and social features at the family and tribe levels, which was the basis of the Tuareg lifestyle (Jamal, 2008). This led to a decline in social communication and changes in the contemporary lifestyle experienced by the inhabitants of contemporary residential complexes. Therefore, the social and cultural structure of the town was damaged.

However, these dwellings that were designed by foreign consultants, using a style far removed from the environment, and away from social and cultural considerations, have negatively affected of the population over time. Unfortunately, this type of dwellings design is still used in Ghat, which has further distorted the architectural landscape (see figure 5.40).

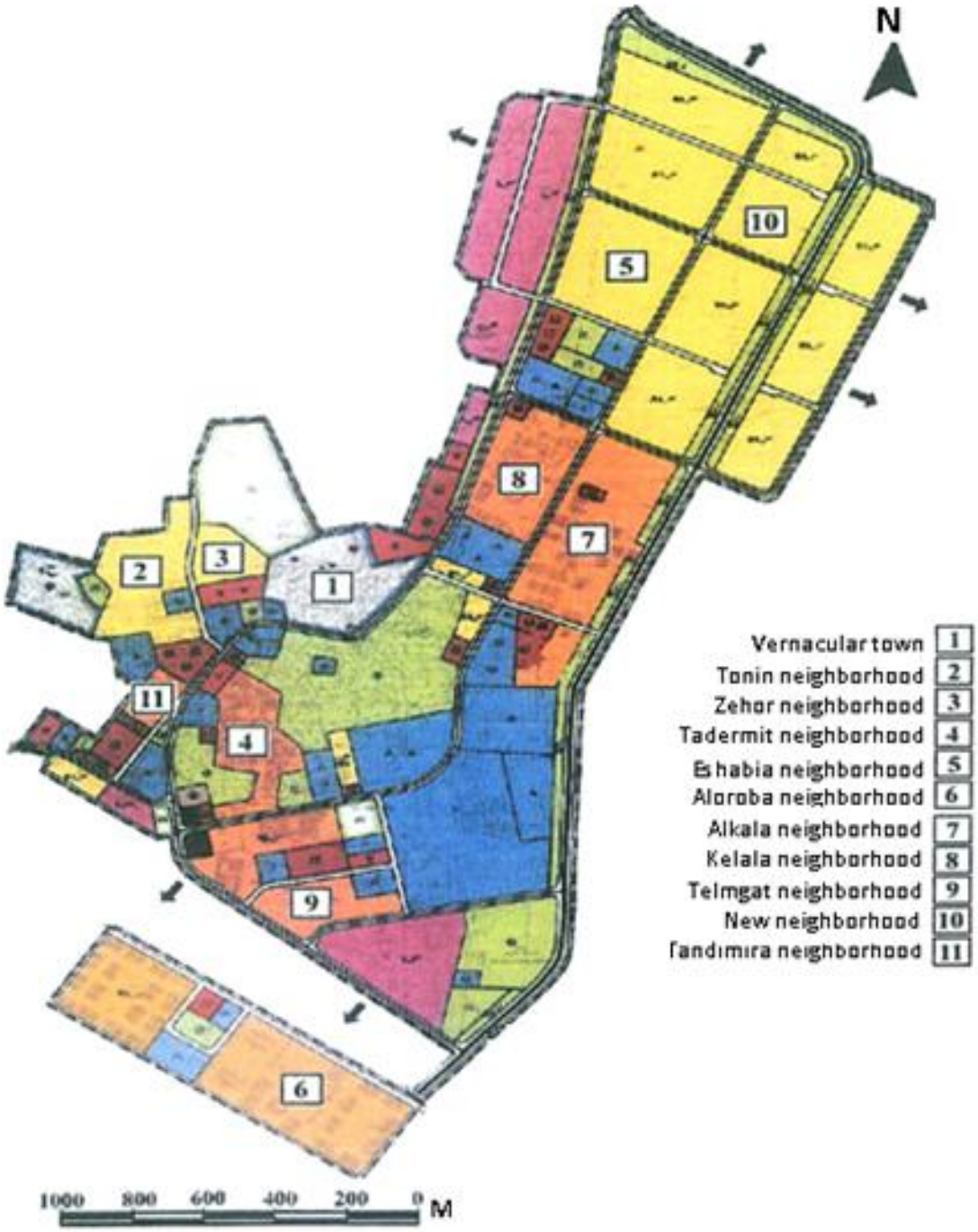


Figure 5.39: Plan of the contemporary town of Ghat.
Source: Researcher, adapted from Finland Finmap Ltd(1995)

Figure 5.40: Panorama of part of the contemporary town of Ghat.
Source: Malik, (2014)

5.4.5 Contemporary desert dwellings in Ghat

Contemporary dwellings vary from two-storey residential units to villas and separate residences. However, the study focuses on two-storey public dwelling units, which are the most common in the contemporary town of Ghat (see Figure 5.41). Most of these contemporary dwellings are in the form of adjacent blocks that are side by side or completely separate architectural blocks. Sometimes in the main streets there are mixed residential and commercial buildings. Most of the contemporary dwellings do not have the same shape, size, and distribution of architectural elements, except for government dwellings, which have a uniform design. Most of them are open to the outside through fairly large windows. The average size of these dwellings ranges from 120 to 240 m2. These houses have two or three bedrooms, one storage room of about 9 m2, and one bathroom of about 6 m2.

In fact, having a rapid transition to the contemporary pattern of housing without going through any periods of development between the vernacular and the contemporary has meant that contemporary dwellings in Ghat were built in line with global architectural trends, which has changed the interior design of spaces and resulted in them being quite different from what people are used to. This has actually happened in most of the historical towns in Southwest Libya.

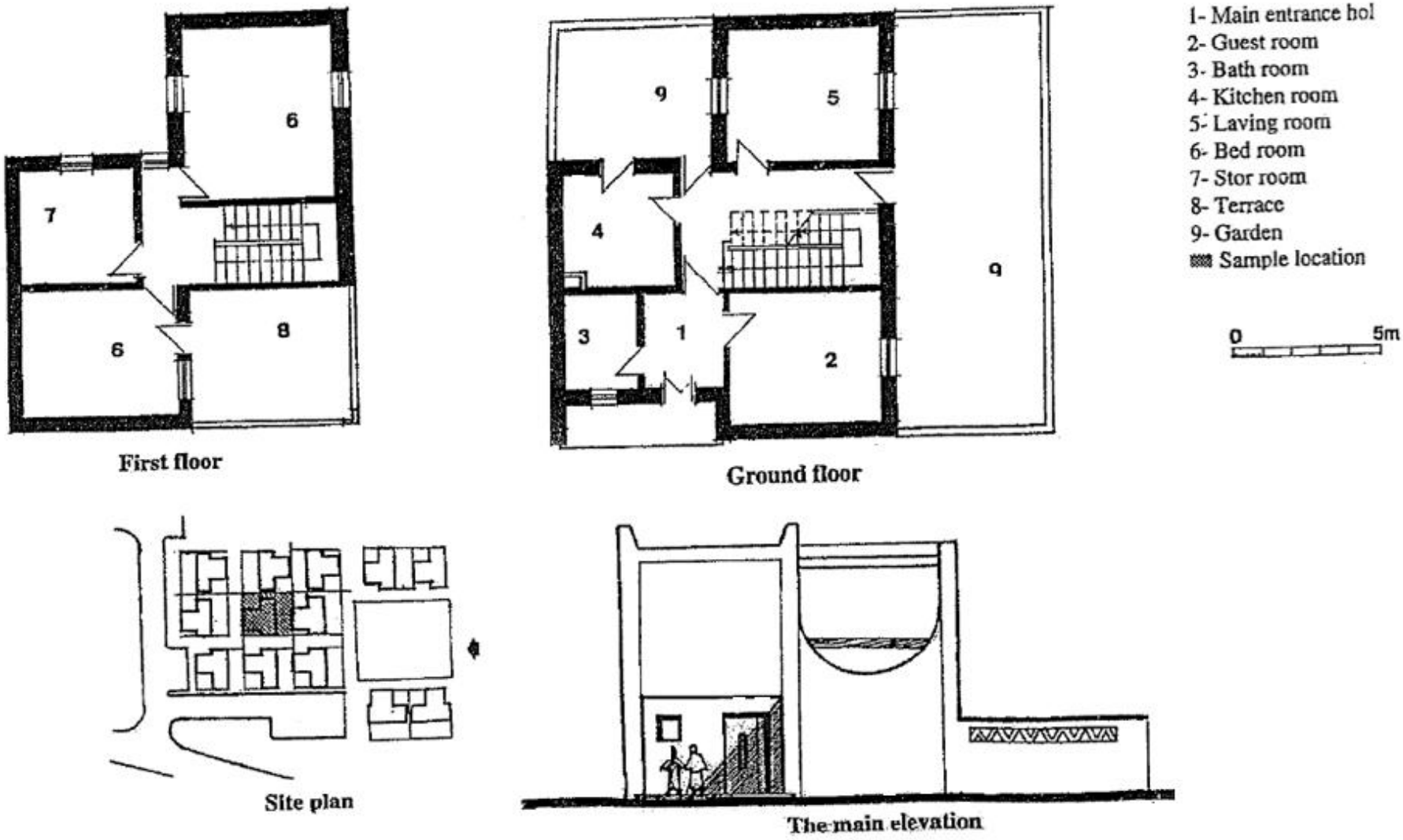


Figure 5.41: Government Model of the contemporary desert dwellings of Ghat.
Source:Ghat Municipality

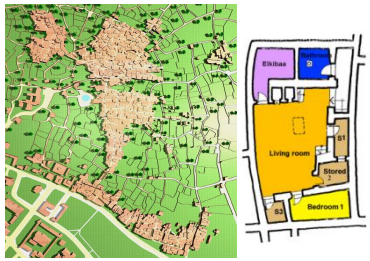
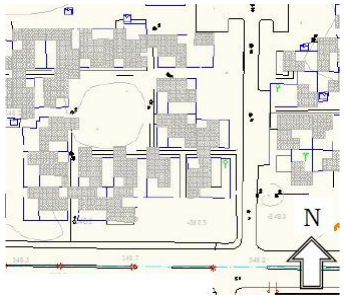
For example, modern buildings have fairly large interior spaces and are open to the outside through windows, but spaces in vernacular dwellings opened to the inside and there were rarely openings to the exterior. In addition, there has been the inclusion of modern spaces, such as the living room in its contemporary form, as well as the position of the stairs and the distribution of internal spaces.

The structural system for the contemporary dwellings is based on the technique of using reinforced concrete for columns, floors, and ceilings; hollow concrete bricks for walls; and wood and marble in interior finishes. Without a doubt, contemporary desert dwellings in Ghat and other desert historical towns have contributed significantly to providing adequate dwellings for this period since vernacular dwellings are no longer able to keep up with the times, despite their long-term stability in the past. However, the designers did not address the historical, social, and cultural background of the Tuareg people when designing these dwellings. Moreover, these current designs are not concerned with the local context in Ghat. The visual and audio privacy, and social aspects were neglected, leading to defects in safety and security. In addition, the contemporary architectural form is not compatible with the cultural identity of the region.

5.5 Vernacular and contemporary desert dwellings in Ghadames, Sabha, and Ghat: a comparative summary

This study has considered the natural characteristics, the historical background, and the general shape of the three historical towns in Southwest Libya that are under investigation, which included reviewing and studying models of the vernacular dwellings in these towns. In addition, a review and critique has been performed of the present situation of these contemporary towns and their contemporary dwelling designs. It is, therefore, useful to highlight the main differences between the designs of vernacular and contemporary dwellings in the context of social and cultural sustainability. This will later contribute to drawing out the most important lessons learned from the vernacular architecture, as well as the important advantages of contemporary dwelling designs for inclusion in the proposed guidelines for the design of socio-culturally sustainable desert dwellings. The following table (Table 5.1) shows the most important differences between vernacular and contemporary desert-dwelling designs.

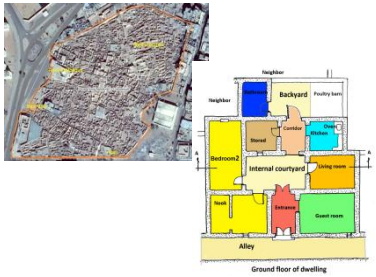
Table 5.1: Comparison of vernacular and contemporary desert dwellings in the three towns in terms of socio-cultural features

Town	Vernacular desert dwellings	Contemporary desert dwellings
Ghadames	The vernacular dwellings found are in the form of compacted conglomerates, and their design is simple and similar to sculptural shapes. The dwellings are built on a small area and are usually two-storey dwellings with different levels. There is no courtyard within the adjacent dwellings blocks, which encouraged communication with neighbours, especially for women. There are tight alleys and cul-de-sacs inside the residential neighbourhoods, as a response to the environmental, social, and cultural needs of the population. They have high and thick walls, and few external openings. Most of the spaces open to the inside. All this enhances visual and audio privacy, safety, and security, and religious beliefs. Most of spaces have multiple purposes. The dwellings were constructed with local building materials and simple traditional techniques that are compatible with the cultural heritage of the population. The interior design and decoration reflect the cultural heritage, which enhances the architectural identity.	 	The contemporary dwellings are in the form of separate blocks with large spaces between them. Their design is composite, and, particularly in government dwellings, they often have a shape similar to an enclosed cube. The dwellings are usually built with two or three storeys (separate units),and with open spaces. They are built with new building materials. They have caused a social imbalance and have not achieved cultural acceptance. They contain a rather large number of external openings. Most spaces open onto the outside. The walls are of medium thickness and are built with hollow concrete bricks. The dwellings are constructed with concrete, marble, and concrete tiles. Most of the building materials are alien to the culture of the population and are in contradiction to the environment of the place. They are distributed in a semi-random manner, which has distorted the architectural landscape.	 

Sabha

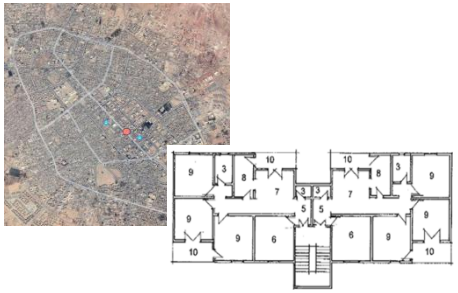
The vernacular dwellings are in the form of compacted conglomerates and their shape is similar to irregular squares. They are built on a medium-size area and usually have one or two storeys with an inner courtyard that is opened onto by most of the spaces. The courtyard is a place for the daily and social activities of the family. Despite the simplicity of the design of the dwellings, it is in response to the social, cultural, and environmental needs of the population at the time.

They are of simple design with few external openings. Most of the spaces open onto the inner courtyard. They have thick walls. The spaces have multiple purposes. The dwellings were constructed with local building materials and simple traditional techniques. All the elements of the dwellings enhance privacy, safety, and security. The interior design and decoration are less rich than Ghadames, but are compatible with the cultural heritage of the population and architectural identity.



The contemporary dwellings are in the form of separate blocks with large spaces between them. Their design is composite, and particularly in government dwellings, they often have a shape similar to an enclosed cube. The dwellings are usually built with three to five storeys (flats) in the residential neighbourhoods. The methods used for the design and distribution of residential buildings has damaged the social structure of locals.

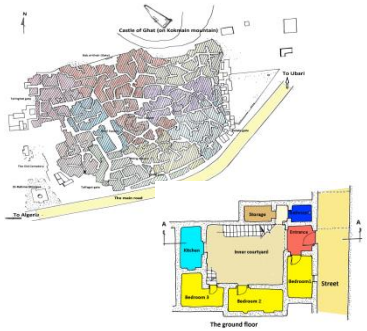
Residential units are designed within buildings and are distributed in different areas. Most spaces open onto the outside. The walls are of medium thickness and built of hollow concrete bricks. The apartments are built of concrete, marble, and concrete tiles. The facades of buildings are alien to the population's culture. The town has different and contradictory contexts for the forms and types of housing, which have distorted the architectural landscape. There are defects in privacy, safety, and security.

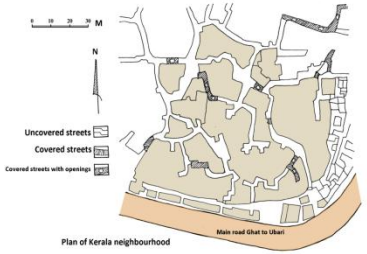


Ghat

The vernacular dwellings are in the form of compacted conglomerates, and their shape is similar to simple, irregular squares. The dwellings are built on a medium area and usually have one or two storeys with an inner courtyard that is opened onto by most of the spaces within the adjacent dwellings blocks, which encourages communication among neighbours, especially for women. There are tight alleys and cul-de-sacs inside the neighbourhood. Despite the simplicity of the design of the dwellings, it is in response to the social, cultural, and environmental needs of the population at the time.

They have high and thick walls, with few external openings. Most of the spaces open onto the inner courtyard. This enhances privacy, safety, security, and religion beliefs. Most of spaces have multiple purposes. The dwellings were constructed with local building materials and simple traditional techniques that are compatible with the cultural heritage of the Tuareg people. The interior design and decoration reflect the cultural heritage, which enhances the cultural identity.





The contemporary dwellings are in the form of separate blocks with large spaces between them, and their design is composite, and, particularly in government dwellings, they often have a shape similar to an enclosed cube. The dwellings are usually built with two or three storeys (separate units), and with open spaces. They are built with new building materials. Although they have created a healthier residential environment, they are not compatible with the identity and cultural heritage of the Tuareg people.

They have a large number of external openings. Most spaces open onto the outside. The walls are of medium thickness and are built with hollow concrete bricks. The dwellings are constructed with concrete, marble, and concrete tiles. Most of the building materials are alien to the population's culture and are in contradiction to the environment of the place. They have provided a solution to the problem of providing healthy dwellings and with some flexibility. They are disproportionate to the cultural and social context of Ghat.

The comparison in Table 5.1 illustrates that there are different socio-cultural architectural features of both vernacular and contemporary desert-dwelling design, and each of them has advantages and disadvantages in the same context.

It seems that the profiles of the contemporary landscape in Ghadames, Sabha, and Ghat give impressions of segregation, while the communities of the vernacular towns claim to have unity and organisation, which is often achieved through the gradual transformation from urban fabric to a building unit. For example, the vernacular towns give the perception of a single unit, and each neighbourhood works separately within the town, plus the vernacular dwellings provide a visualisation of the unit and each unit operates independently.

Figure 5.42 shows an interpretation of the designs for the vernacular historical towns and vernacular desert dwellings of Southwest Libya, based on the following:

- Distinct architectural designs from towns for desert dwelling design, through historical developments, integrated urban fabric, unique architectural style, and distinctive architectural identity.
- Compatibility with social and cultural features, through the context of inhabitants' lifestyles: privacy, safety, and security; social considerations; religious beliefs; and cultural heritage.
- Construction techniques, vernacular structure and local building materials, using local natural materials that have contributed to the formation of these towns' identities.

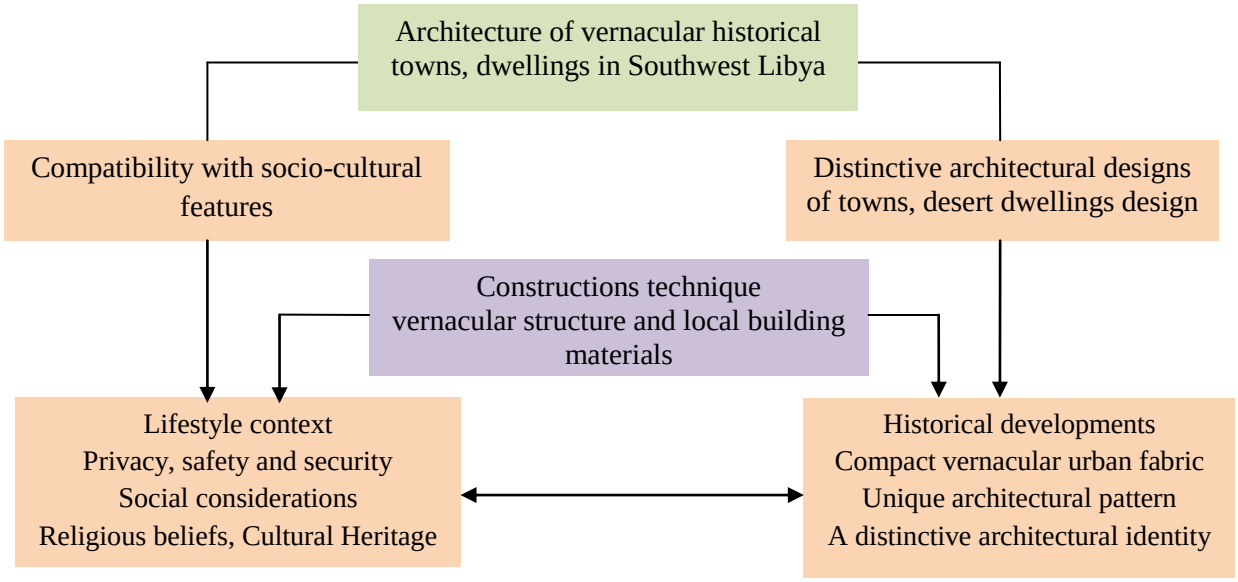


Figure 5.42: Key features of socio-cultural of the historic towns of Southwest Libya. Source: the researcher

Figure 5.43 shows an interpretation of the design of the contemporary towns and contemporary desert dwellings of Southwest Libya, based on the following:

- Contemporary architecture of desert dwellings design, through contemporary design trends (international design trends), which are far from the local context of historical cities, with open spaces, modern landscapes, and modern building techniques and materials.
- General facilities for dwellings, with respect to administrative and service, educational, health, and other buildings required in a contemporary lifestyle context, with aflexible design and a healthier environment.
- Road construction, traffic, parking, and other things are taken into consideration, but other important design aspects are neglected, such as social and cultural needs, cultural heritage, and architectural identity.

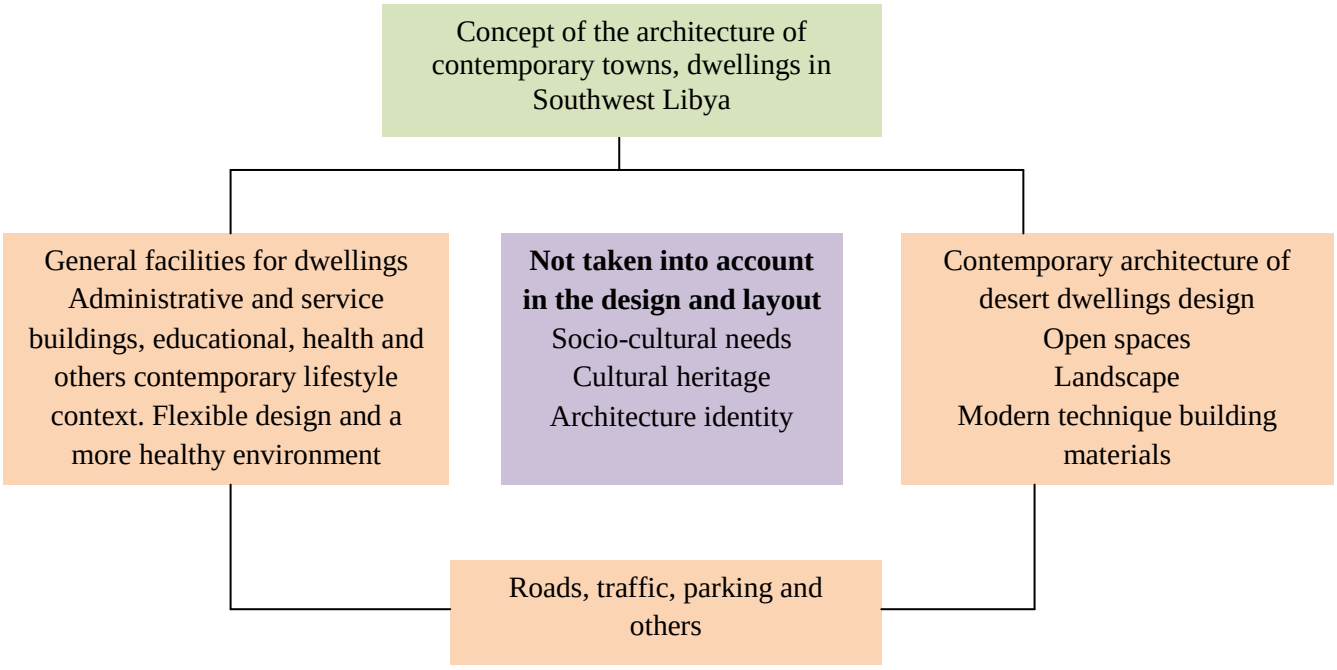


Figure 5.43: Foundations on which the contemporary towns and desert dwellings are based in Southwest Libya. Source: the researcher

The next chapter will discuss in detail the concluding of the section (5.5) with further detail and verified through data analysis and verified it through the responses' statements and their satisfaction with the design of vernacular and contemporary desert dwellings design.

5.6 Summary and Link

This chapter has explored the three historical towns in southwest Libya that have been selected as the case study, and has presented the general characteristics of these towns, including the historical and natural background of the vernacular architecture of desert dwellings and their character. It has presented the layout of the urban fabric of vernacular towns, and described and studied the types and patterns of vernacular desert dwellings for each town, including a review of the models of vernacular dwelling designs, a brief presentation of the most important factors influencing the designs, and a description of the local buildings materials used. Similarly, for each town, the plans for each contemporary towns and the models for the contemporary dwellings have been presented. The chapter has also highlighted, for both the vernacular and contemporary towns and dwellings, the architectural features of socio-cultural sustainability that have influenced the desert-dwelling designs, and the patterns of vernacular and contemporary architecture for desert dwellings. Finally, a comparative summary of the vernacular and contemporary desert dwellings has been provided to explain the basis for the vernacular and contemporary towns and desert dwellings in Southwest Libya in general, in an attempt to highlight the most important features of each type. The next chapter presents the data collection and analysis for the questionnaire and semi-structured interviews of this research.

CHAPTER SIX

DATA ANALYSIS AND FINDINGS

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DATA ANALYSIS AND FINDINGS

6.1 Introduction

This chapter of the thesis presents the data analysis performed to facilitate achieving the aim, objectives, and answers to the research questions posed in Chapter One. This is based on completing the data collection using the methods described in the research methodology in Chapter Four, which is conducted on three towns in Southwest Libya (Ghadames, Sabha, and Ghat)..

Socio-cultural architectural features, and the concepts and principles of socio-cultural sustainability for dwellings were discussed in Chapter Three. Chapter Four showed the research methodology followed in this research, and Chapter Five introduced the case study for the three historical towns in southwest Libya. This discussion and the literature review presented aspects of the theory, this has left some issues of the research aim and research questions with unclear answers, which will be addressed in-depth in this chapter.

The first part of this chapter presents the findings from the analysis of the data collected via a questionnaire, conducted in accordance with the research methodology. The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. Therefore, a questionnaire was conducted ostensibly to define the opinions of different generations in Southwest Libya about the vernacular architecture of desert dwellings, and about their contemporary desert dwellings in terms of the suitability of their socio-cultural architectural features from the perspective of socio-cultural sustainability. The design of the questions of questionnaire aims to obtain information to find the logical answers required for the research questions and to achieve the research aim and objectives. The data sources additionally identify the opinions of the youth about the architectural identity and cultural heritage of vernacular and contemporary desert dwellings, the contemporary lifestyle, and their desires for developing sustainable desert-dwelling designs in the future. In order to achieve the aim of the survey of respondents, three age groups, with the predominant age group being youth, were selected to include all examples in three historical towns that have vernacular and contemporary desert-dwelling sectors in Southwest Libya.

The second data source in this research are semi-structured interviews with specialists, including professionals and academics who have vast experienced in the housing field, to identify their opinions concerning the advantages and disadvantages of vernacular and contemporary desert dwellings in terms of socio-cultural sustainability for desert dwellings. The findings of both sources are compared, discussed and synthesised to formulate the proposed guidelines for desert dwellings design in the future later in Chapter Seven. Figure 6.1 outlines the data collected from the two sources, as follows:

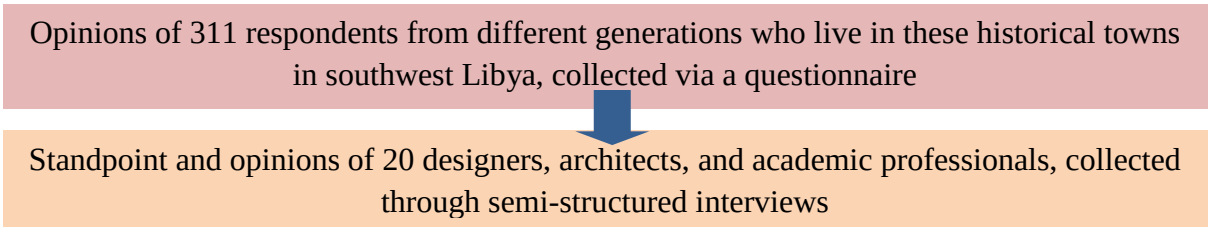


Figure 6.1: Data collected sources

The questionnaire used with respondents for the first source of data collection is shown in Appendix 4, and the guide for the interviews with the group of specialists and professionals for the second source of data collection is shown in Appendix 5. To achieve the aim of the research and provide suitable answers to the research questions, this chapter is structured as shown in Figure 6.2:

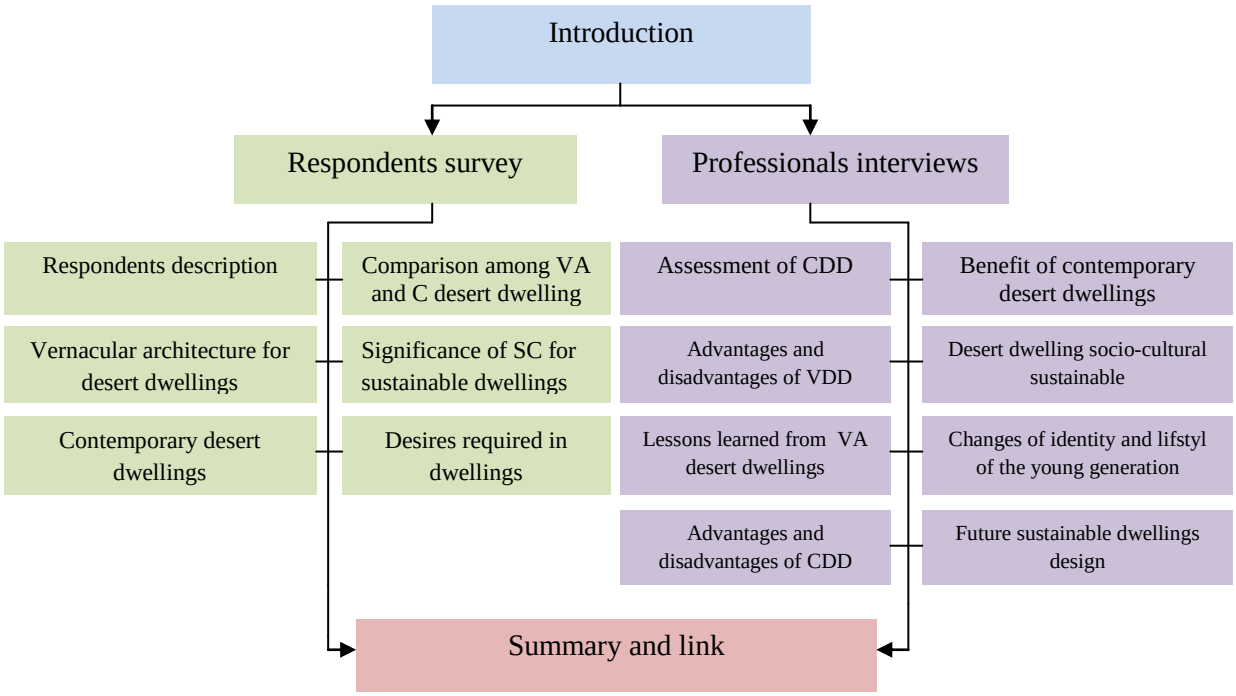


Figure 6.2: Structure of Chapter Six

6.2 Findings and analysis of questionnaire survey

The following sections will present the analysis of the findings of the questionnaire and the implications for sustainable desert-dwelling designs in southwest Libya. The questionnaire was created with relevant research questions, which can be classified into the following six sections:

- **Section 1:** Respondents description
- **Section 2:** Vernacular architecture for desert dwellings
- **Section 3:** Contemporary desert dwellings
- **Section 4:** Comparison among the vernacular and contemporary desert dwellings
- **Section 5:** Significance of socio-cultural architectural features for sustainable desert dwellings design
- **Section 6:** Desires required in dwellings design, and involvement the opinion of respondents

6.2.1 Section 1: Respondents description

The first section of the questionnaire aims to provide information about respondents and target age groups of this questionnaire in order to ensure that respondents are actually targeted in this research. This section is divided into the following five points:

6.2.1.1 Gender, the age group and marital status of respondents

According to the data in Table 6.1, 81% of respondents (the majority) are male and 19% are female. Figure 6.3 illustrates the percentages for each gender.

Table 6.1: Frequency of the distribution of gender

Gender	Frequency	Percentage
Male	252	81%
Female	59	19%
Total	311	100%

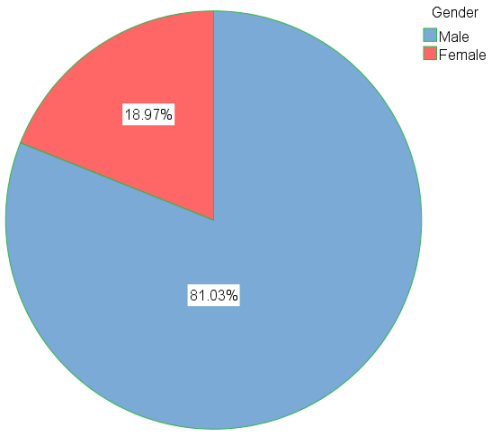


Figure 6.3: Percentages for the distribution of gender

The approaches adopted for this study focus on three age groups chosen from different generations. Table 6.2 shows the responses predominantly come from the younger generation age group (18 to 24 years), comprising 40%. This research aims to find the views of the younger generation about socio-cultural features especially with respect to the contemporary lifestyle and the consolidation of architectural identity. The second age group, those between 25 and 50 years old, is 32% of the sample. The age group over 50 years old is a mere 28% of the sample (see Figure 6.4).

Table 6.2: Frequency of the distribution of ages

Age group	Frequency	Percentage
18 to 24 years	122	40%
25 to 50 years	101	32%
> 50 years	88	28%
Total	311	100%

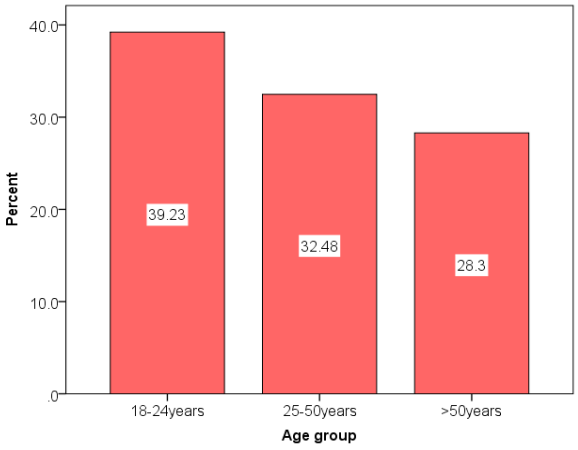


Figure 6.4: Distribution for different age groups

Table 6.3 reveals the information on the marital situation (M-Status) of the respondents: 51.1% are married, 44.7 % are single, only 2.3% are widowed, and 1.9% are divorced (see Figure 6.5).

Table 6.3: Frequency of distribution of M-Status

M-Statutes	Frequency	Percentage
Single	139	44.7%
Married	159	51.1%
Divorced	7	2.3%
Widowed	6	1.9%
Total	311	100%

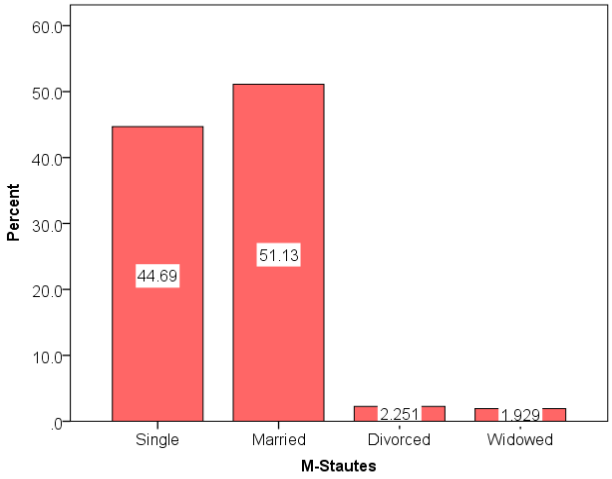


Figure 6.5: Percentages for distribution of M-Status

6.2.1.2 Level of education

Table 6.4 shows data on the maximum level of education of achieved by each respondent , which is considered to be an important factor that impacts the viewpoints of the respondents regarding desert-dwelling circumstances, and gives an evaluation of the comparisons. According to the data in Figure 6.6, 57.5% have a university education, 28.3% of respondents have a high school education, 9% have postgraduate education, and only 5.2% have a primary school education. Hence, the majority of respondents are educated to high school or university level, and have a good level of education, which helps them to give realistic answers to enrich the topic and also facilitates identifying the views of this generation about future dwellings.

Table 6.4: Frequency of level of education

Education	Frequency	Percentage
Primary school level	16	5.2%
High school level	88	28.3%
University level	179	57.5%
Postgraduate level	28	9%
Total	311	100%

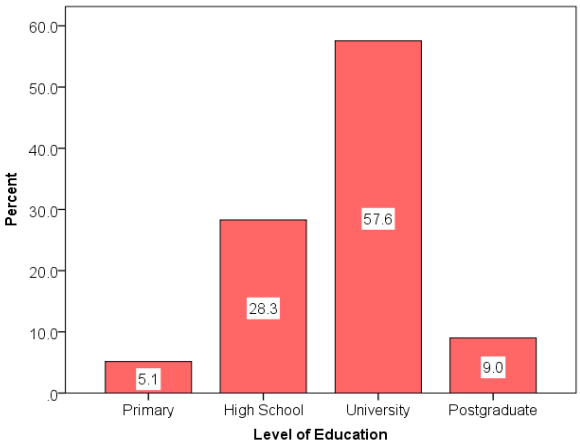


Figure 6.6: Percentages for level of education

6.2.1.3 The profession

According to the information given in Table 6.5, 40% of respondents are students in high schools and universities; 42.7% are employees in different jobs, such as teachers, medical doctors, and so on; 13.5% of respondents are technicians in other different fields in the private sector; and only 3.8% are retirees (see Figure 6.7).

Table 6.5: Frequency of the profession

Occupation	Frequency	Percentage
Employee	133	42.7%
Student	124	40%
Technical	42	13.5%
Unemployed	0	0%
Retired	12	3.8%
Total	311	100%

Figure 6.7: Percentages for each profession

6.2.1.4 Family structure and number of persons

Table 6.6 shows the family structure and number of persons of respondents' families, where 78.1% are small families, which means the family is made up of parents and children who live in independent dwelling unit; and 21.9% are extended families, which means the family is made up of parents and their son's families living together in one large dwelling. This indicates a change in socio-cultural life as some previous studies indicate that extended families are the most common in Libyan society (Bilghit, 2007). The size of these families is diverse, ranging from three to eight people or more; this means the average family size for the respondents is about six people. In more detail, 49.8% of families have five to eight persons, 32.8% of the respondents' families consist of three or four persons, and 10.6% of families have eight people or more.

Table 6.6: Family structure and number of persons

Family structure	Percentage	No. Of persons	Percentage
Small family	78.1%	Two persons	6.8%
Extended family	21.9%	Three to four persons	32.8%
Total	100%	Five to eight persons	49.8%
		> Eight persons	10.6%

6.2.1.5 Native-born respondents in the region (Ghadames, Sabha and Ghat)

It significant to review whether the vast majority of respondents are native and were born in Ghadames, Sabha, or Ghat, or other towns in Southwest Libya. This is considered to be an essential issue for making a valid assessment of the data collected through this survey. If most of the respondents were from outside Ghadames, Sabha, and Ghat, it means the replies of respondents are deficient or unclear because they would not have enough knowledge to evaluate the vernacular architecture and contemporary desert dwellings in those towns. Table 6.7 gives a summary of the data collected.

Table 6.7: Frequency of native-born residents of region

Place of birth	Frequency	Percentage
In the region	286	91.9%
Outside of the region	25	8.1%
Total	311	100%

From Table 6.7 it can be observed that 91.9% of respondents were born in the region, which means they are local, indigenous inhabitants, while only 8.1% of respondents were born in outside of the region.

6.2.2 Section 2: Vernacular architecture for desert dwellings

The second section of the questionnaire aims to provide information about the vernacular architecture for desert dwellings in order to ensure proper comparison and measurement of the level of population satisfaction in section four of the questionnaire. This section is divided into the following three points:

6.2.2.1 Type of the vernacular architecture desert dwellings in your region

With respect to the responses on types of vernacular desert dwelling, Table 6.8 shows that 64.3% of respondents live in Sabha and Ghat where vernacular dwellings with courtyards exist in their region, some of them live in such dwellings and others lived in those dwellings when he/she was a child. Also, 35.7% of respondents live in Ghadames where vernacular compact desert dwellings exist; most of those respondents live in those dwellings, the majority of them were accustomed to frequents visits to vernacular dwellings, and some of them invested had invested in that type of dwelling, such as for accommodation for tourists.

Table 6.8: Frequency of type of vernacular desert dwellings

Type of desert dwellings	Frequency	Percentage
Vernacular compact desert dwellings	111	35.7%
Vernacular courtyard desert dwellings	200	64.3%
Other	0	0%

Based on the results of the analysis presented in Table 6.8, the vast majority of desert dwellings are of the courtyard type, especially in Sabha and Ghat. The second most common type of vernacular desert dwellings are the vernacular compact desert dwellings found in Ghadames. Most vernacular desert dwellings were built from local sustainable building materials available in the surrounding environment, as described in the next section

6.2.2.2 Number of rooms in vernacular desert dwellings

Table 6.9 shows the respondents' answers on the number of rooms in two types of vernacular desert dwellings (compact and courtyard desert dwellings). According to the analysis, 51.7%

of vernacular desert dwellings consist of three bedrooms. This number of bedrooms is dominant in most vernacular desert dwellings in Southwest Libya (Amer, 2007). In addition, 26% have two bedrooms, 4.5% have four bedrooms or more, and only 7.8% of vernacular desert dwellings have one bedroom. Regarding the guest rooms, 77.5% of vernacular desert dwellings have one room for guests, usually used for males, and it is separate from other rooms in the dwellings. Some dwellings have a space in the middle of dwelling used as a living room; this space is also used as a dining room. In addition, 15.4% have two spaces used as living rooms, which are usually found in big vernacular desert dwellings. Only 6.8% do not have a separate living room. Also, 82.9% of vernacular desert dwellings have one kitchen, while 15.4% have two kitchens; just 1.7% do not have kitchens. Finally, 78.1% of vernacular desert dwellings contain one bathroom, while 21.9% have two, one of which is used for guests.

