A Future for the Past of Desert Vernacular Architecture

Dabaieh, Marwa

2011

A Future for the Past of Desert Vernacular Architecture

Testing a novel conservation model and applied methodology in the town of Balat in Egypt

Marwa Dabaieh

Lund University
Faculty of Engineering - LTH
Department of Architecture and Built Environment

A Future for the Past of Desert Vernacular Architecture

Testing a novel conservation model and applied methodology in the town of Balat in Egypt

Marwa Dabaieh
2011

ISBN 978-91-7740-102-5

Division of Architectural Conservation and Restoration

Department of Architecture and Built Environment

Faculty of Engineering

Lund University

P.O Box 118

SE- 221 00 LUND

Sweden

Photographs by author unless otherwise stated

Layout: Marwa Dabaieh

Cover design: Marwa Dabaieh

English editing: Margaret Newman-Nowicka

Printed by: Media-tryck, 2011

To my beloved Egypt

To my grandmother's soul

Thesis summary

Desert vernacular architecture has always been the product of a sustainable building cycle. People inherited the traditional way of building from their ancestors and the knowledge was transferred and developed from one generation to another. Inhabitants responded to their environment and climate through trial and error in a way that satisfied their needs and aspirations to create a developing building tradition. This natural and cultural cycle is about to disappear in many desert vernacular settlements of the world, and in Egypt as well. Global ambitions and socio-economic development are some of the factors behind inhabitants' deserting their houses, leaving them to deteriorate or demolishing them to build new houses using industrialized materials. People are seeking modern living facilities which respond to needs that their desert vernacular houses sometimes no longer satisfy. As a result of these changes, centuries of accumulated tangible and intangible tacit knowledge is being lost.

The aim of this research is to create a theoretical conservation model for thinking re-vernacular in a contemporary context and to develop a methodology for applying and testing the model. This theoretical model is a tool for conserving desert vernacular and for supporting its continued existence. To fulfill this objective, the research investigated the existing know-how used to design and build desert vernacular architecture in Egypt. The focus was also on how to adjust contemporary desert vernacular housing to contemporary life-style demands while still preserving the beneficial aspects of traditional vernacular techniques. The research applied a practical case study methodology in investigating the town of Balat in the Western Desert of Egypt.

In applying the theoretical conservation model, the research developed several survey methods and tools for documenting not only desert vernacular architecture, but also characterizing urban patterns and building know-how in Balat. To benefit from local know-how, a physical neo-desert vernacular model house was constructed using a transdisciplinary participatory action research method that engaged the local community throughout the design and building phase. The physical model house was a tool for investigating the needs of those living in contemporary desert vernacular houses. The model house was constructed based on an understanding of desert vernacular architecture as well as of the urban fabric and building technology.

In this way, the present research provides a methodology that creates a bridge between sustainable desert vernacular know-how as used for centuries, and contemporary vernacular housing demands. This approach proposes a new perspective for looking at the future of the traditional and contemporary desert vernacular through conservation by modeling. The methodology developed provides a way to benefit from tangible and intangible vernacular values in contemporary and future houses and to ensure the continuation of the natural desert vernacular architecture. The research has also developed a set of recommendations for continuation of further desert vernacular architecture research.

This thesis has potential application for inhabitants of desert vernacular settlements, conservation architects, planners, architects, anthropologists and theorists.

Key words: Architectural conservation, desert vernacular, thinking re-vernacular, transdisciplinarity, participatory action research, neo-desert vernacular, Balat.

Thesis content

Preface

The thesis in hand is about desert spaces and places. It is about dwellings of ordinary people in desert towns and villages. It is about inhabitants who think, design and build with the feeling that they are influencing the environment through the nature of their own homes. It is about earth, mud, clay and local materials. In short it is about buildings we have come to call desert vernacular architecture.

The enthusiasm to work on my thesis started with an interest in vernacular architecture and a fascination with earth construction. As an architect it was always striking to learn how people designed and built vernacular settlements in the past without any technical education and how they produced spectacular complex architectural forms. Moreover their dwellings are still alive today and have managed to survive for centuries.

The decision to study desert vernacular architecture in the Western Desert in Egypt was based on the personal belief that this strikingly vernacular work should be saved from the severe danger and acute risks it is now facing. In the beginning of my work I was advised by senior colleagues not to tackle such problems in the Western Desert in Egypt. They claimed that I am swimming against the stream.

The town of Balat was chosen as a location for my work application. During my four years working with Balat locals, I came to understand that Balat is a place that in addition to farming has harbored many traditional crafts for hundreds of years, including traditions of carpentry, blacksmithing, oil pressing, mud plastering, mud casting and pottery making. Inhabitants who lived harsh and ascetic lives were working and continue to work and build within ancient traditions that personified discipline, persistence, and insistence on perfection. I learned a great deal from these people during my work. I baked, cooked, plastered, cast mud brick and shared with them many social activities as well.

Along the periphery of the compact urban fabric of this little town of Balat there are contrasts and extremes. You feel there is another world with different patterns of identity and spirit, a world of modernity and buildings made of steel and cement instead of traditional materials. People who have built that new world within the vernacular one have created a contrast in which there are fundamental differences between vernacular and contemporary systems of building.

Although the modern concrete built environment is to a large extent brutal to vernacular environments, it contains elements of human ambitions towards a dream for a better future that should be considered when using a vernacular approach. Desert vernacular settlements are a precious past that must be conserved and retained. However, I believe that understanding the past vernacular practice is also a tool for improving the present and future. This belief is the driving force that has kept me working with my thesis.

The above idea started on 2007 and my work has developed until it is accomplished in the present form. I cannot deny that my project has encountered some problems along the way and has sometimes been a tiring process due to lack of accurate maps and at other times lack of documentation. Travelling long distances and staying for long periods in the desert seemed at times to be torture, but now looking back I perceive it as an enjoyable learning experience and a rare chance to get in touch with myself.

Acknowledgment

All praise to almighty Allah the most merciful, most benevolent to man and his actions. This work has been graced by the caring hands and minds of many special people. All of them have contributed something of themselves as thinkers and with their hands as makers and I thank them all.

In particular, I have benefited from the help, support and interest of the great people in the Western Desert of Egypt. I would like to express my most profound gratitude to Balat dwellers who have welcomed me in their homes, graciously accepting my inquisitive presence and giving their generous assistance, collaboration and enthusiasm to the research idea of my study. Thanks to the interviewees for their co-operation in questionnaires and interviews. Special thanks to the Desert Lodge team who made my stay in the oases a comfortable one.

My indebtedness to the Division of Conservation and Restoration, the Department of Architecture and Built Environment at Lund University for giving me the opportunity to write this thesis.

I would like to express my gratitude to my mother-supervisor Professor Kerstin Barup. With her belief in my project, her clear vision on the subject, indefatigable guidance, wise planning and support, the thesis has come to the light of day. She has shared her knowledge and precious time with me. She was not only my supervisor, she shared with me a sense of caring and personal kindness.

I am also indebted to my co-supervisor Professor Bahaa Bakry in Egypt for his guidance. His intellectual directions gave me the way to conduct this research in a systematic way.

To Professor Mats Edström, the head of the Division of Conservation and Restoration, with whom I had fruitful intellectual discussions about the field of conservation, my thanks for your advice during meetings and seminars.

Deep thanks to Margaret Newman who willingly sacrificed her vacation to help in the professional editing of my text. She participated in creating the researcher within. Being one of her students is an honor I will cherish forever.

Sincere thanks to Dr. Alaa El-Habashi for his push in 2009, which was at a critical stage, and a paradigm shift in my academic career. Thanks to Dr. Nairy Hampikian. I will never forget her words, which were fuel for my endless enthusiasm for my research, “Marwa, be the one for Balat and never give up”. Thanks to Dr. Heba Safie for her advice and comments on my very early work drafts. Thanks to Dr. Hossam Mady for his insight and fruitful comments on my work during my final seminar. I am so grateful for Catharina Sternudd and Thorbjörn Laike for their constructive comments during my annual seminars.

Thanks and gratitude to Åsa Sellgren and Hanna Nilsson for their sisterly help with all needed sources from libraries all over Sweden and abroad.

Gratitude should go to all my colleges in the Department of Architecture, especially dear Birgitta, Gunilla and Hans, all my colleges in our Division of Architectural Conservation and Restoration, especially my caring friend Anna, together with Ingela, Jenny and Richard. Those in the HDM division were the best company and most supportive people ever. Lena, Maria, Erik, Laura and Johnny, a million thanks for their kind help. Thanks to all my doctoral colleagues for the fun times we spent together.

I am especially thankful to my mother, my father and my sister, as well as to all of my family members, who endured a great deal of pain and spared me from family activities during my thesis work. Without their cooperation, support, and continuous inspiration, it would have been a tough time for me. I can only send a note of thanks to them for their prayers, patience and untiring support in every way during my long absence from them.

Thanks should go to all my friends in Cairo -GAG’s- especially Noha Mostafa for prayers and caring support. Also Passant Hamza at the Ministry of Urban Planning for providing me with updated information and materials for Balat.

Great thanks go to book authors who wrote long ago about ideas that resonate with my thoughts; they provided me with evidence that enriched my arguments.

"Just as the history of music was concentrated on great classical music while virtually ignoring popular music and the history of literature has concentrated on ancient and modern classics while virtually ignoring the oral tradition, so the history of architecture has concentrated on magnificent structures and virtually ignored the important contribution made by vernacular architecture"

Senosiain Javier, Bio architecture, 2003

1. Background and aim of the study

1.1 Research problem

The concern for conserving vernacular has been expanding recently beyond the confines of antiquarian and nostalgic interest in traditional buildings (Brunskill, 1987), even though the interest has been latent for long periods. The last thirty years has witnessed a revitalized interest in vernacular architecture and a growing awareness of the importance of vernacular conservation (Bourdier & Trinh, 2011). This concern dates back to 1839, when the expression "vernacular architecture" was first used in England (Wells, 1986). After that date, vernacular buildings became more than just objects of ethnographic concern for architectural, historic and cultural disciplines. As Well argued, until that time, vernacular architecture had been neglected as a field of investigation in architectural studies and social sciences while minor concern had been shown for the patterns of human behavior of populations living in vernacular dwellings (Wells, 1986).

ICOMOS announced in 1999 that vernacular buildings were a cultural heritage suffering a great risk of decline or disappearance.[1] Despite this warning, Prieto stated, important vernacular heritage buildings have increasingly disappeared due to the absence of laws to protect them as well as to the impact of urban culture, which is often seen by local populations as the paradigm of progress and development (Prieto, 2005). It was also argued by the global heritage fund in their biennial report in 2009-2010 that the vernacular heritage was threatened either as a result of outside factors such as urban crawl and natural disasters including floods or earthquakes, and as a result of changes in users' perspectives on how they want to live. John May stated that all over the world traditional vernacular architecture is disappearing. He added that it is not only building forms that are disappearing but knowledge, skills and traditions behind the creation of such vernacular buildings (May, 2010).

[1]From the International Council of Moments and Sites (ICOMOS) 12th General Assembly, in Mexico, October 1999. Charter on the built vernacular heritage (1999).

It was argued by the International Committee for Vernacular Architecture (CIAV)[2] that it is part of its very nature for the vernacular heritage to be vulnerable and sensitive to many influences. The committee pointed out that threats come not only from natural disasters, but especially from progress in industry or telecommunications and also from social and economic changes occurring both in modern urban and in the traditional rural areas.

Egypt has had a long history of human settlements since early times. One type of ancient settlement is the desert vernacular settlement. The formation of such settlements was influenced by the natural environment, geography, topography and landscape. Waly mentioned that desert vernacular settlements in Egypt have been undergoing severe physical changes since the mid 20th century (Waly, 1996).

From my on-site investigation it was observed that desert vernacular settlements in the Western Desert of Egypt were facing dramatic problems. Inhabitants in desert vernacular dwellings, for example, are leaving their houses to deteriorate and moving away from their old towns and villages. Others demolish their vernacular dwellings and replace them with houses made from industrialized building material. In some parts of the Western Desert, a tendency has been noted for inhabitants to change their lifestyle-moving into concrete houses or demolishing their traditional ones-without a keen sense of adaptation to change or respect for the inherited values of the regional dwellings.

Today, the existing and remaining desert vernacular architecture in remote communities and settlements in Egypt is about to vanish. There is limited documentation and listing efforts by local authorizes. Traditional desert vernacular settlements are being abandoned, are deteriorating and/or are being demolished intentionally or unintentionally.

One cause of this dilemma lies in a currently adopted norm by some dwellers, especially youth, which is characterized by a lack of appreciation for the facilities in desert vernacular dwellings. The young dwellers have an overwhelming desire to adopt a modern lifestyle. Their response reflects the ambition of youth to attain better living conditions with better facilities such as proper drainage and water systems. The majority of their vernacular dwellings sometimes do not currently fulfill such demands in the way these young people want. However, by entering the stream of urbanization and absorbing westernized concepts, people greatly endanger the continued existence of ethnic desert vernacular architecture in the desert oases in

[2]International Committee for Vernacular Architecture (CIAV) is one of the ICOMOS scientific committees. CIAV's objective is to endorse the research and conservation strategies of Vernacular Architecture, in keeping with ICOMOS' objectives.

Egypt. There is a change in the appreciation of traditional values which is reflected in new views among people in desert areas about how they want to live. It might be argued that these changes are now harming the desert vernacular architecture and traditional structures in Egypt and unfortunately, the causes and course of these changes are currently not sufficiently understood and documented.

From the above it is clear that studying desert vernacular architecture is highly important. This architecture makes up a large portion of the human building heritage and it is facing threats to its continued existence. There is thus an urgent need for research into how measures can and should be taken to save what is left of this valuable architecture. There is also an urgent need to investigate the situation in these desert settlements because the above-mentioned problems are leading rapidly to a catastrophic transformation of desert vernacular architecture in Egypt. The current situation requires an effective conservation methodology and creative action to save desert vernacular architecture.

Figure 1.1 Deterioration of vernacular architecture and replacement of Karshif (salt rocks and clay) vernacular houses with concrete skeleton and fired brick ones in the Siwa oasis.

Figure 1.2 Deterioration of vernacular architecture and replacement of vernacular houses with concrete skeleton and white brick ones in the Baharia oasis.

Figure 1.3 Replacement of mud brick vernacular houses with concrete skeleton ones in the Dakhla oasis.

Figure 1.4 Replacement of mud brick vernacular houses with concrete skeleton ones in the Kharga oasis.

Figure 1.5 Deterioration of vernacular houses and replacement with concrete skeleton ones in the Farafrah oasis.

1.2 Research purpose and objectives

The aim of this thesis is to provide a tool to help to save the future of the currently deteriorating desert vernacular architecture in the Western Desert of Egypt. To fulfil this goal, a theoretical conservation model was developed to assist desert local inhabitants and researchers in areas such as architecture, conservation and desert studies to think re-vernacular in a contemporary context. The model developed is intended as a support for keeping the essence of sustainable aspects of desert vernacular building knowledge. The model was developed and verified through tracing and documenting the desert vernacular building heritage in Balat in the Western Desert in Egypt and then mapping its future continuation and development possibilities.

The main purpose of the research is to bridge the gap between desert vernacular architecture as a heritage and contemporary housing needs in desert vernacular settlements so as to allow for a fit between traditional and contemporary vernacular building values.

Although the practical application of the theoretical conservation model led to the building of a physical model house which was built and tested in the town of Balat, the process was designed for flexibility and easy modification for further relevant or similar applications.

In addition to the primary goals, the research had several secondary objectives:

- Gaining access to what can be described as building know-how and tacit knowledge of desert vernacular architecture, to be used for purposes of documentation and conservation.
- Using the case study to offer a documentation approach to help in understanding the desert vernacular architecture and urban morphology in other similar environments.
- Offering a course of action for working with the vernacular ways of construction so as to raise inhabitants' awareness, pride and sense of belonging to their vernacular dwellings.
- Helping inhabitants adapt their current “wish lists” to a more developed manifestation of their desert vernacular dwellings.
- Applying a transdisciplinary participatory action research method to conserve desert vernacular architecture taking Balat as a test ground.

The diagram below summarizes the thesis goals of developing methods and tools for continuing the use of vernacular wisdom into the future while tackling current needs. It illustrates the links between the past, present and future of vernacular knowledge. Because of these links, it is only possible, in my view, to solve current and future desert vernacular architecture problems if we develop a sustainable desert vernacular in the near future.

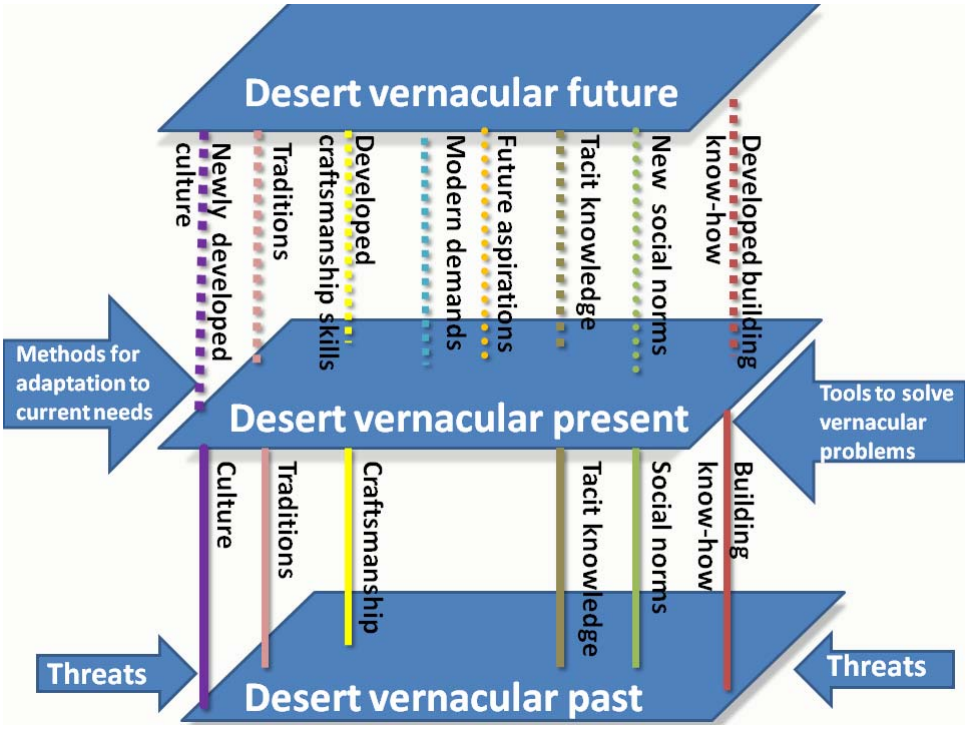


Figure 1.6 The figure shows that the future of desert vernacular is based on the vernacular past and connected to contemporary needs.

The figure below shows the theoretical model approach applied in the case study to develop the practical applications for conserving desert vernacular architecture. The model provided a means of studying the social organization, community behaviour, etc of a desert vernacular community together with its culture, beliefs and other factors that affect the vernacular building outcome, as well as the community life style and shared values. With this model, the architecture and urban formulation are studied together with vernacular building tradition and technology so as to understand the design typology and building know-how process.

Central to the approach was the involvement of local building owners, decision-makers, builders or craftsmen, etc in defining current problems, local criteria and concerns. Their input was central to developing an understanding of the locals' current needs and future building desires. Moreover, the approach allows the sharing of the local tacit knowledge with researchers and practitioners in the area of conservation. Such sharing results in a mutual work experience between the local community, researchers and practitioners in the action project. In this way, the theoretical model provides a means to benefit from the accumulated desert vernacular knowledge and provides a means to create future solutions through understanding problems encountered in the present.

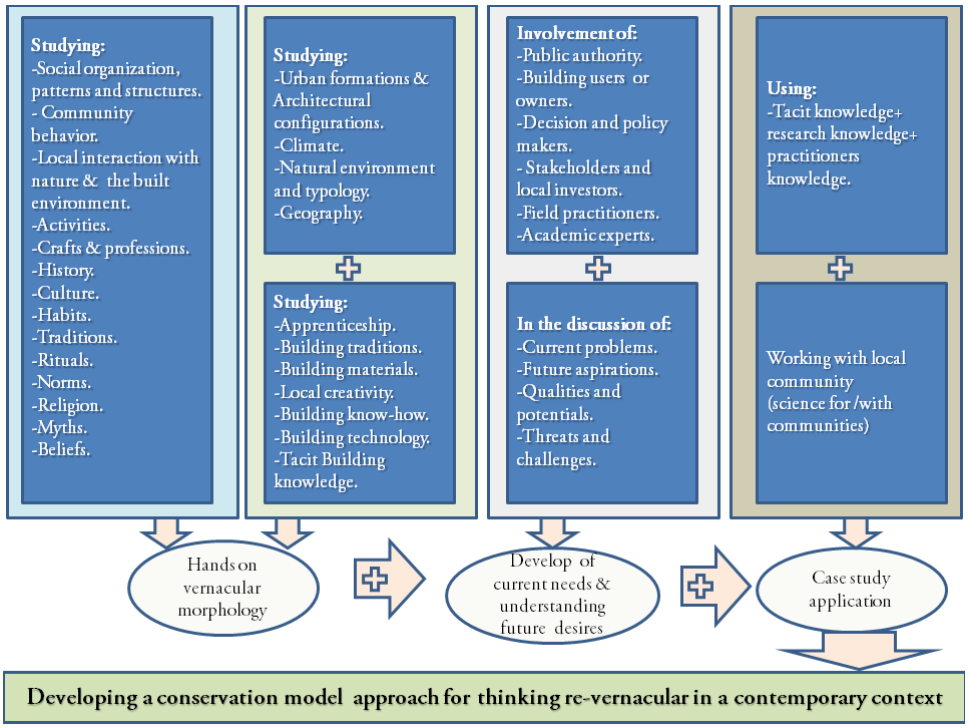


Figure 1.7 Diagram outlining the theoretical conservation model.

1.3 Research questions

The thesis addressed five main research questions:

1-Why is the future existence of desert vernacular architecture in Egypt being threatened?

2- What specific risks is desert vernacular architecture currently facing in the Western Desert in Egypt?

3-What is desert vernacular building tradition know-how, and how can it be documented and adapted to the needs of those living in the desert vernacular dwellings?

4- How can we conserve the future of desert vernacular architecture on a cooperative basis with inhabitants?

5- How can we think re-vernacular in a contemporary context and still preserve the environmental and cost-benefits as well as the picturesque outward appearance of desert vernacular architecture?

1.4 Literature study

A literature study was carried out for the following purposes:

- To gain an overview of the subject (vernacular architecture).

- To categorize literature in support to the research work.

- To draw conclusions as to which literature is of greatest relevance regarding their analysis and approach, their opinions, and their contribution to the research into understanding and developing desert vernacular architecture.

- To identify areas of prior scholarship so as to prevent duplication of effort.

- To place my own work in the context of existing literature.

The literature study was a stepping stone that served to create a knowledge base about the patterns of desert vernacular architecture in general and specifically in Egypt. The study helped in developing a clearer understanding of desert vernacular and in developing a suitable methodology. The sources chosen covered several themes in vernacular architecture research and studies, including history, geography, gender and physical landscape.

The literature study started with the formation of an overview of vernacular architecture in general in different parts of the world, including a study of the definitions of the term as applied in different disciplines. The aim was to understand and to reflect on the influence of culture, traditions, climate and natural environment on the outcomes of vernacular architecture. The main sources used were books such as *Vernacular Architecture: an illustrated handbook* by Ronald Brunskill *and Vernacular Architecture* by Henry Glassie and encyclopedias of particular interest such as *Encyclopedia of Vernacular Architecture of the World* [3] and the *Atlas of Vernacular Architecture of the World* by Paul Oliver et al.

The search was next narrowed down to studies of desert vernacular architecture in different parts of the world. Here, the aim was to discover commonalities and to conduct a methodological analysis of the existing research into desert vernacular environments. The main sources were books such as *The valley of mud brick architecture: Shibām, Tarīm & Wādī Hadramu't* by Salma Samar Damluji and *Spectacular Vernacular-New Appreciation of Traditional Desert Architecture* by Jean-Louis Bourgeois, in addition to scientific journals and forums such as Perspectives in Vernacular Architecture. Also useful sources for this phase were newsletters and conference proceedings.

On reaching the main focus, vernacular architecture in the Western Desert in Egypt, the literature was chosen to provide detailed and specific background on this subject. Of particular interest were different architectural and urban patterns, building materials, building techniques, geography, history, and social and cultural constraints. The main sources were national archives together with books, scientific journals, and government reports and studies. Also included were research projects reports and research publications conducted by universities, foreign missions', and research institutes such as the 'Dakhla Oasis Project' published by Monash University, and site work reports published by the French Institute for Oriental Archaeology in Cairo.

The final phase of the research was to locate updated information about recent, current and ongoing studies on the main focus of the thesis. In this stage, it was deemed important to determine what methodologies, if any, currently exist for dealing with the thesis problem. The literature search targeted masters and PhD dissertations, conference papers, journals, empirical studies, reports on current governmental strategic and planning projects.

---

[3] 1997 three volumes named The Encyclopaedia of Vernacular Architecture of the World by Paul Oliver with 250 other researchers in 80 countries around the world were the first international surveys of vernacular structure and buildings.

This phase of the literature study revealed clearly a need for research in the field of desert vernacular architecture in Egypt, and in the Western Desert specifically. Although there is multidisciplinary research for desert studies in general, there is insufficient focus on desert vernacular architecture, especially given its importance and current precarious situation. Warner stated that "There is a need for further thorough documentation of traditional desert habitats in Egypt before they disappear entirely, swept away by a tide of concrete, steel, fired brick and cheap limestone blocks." (Warner, 2010, p. 1).

Although some research shows the importance of desert vernacular in the Western Desert from a geographical and historical point of view (see Giddy, 1987 & Hanafy, 2006), and other studies focus on establishing their archaeological importance (see Fakhry 1942, 1944, 1973 & 1974 & Kobusiewicz, 2010) or environmental importance (see Gado & Osman, 2010), there is few research in investigating and documenting desert vernacular architecture (see Defilippi, 2006 & Gado et al, 2010) or in conservation and restoration (See Defilippi, 2010, Dakhla Oasis Restoration and Archaeology Project, 2003-2010 & Siwa Oasis Project, 2005). In addition, few informative studies exist about vernacular mud brick building technology (see Schijns, W. and O. Kaper & J. Kila. 2008: *Vernacular Mud Brick Architecture in the Dakhleh Oasis, Egypt.* Dakhleh Oasis Project-Monograph 10). Few individuals are currently concerned with the use of mud brick in archaeological contexts.

Moreover there are limited attempts to carry out research in conservation of contemporary vernacular buildings, to ensure the continued existence of desert vernacular architecture in Egypt, or to develop effective proposals and solutions for protecting this valuable heritage.

1.5 Documentation review

In the beginning of the search for documents in archives, there was difficulty in finding detailed maps with proper scale for urban and architecture survey analysis. It was clear that there was a need to draw an edited updated map for the town of Balat. A land survey was carried out together with using orthorectified digital aerial photos, the most feasible way to produce a digital map. The available maps were used and integrated in this mapping survey. A site survey was conducted to establish an urban study of the current situation in Balat where some updated information was missing. It was also necessary to measure several sample buildings within Balat for architectural analysis. Manual measurements were performed. While laser scanning was used to introduce a new tool for measuring complex vernacular structure, which revealed a possibility to produce accurate measurements for documentation in further future research.

Below are several reliable examples that were found during the search for measured drawings for buildings along the oases. They show the limitations of the sources found.

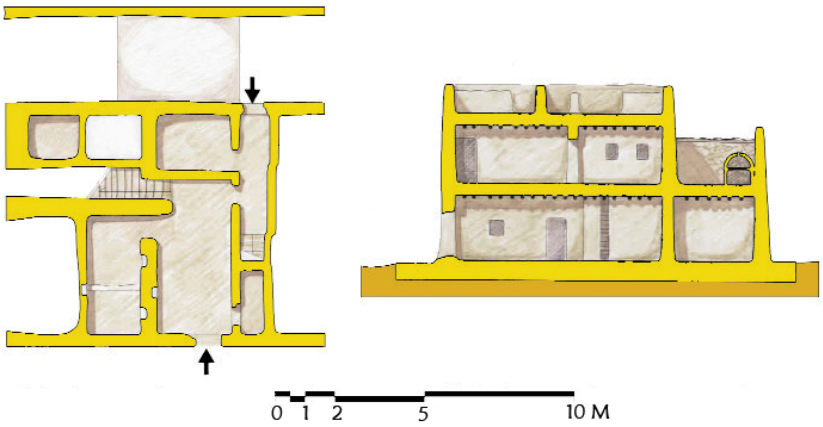


Figure 1.8 Sample of a mud brick house in the Dakhla oasis.
Source: De Filippi Francesca, (2010). *Architettura e culture costruttive a sud del Mediterraneo*. Le città oasi egiziane, Aracne, Politecnico di Torino, Roma.

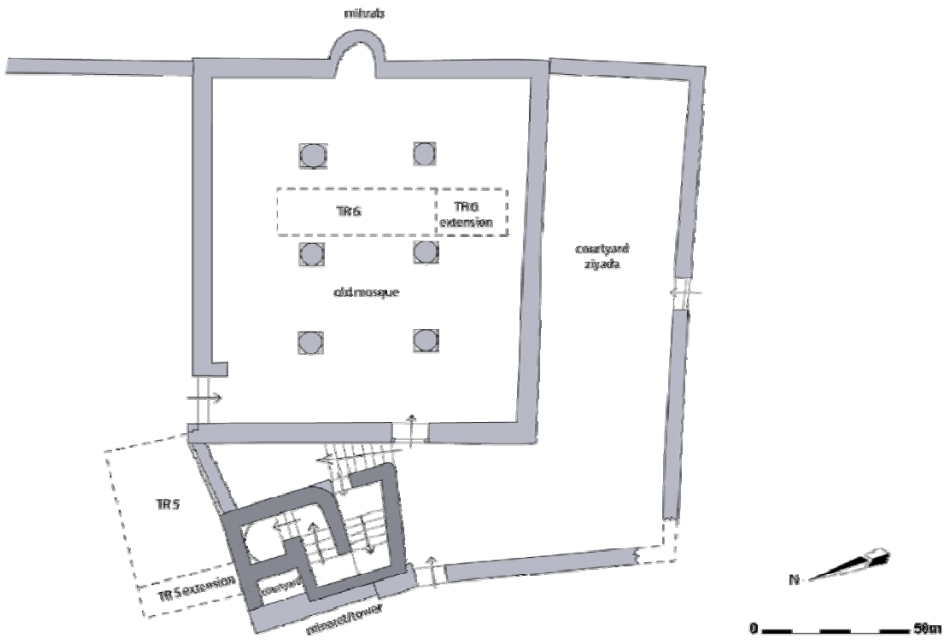


Figure 1.9 Plan of the old mosque in the Al-Qasr in Dakhla oasis.
Source: Dakhla oasis project annual report 2010.

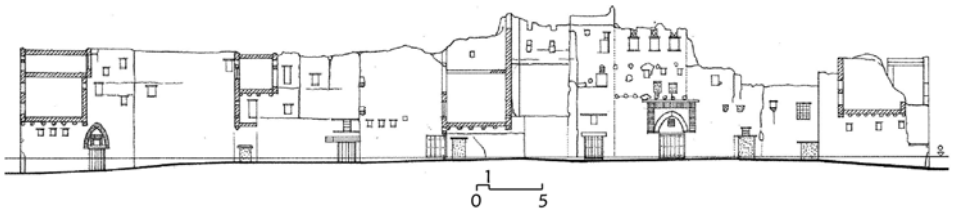


Figure 1.10 Western facades of the Shihabiyya quarter in the Al-Qasr in Dakhla oasis.
Source: Dakhla oasis project annual report 2008.

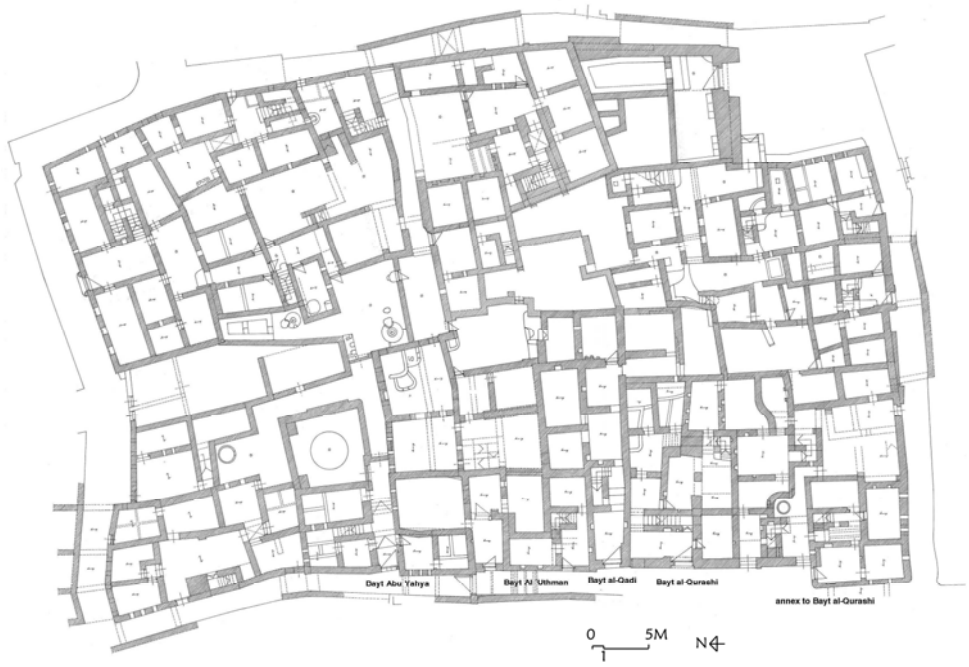


Figure 1.11 A ground floor plan of the Shihabiyya quarter in the old town of Al-Qasr.
Source: Dakhla oasis project annual report 2008.

1.6 Methodology

A case study methodology was chosen for application. Robert K. Yin defines the case study research method as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 1984, p. 23). In this study, I followed a dual approach comprising both descriptive explanatory and exploratory phases.

The first phase in the present study was the explanatory descriptive phase, where site observations, survey and analysis of the current site situation were conducted in addition to a literature search to collect materials on the history of the town of Balat. I felt that site direct observations and survey investigations were important to tackle in this phase, since, according to Yin, direct observations serve as a source of data collection activities and a multiple source of evidence in a case study (Yin, 2009). In this phase questionnaires, walking interviews, field notes, site observations, video filming and photographing were used to collect information, as well as the literature and archive search. In addition, mapping was carried out for the current site situation, as well as manual architectural measurements together with experimenting laser scanning.

To support the study, lab tests were performed for some physical aspects of the mud brick building material to determine properties such as thermal conductivity, water resistivity and compression.

The second phase was the exploratory phase, where a transdisciplinary participatory action research method was applied that involved local inhabitants of the town of Balat. This transdisciplinary participatory action research application resulted in the design and partial construction of a physical neo-desert model house.

In discussion of the case study, both phases are guided by the theoretical conservation model. That is, the theoretical model guided the thinking about the re-vernacular in a contemporary context and was the basis for the practical application.

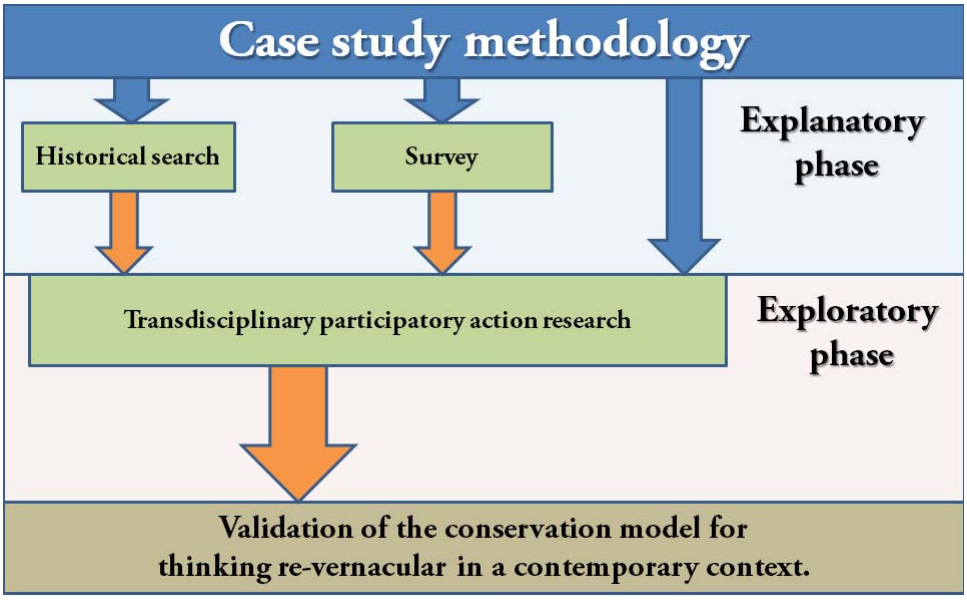


Figure 1.12 Diagram illustrating the case study methodology developed using the theoretical conservation model approach and showing the explanatory and the exploratory phases.

1.7 Scope and limitations

The study mainly encompassed future development possibilities for desert vernacular architecture building know-how. The aim was to help prevent the further loss of desert vernacular architecture knowledge and to encourage this know-how becoming a living part of future building practices. The thesis focused on how the intangible desert vernacular building know-how relates to the tangible desert vernacular architecture. The thesis focus was on mud brick vernacular architecture in Balat. The vernacular architecture and urban fabric in Balat was surveyed to understand the desert vernacular know-how and then to refine the theoretical model and design the practical methodology for its application. The work did not go beyond the implementation of the theoretical model; the aim was to show the feasibility of the theoretical model in a practical application.