Table 6.9: Frequency number of rooms in the vernacular desert dwellings

Bedrooms	**Frequency**	**Percentage**
One	24	7.8%
Two	81	26%
Three	161	51.7%
Four	31	10%
More than 4	14	4.5%
Guest room	**Frequency**	**Percentage**
Zero	19	6.1%
One	241	77.5%
Two	35	11.2%
Other	16	5.2%
Living room	**Frequency**	**Percentage**
Zero	21	6.8%
One	236	75.8%
Two	48	15.4%
Other	6	2%
Bathrooms	**Frequency**	**Percentage**
One	243	78.1%
Two	68	21.9%
Other	0	0%
Kitchen	**Frequency**	**Percentage**
Zero	5	1.7%
One	258	82.9%
Two	48	15.4%

6.2.2.3 The nationality of the builders whose built vernacular desert dwellings

With regard to the answers of the respondents on the nationality of the builders of the vernacular dwellings in order to know the origin of the ideas that used to designed and constructed these dwellings, Table 6.10 shows that 76.5% were locals, 20.6% were of foreign nationalism, and 2.9% were a combination of both local builders and foreign builders. Foreigners here means the people they are not a Libyan descent. According to local construction experts in Ghadames, the participated of the other people from other desert areas were very limited in building some vernacular dwellings. Thus, most of the vernacular desert dwellings were built by local workers with local building materials. Therefore, those vernacular desert dwellings may reflect the ideas of local builders, which were inspired from the natural sustainable environment and their lifestyle as well.

Table 6.10: Frequency of builder's nationality for vernacular desert dwellings

Nationality of the builders	Frequency	Percentage
Foreigners	64	20.6%
Locals	238	76.5%
Combination	9	2.9%

6.2.3 Section 3: Contemporary desert dwellings

This section aims to provide spicific information about the contemporary desert dwellings in order to ensure proper comparison and measurement of the level of population satisfaction in section four. This section is divided into the following three points:

6.2.3.1 Type of contemporary desert dwelling

Table 6.11 shows that 60% of respondents live in contemporary desert dwellings, 17% live in flats within a block of flats, 12.8% of respondents have single-storey villas, while only 10.2% live in villas with two or more storeys. This means that most of respondents live in contemporary desert dwellings.

Table 6.11: Frequency of type of contemporary desert dwellings

Type of dwelling do you occupy	Frequency	Percentage
Contemporary dwelling	186	60%
Single-storey villa	40	12.8%
Villa two-storey or more	32	10.2%
Flat in Building	53	17%
Total	311	100%

6.2.3.2 Number of rooms in contemporary desert dwellings

Table 6.12 reveals the results from the respondents in terms of the number of rooms in their contemporary desert dwellings. According to the results of analysis, 44.4% of contemporary desert dwellings have three bedrooms, and 76.8% of those dwellings have one guest room, which is usually used for males and is separate from the other rooms in dwelling the. A total of 77.8% have one room that is used as a living room. With respect to kitchens, 85.3% of contemporary desert dwellings have one kitchen; 13.2% have two kitchens, which are generally found in the large dwellings; and 1.4% do not have separate kitchens (in such dwellings the kitchen is a part of living room rather than being a separate space). Finally, 65.6% of contemporary desert dwellings have two bathrooms, 32.8% have one, and only 1.6% have more than one.

Table 6.12: Frequency number of bedrooms in a contemporary desert dwellings

Bedrooms	**Frequency**	**Percentage**
One	15	4.8%
Two	96	30.9%
Three	138	44.4%
Four	52	16.7%
More than 4	10	3.2%
Guest room	**Frequency**	**Percentage**
Zero	6	2%
One	239	76.8%
Two	53	17%
Other	13	4.1%
Living room	**Frequency**	**Percentage**
Zero	0	0.0%
One	242	77.8%
Two	40	12.9%
Other	29	9.3%
Bathrooms	**Frequency**	**Percentage**
One	102	32.8%
Two	204	65.6%
Other	5	1.6%
Kitchen	**Frequency**	**Percentage**
One	266	85.5%
Two	41	13.2%
Other	4	1.3%

6.2.3.3 The nationality of the builders whose built contemporary desert dwellings

With respect to the results from the respondents regarding the nationality of the builders who built their contemporary desert dwellings, Table 6.13 shows that 78.1% were foreigners, 14.5% were locals (here, local means a local limited company that works in the field of construction), and 7.4 % involved a combination of locals and foreign builders . Almost 90% of those companies used the same contemporary construction techniques and modern building materials, such as cement and concrete.

Table 6.13: Frequency of builder's nationality for contemporary desert dwellings

Nationality of builders	Frequency	Percentage
Foreigners	243	78.1%
Locals	45	14.5%
Combination	23	7.4%

6.2.4 Section 4: Comparison among the vernacular and contemporary desert dwellings

The questions in Section 4 are to investigate the socio-cultural-sustainability features of both vernacular and contemporary desert dwellings in Southwest Libya, that aim to identifying the respondents' opinions, and measuring their satisfaction levels with both vernacular and contemporary dwelling designs to identify socially and culturally sustainable features to contribute to the formulation of guidelines using the Likert scale. Likert-type data is ordinal data (i.e. where one score is higher than another), rather than providing the distance between the points. The response categories of a five-point Likert scale are used, with the data coded as values 1 to 5 and the item responses viewed as being ordinal. The following Likert scale is used for the respondents' answers to the questions in this section:

(1=Strongly dissatisfied, 2=Dissatisfied, 3= Neutral, 4= Satisfied, and 5= Strongly satisfied).

6.2.4.1 Respondents' opinions on privacy in dwellings

This section deals with five questions used to examine the opinions of respondents on dwelling privacy to find out their degree of satisfaction. This is in order to investigate all of socio-cultural-sustainability features in both vernacular and contemporary desert dwellings,

which are visual and acoustic privacy, privacy around the dwelling (with respect to the street and neighbours), privacy in sleeping spaces, and, finally, the interior organisation.

1. Visual privacy

The analysis in Table 6.14 provides the overall picture for respondents' satisfaction with vernacular and contemporary desert dwellings in terms of visual privacy.

Table 6.14: Satisfaction levels for visual privacy

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	14	4.5%	38	12.2%
Dissatisfied 2	65	20.9%	121	38.9%
Neutral 3	35	11.3%	53	17%
Satisfied 4	152	48.9%	78	25.1%
Very Satisfied 5	45	14.5%	21	6.8%
Total	311	100%	311	100%

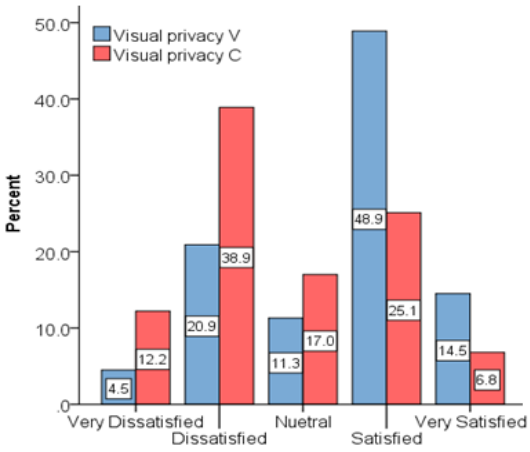


Figure 6.8: Satisfaction for the internal visual privacy in dwelling

According to the data in Table 6.14, 63.4% of respondents are very satisfied or satisfied with the vernacular desert dwellings. This may indirectly be due to the design of the main entrance of vernacular desert dwellings . For the contemporary desert dwellings, not enough attention was given to this type of privacy when they were designed, especially in flats, where only 31.9% of respondents express they are satisfied or very satisfied with the visual privacy of contemporary dwellings, as shown in Figure 6.8.

2. Acoustic privacy of dwelling

The majority of people in the study sample are concerned about acoustic privacy, particularly between males and females, as well as from children. The statistical analysis regarding respondents' satisfaction level for acoustic privacy in both vernacular and contemporary desert dwellings is reported in Table 6.15.

Table 6.15: Satisfaction levels for acoustic privacy

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	7	2.3%	33	10.6%
Dissatisfied 2	71	22.8%	126	40.5%
Neutral 3	46	14.8%	43	13.8%
Satisfied 4	141	45.3%	95	30.6%
Very Satisfied 5	46	14.8%	14	4.5%
Total	311	100%	311	100%

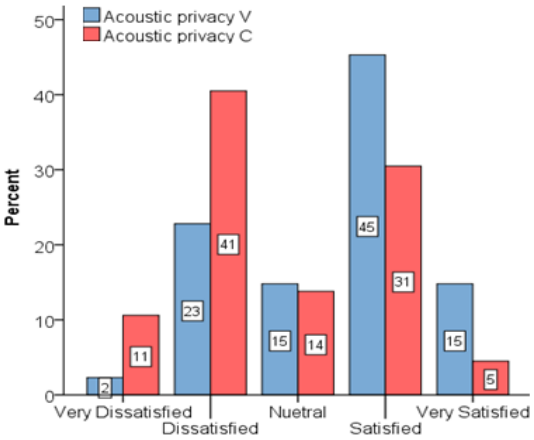


Figure 6.9: Satisfaction for the acoustic privacy in dwelling

As can be identified from Table 6.15 and Figure 6.9, 60.1% of respondents are either very satisfied or satisfied with vernacular desert dwellings, where the thick walls play an important role in achieving this acoustic privacy. The amount of respondents who are satisfied or very satisfied with contemporary dwellings is 35.1%, which may be due to most of these dwellings not having insulation material, and the guest room and kitchen being located near to the main entrance, especially in flats.

3. Privacy around the dwelling

Table 6.16 clearly illustrates high satisfaction levels (56.3%) with privacy around the dwelling for the vernacular desert dwellings, due to them being designed so that none of their windows overlook any other dwellings. However, 50.8% of respondents are dissatisfied / very dissatisfied with contemporary desert dwellings as they were designed without consideration for the privacy required by the local desert society lifestyle.

Table 6.16: Satisfaction levels for privacy around the dwelling

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	4	1.3%	36	11.6%
Dissatisfied 2	80	25.7%	122	39.2%
Neutral 3	52	16.7%	56	18%
Satisfied 4	137	44.1%	84	27%
Very Satisfied 5	38	12.2%	13	4.2%
Total	311	100%	311	100%

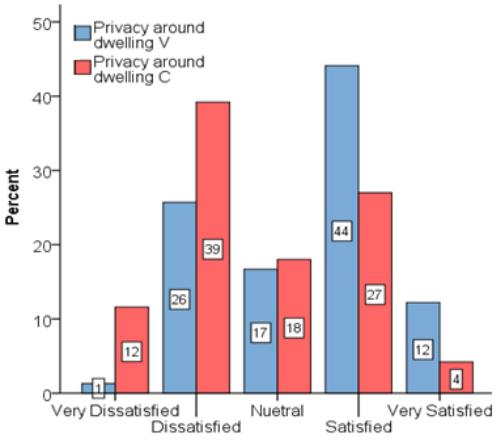


Figure 6.10: Satisfaction for the privacy around the dwelling

From observing of the layout of the vernacular desert towns, street privacy is evidenced through the minor local streets and alleys. In addition, most of the vernacular dwellings are similar in height and the rooftops are surrounded by walls to a height of 2 m. This enhances the privacy from neighbours. Figure 6.10 shows the results for the responses regarding the satisfaction level in terms of privacy from neighbours.

4. Privacy of sleeping spaces

Another significant aspect of the socio-cultural sustainability of dwelling design in relation to privacy relates to providing segregation between brothers and sisters in the sleeping spaces. The responses in terms of the respondents' levels of satisfaction with the separation between brothers and sisters are reported in Table 6.17.

Table 6.17: Satisfaction levels for sleeping spaces

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	39	12.5%	14	4.5%
Dissatisfied 2	132	42.5%	76	24.4%
Neutral 3	50	16.1%	42	13.5%
Satisfied 4	79	25.4%	134	43.1%
Very Satisfied 5	11	3.5%	45	14.5%
Total	311	100%	311	100%

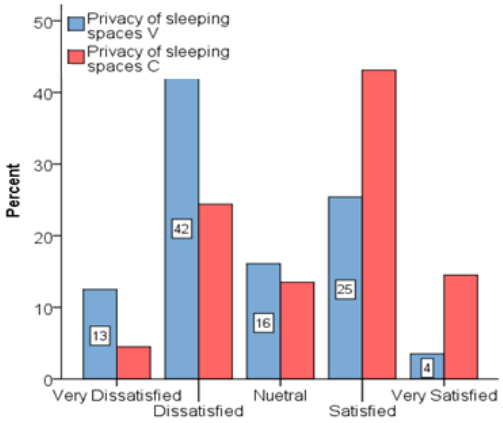


Figure 6.11: Satisfaction for sleeping spaces

The results in Table 6.17 indicate a high level of satisfaction with the privacy of sleeping spaces found in contemporary desert dwellings (57.6%) and the dissatisfaction level for vernacular desert dwellings is 55%, as shown in Figure 6.11. According to the field study, 78.1% of respondents' lived in small families, while only 21.9% lived in extended families, meaning that most dwellings are used by small families. This may facilitate the use of more than one room for children.

5. Privacy of interior organisation

Most of the respondents were concerned about privacy in terms of the interior organisation of spaces, particularly regarding the location of kitchen with respect to the living room and the location of the bathroom with respect to the guest room. Respondents' satisfaction levels with the privacy from the interior organisation of spaces in both vernacular and contemporary desert dwellings are reported in Table 6.18.

Table 6.18: Satisfaction levels for interior organisation

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	19	6.1%	40	12.9%
Dissatisfied 2	76	24.4%	98	31.5%
Neutral 3	43	13.8%	53	17%
Satisfied 4	137	44.1%	101	32.5%
Very Satisfied 5	36	11.6%	19	6.1%
Total	311	100%	311	100%

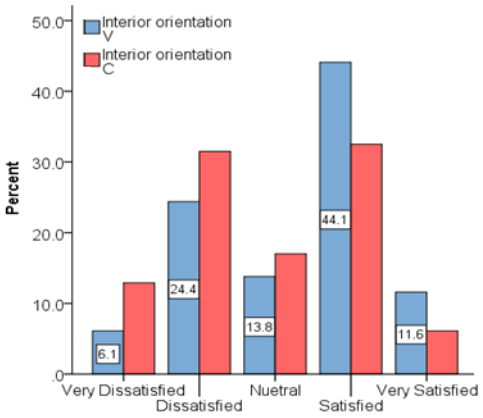


Figure 6.12: Satisfaction for the privacy of interior organisation

As can be seen from Figure 6.12, 44.1% of respondents are satisfied and 11.6% are very satisfied with vernacular desert dwellings, where the distribution and design of the interior orientation of spaces are compatible with the customs and socio-cultural needs. The percentage of those respondents who are satisfied is 32.5% in contemporary desert dwellings. This is because most of the designers, architects, and contractors that built those dwellings do not have adequate knowledge about the socio-cultural needs of the local population. On the other hand, this does not mean that all the vernacular desert dwellings are suitable in terms of the organisation of interior spaces, where the small size of some of the vernacular dwellings does not allow the existence of a sufficient number of rooms for occupants.

Table 6.19, shows the results of the statistical tests for the responses on privacy. For 'acoustic privacy', the participants are satisfied in the case of vernacular desert dwellings (median=4), while they are dissatisfied in the case of contemporary desert dwellings (median=2), see Table 6.19. Using the Wilcoxon signed-rank test to analyse the data, the difference between vernacular and contemporary dwellings is very highly significant (p-value<.001). Similarly, the participants are satisfied with 'acoustic privacy', 'privacy around the dwelling', and 'interior space organisation' (median=4) in the case of vernacular desert dwellings, while they are dissatisfied with contemporary desert dwellings (median=2). Statistically, the Wilcoxon signed-rank test confirms that the difference between attitudes to vernacular and contemporary dwellings is very highly significant (p-value<.001). In contrast, for 'privacy of sleeping spaces', the participants are dissatisfied with vernacular dwellings (median=2), but they are satisfied with contemporary dwellings (median=4). This difference between contemporary and vernacular dwellings for 'privacy of sleeping spaces' is very highly significant (p-value<.001). Overall, the participants are seen to be more satisfied with vernacular dwellings.

Table 6.19: Comparison in privacy of dwelling between vernacular and contemporary desert dwelling using the Wilcoxon test

Privacy of dwelling	Vernacular desert dwellings				Contemporary desert dwellings				Wilcoxon test	
	Median	Mean	SD	Rank	Median	Mean	SD	Rank	Z	p-value
Visual privacy	4.00	3.48	1.110	2	2.00	2.75	1.158	4	7.280	<.001
Acoustic privacy	4.00	3.48	1.068	1	2.00	2.78	1.127	3	6.696	<.001
Privacy around dwelling	4.00	3.40	1.039	3	2.00	2.73	1.106	5	7.209	<.001
Privacy of sleeping spaces	2.00	2.65	1.097	5	4.00	3.39	1.135	1	7.322	<.001
Interior space organisation	4.00	3.31	1.142	4	3.00	2.87	1.178	2	4.431	<.001

6.2.4.2 Respondents' opinions on safety and security

This section deals with four questions used to examine the respondents' opinions of their dwelling to find out whether they are satisfied or dissatisfied with safety and security in general, safety around the dwelling, family safety, and safety of the location.

1. Safety and security of dwelling

The responses regarding security and safety of both vernacular and contemporary desert dwellings are summarised in Table 6.20. The great majority of respondents (39.9%) are satisfied or very satisfied with vernacular desert dwellings; this is compared to contemporary desert dwellings where 56.3% are satisfied or very satisfied.

Table 6.20: Satisfaction levels for dwelling safety and security

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	36	11.6%	23	7.4%
Dissatisfied 2	99	31.8%	61	19.6%
Neutral 3	52	16.7%	52	16.7%
Satisfied 4	106	34.1%	133	42.8%
Very Satisfied 5	18	5.8%	42	13.5%
Total	311	100%	311	100%

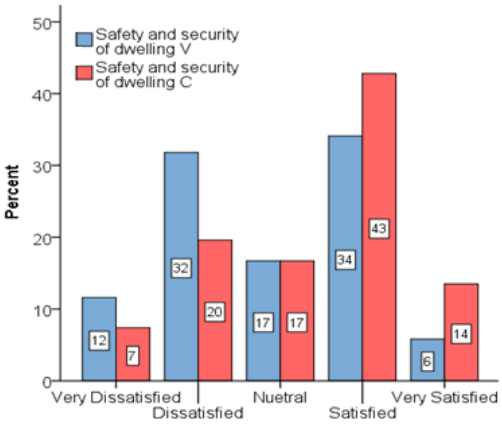


Figure 6.13: Satisfaction for the safety and security of dwelling

According to the data in Figure 6.13, the level of satisfaction with contemporary desert dwellings for safety and security may be as a result of the security and safety measures implemented in those dwellings, such as the durability of the concrete structure and the quality of building materials, which provide protection from theft . In contrast, Crawford (2006) suggests that neighbours provide strong social ties, which may help to provide security.

2. Safety around dwelling

The responses for safety around the dwelling for both vernacular and contemporary desert dwellings is shown in Table 6.21.

Table 6.21: Satisfaction levels for safety around dwelling

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	5	1.6%	42	13.5%
Dissatisfied 2	84	27%	116	37.3%
Neutral 3	53	17%	51	16.4%
Satisfied 4	126	40.5%	89	28.6%
Very Satisfied 5	43	13.8%	13	4.2%
Total	311	100%	311	100%

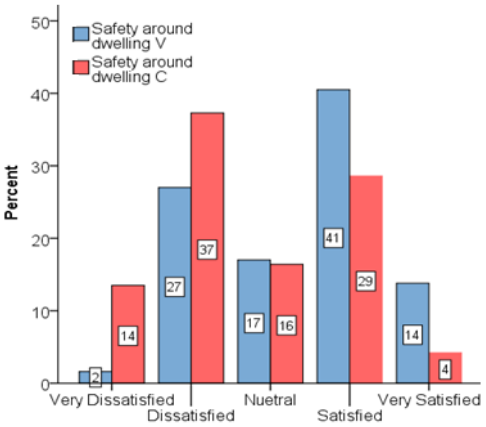


Figure 6.14: Satisfaction for safety around dwelling

The analysis of the responses indicate that 54.3% of respondents are either very satisfied or satisfied with the safety around the dwelling for vernacular desert dwellings. This may be due to the streets in the vernacular town neighbourhoods being free of cars, such as in the Ghadames and Ghat. Merely 32.8% are satisfied or very satisfied with the safety around the dwelling for contemporary desert-dwelling sectors (see Figure 6.14).

3. Family safety

The results of responses on family safety for both vernacular and contemporary dwellings are shown in Table 6.22.

Table 6.22: Satisfaction levels for the family safety

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	40	12.9%	19	6.1%
Dissatisfied 2	118	37.9%	89	28.6%
Neutral 3	38	12.2%	46	14.8%
Satisfied 4	99	31.8%	119	38.3%
Very Satisfied 5	16	5.1%	38	12.2%
Total	311	100%	311	100%

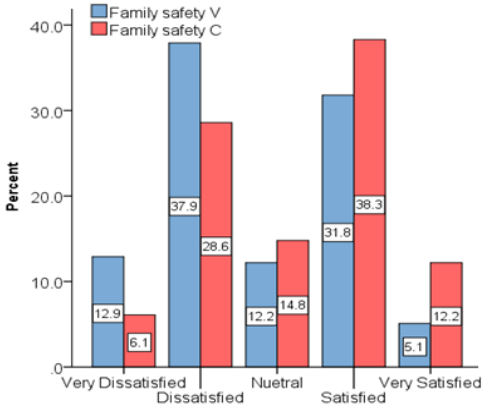


Figure 6.15: Satisfaction for the family safety

Based on the results in Table 6.22, 50.5% of respondents are very satisfied or satisfied with family safety in contemporary desert dwellings, whereas 34.7% are dissatisfied or very dissatisfied. This is compared with vernacular desert dwellings, for which those who are satisfied or very satisfied is only 36.9%, while 50.8% are dissatisfied or very dissatisfied. The analysis in Figure 6.15 shows that the majority of respondents' were either very satisfied or satisfied with contemporary desert dwellings sector.

4. Safety of location

The results of responses on the safety of the location for both vernacular and contemporary dwellings are shown in Table 6.23.

Table 6.23: Satisfaction levels for safety of location

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	24	7.7%	53	17%
Dissatisfied 2	80	25.7%	107	34.4%
Neutral 3	43	13.8%	44	14.1%
Satisfied 4	122	39.2%	93	29.9%
Very Satisfied 5	42	13.5%	14	4.5%
Total	311	100%	311	100%

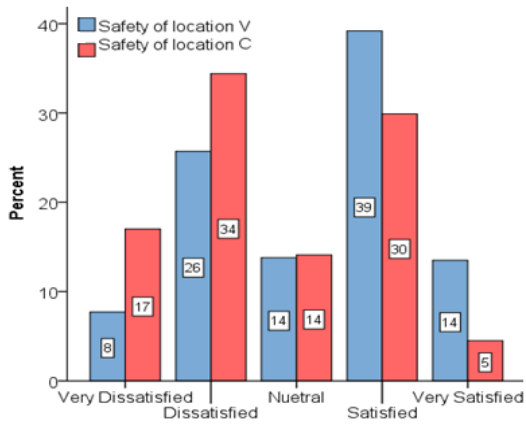


Figure 6.16: Satisfaction for the safety of location

As can be noted from Figure 6.16, the results indicate that more than 52% of respondents were satisfied or very satisfied with the safety of the location, such as for children's play areas, shopping areas (which are mostly used by women) , and men's seating areas within the sectors for vernacular desert dwellings. This may be due to the vernacular towns having open spaces, such large courtyards between desert dwellings, which offer a space for children to

play or do some other activities without having to leave the neighbourhood, compared with some contemporary desert dwellings where children mostly play in the street or in any another open area, which increases the risk of accidents.

Table 6.24 shows the results of the statistical tests for the responses on safety and security. For the first item, 'safety and security of the dwelling', the participants show neutrality in the case of vernacular desert dwellings (median=3), while they are satisfied in the case of contemporary desert dwellings (median=4). Using the Wilcoxon signed-rank test, the difference between vernacular and contemporary dwellings is very highly significant (p-value<.001). In contrast, the participants were satisfied with 'safety around dwelling' (median=4) in the case of vernacular desert dwellings, but dissatisfied for contemporary desert dwellings (median=2). Statistically, the Wilcoxon signed-rank test confirms that the difference in the attitudes of respondents to vernacular and contemporary dwellings was very highly significant (p-value<.001). The scenario is different for 'family safety', where the participants are dissatisfied with vernacular dwellings (median=2), but satisfied with contemporary dwellings (median=4). This difference between vernacular and contemporary dwellings for family safety is very highly significant (p-value<.001). For the safety of the location, the participants are satisfied with vernacular dwellings (p-value<.001) and dissatisfied with contemporary dwellings. Overall, the participants' satisfaction with the safety and security of the dwelling, for both vernacular and contemporary desert dwellings, depends on the type of safety in question.

Table 6.24: Comparison in safety and security of dwelling between vernacular and contemporary desert dwelling using the Wilcoxon test

Safety and security of dwelling	Vernacular desert dwellings				Contemporary desert dwellings				Wilcoxon test	
	Median	Mean	SD	Rank	Median	Mean	SD	Rank	Z	p-value
Safety and security	3.00	2.91	1.162	3	4.00	3.35	1.157	1	4.720	<.001
Safety around dwelling	4.00	3.38	1.073	1	2.00	2.73	1.138	3	6.975	<.001
Family safety	2.00	2.78	1.173	4	4.00	3.22	1.166	2	4.506	<.001
Safety of location	4.00	3.25	1.200	2	2.00	2.70	1.192	4	5.410	<.001

6.2.4.3 Respondents' opinions on shape and design of dwelling

This section deals with five questions used to examine the opinion of the respondents about the shape and design of dwellings to find out whether they are satisfied or dissatisfied. This is in order to cover all aspects of the investigation into the socio-cultural features in both

vernacular and contemporary desert dwellings, which are the area of the dwelling; the location; the windows, openings, and doors in terms of size and shape; and the quality of finish and external facades.

1. Area of dwelling

The responses in terms of level of satisfaction with the areas in the dwellings for both vernacular and contemporary desert dwellings are displayed in Table 6.26.

Table 6.25: Satisfaction levels for area of dwellings

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	50	16.1%	20	6.4%
Dissatisfied 2	109	35%	87	28%
Neutral 3	46	14.8%	43	13.8%
Satisfied 4	91	29.3%	117	37.6%
Very Satisfied 5	15	4.8%	44	14.1%
Total	311	100%	311	14.1%

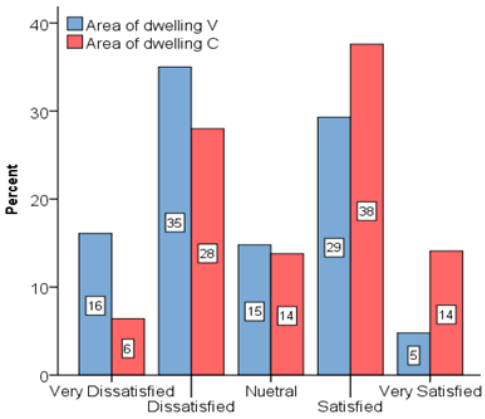


Figure 6.17: Satisfaction for the area of dwelling

Based on the results in Table 6.25, 63% of respondents are very satisfied or satisfied in terms of the area of the contemporary desert dwellings, whereas 22% are dissatisfied. This is compared with vernacular desert dwellings, for which the satisfaction level is only 37%, while 40% are dissatisfied or very dissatisfied. Figure 6.17 shows this big difference in satisfaction levels between vernacular and contemporary desert dwellings regarding the area of the dwelling, which may be due to the variety of sizes in the new designs.

2. Dwelling location

The results of the analysis of responses pertaining to the location of desert dwellings in terms of proximity to public services, such as schools, markets, mosques, and other public services, is summarised in Table 6.26.

Table 6.26: Satisfaction levels for dwelling location

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	39	12.5%	20	6.4%
Dissatisfied 2	119	38.3%	82	26.4%
Neutral 3	45	14.5%	51	16.4%
Satisfied 4	92	29.6%	130	41.8%
Very Satisfied 5	16	5.1%	28	9%
Total	311	100%	311	100%

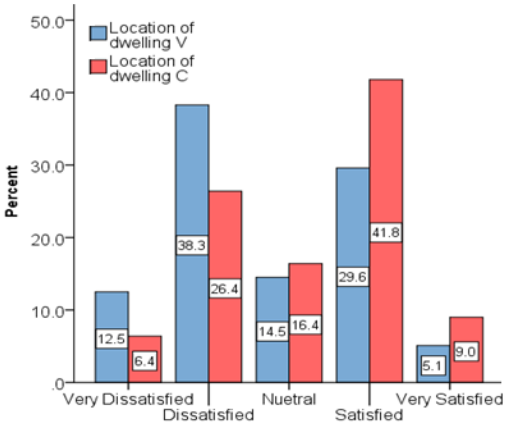


Figure 6.18: Satisfaction for dwelling location

According to the results in Table 6.26, 50.8% of respondents in southwest Libya have a reasonable level of satisfaction with the location of contemporary desert dwellings. This is compared to vernacular desert dwellings for which the percentage of satisfied or very satisfied is almost 34.7%. The level of satisfaction with contemporary desert dwellings, as a shown in Figure 6.18, is because most dwellings are located in contemporary planned areas that have proximity to most services.

3. Windows, openings and doors in terms of shape, size and quality

The analysis in Table 6.27 provides the overall picture of respondents' satisfaction with respect to the dwelling's windows, openings, and doors in terms of shape, size, and quality.

Table 6.27: Satisfaction levels for the windows, doors for shape, size and quality

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	37	11.9%	13	4.2%
Dissatisfied 2	106	34.1%	72	23.2%
Neutral 3	48	15.4%	52	16.7%
Satisfied 4	98	31.5%	128	41.2%
Very Satisfied 5	22	7.1%	46	14.8%
Total	311	100%	311	100%

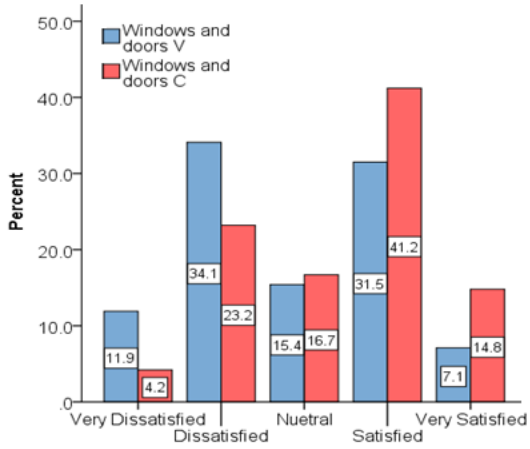


Figure 6.19: Satisfaction for the windows and doors

Figure 6.19 illustrates that 56% of respondents are very satisfied or satisfied with the windows, openings, and doors, in terms of shape and quality, for contemporary desert

dwellings, as the design and quality of materials for windows and doors in contemporary dwellings are suitable for controlling the entry of dust, air currents, and other climatic conditions. For example, the presence of some modern materials, such as glass and reinforced aluminium panels with rubber surrounds, in the windows and doors helps to preserve the internal environment of the dwelling.

4. Quality of finishing and external facades

The responses regarding the respondents' opinions on the quality of finishes and external facades for both contemporary and vernacular desert dwellings are reported in Table 6.28.

Table 6.28: Satisfaction levels for quality finishing and external facades

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	30	9.6%	12	3.9%
Dissatisfied 2	92	29.6%	69	22.2%
Neutral 3	50	16.1%	42	13.5%
Satisfied 4	110	35.4%	142	45.7%
Very Satisfied 5	29	9.3%	46	14.8%
Total	311	100%	311	100%

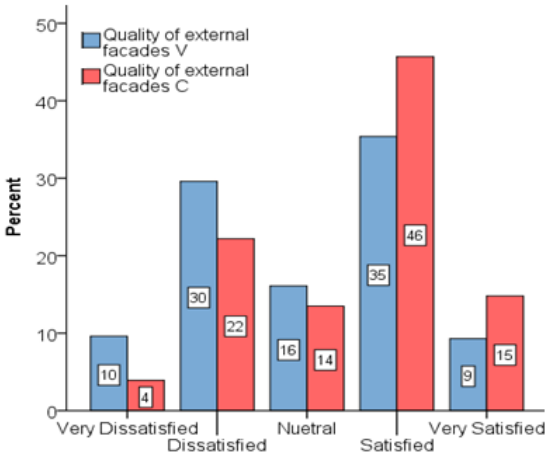


Figure 6.20: Satisfaction for quality finishing, external facades

As can be seen in the Figure 6.20, there are disparities in the levels of satisfaction of the respondents with the external facades for vernacular and contemporary desert dwellings, where 60.5% of respondents are very satisfied or satisfied with the contemporary desert dwellings, which may refer to the more exciting aesthetics and materials. This is compared with vernacular desert dwellings where almost 44.7% are satisfied with the shape and aesthetics of the external facades.

Table 6.29 shows the results of the statistical tests for the responses on the shape and design of dwellings . The participants are dissatisfied with the 'area of the dwelling' and also the 'location of the dwelling' with respect to vernacular desert dwellings (median=2), but they are satisfied in the case of contemporary desert dwellings (median=4), as stated in Table 6.29. Using the Wilcoxon signed-rank test, the difference between vernacular and contemporary dwellings is very highly significant (p-value<.001). In addition, the participants are satisfied with 'windows, openings, and doors' and the 'quality of external facades'(median=4) for

contemporary desert dwellings, while they are neutral on these for vernacular desert dwellings (median=3) . Statistically, the Wilcoxon signed-rank test confirms that the difference in the attitudes towards vernacular and contemporary dwellings is very highly significant (p-value<.001). Overall, the participants are more satisfied with contemporary desert dwellings with regard to shape and design.

Table 6.29: Comparison in shape and design of dwelling between vernacular and contemporary desert dwelling using the Wilcoxon test

Shape and design of dwelling	Vernacular desert dwellings				Contemporary desert dwellings				Wilcoxon test	
	Median	Mean	SD	Rank	Median	Mean	SD	Rank	Z	p-value
Area of dwelling	2.00	2.72	1.185	4	4.00	3.25	1.192	3	5.303	<.001
Location of dwelling	2.00	2.77	1.155	3	4.00	3.21	1.123	4	4.268	<.001
Windows and doors	3.00	2.88	1.185	2	4.00	3.39	1.119	2	5.473	<.001
Quality of facades	3.00	3.05	1.188	1	4.00	3.45	1.106	1	4.188	<.001

6.2.4.4 Respondents' opinions on religious and social consideration in dwelling

The local population in Southwest Libya have natural tendencies to adhere to their religion more than anywhere else in Libya. Therefore, one can find that the respect of religious doctrine, which has a traditional social character, is reflected in the design of the vernacular desert dwellings in southwest Libya. This section deals with four questions to examine the opinions of the respondents about the religious and social considerations of their dwellings to find out whether they are satisfied or dissatisfied. This is in order to cover all aspects of the investigation into the socio-cultural features in both vernacular and contemporary desert dwellings, which includes opinions about the religious-belief considerations and social considerations in dwellings in terms the family relationship, relationships with neighbours, social relationships, and relationships with religious places.

1. Social considerations and religious beliefs in terms the family relationship

The analysis in Table 6.30 provides the overall picture of respondents' satisfaction with the religious and social considerations of vernacular and contemporary desert dwellings in terms of family relationship.

Table 6.30: Satisfaction levels for the family relationship

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	16	5.1%	50	16.1%
Dissatisfied 2	91	29.3%	112	36%
Neutral 3	40	12.9%	45	14.5%
Satisfied 4	119	38.3%	89	28.6%
Very Satisfied 5	45	14.5%	15	4.8%
Total	311	100%	311	100%

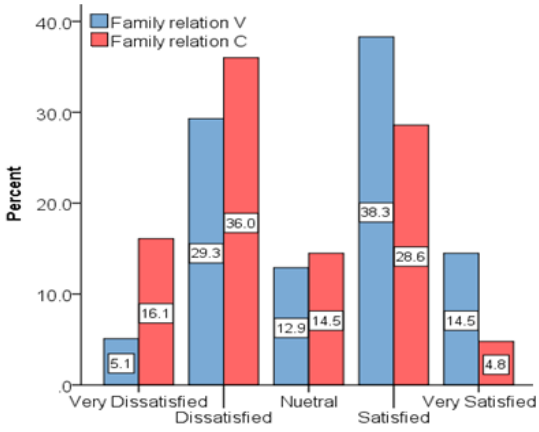


Figure 6.21:: Satisfaction for family relationship

The results indicate that 52.8% of respondents are very satisfied or satisfied with vernacular dwellings in terms of family relationships, due to having family and women's spaces, and daily activities are considered to be an occasion for desert society in vernacular towns. A total of 33.4% of respondents are satisfied or very satisfied with contemporary desert dwellings regarding this aspect. However, Figure 6.21 shows the importance of this feature for both vernacular and contemporary dwellings, which is because it reflects the religious identity of the local populations.

2. Relationship with neighbors

The responses on respondents' levels of satisfaction with religious and social considerations in terms of relationships with neighbours, for both vernacular and contemporary desert dwellings, are reported in Table 6.31.

Table 6.31: Satisfaction levels for relationship with neighbours

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	17	5.5%	46	14.8%
Dissatisfied 2	60	19.3%	115	37%
Neutral 3	47	15.1%	50	16.1%
Satisfied 4	149	47.9%	84	27%
Very Satisfied 5	38	12.2%	16	5.1%
Total	311	100%	311	100%

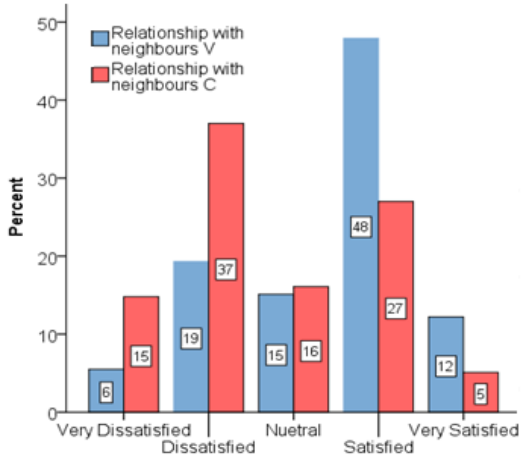


Figure 6.22: Satisfaction for relationship with neighbours

The results in Table 6.31 shows 60.1% of respondents are very satisfied or satisfied with vernacular desert dwellings regarding the religious and social considerations in terms of the

relationships with their neighbours, and only 24.8% are dissatisfied or very dissatisfied for vernacular desert dwellings for the same aspect. However, 32.1% of respondents are satisfied or very satisfied with contemporary desert dwellings for that aspect (see Figure 6.22).

3. Social relationship

The responses on the level of satisfaction with religious and social considerations in dwellings in terms of social relationships, for both vernacular and contemporary desert dwellings, are detailed in Table 6.32.

Table 6.32: Satisfaction levels for social relationship

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	18	5.8%	48	15.4%
Dissatisfied 2	92	29.6%	108	34.7%
Neutral 3	42	13.5%	56	14.8%
Satisfied 4	109	35%	95	30.5%
Very Satisfied 5	50	16.1%	14	4.5%
Total	311	100%	311	100%

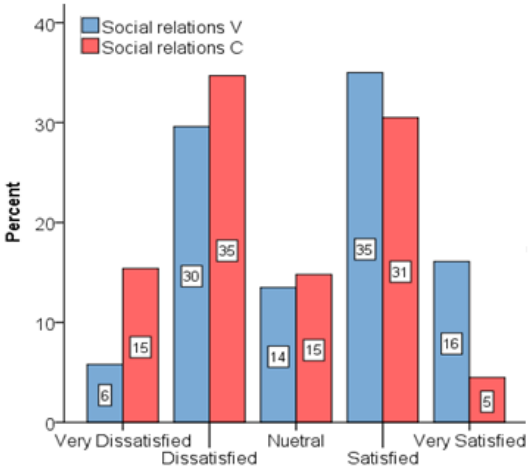


Figure 6.23 Satisfaction for social relationship

The analysis results in Table 6.32 show that 51.1% of respondents are very satisfied or satisfied with religious and social considerations regarding social relationships for vernacular desert dwellings, both at the level of families in residential neighbourhoods and at the community level of the town as a whole. The level of dissatisfaction with contemporary desert dwellings is 50%.

As shown in Figure 6.24, more than half of the respondents are satisfied with the vernacular dwellings within the compact urban fabric in terms of social considerations regarding social relationships among the populations, and with the different spaces, such as public spaces, markets, cultural places, cafes, and social forums. Since most vernacular towns in southwest Libya are divided into several neighbourhoods, and each of these neighbourhoods has a place for the elderly to gather, a place for the youth to gather, playgrounds for the children, and popular cafes, all of these places contribute to strengthening social relations among the population of the neighbourhood and at the level of the town. However, some of the

respondents believe that the existence of such buildings and services that are far away from the dwelling sectors, whether vernacular or contemporary, can help to reduce the level of environmental pollution and noise, and also preserves the privacy and security of dwellings.

4. Relationship with religious places

The responses on respondents' levels of satisfaction with religious and social considerations in terms of the relationship with religious places, for both vernacular and contemporary desert dwellings, are given in Table 6.33.

Table 6.33: Satisfaction levels for relationship with religious places

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	18	5.8%	29	9.3%
Dissatisfied 2	78	25.1%	76	24.4%
Neutral 3	53	17%	50	16.1%
Satisfied 4	124	39.9%	112	36%
Very Satisfied 5	38	12.2%	44	14.1%
Total	311	100%	311	100%

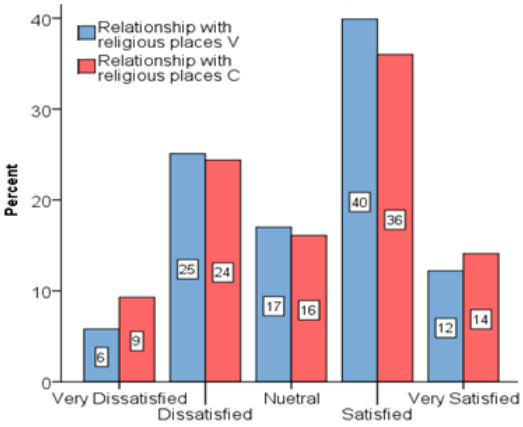


Figure 6.24: Satisfaction for relationship with religious places

As Table 6.33 shows, 70% of respondents are very satisfied or satisfied with the religious and social considerations in terms of their relationship with religious places (mosques, religious oratories, and Quranic schools that are spread throughout most of the towns and oases of southwest Libya) for vernacular dwellings. The dissatisfaction level for contemporary desert dwellings is only 37%, while 40% of respondents are satisfied with the contemporary desert dwellings for this aspect.

Table 6.34 shows the results of the statistical tests on the responses for social considerations and religious-belief considerations. The participants are found to be dissatisfied with'family relationships', 'relationships with neighbours', and 'social relationships'for contemporary desert dwellings (median=2), but they aresatisfied with 'relationships with religious places' for contemporary desert dwellings (median=4), as given in Table 6.34. Using the Wilcoxon signed-rank test for 'family relationships', 'relationships with neighbours', and 'social relationships', the difference between vernacular and contemporary dwellings is very highly significant (p-value<.001). However, no difference is seen in 'relationships with religious places', where satisfaction (median=4) is seen for both types of dwelling. This result is

confirmed by the Wilcoxon signed-rank test, where no significant difference is detected (p-value=.450).

Generally, the participants showed more the satisfaction with vernacular than contemporary with respect to social considerations and religious beliefs.

Table 6.34: Comparison in social considerations and religious beliefs between vernacular and contemporary desert dwelling using the Wilcoxon test

Social considerations and religious beliefs	Vernacular desert dwellings				Contemporary desert dwellings				Wilcoxon test	
	Median	Mean	SD	Rank	Median	Mean	SD	Rank	Z	p-value
Family relation	4.00	3.28	1.178	3	2.00	2.70	1.182	4	5.479	<.001
Relationship with neighbours	4.00	3.42	1.098	1	2.00	2.71	1.164	3	6.844	<.001
Social relations	4.00	3.26	1.207	4	2.00	2.74	1.178	2	5.015	<.001
Relationship with religious places	4.00	3.28	1.139	2	4.00	3.21	1.226	1	.755	.450

6.2.4.5 New- generation respondents' opinions on cultural heritage and identity

Although the new generation of young people in southwest Libya were born and raised in contemporary dwellings, they are still linked with the vernacular dwellings that are found in their historical towns (the dwellings of their fathers, grandparents, and neighbours). Furthermore, many of the population, especially in Ghadames, Sabha, and Ghat, still inhabit vernacular dwellings. Some of them are rented to tourists, as in Ghadames. The vernacular dwellings are representative of the essence of the local architecture, history, and cultural heritage of the region. However, over time, the fear of the extinction of the unique vernacular architecture is increasing due to several different factors. The most important of these factors is the neglect of these dwellings as a result of the rapid move to the contemporary dwelling sectors. This has led to the distortion of the architectural landscape of the historical towns of southwest Libya, and highlights the problem of the risk of losing the cultural and architectural identity and history of the region for locals, especially for the younger generation. This is because young people may be the age group that is the least interested in the vernacular architecture and cultural heritage, perhaps as a result of living in contemporary dwellings. This problem is further exacerbated by the existence of two different types of dwellings in the historical towns, and the continuation of designing contemporary dwellings in a way that does not meet the cultural and social needs of the population and that is far from the spirit of the

local architecture and cultural identity of the region that the youth live in, where they are facing the risk of losing their cultural and architectural identity.

Young people are a part of the renaissance of the nation . Thus, the study seeks to involve them in the issue of preserving their cultural and architectural heritage, and developing their future dwelling designs through incorporating their visions into the sustainable dwelling designs from the perspective of socio-cultural sustainability.

This section will deal with four questions to examine the opinions of young people about cultural heritage and identity with respect to dwellings to find out whether they are satisfied or dissatisfied. This is in order to cover all aspects of the investigation of the socio-cultural-sustainability features in both vernacular and contemporary desert dwellings, which are their opinions about identity and self-expression, cultural identity, the link with the collective memory of the place, and the compatibility of those dwellings with customs and traditions.

1. Identity and self-expression

The analysis in Table 6.35 provides the overall picture of the younger (18-24 years) respondents' satisfaction in terms of the identity and self-expression for both vernacular and contemporary desert-dwelling designs.

Table 6.35: Satisfaction levels for identity and self-expression

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	13	10.7%	22	18%
Dissatisfied 2	17	13.9%	42	34.4%
Neutral 3	38	31.1%	23	18.9%
Satisfied 4	34	27.9%	19	15.6%
Very Satisfied 5	20	16.4%	16	13.1%
Total	122	100%	122	100%

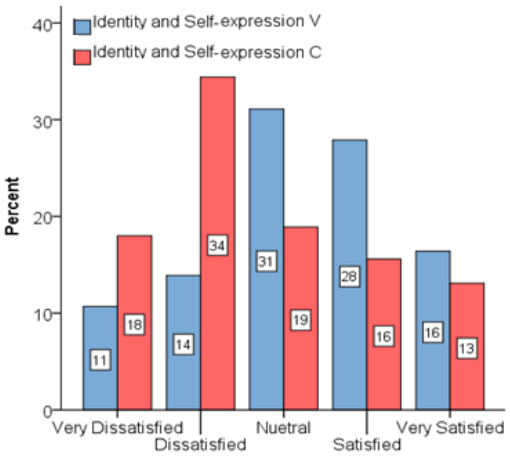


Figure 6.25: Satisfaction for identity and self-expression

As can be observed from Table 6.35, 44.3% of the younger respondents are very satisfied or satisfied in terms of identity and self-expression with respect to vernacular desert dwellings, and the dissatisfaction level for vernacular desert dwellings is only 24.6%; also, 28.7% of younger respondents are satisfied or very satisfied with the contemporary desert dwellings for this aspect.

As shown in Figure 6.25, 44.3% of the younger respondents stated that the vernacular desert-dwelling designs express their identity and self-expression. This percentage represents a low satisfaction rate to some extent; however, it is considered to be a worthy proportion with respect to promoting the concept of pride in the cultural heritage and local identity of the region. It should also be noted that 31.1% of the younger respondents have given a neutral answer, perhaps due to their lack of knowledge of the importance of the history and heritage of their region. However, more than half of the younger respondents (52.4%) expressed their dissatisfaction with this aspect of contemporary dwelling designs; that is, they make it clear that these dwellings do not represent their identity and do not provide self-expression. The study seeks to formulate the principles of social and cultural sustainability for dwelling design that include recommendations to enhance the architectural identity and preserve the cultural heritage of the historical towns of Southwest Libya.

2. Cultural identity

The analysis in Table 6.36 provides the overall picture of the younger respondents' satisfaction in terms of cultural identity for both vernacular and contemporary desert-dwelling designs.

Table 6.36: Satisfaction levels for cultural identity

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	14	11.5%	23	18.9%
Dissatisfied 2	18	14.8%	40	32.8%
Neutral 3	26	21.3%	22	18%
Satisfied 4	43	35.2%	25	20.5%
Very Satisfied 5	21	17.2%	12	9.8%
Total	122	100%	122	100%

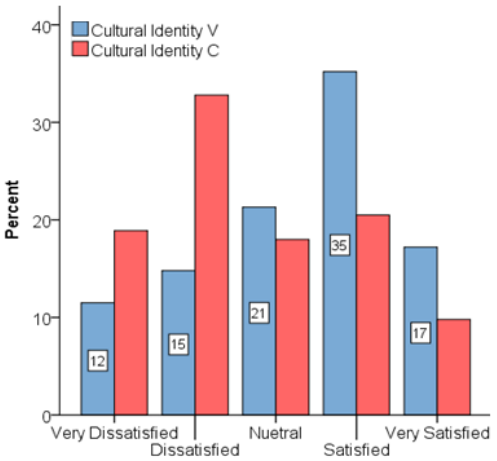


Figure 6.26: Satisfaction for cultural identity

As Table 6.36 reveals, 52.4% of the younger respondents are very satisfied or satisfied in terms of cultural identity for vernacular desert dwellings, and the dissatisfaction level for vernacular desert dwellings is only 26.3%, while 30.3% are satisfied or very satisfied with contemporary desert dwellings for this aspect.

As shown in Figure 6.26, more than half of the younger respondents confirmed that the vernacular desert-dwelling designs express their cultural identity. This percentage represents a

good level of satisfaction to some extent; however, it can be taken as a starting point to establish a local cultural identity for the younger generation. In addition, 26% of younger respondents have given a neutral answer, perhaps due to their inclination towards the culture of globalisation that is prevailing in most developing countries. However, more than half of the youth (51.7%) expressed their dissatisfaction with this aspect of contemporary dwelling designs; that is, they make it clear that these dwellings do not reflect their cultural identity. The study seeks to formulate a set of guideline for sustainable dwelling design within the principles of social and cultural sustainability that include on recommendations that enhance the cultural identity of historical towns of in Southwest Libya.

3. Link with the collective memory of the place

According to the responses of respondents of youth for their level of satisfaction in terms of the link with the collective memory of place, with both vernacular and contemporary desert dwellings, their responses are reported in Table 6.37.

Table 6.37: Satisfaction levels for link with the collective memory of the place

	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	14	11.5%	17	13.9%
Dissatisfied 2	29	23.8%	48	39.3%
Neutral 3	24	19.6%	19	15.6%
Satisfied 4	30	24.6%	23	18.9%
Very Satisfied 5	25	20.5%	15	12.3%
Total	122	100%	122	100%

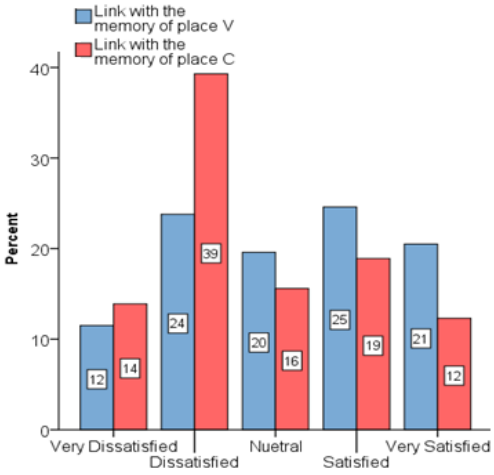


Figure 6.27: Satisfaction for link with the collective memory of the place

As can be observed from Table 6.37, 45.1% of the younger respondents are very satisfied or satisfied in terms of the link with the collective memory of the place for vernacular desert dwellings, and the dissatisfaction level for vernacular desert dwellings is only 35.3%, while the satisfaction level with contemporary desert dwellings is 31.2%.

As shown in Figure 6.27, nearly half of the younger respondents expressed their satisfaction with the vernacular desert-dwelling designs in terms of the link with the collective memory of the place. This percentage represents a good level of satisfaction to some extent; however, it can be taken as a starting point to enhance the collective memory of the population by taking

care of buildings of historical importance and maintaining them. In addition, 38% of the younger respondents are satisfied with the contemporary dwelling designs. However, more than half of the younger respondents (53.2%) confirmed their dissatisfaction with this aspect of contemporary dwelling designs; that is, they make it clear that these dwellings do not represent the collective memory of the place, perhaps because the designs do not replicate its styles and distort its landscape . Although not all young people live in the historical towns, they still have a link with vernacular dwellings and important historical buildings , such as castles and ancient mosques. For example, most students and young people in the vernacular town of Ghadames participate in the vernacular town's festival and its activities. However, young people, especially in Sabha and Ghat, still need more education on the importance of their link with their local identity. This study aims to formulate a set of guidelines for sustainable dwelling designs. It includes recommendations for paying attention to historical buildings and vernacular dwellings, which express an important part of the history of Southwest Libya.

3. The compatibility with custom and tradition

The responses of the young people for their level of satisfaction in terms of compatibility with customs and traditions, for both vernacular and contemporary desert dwellings, are reported in Table 6.38.

Table 6.38: Satisfaction levels for compatibility with custom and tradition

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	10	8.2%	25	20.5%
Dissatisfied 2	16	13.1%	42	34.4%
Neutral 3	18	14.8%	19	15.6%
Satisfied 4	58	47.5%	21	17.2%
Very Satisfied 5	20	16.4%	15	12.3%
Total	122	100%	122	100%

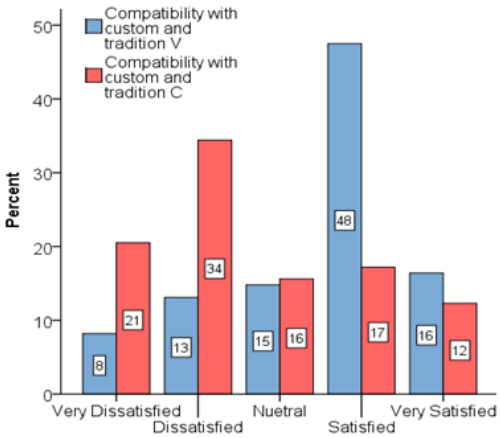


Figure 6.28: Satisfaction for compatibility with custom and tradition

As Table 6.38 illustrates, 63.9% of the young people respondents are very satisfied or satisfied in terms of compatibility with customs and traditions for vernacular desert dwellings, and the dissatisfaction level for vernacular desert dwellings is only 21.3%, while the satisfaction level with contemporary desert dwellings was 29.5%.

As shown in Figure 6.28, nearly 64% of the younger respondents expressed their satisfaction with the vernacular desert-dwelling designs in terms of compatibility with customs and traditions. This percentage represents a high satisfaction level that strengthens the position of vernacular dwellings in this aspect, which can be regarded as an adequate proportion to indicate the satisfaction of the young generation with how customs and traditions are represented in dwellings, and with how dwellings are adapted to social and cultural changes. It can also be noted that 21.3% of the younger respondents are dissatisfied with the vernacular dwelling designs. However, 29.5%. of the younger respondents expressed their appreciation for their present contemporary dwellings in terms of their compatibility with customs and traditions, and with present cultural changes. Therefore, it is important to encourage designers and architects to think about integrating the features of this aspect, for both vernacular and contemporary desert dwellings, into their design. Nevertheless, this study aims to formulate a set of guidelines for sustainable dwelling designs and provide recommendations for paying attention to historical buildings and vernacular dwellings, which express an important part of history of in Southwest Libya.

The younger participants are satisfied with 'cultural identity' and 'compatibility with customs and traditions' in the case of vernacular dwellings (median=4), while they are dissatisfied in the case of contemporary dwellings (median=2), as given in Table 6.39. Using the Wilcoxon signed-rank test, the difference between vernacular and contemporary dwellings is highly significant (p-value<.01). Neutrality is shown for vernacular dwellings in terms of 'identity and self-expression' and 'link with the collective memory of place' (median=3), while dissatisfaction (median=2) is observed for contemporary dwellings. The difference between vernacular and contemporary dwellings is highly significant (p-value<.01).

Generally, the participants show either neutrality or satisfaction with vernacular dwellings, while dissatisfaction with contemporary dwellings is confirmed.

Table 6.39: Comparison of identity and cultural heritage between vernacular and contemporary desert dwelling using the Wilcoxon test

Identity and cultural heritage of dwelling	Vernacular desert dwellings				Contemporary desert dwellings				Wilcoxon test	
	Median	Mean	SD	Rank	Median	Mean	SD	Rank	Z	p-value
Identity and self-expression	3.00	3.25	1.203	3	2.00	2.71	1.295	2	2.939	.003
Cultural identity	4.00	3.32	1.248	2	2.00	2.70	1.265	3	4.048	<.001
Link with the memory	3.00	3.19	1.319	4	2.00	2.76	1.260	1	2.817	.005
Custom and tradition	4.00	3.51	1.159	1	2.00	2.66	1.315	4	5.139	<.001

6.2.4.6 New- generation respondents' opinions on contemporary lifestyle

Young people always have their aspirations and ambitions to keep pace with modern changes in contemporary lifestyle, and they have natural tendencies to change. Young people in Southwest Libya are no different from others regarding these aspirations. Therefore, it may be found that young people are less interested in the traditional way of life and the cultural heritage than parents and grandparents. For example, the youth desire to imitate other people of their generation anywhere in the world, perhaps to a greater extent than they are influenced by their cultural heritage, as a result of the propaganda and media that connects the world as if it were a small village. This section deals with three questions to examine the opinions of young people about the contemporary lifestyle in dwellings to find out whether they are satisfied or dissatisfied. This is in order to cover all aspects of the investigation of the socio-cultural-sustainability features of both vernacular and contemporary desert dwellings, which include their opinion about the compatibility of elements of finishes in the dwellings with the nature of their lifestyle and keeping up with contemporary socio-cultural developments, plus their keeping up with modern technology during daily activities.

1. The compatibility of elements for finishes with the lifestyle nature

Table 6.40 provides a the overall picture about the youth respondents' satisfaction in terms of the compatibility of elements for finishes in dwellings with the lifestyle nature.

Table 6.40: Satisfaction levels for compatibility of elements for finishes with nature of lifestyle

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	24	19.6%	17	13.9%
Dissatisfied 2	44	36.1%	18	14.8%
Neutral 3	19	15.6%	21	17.2%
Satisfied 4	20	16.4%	52	42.6%
Very Satisfied 5	15	12.3%	14	11.5%
Total	122	100%	122	100%

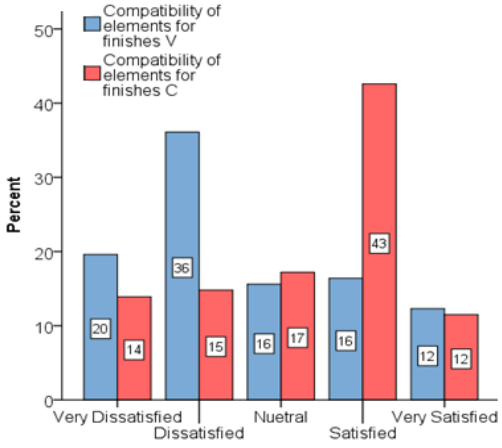


Figure 6.29: Satisfaction for elements of finishes with the lifestyle nature

As can be observed from Table 6.40, 54.1% of younger respondents are very satisfied or satisfied regarding contemporary life in terms of the compatibility of elements of finishes with their the lifestyle nature with contemporary desert dwellings, and the dissatisfaction level for

contemporary desert dwellings is only 28.7%, while 28.7% of respondents are satisfied with the vernacular desert dwellings for this aspect. As shown in Figure 6.29, more than half of younger respondents express a good level of satisfaction with the contemporary dwelling designs for this aspect.

2. keeping up with contemporary socio-cultural developments

The responses of younger respondents on their level of satisfaction in terms of keeping up with contemporary socio-cultural developments, for both vernacular and contemporary desert dwellings, are detailed in Table 6.41.

Table 6.41: Satisfaction levels for keeping up with contemporary socio-cultural developments

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	32	26.2%	12	9.8%
Dissatisfied 2	43	35.3%	20	16.4%
Neutral 3	17	13.9%	26	21.3%
Satisfied 4	18	14.8%	48	39.4%
Very Satisfied 5	12	9.8%	16	13.1%
Total	122	100%	122	100%

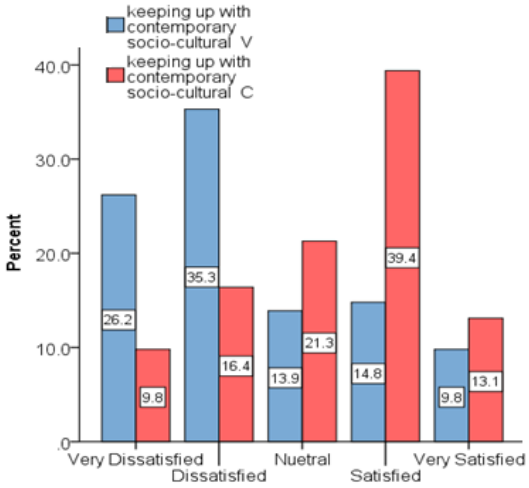


Figure 6.30: Satisfaction for keeping up with contemporary socio-cultural developments

As Table 6.41 identifies, 52.5% of younger respondents are very satisfied or satisfied in terms of keeping up with contemporary socio-cultural developments for contemporary desert dwellings, and the dissatisfaction level for contemporary desert dwellings is only 26.2%, while only 25.6% of younger respondents are satisfied or very satisfied with vernacular desert dwellings for this aspect.

As shown in Figure 6.30, more than half of younger respondents expressed that the contemporary desert-dwelling designs are keeping up with contemporary socio-cultural developments to some extent. This percentage means the need for the design of contemporary desert dwellings to keep up with the requirements for socio-cultural developments and make them comfortable for inhabitants is worthy of attention, but should be done without losing the local identity that reflects the urban architectural heritage of Southwest Libya.

3. Keeping up with modern technology used during daily activities

The analysis in Table 6.42 provides the overall picture of the youth respondents' satisfaction in terms of keeping up with modern technology during daily activities.

Table 6.42: Satisfaction levels for keeping up with modern technology used during daily activities

Satisfaction level	VDD		CDD	
	No. R	%	No. R	%
Very dissatisfied 1	34	27.8%	11	9%
Dissatisfied 2	40	32.8%	13	10.7%
Neutral 3	20	16.4%	19	15.6%
Satisfied 4	18	14.8%	43	35.2%
Very Satisfied 5	10	8.2%	36	29.5%
Total	122	100%	122	100%

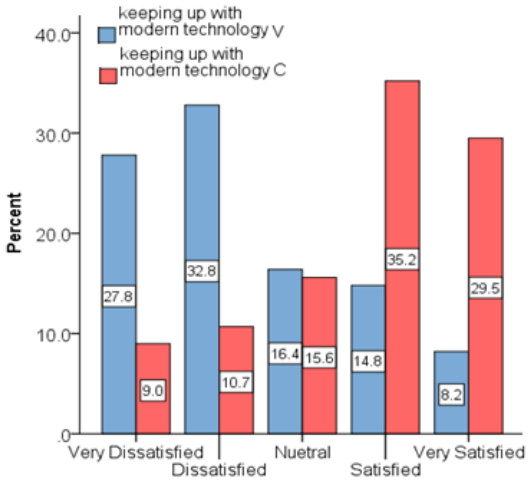


Figure 6.31: Satisfaction for keeping up with modern technology used during daily activities

As can be observed from Table 6.42, 64.7% of the younger respondents are very satisfied or satisfied in terms of keeping up with modern technology during daily activities for contemporary desert dwellings, and the dissatisfaction level for contemporary desert dwellings is only 19.7%, while 23% of younger respondents are satisfied with the vernacular desert dwellings for this aspect.

As shown in Figure 6.31, 64.7% of younger respondents expressed that the contemporary desert-dwelling designs are keeping up with modern technology during daily activities in their dwellings. This percentage represents a good level of satisfaction. However, most of the daily activities are closely linked with technology, and facilitate providing comfort and entertainment. This study seeks to formulate the principles of social and cultural sustainability, which include the comfort and welfare of the inhabitants, within the context of the social and cultural features of the region in order to preserve the sustainable dwelling design within the character and architectural identity of towns in Southwest Libya.

Unlike the previous features, the participants are found to dissatisfied with 'compatibility of elements of finishes', 'keeping up with contemporary socio-cultural developments' and 'keeping up with modern technology during daily activities' in the case of vernacular dwellings (median=2), while they are satisfied in the case of contemporary dwellings

(median=4), as given in Table 6.43. Using the Wilcoxon signed-rank test, the difference between vernacular and contemporary dwellings is very highly significant (p-value<.001).

Generally, the participants show dissatisfaction with vernacular dwellings regarding the contemporary lifestyle, while satisfaction is confirmed for contemporary dwellings.

Table 6.43: Comparison in contemporary lifestyle between vernacular and contemporary desert dwelling using the Wilcoxon test

Contemporary lifestyle	Vernacular desert dwellings				Contemporary desert dwellings				Wilcoxon test	
	Median	Mean	SD	Rank	Median	Mean	SD	Rank	Z	p-value
Compatibility of elements for finishes	2.00	2.66	1.303	1	4.00	3.23	1.245	3	4.582	<.001
Keeping up with contemporary socio-cultural	2.00	2.47	1.293	2	4.00	3.30	1.183	2	5.235	<.001
Keeping up with modern technology used during daily activities	2.00	2.43	1.266	3	4.00	3.66	1.258	1	6.843	<.001

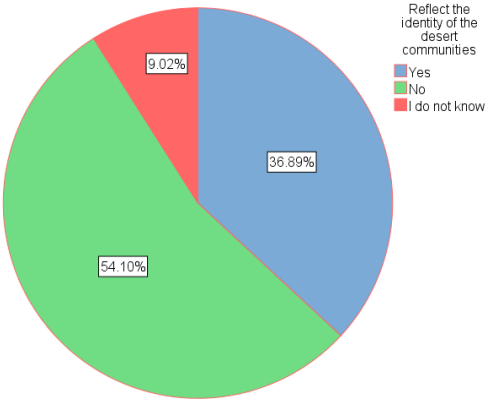
In summary, Sections 6.2.4.1 to 6.2.4.6 show an in-depth comparison of vernacular and contemporary desert dwellings in terms of socio-cultural-sustainability features. This comparison was conducted with respect to six major aspects of socio-cultural features, each with different minor aspects, which represent a differentiation gauge for the integration of the socio-cultural features of architecture into vernacular and contemporary desert dwellings into new sustainable designs for desert dwellings in Southwest Libya. The opinion of different generations of respondents was investigated, especially with respect to the views of youth on vernacular and contemporary desert dwellings design in terms of their suitability to the young people's present socio-cultural life.

6.2.4.7 Reflection of vernacular architectural identity in the form of the contemporary desert dwellings design

The younger respondents were asked to answer yes, no, or I do not know regarding whether they believe the design of contemporary desert dwellings reflects the identity and the history of the desert society, and the unique architecture of the vernacular desert dwellings. The results of the analysis given in Figure 6.32 demonstrate that 54.1% of younger respondents answered no (i.e. they do not believe the contemporary dwellings reflect the identity and architecture of the historical towns), 36.8% of the youth answered yes (i.e. they do believe the

contemporary dwellings reflect the identity and architecture of the historical towns), and only 9% expressed that they do not know. This percentage shows it is clear that the young people have the opinion that the contemporary dwellings do not represent the identity and history of the desert society, or the unique architecture of the vernacular desert dwellings of historical towns in Southwest Libya.

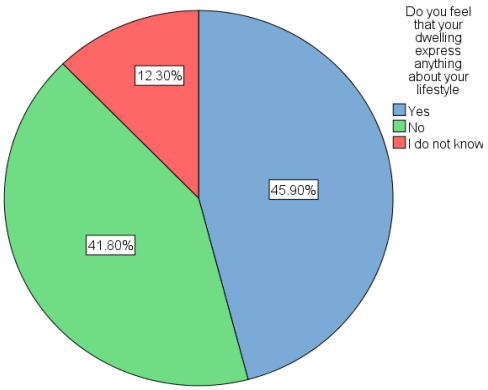
Figure 6.32: Percentages of new generation in terms of reflection of the identity



6.2.4.8 Reflection of the aesthetic values of dwelling on personal lifestyle

Regarding reflection of some aesthetic values and capabilities of users in the dwellings design to see how young people feeling about their dwelling. The young respondents were asked to answer yes, no, or I do not know regarding whether their lifestyle and personality is reflected in some of the aesthetic values and features of the dwelling designs.

Figure 6.33: Percentages of new generation in terms reflection of the aesthetic values of dwelling



The results of the analysis in Figure 6.33 show that 45.9% of the youth respondents said yes, confirming that those dwellings express their lifestyle and personality, 41.8% of young people respondents answered no, and only 12.3% expressed they do not know. These percentages demonstrate that a reasonable percentage of young people believe that the design of their dwellings is important, and reflects their lifestyle and personality.

6.2.4.9 Respondents' opinions on the vernacular architectural identity in Southwest Libya

Regarding whether important features of vernacular architecture are related to the architectural identity and architectural landscape of vernacular desert dwellings in their regions, younger respondents were asked to identify which one of the six important features of vernacular architecture is the most important feature from the perspective of young people.

The results of the analysis in Table 6.44, reveal that 23% of younger respondents mentioned that the architectural landscape of vernacular dwellings is considered to be the most important characteristic of the vernacular architectural identity in Southwest Libya. This percentage, shown in Figure 6.34, indicates that the architectural landscape of vernacular dwellings is receiving attention from the perspective of young people. They younger respondents also added that the simple design of dwellings, the homogeneity of the elevations of the dwellings, and the human scale in the vernacular dwellings also represent other important features of vernacular architecture.

Table 6.44: Responses of the new generation on the features of the vernacular architecture

Features of the sustainable vernacular architecture	Frequency	Percent
Human scale in the vernacular dwellings	20	16.4
Homogeneity of elevations of dwellings	23	18.9
The internal design of dwellings	15	12.3
The existence of courtyard	12	9.8
Simple design with similar shape and colour	24	19.7
Architectural landscape of dwellings	28	23.0

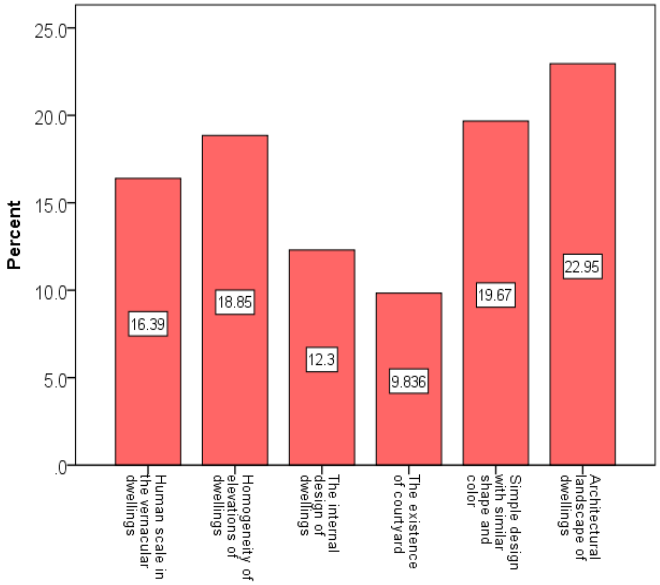


Figure 6.34: Percentages of new generation for satisfaction with the features of the vernacular architecture

6.2.5 Section5: Significance of socio-cultural architectural features to the sustainable desert dwellings design

This section of the questionnaire is designed in order to find out to define the significance of socio-cultural architectural features to the sustainable desert dwellings design for the population and to consolidate its importance in the design of sustainable dwellings. This section is divided into the three points:

6.2.5.1 Importance of harmony of socio-cultural features with the dwelling design

The responses in terms of whether or not it is important that the dwelling design is compatible with the socio-cultural features are reported in Table 6.45.

Table 6.45: Respondents' responses on the importance of the socio-cultural features

Responses	Frequency	Percentage
Yes	187	60.1
No	75	24.1
Do not know	49	15.8

As can be seen from Table 6.45, 60.1% of respondents answered yes to express that their dwelling designs should be compatible with the socio-cultural features and their lifestyle, 24.1% of respondents answered no, and only 15.8% of respondents expressed that they do not know. The high percentage of those who answered yes reflects the fact that the people understand this aspect, and shows the importance of harmonising socio-cultural features with dwelling design to provide an appropriate dwelling environment for the lifestyle of local population.

6.2.5.2 Compatibility of dwellings with socio-cultural needs and the enhancement of quality of life

The responses in terms of the compatibility of the dwelling design with socio-cultural needs, (the six features with sub items) and increasing the feeling of well-being and enhancing the quality of life are reported in Table 6.46.

Table 6.46: Respondents' responses on the socio-cultural needs and life quality

Responses	Frequency	Percentage
Yes	190	61.1
No	74	23.8
Do not know	47	15.1

As can be observed from Table 6.46, 61.1% of respondents expressed that the compatibility of their dwelling design with socio-cultural needs will increase their feeling of well-being and enhance their quality of life, and 23.8% of respondents answered no, and only 15.1% of respondents expressed that they do not know. The high percentage is worthy of attention as it reflects that, in accommodating different generations of the population, there is a correlation between providing for their cultural and social needs in their dwelling design and increasing their welfare and quality of life.

6.2.5.3 Respondents' opinions on their comfortable with functional spaces in their dwelling

The responses in terms of whether the interconnection of the following features in dwelling design provides comfortable and appropriate functional spaces in a dwelling are detailed in Table 6.47.

Table 6.47: Respondents feeling on socio-cultural features in deset dwellings

Some selected features in dwelling design	Yes	No	Do not Know
Interior decoration expresses your culture and identity	61.7%	24.4%	13.8%
Interior spaces are in line with your modern lifestyle	62.4%	20.3%	17.4%
Facades of dwelling are compatible with place identity	65.6%	19.6%	14.8%
Perimeter of the dwelling is harmonious with the environment	63.3%	22.2%	14.5%

As Table 6.47 reveals, 65.6% of respondents articulated that if the interior decoration in their dwelling design expresses their culture and identity, this will provide comfortable functional spaces for them. A total of 63.3% of respondents expressed that if the facades of their dwelling are compatible with the identity of the place, this will enhance the sense of belonging to the place and thus support the preservation of local identity. In addition, 62.4% of respondents revealed that if the design of interior spaces is in line with their contemporary lifestyle, then that would also enhance their sense of comfort and well-being within their dwellings. Finally, 61.7% of respondents expressed that if their dwelling is harmonious with the environment, then this will increase their interest in the environment of place and promote the principles of sustainability.

6.2.6 Section 6: Desires required in dwellings design and involvement the opinion of respondents

This section aims to define the desires required of population regarding to sustainable desert dwellings design and the importance of their participation in the design of such dwellings. This section is divided into the following five points:

6.2.6.1 Responses on the effect of contemporary dwelling designs on lifestyle, and whether people wish to make changes to the design of their current dwelling.

The responses regarding whether the current dwelling designs affect the respondents' lifestyles in any way are reported in Table 6.48.

Table 6.48: Responses on the effects of contemporary dwelling design on lifestyle

Responses	Frequency	Percentage
Yes	184	59.2
No	73	23.5
No reply	54	17.4

According to the findings in Table 6.48, 59.2% of respondents indicated that the design of the current dwelling affects their lifestyle, while 40% said it does not. People who had answered yes were then asked if they would like to make some changes in their current residence in terms of social and cultural sustainability, and 60% confirmed they would wish to do so . The following section discusses the responses about the most important changes they would like to make and why they would make this change.

6.2.6.2 Changes that people wish to make to the design of their current dwellings and the motivation behind it

Based on the results shown in Table 6.49, most of respondents would like to make some changes to their current dwelling regarding their socio-cultural needs; some of them have already made some of these changes in interior and exterior design (see Figure 6.36), and the motivation behind these changes is their dissatisfaction with the contemporary dwelling designs regarding to socio-cultural sustainability.

Table 6.49: Changes people wish to make to the design of their current dwelling

Changes in the interior and external design	Frequency	Percent
Converting or adding rooms	31	16.7
Changing decoration and colours	26	14.0
Changing the size and organisation of spaces	26	14.0
Changing the level of the dwelling	14	7.5
Closing openings or balconies	23	12.4
Adding walls, an iron door, or curtains	27	14.5
Adding some new elements	21	11.3
Adding garden and green areas	18	9.7

According to the results displayed in Table 6.49, 16% of respondents need to convert or add some rooms in the interior design of their dwellings, which may be as a result of the size of dwelling. Also, 27% of respondents need to add walls, an iron door, or curtains to external design of their dwellings, which may be as a result of lack of privacy and security. In addition, 14% of respondents need to change the size and organisation some spaces and a further 14% need to change the decoration and colours in the interior design of their dwellings to make these dwellings more comfortable, and more compatible with their lifestyle and culture.

Furthermore, 12% of respondents wish to close some openings and balconies in the external design of their dwellings to get more space. The reason for these modificationsto their dwellings may be to provide more safety, to maintain privacy and safety,to create an internal environment suitable for their lifestyle, or to make the location of rooms and the internal design of the dwelling more suitable for their family.

Other respondents state that the reason for the need to make changes and add colours or new elements to the external design of their current dwellings is to make those dwellings more compatible with their cultural identity and the local environment of the town . Some of respondents express that there are other reasons for needing to make changes to the interior and external design of their dwellings; for example, a change in the marital status or economic conditions for the family, or to keep pace with evolution of technology

The motivation behind those changes is shown in Figure 6.35

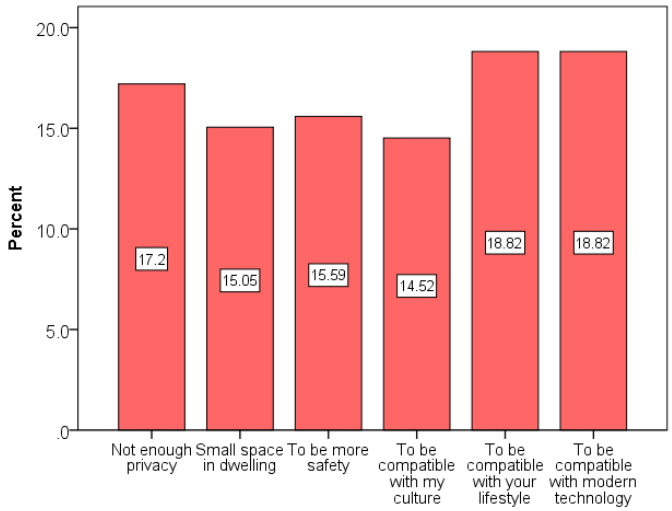


Figure 6.35: Percentages of respondents for the motivation behind making changes to the current dwelling design

From the analysis given in Table 6.49 and Figure 6.35, the following points detail the most important changes that people need to do or would like to do, and the motivation behind those desires. Those changes at the level of design of the dwelling, the neighbourhood and the level of the town, by adopted approach of the sustainable dwellings design:

1. Changes in interior design: The results imply a need to convert or add some rooms to provide more privacy and safety. Some residents have built rooms or a storey over the terrace of the residential building or have expanded the dwelling. Some of them wish to change the decoration and colours to be compatible with the culture or with the modern lifestyle. Others would like to modify the size and organisation of some spaces, or change the level of dwelling and increase the space in the dwelling for social reasons, including demolishing walls, or separating the balconies and internal spaces. Finally, some inhabitants wish to make the dwelling design compatible with the culture and customs, and suitable for the social relationships among the family members, as well as with guests, neighbours, and relatives.

2. Changes in external design: The results also imply the need to make some changes in the external dwelling design regarding several socio-cultural aspects. For example, closing some windows, openings, or balconies, which is justified as being for social and psychological reasons; in order to achieve family privacy, security, and safety, or to avoid children falling. Other reasons that impelled them to close their balconies are to prevent other climatic factors entering the dwelling, such as dust or the sun's rays in summer . Their methods of closing these openings can be classified as being one of three levels: full closing of the balcony with

one window remaining in the middle of the wall built, closing only one part of the balcony, or fencing it off using steel sheets or aluminium with glass , which exacerbates the problem of distorting the general architectural landscape of the historical towns. The reasons underlying these changes are largely concerned with creating additional space to make the dwelling more flexible, and providing security and privacy. It is indicated that the area of the dwelling is often inadequate due to an increase in family numbers. Most of these external changes are in order to achieve an internal architectural design for the dwelling that is appropriate to the nature of the socio-cultural elements of people's lives. Some further external changes are in the form of adding iron doors to the main door of dwelling, adding walls, or adding curtains, which may be to achieve greater security from theft, especially with the growing incidence of burglary and theft that occurred as a result of the lawlessness of the events in 2011. Furthermore, some respondents added colours or some elements to the external interfaces of dwellings to make the dwelling design more compatible with their cultural identity. Some respondents built walls surrounding their dwellings, which has altered the external look of many buildings. These walls have one main entrance solely for the residents' use, meaning they will be entirely free to exclusively utilise the enclosed space for their social activities . Finally, inside this walled area, some have also built a storeroom ,a garage with a corrugated iron cover for their cars, or, in some cases, shops inside the walls, also with corrugated iron.

3. Changes in the level of neighbourhood: The respondents express their desire that the dwelling's location should be near to services, such as schools, clinics, markets, and service buildings, as well as being in quiet residential areas. The respondents also identify a desire that the distribution of dwellings, and main and subsidiary roads should be such that they ensure the safety of population, especially children. This distribution must also preserves the privacy of the population within the boundaries of their dwelling. A set of entrances and exits to the neighbourhood must also be designed that help to control the movement of cars and maintain security, especially at night. Another important aspect is that the facades of buildings and dwellings are designed in a consistent manner, and that they integrate and are compatible with the architectural elements that are used in the town as a whole, especially with respect to decoration materials, colours, and architectural elements. This is to create a consistent picture and ensure that all buildings and dwellings are compatible with the architectural landscape and architectural identity of the historical towns in southwest Libya. Other elements of modern technology that are added to the facades, such as the solar panels, water tanks, communication cables, electricity, etc. must be concealed or designed in a way that does not distort the general architectural landscape of the neighbourhood.

4. Changes in the town level: Most respondents express the view that the design of housing at the city level should utilise almost the same pattern in terms of the colours and architectural elements used in the facades. This is in addition to ensuring the consistency of building heights, and supporting the policy of preserving and building cultural centres that are concerned with cultural heritage to educate new generations, encouraging youth to preserve their historical towns, and encouraging their investment in various cultural and tourism fields . Policies should be adopted to develop these towns economically, and encourage handicrafts and artistic crafts that promote the preservation of the culture of the peoples of the region. The amount of green spaces, parks, trees, and semi-enclosed children's playgrounds should be increased. Finally, laws should be developed and activated that reduce environmental pollution and help to preserve the environment.

6.2.6.3 Preferred type of dwelling to inhabit if you have a choice

The responses when given the option to choose the type of dwelling respondents would prefer to dwell in, plus some of the common reasons for these choices, are provided in Table 6.50.

Table 6.50: Preferred types of dwelling and causes for preference

Type of dwelling	Frequency	Reasons	Percentage
Modern combination of vernacular and contemporary dwelling styles, with a garden	191	Provides a convergence between modern dwelling-design concepts and maintaining the socio-cultural aspects and architectural identity of historical towns in Southwest Libya. Flexible design as desired	61.4%
Contemporary private dwellings	53	Provides more space, privacy, and safety with a modern style of facade. Comfortable to dwell in	17.1%
Contemporary courtyard dwellings	35	Simple dwelling design and suitable for social needs.	11.2%
Flat in Building	32	Suitable for small family, low cost and easy to decorate	10.3%

As can be noted from Table 6.50, the type of dwelling that is a modern combination of vernacular and contemporary dwelling styles with a garden has the highest preference level. This is due to them providing a convergence between contemporary dwelling-design concepts that are in line with contemporary lifestyles and modern technology to some extent, while maintaining the socio-cultural values that are found in vernacular dwelling designs, and preserving the identity of historical towns in Southwest Libya, also provide a flexible design, as desired. The respondents have the desire for dwelling designs that satisfy their socio-cultural needs, including offering safety and privacy, compatibility with social considerations and cultural identity, and being in line with the contemporary lifestyle and technology.

6.2.6.4 Respondents' opinions in terms of participation in the dwelling design process

Respondents were asked if they wish to participate in the dwelling design process; their responses are reported in Table 6.51.

Table 6.51: Participation in the dwelling design process

Responses	Frequency	Percentage
Yes	218	70.09
No	50	16.08
Do not know	43	13.83

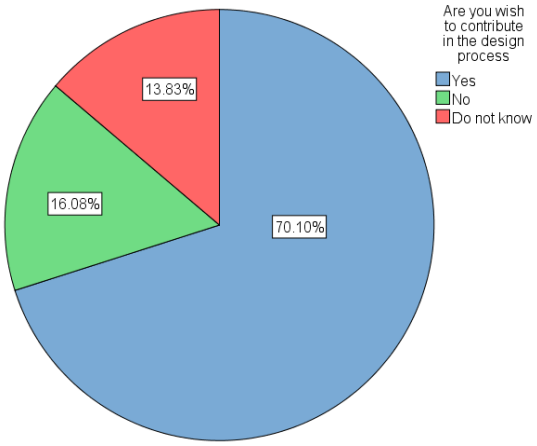


Figure 6.36: Percentages of respondents for the desire to participation in the dwelling design process

As can be noted in Figure 6.36, high number (70.09%) of respondents prefer to be involved to the dwelling design process in order to the design is prepared according to their wishes and compatible with their socio-cultural and psychological needs, also people will be able to choose finishes, colors and fixed and mobile furniture and furnishings. In addition to, choose of decoration materials which reflect the architectural character and identity.

Furthermore, people are interested in participating in choosing the internal arrangement of the elements within the dwelling that allow them to achieve internal and external privacy. Likewise, this will help in creating a suitable environment for them inside their desert dwellings, especially in the harsh environment of Southwest Libya.

6.2.6.5 Comments and suggestions about desert-dwelling designs in the future

Generally, the majority of respondents from different generations in the study sample have expressed their desire to have a suitable desert dwelling that meet their socio-cultural and environmental needs, and is compatible with the nature of their lifestyle. At the same time, the design of those dwellings should be harmonised with contemporary developments and modern technology. All respondents' comments and suggestions regarding the future design of dwellings from the socio-cultural sustainability perspective are summarised in Table 6.52.

Table 6.52: Most frequent comments of respondents on future dwelling designs

Most frequent comments on future dwelling designs	Frequency	Percent
The dwellings must have a suitable contemporary dwelling design that is compatible with all aspects of socio-cultural-sustainability features and contemporary lifestyle, and expresses their cultural identity (architectural identity), while keeping up with technological developments.	189	60.8%
The dwellings must be designed in line with technology developments and to be environmentally friendly.	63	20.2%
The new desert-dwelling designs must be simple, like the vernacular dwellings, and flexible.	30	9.7%
The dwellings must be located near to services and in quiet residential areas.	28	9.3%

The analysis shows that the high percentage of the answers explains that respondents echoed the desire for a suitable contemporary dwelling design that is compatible with all aspects of socio-cultural-sustainability features and contemporary lifestyle, and expresses their cultural identity while keeping up with technological developments , which is required in order to provide the highest possible degree of comfort, especially in the harsh desert environment of Southwest Libya.