1.8 Project background

The Western Desert was the area chosen for this thesis project because of the historic and architecture significance of settlements in the area compared to those in the rest of Egypt such as the Delta of the Nile valley, the Eastern Desert, the Sinai valley, and along the costal line by the Mediterranean and the Red sea. A comparative site study was carried out by conducting on-site visits in the five oases in the Western Desert (Kharga, Dakhla, Siwa, Farafra, and Baharya). Dakhla oasis was selected as the location for the study. The criteria for selection were mainly the historical importance and the significance of the type of vernacular.

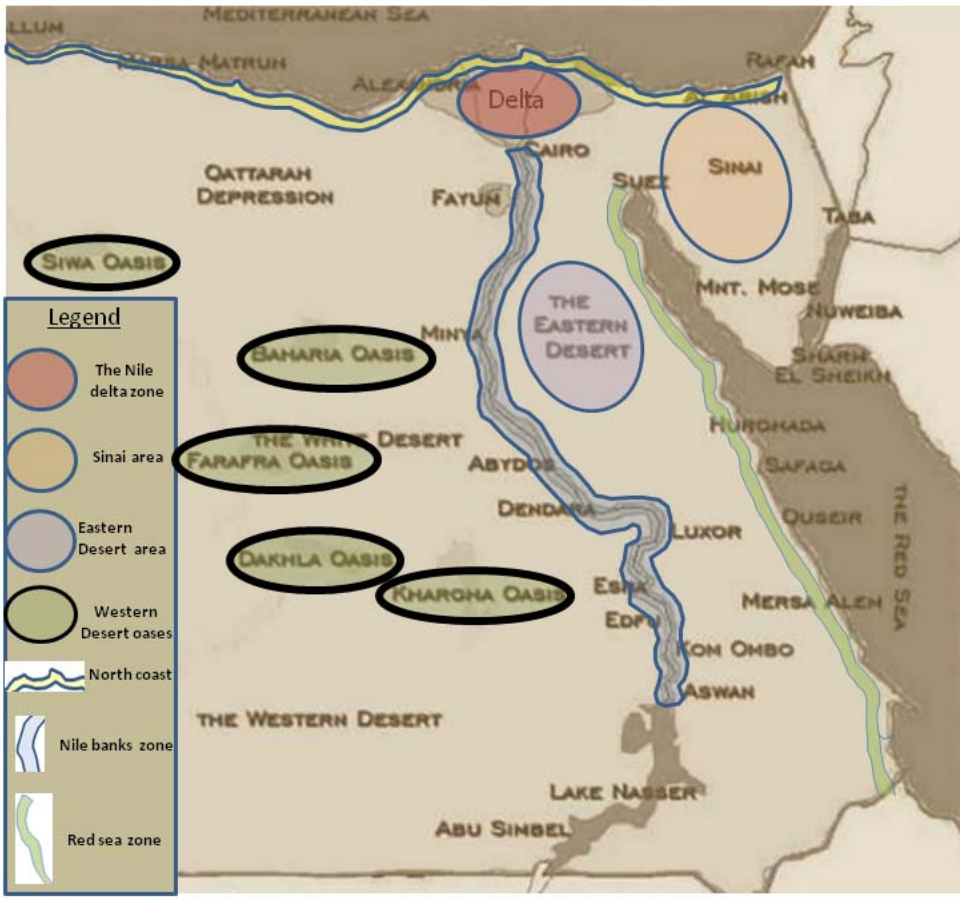


Figure 1.13 Edited map of Egypt showing the location of different vernacular settlements. Main map source: www.Safariegypt.com. Retrieved in May, 2009.

Table 1.1 Compression table showing the criteria for deciding how to select one of the five different desert oases in Egypt for the study.

Following this step was the choice of one of the desert towns in Dakhla on which to conduct the study. The town of Balat was chosen based on a comparative study among desert towns and villages in the Dakhla oasis. The determining criteria for selection were the historical importance, the type of vernacular, aesthetic features, architectural and urban typological significance, the current status of buildings, the degree of vandalism or building deterioration, the percentage of habitation, field safety precautions and the feasibility and accessibility for field survey.

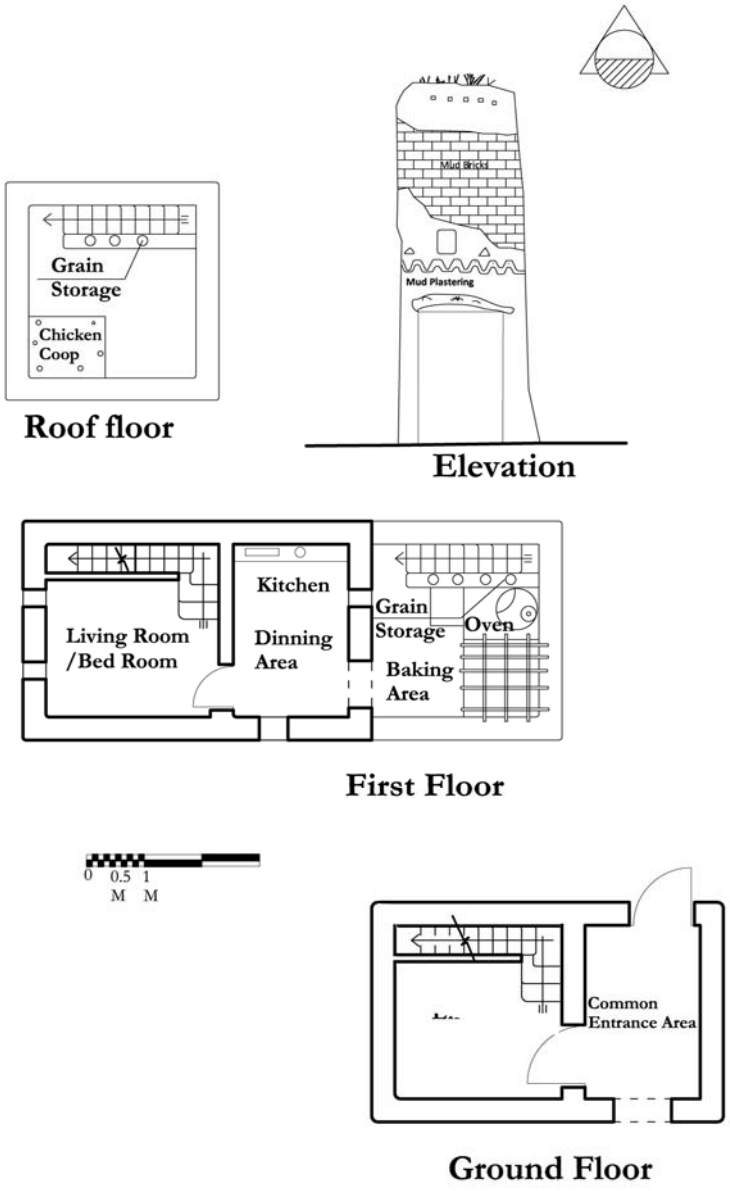


Figure 1.14 A sample of a mud brick house in the Dakhla oasis. Drawn during my site investigation in the early research stages.

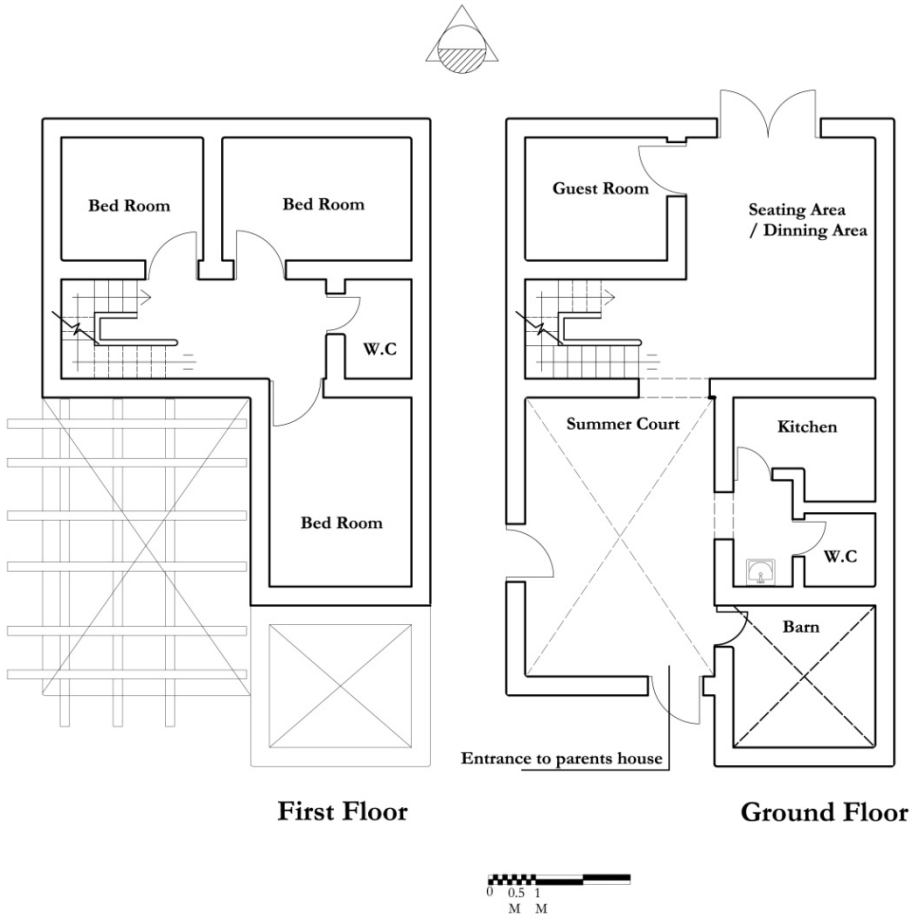


Figure 1.15 Plan for a sample mud brick house in the Farafra oasis. Drawn during my site investigation in the early research stages.

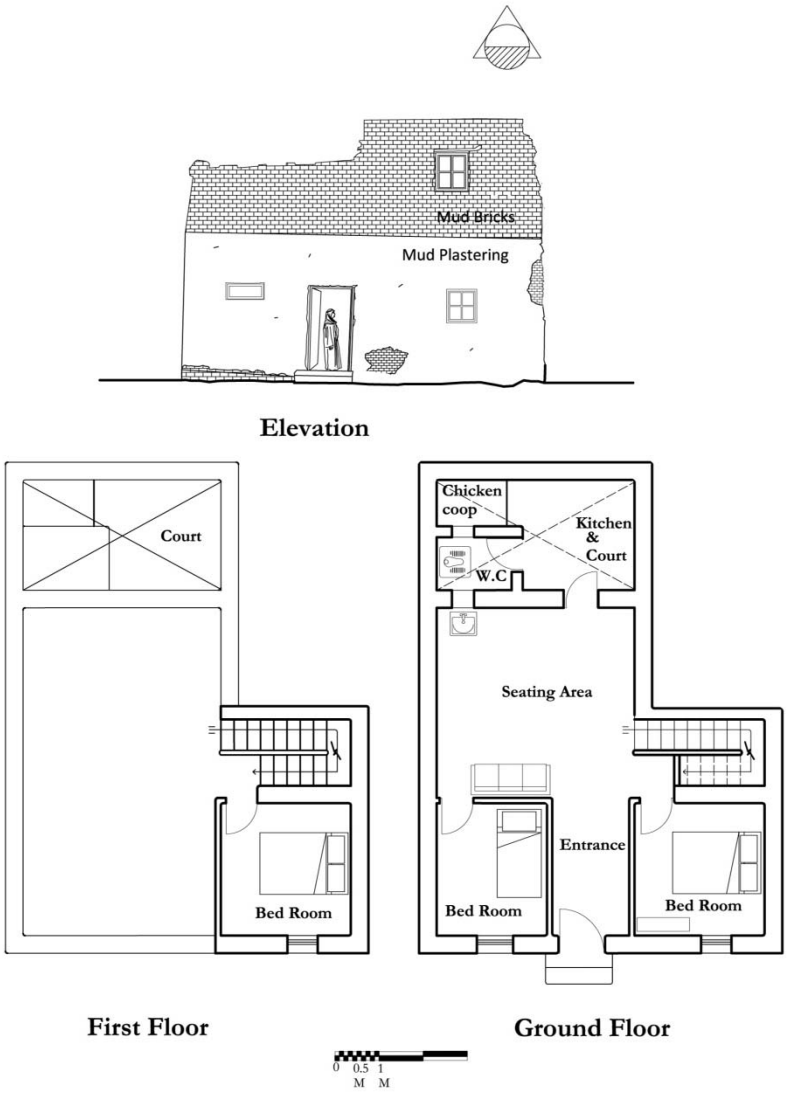


Figure 1.16 Sample of mud brick house in the Kharga oasis. Drawn during my site investigation in the early research stages.

After choosing Balat as a case study location, on-site work was conducted between January and March every year. The work started in Balat in January 2008 and ended in March 2011. The project was conducted in phases.

- **Phase one** entailed on-site investigations and then on-site observations followed by preliminary questionnaires and walking interviews. This phase was carried out to evaluate the research question and to ensure the validity of choosing Balat as a proper location for case study work.

- **Phase two** was comprised of the site survey (site architectural measurements, mapping, video filming, photographing, and laser scanning, more intensive questionnaires and structured interviews).

- **Phase three** was taken up with the transdisciplinary participatory action research process which led to the design and partial construction of the neo-desert vernacular model house.

1.9 Beneficiaries

The thesis proposes methods and approaches for the application by inhabitants of desert communities, architects, conservation architects, folklorists, preservationists, desert studies specialists, planners, anthropologists, archaeologists and ethnographers as well as architectural, social and cultural historians.

1.10 Terms used in the thesis

- **Vernacular architecture:** Many different terms have been used to describe how people build their own dwellings and deal with their needs as translated into the forms of their housing. Mainly the terms describe the way people construct such shelters with respect to climate, environment, culture, traditions, beliefs and the local materials available. *Architecture without architects, handmade, low tech, no engineers, self help* and *craftsmen* are some terms used to describe the above mentioned processes. They are usually characterized by an important adaptation to the conditions of the natural environment. Encyclopaedias, books, research and scientific journals refer to the building product as cursive vernacular, popular, traditional, indigenous, native, ethnic, folk, aboriginal, ancestral, anonymous, spontaneous, pedigree, conventional, local, populist and rural architecture. Each adjective has been used to describe this architecture in a special region, climate and culture. However, the term vernacular was selected for this study. It remains the most common term adopted and used by academics and professionals concerned with these types of buildings and by the general public as well. Moreover it is the term used by UNESCO and ICOMOS in their publications and documentation.

- **Desert vernacular architecture:** This term is used in the thesis to refer to ethnic architecture in hot dry climates and desert geographical environments. The specific focus of the thesis is desert vernacular architecture in the Western Desert oases in Egypt.

- Conservation model for thinking re-vernacular in a contemporary context: I developed this expression to refer to the main outcome of the thesis. This conservation model is based on a theoretical model approach that was verified by the case study application.

- **Neo-desert vernacular model house:** Neo-vernacular architecture is a general term coined by Charles Jencks in the 1980s to refer to an anti-modernist tendency in architectural design in the '70s and '80s which, he claims, began in the '50s (see Jencks, 1998, pp. 150-157). In this thesis I elaborate on the term (neo-desert vernacular model house) specifically to refer to a physical built model house developed through a transdisciplinary participatory approach involving local inhabitant.

- **Thinking re-vernacular:** The terms Thinking Re-Vernacular and Vernacular Re-Thinking were both used by researchers to express the idea of thinking about applying previously held vernacular building values (see Mitcham, 2005, Wagner & Naidu, 2008). In this thesis the term thinking re-vernacular is used in explaining the notion of continuing to think and build with vernacular techniques and trying to evoke the idea of thinking and acting again in a vernacular manner in developing the houses currently being constructed in desert settlements.

- **Transdisciplinary participatory action research:** this term refers to the research method used to engage local inhabitants in the design and building of a physical neo-desert vernacular model house and allows for a mutual sharing of knowledge between locals and researcher. The transdisciplinary approach was chosen due to the complex nature of the research problem.[4] The neo-desert vernacular model house was designed and built using a transdisciplinarity participatory approach with local involvement in an action research implementation steps. (See chapter three for detailed explanation on the method).

- **Un-vernacular vernacular:** This term has been used by some researchers (see Chase, 1986) to express the ambiguity in some forms of vernacular when commercialized architecture has taken the place of the vernacular building process in communities with vernacular dwellings. The term is used in this thesis when questioning the construction of houses using industrialized materials imported from

---

[4] See UNESCO publication: Symposium on Transdisciplinarity, "Stimulating synergies, integrating knowledge", Royaumont Abbey, May 1998.

outside the local desert oases but that are still more or less influenced by the desert vernacular method in function and spatial arrangement. The term is thus used in asking questions whether this type of house can be called vernacular or whether it is un-vernacular in the way of building and vernacular in the way of thinking.

1.11 Definition of vernacular architecture

The term “vernacular” has different meanings, and implications depending on the context of its use. This term has been used by architects, historians, archaeologists, folklorists and others. The word derives from the Latin vernaculus, which means "native". Given that architecture is defined as the science of building (Oliver, 2006, p. 4), we can simply say that the definition of vernacular architecture is the "native science of building".

It was Bernard Rudofsky who first made use of the term vernacular in an architectural context. He introduced the ideas of "architecture without architects" in an exhibition in 1964 and in his book in 1970 of the same title. He brought the concept into mainstream architecture as well as to the attention of the general public. Since the emergence of the term in the 1970s, vernacular considerations have played an increasing part in architectural design, although individual architects have widely varying opinions of the merits and virtues of the vernacular.

Earlier Paul Oliver, in his book *Dwellings*, explained the term vernacular as the type of building that is not designed by professional architects or builders (Oliver, 1987 & Senosiain, 2002). *The Encyclopaedia of Vernacular Architecture of the World* (Volume one) defines vernacular architecture as peoples’ dwellings that are related to their local environmental contexts and available resources. They are normally owner or community-built and utilize traditional inherited technologies (Oliver, 1997). Frank Lloyd Wright described vernacular architecture in another way. He said "Vernacular building grows in response to actual needs, fitted into the environment by people who knew no better than to fit them with native feeling". (Oliver, 2003, p. 9). It is further explained by Oliver that such architecture is built to meet specific needs and to accommodating local values, economies and the ways of life of the cultures that produce them (Oliver, 1997). Oliver also offers the following simple definition of vernacular architecture: the architecture of the people and by the people (Oliver, 2003, p. 14). Vicky Richardson perceives vernacular as the unconscious work of craftsmen that is built using the accumulated knowledge of generations (Richardson, 2001).

In line with the previous definitions, John May defines vernacular architecture as the architecture of people, designed by local communities, families and builders. For him vernacular architecture is what is built from local materials using local tools and defined by the local climatic conditions, ecology and geology (May, 2010).

In his book *Vernacular Architecture,* Henry H. Glassie had a different view. He explained vernacular as a term we use when facing architectural objects with a wish to understand their meanings (Glassie, 2000). UNESCO publications on vernacular architecture define vernacular according to two main criteria. The first is that it is built without architects and the second is that it is traditional (Ringbom, 1984, p. 7).