Some respondents also added that the design of the future dwelling in southwest Libya should respond to socio-cultural aspects, be suitable for their daily lives, reflect the local environment of the historical towns in that region in terms of 'architectural identity', and offer a safe place for children play through providing a garden, courtyard, or terrace instead of the small balconies that are found in most public dwellings, such as flats. Other respondents wish for the design of the new desert dwellings to be simple, like the vernacular designs; be flexible in their construction; avoid large windows; use high-quality finishing materials; and avoid high expenditure. The dwellings should be located near to services and in quiet residential areas. Respondents also desire the development of the external and internal design to use the features of vernacular desert dwellings that reflect the architectural identity, especially regarding the use some of architectural elements and colours; this should be coupled with the use of new technology.

In summary, all of the above clearly shows the desire of different generations in southwest Libya to have desert dwellings suitable for their socio-cultural needs, and that represent, according to their expressed wishes, the great importance of preserving their identity and cultural heritage. In the same context, this demonstrates the importance of the different aspects of contemporary socio-cultural features, and their compatibility with the contemporary lifestyle and the use of modern technology such as internet, wifi networks, mobile connection which were not available in vernacular dwellings sectors, which have to be

taken into account when developing new sustainable designs for contemporary desert dwellings. The following section presents an in-depth discussion of the key issues of different aspects of the research through the analysis of the semi-structured interviews with 20 professionals and specialists who are designers, architects, and academics.

6.3 Interviews with professionals

The previous section presented the findings of the questionnaires, in an attempt to answer some of research questions that have been raised in this research (see Section 1.5.3 in Chapter One). It was not possible to further investigate issues in the questionnaire; therefore, semi-structured interviews were conducted to provide the second main source of data collection in this research. These interviews were conducted with 20 professionals in various engineering fields relating to the design and construction of dwellings or housing projects; for example, professionals, academics, and architects who have experience in the fields of architecture, urban planning, design, and construction. Table 6.53 shows the professions, name coding, and years of experience of the interviewees.

Table 6.53: Professions' workplace, name coding, and experiences of the interviewees

Workplace	Profession	Name coding	Experiences
University	4 Architects 2 Urban planning Civil engineers 1	UPA UPU UCE	More than 20 years
Ministry of Housing	3 Architects	MHA	More than 14 years
Private engineering consultants offices	2 Architects 1 Urban planning 1 Civil engineers	COA COU COE	12 years
Department of urban planning	3 Urban planning	DUP	10 years
Municipal councils	3 Architects	MCA	8 years

6.3.1 Assessment of contemporary desert-dwelling designs

6.3.1.1 Satisfaction level for the current situation of desert dwellings in Southwest Libya

To assess the current situation, this section aims to understand the professionals' satisfaction level and their opinions about the contemporary architectural designs for desert dwellings in southwest Libya during the last few years, in terms of suitability for socio-cultural sustainability, and including keeping pace with the developments for the contemporary

lifestyle requirements of different generations, especially for the youth. The professionals were asked to give their level of satisfaction with the contemporary dwelling designs(using the same Likert scale of five degrees of satisfaction used in the questionnaire) and in addition to give reasons for their choices.

According to the results in Table 6.54, 65% of professionals expressed they are dissatisfied with the contemporary desert-dwelling designs of the last few years, 20% are satisfied with the designs, and 15% gave a neutral answer. None of the professionals were either very satisfied or very dissatisfied.

Table 6.54 : Professionals' satisfaction level with contemporary desert-dwelling designs

Satisfied level	Frequency	Percentage
Very dissatisfied	0	0%
Dissatisfied	13	65%
Neutral	3	15%
Satisfied	4	20%
Very Satisfied	0	0%

Several professionals expressed that the rationale behind their dissatisfied opinion is that the contemporary desert-dwelling designs are not suitable for different generations of locals, including the new generation because they ignore many socio-cultural-sustainability features, such as privacy and security requirements; this means that the socio-cultural-sustainability features have an effect upon the design of dwelling in southwest Libya (Abubrig, 2013). This indicates that the designs of contemporary dwellings ignore the architectural identity of the vernacular architecture that characterises those historical towns in southwest Libya. In the same context, COA1 also mentioned that the contemporary dwellings are not able to keep pace with the technological developments and the requirements of the modern life of the current generation. The other professionals argued that the rationale behind their satisfactory rating is that the contemporary desert-dwelling designs are satisfactory to some extent because they have added new architectural elements, designs, and spaces to the contemporary desert dwellings, such as dining rooms, new living rooms, and sitting rooms, which are unknown in the vernacular architecture for desert-dwelling designs. Furthermore, 15% of interviewees expressed that their opinion about contemporary desert-dwelling designs is neutral.

6.3.1.2 Contemporary desert-dwelling designs in terms of their suitability for Libyan desert society

This section consists of two parts: the first part aims to identify the professionals' opinions on whether the current designs for contemporary desert dwellings are suitable for Libyan desert society and express their identity, the second part is to identify whether contemporary desert dwellings are influenced by any other architectural design trends or not, with the professionals giving reasonable grounds for their answers.

The analysis shows 67% of the professionals consider that the contemporary desert-dwelling designs are unsuitable for Libyan desert society, and do not express their identity and their cultural heritage. This is due to their negative impact on inhabitants' lifestyles, and because the contemporary dwellings do not reflect the identity and spirit of vernacular architecture that characterise the history and culture of Southwest Libya, whether in terms of the exterior design or the interior functions of dwellings. On the other hand, 33% believe contemporary desert-dwelling designs are suitable for Libyan desert society because those contemporary dwellings contain many of the features that improve local inhabitants' lifestyles and well-being. Table 6.55 shows the percentages of interviewees who believe the contemporary desert-dwelling designs are suitable or unsuitable for the desert community in Southwest Libya.

Table 6.55 shows the percentages of interviewees who believed the contemporary desert dwellings design was suitable or unsuitable for Libyan desert society in Southwest Libya.

Table 6.55: Professionals' opinions on the suitability of contemporary desert-dwelling designs to Libyan desert society

Opinion of professionals	Frequency	Percentage
Yes, Suitable	6	33.3%
No, Unsuitable	14	66.7%
Total	20	100%

The reasons of the professionals who chose yes, the contemporary desert-dwelling designs are suitable are reported in Table 6.56, while the reasons of those who chose no, they are unsuitable are summarised in Table 6.57.

Table 6.56: Reasons for choosing 'Yes, the contemporary desert-dwelling design is suitable for desert society'

No	The Reasons
1	Contemporary desert-dwelling designs are suitable, in terms of providing more spaces.
2	They provide more privacy in terms of bedrooms spaces, especially for children.
3	They are suitable for the contemporary lifestyle.
4	They include new spaces such as a ladies salon (sitting room).
5	They are suitable for using new modern technology, such as building materials.

The previous table explains the positive aspects of the contemporary desert-dwelling designs that were mentioned by interviewees. UPA1 expressed the following view:

> *"…I think the contemporary desert-dwelling design is suitable because the interior spaces' design in the contemporary dwelling is compatible with the evolution of the contemporary lifestyle for the local population, especially the modern lifestyle that is rapidly evolving…"*

In this context, UPA2 added: Nevertheless, the present contemporary desert-dwelling design in southwest Libya needs to improve to keep up with the contemporary changes. And it is significant enough for the government to come to the aid of the housing sector section of urban planning and local authorities in Sabha to set new regulations, and urge architects and engineering offices to look into the development of the environmental needs, especially taking the socio-cultural-sustainability needs into account when designing buildings. Furthermore, it appears the majority of local architects, engineering offices, and companies, do not have enough ideas and information about how to do appropriate architectural design for the socio-cultural-sustainability needs for the local inhabitants.

UPA3 agreed by commenting that the contemporary desert-dwelling design is in line with new technology, which has a role to play in providing the indoor environment in the desert dwellings, such as air-conditioning and Internet connectivity . All of these can be utilised to meet the requirements of modern life in desert areas. Of course, this technology did not exist in the vernacular dwelling designs.

On the other hand, the majority of the interviewees had a completely different opinion on this issue. Table 6.57 shows the reasons for choosing no, they are unsuitable.

Table 6.57: Reasons for choosing 'No, the contemporary desert-dwelling design is not suitable for desert society'

No	The Reasons
1	They fail to meet needs of Libyan desert society in terms of privacy of the design of the interior spaces of the dwelling, and privacy from the street and neighbours.
2	They ignore many architectural elements that have been used in vernacular desert dwellings, which have socio-cultural significance.
3	The small size of the contemporary dwellings, especially flats in buildings, which has a negative impact on social relationships.
4	The building materials and finishes of contemporary desert dwellings are not compatible with the customs and traditions of the local population, or the natural environment of the desert, and expensive processors are needed to fit with the desert environment.
5	Besides lacking proper design, they also lack other features to deal with the desert environment and local culture.
6	They do not reflect, in any way, the historical identity of cities in Southwest Libya.
7	Contemporary desert-dwelling designs are peculiar compared to the surrounding environment of the area and are unrelated to the cultural heritage of the people in Southwest Libya.

Table 6.57 demonstrates the negative aspects of the contemporary desert-dwelling designs, based on the opinion of the interviewees. MHA3 stated the following view:

> *"…Unfortunately, designs which are implemented, especially for government housing projects, are often designed and implemented by foreign companies that do not have any familiarity with the customs and traditions of the region, resulting in the failure of these designs functionally…"*

In the same context, COA2 noted that the contemporary desert-dwelling designs are just modern dwelling designs that can be implemented in different places without specifying the environmental and social conditions of the region, and are often a mixture of the ideas of a novice architect and a contractor. In support of this view, P6 expressed the following:

> *"…design of a dwelling is done entirely by foreign architects or Libyan architects from outside southwest Libya, and then a contractor is engaged to implement this design; the contractor has no idea about the desert-dwelling conditions as well as status of their owner, and has no knowledge about the architecture processes required that keeps the architectural identity of the area…"*

The lack of sustainable architectural design appropriate to the culture of the desert society inhabitants and their identity, as well as in line with their contemporary lifestyle in Southwest

Libya, is an issue that has to receive attention; something has to be done to support the local architects and contractors to adequately understand the social reality and the socio-cultural features for the inhabitants.

Regarding the second part of the question, under the theme of architectural style, most interviewees were clear in their responses acknowledging that, yes, the international architectural design trends (international style) have affected the design of contemporary desert dwellings in Southwest Libya; this has occurred since the onset of the Italian period, during the period when France ruled Fezzan, and even more clearly so after the discovery of oil in Libya. Moreover, most of the companies that have worked in the fields of architectural design and the construction of dwellings in Southwest Libya, from independence until the last few years, are foreign companies. The foreign architects bring several changes into the construction of dwellings, which ignore the vernacular architectural patterns for dwelling designs in desert areas, and use the international style in the dwelling designs without paying regard to the socio-cultural desert environment or even the climate. This is in addition to changes in the building materials; the use of materials that are unfamiliar in the desert environment; new architectural elements, such as external balconies with large, glass, opening windows; and introducing new architectural spaces, such as the master bedroom, western dining room, and oriental salon. Furthermore, there have been changes in the types of the dwelling units, such as bringing in the idea of constructing studio apartments and single-function rooms. Ignoring the architectural identity and cultural heritage of the towns of Southwest Libya has led to the loss of the identity that characterises the major historical towns in the area, such as Ghadames, Hoon, Sabha, Murzuq, and Ghat, which is considered to be one of the important aspects of the impact of international trends.

This information demonstrates that the majority of the interviewees believe that the rapid turning to contemporary and international trends, and intercalating the patterns of contemporary architecture without giving a chance for local architectural patterns to be developed has had a negative impact on the identity and cultural heritage of the region, in spite of some of the pros of the contemporary architecture. Moreover, this sudden turn towards the international architectural trends and using modern building materials is the latest growth spurt and has made large changes in the architectural landscape in Southwest Libya . In the same context, the question has emerged as to whether the contemporary desert dwellings in the region have been impressed upon by the modern architecture. Professionals have discussed this and the majority of them agree that the contemporary desert architecture in Southwest Libya has directly been affected by international style.

The aforementioned opinions support the arguments confirmed in the literature review (Bilghit, 2007, Almansuri, 2008) that international architectural design trends have had a negative influence on contemporary desert dwellings in Southwest Libya, which has led to the worsening of the problem of current dwellings in terms suitability to the principles of the socio-cultural sustainability of the region.

6.3.2 Advantages and disadvantages of vernacular architecture for desert-dwelling designs in terms of socio-cultural sustainability in Southwest Libya

This section aims to identify the professionals' opinions about both the advantages and the disadvantages of vernacular desert-dwelling designs in terms of socio-cultural sustainability. This is in order to identify the important advantages of the vernacular dwellings that can be integrated with the advantages of contemporary dwellings to develop sustainable guidelines for new dwellings designs.

6.3.2.1 Advantages of vernacular architecture for desert-dwelling designs

Table 6.58 sets out a summary of the details of what the professionals consider to be the greatest advantages, in terms of socio-cultural sustainability of the vernacular architectural design in Southwest Libya.

Table 6.58: Advantages of vernacular desert-dwelling designs

No	Greatest advantages of vernacular desert-dwelling designs in terms of socio-cultural sustainability	No. professionals	Percentage
1	VDD are more compatible and favourable with the surrounding environment.	15	75%
2	The historical depth of the evolution of VDD make them an important part of the history and identity of the region.	15	75%
3	The convergence of shape, design, and architectural elements give them a distinctive personal identity that reflects the local culture.	14	70%
4	The convergence of VDD with the neighbouring units provides more safety and security for the locals.	14	70%
5	The organisation and distribution of the internal spaces in VDD allows the occupants to move comfortably around the dwelling.	14	70%
6	VDD that have an internal courtyard characterise good visual privacy.	13	70%
7	VDD are characterised by having nearly the same simple design.	13	65%
8	The interior design of VDD provides spaces that facilitate strong family relationships, especially for large families.	14	65%
9	The interior design of vernacular courtyard dwellings provides safety, a private play area for children, and multiple uses of the space.	12	60%

The majority of the professionals stress the importance of the advantages of vernacular desert dwellings, which support socio-cultural sustainability in several aspects. The analysis in Table 6.59 shows that 75% of professionals said that the harmony of vernacular architecture with the surrounding environment, and the evolution of vernacular desert dwellings throughout history are two important factors that have contributed to the formation of the identity of the region. From a similar point view, 70% of them expressed that vernacular desert dwellings reinforce visual privacy; the organisation and convergence of the dwellings provide comfort and safety for the occupants; and the shapes, colours, and architectural elements form a distinctive unique identity that reflects the cultural heritage of the locals. Furthermore, 65% of professionals believe that the vernacular dwellings having almost the same simple design of interior spaces allows for the development of strong family relationships, particularly through the inner courtyard, where the family meets to do several activities. Furthermore, the interfaces of vernacular dwellings are compatible with the cultural heritage in terms of the building materials and components used, colours, and textures.

6.3.2.2 Disadvantages of vernacular architecture for desert dwellings design

In the same context, Table 6.59 shows a comparable breakdown of opinions on what professionals stated about the disadvantages of aspects of vernacular desert-dwelling designs.

Table 6.59: Disadvantages of vernacular desert-dwelling designs

No	Disadvantages of vernacular desert-dwelling designs	No. professionals	percentage
1	VDD designs do not meet the requirements of modern technology.	15	75%
2	Some types of VDD are no longer valid in terms of the providing the different contemporary facilities within the dwelling, such as electricity, communications, and a water and sewage system.	13	70%
3	Some types of VDD are not suitable or relevant for the contemporary lifestyle in terms general physical properties.	13	70%
4	Some types of VDD have weaknesses in terms of providing light and ventilation in some spaces, such as bathrooms and kitchens.	13	65%
5	Some types of VDD have weaknesses in terms of internal privacy, particularly between the bedrooms.	12	60%
6	Building materials used in the VDD are not very resistant to rain and need periodic maintenance.	12	60%
7	Most of the rooms in VDD are small in size.	11	55%
8	VDD have a limited capacity for extension, both vertical and horizontal.	11	55%

Most professionals believe that the vernacular desert dwellings are no longer appropriate to live in currently, particularly for the new generation. However, they possess historical and heritage value, and are a historical witness to the civilisation and identity of the people in Southwest Libya; therefore, the designs of those dwellings is considered to be a source of inspiration from which to learn lessons for socio-cultural sustainability as well as lessons that contribute to establishing the identity of the region. The analysis in Table 6.59 illustrates that 75% of professionals have the conviction that vernacular desert-dwelling designs no longer meets the requirements of technology for people's contemporary lifestyles, especially for the younger generations; for example, the sizes of the interior spaces, the quality of construction materials, and the existence of contemporary facilities and services within the dwelling, which cannot be done without. In addition, 70% of them mentioned that types of vernacular dwelling are no longer valid in terms of providing new technological facilities within the dwelling, such as extending electric cables, communications, fibre optics, air-conditioning, and sewage systems. Therefore, it is difficult to find the general physical properties of vernacular dwellings suitable for contemporary lifestyles. Furthermore, there are additional opinions that give a multiplicity of other flaws, such as the limited ability to vertically extend, and the constant need for maintenance due to the poor resistance of building materials to erosion and some extreme climatic conditions, such as high winds and heavy rain.

6.3.2. Lessons learned from the advantages of vernacular architecture for desert-dwelling designs in terms of socio-cultural sustainability in Southwest Libya

In fact, vernacular architecture depends on the practice of traditional techniques and knowledge, and disclose a high estimate of professional and quality (Sundarraja *et al.*, 2009). Based on the discussion with the specialists regarding the answer to this question, indeed, there are several points that have been derived from vernacular desert dwellings, through exploring the views of professionals on the lessons learned from the advantages of sustainable vernacular architecture for the design of desert dwellings, which can support the integration of socio-cultural-sustainability features into contemporary dwelling designs, for which guidelines will be provided. Most of those points are summarised as follows:

The first point is regarding the design of the main entrance of desert dwellings, which are required to not directly reveal the inside of the dwelling to provide enhanced privacy between public and private spaces within the dwelling; this is to conserve and respect the local customs, traditions, and cultural heritage of the population of Southwest Libya.

The distribution of desert dwellings in most of the vernacular oases and towns in Southwest Libya follow certain techniques to keep privacy from neighbours. For example, roofs that are used as a sleeping place for the family in the summer time, the morphology of vernacular desert dwellings, particularly for dwellings that face each other, was developed to maintain the privacy of the family space, the inner courtyard, and roof by using differing heights of walls and the location of the bulk of the second floor that is built around the courtyard.

The existence of a central space in desert dwellings, such as an inner courtyard, provides an area that encourages social interaction between family members, and it also can be a gathering place for women at events among neighbours and relatives. In addition, the existence of a central outdoor space provides a sitting area, which encourages social contact among the members of the community, such as those in Ghadames that are called a 'mastaba'.

The morphology of vernacular desert dwellings and the compact urban fabric provide a private indoor environment to reinforce security and safety, especially for the children in each neighbourhood. In addition, there are other examples that support security and safety through the compact architectural compositions of vernacular architecture, such as the presence of gates and narrow entrances in residential neighbourhoods. Furthermore, people prefer to have their dwellings near their relatives, in the same neighbourhood.

The similarities in shapes, sizes, and colours of vernacular desert dwellings; the suitability of those dwellings on a human scale; and their compatibility with the surrounding environment of the oases has conferred a sense of place and identity. Furthermore, they provide comfort and tranquillity for the locals. From the further investigation of the lessons learned from the advantages of vernacular architecture for desert-dwelling designs in Southwest Libya, COA2 noted the following:

> *".... The source of the building materials for vernacular dwellings is from the same environment; thus, the materials used were sustainable...and compatible with the nature of the place...."*

UPA3 expressed an opinion based on the experience gained in his studies of vernacular architecture in an oasis in Southwest Libya, as follows:

> *"... Interior design, decoration, colours, and the distribution of spaces in vernacular dwellings came from the cultural heritage, and values, customs, and traditions of locals...which led to boosting the cultural and architectural identity of vernacular dwellings in southwest Libya..."*

All the previous vernacular dwelling designs and techniques support achieving socio-cultural sustainability in external and internal desert-dwelling designs. In summary, most of the arguments support the efficiency of creating a sustainable framework between vernacular architecture and new desert-dwelling designs in terms of socio-cultural sustainability. However, it is important to take the lessons of the past and evolve a new design for dwellings that will be more suitable to the changes in people lifestyles and technological innovation.

6.3.3 Advantages and disadvantages of contemporary desert-dwelling designs in terms of socio-cultural sustainability in Southwest Libya

This section aims to explore views about both the advantages and the disadvantages of contemporary desert-dwelling designs in terms of socio-cultural sustainability. This is in order to identify the important advantages of the contemporary dwellings that can be integrated with other advantages of vernacular architecture to develop guidelines for new dwelling designs, and also to prevent the repetition of the disadvantages of contemporary dwellings in the future.

6.3.3.1 Advantages of contemporary desert-dwelling designs

Table 6.60 sets out a summary of what the professionals consider to be the most important socio-cultural-sustainability advantages for contemporary design in Southwest Libya.

Table 6.60: Advantages of contemporary desert-dwelling designs

No	Greatest advantages of contemporary desert-dwelling designs in terms of socio-cultural sustainability	No. professionals	percentage
1	It keep up with changing contemporary lifestyle.	15	75%
2	It keep up with modern technology to a certain extent.	14	70%
3	Modern building materials, in spite of their environmental problems, are more resistant to climatic conditions.	13	65%
4	Construction structures for contemporary dwellings are safe and allows for vertical extensions.	13	65%
5	They respond to the socio-cultural changes.	13	65%
6	Contemporary dwelling designs have provided several new multifunctional spaces, such as modern guest salons.	12	60%
7	The quality of finishing materials is good.	12	60%
8	They provide good internal privacy to a certain extent, especially for separation of sleeping spaces.	12	60%
9	Window facades allow for the entry of good ventilation and the light required.	12	60%

Most professionals believe that the advantages of the contemporary desert dwellings corroborate the socio-cultural changes, more than they support the socio-cultural-heritage features. Table 6.60 shows that 75% of professionals expressed that one of the most important advantages of contemporary dwellings is keeping up with the changing contemporary lifestyle. As well, 70% of professionals said that contemporary desert dwellings keep up with contemporary technology to a certain extent. Furthermore, 65% of them stressed that the construction structures and modern building materials used for the contemporary dwellings are safe and more resistant to climatic conditions; moreover, contemporary dwellings have more flexibility to be adapted to socio-cultural changes. A total of 60% of interviewees indicated that the contemporary dwelling designs provide several new spaces, such as guest salons, open kitchen designs, and master bedrooms, with good internal privacy for separation of sleeping spaces. Furthermore, the contemporary dwellings have modern facades that allows the entry of good ventilation and the light required.

6.3.3.2 Disadvantages of contemporary desert-dwelling designs

Table 6.61 outlines the opinions of professionals in terms of the disadvantages of the contemporary desert-dwelling designs.

Table 6.61: Disadvantages of contemporary desert-dwelling designs

No	Disadvantages of contemporary desert-dwelling design	No. professionals	percentage
1	The overall shape of contemporary desert-dwelling design does not express of the identity of the region.	16	80%
2	Contemporary dwellings are completely unrelated to the architectural heritage of the region.	15	75%
3	The design and distribution of interior spaces is not in line with the customs, traditions, and norms of desert society.	14	70%
4	There are contrasts in the colours, shapes, sizes, and architectural elements of contemporary desert dwellings, which create chaos and randomness in the architectural landscape.	13	65%
5	There is poor visual and acoustic privacy from the streets and neighbours.	13	65%
6	The large windows and the balconies reduce visual privacy, in addition to them having a negative climatic influence.	13	65%
8	The interior design of spaces reduces the chance of social communication among family members and also with their neighbours.	12	60%
9	The distribution of contemporary dwellings and the isolation of some of them increase the chances of reducing the safety and security of the dwellings.	11	55%

Most of the views of the interviewees consider ignoring the socio-cultural needs is one of the most important disadvantages of contemporary desert-dwelling designs. This is because most of them were constructed out by foreign companies (see Section 6.2.3.3). From the analysis shown in Table 6.61, 75% of the professionals indicated that the design of contemporary dwellings is completely unrelated to the architectural heritage of the region. Plus, 65% further argued that the contemporary dwelling designs ignore the need for visual and acoustic privacy from the streets and neighbours, which necessitates a change to some architectural elements of the dwellings . As a result of the existence of large windows and balconies in the facades of contemporary desert dwellings visual privacy is reduced, and these elements also have a negative climatic influence. There are also contrasts in architectural elements, colours, sizes, and shapes in the compositions of contemporary desert dwellings, which create chaos and randomness in the architectural landscape. In the same context, 55% of professionals mentioned that the distribution of contemporary dwellings and the isolation of some of them increases the chance of reducing the safety and security of the dwellings.

UPU2 explained the last point and he further added the following:

> *"... The compact constructional texture in vernacular architecture that links the desert dwellings with each other, interspersed with alleys, has created internal spaces between dwellings giving a sense of security and safety for pedestrians and children. Conversely, contemporary dwelling designs are spaced from each other with wide streets, and there car traffic along thoroughfares; all of these things have led to reducing the feeling of safety and security..."*

6.3.3.3 Benefits of contemporary architecture for desert-dwelling designs

Undoubtedly, the contemporary desert-dwelling designs have many positive aspects and benefits, which may be integrated with other positive features coming from vernacular architecture. This is in spite of the glaring deficiencies of these dwellings associated with failing to meet the socio-cultural-sustainability needs and changing the usual architectural landscape of the historical towns in Southwest Libya, which is associated with changing the identity of the region over time. The discussion with the professionals about those benefits and integrating them with the lessons learned from the vernacular dwellings will support the formulation of a set of guidelines for sustainable dwelling designs in Southwest Libya. The majority of the interviewees confirmed that, in addition to the most significant advantages of

contemporary desert-dwelling design in terms of socio-cultural sustainability (indicated in Table 6.60), there are other benefits. UPA1 expressed the following view:

> *"... The design flexibility of some contemporary private dwellings, which are adjustable by adding new architectural elements, gives us the opportunity to modify their design to some extent to suit the socio-cultural environment of the locals..."*

To support the above opinion, UPA2 stated the following view:

> *"... The structure of contemporary dwellings has more toughness and consistency, and therefore there is the possibility of vertical expansion and the easy addition of supplements to the dwelling…This helps to add other spaces that can be used for many social activities..."*

UPU1, on the other hand, lauded the contemporary dwelling designs and argued the following opinion:

> *"... Contemporary dwellings are more favourable for the current contemporary lifestyle for several reasons, such as the presence of a modern kitchen space with different fittings, also bathrooms and spaces that need to be supplied with heating or cooling, in addition to communications…All of these things and others are from the basic requirements that can no longer be indispensable in the contemporary lifestyle..."*

MCA1 further added the following:

> *"... in contemporary residential areas, more services are provided, such as roads, lighting, sewers, open parks, and others..."*

The survey shows that most of the families in southwest Libya are small families; thus, COA gave this further explanation:

> *"... the contemporary dwellings are suitable for the nature of the lifestyle of small families more than vernacular dwellings..."*

The arguments of UPA 1 and UPA 2 support the opinions in the literature review of Amer (2007) regarding the flexibility of the contemporary dwelling designs. Furthermore, most of the aforementioned views explain that the importance of the contemporary dwelling designs is represented in the capability of those dwellings to be compatible with the contemporary lifestyle.

6.3.4 Desert dwellings and socio-cultural sustainability in Southwest Libya

Discussions of the theme of socio-cultural sustainability in Southwest Libya (the presence or absence of socio-cultural sustainability features, whether in vernacular or contemporary desert dwellings, and the attempt to deduce the features that support the socio-cultural sustainability issues in the design of future dwellings) revolve around four main themes, beginning with the views of interviewees about the changes of perception of identity and lifestyle for the younger generation. This is to identify concordant points for integration with the views of young people about these changes to help crystallise the guidelines for future sustainable designs. This will be followed by dialogue on the socio-cultural-sustainability features for vernacular and contemporary desert dwellings; there are differing views on this subject, though they demonstrate that the majority of the respondents attested that the vernacular desert dwellings were more sustainable than the contemporary desert dwellings in terms of socio-cultural features. On the other hand, some interviewees likewise indicated that the contemporary desert dwellings have features that can be drawn upon to support the sustainable design scheme. Finally, it needs to be determined how to involve young people in the design process, and what the views are with respect to youth participation in sustainable dwelling designs for the future in Southwest Libya.

6.3.4.1 Changes of identity and lifestyle for the younger generation

Changes in identity and lifestyle for the youth is considered to be one of the vital and important topics that should be discussed, especially regarding the new generation. Young people in desert regions in Southwest Libya, like young people in any other region of the third world, have an interest in and a passion for the modern lifestyle and technology, and they aspire to imitate some of the culture of globalisation and Western European cultures. This, in turn, has led to a weak link with national and local culture. However, one needs to understand and identify the most important steps that can be taken to heal the new generation with respect to the change of identity, and keep up with the requirements of the contemporary lifestyle.

Professionals UPA1 and UPA2 confirmed that the changes of identity and lifestyle for the young people in Southwest Libya presents a different challenge for them.

UPA3 expressed an opinion based on experience and dealing with youth of both genders through his work as a faculty member in the University of Sabha and some universities in Southwest Libya, as follows:

> *"... Young people always have aspirations to others in other areas, especially the north and European areas, through what they see from various media and communications, which represents their window on the world, such as following news of celebrities, artists, famous football players, and others, and some of them try to reverse some of the cultures and traditions in their life...Therefore, it is important to face the cultural changes and globalisation trends through education and training in the stages of basic education, and in the higher institutions and universities, and raise the scientific and cultural efficiency of the youth, to help young people to return to tracking, preserving, and strengthening the local cultural identity..."*

UPA2, in the supporting the same point of view as UPA3, expressed the following opinion based on his experience as a former faculty member in the architectural department in Sabha university:

> *"...One of the important steps that must be taken to face the changes in identity it is attention and auspices of new generations through the media such as television programs, documentaries, and means of communication including Internet and social media which supports culture of noble values for desert society and enhance its relationship with youth..."*

In a further probe to solve that issue, PML1 noted the following:

> *"... Should the relevant authorities provide the educational and information programs that helps to strengthen youth society in Southwest Libya with their cultural identity and develop the spirit of a sense of belonging to the place with its different elements, as well as encourage studies and research in the framework of strengthening the cultural and architectural identity, especially in the upper specialised institutes and departments of architecture at various universities..."*

Discussing this further, UPA3 noted that the contemporary lifestyle and the use of modern technology have become characteristics of this era and cannot be dispensed with. However, the important challenge is to create a balance between the needs of the new generation and their contemporary lifestyle, and the cultural-heritage features to address the issue of the disappearance of this heritage. PML1 noted that the nature of the contemporary lifestyle sometimes imposes the use of some exotic vocabulary and methods in local culture. However, it is useful to find a way to fit this vocabulary into the local culture. In other words, to allow for the development of local culture to accommodate contemporary variables.

Additionally, caring about the local cultural and architectural heritage, and re-adapting and employing it, in accordance with the contemporary requirements, make it a strong point for maintaining their cultural identity. Plus, showing the importance of the identity elements would go a long way towards healing the new generation's changes of identity and address the rapid changing of the private architectural landscape in the historical towns from a vernacular pattern to a contemporary pattern. For example, an architect, PMF1, from an engineering consultancy office pointed out that the preparation of educational and information programmes helps to strengthen the relationship of the youth in Southwest Libya with their cultural identity and to develop the spirit of a sense of belonging to the place.

MCA1 further added:

> *"... The local authorities paying attention to the local architecture industry, encouraging the young people to engage in workshops, and supporting small and medium enterprises economically, would enhance the importance of the local cultural identity among young people..."*

From further probing of the interviewees about what the most important steps that can be taken to heal the new generation with respect to the change of identity and keeping up with requirements of the contemporary lifestyle, MHA2, as an architect in Ministry of housing, expressed the following view based on his experience:

> *"... urged various government institutions to allocate financial incentives to support architectural designs that boost the adoption of local ideas, to support the tourism activities that assist the maintenance of the architectural heritage and that are associated with the unique vernacular architecture, and to encourage investment in this aspect, which will help to preserve the local identity..."*

These statements support the arguments advanced in the literature that focus on the role of education and using the media to educate young people about the promotion of cultural identity (Warm, 2014, Al-Otaibi, 2007).

6.3.4.2 Socio-cultural sustainable features for vernacular desert dwellings

The discussions on this matter begin with the views concerning socio-cultural-sustainability features of vernacular desert dwellings. The majority of interviewees (20 professionals), highlighted that the vernacular desert dwellings are characterised by the socio-cultural

features that reflected the values stemming from the cultural heritage, and ideological and religious beliefs of the local population, such as privacy, safety, social considerations (family relationships and social contact), and cultural identity, including the customs, traditions, and beliefs. For example, architect MCA1 of an Al-Amara engineering consultancy office pointed out the following:

> *"... The design of vernacular desert dwellings in southwest Libya is according to the socio-cultural and heritage principles, such as visual privacy, acoustic privacy, privacy through isolation and respect distances , safety and security, and social considerations, which is considered to be an influential factor in these principles..."*

Through the discourse with the professionals about this issue, many of the important socio-cultural features are clearly identified. COA2 noted that the design and construction of vernacular dwellings were not achieved through planning and architects, but was done by local builders who were experts in this field, and they aimed to create dwellings that meet the humanitarian needs in accordance with the culture and the environment at that time. Therefore, most of the architectural features of vernacular dwellings came about to meet social needs, such as respecting the customs, traditions, and beliefs; in addition, they reflect the culture of the local population over the years. For example, the presence of guest rooms that are isolated from the rest of the rooms, which are usually found on the ground floor, such as in the vernacular dwellings in Ghadames. Furthermore, having a guest room on the ground floor, having the kitchen and the women's rooms on the second floor, and the existence of the upper passages that are used as footpaths for women such that in vernacular architecture in Ghadames, which helps to achieve the freedom of movement for women and encourage social contact with each other. Therefore, these features to a great extent expresses the cultural heritage and architectural identity of the people of Southwest Libya.

On further probing into this subject, COA2 explained the following:

> *"... Windows and openings in the vernacular desert dwellings are small and mostly elevated to provide visual privacy, as well as easing the entry of sunlight and preventing dust from entering the dwelling..."*

In the same context UPU1 noted that:

> *"... the existence of vernacular dwellings within the one-dwelling units with narrow streets, corridors, and courtyards provide a safe environment for pedestrians and especially for children..."*

MHA1 mentioned that the most important feature of the vernacular dwellings is the inner courtyard, which can be found in Sabha, Murzuq, and Ghat, as they create an internal environment of privacy, and provide space for social events, meetings, and dinner parties, which supports social contact at the family and neighbour level. In this social context, the existence of vernacular dwellings in adjacent rows also encourages rapprochement and communication with neighbours. The vernacular shape of a single, monolithic block, like one body, is based on the harmonious combination of the architecture and the people , which, over centuries, have formed the cultural heritage and architectural identity of the region.

MCA1 further expressed the following view(s):

> *"...other features of vernacular dwellings in historical towns in Southwest Libya are the unified architectural landscape. Although there are differences in the forms and sizes of some dwellings, but there is a unit of designing without prior design..."*

In another point in the context of the identity of vernacular dwellings, UPA4 noted that the existence of some important avatar vernacular buildings in vernacular towns, such as historic castles (e.g. the Castle of Murzuq, Sabha) and ancient mosques (e.g. Younis mosque in Ghadames and the ancient mosques of Ghat), are considered to be a vital symbol that have become entrenched in people's minds and represented the collective memory of the place. For example, the composition of the architectural landscape of desert dwellings with domes of ancient mosques, old castles, and markets, with a background of plants and palm trees, all of which represent the typical scene of the local architecture of the oases in Southwest Libya.

MHA1 disclosed that the interior design of vernacular desert dwellings are rich with bright colours, and decorated with local handmade products, such as copper pots, crockery, fabrics, and natural animal-skin pieces that are hung on the walls, which showcase the local artistic ideas that reflect the traditional desert lifestyle. The vernacular desert-dwelling adornments are also combined with some interior architectural elements, such as windows decorated from the inside with coloured porcelains, pitchers of water, and mirrors; all of those form important manifestations of the cultural heritage and cultural identity of the inhabitants:

In support the above view, UPA3 expressed the following view:

> *"... The roofs and facades of vernacular desert dwellings are formed from architectural elements that came from the ancient cultural heritage of the peoples of the region, such as the existence of the Trinity on the top of the roofs of dwellings in Ghadames, Ghat, and Murzuq..."*

These statements highlight the socio-cultural-sustainability features for vernacular desert dwellings, which have come from the social values stemming from the culture, and ideological and religious beliefs of locals. Most of these values emphasise the respect for traditions, some of which are derived from ideological and religious concerns. Others are inherited over time from ancestors.

6.3.4.3 Socio-cultural features for contemporary desert dwellings

Despite the failure of contemporary dwelling designs to meet the social and cultural needs of the desert society of Southwest Libya, according to views of professionals and many of the previous studies, those dwellings have advantages in terms of social and cultural sustainability that must be taken advantage of in order to integrate them with the advantages of vernacular dwelling designs to synthesise the guidelines for the design of contemporary sustainable desert dwellings in future.

UPA2 pointed out that the durability of concrete structures of contemporary dwellings gives them flexibility so that they can easily have rooms and other spaces added or enlarged , based on to what serves the desires of the inhabitants. In addition, another floor can be added to the dwelling in case of need, when there is an increase in the number of family members, or if one of their sons gets married. This flexibility is considered to be a good feature for further modifications, such as increasing the number of openings or doors, or closing them in order to meet the socio-cultural needs of the inhabitants. From a similar point view, UPA3 argued that contemporary dwellings can provide good security facilities through using solid building materials, such as irons doors and windows, and fences that surround the dwelling. Although this affects the shape of the interfaces of dwellings, it helps to provide a safe indoor environment, especially in private dwellings in the suburbs of desert towns. On the other hand, modern technology provides early warning signals for theft and fire, which support the security and safety aspects of dwelling.

Also, MHA1 noted that the contemporary desert dwellings are considered to be more convenient to the contemporary lifestyle than the vernacular desert dwellings. For example, through providing sewage and water systems, communication systems, heating and cooling systems, television, Internet connectivity, and other modern technologies in the contemporary desert dwellings that are indispensable for our modern lifestyle.

To support the previous opinion, MHA3 confirmed that the contemporary dwellings are located in sites close to important services and facilities, such as schools, universities,

hospitals, and shops, which are important for these dwellings, whereas the gatherings of vernacular dwellings lack infrastructure, services, and basic facilities.

In addition, MCA1 stated that the interior spaces and rooms of contemporary dwellings are considered to be somewhat larger than the spaces in the vernacular dwellings, especially if one takes into account the possibility for the future expansion of contemporary dwellings, particularly regarding vertical expansion.

In the same context, COA indicated that the architectural elements of contemporary dwellings such as porch doors and windows may not work well in the desert environment in terms of the climatic and social aspects. However, the types of materials used for the doors and windows offer better quality to the inhabitants, compared with the doors and windows in the vernacular dwellings.

COE expressed an opinion based on his experience in the building construction sector in southwest Libya, as follows:

> *"... the facades of some contemporary dwellings do not reflect the cultural and architectural identity of those historical towns. However, they can take advantage of some of the finishing materials that are used in dwellings' facades for the resistance to erosion and difficult weather conditions in desert regions, if used properly to serve the sustainability of those dwellings...."*

COE added that the compatibility of finishing materials in contemporary dwelling designs are pretty appropriate, to a large extent, to the contemporary lifestyle. For example, the presence of marble tiles prevents dust accumulation inside the dwelling, in addition to being easy to clean; smooth walls reflect light well, and aluminium curtains that are easy to change and maintain can be used as partitions to separates some spaces.

MHA2 added that the circumstances of contemporary life are evolving quickly, and this is reflected on the social, cultural, and economic lifestyle of humans, and this development may mean that contemporary dwelling designs are suitable to some extent, as they are amenable to rapid technological changes.

6.3.4.4 Future of sustainable dwelling design in Southwest Libya, and the participation

When probed on the future of sustainable dwelling designs in Southwest Libya, in terms of socio-cultural sustainability, the majority of professionals confirmed that there is a need for

architects and the relevant authorities to commit themselves to the design and implementation of desert dwellings that take into account the importance of socio-cultural-sustainability features, including reconciliation with the nature of the region, its cultural heritage, and the architectural identity of the historical towns in Southwest Libya. This is compatible with achieving the desired level of well-being for the different generations regarding the requirements of the contemporary lifestyle and the use of modern technology to ensure the success of the designs and the implementation of those dwellings.

For instance, COA1, through his experience as an architect in the Office of Al-Amara, pointed out that the dwelling designs should precisely take account of the socio-cultural needs of the locals, including the general appearance of those dwellings, and their suitability to the urban landscape and architectural identity of those historical towns.

In the context of the urban planning of dwellings, COU, through his work experience in urban planning, mentioned that the dwelling designs should consider the safety and security aspects, such as pedestrians' safety, especially for children, and road safety, by taking into account the safety considerations when designing of the streets or main roads beside dwellings blocks.

MCA1 noted that there is the need to provide privacy in the design of the interior spaces of the dwellings; spaces should be divided into semi-public, semi-private, and private areas, and in order to create a more secure environment in terms of privacy, especially for areas used by the family and children.

In the context of privacy, DUP1 expressed the following opinion based on his experience on working for more than 10 years in the department of urban planning in municipality of Ghadames:

> *"... In addition to the importance of privacy, safety and social considerations in the design of blocks of residential units must also consider providing all the public facilities and services that ensure the welfare of the inhabitants..."*

UPA1 added that the building materials of desert dwellings must respond to their context and be inspired by surrounding environment to be more harmonious with local architectural scene, and to enhance the preservation of the character and identity of the region. The finishing materials and colours that are used in dwellings' facades should also be in response to the same context and give dwellings their own character.

In the same context of the future design of dwellings, UPA2 indicated that it is important to take into account the appropriate space in a dwelling that is suitable for the size of the family

in Southwest Libya (six to eight persons, according to the survey, see Section 6.2.1.4), and should also be appropriate to their customs, traditions, and daily lifestyle. The spaces of the dwelling ought to adequate for social events, meet the social and cultural aspects, and be compatible with the cultural identity of the people and place. At the same time they should meet the requirements of modern technology. It is important for the location of the dwelling to be near to the services needed by the inhabitants on a daily basis, such as schools, markets, health clinics, and others. In addition, service infrastructure should be provided that is compatible with the environment and that deals with the principles of the conservation of the environment (environmentally friendly). For example, ensuring the existence of green landscapes and water fountains; using materials that reduce the sun's rays to provide the greatest amount of shade on the facades of dwellings; using technology in dwelling designs that protect the environment, such as solar panels, especially because this is an easy way to get energy in the desert areas. All of this will help to provide for the well-being of inhabitants, which is an important aspect of social sustainability.

On further probing into sustainable dwelling design, UPA1 confirmed that the new design should create a balance between the socio-cultural needs, and the requirements of contemporary life and technology to ensure that the desert-dwelling designs are moving towards achieving socio-cultural sustainability. This is achieved, to a large extent, firstly, by revisiting the current desert-dwelling designs. Secondly, it is accomplished by stopping the use of the current designs. Finally, it can be brought about by educating and training the new generations; helping them to understand the importance of social and cultural sustainability, and the concepts that preserve their cultural and architectural identity; and by helping them to achieve a sense of well-being as a result of living in their new dwellings.

UPA1 also added that the research centres, and schools of architecture in universities and higher institutions have an important role to play in supporting and encouraging scientific research to educate and raise the awareness of different generations, especially youth, regarding the importance of cultural and architectural heritage, and preserving the history and culture. Furthermore, those educational centres help the youth to obtain sufficient knowledge to participate in the design process of their future dwellings. There is also another role for intellectuals, writers, and architects in cultural festivals and forums. Media can play an important role in this matter through television programmes and documentaries. The state should play its role alongside the civil sector by supporting maintenance projects and preserving the historical towns in Southwest Libya, such as Ghadames, Hoon, Murzuq, Sabha, and Ghat.

In the context of the effective involvement of young people to achieve success for sustainable housing projects, UPA2 indicated that the people often feel the need to make their mark in their dwellings, establish their right to use spaces that they made, or collaborate in designing them in one way or another. In order to develop inventive and successful methods of involving young people in improving desert-dwelling design in Southwest Libya at the level of dwelling or dwellings units, it is helpful to understand the importance of new dwelling designs for this age group, and the importance of identifying new design needs to raise the level of well-being and comfort for inhabitants, especially the younger age group, which, in the near future, will represent the largest segment of the local population. Finally, there is a need to identify the barriers that can prevent young people from getting involved and interacting with important issues that concern their lives in the future; for example, the need to have a dwelling is considered to be one of the most important matters for them. Consequently, they should understand these issues in order to overcome them.

In terms of the involvement of young people in the design of future sustainable dwellings in Southwest Libya, the majority of professionals confirmed that the involvement of the new generations of young people in the design process is required, and there is a need to listen to their views and aspirations for the future dwellings to create common ground between them and the designers. This would allow them to feel they were participating in this process, and make them feel that these dwellings reflect some of their ideas. This is should be done side by side with training the young people and educating them about the importance of their cultural identity. This participation would also allow the architect to become familiar with the social, psychological, and economic characteristics of the inhabitants, so that they would be able to give sufficient attention to any other factors that may arise.

6.4 Summary and link

The findings from the views of the respondents from the different generations of the population of the three selected historical towns in Southwest Libya have been discussed, and their level of satisfaction with socio-cultural-sustainability features identified. In addition, the views and arguments of professionals, architects, and academics specialising in architecture and housing relating to the socio-cultural architectural features of both vernacular and contemporary desert-dwelling designs have been disclosed. The next chapter presents a discussion on the findings, summarises the final findings, and synthesises the key issues of the research into a set of specific points. Accordingly, a set of guidelines for the design of socially and culturally sustainable desert dwellings in Southwest Libya will be proposed.

CHAPTER SEVEN

DISCUSSION OF FINDINGS, FORMULATE A SET OF GUIDELINES AND VALIDATION

CHAPTER SEVEN

DISCUSSION OF FINDINGS, FORMULATE A SET OF GUIDELINES, AND THEIR VALIDATION

7.1 Introduction

This chapter presents in details a discussion of the findings of this research, as provided in Chapter Six, to achieve the aim of the research, which is formulated a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya, through finding answers to the research questions. This chapter will then formulate the proposed guidelines for the design of socio-culturally sustainable desert dwellings in Southwest Libya; these guidelines were verified by a group of housing experts in Libya, which is also presented in this chapter. Figure 7.1 shows the chapter outline:

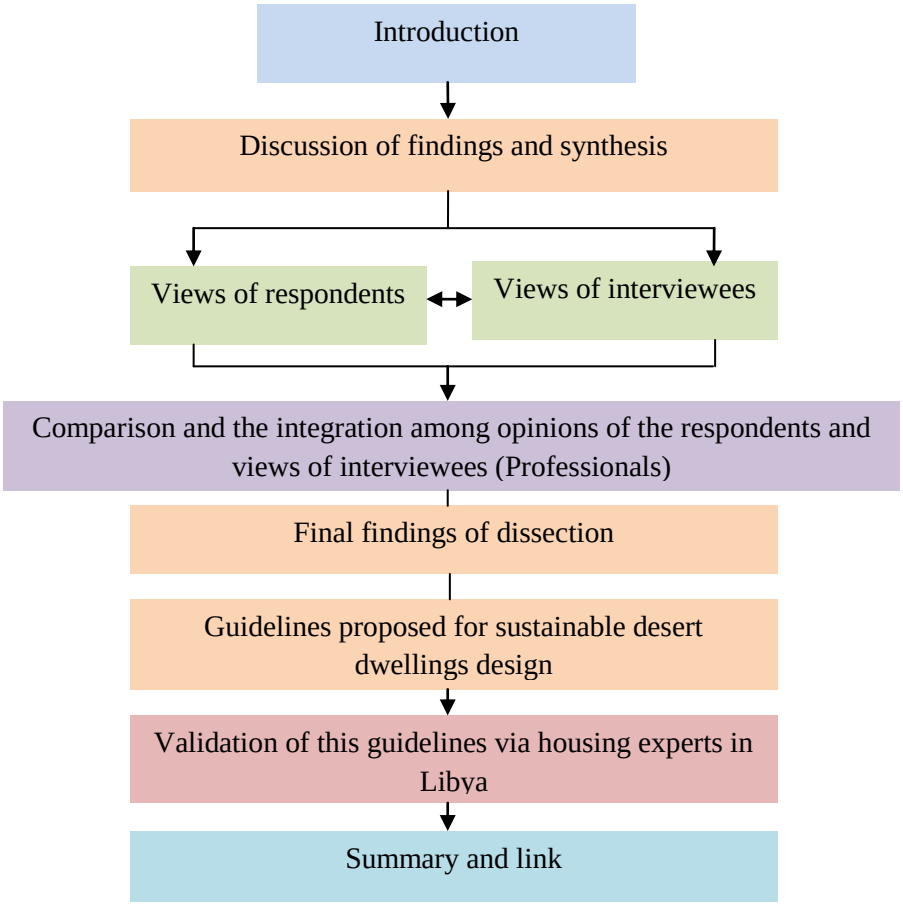


Figure 7.1: Categorisation and structure of chapter seven

7.2 Discussion of findings and synthesis

The discussion in this section is primarily based on two consultation sources in this study: wide samples of respondents (quantitative data) and in-depth discussions with professionals (qualitative data). This is in addition to the background of the theoretical framework of the subject. The following section discusses the findings according to the views of both of these sources, in turn.

7.2.1 Views of respondents

As mentioned in Section 6.2.1 in Chapter Six, the 311 of respondents they live in three towns (Ghadames, Sabha, and Ghat that have various types of vernacular desert dwellings), and are mostly university and higher institution students. The majority of the respondents are young people which have a good level of education. This helped them to provide a clear opinion regarding the socio-cultural aspects in terms of the sustainability of both vernacular and contemporary desert dwellings in their regions.

7.2.1.1 Situation of both vernacular and current contemporary dwellings design

Regarding the background information that was given by the respondents, it could be argued that they have brought a diversity of experiences of vernacular and contemporary desert-dwelling designs in their regions based on their perspective, and this is reflected in the opinions (see Sections 6.2.2 and 6.2.3 in chapter 6) that they offered on both of those types of desert dwelling. The majority of the respondents were originally from those regions (Ghadames, Sabha, and Ghat) as shown in section (6.2.1.5) in Chapter Six, and the results offer reliable opinions regarding vernacular and contemporary desert-dwelling designs in Southwest Libya. The realistic perception of the respondents and the information they provided about the architecture of vernacular and contemporary desert dwellings is summarised in Table 7.1:

Table 7.1: Summary information on vernacular and contemporary desert dwellings

No	Vernacular desert dwellings (VDD)	Contemporary desert dwellings (CDD)
1	64.3% of vernacular dwellings (in samples in the case study, in three towns) were courtyard dwelling and 35.7% were compact dwelling;	60% of contemporary dwellings (in samples the case study, in three towns) were private dwelling and 17% were flats and 12.8% were single-storey villa and 10% were villa two-storey;
2	Most of vernacular dwellings consist of 2 to 3 bedrooms, 1 guest room, 1 bathroom and 1 kitchen;	Most of contemporary desert dwellings consist of 3 to 4 bedrooms, 1 guest room, 1 living room 2 bathroom and 1 kitchen;
3	Most of vernacular desert dwellings built by locals;	Most of contemporary desert dwellings built by foreign companies;

7.2.1.2 Respondents' satisfaction levels with vernacular and contemporary dwelling designs

This section presents a description of respondents' satisfaction levels for both vernacular and contemporary desert-dwelling designs in terms of them meeting socio-cultural needs through their socio-cultural-sustainability features.

The diversity of satisfaction levels among respondents of different generations can be observed around the various items of the first four main features, and its various items, varying from low to medium and high. In addition to the views of new generation of young people about the architectural identity, cultural heritage, and contemporary lifestyle. However, can be also observed differentiated views in a particular direction. However, in general they reflect the youth's orientation on these issues which represent an important argument in this research.

The analysis results that indicate the satisfaction level for both vernacular and contemporary dwellings design are reported in Table 7.2:

Table 7.2: The average satisfaction levels for vernacular and contemporary desert dwellings

Features of socio-cultural sustainability		VDD	CDD
1	**Privacy**		
1.1	Visual privacy	**63.4%**	31.9%
1.2	Acoustic privacy	**60.1%**	35.1%
1.3	Privacy around the dwelling	**56.3%**	31.2%
1.4	Privacy of sleeping spaces	28.9%	**57.6%**
1.5	Privacy of interior organisation	**55.6%**	38.5%
2	**Safety and security**		
2.1	Dwelling safety and security	39.9%	**56.3%**
2.2	Safety around the dwelling	**54.3%**	32.8%
2.3	Family safety	36.9%	**50.5%**
2.4	Safety of location	**52.7%**	34.4%
3	**Shape and design**		
3.1	Area of dwellings	34.1%	**51.7%**
3.2	Location of dwelling	34.7%	**50.8%**
3.3	Windows, doors and openings	38.6%	**56%**
3.4	Quality finishing , external facades	44.7%	**60.5%**
4	**Social considerations and religious beliefs**		
4.1	Beliefs and the family relationship	**52.8%**	33.4%
4.2	Relationship with neighbours	**60.1%**	32.1%
4.3	Social relationship	**51.1%**	35%
4.4	Relationship with religious places	**52.1%**	50.1%

Followed **Table 7.2:** Youth response for identity, cultural heritage and contemporary lifestyle

Features of socio-cultural sustainability		VDD	CDD
5	**Identity and cultural heritage**		
5.1	Self-expression	**44.3%**	28.7%
5.2	Cultural identity	**52.4%**	30.3%
5.3	Link with the collective memory of the place	**45.1%**	31.2%
5.4	Compatibility with custom, tradition	**63.9%**	29.5%
6	**Contemporary lifestyle**		
6.1	Compatibility of elements for finishes with nature of lifestyle	28.7%	**54.1%**
6.2	keeping up with contemporary socio-cultural developments	24.6%	**52.5%**
6.3	keeping up with modern technology used during daily activities	23%	**64.7%**

In terms of visual privacy, acoustic privacy, privacy around the dwelling, and privacy of interior organisation, it is clear from the previous tables in Chapter Six (see Tables 6.14, 6.15, 6.16 and 6.18, and Table 6.19 for the statistical analysis) that the majority rate vernacular dwellings as satisfactory (see Table 7.2). Because in most of the vernacular dwelling there are elements and spaces that have a connection with traditional, religious, socio-cultural values such as the principle of preserving privacy. As in some vernacular dwellings with inner courtyard, the thick walls that support the acoustic privacy, and also the enhancement of visual privacy through some spaces design in those dwellings. Except for the privacy of sleeping areas, which is not satisfactory in the vernacular dwellings (see Table 6.17 in Chapter Six) due to there are not enough numbers of rooms for children. On the other hand, contemporary dwellings design neglects some aspects of privacy. For example, most contemporary dwellings doors face each other, especially the doors of apartments. However, the contemporary design provide more rooms, especially for large families, which means that respondents are more satisfied in terms of number of rooms with contemporary dwellings compared to vernacular dwelling.

With regard to the safety and security of the dwelling with respect to both the dwelling itself and family safety (as shown in Tables 6.20 and 6.22, and Table 6.24 for the statistical analysis). The majority of respondents are satisfied with contemporary dwellings (see Table 7.2), which is due to the durability of concrete structures, high walls in some contemporary dwellings, quality and durability of doors and windows, and the presence of fire alarms and theft alarms in some modern residential buildings. However, regarding to the safety around the dwelling and the safety of the location, the average of satisfaction with vernacular dwellings is higher than contemporary housing as a result of urban planning in modern sectors that encourage secondary street traffic and provide wide roads. Resulting in increased traffic accidents in the streets of modern sectors (see analysis in Tables 6.21 and 6.24 in Chapter Six). This has led to the impact on the safety of pedestrians, especially that the distribution of contemporary dwellings is described as open planning, means that strangers can cross these secondary streets easily, because most people do not know each other. This also negatively affects of social contacts.

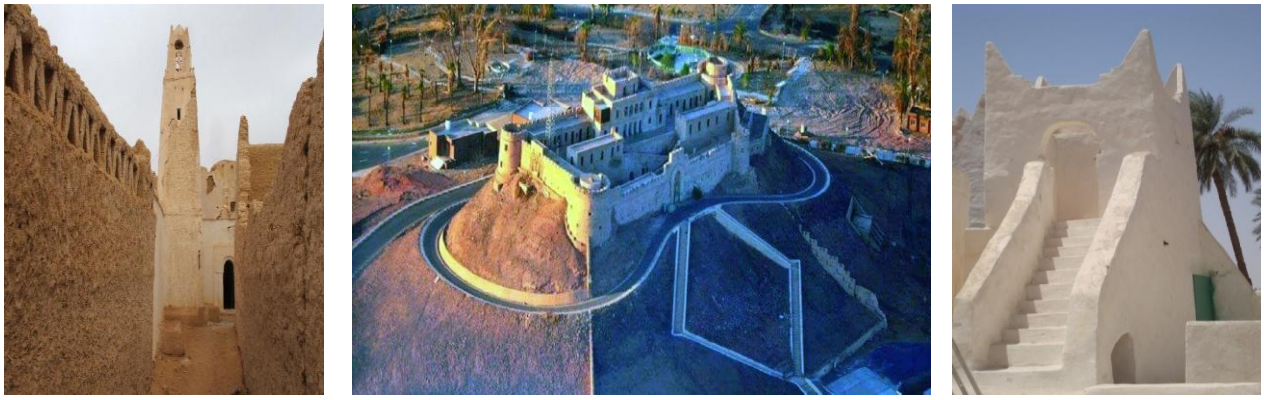
With respect to the shape and design of dwellings in terms of the area and location of dwellings (as shown in Tables 6.25 and 6.26, and Table 6.29 for the statistical analysis), the majority of respondents are satisfied with contemporary dwellings (see Table 7.2) because the contemporary dwellings provide more space, have a more flexible design to some extent, and also because most of these dwellings are located in the contemporary sectors near to the

services, schools, and other facilities; therefore, the population prefer their location to the vernacular sectors. On the other hand, most respondents believe that the quality and durability of building materials in contemporary dwellings are safer (see the analysis in Table 6.27 in Chapter Six). The majority of the respondents are more impressed with the modern materials in the facades of contemporary dwellings, or perhaps with the quality of finishing materials in the facades and their resistance to erosion in the desert than the vernacular dwellings (see the analysis in Table 6.29 in the previous chapter), although the materials were not designed for use in the desert climate and are not environmentally friendly.

For the social considerations and religious-belief considerations, in terms of religious beliefs, family relationships, relationships with neighbours, social relationships, and relationships with religious places (as indicated in Tables 6.30, 6.31, 6.32 and 6.33, and Table 6.34 for the statistical analysis), the majority of respondents rated vernacular dwellings as satisfactory (see Table 7.2). This is due to several considerations in the interior design of vernacular dwellings and the distribution of spaces, which take into account respect for social relations, such as the privacy of women, places for guests, and the internal courtyard, and also for features in the external design, especially doors and windows, and the location of the dwelling within the vernacular urban fabric, where most dwellings are contiguous with each other. The owners of these dwellings have strong social relationships, either through being relatives or because they have been neighbours for a long time. Most of the outer spaces between the dwellings encourage such communications; for example, there are social forums, squares of mosques, etc. that are used for seasonal events, celebrations, and various social activities.

Regarding identity and cultural heritage in terms of self-expression and linking with the memory of the place (see Tables 6.35 and 6.37, and Table 6.39 for the statistical analysis), it can clearly be seen that the majority of the youth rated vernacular dwellings as satisfactory with a lower percentage being satisfied with contemporary dwellings (see analysis in Table 6.35 in Chapter Six and Table 7.3 in this chapter) and als othere is a proportion of young people who responded neutrally. This may be due to the fact that young people were not directly associated with the vernacular buildings, dwellings. However, they expressed their respect, and that they consider the vernacular dwellings and buildings to reflect their self-expression and are related to their collective memory. This may be because the famous historical buildings in their region have become an important part of their memory, which links them to their region. For example, the architectural landscape of these towns, in particular the historic castle of Sabha, which is located on the top of the mountain overlooking the historical city and near to Sabha international airport; the ancient mosque of Ghadames,

which is still used now; and the historical castle of Ghat (see Figure 7.2). In terms of the satisfaction rate for vernacular dwellings with respect to cultural identity, and compatibility with customs and traditions it can be noted that it is slightly higher than the satisfaction rate for self-expression and connection with the collective memory of the place, and this reinforces the hypothesis that the slightly percentage of young people still appreciates and respects the cultural heritage and cultural identity which they inherited from parents and grandparents. This proportion deserves attention to be intended to promote the cultural identity of the communities of historic towns in Southwest Libya.



A B C

Figure 7.2: The famous historical buildings. A the ancient mosque of Ghat, B, historical castle of Sabha, C, the ancient mosque of Ghadames

Regarding the contemporary lifestyle in terms of the compatibility of elements of the finishes with the nature of the lifestyle, keeping up with contemporary socio-cultural developments, and keeping up with modern technology used during daily activities (see Tables 6.40, 6.41, and 6.42, and Table 6.43 for the statistical analysis), the majority of youth rated contemporary dwellings as satisfactory (see Table 7.2). This is due to the design of contemporary dwellings being in line with modern requirements more than vernacular designs are (see the analysis in Table 6.42 in Chapter Six). For example, the designs of spaces and rooms in the contemporary dwelling are suitable for modern technology, such as the sizes and shapes of electrical and electronic equipment used in kitchens and living rooms, and are also suitable for the presence of contemporary furniture designs, which need certain heights of roof, as well as suitable space for them. However, the contemporary designs still need to be further developed in this respect. On the other hand, through the discussions during the fieldwork, many young people expressed their aspiration to live in a contemporary dwelling that meets their social and cultural needs, and that is dynamic and flexible so it is able to cope with the rapid contemporary-lifestyle changes.

As to whether the design of the contemporary desert dwellings reflect the architectural identity of the historical towns and the unique architecture of the vernacular desert dwellings, 54.1% of the responses of the youth express that those dwellings do not reflect the architectural identity of the historical towns in any way; on the contrary, they have contributed to distorting the architectural landscape of those vernacular towns (see Figure 6.33in the previous chapter). In terms of the reflection of the personal lifestyle on the aesthetic values of the dwelling, 45.9% of the responses of the youth state that those dwellings express their lifestyle and personality. This means that the aesthetic values in their current dwellings reflect their lifestyle and personality, no matter that these values and shapes are simple. Therefore, they seek dwelling designs that meet their aspirations, and provide them with the comfort and well-being that is compatible with social and cultural sustainability. Therefore, improving the design of the interior environment increases the level of well-being and positively reflects the lifestyle of the population (see Figure 6.34in the previous chapter).

In terms of the responses of youth about the which important features of the vernacular architecture which related with architectural identity were 23% of respondents of youth they mentioned that the architectural landscape of vernacular dwellings considered the most characteristic of the vernacular architecture identity in Southwest Libya, and they also add the simple design of dwellings, homogeneity of elevations of dwellings and human scale in the vernacular dwellings also represent the most important features of vernacular architecture (see Figure 6.34 in the previous Chapter).

7.2.1.3 Significance of socio-cultural sustainable features

A good proportion of the respondents (60.1%) from different generations expressed that their dwelling designs should be compatible with their socio-cultural needs and their lifestyle. On the one hand, this shows the importance of the harmony of socio-cultural features with dwelling designs to provide a proper dwelling environment for the lifestyle of the local population (see Table 6.45 in Chapter Six). Furthermore, 61.1% of respondents from different generations expressed that the compatibility of their dwelling designs with socio-cultural needs enhances the quality of life and increases their sense of well-being. In the same context, regarding the respondents' being comfortable with the functional spaces in their dwellings, a high percentage of respondents expressed that if the interior decoration in their dwelling expresses their culture and identity, this will provide comfortable functional spaces for them. In addition, their opinions about the facades of their dwellings are that they should be compatible with the identity of the place as this will enhance their sense of belonging to the

place and thus support the preservation of the local identity. Finally, the design of the interior spaces should be compatible with their lifestyle and harmonious with the environment to enhance their sense of comfort and well-being, and promote the principles of sustainability (see Table 6.46 in Chapter Six).

7.2.1.4 Desires required in future dwellings design

The findings show that almost 60% of respondents mentioned that the current dwelling designs affect their lifestyle and they would like to make some changes to their current dwelling regarding socio-cultural sustainability. Some of them have already made some of these changes in the interior and exterior designs of their dwellings (see Table 6.47 in Chapter Six). Most of these changes, whether carried out or only desired by the respondents, are the result of two things. First, the need to meet urgent socio-cultural needs, such as privacy, safety, and security(adding walls, iron doors, curtains, etc.), some important social needs, or the need for more spaces (converting and/or adding rooms). Second, to make the dwelling designs more suitable for the cultural aspects and cultural identity (such as changes to the decoration and colours, or adding colours or some elements to the facades of the dwelling), and the contemporary lifestyle and use of technology, and thus to enhance the sense of well-being of the population (see Figure 6.36). A detailed discussion was presented in Section 6.2.6.2 of Chapter Six for the changes in four levels of interior and exterior design, including the neighbourhood and town levels. In terms of the type of dwelling which prefer to inhabit in, 61.4% of respondents prefer to obtain the flexible design of modern combination pattern between vernacular and contemporary dwellings with garden due to provided convergence between contemporary dwellings design concept that is in line with contemporary lifestyle and modern technology to some extent while maintaining of socio-cultural values and preserve their cultural heritage and cultural identity that found in vernacular dwellings design, therefore, preserve the architecture identity of historical towns in Southwest Libya.

Finally, a high percentage of respondents expressed a desire to participate in the design of their dwellings in order to ensure that the design is prepared according to their wishes and that the design of the dwellings is compatible with their socio-cultural and psychological needs. This will allow people to be able to choose the distribution of spaces within the dwelling, sizes, finishes, colors, and furniture, with proportion to their socio-cultural identity, and also provide them with the comforts and well-being of their dwellings; to achieve one of the foundations of socio-cultural sustainability. Furthermore, in their comments and suggestions (see Section 6.2.6.5), the majority of respondents stressed their desirea to obtain a suitable

contemporary dwelling design that is compatible with all aspects of socio-cultural-sustainability features and contemporary lifestyle, and expresses their cultural identity (architectural identity) while keeping up with technological developments (see Table 6.52 in Chapter Six).

7.2.2 Views of interviewees

The majority of the professionals (65%) were dissatisfied with the contemporary desert-dwelling designs of the last few years (see Table 6.54). The rationale behind this views is that contemporary housing designs are not suitable for different generations of local residents, including the new generation, since the contemporary dwelling design ignores many social and cultural sustainability features, such as privacy and security, various social considerations, And also ignore the architectural identity of the vernacular architecture that characterizes these historic towns in Southwestern Libya. Contemporary dwellings designs are also ineffective to keeping pace with technological developments and the requirements of modern life for present generations.

Nevertheless, the majority of experts (67%) stated that the architectural design of contemporary dwellings is unsuitable to the society of Libyan desert. Furthermore, they believe that the design of these dwellings did not reflect the character, culture and traditions of the people, whether in terms of both of external design as well as the interior design and functionalities of these dwellings (see Tables 6.55 and 6.57 in Chapter Six). Whilst the participants in the interviews acknowledged some advantages of the contemporary dwellings. They emphasised that the problem is the rapid turning to contemporary and international trends, and the intercalation of the patterns of contemporary architecture without reflecting anything of the people's rich culture and heritage which impacted negatively on them in terms of feeling satisfied and comfortable in these contemporary dwellings. Thus, the sudden turn towards the international architectural trends and using modern building materials had a large change in the architectural landscape of Southwest Libya (see Section 6.3.1.2).

In terms of the important advantages of the vernacular dwellings that can be integrated with other advantages from contemporary dwellings to develop sustainable guidelines for new dwelling designs, most of professionals mentioned that the vernacular desert dwellings were more compatible with the surrounding environment, and the historical depth of the evolution of the vernacular desert dwellings makes them an important part of the history and identity of the region. In addition, the convergence of the shape, design, and architectural elements give

it a distinctive personal identity that reflects the local culture, plus the convergence between vernacular dwellings in the neighbouring units provides more safety and security for the locals, also provide good privacy by vernacular dwellings with a courtyard, they demonstrate simplicity in design, and are suitable for social considerations. The vernacular desert dwellings are more compatible with the cultural heritage of the locals (see Table 6.58)

In the same context, the professionals emphasised the important to the lessons learned from the advantages of sustainable vernacular architecture for the design of the desert dwellings, that can support integration with socio-cultural sustainable features to guidelines of new desert dwellings design. Such as the designing of the main entrances of desert dwellings that enhanced privacy between public and private space within the dwellings to conserving and respect the local customs, traditions and cultural heritage of population in Southwest Libya, and the distribution of dwellings in the vernacular urban fabric which followed certain technique to keep neighbours' privacy. For example; roofs that used sleeping place for the family in the summer time, the morphology of vernacular desert dwellings, particularly the dwellings which faced each other, developed to maintain the privacy of family space, the inner courtyard and roof by differing height of walls and locating the mass of the second floor that build around the courtyard. And the existence of central space in desert dwellings such as inner courtyard which encouraging social interaction between family members and also, it can be a gathering place for women at events among neighbours and relatives.

The morphology of vernacular desert dwellings and the compact urban fabric provide a private indoor environment that reinforces security and safety, especially for the children in each neighbourhood. There are other examples that support the provision of security and safety through the compact architectural compositions used in vernacular architecture, such as presence of gates and narrow entrances in residential neighbourhoods. The lessons learned also include the similarities of shapes, sizes, and colours of vernacular desert dwellings, as well as the suitability of those dwellings on a human scale, and their compatibility with the surrounding environment at the oases; this confers a sense of place and identity. Furthermore, they provide comfort and tranquillity for the locals (see Section 6.3.2.3)

In terms of the advantages and benefits of contemporary desert-dwelling designs, which can be integrated with the advantages and lessons learned from the vernacular architecture of dwellings, most of interviewees indicated that the contemporary dwellings are keeping up with the changing contemporary lifestyle and keeping up with contemporary technology to a certain extent. In addition, they stressed that construction structures and modern building

materials used for the contemporary dwellings are safe and more resistant to climatic conditions; moreover, they provide more flexibility to be adapted to socio-cultural changes (see Section 6.3.3.1).

On the other hand, the disadvantages of contemporary desert-dwelling designs due to these adverse impacts, in the development of sustainable desert dwellings in the future (see Table 6.52 in Section 6.3.3.2). However, the professionals did admit that some of these new desert-dwelling designs had certain inbuilt construction flexibilities which allowed for adaptability in order to adjusted to add new architectural elements gives us the opportunity to be suit with the socio-cultural needs.

Additionally, the professional interviewees pointed out that contemporary desert-dwelling designs could be extended by additional storeys or additional rooms and that they were also more robust and resilient to severe climatic conditions. Some of the professional who were interviewed pointed out a number of advantages of the contemporary desert-dwelling designs, for example modern fitted kitchens, bathrooms, modern heating and air-conditioning and communication which were now being viewed as essential features of contemporary lifestyle (see Section 6.3.3.3).

The investigation into socio-cultural sustainability in Southwest Libya has been divided into four main themes, as follows:

Firstly; the issue of the changes of perception of identity and lifestyle for youth generation as a shown in Section (6.3.4.1). Professionals emphasised that should understand the most important steps that can be taken to healing the new generations with respect to change of identity and keep up with requirements of the contemporary lifestyle, which identified as follows:

1. Interest in local cultural and architectural heritage and re-adapted and employed it in accordance with the contemporary requirements to make it the strength point to maintain their cultural identity as an important element of identity elements.
2. Facing the cultural changes and globalisation trends for youth through education and training as part of both the stages of basic education, and in the higher institutions and universities, and raising the scientific and cultural efficiency of the youth.
3. Gaining the attention and auspices of the new generation through the media, such as television programmes, documentaries, and means of communication (including the

Internet and social media), which will support the culture of the noble values of the locals and enhance its relationship with the youth.

4. Raising interest in language and vocabulary as one of the ways to protect society and its socio-culture.
5. Preparing educational and information programmes that help to strengthen the youth's association with their cultural identity in southwest Libya and to develop the spirit of a sense of belonging to the place with its different socio-cultural elements.
6. Encouraging studies and research in the framework of strengthening the cultural and architectural identity, especially in the specialist higher institutions and departments of architecture at various universities and institutions at the state level.
7. Ensuring the local authorities and municipalities in Southwest Libya give importance and attention to local products and the local architectural industry , and encouraging the young people to engage in workshops, and to support small and medium-sized enterprises economically.
8. Supporting the tourism activities that facilitate the maintenance of the architectural heritage that is associated with the unique vernacular architecture, and encouraging investment in this aspect.
9. Creating festivals and cultural activities that reinforce the local products, and promote the cultural and architectural heritage.
10. Urging various government institutions to allocate financial incentives for supporting architecture of dwellings that boost the adoption of local ideas.

Other interviewees further noted that the contemporary lifestyle and the use of modern technology has become of characteristic of this era and cannot be dispensed with. However, the real challenge is create a balance between the needs of the contemporary lifestyle of the new generation and the features of cultural heritage through using the previous points to address the issue of the disappearance of this heritage.

Secondly; discussions for socio-cultural sustainable features for vernacular and contemporary desert dwellings. The majority of the professionals explained that the vernacular desert dwellings are characterised by the socio-cultural features that reflect the values stemming from the cultural heritage, and ideological and religious beliefs of the local population. For example, privacy, safety, social considerations (family relationships and social contact), and preserving the cultural identity, including the customs, traditions, beliefs, and social values. In

other words, most ideas in the designs for vernacular desert dwellings were dedicated to meeting these needs, based on the possibilities available at that time, and using simple, traditional building techniques with the primary building materials coming from the same environment (see Section 6.3.4.2 in Chapter Six for further details).

This confirms the importance of values, and social, cultural, and religious considerations in the vernacular architecture, which many researchers stress regarding the vernacular desert dwellings in Southwest Libya. In addition, consistency is added to the architectural landscape of the historical towns through the sizes and shapes of some architectural elements in vernacular dwellings, such as windows, openings, doors, surface shapes, and some external decorations and colours (especially white and the colour of clay) in the facades of the dwellings, the inner courtyard with openings to the inside, the dwellings being contiguous and compact in a semi-closed residential neighbourhoods, provide corridors and roofed courtyards, and small ends of the toys away from the big streets and vehicle traffic. Furthermore, the vernacular architecture has created an internal environment of privacy and provides space for several social events. All of these play an important role in promoting many principles of socio-cultural sustainability.

In terms of the socio-cultural sustainability features for the contemporary desert dwellings, many of the professionals who were interviewed commented on the robustness concrete structures of contemporary desert dwellings as well as their adaptability in easily adding additional rooms or storeys if required. They considered this flexibility to be an advantage. The contemporary dwellings had been constructed so that modifications could be made including adding additional doors and entrances or blocking off others according to what serves the desires of the inhabitants. In addition, the advantage of security through the stronger walls and doors as well as secure fencing equipped with alarm signals for intruders, theft alarms and fire safety systems (see Section 6.3.4.3).

Despite the points made about the contemporary desert dwellings design failing to reflect the cultural ethos of the desert communities, positive aspects of those contemporary dwellings were seen as including sewage and water systems, heating and air conditioning facilities as well as modern conveniences. Additionally, many contemporary desert dwellings are located adjacent to shops, health centres, schools and colleges. However, the vernacular desert dwellings often lack modern infrastructure which was seen as disadvantageous and essentially unsustainable. The contemporary desert dwellings use high quality materials which are of a superior standard than those used in the more vernacular desert dwellings. Although not

reflecting local culture, they do provide attractive finishes which are sustainable and resistant to extremes of weather conditions.

Contemporary life is evolving quickly, which is reflected in the social, cultural, and economic elements of the human lifestyle, and this development may mean that the contemporary dwelling designs are suitable to some extent, as they have the capacity to be changed in response to rapid technological changes (see Section 6.3.4.3 in Chapter Six further details).

Thirdly; future of sustainable dwelling design and involve young people in the design for sustainable dwellings for future in Southwest Libya. In this context, most of professionals confirmed that there is a need for architects and the relevant authorities to commit themselves to the design and implementation of desert dwellings, taking into account the importance of socio-cultural-sustainability features, including reconciliation with the nature of the region, its cultural heritage, and the architectural identity of the historical towns in Southwest Libya. As Gamboa (2008) and Al-Jamea (2014) point out, architects have the responsibility to provide dwelling designs that are suited to the nature of the community, and, similarly, the population is responsible for maintaining the sustainability of these dwellings. This is in addition to guaranteeing they are compatible with achieving the desired level of well-being for different generations regarding the requirements of the contemporary lifestyle and the use of modern technology, and to ensure the successful design and implementation of those dwellings (see Section 6.3.4.4).

The professionals also recommended that future dwelling designs should take into account all planning aspects in terms of safety and security, and privacy in the design of the interior spaces of the dwellings. The spaces should be divided into semi-public, semi-private, and private area, in order to create a more secure environment in terms of privacy, especially for use by the family. They should also consider providing all the public facilities and services that ensure the welfare of the inhabitants.

The building materials of the desert dwellings must respond to their context and be inspired by the surrounding environment to be more harmonious with the local architectural scene to enhance the preservation of the character and identity of the region. The contemporary finishing materials and colours that are used in dwelling facades should also respond to the same context and give dwellings their own character. This is in order to blend the traditional ideas with a contemporary spirit in keeping with the nature of the contemporary lifestyle and to meet the contemporary needs that should not be neglected.

In the same context of the future design of dwellings, some other interviewees indicated that it is important to ensure there are appropriate spaces in the dwelling that are suitable for the size of the average family in southwest Libya (five to eight persons, according to the survey, see Section 6.2.1.4), and the design also should be appropriate to their customs, traditions, and daily lifestyle. The spaces in the dwellings ought to be adequate for the inhabitants' daily social life, and be compatible with the cultural identity of the people and place, and also meet the modern technology requirements. It is important for the location of the dwelling to be near the daily services needed by inhabitants, such as schools, markets, health clinics, and others, as well as providing a services infrastructure that is compatible with the environment and deals with the principles of the conservation of the environment (environmentally friendly). For example, creating green landscapes and water fountains, providing a large amount of shade through the use of some materials in the facades of dwellings that reduce the sun's rays, and using technology that makes use of the environment in dwelling designs (such as the use of solar panels, especially as it is easy to get energy in this way in desert areas); this will help to ensure the well-being of the inhabitants, which is an important aspect of social sustainability.

Finally, the involve young people in the design for sustainable dwellings for future in Southwest Libya. The professionals stressed the need to involve the new generation of young people in the design process, and to listen to their new views and future aspirations regarding the future dwellings; this is to create common ground between them and the designers in order for them to feel they are participating in the process and that these dwellings reflects some of their ideas. This naturally goes side by side with training the young people and educating them about the importance of their cultural identity. This is in order for the designer or architect to become familiar with the social, psychological, and economic characteristics of the inhabitants, and to give sufficient attention to any other factors that may arise (see Section 6.3.4.4).

The following section deals with a comparison of opinions of both the respondents and professionals:

7.2.3 Comparison and integration of the opinions of the respondents and the views of the interviewees (professionals)

This section presents a summary of the results that emerged from the quantitative and qualitative data analysis concerned with the vernacular and contemporary desert-dwelling designs in three historical towns in Southwest Libya. Four questions were raised in this research to confirm the achievement of its main aim (see Section 1.6.3 in Chapter One) and these questions have been answered in this research through the findings of data analysis (see Section 6.2.3 to Section 6.2.4 in Chapter Six). Therefore, the main purpose of the section is to determine how the research questions were addressed, extract the answers through a comparison of the views of the respondents and the views of the interviewees (professionals), link them with the literature review, and, by synthesising the views, and provide information about vernacular and contemporary desert-dwelling designs in terms of appropriateness for socio-cultural sustainability aspects.

To answer those research questions, and in order to synthesise and formulate a set of guidelines for sustainable desert dwellings design, a mixed-methods approach was used to collect and derive the results using qualitative and quantitative data as the primary data sources. An extensive set of literary reviews related to the subject of the study are used as a secondary data source, as well as some local and governmental documents and reports. Basic data was obtained from three age groups of the population through questionnaires. Semi-structured interviews were also held with some professionals. Finally, some other data was generated during the fieldwork, such as drawings and photographs. The following sections address the research questions in the order:

Regarding the first question, *'How can the socio-cultural architectural features of vernacular and contemporary desert dwellings be integrated to synthesise a set of guidelines for the sustainable design of desert dwellings in southwest Libya?',* the answer determined using the mixed-method approach, as follows. First, it was investigated, via the findings obtained from the questionnaires, what the general trends are in terms of the satisfaction of the population with the socio-cultural features of both types of dwelling (vernacular and contemporary) (see Section 6.2.4) . The population's satisfaction trends give an initial perception of the socio-cultural architectural features that the population prefer to be included in the design of their dwellings. These findings show that the population tends to be satisfied with the architectural design of the vernacular dwellings in relation to the social characteristics of heritage and religious values, such as privacy, social considerations, religious-belief considerations , and

some aspects related to architectural identity and cultural heritage. On the other hand, the findings also show the population is satisfied with contemporary architectural design, to a certain extent, with regard to other features related to aspects of the contemporary lifestyle, such as safety from strong building materials, the use of modern technologies, the design of housing in terms of flexibility and the size of dwellings, contemporary finishing materials that provide comfort and well-being, and socio-cultural-sustainability features related to keeping pace with contemporary social changes and keeping pace with technology.

The second step completed was a series of in-depth discussions with professionals and experts (see Sections 6.3.4.2 and 6.3.4.3) on the most important socio-cultural features of the design of both vernacular and contemporary desert dwellings, which highlighted many aspects and added further investigation of this issue. In general, most of the investigations confirmed the findings of the questionnaire, and added a set of points and explanations of several phenomena generated from the socio-cultural features common to the vernacular and contemporary dwelling designs, and the findings of both sources were merged. This method of determining how to the integrate features of two types of dwellings has been adopted in many literature reviews by many researchers (Amer, 2007, Foruzanmehr, 2009, Nunta, *et al.*, 2012, Al-Jamea, 2014).

To answer the second research question, '*what are the difference between the features of vernacular and contemporary desert dwellings in terms of suitability for the socio-cultural sustainability features?'* first, the features of the vernacular and contemporary dwellings were identified through literary reviews (Mahgoub, 1997, Asfour *et al.*, 1998, Ahmed, 2011, Al-Jamea, 2014, Shehab *et al.*, 2016) before being measured and analysed (see Section 3.3 in Chapter Three). This research adopted four basic features to consider (privacy, safety and security, shape and design, and social and religious considerations), each of which generates a set of sub-items that are used to measure the levels of satisfaction of the different generations of the population about both the vernacular and contemporary desert-dwelling designs. It added two other main features (architectural identity and cultural heritage, and contemporary lifestyle) with another set of sub-items. These last couple of features require a greater correlation for the younger age group to create a balance between the requirements of the modern lifestyle and the cultural identity of young people, and preserving the cultural heritage and architectural identity of the historical towns of Southwest Libya. An investigation the features of both vernacular and contemporary desert dwellings was then completed to highlight the absence of socio-cultural-sustainability considerations in the design of

contemporary desert dwellings in Southwest Libya in the three selected historical towns (Ghadames, Sabha, and Ghat).

In the second step, these different socio-cultural features were subject being measured using the questionnaire. The levels of satisfaction of the different generations of the population were measured for these features in both vernacular and contemporary desert-dwelling designs. The sustainable dwellings are devoted to the principles of protecting the residential environment and enhancing the quality of life of the population, which is often linked to residents' satisfaction with their dwelling designs (Makinde, 2015) .The next step was analysing the measured level of satisfaction through SPSS software by using the Wilcoxon signed-rank test; due to measuring two matched (related) samples using a Likert scale, a non-parametric method needed to be used for the comparison of Likert question responses (Gregory, 2010). The Wilcoxon signed-rank test is a non-parametric statistical hypothesis test used when comparing two related samples in order to examine whether the mean ranks differ (Paul, 2008). For this research question, the aim was to compare the attitude of respondents towards the vernacular and contemporary of desert-dwelling designs. That is, each participant was asked for his/her opinion and level of satisfaction with the two types of dwelling. The median was used to define the attitude, and the mean and standard deviation (SD) were used to rank the most frequent attitude to the least frequent attitude.

After the analysis, several differences are found between the features of vernacular and contemporary desert dwellings in terms of suitability for the socio-cultural-sustainability features (see Section 6.2.4), which constitutes an important difference in the matter of the integration of these features into the formulation of the proposed guidelines. Significant differences were identified by determining the level of satisfaction of different generations of the population about these features, which were subsequently confirmed by discussing them with professionals in semi-structured interviews.

The results show that there are significant differences between the features and the items of each features in terms of the hierarchy in both vernacular and contemporary dwelling designs, as shown in Section 6.2.4.1 (Table 6.19). For example, there is a difference between the design of vernacular and contemporary desert dwellings in terms of privacy. For 'acoustic privacy', the participants are satisfied in the case of vernacular desert dwellings (median=4), while they are dissatisfied in the case of contemporary desert dwellings (median=2). The difference is very highly significant (p-value<.001). Similarly, the participants are satisfied with 'visual privacy', 'privacy around the dwelling', and 'interior space organisation'

(median=4) in the case of vernacular desert dwellings, while they are dissatisfied with those items for contemporary desert dwellings (median=2). Statistically, the difference in the attitudes between vernacular and contemporary is very highly significant (p-value<.001). In contrast, for 'privacy of sleeping spaces', the participants are dissatisfied with vernacular dwellings (median=2), while they show satisfaction with contemporary dwellings (median=4). This difference in 'privacy of sleeping spaces' is very highly significant (p-value<.001). Overall, in terms of privacy, the participants are more satisfied with vernacular dwellings design. This also applies to other features, such as safety and security, the shape and design of dwellings, social and religious considerations, identity and cultural heritage, and, finally, contemporary lifestyle (see Sections 6.2.4.2, 6.2.4.3, 6.2.4.4, 6.2.4.5, and 6.2.4.6, and Tables 6.25, 6.30, 6.35, 6.40, and 6.44 in Chapter Six).

The main purpose of the answer to this question was to identify the differences described, which makes it possible to understand the comparison and facilitate the process of selecting the features that have a level of satisfaction from the different generations of the population; this is so that aspects of the designs of vernacular and contemporary desert dwellings can be integrated into the proposed guidelines for the design of socio-culturally sustainable desert dwellings.