Based on the preceding review of the term vernacular from the point of view of architects and specialists in vernacular, it can be affirmed that: vernacular architecture is architecture that is designed and built by people for people to meet needs, comfort, utility and functionality in their dwellings. Local building materials and inspiration from the surrounding environment are the key elements in the success of vernacular architecture and that sustain it to this day.

Rapoport wrote that only about five percent of the world's built environment is not vernacular; this five percent is designed by architects or built by engineers (Rapoport, 1969). According to the Centre for Vernacular Studies, 10 percent of the world's buildings were designed by architects[5] in 2006. This means that 90 percent of the world's built environment is vernacular. Frank Lloyd Wright stated in 1910 that it is better and more worthwhile for architects to study vernacular than all the highly self-conscious academic architectural attempts (Oliver, 2003).

[5] Centre for vernacular architecture studies, international studies in vernacular architecture, brochure (Oxford: Oxford Brookes university, n.d).

1.12 Desert vernacular architecture in Egypt

Susi Moor mentioned in her book *Under the sun* that long before the great pyramids in Egypt, humans were living in deserts. She added that after the advent of agriculture, desert vernacular was born (Moore, 1999). About one third of the earth's land area is arid and semi-arid (Altschul, 2007). A large area of this percentage is located in Africa and the Middle East, where traces of vernacular desert settlements still exist[6]. More than 80 percent of the Middle East is classified as desert or semi-desert (Krech, 2005). Sixty-eight percent of Egypt is desert, which covers 681,000 square meter (Saleh, 2003).

Shehab defined desert vernacular architecture in Egypt as a "product of the interaction between human traditions, abilities and art with the surrounding environment."(Shehab, 2009, p. 8). Du Camp mentioned in his book chapter “Vive le désert” that in the Egyptian desert you feel that there is no one to count on but yourself and you have to create solutions out of limited resources (Du Camp, 1987).

In these vast desert areas in Egypt, ancient, traditional and vernacular desert settlements are suffering from neglect. Referring to this situation Warner said in his review about mud brick architecture in the Dakhla oasis in Egypt, "As a regular visitor to the oasis over the past decade, I would observe that the architectural tradition is now virtually dead."(Waner, 2010, p. 1).

1.13 The concept of desert oasis settlements in Egypt

The word oasis is derived from the ancient Egyptian languages. A desert oasis is a dwelling place with fertile land, vegetation and water resources from natural wells (El-Gohary, 1976, p. 362). A desert is defined as land with flat shifting sand formations, occasionally broken up by small pockets of green oases (Morre, 1999).

The five Egyptian oases in the Western Desert start from the great sand planes of Siwa, Baharia, Farafrah, Dakhla and Kharga. The natural geographical and topographical characteristics of these areas give local communities living there a special nature and influence as a consequence the composition of their dwellings (Atiya & Jobbins, 2003). In the book *The Desert* the author describes the special nature of the oases in the Egyptian desert, where habitats and vegetation are formed around water sources (Baladi, 2000). In the Western Desert, people manage the limited water and fertile land carefully and sustainably. They need water to grow plants such as dates, figs and olives, the essential source of living (El-Gohary, 1976).

---

[6] A summary from Encyclopaedia of the biosphere: humans in the world's ecosystems. Vol. 4, Deserts.

In the distant past, people formed closed communities to protect themselves from attacks from trading caravans passing through their lands (Hakim, 1986). The location of the oases were also of importance for trading routes in desert areas, as caravans must stop at oases for water and food supplies (Hakim, 1986 & Hassanein, 1925). Thus, one can conclude that cultural and social aspects were carried between the oases along the trading routes. At the same time, the oases communities had to provide safety, comfort and sustainability; for this reason, they tended to use all the available resources to build their dwellings with minimum waste and the least cost.

1.14 Content and structure of the thesis

The thesis chapters are listed below along with the specific topics taken up in each chapter.

Table 1.2 Shows the five main chapters, the objective of each, the method applied and intended outcome.

Objectives	**Chapter topic**	**Methods**	**Chapter outcome**
- Basic plan for the thesis structure, problem, methodology, scope, objectives and goals. - Determining what problems and challenges are facing desert vernacular architecture in Egypt.	**Chapter one:** - Research problem, research questions, methodology and scope. - Justifications and discussions of the research project importance.	- Historical search and survey.	- Orientation to the thesis problem, methodology, focus and goals. - Description of the thesis argument. - Description of the thesis structure and content.

Objectives	Chapter topic	Methods	Chapter outcome
- Determining what can be described as the desert vernacular through understanding the know-how behind its formation and development.	**Chapter two:** - Desert vernacular shape, form, identity, aesthetics, architectural and urban formation. - Desert vernacular character, human aspects, urban fabric, environmental context, cultural traits, traditions, societal needs, climate, building materials and technology.	- Historical search and survey.	- Description of insights about the meaning and characteristics of desert vernacular in the Western Desert being the thesis main focus.
-Establishing a basis for research methodology. Explanation and justification of the theoretical approach.	**Chapter three:** Methodology and theoretical research analysis.	- Historical search and survey.	- Creating the foundation for the research methodology application.
- Documenting the vernacular aspects of Balat. - Supporting the thesis argument and establishing a base for the model application.	**Chapter four:** - Survey and analysis of Balat characteristics. - Establishing a documentation base for architectural and urban documentation for Balat.	- Survey.	- Selecting the main aspects of desert vernacular in Balat as a tool for understanding the problem and a key for the solution. - Overlap between ethnography and architecture is explored.

Objectives	Chapter topic	Methods	Chapter outcome
- Documenting facts and deducing a future prospective. - Building a demo workable physical model for a vernacular desert house. - Recommendation for further continuation of the research. - Achieving research objective.	**Chapter five:** - Discussing challenges and potential within the case study. - Practical application of the neo-desert vernacular model house. - Thesis recommendations and conclusions.	Transdisciplinary participatory action research site application.	- Introducing a workable model for re-thinking contemporary design in vernacular terms. - Building a neo-vernacular physical desert model through a participatory transdisciplinary method. - Introducing recommendations for further research. - Discussing findings and outcomes of both theoretical and practical aspects of the research.

1.15 Chapter conclusion

In this chapter an overview of the thesis problem is given, its objectives and methodology are discussed, and a foundation is laid consisting of central facts and definitions used in the coming chapters. The chapter describes the path followed to reach the final research goal and the groups who, it is hoped, will benefit from this research. The thesis project was discussed, including how it started, the different phases and how it ended. The chapter ends with a summary of the whole thesis structure to orient the reader and clarify the research sequences.

2. Desert vernacular know-how formation in the Western Desert

2.1 Introduction to the chapter

Chapter two provides an overview of the concept of desert vernacular in the Western Desert oases in Egypt. The objective is to describe the nature of vernacular settlements in these oases, and to discuss the influence of natural and cultural factors affecting the change in dwellers' preferences taking place today in the desert environment. There has always been a complex and dynamic relationship between the built environment and its economic, social and cultural values.

This chapter is also intended to provide an understanding of the morphology of desert vernacular architecture and factors that affect its formation and existence. Due to the lack of sufficient literature about this topic (desert vernacular), the method applied in this chapter was based on the literature available and reflections from field work study.

2.2 Desert oasis vernacular architecture: characteristics and identity

As mentioned earlier, due to the scarcity of literature about desert vernacular, it was essential to establish a general platform for analyzing important aspects and characteristics of desert vernacular to prepare for the detailed discussion and analysis of the case study. This platform was developed mainly based on a search of the literature available dealing with desert vernacular and on the literature dealing with vernacular in general with applications to desert architecture.

In the introduction to *Desert Works*, the author describes how vernacular buildings reflect the beauty of the desert landscape in their gradation of earthy colours and sky tones and in the collaboration of opposition and beauty in harmony (Joy, 2002). Khanghahi & Abdolmaleki describe desert vernacular architecture as the art of the truth of the inhabitants of a certain region (Khanghahi & Abdolmaleki, 2011).

Desert vernacular in the oases has a unique natural identity and character that has evolved from the amalgamation of influences such as natural desert topography, climate, and geography, along with cumulative cultural, social, religious and historical factors (Correa & Silvetti 2009). All these factors affect the way of life there and add distinctiveness to the building patterns and forms as well. There is harmony and homogeneity between buildings and nature because of the use of local natural resources as building materials. As the famous Egyptian architect Hassan Fathy used to say, a building dwells in the land to which it belongs (Ultav & Sare, 2004).

Figure 2.1 The homogeneity of natural colours and integration with the natural landscape of dwellings in the Siwa oasis.

In *Deserts* the author also discusses the history of the people of the Sahara and the Arabian deserts, and describes how desert settlements often grew from places where traders met to exchange goods (Allaby, 2006). Trading thus played a role in forming the character and identity of the desert vernacular oases. Although communities in the desert oases settlements are self sufficient, trading between the oases was and still remains important for economic reasons and for obtaining goods that are not available in their local society. One can find the reflection of that exchange in the mutual architectural influence among the oases. However, despite some similarities, the distinctive natural landscape of each oasis still creates a different architectural character and identity for each town or village.

Figure 2.2 A mud brick house in the Siwa oasis.

Figure 2.3 A mud brick house in the Baharia oasis.

Figure 2.4 A mud brick house in the Farafra oasis. There are similarities but also distinctions between the houses in Baharia, Farafra and Siwa.

2.3 Desert oasis environment and climate

Based on the statistics and reports of the Egyptian Meteorological Authority (EMA) in 2009-2010, the Western Desert oases are exposed to extreme conditions of temperature, with 38°C annual mean maximum day temperatures in the shade, rising in some instances to 45°C. In the summer of 2010, a daytime temperature of 55°C was recorded. Night temperatures average 20°C, dropping to as low as 10°C and in cool winter months it drops at night to 0°C. Generally, the humidity is low and rains are rare, but strong sand storms during windy seasons raise sandy dust. These dusty winds are important factors in the adaptation of the dwellings to the desert climate because wind direction is unstable and dwellers have to create effective solutions to avoid its hazardous effects.

Dwellers in desert oases have survived by sheltering and protecting themselves from these extremes in climatic conditions using vernacular building techniques developed by experimentation through the age. In the harsh climate in the oases, the dwellings have been configured to facilitate daily life activities. Oasis dwellers had to adapt by creating suitable forms for their buildings and by using the local building material to overcome the negative impacts of the harsh desert climate.

Based on Givoni's studies of thermal control in desert buildings (Givoni, 1994), it was observed that vernacular dwellings in the Western Desert were built to prevent heat gain, maximise heat loss and control removal of excess heat by using cooling air circulation. For example they utilized air currents to minimize the affects of heat; they constructed their towns and villages with shaded and tunnelled streets, which protect pedestrians from direct sun and provide maximum shade for their buildings. These tunnelled streets also facilitate air current circulation and filtration of sand particles especially during sand storms.

Figure 2.5 Example of shaded tunnelled alleys.

Figure 2.6 Tunnelled shaded streets with light shafts.

2.4 Desert oasis society, culture and tradition

Social formation in the oases is family-and kin-oriented. Ancestral kinship units play a significant role in social identification and one's standing in the community. Most families prefer to live in the same neighbourhood as their kin. Hivernel mentioned in his ethnographic study that in the Western Desert oases the social organization is primarily based on blood relations, which play a main role in the site selection, configuration, grouping and location of dwellings within towns and villages (Hivernel, 1996). The social structure of desert societies and evidence of the community strength is shown in the organizing of space. A strong architectural base has evolved to enrich the lives of inhabitants through reflecting their socio-cultural structures and values.

Kroeber holds that culture consists of trained or learned activities plus their manufactured results (Kroeber, 1952). Respect for elders, generosity, privacy and care for children are societally inherited norms in the oases. It is for this reason nearly impossible to isolate cultural and traditional artefacts and ways of producing them from the influence of religion, norms and daily practices.

For example, privacy is highly represented in the design of oasis towns and desert villages. The concept of privacy in those towns is based on a mixture of religious and cultural norms. The hierarchy of urban spaces allows and reflects privacy in different types of social activities. Space is planned to change gradually from semi-public spaces to semi-private to private. For example, women can make use of tunnelled streets and cool recess in their doorways to socialize and talk to each other in parallel with finishing their household activities without being visible to the outside.

Figure 2.7 A lady doing her washing in the recess in front of her house in a semi-private area.

Figure 2.8 Elderly ladies chatting nearby their houses on a sunny winter day in a semi-private area.

Figure 2.9 Elderly men chatting after noon prayers in a semi-public space.

Figure 2.10 A family meeting a guest in front of their house in a side alley in a semi-private area.

2 .5 Transmission of desert vernacular traditional building knowledge

Edward Shils observed in his book *Traditions* that in all the great vernacular cultural accomplishments, oral transmission plays an essential role in the production of buildings. He explained that the instruction given to the learner to a large extent has been oral, in addition to requiring observation by novices. He added that this way of disseminating knowledge has the same effect and value as written manuals, drawings and models (Shils, 1981). In Paul Thompson's view, the oral inheritance of building traditions gives history back to the people in their own words, and handing down past experience helps locals towards a future of their own creation (Thompson, 1978). Paul Oliver holds that internal oral transmission encourages people to move towards a future of their own making, and not one that is based on the documentation of scholars from outside their culture. Oliver added that oral transmission of vernacular building traditions is a means of expression which we still have little knowledge about (Oliver, 2006).

Although the people in the Western Desert have developed only spoken or sometimes tacit means of codifying their building technologies, they have still been able to hand down the traditional ways of building from one generation to the next. This person-to-person method teaches the younger generations by word and example. They depend mainly on memory and the repetition of the technical knowledge that they inherited from their ancestors. For example craftsmen such as carpenters or blacksmiths design and implement doors, windows and farming tools without any drawings or any detailed diagrams. These same norms of transmission of building traditions, culture and tacit knowledge continue to this day within many of the Western Desert vernacular communities. However, they have also begun to disappear in many desert settlements within the oases.

Figure 2.11 A local blacksmith while working.

Figure 2.12 A local carpenter while working.

Figure 2.13 Traditional olive oil pressing.

Figure 2.14 Traditional pottery making.

2.6 Building material and building technology

In nearly all hot-arid climates, earth[7] has always been the most prevalent building material (Minke, 2006, p. 11). It is one of the materials that can be considered a viable and realistic option for much of world housing (Steen, Steen & Komatsu, 2003, p. 14). It comes in a thousand different compositions and can be variously processed (Minke, 2006, p. 7) and can be used as a plastering material and also in painting and decorating of walls (Guelberth, 2003). Earthen architecture is the product of relatively simple yet highly effective technology (Bourgeois, Pelos & Davidson, 1989, p. 55).

Morgan describes the benefits of earth vernacular building in his book *Earth architecture from ancient to modern.* He argues that earth vernacular structures in desert climates reach a degree of sophistication that makes houses warm in winter, cool in summer, well protected against wind and sand storms, capable of absorbing excess humidity, impervious to insects, fire and rot resistant as well (Morgan, 2008).

"One of the earth constructions' great advantages is its thermal properties. Because they may be as much as two feet thick, mud has high heat-retaining capacity. During the day, acting as passive solar collectors, they insulate well against high temperature, and at night the heat that has been absorbed is slowly released. While outside the temperature may soar or plummet, indoor ones stay remarkably constant."

(Bourgeois, Pelos & Davidson, 1989, p. 56)

This quote supports the contention that earth is an environmental building material and copes efficiently with the harsh arid desert climate, especially during hot summers. It was mentioned in the book *Building without Borders* based on Hassan Fathy's experience in Egypt that traditional earthen interiors remain cool during the day and release warmth at night, the opposite of concrete, a material that, in Egypt's hot climates, traps and holds high temperatures unbearably (Kennedy, 2004).

---

[7]Many academics and architects have noted that between one third and a half of the population of the world lives or works in earth construction buildings (See Dethier, 1983, McHenry, 1989, Warren 1999, Elizabeth, 2000, & Rael, 2009). Rammed earth, soil blocks, mud bricks or adobe are various applications for earth or clay soil (Minke, 2006). Earth is an extremely versatile substance. It can be combined with many other components or materials, especially straw and natural fibres, to form solid volumes, thick walls and unifying plaster. Earth provides a wide range of methods and techniques in building walls, roofs and floors. It was mentioned in the book *Built by hand* that earth can be moulded into blocks; or hand-packed into structures or frames of other materials (Steen, Steen & Komatsu, 2003).

In the Western Desert oases too, earth is the main building material. Earth block buildings in Upper and Middle Egypt have been dated to more than 4,000 years back (May & Reid, 2010) and still exist today. Examples include the fortification of Habu city and the Ramses II temple near Gourna in Upper Egypt (Minke, 2000).

Desert vernacular in the Western Desert in Egypt is rich in examples of different approaches to earth building technology. Mainly in Western Desert oases, the building method for walls is mud brick[8] while in the Siwa oasis it is salt blocks and mud (Karshif blocks). According to Rovero these blocks were utilised in the masonry with an abundant mud mortar very rich in salt (Rovero & others, 2009). Along with the earth, the main roof material is local wood, either from trees or palms. Reeds and palm ribs are used as secondary construction materials in roof construction.

Figure 2.15 Vernacular builders in the Siwa oasis using salt blocks (Karshif) and mud. Roof construction is palm wood and mud brick.

[8]Dethier and Rael mentioned that archaeologists discovered one pair of decorated coloured mud brick that is 3700-year-old in Egypt (Dethier, 1983, p. 8 & Rael, 2009, p. 113). Rael also mentioned that descriptions of tools, methods and techniques for making and building with mud brick are well documented in the hieroglyphs of ancient Egypt (Rael, 2009, p. 113).

Desert oases' inhabitants can recycle earth easily, either re-using old earth blocks or bricks as building material or returning it to the soil to grow vegetation. Earth has the ability to conserve energy, provides thermal insulation, good heat storage and stabilizes indoor temperature (Bourdier & Trinh, 2011, p. 86) and it can absorb excess humidity (Steen, Athena & others, 2003, p. 14).

Economically, constructing an earthen house in the Western Desert costs almost nothing because its material is obtained from the surrounding environment. In addition, a house built with such local resources can be easily enlarged at low cost, as need arises. As people build by themselves, there is no cost for workers' fees. In fact, neighbours and families help each other in the building process. In the oases you can offer your neighbour a meal as gratitude for helping with the construction and that is the maximum cost. Moreover there are no transportation or manufacturing costs.

Although earth may be perceived as a weak building material, due to desert vernacular trial and error experimentation of uncountable ideas, earth structures have managed to survive for centuries. Also the delicate craftsmanship, wisdom and accumulation of experience have led to good designs that are comfortable for living and sustainable to this day.

Figure 2.16 Local bank branch designed and constructed by The Siwa Sustainable Development Initiative with earth vernacular building technology in the Siwa oasis using Karshif. According to the designer, the building passed safety and security bank tests in 2008.

Recently, earth building techniques have not been as widely used by local inhabitants in the oases as in the past. The authors of *Vernacular Mud Brick Architecture in the Dakhleh Oasis* stated that in many places in Western Desert oases this form of architecture is slowly being superseded by more recent building techniques using reinforced concrete and concrete blocks (Schijns, Kaper & Kila, 2003).

2.6.1 Mud brick desert vernacular

Mud brick (adobe[9]) as a material for building has been claimed to be the oldest and most widely used form of vernacular construction in the world (Wright, 1991). Houses in the desert of Egypt, North Africa and also in the Middle East have been made out of mud bricks for at least 1,000 years (Marchand, 2009). Rael mentioned in his book *Earth Architecture* that almost half the world's people know how to build dwellings with unfired earth bricks, adobe, rammed earth or stamped earth and have extensive traditions for passing their knowledge on to following generations (Rael, 2009). Khalili stated that mud-brick is a traditional material which has high power of storage of cooling and heating energy and is able to equilibrate temperature in the interiors of buildings (Khalili, 1996).

In the Western Desert of Egypt people build with blocks of loamy soil earth, packed and produced manually by throwing wet earth into a mould without bottom or cover. The mould is lifted off once the brick has been placed on the ground. This technique produces so-called mud bricks or sun dried earth blocks. To produce them, sand and soil are dug from the ground and mixed with water, straw and manure in proportions that differ from one place to another depending on soil type. Not all soil types are good for mud casting. Locals know from experience and trial and error where to get the proper soil. Mud brick can be cast on-site easily and quickly, thus eliminating the need for transportation and allowing mass production of bricks in a short time. Normally, bricks are cast first and building starts when the amount needed is ready. One person can cast over 600 bricks in 7 working hours.

[9]Adobe is an ancient term for mud brick dating back more than four thousand years in Middle Egypt (Elizabeth & Adams, 2000). The word came from the Arabic *tuba* meaning brick which came from the Coptic *tobe* and from the Egyptian *dbt* (Garcias, Dethier & Meade, 1985). Then adobe was used in modern English to refer to an architecture style popular in desert climates in North America (May, 2010).

Figure 2.17 Moulds used in mud brick casting in the Dakhla oasis.

Figure 2.18 Process of casting mud brick in the Dakhla oasis.

Figure 2.19 Locals in the Dakhla oasis casting mud bricks for restoration work.

2.7 Desert vernacular building know-how

Vernacular know-how in the Western Desert can be described as a continuously developing and maintained building tradition, a process out of which basic building principles were created. This transfer of know-how has succeeded in sustaining the desert habitats we see today. Oliver described this know-how as the power of knowing and as a cognitive mix of the knowledge, awareness, understanding and intuition of the local inhabitants. He also stated that over long periods in the past this vernacular building know-how has been in continuous development (Oliver, 2006).

The most distinctive aspect of desert vernacular is not only the product of the know-how but the know-how process itself. Its distinctiveness is also in the correlations of disciplines involved in the way of thinking about and implementing building traditions and in planning the towns and villages. Decisions must be made based on factors relevant to the inhabitants' understanding of the safety and security of their dwellings in relation to topography and the desert landscape. Know-how in desert vernacular is a mix of locals' desire for consistency in developing their dwellings, their understanding of causality in taking their decisions, and economic aspects of building and construction.

In the building process itself, the know-how is a mix of the influence of culture, social inheritance, tradition and environmental adaptations. The building technology embodies considerations of belief, custom, and doctrines of traditional vernacular principles. The know-how in the building tradition is based on deep awareness and understanding of the harsh desert climate and weather conditions. Without any technical equipment or advanced technology, locals have managed to cope with their surrounding environment.

Oliver stresses that vernacular know-how is not a single phenomenon, and vernacular technology cannot be studied in general terms. He described this know-how as knowledge intermingled with the specific nature of the particular cultures which employ its countless forms. He emphasizes the necessity of considering this inherited knowledge in relation to the cultural context, as well as in terms of its efficiency or performance, to understand the full implications of the technologies used (Oliver, 2006).

The know-how is also found in practical details, for example in the proper choice and use of building materials, or the proportions of sand, straw and mud used in clay mixtures for mud brick casting. How do builders cast the mud brick and what are the appropriate dimensions of bricks? What is the best type of wood to use for roofs or stairs and wall supports? How and when should they cut the wood and when should they start the building process; in what specific season and time of the year?

To answer such questions, locals always relate the details of building to cultivation and harvest seasons and to climatic changes affecting the natural building resources.

The know-how is also found in the knowledge of how to utilize the available natural materials and resources. It is the basis for selection of the materials used for construction or decoration and even for simple things such as mud plastering and rendering. Traditional know-how also dictates the selection of the proper tools to use with certain materials in addition to the methods for building or construction. All these factors are also related to the skills and abilities of the builders who developed these techniques and inherited them from previous generations.

Figure 2.20 Traditional roof structure making process in the Dakhla oasis.

2.8 Desert vernacular urban fabric

Urban forms of the cities in the Western Desert oasis settlements in Egypt have a distinctive character. Cities, towns and villages are planned according to an amalgamation of topographical, climatic, social and cultural factors together with inherited traditions, beliefs and religious considerations. The settlements clearly reflect the highly communal spirit of the old desert vernacular societies and are based on rules and regulations that have long existed.

Basem Hakim discussed the laws and regulations controlling urban formation within desert vernacular settlements in North Africa and the Middle East. He highlighted the fact that urban and building rules are derived from societal values, which are in turn based on religious beliefs. These beliefs are set out with clear explanations of the purpose and meaning of each of these urban and building rules (Jayyusi & Holod (red.) 2008). In the Western Desert in Egypt, such rules are set according to rules ('Urf) previously agreed upon by dwellers and the town/city mayor. The rules are based on local cultural and traditional norms as well as on Islamic jurisprudence and laws (Fiqh and Sharia[10]). They are usually set and discussed in meetings with the inhabitants' representatives and with delegates from different families in their community.

The compact organization of space, with high density, narrow streets and small buildings, was a response to a shortage of safe land at the time when desert oases settlements were originally established (Hakim, 1986, Amer & Almumen, 2002). Locals in the oases are quoted from interviews as saying that their towns and villages had gates for protection against enemies in old times. In addition to responding to defence and climatic needs, compact use of urban space provides maximum shades and lessens exposure of walls to direct sun. In addition, this street structure offers protection from strong sandy winds. The compact organization also determines the distinction between public, semi-public, semi-private and private areas, which is established by varying the degree of accessibility and enclosure.

[10]See Hakim, Besim Selim (1986). *Arabic-Islamic Cities: Building and Planning Principles*. London: KPI, for a more detailed study about Islamic Sharia rules in planning. It is a study in vernacular architecture covering the Middle East and North Africa, particularly concentrating on the interaction between religion, society, building practice and city planning. The study shows that building and urban development within the Arabic-Islamic cultural framework reached a high level of sophistication and detailed regulations based on and deduced from Sharia rules. The author based his study on various old sources and archives, some of which date back to 14th century.

This urban layout was also devised in a way that even a tight city plan can be expanded, thus enabling the dwellings to be easily extended over the years. When there is a need for extra functional spaces for a family, a room or more can be built on top of existing ones often overlapping rooms of their neighbours' roof. These extensions may be built over a part of a street; such constructions are all based as previously mentioned on a set of 'Urf rules and regulations.

Figure 2.21 Shaded street in the Kharga oasis.

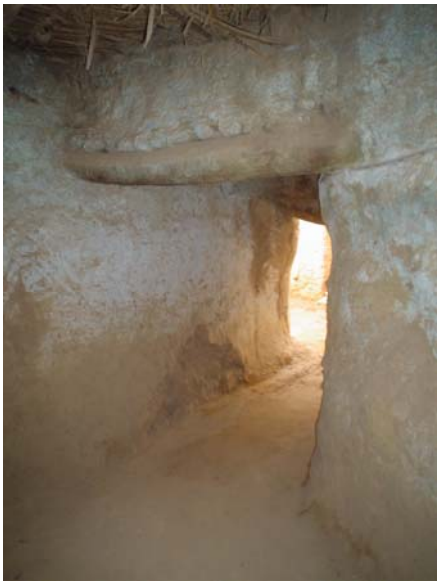


Figure 2.22 Shaded alley in the Kharga oasis.

Figure 2.23 Smooth curved building corners in the Dakhla oasis.

Figure 2.24 Shaded tunnelled streets in the Dakhla oasis.

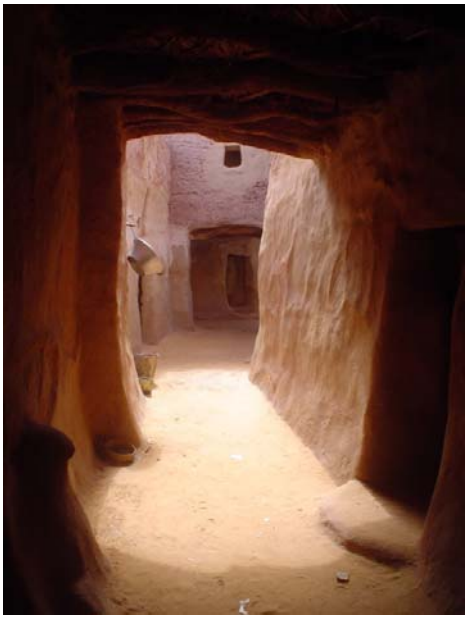


Figure 2.25 Tunnelled, covered and semi- covered streets.

Figure 2.26 Curved building corners and covered streets.

Figure 2.27 Hierarchy of streets patterns in the the Dakhla oasis.

Figure 2.28 Shaded building facades in the Dakhla oasis.

Figure 2.29 The compact urban fabric and tunnelled streets show a homogenous urban density pattern and human scale together with aesthetic composition of forms in the town of Balat in the Dakhla oasis.

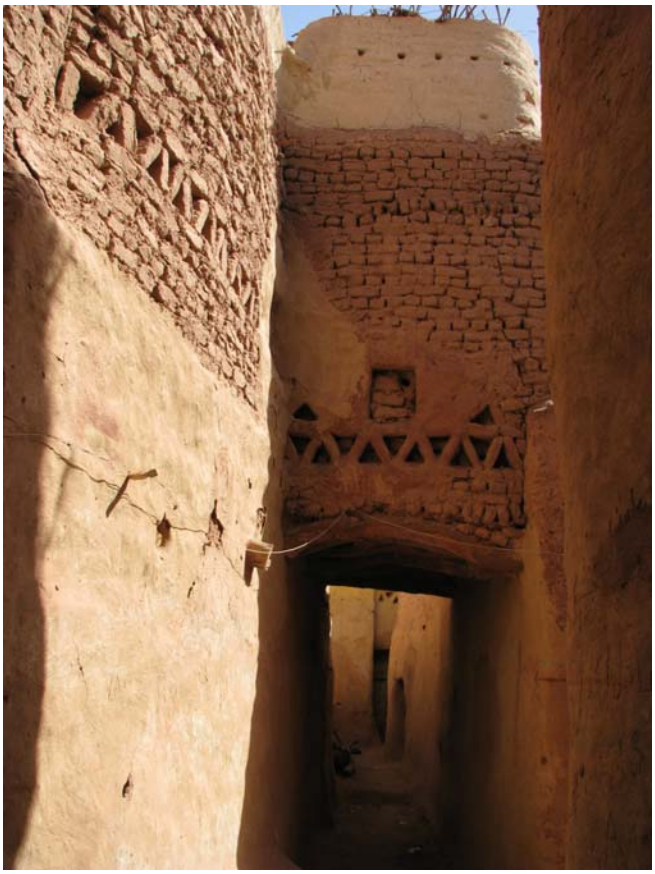


Figure 2.30 A room bridging a street (Sabat). An example of the possibility of making a house extension covering a public alley based on the local civic and Sharia rules ('Urf) within this settlement. The town of Balat in the Dakhla oasis.

In *Spectacular Vernacular,* the author points out that in desert communities it is rare to find isolated dwellings. Desert vernacular houses tend to be located in compact clusters. The farm lands, lie on the outskirts of the settlement (Bourgeois, Pelos & Davidson, 1989). Site observations from the present study show that the configuration of dwellings is based on the social system, which requires both segregation of domestic life and participation in the religious and economic life of the community. Mosques are placed in central locations within areas of dwellings and beside water sources for ablution. Markets and cemeteries are placed on the periphery of the settlements.

Figure 2.31 Example of a compact structure of a desert vernacular settlement with farm lands and cemeteries lie on the outskirts of Al Qasr town in the Dakhla oasis.

Figure 2.32 Compact layout of cities in desert vernacular settlements, with farm lands on the outskirts in the Dakhla oasis.

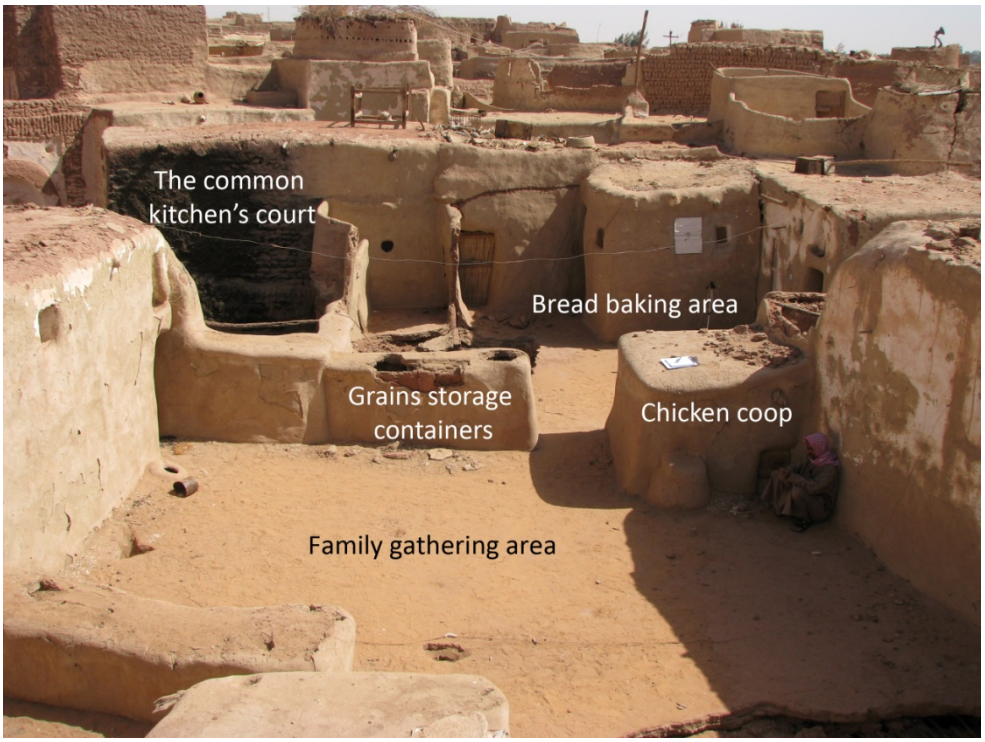


Figure 2.33 A floor constructed on a roof in order to extend a house, with four families sharing facilities such as a common kitchen, chicken coop and wheat storage, Dakhla oasis.

2.9 Desert vernacular and sustainability

Crouch and his colleague have discussed the fact that over the years sustainable building materials have been integrated into vernacular architecture through processes of trial, error, reflection and new trials that take into consideration climate, physical constraints and cultural practice. Through these processes architectural forms are evolved that meet the locals' needs and produce a sustainable built environment (Crouch & Johnson, 2001).

The sustainability of desert vernacular is also about managing the balance between preservation and use. Desert vernacular dwellers show multi-layers of wisdom in their use of the limited local materials, the minimum waste of such resources and an ability to be inspired by forms from nature. In addition, from an economical point of view, such local building materials are almost cost-free, as locals use wood trees and palm trees grown on their farmlands, and cast mud bricks using earth from their surroundings. People build their own dwellings, so there is almost zero labour cost. The possibility of re-using the earth material is another aspect of sustainable desert vernacular. Almost no waste product is produced from desert vernacular buildings.

It can thus be argued that desert vernacular buildings are sustained by practices transmitted from one generation to another. However, there is little theoretical discussion in the field about how and why traditions in desert vernacular buildings are sustained across generations despite the wide interest in sustainable development (Asquith & Vellinga, 2005). This lack of interest is unfortunate, especially given the concern about the conservation and preservation of vernacular buildings in Egypt.

Dwellers in oasis communities could appear to outsiders to have no vision for their life in the future. It might seem that they only consider it important to respond to tradition or to their basic needs and their desire for self sufficiency. Desert dwellers do, in fact, normally respond, often in traditional ways, to their current needs. However, they are also conscious about the future as they develop logical solutions, especially as regards the comfort inside their dwellings.

Thus an important issue today is how dwellers living in the vernacular settlements can and should respond to modernity. How can oasis dwellers respond to the need for sustainability, recyclable materials and green technologies? How can they respond to the demands of many inhabitants for modern development delivered at high speed? Ward raises such questions in his discussion about sustainable vernacular (Ward, 2005).

Given this interest in sustainable architecture, it is ironic that the ecological and environmental benefits of building with mud brick structures may gradually disappear because of the perception of oasis inhabitants' that concrete houses are a beneficial part of a modern lifestyle. As a consequence of these new attitudes, the orally transmitted concepts underlying the sustainability of desert vernacular building practices may soon vanish. Newly adopted social life habits have started to invade desert vernacular societies, which are more attracted by consumption than by the idea of learning self-sufficiency and being productive. In his studies of urban vernacular, Hough mentioned that the pressures of modern times have greatly influenced vernacular cities (Hough, 1989). Inhabitants used to depend on local products which they produced from the resources in their environment. While such sustainable habits are still encouraged by seniors, youth are more concerned with consuming than producing. In his article "Speaking the vernacular" Bourgeois Kennedy stated that "the global economy turns people into consumers by convincing them that only industrial goods can satisfy their needs." (Kennedy, 2004, p. 37).

2.9.1 Producing more with less

In the past, a common value in the desert oases has been to utilize the maximum amount of naturally available energy to greatest advantage. Due to the shortage of natural resources and raw materials in the desert, inhabitants tend to appreciate opportunities to evolve creative ideas and solutions that maximize the use of the scarce available resources. They have tended to use any by-products of materials in their daily activities. For example, when tree trunks are used as beams for roof support, the medium sized branches that remain are used for wall supports in corners or in making small shelves in kitchens and living areas or for windows or lintels for doors. The small braches are then tied together as a mesh to be used as secondary layers over the main roof beams, or for small interior doors. Finally, the leftovers are used as a fuel for ovens.

Animal manure is another example of producing more with less. It is used in the clay mixture for the mud bricks and also as organic fertiliser in farms. Moreover, it is shaped into pie-like forms and then left to dry in the sun to be used as a fuel for ovens.

Figure 2.34 Doors in the Dakhla oasis made from palm tree ribs or reeds and the wooden key and lock are made from building construction wood leftovers.

Figure 2.35 Doors in the Siwa oasis made from building construction palm wood leftovers and the door frame and door lock are made from ropes made from palm tree raffia fibers.

Figure 2.36 Dung cakes (animal manure) used as a fuel for ovens in the Kharga oasis.