For the third research question, *'How can the lessons learned from the architecture of vernacular and contemporary desert dwellings support the integration of socio-cultural-sustainability features for sustainable desert dwellings in Southwest Libya?'*, the answer to came first through the literature reviews. Several authors and researchers confirm the importance of the lessons learned from vernacular architecture with respect to the various environmental, cultural, and social aspects (Gabril, 2014). As Sundarraja *et al* (2009) point out, the vernacular architecture relies on the different practices of conventional knowledge and techniques, and reveal a high appreciation of good quality and the professionalism of the work . In addition, the different socio-cultural features show the strength of different aspects, such as privacy, social considerations, religious beliefs, cultural heritage and identity, etc., where there is natural integration and harmony in the combination of the architecture and the local environment . Therefore, it is an important example for contemporary dwelling designs, especially in the desert areas. Thus, a lot can be learned from vernacular architecture, through its history and how it has evolved over time, which will benefit the development of the current dwellings designs and the building of identity, as well as providing benefits from the development of several ideas of traditional construction techniques (Heal et al., 2006, Amer, 2007; Dodo, et al., 2014, Ahmed, 2014, Eltrapolsi, 2016) (see Section 3.5 in Chapter Three).

The second step of finding the answer to this question was the in-depth discussions with professionals to draw the most important lessons learned from the vernacular architecture of desert dwellings, as well as identifying the benefits from contemporary desert dwellings, which can support the integration of socio-cultural-sustainability features for sustainable desert dwellings (see Section 6.3.2.3 in Chapter Six). The results of the discussions show the assertion of the professionals on the design of the vernacular desert dwellings in terms of many features related to social and religious values, and cultural heritage, from which lessons can be learned for contemporary desert dwellings design. For example, the main entrances of vernacular desert dwellings do not directly reveal the inside of the dwelling to give enhanced privacy between public and private spaces within the dwellings, which conserves and respects the local customs, traditions, and cultural heritage of the population in Southwest Libya. The distribution of desert dwellings in most of the vernacular oases and towns in southwest Libya follows certain techniques to keep neighbours' privacy. There is also an inner courtyard that provides an area to encourage social interaction among family members and can also be a gathering place for women at events among neighbours and relatives. Also, the existence of an outdoor central space provides a sitting area that encourages social contact among the members of the community.

Furthermore, the morphology of vernacular dwellings and the compact urban fabric provide a private indoor environment to reinforce security and safety, especially for the children. In addition, the similarities in the shapes, sizes, and colours of vernacular desert dwellings, as well as the suitability of those dwellings on a human scale and their compatibility with the surrounding environment at the oases, confer a sense of place and identity, and comfort and tranquillity. There are also lessons to be learned from the techniques used for vernacular architecture that promote socio-cultural sustainability. For example, the building materials of vernacular dwellings are sourced from the same environment; thus, the materials used were sustainable, renewable, and compatible with the nature of the place and man. The interior design, decoration, colours, and distribution of spaces in vernacular dwellings came from cultural heritage and the values, customs, and traditions of locals, which led to boosting the cultural and architectural identity of vernacular dwellings in Southwest Libya.

The second part of the answer to this question is regarding the benefits from contemporary desert dwellings. The professionals confirmed that the contemporary desert-dwelling designs have several benefits (see Table 6.60 in Chapter Six), which can integrated with the lessons learned from the vernacular dwellings to support the synthesis and formulate set of guidelines for sustainable desert-dwelling designs in southwest Libya. For example, the design flexibility

of some contemporary dwellings, which means they are adjustable by adding new architectural elements, gives us the opportunity to modify their design to some extent to suit the socio-cultural environment of the locals. Also, the structure of contemporary dwellings is tougher and has more consistency, and, therefore, there is the possibility of vertical expansion, and the easy addition of supplements to the dwelling; this may help to add other spaces that could be used for many social activities.

Furthermore, the contemporary dwellings are more favourable to the contemporary lifestyle for several reasons, such as the providing a modern kitchen space with different fittings, bathrooms, spaces that need to be supplied with heating or cooling, and communications; all of these things and others are basic requirements that are no longer indispensable in the contemporary lifestyle. More services are provided in contemporary residential areas, such as roads, lighting, sewers, open parks, and so on, which give them a modern urban property (see Section 3.3 in Chapter Three and see Section 6.3.3.3 in Chapter Six).

Overall, all the arguments support the opinions in the literature reviews expressed by Al-Jamea (2014), Gabril (2014), and Amer (2007), which indicate that the contemporary dwellings are more suitable for the nature of the contemporary lifestyle than vernacular dwellings.

The fourth research question, *'What are the socio-cultural architecture features of both vernacular and contemporary desert dwellings that can contribute to developing the sustainable design of desert dwellings in Southwest Libya?',* is considered to be a pivotal and fundamental question to achieving the aim of this research, which is the formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. To answer this question, a mixed-methods approach was used to collect and derive the results using quantitative data (questionnaire), qualitative data (semi-structured interviews), and an extensive set of literature reviews related to the subject of this research question. The question was answered at length, through the dissection and arguments in Section 6.2.4, which examines the degree of respondents' satisfaction with both vernacular and contemporary desert dwellings from the perspective of socio-cultural sustainability; through the in-depth discussions with professionals about these features in Section 7.3.4; and through the discussion of findings and synthesis in Sections 6.4.1.2 and 6.4.1.3.

In summary, the results analysis show that there are significant socio-cultural architectural features of both vernacular and contemporary dwellings that can be combined to formulate the

proposed guidelines for new sustainable desert dwellings in Southwest Libya. The results indicate that most respondents are satisfied with the design of the vernacular dwellings in terms of privacy, except for privacy in sleeping spaces, for which they are satisfied with the design of contemporary dwellings, which provide an appropriate number of bedrooms (see Section 6.2.4.1, and Tables 6.20 and 6.60). These results are consistent with the studies of Amer (2007) and Al-Jamea (2014). Amer (2007) indicates that the locals in Libya prefer the contemporary dwellings than the vernacular dwellings in terms of the number of bedrooms (see Table 6.60, and Section 3.10.1 in Chapter Three). It can be recalled that privacy is an important socio-cultural feature for sustainable dwelling designs, as a confirmed by many professionals in the interviews (see Section 7.3.4). Therefore, when designing desert dwellings, attention should be paid to ensuring the internal and external privacy, through the arrangement of the different internal spaces (for example, the location of the main entrance, kitchen, and guest room); considering the design of openings (windows and doors), especially in front facades. In addition, attention must be paid to the distribution of housing, the organisation of streets and communication areas, and maintaining the degree of privacy in ways that correspond to the culture of the population in Southwest Libya.

Safety and security represents one of the most important aspects of providing comfort, well-being, and safety, which is considered to be an indispensable part of socio-cultural sustainability in dwelling designs. Lango *et al* (2011) explain that "The society's ability to maintain social functions, to protect the life and health of the citizens and to meet the citizens' basic requirements in a variety of stress situations". This includes providing protection from all unwanted events or circumstances, either in the internal or external environment. Therefore, most respondents are satisfied with the design of the vernacular dwellings in terms of safety around the dwelling and safety of the location, due to the design of the urban fabric and method of distribution of vernacular dwellings. Furthermore, the respondents were satisfied with the design of contemporary dwellings in terms of dwelling safety and security, and family safety due to the durability modern building materials, and the availability of security and safety techniques (see Section 6.2.4.2 in Chapter Six). The majority of the professionals confirmed this through the in-depth interviews (see Section 6.3.4.2 and 6.3.4.3 in Chapter Six). Therefore, arrangements must be made to ensure the safety and safety of the population, and safety and security must be taken into consideration when designing desert dwellings (see Section 6.4.1.2).

The findings show that most respondents are satisfied with the contemporary desert-dwelling designs in terms of size and shape, including the area and location of the dwellings; the

windows, doors, and openings; and the quality of finishes and external facades (see Section 6.2.4.3). They are also satisfied that most contemporary dwellings are located in contemporary sectors near to the different services needed by the inhabitants .The contemporary dwellings provide more space and have a more flexible design to some extent, also the quality and durability of the building materials in contemporary dwellings are better. With respect to the quality of finishing materials in the dwellings, the majority of respondents are more impressed with the modern materials, especially in the facades (see Section 6.4.1.2). This is largely consistent with the opinions of the professionals on this aspect (see Section 6.3.4.3). Several studies (Amer, 2007, Ahmed, 2011, Susilawati *et al*., 2011, Ghaffarian Hoseini *et al*., 2013, Al-Jamea, 2014) point to the importance of dwelling designs being suitable for the size of the family (the number of its members), that it is important that services are available near the dwelling, and that advantage should be taken of modern materials and techniques in construction to provide the most appropriate and comfortable dwelling that will enhance the welfare of the population. This is one of the most important purposes of socio-cultural sustainability.

Conversely, the findings also indicate that most respondents are satisfied with the vernacular desert-dwelling designs in terms of social considerations and religious-belief considerations, including religious beliefs, family relationships, relationships with neighbours, social relationships, and relationships with religious places. Vernacular desert dwellings are characterised by the socio-cultural features that reflect the values stemming from the cultural heritage, and ideological and religious beliefs of local population, such as privacy, safety, social considerations (family relationships and social contact), and preserving cultural identity, including the customs, traditions, beliefs, and social values. As shown in Sections 6.2.4.4 and Section 6.3.4, this is because there are many considerations in the design of vernacular dwellings (such as the distribution of spaces), which take into account respect for social relationships (such as the privacy of women, places for guests, and the existence of an internal courtyard, which provide more privacy for social activities), and also for the external design (especially for doors and windows), and the location of the dwelling within the vernacular urban fabric (most dwellings are contiguous with each other in the vernacular sectors). The strong social relationships, either through being relatives or through being neighbours for a long time, are encouraged by most of the outer spaces between the dwellings, and the social forums, squares of mosques, and other locations used for seasonal events, celebrations, and various social activities. They create a vernacular hierarchy of architectural spaces from the dwelling to the residential neighbourhood where privacy and social

considerations are respected. Chehastani *et al*. (2014) observe that "…hierarchy of space is built so that people can establish social relationships". The underlining hypothesis is that social interaction is affected by the formation of proper paths for the movement of residents and the placement of services. Joining social interactions and social activities makes the involvement of people a significant factor for unity (Chahestani *et al*., 2014). In addition, the philosophy of vernacular design with regard to beliefs and religious aspects has also gained more attention. Furthermore, many professionals have shown their admiration for the way in which vernacular dwellings treat social and religious considerations (see Section 6.3.4.2).

Regarding the feature of identity and cultural heritage, including self-expression and the link with the collective memory of the place , the findings also indicate that most of the youth expressed a low level satisfaction with the vernacular desert-dwelling designs , but an even lower level of satisfaction with this element for contemporary desert-dwelling designs (see Section 6.4.1.2 and Table 7.2). In terms of cultural identity and compatibility with customs and traditions, it can be noted that the satisfaction level for vernacular dwellings is slightly higher than the satisfaction level for self-expression and connection with the collective memory of the place. This may be due to the fact that young people were not directly associated with the vernacular buildings or dwellings. However, they expressed their respect for them, and that they consider them to reflect their self-expression and their link to the collective memory . With respect to the contemporary lifestyle in terms of the compatibility of elements of finishes with the nature of their lifestyle, keeping up with contemporary socio-cultural developments, and keeping up with modern technology used during daily activities, the majority of youth rated contemporary dwellings as satisfactory (see Section 6.4.1.2 and Table 7.2). This is due to the fact that the design of contemporary dwellings is in line with modern requirements more than vernacular dwelling designs.

However, the contemporary designs still need to be further developed in this respect. It is worth mentioning that many professionals confirmed that the changes to identity and lifestyle for the young people in southwest Libya present them with a different challenge. The professionals noted several measures and steps that could be taken to address the issue, in which the efforts of the state, local authorities, civil society, cultural clubs, and even people should be intensified (see Section 6.3.4.1). In the same context, there are some authors who address this issue of identity change for the younger generation based on different opinions. The literature reviews relating to desert Arab society (in the Gulf region, Algeria and Egypt) that are similar to the desert society in southwest Libya to an extent are the closest to the subject of this research (Al-Otaibi et al., 2008, Maho, 2013, Al-Eid, 2014, Ashraf, 2017).

There is a great consensus among the views of the professionals and the literary reviews, especially with regard to the measures and steps to be taken to address the questions of identity and youth (Al-Otaibi *et al*., 2008, Al-Eid, 2014).

Through the aforementioned, it is possible to identify the socio-cultural sustainability features derived from the integration of the features of vernacular and contemporary desert dwellings into the sustainable design of new desert dwellings.

The next section summarises the findings that have emerged from data analysis related to the socio-cultural-sustainability features for vernacular and contemporary desert-dwelling designs in three historical towns within Southwest Libya:

7.2.4 Final findings of dissection

Based on the discussion and findings of the analysis in Sections 7.2.1 and 7.2.2, and the comparison in Section 7.2.3, the final findings can be summarised in the following points:

1. Most respondents prefer the design of vernacular desert dwellings in terms of maintaining visual privacy, acoustic privacy, privacy around the dwelling, and interior organisation. Most of them also emphasised the importance of privacy in designing their future dwellings.

2. Most respondents are satisfied with contemporary dwelling designs in terms of the number of rooms and privacy in the sleeping spaces.

3. The respondents are satisfied to some extent with the design of contemporary dwellings in terms of the safety and security of the dwelling, and family safety. They consider it to be one of the most important features that should have priority in the design of sustainable dwellings and emphasised the importance of employing modern technologies to enhance this feature.

4. Most respondents expressed their satisfaction with the method of designing of vernacular desert dwellings in terms of safety around the dwelling and safety of location of dwellings.

5. The findings indicate that the morphology of vernacular desert dwellings and the compact urban fabric provide a private indoor environment that reinforces privacy, security, and safety, especially for the children, at the neighbourhood level.

6. Most respondents are satisfied with the contemporary desert-dwelling designs in terms of the area of dwellings and the location of dwellings, which has more flexibility design to some extent and emphasised the need to equip the of dwelling sectors with the different primary services requested.

7. There is agreement from all participants on the level of satisfaction with contemporary dwellings in terms of the size and shape, and the quality of materials of windows and doors, and the quality of finishes of external facades. This indicates the importance of employing modern finishing materials for the convenience and well-being of the population.

8. Most participants agreed that they prefer the design of vernacular desert dwellings with respect to dealing with the social considerations and religious beliefs.

9. The distribution of vernacular dwellings takes into account respect for social relationships, such as the privacy of women. Most of the outer spaces between the dwellings encourage social contact and various social activities.

10. The youth have a fairly low level of satisfaction with vernacular desert-dwelling designs in terms of the designs expressing their identity, self-expression, and the link with the memory of the place.

11. The youth have a high level of dissatisfaction rate with contemporary desert-dwelling designs in terms of the designs reflecting their cultural identity.

12. The findings indicate that it is necessary to understand the most important steps that can be taken to awareness the new generation with respect to the change of identity, and to ensure the keeping up with the requirements of the contemporary lifestyle to create a balance between the cultural heritage features, and the needs of the new generation and their contemporary lifestyle (see the previous points in Section 7.2.2 page 273).

13. The majority of young people rated contemporary dwellings as a satisfactory in terms of the compatibility of the elements of finishes with the nature of their contemporary

lifestyle, which is due to the design of contemporary dwellings being in line with contemporary lifestyle requirements.

14. The young people are satisfied with contemporary dwellings in terms of keeping up with contemporary socio-cultural developments and keeping up with modern technology used during daily activities, to some extent.

15. Many young people have the aspiration to inhabit a contemporary dwelling that meets their social and cultural needs, and is dynamic and flexible enough to cope with rapid contemporary lifestyle changes.

16. Most interviewees indicated that the contemporary dwellings are keeping up with the changing contemporary lifestyle and keeping up with contemporary technology, to a certain extent.

17. The structures and modern building materials for the contemporary dwellings are safe and more resistant to climatic conditions; moreover, they provide more flexibility to adapt them to socio-cultural changes.

18. The flexible design of some contemporary private dwellings means they are able to be adjusted by adding new architectural elements, which gives the opportunity to modify their design, to some extent, to suit the socio-cultural environment of the locals.

19. The findings indicate that the contemporary dwellings are more favourable to the contemporary lifestyle.

20. There a good percentage of youth expressed that contemporary desert-dwelling designs do not reflect the architectural identity of the historical towns in any way.

21. The aesthetic values in current dwellings are reflected in lifestyle of youth and their personality even though these values and shapes are simple.

22. The provision of service infrastructure that is compatible with the environment and deals with the principles of the conservation of the environment (environmentally friendly) is necessary ; for example, green landscapes and water fountains.

23. The features of vernacular architecture that are most related to the architectural identity are the architectural landscape, the simplicity of dwelling designs, and the homogeneity of the elevations of the dwellings.

24. There is dissatisfaction with the contemporary desert-dwelling designs because the designs are not suitable; ignore many socio-cultural-sustainability features, such as privacy and security requirements; and ignore the architectural identity of sustainable vernacular architecture that characterises these historical towns in Southwest Libya.

25. The designs of contemporary dwellings is unsuitable for Libyan desert society, and do not express the identity and cultural heritage of the locals due to their negative impact on inhabitants' lifestyle, and because the current dwellings do not reflect the identity and spirit of the sustainable vernacular architecture that characterises the history and culture of Southwest Libya.

26. Most professionals mentioned that the vernacular desert dwellings are more compatible with and favourable to the surrounding environment, and the historical depth of the evolution of the vernacular desert dwellings make it an important part of the history and identity of the region.

27. The professionals emphasised the importance of the lessons learned from the advantages of sustainable vernacular architecture for the design of desert dwellings, which can support the integration of the socio-cultural-sustainability features into the guidelines for new desert-dwelling designs.

28. The professionals emphasised the importance of the historic towns in Southwest Libya, due to they represent an important part of the history, cultural heritage, identity of the region.

29. A good proportion of respondents expressed that the new dwelling designs should be compatible with their socio-cultural needs and their lifestyle.

30. Many respondents stated that if the dwelling designs are compatible with their socio-cultural needs, it will increase their feeling of well-being and enhance their quality of life.

31. A high proportion of respondents explained that if the interior decoration in their dwelling designs expresses their culture and identity, this will provide them with comfortable functional spaces.

32. A good proportion of respondents expressed that if the facades of their dwellings are compatible with the identity of the place, this will enhance their sense of belonging to the place and thus support the preservation of the local identity.
33. A high proportion of respondents observed that if the design of the interior spaces of their dwellings are in line with their contemporary lifestyle, then it will enhance their sense of comfort and well-being within their dwellings.
34. A high proportion of respondents maintained that if their dwelling is harmonious with the environment this will increase their interest in the environment of place and promote the principles of sustainability.
35. Many respondents from different generations expressed that their dwelling designs should be compatible with their socio-cultural needs and their lifestyle.
36. A good proportion of respondents from different generations explained that the design of their current dwelling affects their lifestyle and they wish to make some changes to their current dwelling regarding socio-cultural sustainability.
37. The respondents would like to have a flexible design that is a modern combination of the features of vernacular and contemporary dwellings, with a garden.
38. A high percentage of respondents expressed a desire to participate in the design process for their dwellings in order to ensure the design is prepared according to their wishes, and is compatible with their socio-cultural and psychological needs.
39. The new generation of young people should be involved in the design process, and to their new views and future aspirations should be listened to regarding the future dwellings, to create common ground between them and the designers.
40. Many respondents stated that they have a desire to obtain a dwelling with a suitable contemporary design that is compatible with all aspects of the socio-cultural-sustainability features and contemporary lifestyle, and expresses their cultural identity, while keeping up with modern technological developments.

The discussion and arguments from the previous analysis in Sections 7.2.1, 7.2.2, and 7.2.3; the final findings in Section 7.4.4; the various views identified from both the respondents of different generations and professionals in field of architectural design; and the literature reviews have been compiled, reformulated, and synthesised into points and recommendations in the form of proposed guidelines, as follows:

7.3 Proposed guidelines for desert-dwelling designs that have emerged from the findings of this research

7.3.1 Introduction

To begin, the term 'guideline' needs to be defined. According to the Public Education Department (2006) ,a guideline is defined as a uniform standard through which something can be judged or tested. The work of Sadler (1987) defines a guideline as a *"distinguishing property or characteristic of anything, by which its quality can be judged or estimated, or by which a decision or classification may be made"*. Some relevant previous studies present different experiences on formulating criteria, recommendations, and guidelines for achieving specific goals on housing-related issues (such as urban planning, housing policy, and house design), by dealing with different aspects (Ashawesh, 2000, Amer, 2007, Galal, K., 2011, Al-Jamea, 2014).

These endeavours provide various global experiences from both developing and developed countries; for example, the USA (Macdonald, 2000), Australia (The Royal Australian Institute of Architects) (RAIA, 2005), and the UK (Bexley Council, 2006) .The predominant guidelines in literature reviews basically relates to developing the foundations for new dwelling policies, dwelling designs, and the (internal and external) arrangement of urban design. In a general sense, the aforementioned publications bring useful functional insights that aid the securing and creating of the introductory rules of guidelines for appropriate dwelling designs.

The main aim of this thesis is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. The proposed guidelines are formulated to improve the quality of the contemporary designs in terms of the development of socio-cultural sustainability, through improving the internal and external design of dwellings, neighbourhood-unit dwelling designs, sophistication of sustainability trends to make them compatible with their cultural identity and the contemporary lifestyle. The guidelines formulated will be based on to the findings from the analysis of the questionnaire responses and the views of the professionals. In order to make these proposed guidelines clear and easily understood the items in these guidelines will be organised and arranged to identify the priorities of the authorities that are responsible for applying these principles and to make them easy to implement; therefore, the guidelines have been divided into the following categories, as shown in Figure 7.3:

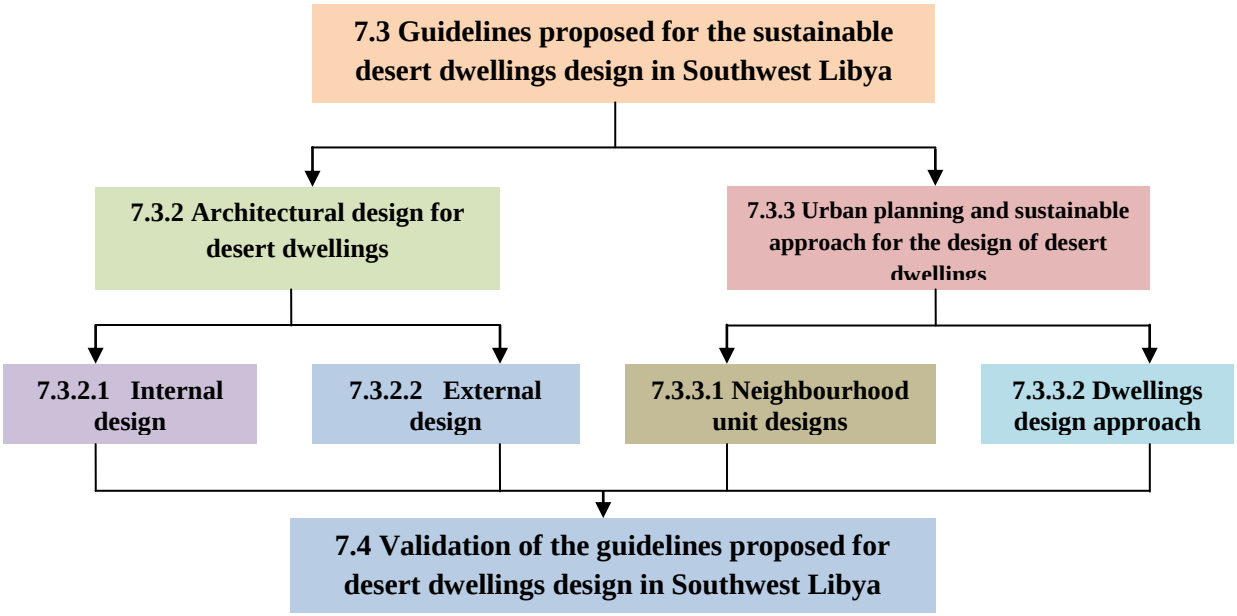


Figure 7.3: Categorisation of the proposed guidelines for sustainable desert-dwelling designs

As shown in Figure 7.3, the proposed guidelines for the sustainable desert-dwelling designs in southwest Libya are divided into two main levels, as follows:

7.3.2 First level: Architectural design for desert dwellings

Socio-cultural-sustainability features in architecture are considered to be one of the most important factors that mightily influence dwelling designs. Therefore, architects and designers must pay attention to the following criteria for both the internal and external design of desert dwellings, to ensure the success of the design process, and to meet the socio-cultural needs and the contemporary-lifestyle needs of different generations by taking into account the lessons learned from the design of vernacular sustainable architecture and the positive aspects of the contemporary architecture in a positive integration. The first level of these guidelines is separated into two sections: the internal design of desert dwellings and the external design of desert dwellings.

7.3.2.1 Internal design of desert dwelling

In order to achieve the creation of the interior design of socio-culturally sustainable desert dwellings, architects and designers should consider the following points:

1. The interior design of the desert dwellings should preserve visual privacy by positioning the main entrances of the dwellings in such a way that they are not be directly opposite the entrances of neighbours' dwellings, especially for apartments.

2. The interior design of desert dwellings should maintain acoustic privacy and interior organisation by using modern insulation materials and through the distribution of bedrooms, the living room, the bathroom, the kitchen, and the guest room in relation to each other.

3. The design of the dwellings should preserve the socio-cultural concept of privacy of social life, and support the comfort and well-being of the family via providing enough rooms in the dwelling as appropriate to society in southwest Libya. The possibility of the family size increasing should also be considered. Consequently, the dwelling design should be flexible and allow the possibility of vertical and horizontal expansion.

4. The design and planning of the dwellings should take into consideration the local socio-cultural features, such as customs, traditions, and religious beliefs. The design of desert dwellings should allow for the desire for total privacy by organising the spaces of each dwelling into three parts: a general area for guests, a mixture between public and private areas for family living, and private areas for sleeping. This will ensure the designs respect the concept of privacy.

5. The interior design of desert dwellings should maintain the safety and security of the population by using modern technologies to enhance this feature, such as the use of finishing materials that are safe for children and the elderly, the installation of a fire protection system, using fire-resistant materials, and paying attention to the height of the windows and internal stairs.

6. The interior design of the dwelling must meet the social and cultural needs of the population and be dynamic and flexible to cope with rapid contemporary lifestyle changes.

7. The interior design of the dwellings and elements for finishes should be compatible with the nature of the lifestyle, keep up with contemporary socio-cultural developments, keep up with modern technology used during daily activities, and be adequate for the inhabitants' daily social life.

8. The interior design of the dwellings and elements for finishes should be compatible with the cultural identity of the locals and the place. This will help to provide comfort and welfare within the character and architectural identity of the towns in Southwest Libya.

9. The interior design of the dwellings should provide a healthy and comfortable environment for the residents by providing natural ventilation and natural daylight, and preventing pollution and noise inside the lodging. This may be achieved through innovative technological solutions (such as controlling windows, openings, and entrances, and choosing to locate dwellings in an environmentally sustainable location), and there is the potential for reducing energy consumption, conserving resources, and following the principles of sustainability.
10. The interior design of the dwellings should allow the residents to benefit from the idea of an inner courtyard, as an interior environment in the middle of the dwelling or in one of the corners of the dwelling that will provide more space for social activities and a play area for children. It should use modern techniques for treating patio roofing to protect against rainwater and dust storms. Furthermore, people should be encouraged to use local materials in the interior design of the dwelling, such as wood, palm products, handicrafts, which are associated with the cultural heritage of the region.
11. The interior design of the dwellings should showcase the aesthetic values, and cultural and artistic aspects that reflect the identity, cultural heritage, and personality of the people of southwest Libya, such as using certain colours and interior decorations (for example, the idea of Al-Kawaat, and using Al-Thaloth on the interior facades of windows and textiles and handmade on walls, and including some handmade). This reinforces the preservation of the history, heritage, and identity of the region, and also provides comfortable functional spaces for the inhabitants.

7.3.2.2 External design of desert dwelling

In order to achieve the creation of the external design of socio-culturally sustainable desert dwellings, architects and designers should consider of the following points:

1. The external dwelling design should avoid including the scattered balconies that are usually unused. These can be combined into one or two spaces that operate as an open area, and are protected by a fence to enhance the external privacy.
2. The external dwelling facades should be simple in design and reflect the local artistic, cultural, and architectural aspects of the historical towns of southwest Libya through copying some of the vernacular architectural elements to promote these elements and their meanings into the collective memory of the population.

3. What is mentioned in the second point can be achieved through extracting the historical architectural elements (such as the triad and convex arches) or their meanings, remodelling them in a modern spirit, and emphasising the outlines of these elements to link the architectural design of contemporary desert dwellings with the architectural identity of historical towns in Southwest Libya.

4. In keeping with the contemporary lifestyle, it is possible to filter some of the elements, components, and modern architectural techniques into the design that are appropriate to the cultural and architectural environment of the region. This is with a view to using them in the contemporary desert dwellings, but modifying them to be closer to the concepts known from the local architecture in historical towns.

5. The external design of the dwellings should provide ease of access to the dwellings, maintain privacy around the dwelling, and prevent neighbours from being able to see into the dwelling from the street or neighbouring dwellings, so that the activities occurring in the internal spaces cannot be witnessed from the outside. This should be achieved by using curtains as part of the facades, raising walls around the dwelling, and growing shrubs and climbing plants to block visibility.

6. The external design of the dwellings should reflect the architectural identity of the historical towns in Southwest Libya by simulating some of the features of the sustainable vernacular architecture that are related to the architectural identity, such as the simplicity of the facades of the dwellings and homogeneity of the elevations of the dwellings; this will enhance the sense of belonging to the place and thus support the preservation of the local identity.

7. The height of the windows and the external openings should be enough to ensure privacy and safety, their sizes should be suitable, and durable and sustainable finishes that are safe should be used to ensure the safety and security of the population.

8. Use some vernacular architectural elements that have cultural significance and reflect the spirit of the vernacular architectural identity in the external facades of contemporary dwellings; for example, as has been done in some contemporary dwellings in Ghadames, which indicates it is a worthwhile experience to develop the designs through the studies of specialists, and not just be imitative, which may harm the architectural landscape of those dwellings.

9. It is preferable to use white and clay-based colours in the external design of dwellings that reflect the local architectural identity; use different local technical aspects such as shape, size, and texture in the contemporary methods; and avoid excessive finishes.

7.3.3 Second level: Urban design, planning, and sustinable approach in the design of desert dwellings

According to Carmona (2010), Urban design is the process of designing and forming large residential communities in cities and villages. Urban design deals with the wide collections of buildings, streets, roads, public places, and neighborhoods. It deals with entire cities with a view to making the urban areas functional, attractive and sustainable. Sustainable urban planning is the application of sustainability theories and flexibility to the design, management, and operation of urban communities. Sustainable planning is associated with so-called 'environmental cities', also known as environmental architecture, which is specifically aimed at making cities based on environmentally friendly principles and that are flexible in design, so that environmental resources are saved from depletion through the appropriate distribution and appropriate use (Wheeler, 2013, Abd-Elnaby, 2013). This is to reduce urban problems in the city, provide the city's infrastructure, and meet its socio-cultural sustainable needs, which includes community services, facilities, transportation, housing, and other services, to make the city consistent, suitable for the community, and environmentally friendly (Weingaertner, *et al.*, 2014). The second level of the proposed guideline is separated into two sections: neighbourhood-unit design and the sustainability policy for desert-dwelling designs:

7.3.3.1 Neighbourhood-unit design

In order to achieve the creation of a neighbourhood-unit design for socio-culturally-sustainable desert dwellings, architects, urban planners, and designers should consider the following points:

1. It is important for the location of the dwelling to be near the daily services needed by inhabitants, such as schools, markets, health clinics, and others.
2. The neighbourhood-unit design should consider ways to provide privacy and safety on the streets and between dwellings through measures such as adopting cul-de-sac roads in the neighbourhoods to create private localised environments for the population to reduce the access of strangers to them.
3. The neighbourhood-unit design should consider designing and creating a variety of courtyards (or Al-Masataba, such as those in the vernacular towns in Ghadames and

Ghat) in the vicinity of each neighbourhood, each of which would serve as a private space for meetings of the elderly and different age groups, allowing them to practice social activities and that would encourage connectedness between neighbours to promote social relationships.

4. The neighbourhood-unit design should consider designing streets and open spaces within the residential neighbourhood in a more secure way to reinforce privacy, security, and safety at the level of the neighbourhood, especially for the children. The ideas of the morphology of vernacular desert dwellings and the compact urban fabric can be learned from regarding this aspect, and also with respect to paying attention to safety around the dwellings and the safety of the location of the dwellings.

5. It should be ensured that the population has adequate safety and security by designing the neighbourhood units in a way that discourages anti-social behaviour. For example, ensuring that sub-access roads for dwellings are restricted to residents and the public areas of dwellings are open to observation. In addition, lighting should be provided for pedestrian roads, corridors, and parking lots to improve security and safety for the residents, especially at night.

6. It should be ensured that the design of the residential neighbourhood serves the entire population, allowing for their different circumstances and age groups wherever possible; uses barriers to reduce the access of the entire population; and follows modern techniques to identify tracks , and assist the elderly and the disabled.

7. The design of the residential neighbourhood should provide calm and comfort within the neighbourhood. It should make sure that the residential neighbourhoods are far from the main roads and heavy traffic, in addition to including gardens, green areas, water fountains, and shaded areas to alleviate the effects of the hot weather in the desert areas. This also promotes social communication, and the welfare and comfort of the population, and facilitates families taking part in various social and recreational activities.

8. The design of the neighbourhood units of dwellings should reflect the architectural identity of historical towns in Southwest Libya through creating an affinity with the urban vernacular towns in a contemporary way by adopting an appropriate human scale for the internal and external elevations of the buildings and dwellings within the residential neighbourhoods. The elevations of dwellings should be adapted with

simple and symmetrical designs in similar colours and shapes to create harmony with the architectural landscape of the historical towns.

7.3.3.2 Sustainable approach for desert-dwelling designs

At present, it seems clear that traditional trends in the field of desert dwellings have failed to reach the design of socio-culturally sustainable desert dwellings due to a lack of sound plans, and an absence of sustainability trends and rational planning in the design and implementation of the contemporary dwellings. In addition, housing stakeholders have overlooked the socio-cultural-sustainability features of desert-dwelling designs, which has exacerbated the problems with existing dwellings and the lack of access to sustainable desert dwellings. Based on the fact that sustainability can only be achieved through cooperation, interaction, and sharing responsibility among the population and designers, architects, civil society, and decision-makers from local authorities and state authorities (the Ministry of Housing, the Ministry of Planning and Human Development, the presidency of the government, and others). Therefore, innovative sustainability trends must be adopted on a sound scientific basis. In order to achieve the creation of a sustainability trend for socio-culturally sustainable desert dwellings, architects, urban planners, designers, and the decision-makers in local authorities and the state should consider the following:

1. Providing infrastructure services that are compatible with the environment and address the principles of the conservation of a sustainable environment (environmentally friendly); for example, offering green landscapes, water fountains, seating areas.
2. Encouraging designers and architects to think about integrating features of both vernacular and contemporary desert dwellings into sustainable dwelling designs and providing recommendations for paying attention to historical buildings and vernacular dwellings, which express an important part of the history of Southwest Libya.
3. Enhancing the collective memory of the population by taking care of buildings of historical importance and maintaining them, through encouraging young people who live in historical towns to forma link with vernacular dwellings and important historical buildings, such as castles and ancient mosques. For example, encouraging students and young people to participate in the festival of the vernacular town and in its activities, and support more education about the importance of their link to their local identity.
4. Choosing planners and architects who are experienced, aware of the importance of the local culture, and have a good knowledge of the socio-cultural architectural features of

historical towns in southwest Libya, and the local customs and traditions. Most contemporary desert-dwelling designs show a lack of familiarity with the socio-cultural features of the area and their historical significance. Consideration should also be given to providing good training to the new generation of young architects about the importance of their region, which should be incorporated into the curricula of their universities and institutions.

5. Giving people the opportunity to give their opinions, and participate in the design and implementation process. This could be achieved through the use of questionnaires, conducting periodic meetings with designers and decision-makers, and taking the population's views, comments, and observations seriously in the design process for dwellings and neighbourhood units. In addition, continuous cooperation between the population and the municipality or local authorities is needed, as locals are more knowledgeable about their own needs than the planning body.

6. Giving the population the opportunity to discuss the draft design after obtaining professional comments, and circulating the comments, observations, and objections before the approval of the draft design. Where it is necessary, the different social conditions should be considered before embarking on the implementation and distribution of housing in the case of housing projects initiated by the state . In this case, people should be given the opportunity to choose their neighbours, and choose appropriate housing commensurate with the size of their family and social conditions; this would support social relations, ensure homogeneity of the community of neighbours, and avoid future social problems.

7. Reviewing the current legislation and building rules derived from foreign standards to develop standards that better accommodate southwest Libyan socio-cultural features. In this regard, there is a need to draft new laws dealing with the preservation of the cultural identity, and the establishment of scientific and educational centres for sustainable desert architectural studies.

8. High-rise apartments are not appropriate for the population in the historical towns in southwest Libya. The height of dwellings should, therefore, preferably be limited (to three or four storeys), and the dwellings should be of different types and sizes to suit the locals' needs. The practical study has proven that low-rise dwellings are more socially acceptable (AbdelKarim, 2011) and are more practical for the various private activities of population. Therefore, the research recommends the horizontal extension

of the complexes specified as multi-family residential dwellings, and reducing the number of floors to not exceed four in public desert-dwelling sectors and two in the private dwellings. This is in order for these to be proportionate to the architectural landscape of those towns.

9. Educating young people about the promotion of cultural identity, and addressing the issue of the changes of perception of identity and lifestyle for the younger generation. The research has emphasised that several steps and measures should be taken, which require cooperation among all concerned parties in order to help awareness the new generation with respect to the changing identity and keeping up with the requirements of the contemporary lifestyle, which have been identified as follows:

    - Promoting interest in the local cultural and architectural heritage, and re-adapting and employing it in accordance with contemporary requirements to make it a point of strength for maintaining their cultural identity as an important element of identity.
    - Involving the new generation of young people in the design process, and listening to their new views and future aspirations regarding the future dwellings to create common ground between them and the designers.
    - Helping the new generation to face the cultural changes and globalisation trends through education and training, during the stages of basic education, and in the higher institutions and universities, and raising the scientific and cultural efficiency of the youth.
    - Preparing educational and information programmes that helps to strengthen the association of the new generation in Southwest Libya with their cultural identity, developing the spirit of a sense of belonging to the place with its different elements, and gaining the attention and auspices of the new generation through the media, such as television programmes, documentaries, and other means of communication (including the Internet and social media), which will support locals' culture of noble values and enhance the youth's relationship with their cultural identity because of the impact on cultural and architectural identity.
    - Generating an interest in language and vocabulary as one of the ways to protect society and its socio-culture.
    - Encouraging studies and research into the framework for strengthening cultural and architectural identity, especially in the specialist higher institutions, and

departments of architecture at various universities and institutions at the state level.

- Ensuring the local authorities and municipalities in Southwest Libya understand the importance of paying attention to local products and the local architectural industry, encouraging the young people to engage in workshops, and support small and medium-sized enterprises economically.
- Supporting tourism activities, festivals that reinforce the local products and promote the cultural and architectural heritage, and encourage investment in this aspect.
- Urging various government institutions to allocate financial incentives to supporting housing architecture that boosts the adoption of local ideas. This should be in a manner consistent with the contemporary lifestyle and should support the employment of modern technology in this aspect.

10. Supporting the policy of encouraging scientific research in the field of sustainable desert architecture, protecting the environment, identifying new and renewable resources, developing technology and specifications for building materials, and taking advantage of traditional techniques and materials available in the desert.

11. Introducing and activating the roles of architectural departments in the universities and higher institutions in Southwest Libya (for example, the University of Sabha, Faculty of Engineering and Technology in Hoon, and Higher Institutions of Engineering in Ghadames, Ghat, Murzuq, and Ubari), and expanding the research into sustainable architecture for desert dwellings and construction technology. Furthermore, developing the architectural studies on use of modern techniques aimed at protecting the cultural heritage and reinforcing the architectural identity.

12. Maintaining the status of the historical towns of Ghadames and Ghat, which are on the World Heritage List, and supporting the inclusion of the rest of the historical towns in southwest Libya, such as Sabha, Murzuq, and Hoon.

13. Increasing cooperation between civil institutions, increasing the exchange of information, and increasing education on sustainable design techniques to ensure a common understanding among designers, architects, decision-makers, and locals on the importance of sustainable desert architecture that supports stability and development.

7.4 Validation of the proposed guidelines for desert dwellings design in Southwest Libya

According to Bryman (2004) validation of research findings is the process performed by the researcher that involves providing the findings to the people with whom the research was conducted and experts in the field of research, and asking for their feedback on these findings. In this research, the proposed guidelines for socio-culturally sustainable dwelling designs in Southwest Libya was validated by housing experts in Libya. In order to guarantee the credibility and validity of the guidelines, the researcher gave the proposed guidelines to 16 experts in the field of Libyan and desert housing. This was to validate the specifications of the proposed guidelines, and to determine their suitability and applicability for the desert society in Southwest Libya. This was accomplished using a five-point Likert scale consisting of the following custom options:

(1=Strongly disagree, 2=Disagree, 3=Not sure, 4=Agree, and 5=Strongly agree).

The Likert scale verification of the questionnaire was sent to a carefully selected group of experts in the field of Libyan and desert housing. The selection of experts was based on the qualities and experiences they have (Tongco, 2007). Therefore, the selection of the verification experts was based on their years of experience in the architectural design of Libyan housing, their experience working on several housing projects in Libya, and their academic background. Based on this, the questionnaire with the five-point Likert scale validation was sent with the proposed guidelines to the selected housing experts by email. They were asked to evaluate the proposed guidelines in terms of their ease of understanding, their simplicity, the clarity of their content, their relevance to society in Southwest Libya, their usefulness for future housing projects, and their comprehensiveness in terms of all aspects of social and cultural sustainability for desert society. Furthermore, they researcher asked them to present any comments, notes, advice, additions, or deletions that would improve the guidelines and facilitate their application to the design of sustainable desert housing in Southwest Libya (see Appendix 6 for the verification form). The questionnaire technique was adopted to more quickly obtain data and results from the experts who were selected.

7.4.1 Process of the validation

The questionnaire to was used to examine the housing experts' opinions on the proposed guidelines (see Table 7.4) in terms of understanding, simplicity, clarity, usefulness in future housing projects, and comprehensiveness of all aspects of social and cultural sustainability for dwelling designs. In order to achieve the main aim of this research, which seeks to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya, this questionnaire was designed to validate and be compatible with the above questions , to be in line with the philosophical position of the research (see Section 4.3.4 in Chapter Four),and in the context of research questions 'close and open-ended' (see Section 4.7.1.1 in Chapter Four). The questions in the questionnaire seek to assess the degree to which the experts agree with the proposed guidelines using the five points of the previously identified Likert scale. The experts were given the opportunity to provide additional comments and information that could be useful for improving the guidelines, which were not able to be given previously in the answers to the questionnaire (see Appendix 6 for the verification form). A total of 20 questionnaires were distributed by email, and 16 fully filled-in questionnaires were collected, representing 85% of the total, which were used to analyse the validation.The16 housing experts were divided into four groups. Each group has four experts in the same field. The first group consists of four academic experts from universities and higher institutions specialising in architecture and urban planning . The second group consists of four real-estate developers and contractors, the third group are architects and professionals, and the fourth group are specialists from local authorities, and decision-makers from the architecture and urban planning departments in municipalities in Southwest Libya.

7.4.2 Analysis of validation and findings

The validation questionnaire data has been collected and analysed using SPSS software. Pallant (2010) points out that the descriptive statistics "describes the basic characteristics of the data in a study". Therefore, descriptive statistics were used to analyse the data collected. This provides a brief about the sample that can be used to understand the chart. Furthermore, it shows what is explained by the research (Najimu, 2011). Descriptive statistics were adopted to understand and clarify the views of the selected housing experts on the proposed guidelines regarding the integration of socio-cultural-sustainability features into the sustainable design of desert dwellings in Southwest Libya.