Oases dwellers show an ability to meet the challenges of managing their limited resources. This attitude opens up a great many possibilities and creates a variety of crafts and skills which are reflected in the designs of their dwellings. Locals have always tried to excel despite their limited options to produce various housing solutions and decorative elements for their houses. These creative solutions have always been symbols of pride among each others. By their skills they connect intangible values to the physical tangible vernacular. However, these skills and values may disappear because locals are tending now to use more and more prefabricated materials.

2.10 Desert vernacular and human aspects

The roles of the inhabitants in the building procedures in desert communities are allocated among family members. These roles are more like basic life activities and habits than professional work. We can say that the building process never stops, but is always integrated into daily life. Building and maintaining dwellings is a dynamic practice that develops according to current needs and past customs, and that helps dwellers feel engaged and interactive with their dwellings. All family members share work and different tasks are distributed among them. Rules allocate work differently in the different oases since all rules are based on the local cultures and traditions.

2.10.1 Desert vernacular and gender

Women have, throughout history, taken a central role in planning, construction and use of desert vernacular buildings. Both men and women share the work in all the building phases in addition to taking part in the regular monthly and annual maintenance.

Bernstein and Toma in their studies explored the role of women in the creation of vernacular architecture. They argued that gender studies of vernacular architecture demand new techniques and approaches of research and surveys. They added that changes must affect all aspects of research and not be limited to thematic studies of women and historic resources. They mentioned in their study that an appropriate place to begin is a more comprehensive approach to the issue of "how a building gets built."(Bernstein & Torma, 1991).

Unfortunately, the role of women in the design, construction and use of desert vernacular, is little understood. Sally McCurry in her studies in vernacular landscape formulated a series of more distinct questions about how much control women historically exercise over the design and arrangement of houses in vernacular settlements (McCurry, 1989).

Figure 2.37 Monthly plastering maintenance for houses done regularly by women in the Dakhla oasis.

In desert oases the design and configuration of houses basically depend on the way that women move about the house. The oven and the small chicken coop are placed on the top floor nearby the kitchen to make it easy for them to manage daily activities. The location of openings is decided by women, that is, it is up to them where to place the windows to the court yard of the grandparents and to the street to monitor passers-by.

Everyone in the oases learn various construction and building skills. Men are mainly responsible for raising walls and roofs and doing the first plastering layer of the house. Women are responsible for bringing water for the clay mix. They also help in the mud brick casting process, assisting by handing the bricks to bricklayers during building and by doing the final interior and exterior rendering of the house. They may decorate the exterior together with men in some cases. Young boys help in the brick casting while young girls take care of the children or help in preparing meals for the family. Women do a monthly maintenance and rendering of the floors and walls. They sprinkle new clean sand on the floors and the roof of the house every month. They are also responsible for regular maintenance of the houses if needed in case of cracks.

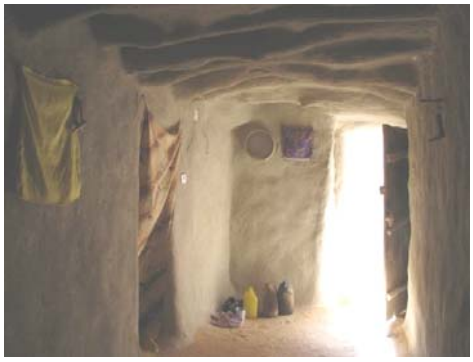


Figure 2.38 A room before monthly regular maintenance in the Dakhla oasis.

Figure 2.39 The same room after monthly regular maintenance in the Dakhla oasis.

The above figures show a room before and after regular maintenance done by women. They plaster the walls and the floors and sprinkle fresh sand on the floor as well. The ceilings are repaired if there are cracks, but normally they plaster the ceilings twice a year before feasts.

2.11 Building with the landscape

One very noticeable characteristic of vernacular architecture, as McCurry and Adams mentioned, is that it is the product of thousands of individual decisions, which when taken together reflect the forms of the landscape (McCurry & Adams, 2000). Desert vernacular landscape is what people experience in their everyday life, places such as mountains, dunes, cliffs and ergs that they are familiar with and are a part of their daily community and work life. These aspects of their environment are a part of the locals' sense of place and their local identity. The desert landscape shapes the inhabitants' memories and daily life activities as well. The natural scenery affects desert vernacular architecture and gives it its unique appearance because the architecture was a natural response to and integration with the topography.

Lewis Mumford devised in his book *Sticks and Stones* the concept of 'regionalism'. He proposed the concept of 'regional architecture'; an architecture based on perception of place (Mumford, 1955). In *Spectacular Vernacular* the authors described the desert vernacular as: "Life linked to place and season. Nature, often harsh, is a force to live with, to take seriously, not to avoid or conquer."(Bourgeois, Pelos & Davidson, 1989, p. 47).

2.11.1 Desert vernacular physical landscape

As vernacular literally means native, this architecture loses its meaning when deprived of the links to this context, as its existence is relative to its location. If we study the topography in the Western Desert in Egypt, we find that it was the natural driving force of the physical typology of vernacular settlements in the oases. Sensitivity in responding to natural forces has long been based on the local inhabitants' deep understanding of the place that they are part of. People living in oasis communities have a bond with their place and surrounding space. The vernacular desert identity and connection to the place come from the response of function, to natural forces, climate, local resources and inherited culture. The smooth curves, the harmonious warm earth colours and the delicate proportions of houses are all inspired by the desert surroundings.

Houses grow out of aesthetics stimulated by the surrounding natural environment. The inhabitants' natural sense of place inside their local society is marked in their vernacular buildings. They build their houses as pieces of sculpture, the same way nature is sculptured around them when the sand erodes the cliffs, dunes and mountains.

Figure 2.40 Integration between vernacular dwellings and the mountains as physical landscape and topography in the Siwa oasis.

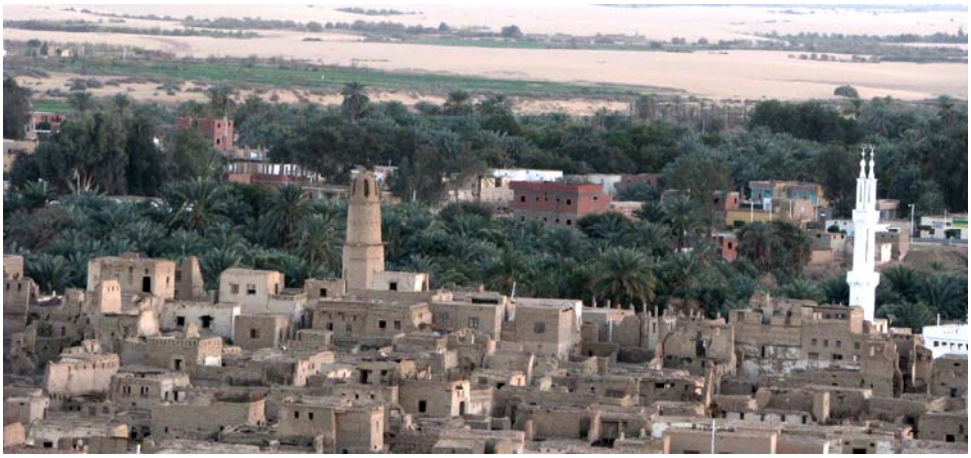


Figure 2.41 The physical setting is correlated with the physical landscape in the Dakhla oasis.

2.11.2 Desert vernacular cultural landscape

The World Heritage Convention defines a cultural landscape as a combination of works of nature and man[11]. The cultural landscape is the interaction between humans' use and adaption of natural resources over time through their traditional settlement activities (Longstreth, 2008). Social and cultural behavioural patterns shape ethnic desert vernacular buildings, which in turn shape the physical appearance of the built environment within the natural landscape (Tilley, 2006). This can be observed both in urban and architectural settings in desert settlements, where the broad formal patterns of street configuration and the organization of houses are based on cultural formulations, religious respect and traditional attitudes.

The buildings are a mirror of the inhabitants' attitudes and way of life. The house unit records relationships within the family in space and time, and between the family and the outside context. The house maps the family and is considered their sacred place; in particular it often serves to support work functions: it is a place to store and process agricultural products as well. Vernacular buildings teach us stories about the past life. Houses grow out of local economic practices, local ecology, local geology and household customs.

[11]UNESCO-ICOMOS Documentation Centre, September 2009, description of world heritage cultural landscapes with a bibliography based on documents available at the UNESCO-ICOMOS documentation centre.

2.12 Chapter conclusion

The desert vernacular architecture we cherish nowadays as picturesque is in fact the outcome of a long struggle for survival in an adverse setting, a struggle by many generations that have squeezed a living out of the available resources in a truly sustainable manner. This chapter has looked at how locals have adapted their dwellings to meet their needs for comfort and respond to the given conditions, merging theses elements into an honest and minimalist architectural expression. Their architecture is a brilliant example of an environmentally sustainable desert vernacular outcome where the ingenuity of the locals has created and sustained life through this mixture.

The chapter discussed desert vernacular as a product of continuous evolution, a process of self correction and learning from trial and error. In day-to-day building practices, people in desert oases have developed the know-how to make the buildings that fit their needs. They did not shy away from the risks of experimenting or trying alternatives that sometimes offered uncertain results. They also knew how to adapt to continuous changing environmental conditions.

The chapter went through the characteristics of desert vernacular architecture and its underlying concept for the creation of desert vernacular know-how. It has described different themes, focusing on certain desert oasis features in Egypt. By understanding all these values one can better understand the importance of preserving this desert vernacular heritage and the necessity of finding solutions that can stop its gradual loss in the face of modern changes. The solution will come from the understanding of the major problems inhabitants of desert vernacular settlements are currently facing, problems which will be highlighted in chapter four.

3. Methodology

3.1 Introduction to the chapter

This chapter presents the methodological backbone of the thesis. It describes the case study methodology in detail, starting from the reasons for choosing a case study approach and then taking up the applicability of this choice for dealing with the main research problem.

This chapter also serves to show the link between theory and practice in the application of the conservation model for thinking re-vernacular in contemporary terms. The application of the model is then described in detail in chapters four and five.

3.2 Case study methodology

The case study methodology[12]was chosen based on the thesis research questions that were mentioned in chapter one. The case study approach was selected because, as Robert Yin states in his book *Case Study Research,* "The more your questions seek to explain some present circumstances e.g. how or why, the more the case study methodology will be relevant."(Yin, 2009, p. 4). The "present circumstance" investigated in this case study is the current situation affecting desert vernacular architecture in communities in the Western Desert of Egypt. The case study approach was selected because it allows for an in-depth examination of the problems there for, in the words of Feagin, the case study is an ideal methodology when profound investigation of a certain problem is needed (Feagin, Orum & Sjoberg, 1991). The aim in applying this case study approach is also to bring an understanding of the complexity of the factors affecting the future of desert vernacular architecture and thereby to contribute to the current research and present recommendations for further studies.

[12] A few critics of the case study method argue that the study of a case can offer no grounds for establishing reliability or generality of findings. Others argue that the intense exposure to study of the case biases the final findings. Some dismiss case study research, calming it is useful only as an exploratory tool. Yet researchers continue to use the case study research method with success, especially in carefully planned studies of real-life issues, situations or problems. Successful examples of case studies from many disciplines are widely available in the literature. See major researcher in this field such as Yin (1989, 1993 & 2009), Stake (1995), Feagin, Orum & Sjoberg (1991) and others who have wide experience in this methodology and have developed robust procedures, see Hamel (1993) Gomm & others (2000), and Gerring (2007). Also see Flyvbjerg, Bent (2006), "Five misunderstandings about case-study research", *Qualitative Inquiry,* Volume 12, No. 2, 2006, pp. 219-245 for more investigation and analysis of this argument, debate and support for case study method application in this type of research.

As mentioned in Chapter one, this case study methodology applies a dual approach consisting of two phases: a descriptive explanatory phase followed by an exploratory phase. The explanatory phase comprises two methods (historical search and survey) while exploratory phase comprises one method (transdisciplinary participatory action research).

The descriptive explanatory phase focused on:

A- Identification of the research problem (previously explained in Chapter one- 1.1 Research problem), in which a content analysis was carried out to establish the basic features of Egyptian desert vernacular architecture, with a focus on the case study in the town of Balat.

B- Site investigation and site observation to determine which aspects of desert vernacular to describe and analyze.

C- Investigation of the needs of the inhabitants in the future, based on earlier problem identification.

D- Analysis, evaluation and synthesis regarding the basic desert vernacular aspects selected for study, followed by an in-depth study of Balat, the case study location.

This descriptive explanatory phase consisted of theoretical research involving a literature search and on-site observations as well as an analytical site survey to document building materials, building techniques, climate features, environmental adaptations, inhabitants' social habits, traditions and current demands regarding their housing needs. The tools used were walking and structured interviews, designed questionnaires, on-site observations, on-site architectural and urban measurements, laser scanning, photographing, video filming and field notes. Lab test for mud brick and thermal measurements for houses were supporting methods. The findings from this phase established a theoretical and factual basis for the second phase, the exploratory phase.

The exploratory phase which then followed focused on:

A- Design of a transdisciplinary participatory action research based on applying the theoretical conservation model and the synthesis of the findings from the explanatory phase.

B- The building of a neo-desert vernacular model house as an outcome for transdisciplinary participatory action research method.

C- Verification of the conservation theoretical model using the findings from the explanatory phase and exploratory phase.

The main tools used in this second phase were local seminars, design workshops, meetings with participants, as well as photographing and video filming.

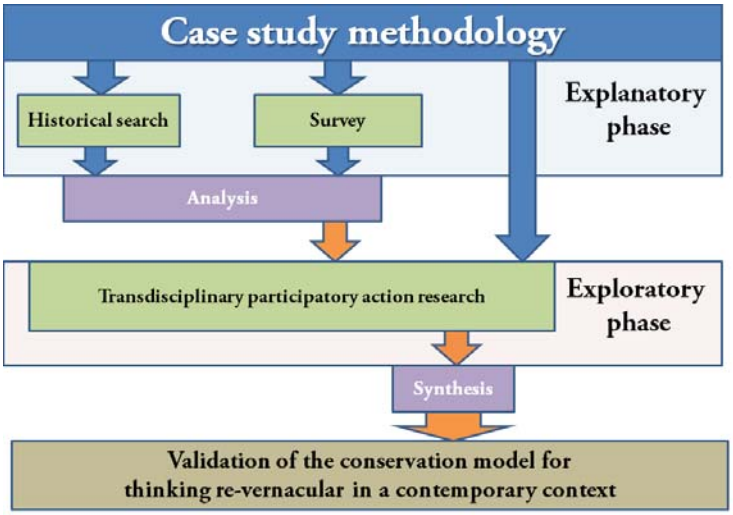


Figure 3.1 Diagram showing case study methodology applying a dual approach consisting of two phases: a descriptive explanatory phase followed by an exploratory phase, including the three main methods used in the case study within the two phases.

The two phases were both implemented using the three main steps recommended by (Yin, 1993) and (Feagin, Orum & Sjoberg, 1991) based on an understanding on the specific nature of this research:

- Step 1: Defining and designing the work plan for the case study.
- Step 2: Preparing and collecting data and conducting an action plan for the case study.
- Step 3: Analyzing the work results achieved and establishing recommendations for future work.

The diagram below illustrates the work plan design protocol.

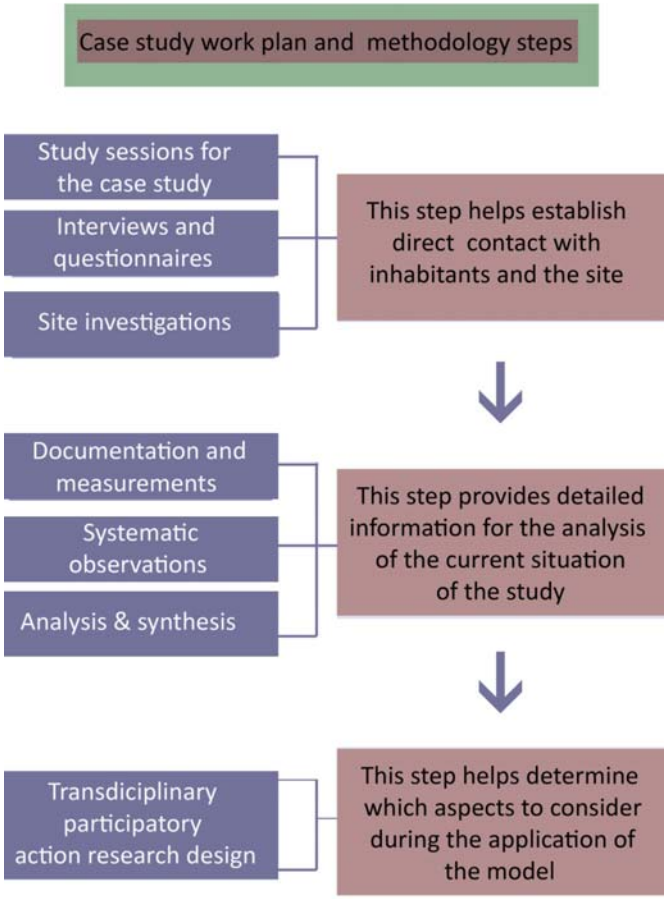


Figure 3.2 Case work plan and methodology, steps developed according to (Yin, 1994 & 2009).

To ensure validity and reliability, the below criteria based on Yin's suggestions were applied before starting to work with the case study action plan (Yin, 2009).

1- The variables of interest should be more than data. This will provide more complex and in-depth results.

2- Data should come from multiple sources of evidence.

3- Work should be based on a previously established theoretical proposition for data gathering and analysis.

Table 3.1 The table below shows the links between the research questions and the methods and tools used to answer these questions, together with analysis techniques applied to reach the methodology goals.

Research question	Methods/Tools	Analysis tool	Methodology goal
-Why is the future existence of desert vernacular architecture in Egypt being threatened?	Survey/Site observation and investigations.	Grounded theory.	To position the research in the field with regard to the main problems it tackles.
-What specific risks is desert vernacular architecture currently facing in the Western Desert in Egypt?	Survey/Walking interviews, site observations, literature search.	Grounded theory.	Investigating current problems within desert vernacular dwellings in Egypt.
-What is desert vernacular building tradition know-how, and how can it be documented and adapted to the needs of those living in desert vernacular dwellings?	Survey/ Structured interviews, site observations, field notes, video filming, and site measurements.	Grounded theory, conversation analysis and frames (event) analysis.	Understanding the urban fabric and architectural configuration. Understanding social habits related to building know-how.
- How can we conserve desert vernacular architecture on a cooperative basis with inhabitants?	Transdisciplinary participatory action research/ Focused interviews, local seminars, meetings with participants, focus groups, constructing a physical model house.	Data synthesis.	Gaining a concrete understanding of the inhabitants' future aspirations and needs.
- How can we think re-vernacular in a contemporary context and still preserve the environmental and cost benefits as well as the picturesque outward appearance of desert vernacular architecture?	Survey/ Questionnaires, interviews, literature search.	Grounded theory, conversation analysis.	Discussing the acceptance of the neo-desert vernacular model house idea (thinking re-vernacular).

As mentioned, three main methods were used in the case study in this research. Two methods were used for data collection: developing historical background and carrying out a survey. The outcomes from the historical search and survey were analyzed and used to design the tools for the transdisciplinary participatory action research method. The analysis and synthesis of the three methods served in the achievement of the main thesis goal, which was to apply the conservation model to think re-vernacular in a contemporary context. The three methods together with tools and techniques used in them will be discussed below.

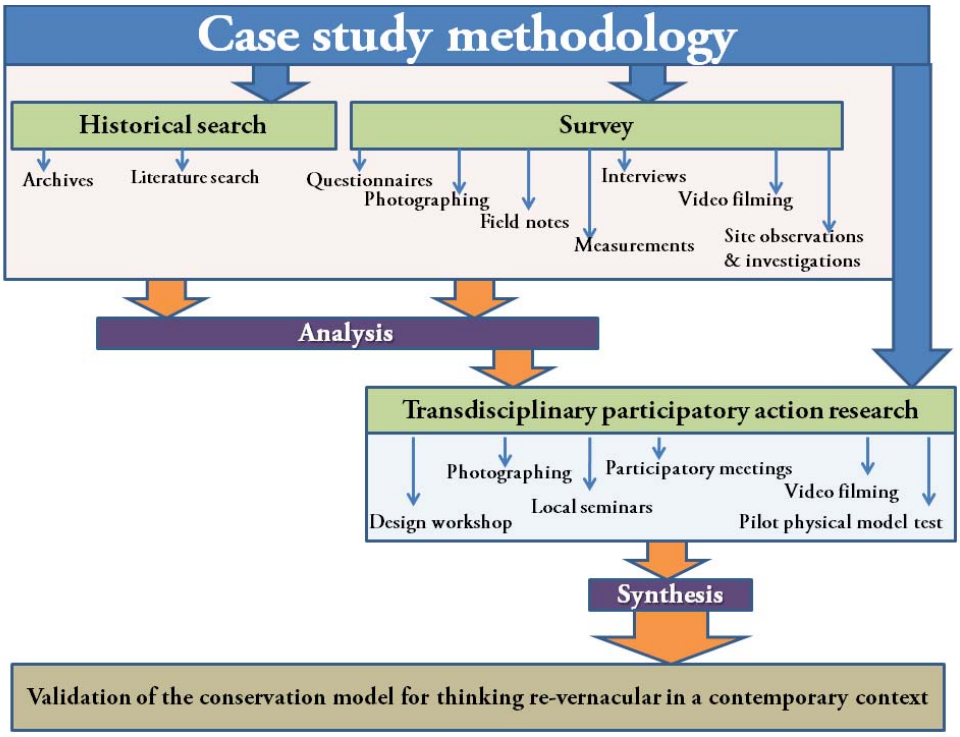


Figure 3.3 Diagram showing the three methods used in the case study and the tools used in each method. The diagram illustrates the input from both the historical data collected and from the survey methods in the transdisciplinary participatory action research, where the inputs from the three methods serve to achieve the thesis goal.

All the methods and research techniques were chosen following Yin's approach to case studies. That is, he holds that such studies should comprise an all-encompassing method which covers the logic of design together with data collection techniques and specific approaches to data analysis. In Yin's opinion this approach ensures that a case study is not limited to a tactic for data collection or a design feature alone (Yin, 2009).

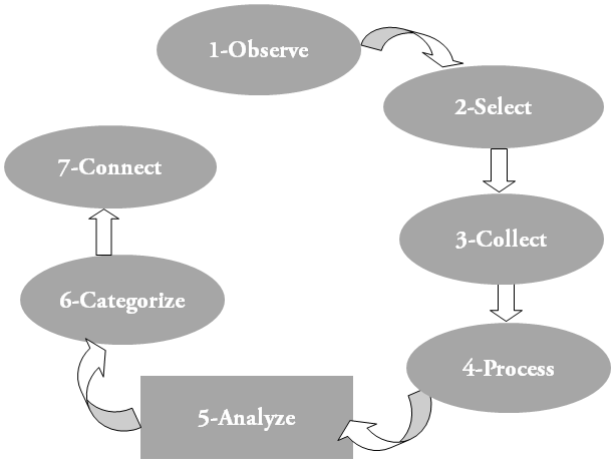


Figure 3.4 Diagram showing the flow of research data collection and analysis developed after (Charmaz, 2006). The process starts with observation to gain insight into a current problem. Then follows a selecting process about which tools of data collection to use. The collection process is followed by processing the data then analyzing their content. Then the analyzed and synthesized materials are categorized and connected together to finally used to answer the research problem.

3.3 Collection of historical background data

Gathering historical data about the town of Balat was extremely important in establishing an initial knowledge base about the town for the case study. The historical data collected served as a guide in understanding the present situation and in making it possible to draw conclusions about future possibilities. Studying Balat's history increased my understanding of its value and importance as an old desert settlement, of how it became what it is today, of what has worked for people in the past, and of what we could build on in applying the results of the case study.

3.3.1 Archives and literature search

The investigation of historical data was mainly carried out in the National Library and Archives of Egypt, The Egyptian Geographic Society Archives, The French Institute for Oriental Archaeology in Cairo, The Centre for Economic Studies and Documentation in Cairo and the Library of the Supreme Council of Antiquities in Cairo. The search was mainly for manuscripts, microfilms, photographs, recordings, archives, literature and maps about the Dakhla oasis and Balat. The information gathered and maps consulted were used in the analysis of Balat that is explained in detail in Chapter four.

3.4 Survey

To ensure that the survey method and tools could provide data relevant for the research questions, several different tools were examined. The tools discussed in this section are those selected because they provided a good fit with the purposes of the case study design.

3.4.1 Questionnaires and interviews with inhabitants of Balat

Data gathered from questionnaires and interviews were used to clarify the research problems and orient the research to the intended goals. Pilot interviews and questionnaires started in Balat in January 2008 as part of the preliminary investigation and observations. In this, the research followed the approach of Fink, who sees pilot tests for interviews and questionnaires as aids to help the survey run smoothly, reveal people's understanding of the questions and estimate the time needed (Fink, 2009). The main survey which resulted from the findings of the pilot tests, took place from January 2009 until March 2011.

Interviews were used to gather information about Balat inhabitants' problems, behaviour, life habits and building know-how. Questionnaires, on the other hand, were mainly used to gather information about the opinions of Balat's inhabitants, their satisfaction with their current vernacular houses and their willingness to live in mud brick houses in the future. The interviews were conducted first, in order to establish the criteria for the questionnaire sampling selection. Selection of respondents for both the questionnaires and interviews was based on stratified random sampling.[13] The focus was on older men and women in the interviews, while in the questionnaire, a balanced selection of older inhabitants and youth (men and women) was used to provide a means to compare the answers of different age groups.

Based on the findings from the literature study, grounded theory was found to be the relevant choice for analyzing the data from the interviews. This approach was chosen because it allowed the development of a collection of possible explanations for the data collected. It was decided that this was preferable to applying a theory to the data (Bryant & Charmaz, 2010). Conversation analysis was also used as a tool because it fitted especially well with the nature of conducting interviews, as it focuses on talk in action rather than talk and interaction.

[13]Stratified random sampling is a way of choosing respondents' samples. It consists in subdividing your sample into groups or subgroups and selecting a given number of respondents. The advantage of this sampling technique is that the surveyor can choose a sample in the desired proportion based on the nature and purpose of the survey (Fink, 2009, pp. 53-55)

3.4.1.1Interviews

Qualitative interviews served as one of the main sources of input for the case study. Rubin argued that one of the most important sources of case study information is the interview (Rubin & Rubin, 2005). Information gathered from interviews was used to corroborate previously gathered data from site observations. Interviews with inhabitants were also a functional tool to document inherited oral building traditions. The final outcomes of the interviews were in the form of written notes that were examined and analyzed to produce a list of the main case study issues. These issues were then used to form the basis of a quantitative questionnaire. Some interviews were taped and transcribed only when there were group interviews, to avoid missing some parts of the conversation.

Local craftsmen such as carpenters and blacksmiths were interviewed as well as local municipality employees. The aim was to gain an understanding of building methods, cultural norms and social practices and habits related to building know-how, socio-economic conditions, beliefs, feelings and opinions about mud brick houses. Current housing needs and problems were also discussed, as well as future aspirations for housing and local municipality planning strategies.

Focused, structured and walking interviews were used. In the focused interviews, four interviewees were interviewed for 30 min each. The focus of the questions was on the case study protocol. The interviews were filmed and the films were shown to the Balat inhabitants at a local seminar as a means of establishing contact with them and showing interest in their building traditions.

Structured interviews were carried out with 30 inhabitants all of whom were still living in their old mud brick vernacular houses in Balat. Among these interviewees were a carpenter, a blacksmith, the mosque Imam, a mason, the mayor and five residents working in the local municipality. Although the age range was from 19 to 90 years, the majority of interviewees selected were older in order to make it possible to gather tacit knowledge handed down from the past. The structured interviews were particularly useful where they provided information that corroborated the other site survey information. The same questions were asked of the 30 interviewees to ensure that the answers were consistently aggregated. At the same time, using the same questions facilitated the comparison of the answers as interviews were not all conducted at the same time. Questions targeted social and cultural habits related to building traditions, building methods and techniques, gender and building processes, way of life inside the houses and its relevancy to house configuration, problems within the mud brick houses and future needs or aspirations.

Walking interviews were conducted with 20 persons from Balat. Ten of the interviewees were still living in mud brick vernacular houses and 10 interviewees had moved into concrete houses. These interviews were helpful in understanding the

locals' sense of place and their daily socio-spatial practices. Walking around with the inhabitants was a way to see the town in their eyes and to observe how they interacted materially and socially with others living in their neighbourhood. It was a successful means of locating special nodes within the town's urban fabric that are of special relevance in daily life or extraordinary events. At the same time, these interviews showed which nodes were significant for them in terms of time, memory or geography. Walking interviews revealed likes and dislikes regarding areas and zones within the town facilities, especially for those inhabitants who were not living there anymore.

Below are excerpts from transcribed structured interviews with inhabitants[14] showing a wide range of feelings, problems and visions about their houses and about the past, present and future situation in Balat. All the interviews were done in Arabic then translated into English.

Om Mostafa, 85-year-old lady

"Life was easier before. We worked and helped each other. We did not take money from each other for a certain job you did. We exchanged benefits and sometimes worked without any reward for poor people and old seniors in the town. We used to start our life with a small house–only two rooms, kitchen, toilet and storage. Before, constructing a house almost cost nothing. We extended the house vertically or horizontally depending on the available spaces. Now when a man is thinking of proposing to a lady, he expects that the first thing she will ask "Do you have a new concrete house?" Although life was very tough before in terms of lack of facilities, we were satisfied and happy with our way of living".

Om Asfraf, 57-year-old lady

"When tourists come to see our town, they feel pity because we are now building with concrete. We know that it is not good for our town, but that is what our children need for their future. They don't want to live any more in mud brick houses. They want to develop their living and follow the new fashion".

She added: "We saw that the foreigners when they come to work here, they live in mud brick houses. We know why because we know how good those houses with mud brick are. Unfortunately, people are moving day after day from Balat, but I will stay here till I die".

"As you can see I live very close to the periphery of the town. I built a new mud brick house just a few meters in front of my old mud brick one. I added the new

[14]The interviewees' names are mentioned only by first name that is for ethical concerns to avoid familiarising who is the interviewee.

facilities I needed. The new house is bigger because I need bigger spaces for my children and grandchildren when they grow up. I have tiles for the floors. I added a bathroom and kitchen tub with good drainage. I have water pipes in the bathroom and the kitchen. Now I can wash the dishes inside my kitchen, not outside the house as before. Now I have a fridge to store my food in, a washing machine and a gas stove. I am happy so far with my life and I have sufficient conveniences for my daily activities. I still use my old houses as storage and I use the old oven for baking as well."

Mostafa, 68-year-old man

"Diseases started to appear when people started to move into concrete houses. We know that the concrete houses are not healthy and are not comfortable both in summer and in winter, but what we can do. That is what our kids want for their future."

"If I get the money, I will build with concrete for my kids, but not for me."

"Some houses in Balat are falling down. They are like ruins. Dogs and foxes are wandering around in these demolished areas. It is not safe anymore."

Mohamed, 60-year-old man

"I used to be the town barber and I used to prescribe herbal medicine to people. Before, I used to take eggs, wheat or rice as a payment for my work."

"It is really comfortable inside my mud brick house. I don't even need a fan in summertime. I have a dark room with very small windows; it is really comfortable in summer. You know the sand we sprinkle on our floors is better than ceramic tiles, it is healthier. Concrete houses bring sickness."

"My children will build with concrete. Even if they want to live in mud brick houses, their brides will not."

Khadeja, 40-year-old lady

"We always keep our houses clean and our town clean. We usually clean the streets and we add a new fresh layer of sand every month. Everyone takes care of each other and loves his neighbours. We know each other and we help those who are in need. We used to share crops with each other and the ones who had gave to the one who didn't have."

The mayor's wife, 60-year-old lady

"I still like to live here in my old mud brick house. My husband died a few months ago. I can't sleep alone, so I go at night to sleep with my son's family in his concrete house on the outskirts of Balat. Every morning I run back to my old mud brick house to spend the whole day. I cook and bake as usual. My son comes to have lunch

with me every day. I still love to be here, it is more comfortable and I like to talk with my old neighbours."

"We used to communicate with each other standing on our roofs. All the houses were close and connected to each other. You could hear what was happening in your neighbour's house."

"Life was much easier before. There was a lack of many facilities but it was not as complicated as today. We used to bring water for daily needs around the house from the well and carry it back home every day. Ladies used to do a lot of physical work, grinding the wheat and peeling the rice, but we loved that way of living.

"I love Balat, it is the place where I grew up. I wish all the best for Balat in the future".

Nadia, 40-year-old lady

"Balat is my paradise."

Abdallah, 55-year-old man:

"People look at Balat as a historic place. We see it as a place where we want to live and develop our lifestyle. Now we feel that we are not free to have new facilities inside the houses for fear that water might destroy the walls."

Om Kamel, 65-year-old lady

"Now I am living alone. I am afraid that the house might collapse at any time. I am trying to maintain the house and restore the cracks. I added a new toilet with a drainage system. Since that time, the cracks have started to appear and I am afraid every night that the house might collapse over my head. Last night the roof fence collapsed. I don't know tomorrow what will happen."

"I built this house with my husband more than 40 years ago. I carried every single mud brick in that house. I used to maintain it to keep it always in good shape. We extended the house two times when our children grew up. If I had money I would move out to a new concrete house for the fear of theses cracks."

Mosque Imam, 90-year-old man

"Our houses are like living elements. They grow, they demand to be regularly looked after, repaired and cared for like a sick person and they die when allowed to fall into disrepair."

"We were created from clay and we will go back to clay when we die. That is why our clay houses suit our way of living best."

Hamuda, 60-year-old man. The town builder.

"I inherited building techniques from my father. My father inherited them from his father and my grandfather inherited them from his father and so on. If you keep this knowledge in your head and don't pass it on to your son, these secrets will go to the grave with you."

Mona, 23- year-old lady

"When I decide to marry, I don't want to live with my husband's family. I need to live in a separate house built of concrete. If a man proposes, the first thing I will ask him is, "Do you have a concrete house?" It is not only me. We all think the same."

Fatma, 19-year-old-teenage girl

"I need to live in a house similar to those built outside Balat. They look modern and new."

So'ad, 29-year-old lady

"This is the fashion and we have to follow the stream. Even if these concrete houses are not good for our climate, we need to look like those who moved out. I will do the same. Why not me? It is not possible any more to live in the old town. The houses are falling down."

Ahmed, 25-year-old man

"I imitated my elder brother and built with concrete. I just moved this winter. I am really afraid of summer when the sun hits strongly. I am praying that my younger brother will build another floor over mine to protect my apartment from direct sun."

Magdy, 32-year-old man

"I don't know exactly how the old houses inside Balat were built. It is rare now to see someone building with mud brick. I know how to cast mud brick but we use them now to build barns or farm houses."

Fawzy, 22-year-old man

"I don't know if I am going to build with concrete or mud brick for my future house. It depends on my financial situation. Mud brick is better but concrete is more fashionable."

Mohamed, 25-year-old man

"I bought a new piece of land to build a new house on for my family. My wife wants to have a separate house. I will build with concrete. If I can put the facilities I need in the mud brick house I will build with mud brick but I know it is difficult. Mud is not water resistant and I don't want to risk my children's life."

Fo'ad, 35-year-old man

"The land value is high. With concrete, I managed to build a four-story building for myself and my children I would never have been able to do that if I had built with mud brick."

Mostafa, 23-year-old man

"You live in a concrete house in Cairo, don't you? Why are you asking us all the time whenever you come here, why aren't you going back to mud brick houses? Would you like to live in a mud brick house and leave your concrete one? We know that mud brick is better, no doubt, but we need to look like city people. Only poor people are still living in mud brick houses now in our town. We need to upgrade and modernize Balat."

Ali, 28-year-old man

"I live in a mud brick house. I plastered it with cement mortar on the outside and then with lime. It looks like a concrete house when you look at it. I am happy because it looks modern and no one can feel that it is mud brick. Moreover it is not hot from inside like concrete ones".

The analysis of the interviews followed the four steps described below, which were developed based on grounded theory and conversation analysis (See Charmaz, 2006 & Fink, 2009).

1- Targeted interviews were carried out and the transcriptions of each one were first examined separately. Once all the interviews had been completed, they were examined as a whole to discover connections and common or related information.

2- Portions of interviews that seemed to have a clear and direct relevance to the main research inquiry were highlighted. The input of relevance was then summarized and categorized using key themes, such as *building know-how, local material, building techniques, social habits, technical problems* and *current needs*.

3- A search was carried out to locate similarities and differences that related to the key themes. Information about these similarities and differences was then summarized and divided into categories related to the research questions using the previously selected key themes.

4- Data was compared by determining relationships among the main themes of the research inquiry from the interviews, as well as from the material derived from site observations, field notes and the questionnaires that are described below. Then these diverse data were synthesised and analysed. The main information was summarized and added as documentation to the analysis of the relevant aspects of the study.

3.4.1.2 Questionnaires

Designed quantitative questionnaires[15] were used mainly to collect information related to the current locals' housing needs and problems as well as information about their future expectations, desires and willingness to live in mud brick houses. The target group was both local residents still living in mud brick houses (30 persons), and others who had moved into new concrete houses (10 persons). A total of 25 men and 15 women ranging from 21 to 85 years of age participated in the questionnaire survey.

The questionnaire was composed of 14 questions. It was first designed in English then translated into Arabic and then translated back into English by another person. The second English translation was then compared to the original English questionnaire to make sure that the meaning was identical after translation into Arabic.