As shown in Section 7.4, through questions of the questionnaire, the housing experts were asked to express their points of view about the proposed guidelines, which they agreed or disagreed with based on the guidelines' simplicity, clarity, applicability, usefulness, and comprehensiveness. The findings presented positive answers for most of the items.

For the first group (four academics from universities and higher institutions that specialise in architecture and urban planning), two out of four strongly agreed, and one out of four agreed that the proposed guidelines are simple for the implementers within the desert-dwelling sector to understand. Conversely, one of the four housing experts disagreed. For the finding regarding clarity, two out of four experts strongly agreed, and one out of four agreed that the proposed guidelines are clear enough and can be understood by the implementers. In contrast, one out of four was not sure. With respect to whether the first group of housing experts believe the proposed guidelines are applicable to the desert-dwelling sector in southwest Libya, one out of four strongly agreed and two out of four (50%) agreed that the proposed guidelines are applicable to the desert-dwelling sector in southwest Libya, while one strongly disagreed. In terms of the usefulness of the proposed guidelines for future dwelling projects, two out of four experts strongly agreed and one out of four agreed that the proposed guidelines are useful for future dwelling projects in the sustainable desert-dwelling sector in Southwest Libya. In contrast, the one remaining expert state they are not sure about the usefulness of the guidelines. In terms of the comprehensiveness of the proposed guidelines, three out of four experts agreed and one out of four was not sure.

For the second group (consisting of four real-estate developers and contractors), two out of four strongly agreed and one out of four experts agreed that the proposed guidelines are simple for the implementers within the desert-dwelling sector to understand, while one out of four was not sure. For the finding regarding clarity, two out of four experts strongly agreed and one agreed that the proposed guidelines are clear enough and can be understood by the implementers, but one disagreed. Regarding applicability, two out of four strongly agreed and one agreed that the proposed guidelines are applicable to the desert-dwelling sector in Southwest Libya, while one strongly disagreed.

In terms of the usefulness of the proposed guidelines, three out of four experts strongly agreed and one out of four agreed that the proposed guidelines are useful for future dwelling projects in the sustainable desert-dwelling sector in southwest Libya. For the comprehensiveness of the proposed guidelines, two out of four experts strongly agreed, one out of four agreed, while one was not sure.

The findings of the feedback from the group of architects and professionals show that two out of four experts strongly agreed and one out of four agreed that the proposed guidelines are simple for the implementers within the desert-dwelling sector to understand, while one disagreed; this means the proposed guidelines are simple enough for the implementers to understand.

The finding regarding clarity shows that three out of four experts (75%) agree that the proposed guidelines are clear enough and can be understood by the implementers, and only one out of four of the housing experts answered not sure. Regarding the housing experts' opinions about the applicability of the proposed guidelines to the desert-dwelling sector in Southwest Libya, two out of four strongly agreed and one out of four agreed that the proposed guidelines, while one said not sure. In terms of the usefulness of the proposed guidelines for future dwelling projects, three out of four experts strongly agreed and one out of four agreed that the guidelines proposed is useful for future dwelling projects in the sustainable desert-dwelling sector in Southwest Libya. For comprehensiveness, the findings show that one out of four experts strongly agreed, one out of four agreed, and one strongly disagreed.

Finally, the findings of the last group (four specialists from local authorities and decision-makers in the architecture and urban planning departments of the municipalities in southwest Libya) show that two out of four experts strongly agreed and one out of four agreed that the proposed guidelines is simple for the implementers within the desert-dwelling sector to understand; in contrast, one was not sure.

The findings regarding clarity demonstrates that three out of four experts strongly agreed and one out of four experts agreed that the proposed guidelines are clear enough and can be understood by the implementers. Regarding the applicability of the proposed guidelines to the desert-dwelling sector in southwest Libya, two out of four strongly agreed, one out of four agreed, and one said not sure. In terms of the usefulness of the proposed guidelines for future dwelling projects, three out of four experts strongly agreed and one out of four agreed that the proposed guidelines are useful for future sustainable dwelling projects in the desert-dwelling sector in Southwest Libya. In terms of comprehensiveness, three out of four experts strongly agreed and one out of four was not sure.

Regarding the findings for the four groups, it should be noted that there are no major differences among them, though there are minor differences between the first group and the fourth group, especially on the applicability of the proposed guidelines to the desert-dwelling sector in southwest Libya, for which the first group has one strongly agree, two agree, and one

strongly disagree, while the fourth group has two strongly agree, one agree, and one not sure. In terms of clarity, the fourth and third groups both have three strongly agree, while the first and second groups both have two strongly agree. In contrast, for the usefulness of the proposed guidelines, the first group have two strongly agree and the second group has three strongly agree. Table 7.3 illustrates the summarised findings of the validation.

Table 7.3: Summarised findings of the five areas of validation

Describe of the evaluation → / Guidelines specification ↓	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Simplicity;	8	4	2	2	
Clearity;	10	3	2	1	
Applicability;	7	5	1	2	1
Usefulness;	11	4	1		
Comprehensiveness;	6	6	3		1

In general , the summary of the findings of the questionnaire, as presented in Figure 7.4, shows that 12 out of 16 experts (75%) strongly agreed or agreed that the proposed guidelines are simple for the implementers within desert-dwelling sector to understand, while two (12.5%) were not sure and the same number/percentage disagreed.

A total of 13 out of 16 experts (81.25%) strongly agreed or agreed that the guidelines proposed are clear enough and can be understood by the implementers. However, only one not sure and two disagreed, which represents 18.75% in total.

On the usefulness of the proposed guidelines,15 out of 16 (93.75%) strongly agreed or agreed that the guidelines are useful for future sustainable dwelling projects in the desert-dwelling sector in Southwest Libya. In contrast, one was not sure.

As illustrated in Figure 7.4, 12 out of 16 experts (75%) strongly agreed that the proposed guidelines are comprehensive.

Furthermore, with regard to the open questions in the questionnaire, one of the housing experts added this following point

"... may I suggest adding this point'Provide modern electrical elevators in residential buildings even if they are not high-rise as proposed in the guidelines (three to four floors). These lifts help in the movement of the disabled and elderly, and transfer other services. In addition to providing a ramp to facilitate the movement of people with a wheelchair'..."

Another expert made another point, as follows:

"...Emphasis should be placed on agriculture via dwellings' gardens in addition to special care for the agriculture of palm trees, and the construction of awnings that are similar to those in the vernacular towns to get the greatest amount of shade..."

These suggestions have been included in the proposed guidelines (see Table 7.4).

Figure 7.4 shows the findings of the questionnaire

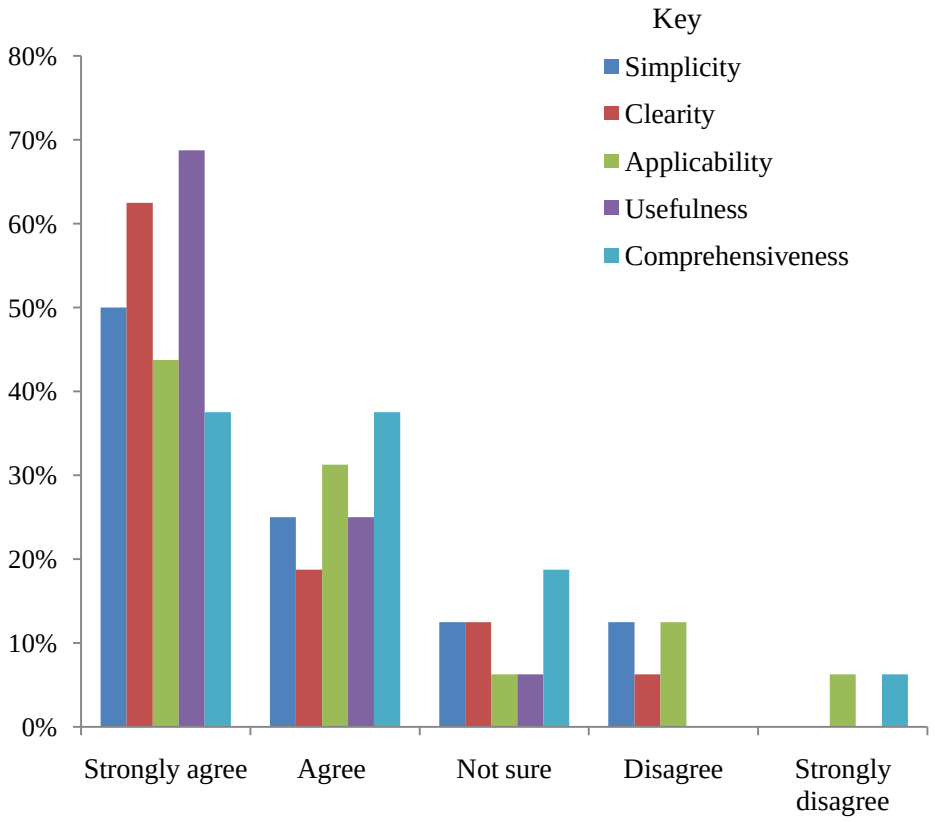


Figure 7.4: Findings of the validation (16 housing experts)

The following section outlines the summary of the proposed guidelines after the validation

7.4.3 Summary of the proposed guidelines after validation

7.4.3.1 First level: Architectural design for sustainable desert dwellings

Table 7.4: Proposed guidelines for the sustainable internal design of desert dwellings in southwest Libya

1. Proposed guidelines for the internal design of desert dwelling	
No	**Description**
1.1	Preserve visual privacy by positioning the main entrances of the dwellings in such a way that they are not be directly opposite the entrances of neighbours' dwellings, especially for apartments.
1.2	Preserve acoustic privacy and interior organisation by using modern insulation materials, and through the distribution of bedrooms, the living room, the bathroom, the kitchen, and the guest room in relation to each other.
1.3	Preserve the socio-cultural concept of privacy of social life, and support the comfort and well-being of the family via providing enough rooms in the dwelling as appropriate to society in Southwest Libya.
1.4	Take into consideration the local socio-cultural features, such as customs, traditions, and religious beliefs, and the desire for total privacy by organising the spaces of each dwelling into three parts: a general area for guests, a mixture between public and private areas, and private areas.
1.5	Maintain the safety and security of the population by using modern technologies to enhance this feature, such as the use of finishing materials that are safe for children and the elderly; the installation of a fire protection system; using fire-resistant materials; paying attention to the height of the windows and internal stairs; providing modern electrical elevators in residential buildings, even if they are not high-rise (three to four floors) to help in the movement of the disabled and elderly and transfer other services; and providing a ramp to facilitate the movement for people with wheelchairs.
1.6	Ensure the interior design of the dwellings meets the social and cultural needs of the population, and is dynamic and flexible enough to cope with rapid contemporary lifestyle changes, and allow for vertical or horizontal expansion without prejudice to the idea of the original design.
1.7	Ensure the compatibility of the interior design of the dwellings and elements for finishes should be compatible with the nature of the lifestyle, keep up with contemporary socio-cultural developments, and keep up with modern technology used during daily activities.
1.8	Provide a healthy and comfortable environment for the residents by providing natural ventilation and natural daylight, and preventing pollution and noise inside the lodging, through innovative technological solutions, and there is the potential for reducing energy consumption, conserving resources, and following the principles of sustainability.
1.9	Create an interior environment in the dwellings to provide more space for social activities and a play area for children. Encourage people to use local materials in the interior design of the dwelling, such as wood, palm products, handicrafts, and leather, which are associated with the cultural heritage of the region.
1.10	Ensure the interior design of the dwellings showcases the aesthetic values, and cultural and artistic aspects that reflect the identity, cultural heritage, and personality of the people of Southwest Libya. This reinforces the preservation of the history, heritage, and identity of the region, and also provides comfortable functional spaces for the inhabitants.

Table 7.5: Proposed guidelines for the sustainable external design of desert dwellings indwelling in Southwest

2. Proposed guidelines for the external design of desert dwelling	
No	**Description**
2.1	Avoid including the scattered balconies that are usually unused. These can be combined into one or two spaces that operate as an open area, and are protected by a fence to achieve external privacy.
2.2	Ensure the external dwelling facades are simple in design and reflect the local artistic, cultural aspects, and architectural identity of the historical towns of Southwest Libya through developing and simulating some of the vernacular architectural elements to promote these elements and their meanings into the collective memory of the population. Such as the simplicity of the facades of the dwellings and homogeneity of the elevations of the dwellings; this will enhance the sense of belonging to the place and thus support the preservation of the local identity.
2.3	Extract the historical architectural elements (such as the triad and convex arches) or their meanings, remodel them in a modern spirit, and emphasise the outlines of these elements to link the architectural design of contemporary desert dwellings with the architectural identity of historical towns in Southwest Libya.
2.4	Filter some of the elements, components, and modern architectural techniques that are appropriate to the cultural and architectural environment of the region into the design, with a view to using them in the contemporary desert dwellings, but modifying them to be closer to the concepts known from the local architecture in historical towns.
2.5	Provide ease of access to the dwellings, maintain privacy around the dwelling, and prevent neighbours from being able to see into the dwelling from the street or neighbouring dwellings, so that the activities occurring in the internal spaces cannot be witnessed from the outside, by using curtains as part of the facades, raising walls around the dwelling, and growing shrubs and climbing plants to block visibility.
2.6	Make sure the heights of the windows and the external openings are enough to ensure privacy and safety, their sizes should be suitable, and durable and sustainable finishes that are safe should be used to ensure the safety and security of the population.
2.7	Preferably use white and clay-based colours that reflect the local architectural identity; use different local technical aspects such as shape, size, and texture in the contemporary methods; and avoid excessive finishes.

7.4.3.2 Second level: Urban design, planning, and sustainable approach in the design of desert dwellings

Table 7.6: Proposed guidelines for the sustainable neighbourhood-unit design of desert dwellings in Southwest Libya

3. Proposed guidelines for the sustainable neighbourhood-unit design	
No	**Description**
3.1	It is important for the location of the dwelling to be near the daily services needed by inhabitants, such as schools, markets, health clinics, and others.
3.2	Provide privacy and safety on the streets and between dwellings through measures such as provide lighting at night, signs, and some gates in the residential complexes for create private localised environments for the population.
3.3	Create a variety of courtyards (or Al-Mastaba, such as those in the vernacular towns in Ghadames and Ghat) in the vicinity of each neighbourhood, each of which would serve as a private space for meetings of the elderly and different age groups, allowing them to practice social activities and that would encourage connectedness between neighbours to promote social relationships.
3.4	Design streets and open spaces within the residential neighbourhood in a more secure way to reinforce privacy, security, and safety at the level of the neighbourhood, especially for the children. Learn from the ideas of the morphology of vernacular desert dwellings and the compact urban fabric regarding this aspect, and pay attention to safety around the dwellings and the safety of the location of the dwellings.
3.5	Ensure that the population has adequate safety and security by designing the neighbourhood units in a way that discourages anti-social behaviour. For example, ensuring that sub-access roads for dwellings are restricted to residents, the public areas of dwellings are open to observation, and providing lighting for pedestrian roads, corridors, and parking lots to improve security and safety for the residents, especially at night.
3.6	Ensure that the design of the residential neighbourhood serves the entire population, allowing for their different circumstances and age groups wherever possible; avoid to barriers to reduce the access of the entire population; and follows modern techniques to identify tracks , and assist the elderly and the disabled.
3.7	Ensure that the design of the residential neighbourhood provides calm and comfort within the neighbourhood, the residential neighbourhoods are far from the main roads and heavy traffic, and include gardens, green areas, water fountains, and shaded areas to alleviate the effects of the hot weather in the desert areas. This also promotes social communication, and the welfare and comfort of the population, and facilitates families taking part in various social and recreational activities.
3.8	Reflect the architectural identity of historical towns in Southwest Libya in the designs of neighbourhood units of dwellings through creating an affinity with the urban vernacular towns in a contemporary way by adopting an appropriate human scale for the internal and external elevations of the buildings and dwellings within the residential neighbourhoods. Adapt the elevations of dwellings with simple designs in similar colours and shapes to create harmony with the architectural landscape of the historical towns.

Table 7.7: Proposed guidelines for the sustainable approach of desert-dwelling designs in Southwest Libya

4. Proposed guidelines for the sustainable approach of desert dwellings design	
No	**Description**
4.1	Provide infrastructure services that are compatible with the environment and address the principles of the conservation of a sustainable environment (environmentally friendly); for example, offering green landscapes and water fountains. Emphasis should be placed on agriculture via dwellings' gardens in addition to giving special care to the agriculture of palm trees, and the construction of awnings that are similar to those in the vernacular towns to get the greatest amount of shade.
4.2	Encourage designers and architects to think about integrating features of both vernacular and contemporary desert dwellings into sustainable dwelling designs and providing recommendations for paying attention to historical buildings and vernacular dwellings, which express an important part of the history of Southwest Libya.
4.3	Enhance the collective memory of the population by taking care of buildings of historical importance and maintaining them, through encouraging young people who live in historical towns to form a link with vernacular dwellings and important historical buildings, such as castles and ancient mosques.
4.4	Choose planners and architects who are experienced, aware of the importance of the local culture, and have a good knowledge of the socio-cultural architectural features of historical towns in Southwest Libya, and the local customs and traditions. Provide good training to the new generation of young architects about the importance of their region, which should be incorporated into the curricula of their universities and institutions.
4.5	Give people especially the new generation of young people the opportunity to give their opinions and participate in the design and implementation process through the use of questionnaires, conducting periodic meetings with designers and decision-makers, and taking the population's views, comments, and observations seriously in the design process for dwellings and neighbourhood units and give them the opportunity to choose appropriate housing commensurate with the size of their family and social conditions.
4.6	Review the current legislation and building rules derived from foreign standards to develop standards that better accommodate Southwest Libyan socio-cultural features. Draft new laws dealing with the preservation of the cultural identity, and the establishment of scientific and educational centres for sustainable desert architectural studies.
4.7	Limit the height of dwellings (to three or four storeys) because high-rise apartments are not appropriate socially in the historical towns in Southwest Libya. Use the horizontal extension of the complexes as multi-family residential in order to respecting the skyline of heritage towns and avoid visual pollution. And ensure the dwellings are of different types and sizes to suit the locals' needs.
4.8	Educate young people about the promotion of cultural identity, and address the issue of the changes of perception of identity and lifestyle for the younger generation. The many steps and measures to be taken, which require cooperation among all concerned parties in order to help awareness the new generation with respect to the changing identity and keeping up with the requirements of the contemporary lifestyle, are identified in the following points 4.8.1 to 4.8.6.

4.8.1	Promote interest in the local cultural and architectural heritage and define it to young people, and re-adapt and employ it in accordance with contemporary requirements to make it a point of strength for maintaining their cultural identity as an important element of identity.
4.8.2	Help the young people to face the cultural changes and globalisation trends through education and training, during the stages of basic education, and in the higher institutions and universities, and raise the scientific and cultural efficiency of the young people.
4.8.3	Prepare educational and information programmes that helps to strengthen the association of the young people in Southwest Libya with their cultural identity, develop the spirit of a sense of belonging to the place with its different elements, and gain the attention and auspices of the new generation through the media, such as television programmes and documentaries, which will enhance the youth's relationship with their cultural identity because of the impact on cultural and architectural identity.
4.8.4	Generate an interest in language and vocabulary as one of the ways to protect society and its socio-culture.
4.8.5	Ensure the local authorities and municipalities in Southwest Libya understand the importance of paying attention to local products and the local architectural industry, encourage the young people to engage in workshops, and support small and medium-sized enterprises economically.
4.8.6	Supporting tourism activities, festivals that reinforce the local products and promote the cultural and architectural heritage, and encourage investment in this aspect.
4. 9	Support the policy of encouraging scientific research in the field of sustainable desert architecture, protecting the environment, identifying new and renewable resources, developing technology and specifications for building materials, and taking advantage of traditional techniques and materials available in the desert.
4. 10	Introduce and activate the roles of architectural departments in the universities and higher institutions in southwest Libya (for example, the University of Sabha, Faculty of Engineering and Technology in Hoon, and Higher Institutions of Engineering in Ghadames, Ghat, Murzuq, and Ubari), and expanding the research into sustainable architecture for desert dwellings and construction technology. And encourage studies and research into the framework for strengthening cultural and architectural identity.
4. 11	Maintain the status of the historical towns of Ghadames and Ghat, which are on the World Heritage List, and support the inclusion of the rest of the historical towns in Southwest Libya, such as Sabha, Murzuq, and Hoon.
4. 12	Increase cooperation between civil institutions, increase the exchange of information, and increase education on sustainable design techniques to ensure a common understanding among designers, architects, decision-makers, and locals on the importance of sustainable desert architecture that supports stability and development.

7.5 Summary and link

These findings were summarised by discussion and were synthesised. The views of the respondents from the different generations of the population in three selected historical towns in Southwest Libya were discussed, together with the views of professionals, architects, and academics specialising in architecture and housing. Then final findings were summarised in a set of specific points, based on which a set of proposed guidelines for the design of socio-culturally sustainable desert dwellings in Southwest Libya was formulated. Furthermore, the validation findings obtained from 16 selected housing experts in Libya, through questionnaire with closed and open-ended questions, have been presented and discussed. The findings show that the proposed guidelines, on the whole, are simple for the implementers to understand, have clear content, are applicable to the society in Southwest Libya, will be useful for future housing projects, and are comprehensive regarding all aspects of social and cultural sustainability for Libyan desert society. In addition, two experts added some points to the proposed guidelines, which have been included in the proposed guidelines after verification, see Tables 7.4 to 7.7.

The next chapter presents the findings with regard to achieving the objectives of this research, final recommendations, contribution to knowledge, limitations, and recommendations for further research in future.

CHAPTER EIGHT

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER EIGHT
CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This chapter of the thesis will detail the conclusions and recommendations based on the issues uncovered in the preceding chapters. Chapter Two of this research presented the background of the study area and an overview of the architecture for desert dwellings. Chapter Three of discussed the main research issues for socio-cultural sustainability, which provided the theoretical background used to prepare the data collection tools. Furthermore, the research methodology adopted for this research was presented and discussed in Chapter Four. Chapter Five detailed the characteristics of three selected historical desert towns in southwest Libya (Ghadames, Sabha, and Ghat)as a case study. Chapter Six presented and discussed the data analysis and the main findings that emerged from this research. Chapter Seven formulated a set of guidelines for sustainable desert-dwelling designs in Southwest Libya, and validated these guidelines. This chapter, therefore, summarises of the findings and recommendations, as shown in Figure 8.1.

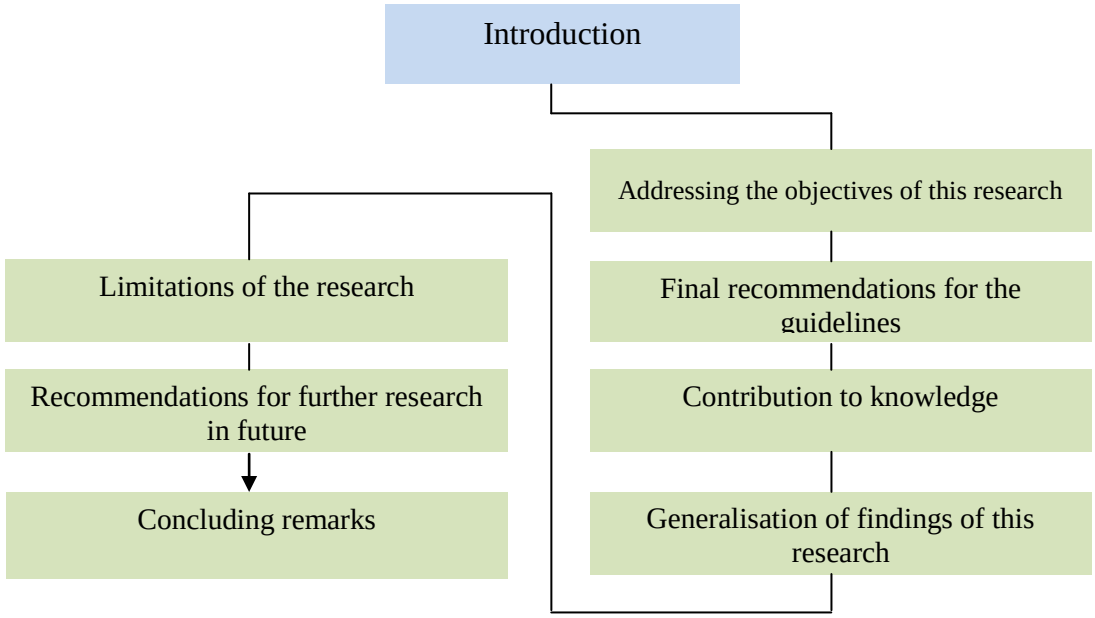


Figure 8.1 : Structure of Chapter Eight

8.2 Addressing the objectives of this research

Five objectives were formulated for this research (see Section 1.6.2 in Chapter One) to facilitate achieving the main aim of the research which is ***to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya*** (see Section 1.6.1 in Chapter One). It was also disclosed in Section 1.4 of Chapter One that there are issues concerning the paucity of the literature and clear information on socio-cultural sustainability with respect to the architectural design of dwellings in desert regions. However, studies and responses to this issue have not been subject to specific academic research, and there has never been any discussion of the subject in a clear and specific manner for the desert regions in the country of study.

These issues concern with the demands for sustainable dwelling design provision aligned with the socio-cultural sustainable needs of the population and which keeping up with socio-cultural transformations, needs of the contemporary lifestyle of different generations that related to design of new desert dwellings in terms of evolution with socio-cultural sustainability in Southwest Libya, which forms the specific knowledge gap investigated by this research (see Section 1.4 in Chapter One). Therefore, this research is designed to address the knowledge gap on the absence of socio-cultural architectural features in the design of desert dwellings in historical cities in southwest Libya (see section 1.6.2 in Chapter One). In order to achieve the research objective of formulating guidelines for the sustainable design of desert dwellings, five objectives were formulated for this purpose (see section 1.6.3 in Chapter One) along with research questions that were used to obtain adequate information for the formulation of the research results. The following sections illustrate how each of the research objectives was addressed:

8.2.1 First Objective

The first objective of this research (see Section 1.6.2 in Chapter One) was ***to define the features of vernacular and contemporary desert dwellings, and perceive the degree of satisfaction of different generations with the socio-cultural architectural features of vernacular and contemporary architecture in southwest Libya***. This objective has been achieved through several steps. First, there was a review of the historical development of the desert dwellings in Southwest Libya to identify the historical background and obtain a

description of architecture features of these dwellings, which has been addressed in Chapters Two and Three of this research. Then the socio-cultural architecture features of both vernacular and contemporary desert dwellings were investigated using statistical analysis of the questionnaire data to determine the general trend of the population's satisfaction with socio-cultural features of both types of dwelling (see Section 6.2.4 in Chapter Six). The findings showed the population's satisfaction trends give a clear perception of the socio-cultural architectural features that the population preferred in the designs of their dwellings, and indicated the tendency of the population to prefer the architectural design of the vernacular dwellings in relation to the social characteristics of heritage and religious values, such as privacy, social considerations, religious-belief considerations, and some aspects related to architectural identity and cultural heritage. However, the population of different generations were satisfied with contemporary architectural design to a certain extent, particularly with regard to other features related to aspects of contemporary lifestyle, such as safety through using strong building materials, using modern technologies, designing dwellings that are flexible and are an appropriate size, using contemporary finishing materials that provide comfort and well-being, including socio-cultural features related to keeping pace with contemporary social changes, and the use of and keeping pace with technology.

8.2.2 Second Objective

The second objective of this research (see Section 1.6.2 in Chapter One) was ***to compare the vernacular and contemporary desert dwellings for synthesise the features of both vernacular and contemporary desert dwellings in terms of suitability for the socio-cultural sustainability features***. The issues of vernacular and contemporary desert dwellings give an understanding of the features of each type of dwelling in terms of architectural design for socio-cultural sustainability. Chapter Five and Six of this research presented and discussed the overall shape of the urban fabric of vernacular and contemporary architecture for both types of desert dwelling in each of the three historical towns. These were then compared in terms of socio-cultural architectural features (see Section 6.6). The research analysis presented an extensive comparison of the designs of both vernacular and contemporary desert dwellings, as detailed in the questionnaire analysis. This objective was also discussed in Chapter Seven in Sections 7.2 and 7.2.3.

8.2.3 Third Objective

The third objective of this research was ***to investigate the standpoint of designers, architects and academic professionals concerning the advantages and disadvantages of vernacular and contemporary desert dwellings in terms of the socio-cultural sustainability for sustainable desert dwellings in Southwest Libya***. This objective was to provide a deep understanding of the advantages and disadvantages of the architectural design of both vernacular and contemporary desert dwellings in terms of socio-cultural sustainability. This objective was achieved through the adoption of a semi-structured interview with designers, architects, and academic professionals. The views and perspectives were explored in an in-depth discussion that yielded important results that contributed to the crystallisation of the final results, and, therefore, contributed to the achievement of the main aim of this research, which is the formulation of guidelines for sustainable desert dwellings in Southwest Libya. Section 6.3.2 in Chapter six has shown the investigated of these opinions.

8.2.4 Fourth Objective

The fourth objective of this research was ***to formulate a set of guidelines to integrate the socio-cultural architecture features for vernacular and contemporary desert dwellings for sustainable desert dwellings in Southwest Libya***. This objective has been achieved through several steps and rigorous measures were used to formulate a set of guidelines and develop a programme to design new sustainable desert dwellings that meet the needs of different generations, and various social and economic groups; this is with the desire to increase people's satisfaction with the design of their desert dwellings.

The analysis and results of the survey questionnaire revealed various opinions and views, as well as varying levels of satisfaction with the designs regarding the socio-cultural-sustainability features of both vernacular and contemporary desert dwellings. The analysis of the information from the interviews conducted with a group of professionals in the field of architecture and desert dwellings then identified important evidence and recommendations, which were used in the formulation of the guidelines for sustainable housing design. The proposed guidelines aim to increase the satisfaction of the population and improve the quality of the architectural design of the sustainable housing. This is in order to encourage and spatially develop the historical towns in Southwest Libya by improving the desert-dwelling

projects and improving the architectural landscape of desert dwellings schemes in terms of socio-cultural features, which is to preserve the cultural heritage and architectural identity of those cities that reflect the heritage of the people of Southwest Libya. These guidelines emerged based on an analysis of the questionnaire and interviews findings, were created for three selected historical towns in Southwest Libya, and investigated both the design of both vernacular and contemporary desert dwellings design. In addition to recommendations developed by the relevant literature. These guidelines were presented in Chapter Seven (see Section 7.3).

8.2.5 Fifth Objective

The fifth objective was ***"to validate of this proposal guidelines with housing experts in Libya ".***

This objective has been achieved through taking several steps. These steps began with the selection of the expert group based on the criteria of having expertise and knowledge of the desert society in historical towns of Southwest Libya. A total of 16 housing experts responded to the validation questionnaire, They were divided into four groups including academics from universities and higher institutions specialising in architecture and urban planning, real-estate developers, architects, professionals, specialists from local authorities, and decision-makers in the urban planning and municipality departments in southwest Libya. The validation questionnaire for the proposed guidelines was designed to determine the experts' opinions in terms of the simplicity, clarity, applicability, usefulness, and comprehensiveness of the proposed guidelines for all aspects of the socio-cultural sustainability of housing design. The experts had the opportunity to provide additional comments and information that might be useful in improving the proposed guidelines. The questionnaire data was analysed using SPSS software. The guidelines were reformulated in light of the verification. This objective was covered in Chapter Seven (see Section 7.4).

8.3 Contribution to knowledge

This thesis attempted to effectively contribute to filling the gap of knowledge concerning the socio-cultural sustainability of desert-dwelling designs in Southwest Libya. This study also serves as a basis for future research, and provides better comprehension on the concepts of vernacular desert architecture in Southwest Libya and contemporary dwelling designs in terms of socio-cultural sustainability. It presented clear concepts that should be taken on

board by designers, architects, and local and national authorities for the affairs of housing on the way of providing new sustainable desert-dwelling designs. The proposed guidelines should enable designers and architects to assess and manage sustainable desert-dwelling designs more effectively with respect to the changes in socio-cultural and technological requirements in the future.

The other obvious contribution of this study is the provision of long-term recommendations to the housing sector in desert areas. On the one hand, the theoretical contribution concerns the depth of understanding of the advantages and disadvantages of vernacular architecture for desert dwellings. On the other hand, it also highlights the contemporary desert-dwelling designs in terms of the socio-cultural-sustainability dimensions that mostly aspire to improve the quality of life for locals and also preserves the society's cultural identity. Thus, the contribution of this research can be also categorised as follows:

- The most important contribution to knowledge from this research is the set of proposed guidelines provided for the integration of the socio-cultural architectural features of vernacular and contemporary desert dwellings into sustainable desert-dwelling designs in Southwest Libya. This integration is considered to be vital for the development of sustainable desert-dwelling projects for different generations, with particular focus on the opinions of young people in this era of information and advanced technology, and its impact on both sides of the architectural identity and contemporary lifestyle. The proposed guidelines also incorporate the views of a group of professionals regarding the concept of socio-cultural sustainability. The proposed guidelines outline the strategic progression points for the modern and technological requirements of the contemporary desert-dwelling designs along with the integration of the socio-cultural-sustainability features of vernacular desert dwellings in all regions of Southwest Libya. Additionally, it helped to provide an understanding of the socio-cultural architectural features of sustainable vernacular architecture.

- It has provided a review of the historical development and the emergence of architecture, urbanism, and primitive dwellings in the desert settlements, and highlights the most important three historical towns in Southwest Libya. These towns are distinguished by unique vernacular architecture, which expresses the identity, diversity, and cultural heritage of the people of Southwest Libya.

- It has revealed new knowledge, and more explicit understanding of how lessons learned from the vernacular architecture for desert dwellings could also help in responding to the new generation to establish an architectural identity and creating a bridge between the past and the present to build a clear vision for sustainable desert dwellings for the youth. It makes an attempt to combine the modern lifestyle with the spirit of cultural heritage and preserving the architectural identity of those towns, which represent the history, culture, and heritage of the desert people.
- The contribution to knowledge from this reserch provide additional literature in the study area. It has identified progression points for both vernacular and contemporary dwellings with in line with the sustainability of the socio-cultural aspects of the architecture from the perspective of the new generation, and provides a reference point for further research in this field.

8.4 Final recommendations for the guidelines

The recommendations for the guidelines of this research are divided into two levels as follows.

The first level: Recommendations for the architects, planners and estate developers (with regarding the architectural design of the desert dwellings):

1. The architecture and concept of the desert dwellings design needs to incorporate aspects of the indigenous culture so that they reflect the traditions and spiritual outlook of the people. Privacy is highly valued by the desert people, so this should be respected in concept designs of the new contemporary desert dwellings. Families are often extended that need more rooms are required than in a typical dwellings in developed countries. Additionally, in Southwest Libya, families often increase in size over time so the dwellings design should allow for extensions to be added including storeys or rooms.

2. As privacy is highly valued among the desert communities, this should be considered in the design of contemporary desert dwellings which incorporate privacy and are insulate against noise pollution. Respect for local traditions and culture requires that dwellings are designed in such a way as to accommodate the need for three sections;

one section reserved for non-family visitors, one section for family members and a third completely private sleeping section.

3. The interior and external design of desert dwellings should maintain the safety and security of the population by using modern technologies to enhance this feature. For example, the installation of security and safety features. Fire alarms can save lives but even more so the incorporation of non-combustible materials, positioning of windows and, where appropriate, elevators. It also includes modern design ideas that accommodate the needs of children and the elderly, for example the provision of a sloped entrance with handrails to aid people with mobility problems and people with wheelchairs.

4. The lifestyle of desert communities is changing as younger members are affected by social media and the internet, so it is expected that there will be an increasing demand for modern conveniences and devices. Thus, provision in architectural design needs to keep such changing lifestyles.

5. The interior design of the dwelling must provide a healthy and comfortable environment and special attention needs to be paid to the internal structure of the dwelling. Innovative technological solutions and electronic devices can control ambient temperature, humidity and opening and closing of entrances and windows as well as availing of natural sunlight. Provision of solar panels to exploit energy from sunlight can also reduce energy costs as well as contributing to the protection of the natural environment in a sustainable way.

6. The interior design of the dwellings should allow the residents to benefit from the idea of an inner courtyard, as an interior environment in the middle of the dwelling or in one of the corners of the dwelling will provide more space for social activities and a play area for children. It should make use of modern techniques for treating patio roofing to protect against rainwater and dust storms. People should be encouraged to use local materials in the interior design of the dwelling, such as wood, palm products, handicrafts, and leather, which are associated with the cultural heritage of the region.

7. Both the internal and external appearance of desert dwellings should resonate with local culture and tradition. The decor should manifest and celebrate the local aesthetics and craftsmanship of this region of Libya in order to preserve its unique history and civilisation in addition to providing useful living and relaxation areas.

8. Some of the historical architectural elements, such as the triad and convex arches, or their meanings, should be extracted and remodelled in a modern spirit. Emphasis should be placed on the outlines of these elements and on simulating some of features of the vernacular architecture that are related to architectural identity, such as the simplicity of facades and the homogeneity of elevations of dwellings. It should be possible to filter some elements, components, and modern architectural techniques that are appropriate, with a view to using them in the contemporary desert dwellings, and they should be modified to become closer to the concepts known in the local architecture. This is to link the architectural design of contemporary desert dwellings to the architectural identity of historical towns in Southwest Libya, which will enhance the sense of belonging to the place and thus support the preservation of the local identity. The appearance of the building should be based on local architectural features such as Arabic arches could be imitated in the design. In this way, modern architecture could mirror historical buildings and incorporate some of those features into the modern housing development. Thus, the contemporary desert dwellings can be constructed in such a way as to reflect the unique and rich culture of the region whilst also offering modern conveniences.

The second level: Recommendations for Municipalities of Southwest Libya, local authority and policy makers (with regarding the architectural design of the desert dwellings):

1. Consideration needs to be given in the planning of the desert dwellings for ease of access by pathways and roads to schools, shops, medical centers and other amenities. These roads need to be safe for locals in order to protect their safety and privacy.

2. The architectural design of the desert dwellings should aim at providing ease of access to all residents with special attention to the needs of children, the elderly and people with disabilities. Provision of courtyards could imitate successful schemes such as Al-

Masateb in Ghadames and Ghat. These courtyards would provide convenient venues for people of all age groups to meet one another and engage in various activities which allowing them to practice social activities and that would encourage connectedness between neighbours to promote social relationships.

3. The design of the neighbourhood should provide ample open areas and roads providing access but which are secure and safe, bearing in mind especially children from the locality. Architects can lerned lessons from existing vernacular desert dwellings. Of prime importance are the issues of safety and security and design should support these as well as discouraging undesirable activities. Access roads could be designed to be accessible only to residents by means of gates controlled by electronic fobs. Public areas should be highly visible and avoiding seclusion as far as possible. Consideration also needs to be given to night time lighting.

4. Design of the neighbourhood should aim at locating the services a distance from main roads and heavy traffic. Provision of shaded areas can help protect against strong sunshine and can also provide recreation by including gardens and fountains to relieve the harshness of extreme desert conditions. In this way architecture can support community development and encourage families to participate in local activities.

5. Ensure that the design of neighbourhood units of dwellings reflect the architectural identity of historical towns in Southwest Libya. This can be achieved by scaling buildings so that they are not too high but mirror the dimensions of their vernacular buildings. In this way, a blend of new modern conveniences can be achieved while preserving all that is best in vernacular architecture.

Recommendations for the sustainable approach of the designs for desert dwellings:

1. Service roads and access roads should comply with regulations especially those concerned with sustainability and the protection of the environment. This would include landscaping with palm trees and the provision of fountains as well as covered areas giving shelter from extreme weather conditions. This would mirror shaded areas in the traditional vernacular architecture.

2. Designers and architects should be encouraged to think about integrating of vernacular architecture with contemporary approaches must be achieved in sustainable ways.This way including attention to historical buildings and vernacular dwellings, which express an important part of the history of Southwest Libya. By preserving the best features of local vernacular architecture, the community's collective memory can be maintained whilst contemporary means of architecture can become an integral part of a dynamic and developing tradition. This can be supported by local events and festivals which celebrate all that is best in traditional culture. Such events can serve an educational functional and the transmission of culture over generations.

3. The choice of designers and planners is something which requires close attention. These professionals need to be sensitive to local cultural values. Many developments for desert communities have failed in this regard. This amounts to ignoring what is of value in the indigenous architectural heritage of the people by importing alien styles of building. Thus, in the education of architects and designers, modules on local culture and preservation should be included in order that future generations of designers become innovative by integrating vernacular design with contemporary developments.

4. It is important that people become involved in the decision-making process in matters affecting their lives. This is especially true in matters related to their dwellings. Questionnaires can be useful for getting an overview of people's views of proposed developments. Public meetings can also be good but they should be genuinely consultative in nature where feedback is taken from the people.

5. The local community should be given opportunities to examine and discuss proposed housing developments. Public meetings allow people from the desert communities to have a voice in matters that will affect their lives. At initial draft stage, people can comment or even raise objections to certain aspects of proposed developments. People should have a say in where they are going to be relocated on government building schemes and will most likely wish to be placed close to their neighbours rather than moved to a different community. Also, they should have a say in the size of the dwellings that is offered them for relocation.

6. Reliance on construction regulations from other countries, particularly developed countries should be approached with caution. Adjustments should be made to make such regulations relevant in the context of building of dwellings in Southwest Libya. New sets of regulations are required which would respect the cultural values of these communities and to ensure that desert dwellings are designed which take account of these values and embed them within the design.

7. It is not appropriate to introduce high-rise apartments for communities in historical towns in Southwest Libya. Buildings should not be allowed to rise above three or four storeys and there should be variations in style and size as people from these communities have been found to have a strong preference for low-rise dwellings and to dislike high buildings. This is because these communities highly value privacy which would be lost in high-rise buildings. It is recommended that horizontal extension be preferred to vertical extension for this very reason. An even more compelling reason is the avoidance of intrusion on the desert landscape of historical towns by building high-rise buildings in these locations.

8. There is a need to promote a sense of cultural identity among the younger generation in these communities. Traditional values can be transmitted to them if the design of their dwellings integrates aspects of their rich culture with contemporary designs which incorporate modern conveniences.

8.5 Generalisation of the findings of this research

It should be noted that this research was carried out within the context of the architecture of desert-dwelling designs, in particular the socio-cultural sustainability of desert dwellings in Southwest Libya, using a mixed-methods data collection approach. Therefore, the results are appropriate to the desert-dwelling sector in Southwest Libya and apply to the design of contemporary desert dwellings in the region. However, the results of research of this type can be generalised for a similar housing context, especially in the historical oases and towns in the neighbouring desert areas such as southern Egypt, Tunisia, and Algeria, which have somewhat similar socio-cultural architectural features.

8.6 Limitations of the research

It is common knowledge within the academic and research community that a researcher often faces some obstacles while working on their research, since any research activity has its own limits. This research is not considered to be an exception to what is known. Research constraints are part of the research process, and this study has suffered from several constraints. However, considerable efforts have been made to deal with them appropriately so as to avoid their impact on the research and findings. This has contributed to improving the researcher's capability and experience for carrying out future research activities.

The limitations identified are as follows:

1. There is a poverty of academic references on the architecture of desert-dwelling designs, particularly for the studies and literature related to architectural sustainability, including socio-cultural sustainability. There are very limited databases for information on Southwest Libya. Furthermore, data collection is difficult due to the wide geographical area of the study area of Southwest Libya. Therefore, the research focused on three selected historical towns only.

2. The nature of the research explores many socio-cultural-sustainability features that relate to the architectural design of desert dwellings, which required access to respondents in different ways, as many of them did not show their desire to participate in the beginning. This obstacle was overcome by taking advantage of the social relations of the researcher and the relationships from previous fellowship with many engineers in most of the towns of Southwest Libya, who facilitated the task by encouraging their relatives and friends to participate; this could not have been done without their cooperation. Many people from different generations are not sufficiently familiar with the importance of research studies in the development of their communities. There were also some difficulties in gaining the participation of women; therefore, there were fewer women participants than men.

3. There was limited availability of data and information on the appropriateness of desert dwellings in Southwest Libya, for both vernacular and contemporary dwellings, especially in the historical towns of Sabha and Ghat. Furthermore, the available data related to the design of contemporary desert dwellings is mostly incomplete and contradictory, possibly due to the constant changes of the authorities that are responsible for this data and documents. Moreover, the changesin municipal

boundaries in Southwest Libya, especially in the last few years, have made it difficult to find some documents, such as maps or other relevant data. Thus, the researcher encountered many difficulties in collecting data and information. In order to overcome this, the researcher was forced to collect most of the data from different governmental bodies from different cities and municipalities, as well as from interested persons, and public and private bodies.

4. There are three pillars of sustainability: environmental, socio-cultural, and economic sustainability. These pillars are the basis for any sustainable developments in the field of architecture and housing. This study was limited to the social and cultural sustainability of the design of desert dwellings, particularly in the historical towns in Southwest Libya.

8.7 Recommendations for further research in future

The investigations and experimental study on socio-cultural architectural features of both vernacular and contemporary desert dwellings for sustainable desert-dwelling designs in Southwest Libya has resulted many other research points that should be covered; therefore, this study recommends the following further research is conducted in the future:

1. The investigation and findings of this study revealed several aspects of the sustainable design of desert dwellings in terms of social and cultural sustainability. It is one of the three pillars of sustainable development. This study, therefore, recommends that the sustainability circle be completed, through continuing in the same context of this research with studies on the environmental and economic sustainability of desert dwellings in southwest Libya.

2. The research recommends applying the proposed guidelines, and evaluating and monitoring their applicability according to current requirements. This will provide new data and information to assist stakeholders, architects, and designers to circumvent many of the problems that may arise during implementation, and provide feedback to refine the proposed guidelines.

3. The study recommends further research in the form of an investigation and a detailed study on the architectural elements of both the vernacular and contemporary desert dwellings that are compatible with environmental, social, cultural, and economic

sustainability while preserving the architectural elements used in the historical towns of southwest Libya.

4. This study may be the beginning of further studies on sustainability in the design and implementation of sustainable desert housing in a more comprehensive sense, and the preservation of the identity of historical towns in southwest Libya, which may include the following subjects:

    - Studies on the traditional building techniques and materials used in the construction of vernacular desert dwellings, and making use of the resources available in the environment that support sustainable architecture.

    - Further studies on the coordination of the sites and architectural landscape of desert dwellings in line with sustainability, and ensuring the preservation of the spirit of cultural and architectural heritage of the historical towns of southwest Libya.

    - Further studies on the requirements and variables in the contemporary lifestyle of the young generation, and their impact on the design of desert dwellings in the future.

8.8 The Concluding remarks

The thesis presented an investigation of the designs of both vernacular and contemporary desert dwellings, in terms of their socio-cultural-sustainability features, and has measured different levels of satisfaction with many of the socio-cultural sustainability features with an aim to increase people's satisfaction with the design of their dwellings by developing sustainable desert dwellings design in Southwest Libya. Although the vernacular dwellings are no longer fit for habitation, and are unable to meet the contemporary needs that are consistent with the daily lifestyle of the different generations in all the historical towns in Southwest Libya. However, their socio-cultural sustainability features are associated with social values, religious beliefs and cultural heritage that have been most closely related to meet the social and cultural needs of the population. Furthermore, the population faces many challenges and problems in terms of their socio-cultural needs being fulfilled by the design of their contemporary desert dwellings and the current method of designing dwellings, generally, on which they still depend to this day.

Despite the fact that contemporary desert dwellings were a solution to the problem of health desert dwellings in that time, however, they did not meet the aspirations of the population to have a design appropriate to their social and cultural needs, including the realisation of their heritage and cultural identity, and keeping pace with contemporary issues through socio-culturally sustainable design. Consequently, the research formulated a set of proposed guidelines to integrate the socio-cultural architectural features for vernacular and contemporary desert dwellings into sustainable desert dwellings in southwest Libya. This was in order to create socio-culturally sustainable dwellings design that preserves the values, social principles, and cultural heritage of the historical towns that represent the cultural identity of the region, and also corresponds to the contemporary lifestyle of different generations, particularly the new generation.

This chapter (Chapter 8) has discussed the research objectives have been addressed and achieved, including accomplishing the main objective, and shows the main results that have emerged from the research (see Section 8.2). This chapter, moreover, has presented final recommendations for the guidelines and described the contribution of knowledge (see Sections 8.3 and 8.4).This final chapter of the thesis has described the limitations of this research and how they were overcome, and generalised of findings of this research. This was then followed by the recommendations for further research to be conducted in the future (see Section 8.7). This research has provided an important outcome regarding the design of desert dwellings. Moreover, has provided a future perspective for the sustainability of desert dwellings and contributed to the sustainable spatial development of the historical towns of Southwest Libya.

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APPENDICES

APPENDIX 1 : PARTICIPANTS INVITATION LETTER

School of the Built Environment
The University of Salford
Manchester
M5 4WT

December, 2015

SUBJECT OF STUDY

A Study of Socio-cultural architecture features for vernacular and contemporary desert dwellings in Southwest Libya

My name is Anwar Elhassi a PhD candidate at the School of the Built Environment, University Salford, UK. I am currently undertaking a study into architecture field in desert dwellings design sector in Southwest Libya to improve the socio-cultural sustainability for desert dwellings design.

The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. In this context, socio-cultural architectural features may be explained from a social and cultural sustainability perspective to develop the sustainable desert dwellings design through the integration of the cultural and social characteristics of both the vernacular and contemporary desert dwellingsfor this regard, I have been designing a set of questions to identify your opinion's views about the vernacular and contemporary dwellings design in terms of socio-cultural features in Southwest Libya, and moreover, your views about the steps to follow in developing sustainable desert dwellings design in Southwest Libya. The questions of interview is designed to take about 45 minutes to complete and it considered an significant contribution to this study.

I will be very glad if you could confirm your participation in this study through the above contact. While thanking you for accepting to participate in this study, your views and contributions are highly expected. I would like also to inform you that I have taken all steps to protect the content of this information and will be kept confidential and be used for only the purposes of this research.

Many thanks

Yours sincerely,
Anwar A Elhassi (PhD Student)
Email: A.El-Hassi@edu.salford.ac.uk

University of Salford MANCHESTER

APPENDIX 2: PARTICIPANT INFORMATION SHEET

Thesis Title: The Socio-cultural architecture features of vernacular and contemporary dwellings for sustainable desert dwellings design in Southwest Libya

Name of Researcher: Anwar A Elhassi

The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya. Your participation in this research contributes to the development to formulate a set of guidelines in desert dwellings sector in historical towns in Southwest Libya to help improve and sustainability of desert dwellings design in terms of socio-cultural needs, and this is considered to be beneficial for dwellings sector in Southwest Libya. This research poses no social or physical, mental risks to participants as it does not require use any dangerous materials.

The interview process is expected to last about 45 minutes. The interviewees shall be allowed to withdraw their participation from this research at any time they want to do that. The information provided prior to withdrawal from the interview process will immediately destroyed. All the information which provided from participants will use for only the intent of this study and kept securely for the duration of this study.

The interviewees will be informed regarding the issues of protection and confidentiality of the information they will provide for this research including the data collected and anonymity of the participants. The participant can gain further information regarding this study through contacting directly with Prof. Hisham Elkadi the Dean of School of the Built Environment, University of Salford, Uk, M5 4WT who is supervising this research.

Anwar A Elhassi (PhD Candidate)
Email: A.El-Hassi@edu.salford.ac.uk

Prof. Hisham Elkadi (Supervisor)
Email: H.Elkadi@salford.ac.uk

APPENDIX 3: PARTICIPANT CONSENT FORM

Title of research : The Socio-cultural architecture features of vernacular and contemporary dwellings for sustainable desert dwellings design in Southwest Libya

Name of Researcher: Anwar A Elhassi
Contact of Researcher: A.El-Hassi@edu.salford.ac.uk

School of the Built Environment
The University of Salford
Manchester
M5 4WT

Statement	Please tick in appropriate place		
	Yes	NO	N/A
I have read and understood the project Information sheet for the above research			
I agree to take part in the project and this participation to the project will include being interviewed and audio-recorded.			
I understand that taking part in the research interview and the tape recording which I agree with it			
I understand that I take part as a volunteer: hence, I can withdraw from the study at any time and I do not have to give any reasons for why I no longer want to be involve			
I understand that information provided by me and my personal details will not be revealed to people outside the research, and my name kept anonymous			
I understand that my words may be quoted in publications, reports, web pages, and other research outputs			

Name of Participant:……Date……Signature:……

Name of Researcher:……Date……Signature:……....

Research Supervisor

Prof. Hisham Elkadi
H.Elkadi@salford.ac.uk
School of the Built Environment
The University of Salford
UK
M5 4WT

APPENDIX 4: QUESTIONNAIRE SURVEY

School of the Built Environment
The University of Salford
Manchester
M5 4WT

Dear/ The participant in Ghadames, Sabha and Ghat

My name is Anwar Elhassi a PhD candidate at the School of the Built Environment, University Salford, UK. I am currently undertaking a study into architecture field in desert dwellings design sector in Southwest Libya to improve the socio-cultural sustainability for desert dwellings design.This will be performed through measuring your level of satisfaction and preferences, regarding of existing dwellings in your regions, for both vernacular and contemporary desert dwellings design.

In this context, the following questionnaire survey is one of important part of data collection sources of this study and to achieve the aims and objectives of research, whereby the socio-cultural architectural features may be explained from a social and cultural sustainability perspective to develop the sustainable desert dwellings design, through the integration of the cultural and social characteristics of both the vernacular and contemporary desert dwellings for this regard. I have been designing a set of questions to identify your opinions about the vernacular and contemporary dwellings design in your region, in terms of socio-cultural features, and moreover identify your views about your desires required in dwellings design in future, and your opinion for involvement in design process. The study aim to improve the socio-cultural sustainability for desert dwellings design and help the architects, planners and designers to implement appropriate sustainable design which will satisfy the population needs. I would like also to inform you that I have taken all steps to protect the content of this information and will be kept confidential and be used for only the purposes of this research.

Please put tick in boxes in every sections, ☐ which suitable with your choice.

1. Respondents description

This section aimed to know initial information on the participants.

Town name:.....

Sample No:.....

1.1 Gender:

Male ☐ Female ☐

1.2 The age of the respondent (Three age group) :

18-24 ☐ 25-50 ☐ over 50 ☐

1.3 The marital status:

Single ☐ Married ☐ Divorced ☐ Widowed ☐

1.4 Level of education:

Uneducated ☐ primary school level ☐ high school level ☐

University level ☐ postgraduate level ☐

1.5 The profession:

Employee ☐ Student ☐ Technical ☐

Unemployed ☐ Retired ☐

1.6 Your family structure:

Small Family ☐ Extended Family ☐ Others (Please specify your answer) ☐

1.7 The number of your family members:

2 ☐ 3-4 ☐ 5-8 ☐ over 8 ☐

1.8 Place of birth of the respondent:

In the region (Ghadames, Sabha and Ghat) ☐ Outside the region ☐

2. Vernacular architecture for desert dwellings VDD

This section aimed to know your point of view about the vernacular desert dwellings to determine the information that assist to the comparison between it and the current contemporary desert dwellings.

2.1 Which types of vernacular dwellings in your region?

Vernacular compact dwelling ☐ Vernacular courtyarddwelling ☐

Other (Please specify your answer) .....

2.2 The number of rooms that usually find in most in the vernacular dwellings?

1. The number of bedrooms:
One ☐ Two ☐ Three ☐ Four ☐ More than four ☐
2. The number of living rooms:
Zero ☐ One ☐ Two ☐ Other ☐
3. The number of guest rooms:
Zero ☐ One ☐ Two ☐ Other ☐
4. The number of bathrooms:
One ☐ Two ☐ Other ☐
5. The number of kitchens:
Zero ☐ One ☐ Two ☐

2.4 What the nationality of builders, who built the vernacular dwellings if you know?

Foreigners ☐ local ☐ Combination ☐

3. Contemporary desert dwellings CCDD

This section aimed to know your point of view about your contemporary desert dwellings to determine the information that assist to the comparison between it and your point of view about the vernacular desert dwellings.

3.1 Currently, Which type of dwelling do you live in?

Contemporarydwelling ☐ Single-storey villa ☐ Villa two-storey or more ☐

Flat in Building ☐ Other (Please specify your answer) .....

3.2 Number of rooms in your current dwelling?

1. The number of bedrooms:
One ☐ Two ☐ Three ☐ Four ☐ More than four ☐
2. The number of guest rooms:
Zero ☐ One ☐ Two ☐ Other ☐
3. The number of living rooms:
Zero ☐ One ☐ Two ☐ Other ☐
4. The number of bathrooms:
One ☐ Two ☐ Other ☐
5. The number of kitchens:
One ☐ Two ☐ Other ☐

3.3 What the nationality of builders, who built the dwelling if you know?

Foreigners ☐ local ☐ Combination ☐

4. Comparison among the vernacular and contemporary desert dwelling

Below different aspects of socio-cultural sustainability features which related to the desert dwellings design, where we need to know your degree of satisfaction with both vernacular and contemporary desert dwellings for those features.

Measurement will be from five levels of satisfaction and according to Likert scale as the following order;

(1.Very Satisfied) (2. Satisfied) (3.Neutral) (4. Dissatisfied) (5. Very dissatisfied)

4.1 Privacy of dwelling in terms of:	Vernacular desert dwellings					Contemporary desert dwellings				
	1	2	3	4	5	1	2	3	4	5
1. Visual privacy in the dwelling;	○	○	○	○	○	○	○	○	○	○
2. Acoustic privacy in the dwelling;	○	○	○	○	○	○	○	○	○	○
3. Privacy around the dwelling;	○	○	○	○	○	○	○	○	○	○
4. Privacy of sleeping spaces;	○	○	○	○	○	○	○	○	○	○
5. Interior spaces organisation;	○	○	○	○	○	○	○	○	○	○

4.2 Safety and security of dwelling in terms of:	Vernacular desert dwellings					Contemporary desert dwellings				
	1	2	3	4	5	1	2	3	4	5
1. Safety and security of dwelling;	○	○	○	○	○	○	○	○	○	○
2. Safety around the dwelling;	○	○	○	○	○	○	○	○	○	○
3. Family safety;	○	○	○	○	○	○	○	○	○	○
4. Safety of location;	○	○	○	○	○	○	○	○	○	○

4.3 Shape and design of dwelling in terms of:	Vernacular desert dwellings					Contemporary desert dwellings				
	1	2	3	4	5	1	2	3	4	5
1. Area of dwelling;	○	○	○	○	○	○	○	○	○	○
2 Dwelling location;	○	○	○	○	○	○	○	○	○	○
3. Windows and doors, shape;	○	○	○	○	○	○	○	○	○	○
4. Quality of external facades;	○	○	○	○	○	○	○	○	○	○

4.4 Social considerations and religious beliefs in terms of:	Vernacular desert dwellings					Contemporary desert dwellings				
	1	2	3	4	5	1	2	3	4	5
1. Family relation;	○	○	○	○	○	○	○	○	○	○
2. Relationship with neighbours;	○	○	○	○	○	○	○	○	○	○
3. Social relation;	○	○	○	○	○	○	○	○	○	○
4. Relationship with religious places;	○	○	○	○	○	○	○	○	○	○

Please, the following choices only for the first age group (18-24):

4.5 Identity and cultural heritage of dwelling in terms of:	Vernacular desert dwellings					Contemporary desert dwellings				
	1	2	3	4	5	1	2	3	4	5
1. Identity and self-expression;	○	○	○	○	○	○	○	○	○	○
2. Cultural identity;	○	○	○	○	○	○	○	○	○	○
3. Link with the collective memory of place;	○	○	○	○	○	○	○	○	○	○
4. Compatibility with custom and tradition;	○	○	○	○	○	○	○	○	○	○

4.6 Contemporary lifestyle in terms of:	Vernacular desert dwellings					Contemporary desert dwellings				
	1	2	3	4	5	1	2	3	4	5
1. Compatibility of elements for finishes with nature of lifestyle;	○	○	○	○	○	○	○	○	○	○
2. Keeping up with contemporary socio-cultural developments;	○	○	○	○	○	○	○	○	○	○
3. Keeping up with modern technology used during daily activities;	○	○	○	○	○	○	○	○	○	○

4.7 Do you think that the form of the current desert dwellings are reflect the identity, the history of the desert communities and unique architecture of the vernacular desert dwellings?

Yes ☐ No ☐ I don't Know ☐

4.8 The Dwelling reflects some of the aesthetic values and wealth capabilities of its inhabitant, do you feel that your dwelling express anything about your lifestyle and personality?

Yes ☐ No ☐ I don't Know ☐

4.9 In your view which of the following distinguishes the vernacular architecture identity in Southwest Libya?

Human scale in the vernacular dwellings ☐
Homogeneity of elevations of dwellings ☐
The internal design of dwellings ☐
The existence of courtyard ☐
Simple design with similar shape and color ☐
Architectural landscape of dwellings ☐

5. Significance of socio-cultural architectural features to the sustainable desert dwellings design

This section aimed to know the significance of socio-cultural sustainability architectural features for you.

5.1Do you think that is important for you that your dwelling design in future will be compatible with your socio-cultural and your lifestyle and why?

Yes ☐ No ☐ I don't Know ☐

If Yes please give the reason.....

5.2 Do you think that the compatible of your dwelling with your socio-cultural needs make you sense of well-being and enhancement of life quality?

Yes ☐ No☐ I don't Know ☐

If Yes please give the reason.....

5.3 Do you think that the interconnection of the following features in your dwelling will provide a comfortable in appropriate functional spaces in your dwelling?

Interior decoration expresses your culture and identity	Yes ☐	No ☐	I don't Know☐
Interior spaces are in line with your modern lifestyle	Yes ☐	No ☐	I don't Know☐
Facades of dwelling are compatible with place identity	Yes☐	No ☐	I don't Know☐
Perimeter of the dwelling is harmonious with the environment	Yes ☐	No ☐	I don't Know☐

6. Desires required in dwellingsdesign, and involvement the opinion of the respondents

This section aims to find out the desires required in your dwelling, that can support integration with socio-cultural sustainability and your lifestyle and the importance of engaging the views of different generations about their preferences and contribute to the design process for their dwellings in future.

6.1 Do you think that your current dwelling design affect your lifestyle in any way?

Yes ☐ No ☐ I don't Know ☐

6.2 If your answer yes, Do you prefer to do some changes in your current dwelling regarding to the socio-cultural sustainability, in order to be your dwelling compatible with your lifestyle and with your socio-cultural needs?

Yes ☐ No ☐

6.3 If your answer yes, please let me know the most important changes you need to do in your current dwelling in terms of the socio-cultural architecture features? You can use the options below please

A. Changes in the interior design. Converting or adding rooms ☐ Changing decoration and colours ☐
Changing the size, organisationof spaces ☐ Changing the level of dwelling ☐

B. Changes in the external design. Closing openings or balconies ☐ Adding walls, iron door, curtains ☐
Adding some new elements ☐ Adding gardening and green areas ☐

C. Any other change you prefer to carried out (Please add.....)

6.4 What inspired you to request these desired changes?

Not enough privacy ☐ Small space in dwelling ☐
To be more safety ☐ To be compatible with myculture ☐
To be compatible with your lifestyle ☐ To be compatible with modern technology ☐

Or mention other reasons if you like please.....

6.5 In terms of socio-cultural architecture features and your lifestyle, which type of dwelling would you prefer to dwell in if you had the option to choose? Please give reasons for your answer.

Modern combination pattern with garden ☐ Vernaculardwelling ☐
Contemporary private dwellings ☐ Contemporary courtyard dwelling ☐
Flat in Building ☐

6.6 Are you wish to contribute in the design process in your new dwelling in future?

Yes ☐ No ☐ I don't Know ☐

Mention the reasons if you like please.....

6.7 Do you have any comments or suggestions about future desert dwelling design in your region?
.....

Thank you for your participation

الاستبيان باللغة العربية

يرجي وضع علامة في المربع ☐ للاجابة علي كل سؤال وفق الظروف التي تنطبق علي وضعك.

القسم الأول:معلومات عامة

أنا مهتم بمعرفة بعض الأشياء عنك وأفراد عائلتك من شأنها أن تساعدنا على تصنيف ردودكم من اجل الدراسة التحليلية.

العنوان:.....

العينة رقم:.....

س1: الجنس.

ذكر ☐ أنثي ☐

س2: المجموعة العمرية.

24-18 ☐ 50-25 ☐ أكثر من 50 ☐

س3: الحالة الاجتماعية.

أعزب/ة ☐ متزوج/ة ☐ مطلق/ة ☐ ارمل/ة ☐

س 4: المستوي التعليمي.

غير متعلم ☐ تعليم إبتدائي ☐ تعليم ثانوي ☐ جامعي ☐ دراسات عليا ☐

س 5: المهنة.

موظف ☐ طالب ☐ تقني ☐ عاطل عمل ☐ متقاعد ☐

س 6: هيكل الاسرة.

أسرة مصغرة ☐ أسرة ممتدة ☐

س 7: عدد الاشخاص في الأسرة.

2 ☐ 3-4 ☐ 5-8 ☐ أكثر من 8 ☐

س 8: مكان الميلاد.

في المنطقة ☐ خارج المنطقة ☐

القسم الثاني:معلوماتك حول المساكن العامية في منطقتك.

س .هذا القسم يهدف إلى معرفة وجهة نظرك حول المساكن الصحراء العامية لتحديد المعلومات التي تساعد على المقارنة بينه وبين

9: ماهو نوع السكن القديم في منطقتك؟

مسكن تقليدي متضام ☐ مسكم تقليدي مع فناء داخلي ☐

مسكن أخر .....

س 10:تحت اي من الفئات التالية تصنف مسكنك السابق من حيث مواد البناء

مبني بالحجر والطين ☐ الطين والخشب ☐ الاسمنت والخرسانة ☐

س 11: عدد الغرف في مسكنك السابق.

1. عدد غرف النوم

1 ☐ 2 ☐ 3 ☐ 4 ☐ أكثر من 4 ☐

2. عدد غرف الضيوف.

0 ☐ 1 ☐ 2 ☐ أخري ☐

3. عدد غرف المعيشة.

0 ☐ 1 ☐ 2 ☐ أخري ☐

4. عدد الحمامات.
1 ☐ 2 ☐ أخري ☐

5. عدد المطابخ.
1 ☐ 2 ☐ أخري ☐

س 12: ما هي جنسية البناؤن الذين بنو المساكن العامية في منطقتك اذا كنت تعرف؟
أجانب ☐ محليين ☐

القسم الثالث:معلومات حول سكنك المعاصر:
هذا القسم يهدف إلى معرفة وجهة نظرك حول المساكن الصحراء المعاصر الحالية لتحديد المعلومات التي تساعد على المقارنة بينه وبين وجهة نظرك حول المساكن الصحراء العامية

س13: ما هو نوع المسكن الذي تسكنه حاليا

مسكن معاصر☐ فيلا سكنية ☐ فيلا دورين ☐ شقة في عمارة سكنية ☐
مسكن أخر .....
س14: كم عدد الغرف في مسكنك الحالي؟

1. عدد غرف النوم
1 ☐ 2 ☐ 3 ☐ 4 ☐ أكثر من 4 ☐
2. عدد غرف الضيوف.
0 ☐ 1 ☐ 2 ☐ أخري ☐

3. عدد غرف المعيشة.
0 ☐ 1 ☐ 2 ☐ أخري ☐

4. عدد الحمامات.
1 ☐ 2 ☐ أخري ☐

5. عدد المطابخ.
1 ☐ 2 ☐ أخري ☐

س 15: ما هي جنسية البناؤن الذين بنو مسكنك الحالي؟
أجانب ☐ محليين ☐

القسم الرابع:مقارنة بين المساكن العامية والمعاصرة:
فيما يلي جوانب مختلفة من الميزات الاجتماعية والثقافية المستدامة التي تتعلق بتصميم المساكن الصحراء، حيث أننا بحاجة إلى معرفة مدى رضاكم مع كل من المساكن الصحراء العامية والمعاصرة لتلك الميزات

1. راضي جدا 2.راضي 3. محايد 4 . غير راضي 5 .غير راضي جدا

س16:الخصوصية من حيث	المسكن العامي					المسكن المعاصر				
	1	2	3	4	5	1	2	3	4	5
1.الخصوصية البصرية										
2. الخصوصية السمعية										
3. الخصوصية حول المسكن										
4. الخصوصية في غرف النوم										
5. خصوصية التصميم الداخلي										

س17:الامن والامان من حيث	المسكن العامي					المسكن المعاصر				
	1	2	3	4	5	1	2	3	4	5
1.سلامة وامن المسكن										
2. السلامة حول المسكن										
3. سلامة الاسرة										
4. سلامة الموقع										

س18:شكل وتصميم المسكن من حيث	المسكن العامي					المسكن المعاصر				
	1	2	3	4	5	1	2	3	4	5
1.مساحة المسكن										
2. موقع المسكن										
3. حجم عناصر المسكن(الابواب والشبابيك..)										
4. جودة تشطيبات الواجهات										

س19:الاعتبارات الاجتماعية والدينية من حيث	المسكن العامي					المسكن المعاصر				
	1	2	3	4	5	1	2	3	4	5
1.العلاقة الاسرية										
2. العلاقة مع الجيران										
3. العلاقات الاجتماعية										
4. العلاقة مع المرافق الدينية										

س 20: هذا السؤال خاص بالفئة العمرية الاولي 24-18

س20:الهوية والتراث الثقافي من حيث	المسكن العامي					المسكن المعاصر				
	1	2	3	4	5	1	2	3	4	5
1.الهوية والتعبير عن الذات										
2. الهوية الثقافية										
3. الارتباط مع المكان										
4. توافق العادات والتقاليد										

س21:الهوية والتراث الثقافي من حيث	المسكن العامي					المسكن المعاصر				
	1	2	3	4	5	1	2	3	4	5
1.التوافق من عناصر التشطيبات مع طبيعة الحياة										
2. مواكبة التطورات الاجتماعية والثقافية										
3. مواكبة التكنولوجيا الحديثة										

س 22: هل تعتقد أن شكل المساكن الصحراوية الحالية يعكس هوية وتاريخ وعراقة المجتمعات الصحراوية ونمط العمارة الفريد للمساكن الصحراوية التقليدية ؟

نعم ☐ لا ☐ لادري ☐

س 23 : المسكن يعكس بعض القيم الجمالية وقدرات ثروة من ساكن فيها، هل تشعر بأن ما تتمتعون به مسكن يعكس شيء عن نمط حياتك وشخصيتك؟

نعم ☐ لا ☐ لادري ☐

س 24 : من وجهة نظرك والتي من التالية يميز هوية العمارة العامية المستدامة في جنوب غرب ليبيا؟

المقياس البشري في مساكن التقليدية ☐
تجانس ارتفاعات المساكن ☐
تصميم الداخلي للمنازل ☐
وجود فناء داخلي ☐
تصميم بسيط مع شكل ولون مشابه ☐
المشهد المعماري للمساكن ☐

القسم الخامس: أهمية ميزات الاستدامة الاجتماعية والثقافية المعمارية للمساكن الصحراوية المستدامة:

هذا القسم يهدف إلى معرفة أهمية المزايا المعمارية الاجتماعية والثقافية المستدامة بالنسبة لك

س25: هل تعتبر توافق مسكنك الحالي مع الميزات الاستدامة الثقافية والاجتماعية مهما ولماذا؟

نعم مهما لانها تعبرعن ثقافتي وهويتي ☐ لا ليس مهم ☐ لا ادري ☐

س 26: تعتقد أن تتوافق من مسكنك مع الاحتياجات الاجتماعية والثقافية الخاصة بك تجعلك تشعر بالسعادة وتعزيز جودة الحياة؟

نعم ☐ لا ☐ لادري ☐

إذا كانت الإجابة بنعم يرجى ذكر السبب :.....

س27: هل تعتقد أن الربط بين الميزات التالية في المسكن الخاص بك سوف توفر راحة في الأماكن الوظيفية المناسبة في مسكنك؟؟

التصميم الداخلي يعبر عن هويتك وثقاتك	نعم ☐	لا ☐	لادري ☐
متوافق مع الحياة العصرية	نعم ☐	لا ☐	لادري ☐
الواجهه متوافقة مع هوية المكان	نعم ☐	لا ☐	لادري ☐
المسكن متلائم مع البيئة الخارجية	نعم ☐	لا ☐	لادري ☐

القسم السادس: الرغبات المطلوبة في تصيم المساكن المستقبلية، وإشراك اراء الناس:

ويهدف هذا القسم لمعرفة الرغبات المطلوبة في مسكنك، التي يمكن أن تدعم التكامل مع الاستدامة الاجتماعية والثقافية ونمط حياتك وأهمية إشراك وفق وجهات نظر أجيال مختلفة حول تفضيلاتهم والمساهمة في عملية تصميم مساكنهم في المستقبل

س 28: هل تعتقد أن تصميم مسكنك الحالي يؤثر على أسلوب حياتك بأي شكل من الأشكال ؟

نعم ☐ لا ☐ لا ادري ☐

س 29: هل تفضل أن تفعل بعض التغييرات في المسكن الحالي بشأن لاستدامة الاجتماعية والثقافية، من أجل أن يكون لديك مسكن متوافق مع نمط حياتك ومع الاحتياجات الاجتماعية والثقافية الخاصة بك؟

نعم ☐ لا ☐

س 30: إذا كان الجواب نعم، واسمحوا لي أن أعرف أهم التغييرات ما عليك القيام به في المسكن الحالي من حيث ميزات العمارة الاجتماعية والثقافية؟ يمكنك استخدام الخيارات أدناه الرجاء

ا. تغييرات في التصميم الداخلي للمسكن :

تحوير واضافة غرف ☐ تغيير الديكور والالوان ☐

تغيير حجم واتجاه بعض الغرف ☐ تغيير المستويات ☐

ب. تغيير في التصميم من الخارج

غلق او فتح شرفات ☐ اضافة حوائط او ستائر ☐

تغيير لون او بعض العناصر ☐ زراعة مناطق خضراء ☐

س 31: ما الذي دفعك إلى طلب هذه التغييرات المطلوبة؟

الخصوصية لا تكفي ☐ مساحات المسكن صغيرة ☐

لتكون اكثر سلامة ☐ لتكون اكثر موافقة مع ثقافتي ☐

للتوافق مع نمط حياتي ☐ لتوافق التكنولوجيا الحديثة ☐

اي تغييرات أخري(نأمل اعطاء تفاصيل).....

س 32: من حيث الخصائص المعمارية الاجتماعية والثقافية ونمط حياتك، أي نوع من مسكن تفضل الخوض في ذلك، إذا كان لديك الخيار لتختار؟ يرجى إعطاء أسباب إجابتك

مسكن ذو نمط مزيج ومعاصر ☐ مسكن تقليدي ☐

مسكن معاصر خاص ☐ فيلا سكنية ☐

مسكن مع فناء وسطي ☐ شقة في عمارة سكنية ☐

س 33: هل تفضل المشاركة في عملية تصميم مسكنك الجديد؟

نعم ☐ لا ☐ لا ادري ☐

اعطي سبب لاجابتك من فضلك:.....

س 34: هل لديك اي تعليقات او اقتراحات حول تصميم مسكن المستقبل؟

.....

شكرا جزيلا علي المشاركة في هذا الاستبيان.

APPENDIX 5: SEMI-STRUCTURED INTERVIEWS GUIDE

Q1: Do you think that contemporary architectural design for desert dwellings in the Southwest Libya, in terms of its suitability with the socio-cultural sustainability and also keep pace with develop of the contemporary lifestyle requirements for youth over the past few years has been:

Very dissatisfied ☐ Dissatisfied ☐ Neutral ☐ Satisfactory ☐ Very Satisfied ☐

In the case of one of the above alternatives, give reasons:.....

Q2: Do you think that the current contemporary desert dwellings design in southwestern Libya are suitable for the current Libyan desert community and express their identity and their cultural heritage of the region? Or has been influenced from other architectural design trends?

Yes ☐ No ☐

If yes, please give reasons.....

If no, please give reasons.....

Q3: What are the advantages and the disadvantages of vernacular architecture for desert dwellings design in terms of socio-cultural sustainability in your opinion?

3.1 The advantages.....

3.2 The disadvantages.....

Q4: How lessons learned from the vernacular architecture, in your opinion can support the integration with the socio-cultural-sustainability features for new desert dwellings design?

.....

Q 5: What are the advantages and the disadvantages of contemporary desert dwellings design, in terms of socio-cultural sustainability in your opinion?

5.1 The advantages.....

5.2 The disadvantages.....

Q6: How can get the benefit from the advantages of contemporary dwellings, in your opinion that can support the integration with the socio-cultural sustainability features for new desert dwellings design?

.....

Q 7: Do you think that the current contemporary architectural desert dwellings design meets the requirements of socio-cultural sustainability and changes of identity and lifestyle for the youth generation in this period and future?

Yes ☐ No ☐

If yes, please give reasons.....

If no, please give reasons.....

Q 8: In the context of socio-cultural sustainability, what do you think regarding to how youth dealing with the identity and what are the most important steps can be taken to healing the new generations with respect to change of identity and keep up with requirements of the contemporary lifestyle?

Q9 : What are the socio-cultural sustainable features for vernacular desert dwellings that can contribute to developing new designing for sustainable desert dwellings in your opinion?

.....

Q10 : What are the socio-cultural features of contemporary architecture that in your opinion can contribute to developing new designing for sustainable desert dwellings?

.....

Q11: What is your vision about the sustainable desert dwellings design, and youth participation in dwellings design in future?

.....

Thank you for your assistance,

.....

أسئلة المقابلة النصف مهيكلة باللغة العربية

س 1 : هل تعتقد أن التصميم المعاصر المعماري للمساكن الصحراوية في جنوب غرب ليبيا، من حيث مدى ملاءمتها مع الاستدامة هي : الاجتماعية والثقافية، وكذلك مواكبة تطوير متطلبات الحياة المعاصرة للشباب على مدى السنوات القليلة الماضية

غير مرضية جدا ☐ غير مرضية ☐ محايد ☐ مرضية ☐ مرضية جدا ☐

في حالة اختيار واحدة من البدائل المذكورة أعلاه، من فضلك وضح السبب:.....

.....

س 2 : هل تعتقد أن تصميم المساكن الصحراوية المعاصرة في جنوب غرب ليبيا هي مناسبة للمجتمع الصحراء الليبية الحالية وتعبرعن هويتهم وتراثهم الثقافي ؟ أو أنها قد تأثرت بأتجاهات تصميمة أخرى؟

نعم ☐ لا ☐

إذا كانت الإجابة بنعم، يرجى إعطاء سبب او اكثر من فضلك:.....

إذا كانت الإجابة لا، يرجى إعطاء سبب او اكثر من فضلك:.....

س 3 : ما هي مزايا وعيوب تصميم المساكن الصحراء العامية من حيث الاستدامة الاجتماعية والثقافية في رأيك؟

المزايا:.....

العيوب:.....

س 4: ما هي أهم الدروس المستفادة من تصميم المساكن العامية في رأيك والتي يمكن ان تدعم التكامل مع مزايا الاستدامة الثقافية والاجتماعية في لتصميم المساكن الجديدة في المناطق الصحراوية؟

.....

س5 : ما هي مزايا وعيوب تصميم المساكن الصحراء المعاصرة من حيث الاستدامة الاجتماعية والثقافية في رأيك؟

المزايا:.....

العيوب:.....

س 6: ما هي المزايا والفوائد الموجودة في تصميم المساكن المعاصرة يمكن استثمارها والاستفادة منها من حيث الاستدامة الاجتماعية والثقافية في رأيك؟

.....

س 7: هل تعتقد أن التصميم المعماري الحالي للمساكن الصحراوية المعاصرة يفي بمتطلبات الاستدامة الاجتماعية والثقافية وهل يسهم في تغييرهوية ونمط الحياة لجيل الشباب في هذه الفترة، والمستقبل؟

نعم ☐ لا ☐

إذا كانت الإجابة بنعم، يرجى إعطاء سبب او اكثر من فضلك:.....

إذا كانت الإجابة لا، يرجى إعطاء سبب او اكثر من فضلك:.....

س 8: في سياق الاستدامة الاجتماعية والثقافية، ما رأيك فيما يتعلق بكيفية تعامل الشباب مع مسئلة الهوية المعمارية وما هي أهم الخطوات يمكن اتخاذها حيال الأجيال الجديدة فيما يتعلق بتغير الهوية وفي نفس الوقت مواكبة متطلبات نمط الحياة المعاصرة؟

.....

س 9: ما هي السمات الاجتماعية والثقافية المستدامة للمساكن الصحراءالعامية التي يمكن أن تسهم في تطوير تصميم جديد للمساكن الصحراء المستدام في رأيك؟

.....

س 10: ما هي السمات الاجتماعية والثقافية المستدامة للمساكن الصحراء المعاصرة التي يمكن أن تسهم في تطوير تصميم جديد للمساكن الصحراء المستدام في رأيك؟

.....

س 11: ما هي رؤيتك حول تصميم المساكن الصحراوية المستدامة من الناحية الاجتماعية والثقافية ومشاركة الشباب في تصميم هذه المساكن في المستقبل؟

شكرا علي مشاركتكم القيمة.....

ملاحظة: المقصود بالاستدامة الاجتماعية والثقافية في هذه الدراسة هو توفر عدة خصائص في تصميم المسكن وهي (الخصوصية- الامن والامان- التوافق مع الاعتبارات الاجتماعية(عادات تقاليد واعراف)- التوافق مع المعتقدات الدينة- التوافق مع الهوية المعمارية- التوافق مع متطلبات الحياة العصرية.

University of Salford MANCHESTER

APPENDIX 6: VALIDATION OF GUIDELINES

School of the Built Environment
The University of Salford
Manchester
M5 4WT

Jun 25, 2017

Dear sir/madam

This the invitation to participate in the validation of guidelines proposed for sustainable desert dwellings design in Southwest Libya

My name is Anwar Elhassi a PhD candidate at the School of the Built Environment, University Salford, UK. I am currently undertaking a study into architecture field in desert dwellings design sector in Southwest Libya to improve the socio-cultural sustainability for desert dwellings design.

The aim of this research is to formulate a set of guidelines for the integration of the socio-cultural architecture features of vernacular and contemporary desert dwellings for sustainable desert dwellings design in Southwest Libya, to help improve and sustainability of desert dwellings design in terms of socio-cultural needs, and this is considered to be beneficial for dwellings sector in Southwest Libya. In this context, the attached guidelines were implemented through a stringent research process. Adopted on mixed method, consisting of questionnaire surveys and semi-structured interviews. Guidelines proposed as shown in the attached Figure consists of four elements that were arrived at through the synthesis of research findings.

The validation process is considered as a significant process in achieving the aim for which guidelines proposed were implemented. Thence, your feedback on the suitability or otherwise is significant in the development of the final version of guidelines proposed. For achieve that, I formulated a set of questions to request your opinion as expert on guidelines proposed as described in the attached questionnaire. I would like also to inform you that I have taken all steps to protect the content of this information and will be kept confidential and be used for only the purposes of this research and you can withdraw your participation at any time you wish to do that.

For more information about this research, please do not hesitate to contact me by the below email

Anwar A Elhassi (PhD Candidate)
Email: A.El-Hassi@edu.salford.ac.uk

Attached (Tables from 7.4 to 7.7) the outlines summary description of the proposed guidelines.

Instructions to the housing experts:

Regarding of the background of guidelines proposed provided, please read the guidelines proposed carefully and answer or tick in the suitable place.

As shown in the table below, please pot tick one answer that describe your view about the implemented guidelines proposed

Describe of the evaluation → / Guidelines specification ↓	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
The guidelines is simple to understandimplementers;					
The contents of guidelines are clear enough;					
Guidelines is applicable in Southwest Libya;					
Guidelines are useful for future sustainable dwelling projects;					
Guidelines are considered as comprehensive;					

Please gave comments or add any point that can be used to improve on guidelines proposed

.....

.....

.....

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.....

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Thank you,

.....

University of Salford MANCHESTER

APPENDIX 7: APPROVE FOR THE ETHICAL FORM

Research, Innovation and Academic Engagement Ethical Approval Panel
Research Centres Support Team
G0.3 Joule House
University of Salford
M5 4WT
T +44(0)161 295 5278
www.salford.ac.uk/

17 December 2015

Dear Anwar,

RE: ETHICS APPLICATION ST15/57 – The Socio-cultural Environment of Traditional and Contemporary Architecture for Desert Dwellings in Southwest Libya

Based on the information you provided, I am pleased to inform you that your application ST 15.57 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

Prof Mohammed Arif

Chair of the Science & Technology Research Ethics Panel
Professor of Sustainability and Process Management,
School of Built Environment
University of Salford
Maxwell Building, The Crescent
Greater Manchester, UK M5 4WT
Phone: + 44 161 295 6829
Email: m.arif@salford.ac.uk

APPENDIX 8: LETTER FROM THE SCHOOL TO TRAVEL TO COLLECT THE DATA

University of Salford MANCHESTER

Professor Hisham Elkadi
Head of School
School of the Built Environment
Maxwell Building
The Crescent
Salford M5 4WT

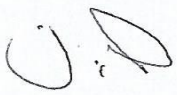
14th July 2015

To whom it may concern

Anwar Elhassi is a PhD Student in the School of the Built Environment, at the University of Salford. His research aims to develop a conceptual framework for the integration of the socio-cultural features of traditional dwellings into the contemporary architecture for desert dwellings in Southwest Libya.

Please provide the assistance in all matters relating to the completion of the field study. Don't hesitate to contact me if you need any further information.

Yours sincerely,



Professor Hisham Elkadi
Head of the School of the Built Environment

APPENDIX 9: PERMISSION FROM LIBYAN EMBASSY IN LONDON FOR TRAVEL TO COLLECT THE DATA

Ministry of Higher Education and Scientific Research
Libyan Embassy – Cultural Attaché
United Kingdom - London

Travel Permission

For: Anwar A Elhassi

Our Ref ** : 9082
@00347268

To whom it may concern

Dear Sir/ Madam,

I ..Prof. Hisham Elkadi.. confirms that the above named has been given permission to travel to ..Libya.. **Start date:** 24/07/2015 **End date:** 6/9/2015
Total of ..45.. Day(s). Also I confirm that the permitted period will not affect his progress of study. If you have any further enquires, please do not hesitate to contact me on:

Supervisor Email*: h.elkadi@salford.ac.uk

Supervisor Office Telephone no*: +44(0)161 295 6807

Regards

Supervisor Signature: ..... **Date:** 8/7/15

Registration office Stamp:

STAMP HERE

University of Salford MANCHESTER
School of the Built Environment
Maxwell Building
Salford, UK M5 4WT
www.sobe.salford.ac.uk

Remarks:

* Compulsory information
** Our reference is the student file number within cultural Attache' Please ask the student.
Please send this to : **Fax: 02075812393** OR via email : **travelpermission@libyanembassy.org**

APPENDIX 10: PUBLISHED PAPERS

Conference papers

ELHASSI, A & ELKADI, H. 2017. TOWARDS SOCIO-CULTURAL SUSTAINABILITY IN DESERT DWELLING DESIGN IN SOUTHWEST LIBYA, SEP 2017.*13th International Postgraduate Research Conference (IPGRC), 13th-15th September 2017 University of Salford.*