In the first attempts at using surveys, the questionnaires were distributed among the inhabitants in one of the sessions organized by the local Balat municipality to explain the project. The aim of the questionnaire was explained to the locals on that day and the questions were clarified one by one. Inhabitants were asked to fill in the forms and return them the following day. This turned out to be an unsuccessful survey technique because some of the locals were illiterate and the educated, who were not used to filling in questionnaires, were unsure about how to fill in the forms. As a consequence, it was decided to make appointments with residents to meet them at their homes or work places and ask them the questions face to face. This new approach was in agreement with the views of Oei and Zwart, who claim that participants respond differently to questionnaire and interview prompts, and that face-to-face interviews or questionnaires trigger strong affective responses while merely handing out questionnaires or interviews permits a wide range of responses (Oei & Zwart, 1986).

---

[15]Expert evaluation questionnaires were also used as a part of the transdisciplinarity method to evaluate: social situation, problems within living environment, the quality of architecture and urban spaces together with measuring experts perceived restorative qualities of favourite places in Balat. Moreover, the aim was to use this designed expert questionnaire form as a source of increasing reliability for site direct observations of current research issues and gaining input about research problem from experts in different disciplines. The 15 respondents were from different disciplines such as archaeology, architectural conservation, urban ecology, environmental design, art history, traditional architecture and ethnography. After the synthesis of these questionnaires outcome, it appeared not to be the best choice as a tool due to using questionnaires designed by other professionals. It would have been better if I had designed a special questionnaire form for that purpose. However the questionnaires outcome gives an indirect contribution to the transdisciplinarity method through involving specialists from different disciplines in the discussion of the research problem.

3.4.2 Video filming and photographing

Video films were helpful in documenting different building process. Filming allowed the visual documentation of building techniques in action together with providing a record of the narrative description of locals talking about what they were doing. (See Heath, Christian & Luff, 2010)

Frame analysis[16] was used in analyzing the videos. This technique was selected because it provided an excellent tool for locating precise information and actions about events that had a specific purpose and were carried out within a specific timeframe (Goffman, 1974 & Erickson 2004).

Conversation analysis[17], on the other hand, was used to analyze dialogue between me and the locals during filming as they described their building know-how or social habits related to building traditions. Then the material from the videos was transcribed and incorporated into the relevant part of the study.

3.4.3 Site observations and field notes

During site visits, events were observed and observations were recorded in field notes. These notes contained thoughts, ideas and reflections about the events or about interviews that had just been conducted. Observations and field notes were personal descriptions of what I had observed. In them, I focused on certain ideas, hunches and personal impressions. Writing down questions that arose from reflecting on the observation data during site walks served to enrich the research discussion and the arguments.

These personal notes also provided ideas for future actions. Recording insights and speculation about what I had observed provided a tool for clarifying points and misunderstandings and reconsidering previous assumptions. Date, time, location and short titles for observed subjects were helpful afterwards in the analysis phase for identifying the purpose of the observation.

---

[16]This method was developed by several researchers from them Erving Goffman, Kurt Lewin and Edward Hall. Also it is named event analysis (see Frederick Erickson, 2004 & Goffman, 1986). It was used in the video analysis as it helps in emphasising precise findings for beginnings and endings of events happened inside the recorded video where these events had specific boundaries.

[17]Conversational analysis is described as performing inductive analysis from a transcribed conversation (Sidnell, 2010 & Spradley, 1979).

3.4.4 Site measurements

As mentioned earlier, an urban survey of the town streets and buildings was essential due to the lack of detailed or updated maps for Balat. The existing maps[18] were used for guidance. They were updated on site and urban investigation was conducted for use in the urban and architectural analysis. Manual architectural measurements together with laser scanning were used for measuring samples of houses, an olive press, the mosque and the Kutab (Qur'an school for children).

3.5 Transdisciplinary participatory action research in Balat

Based on the outcome and analysis of both the historical data and the survey, transdisciplinary[19] participatory action research was chosen as a method in the case study. This combination of participatory and transdisciplinary methodologies then became the basis for the application: the construction of neo-desert vernacular model house.

Transdisciplinary methodology was applied in Balat to make it possible to deal with the complexity of the factors affecting the research problem and the architecture studied. Transdisciplinary research, as explained in the *Handbook of Transdisciplinary Research,* provides a way of perceiving the complexity of problems and of investigating them from a diversity of perspectives (Hadorn & others, 2008). It has been argued that transdisciplinarity is an intellectual space where participants from diverse disciplines can express their views and provide input of different types (Somerville & Rapport, 2002). Lawrence & Després stated that transdisciplinarity deals with problems which are complex and related to several disciplines; it is context-specific and implies intercommunicative action (Lawrence & Després, 2004).

---

[18]Two main maps were used, one obtained from the Egyptian Survey Authority (surveyed in 1932 with scale 1:25000) and another map from the Egyptian Ministry of Urban Planning (surveyed in 2008 with scale 1:2500).

[19]A transdisciplinarity method was chosen over multidisciplinary and interdisciplinary methods because multidisciplinary research involves the juxtaposition of disciplinary contributions without formal exchange or co-ordination between disciplines or professions. Interdisciplinary research involves the exchange and integration of information, concepts and methods with collaboration, interaction and co-ordination but only on a superior level. Transdisciplinarity is a sort of interdisciplinary research approach but within a system or structured research plan through encouraging participation and involvements of different social members in an action collaborative research plan. (See Piaget, 1970 , Lawrance, 2004, Pohl et al., 2008 & Brown, Harris & Russell (red.), 2010).

The participatory component applied the concept of community participation, which is broadly defined, as a social process in which groups and individuals are assisted in order to help them communicate and decide about the future of a specific issue (Gramberger, 2001). Lawrence explained that many tools can be used to assist participants including conventional simulation methods and new information technologies that enhance communication (Lawrence, 2004).

Participatory action research (PAR) is a recognized form of experimental research that focuses on the direct practice of the researcher acting within a participatory community. Its goal is to improve an area of concern (Reason & Bradbury, 2001). It has been argued that (PAR) politicizes the research process as a base from which power relations are transformed and opens the research design process up to collaboration with community partners. This kind of collaboration might include data collection, analysis and planning (Mountez, Moore & Brown, 2008, p. 221).

Stokols's study points to Kurt Lewin as one of the pioneer scientists practicing action research through working with community participation. Lewin's concept of action research highlights the scientific and social value of research into community problem-solving strategies (Stokols, 2006).

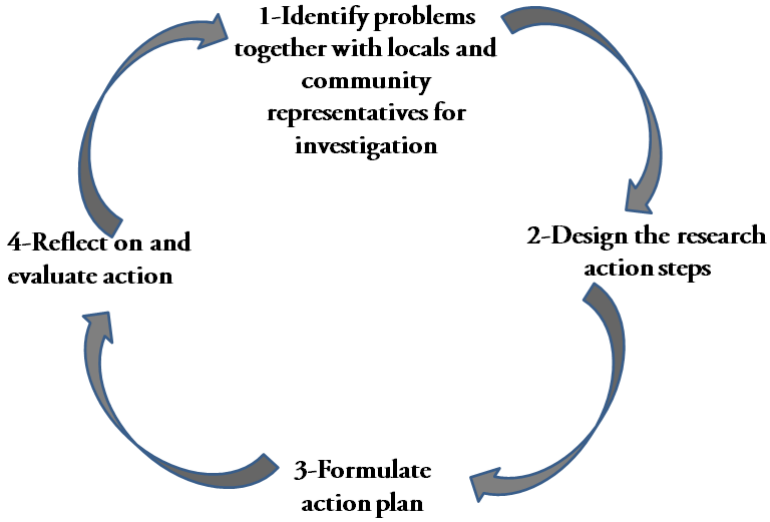


Figure 3.5 The participatory action research thinking model and formulation process derived from Lewin and Kolb experimental learning model (Kolb,1984).

My main role in the PAR process was to facilitate the creation of a mutually agreeable outcome, the model house, together with local Balat participants. The aim was also to help the locals maintain and continue the action research after the project's end. To accomplish this, it was necessary to adopt many different roles at various stages of the process, including being:

- Catalyzer presenting the notion of thinking re-vernacular through the idea of building the neo-desert vernacular model house.

- Planner for the local seminars and the design workshops.

- Facilitator during the building phase when decisions were taken among the local participants.

- Observer of the building process.

- Listener to the locals' discussions and debates during the design and building phase.

- Synthesizer of the outcome of this PAR process.

3.5.1 Asset-based transdisciplinary participatory action research

Applying transdisciplinary participatory action research gave the chance in the present study to bring together scientific research with the everyday experience of field practitioners, engineers, the local authorities, local investors, local NGOs and small local business owners together with members of the local community in Balat. All were given a chance through their participation to define problems and express their views on the future of the town, which the majority of the inhabitants considered to be a heritage land.[20] The main concern was to empower local inhabitants. They were encouraged to contribute their ideas so that the method process could incorporate their specific cultural and traditional beliefs together with rituals; that is, the main concern of this phase was to include their sense of belonging to their community.

Participation was used as a tool to create dialogue between the inhabitants and the policy institutions assembled in the local Balat municipality.[21] This dialogue was intended to enable all concerned to express ideas about their current needs, share in

[20] Based on the questionnaire done on site 75 % of inhabits consider Balat as an important historic place.

[21]This transdisciplinary approach considered the national strategic plan for Balat's future development until 2027 developed in 2008 by the Egyptian Ministry of Urban Planning in the discussions with the local authorities and local inhabitants.

problem-solving as well as articulate their future aspirations. During the entire participatory action phase, representatives of residents of Balat were involved in discussions with the following people: two civil engineers and one architect from among former Balat residents, a local contractor, two mason builders, three local carpenters, one local blacksmith, two local investors, five municipal employee, two local NGO members, two representative from the Supreme Council of Antiquities, five small business owners, and one university history professor.

Generally, involvement of the Balat's local community increased the possibility of developing better understanding of dwellings in Balat, especially in relation to their social uses. The transdisciplinary approach was a useful way to put into effect the proposed construction of the neo-desert vernacular model house. It provided a means of preserving the overall vernacular mix of tangible and intangible factors. The need for the involvement of locals was especially clear in the physical building steps, where it was necessarily to benefit from their knowledge and building know-how.

3.5.2 Transdisciplinary participatory action research in practice

Carsjens argued that community participation, especially in design or planning projects, is necessary for obtaining appropriate solutions. She explained that the harmony between project outcome and users' requirements may avoid failure from non-asked performances or neglect of inhabitants' presence. She made a very important observation when she stated that planning for the people is obviously no longer acceptable, and planning with the people has proved to be too complex, so planning by the people has become the call of many conservation design and planning projects (Carsjens, 2009).

Applying this concept in Balat, PAR was used as a process for creating channels of communication among community members through dialogue. PAR involves empowerment of the community to identify their current problems or contemporary needs, and to be able to decide together with a researcher how to work out solutions. This PAR project gave the chance to locals of Balat, members of local community groups and the researcher to collaborate in researching questions of importance to solving vernacular houses problems in Balat community.

The PAR project reported here built on the existing capabilities of locals, and paid special attention to strategies that engaged families, communities and local authorities in problem analysis and the search for solutions. People in Balat know the area and their problems better than practitioners and outsiders will ever know. Getting their input and having them help decide the nature of a neo-desert vernacular model house was also a way to develop their sense of ownership and increase the chances of success for the model proposal.

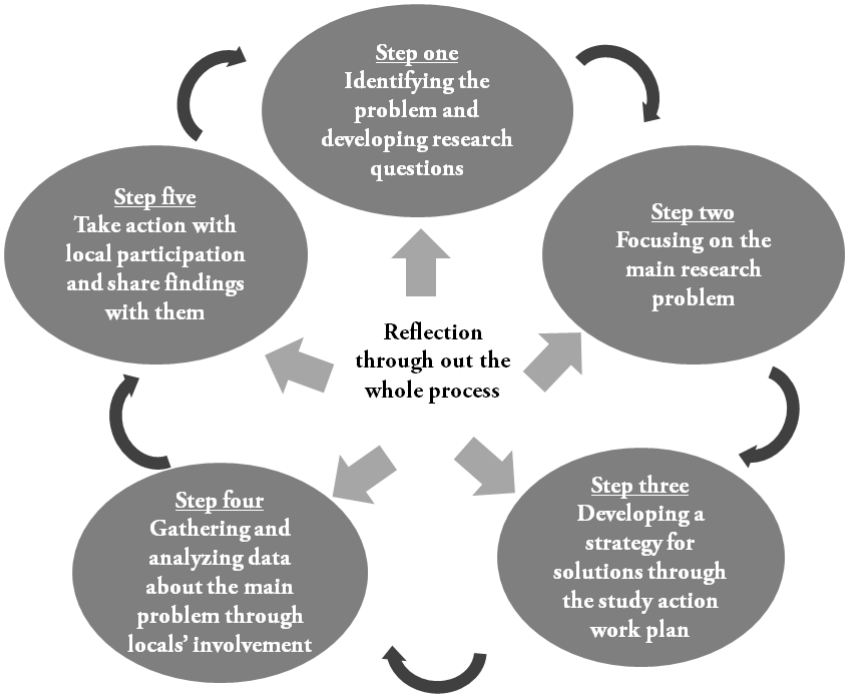


Figure 3.6 Detailed action research process in practice, inspired by Lewin's, Kolb's and Piaget's learning models (Zuber-Skerritt, 1994).

During the work applying PAR to the neo-desert vernacular model house, an important aim was to avoid the 'hit and run' model that Stokols describes in his study, *Toward a science of transdisciplinary action research.* This sort of model had led in many projects to frustration and annoyance among community members, as researchers gave advice about their problems and then left without showing practical solutions for how to solve them (Stokols, 2006). Sommer has pointed out that a researcher cannot tell people that they are mistaken and run away and expect them to change their actions or behaviours. He insisted on the necessity of working with communities to assist in the transformation process (Sommer, 1977).

3.5.3 Modes of participation followed

The following four main modes of participation were applied in the PAR in the present study based on (Biggs, 1989, Cornwall & Jewkes, 1995) discussions on participations modes to be followed:

- **Contractual:** Inhabitants of Balat were engaged by verbal contracts in steps in the action research project. It was agreed that I was allowed to take part and help in their future enquiries and current housing problems or demands.

- **Consultative:** Inhabitants of Balat were asked about their opinions and were consulted before decisions or any practical actions were implemented.

- **Collaborative:** Local inhabitants worked with me on the project design and initiation, but the work process was managed by me.

- **Collegiate:** Local inhabitants with various different skills worked together with me as colleagues in a process of shared learning where locals had control over the process.

3.5.4 Local seminars and the wish lists

Before starting the practical steps of the (PAR), the work process was explained to Balat locals. Meeting with locals in a planned local seminar proved to be a successful start for approaching them. First a meeting was organized with the municipal authority and the local NGO in Balat to plan for this local seminar. Approaching Balat inhabitants through trusted figures in the local community was the first key to gaining their trust and their willingness to co-operate. Alternatives were discussed for a day that suited the majority of locals. That was an important means of increasing the chances for local participation. It was agreed that a Friday evening was the appropriate time for the locals as it is a weekend. A seminar hall was chosen by the municipality that was well known by the locals and could accommodate a large number of people. The next step was to announce this meeting one week ahead and Balat dwellers were invited.

Figure 3.7 Meeting the municipality of Balat personnel to arrange for the local seminar.

Figure 3.8 During the local seminar.

Local investors, small business owners, local NGO representatives, local engineers, local contractors and the local craftsmen were invited to participate with the locals. Both genders were present, as well as people of different ages and professions. Families came together with their little children; for them it was a kind of an outing and that feeling was needed during this meeting to help them feel at ease. The locals called this seminar a local conference and they were proud of being invited to a local conference made especially for them. Fifty-five persons attended the seminar in total.

A short introduction was given by the representative of the municipal authority about the purpose of this gathering; then the seminar started. I started with a brief introduction explaining the aim of the meeting and the final outcome we needed to reach for our discussion in the coming two hours. Visual aids[22] were used, as it was a direct tool that was easy for the majority of the locals to understand. The language was simple and the pace of talking was slow. Both pictures and videos were used as ways to attract audience attention and increase their involvement for as long as possible for the whole two hour seminar.

[22] Sibbet discussed in his book that based on his experience visual aids had proven to be the most proper way to approach dwellers in local communities as it facilitates understanding of the information, increase dynamic participation and encourage the engagement of locals in discussions (Sibbet, 2010).

The presentation was divided into four parts. First was a discussion of the current situation in the town as compared to other desert towns and villages in the Western Desert of Egypt. The second part was a slide show showing mud brick houses in Europe and USA built in the 20th century. Third was a video showing interview with social upper-class Egyptians living in mud brick houses in Cairo and Giza, the two biggest cites in Egypt. Fourth was discussion on suggested solutions for current problems in Balat.

In the video portion of the presentation, one interview was with Ikram Nousshi, an Egyptian architect,[23] talking about his family's and relatives' experience living in mud brick houses built by the famous Egyptian architect Ramses Wissa Wassef at Harrania in Giza. He explained why they had not chosen to live in concrete skeleton houses although they could have afforded the cost of expensive building materials. He talked about his experience in building with mud brick and other traditional materials such as stone. He dedicated part of is talk to Balat residents, explaining the environmental benefits of mud brick houses and moreover he gave some tips on maintaining mud brick structures. The interview included some information about the handicraft centre and also the art museum built with mud brick in Harrania, designed by Ramses Wissa in 1952-72.

Figure 3.9 Architect Ikram during the interview in front of the mud brick art museum in Harrania.

Figure 3.10 Architect Ikram during the interview inside his house, which is built with traditional materials in Harrania.

[23]Ikram Nosshi is an Egyptian architect that devotes his practical experience to designing and building with traditional materials. He trained a lot of workers in building with traditional techniques.

In general these movies with interviews with other dwellers living in mud brick traditional houses in the capital city of Egypt were quite provocative and proved to be a very helpful catalyst in approaching the community. The Balat inhabitants listened very attentively to these people from the social upper-class of Egypt talking about the comfort of the indoor climate, health issues and cultural aspects. These videos made a strong impression because the discussion showed Balat inhabitants that also foreigners in the neighbouring desert oases in Egypt were living and working in mud brick houses and research offices. They showed people talking about how mud brick was a good solution for housing in the desert climate and better than concrete houses. Although the people in the films could have afforded to build with concrete, they choose to build with mud brick for the sake of better indoor climate. This idea helped in breaking the myth which Balat inhabitants believed in that mud brick houses are associated with poverty and low standard living conditions[24].

3.5.5 Design with locals through modelling focus group workshop

During the seminar, the locals were invited to another workshop to design the neo-desert vernacular model house. Ain Alaam piazza was chosen as a location to meet the following day because it is well known and people meet there for afternoon prayers. It was thus a proper place to meet and talk. Seniors and youth were present in this workshop in addition to representatives from the local municipality and the local NGO, who also shared in this design process. Youth contributed by talking about their aspirations and future desires; seniors contributed with the local vernacular wisdom and experience, while the local authority and the local NGO represented the recognition of and support for the design and building process. Seventeen from Balat locals in total participated in this design workshop.

Design alternatives were discussed in a way that allowed a mix between traditional house configurations and facilities for modern living needs. There were different interests and concerns. Seniors were talking about the necessity of house design to cope with the harsh desert climate, and youth talked about ceiling height, finishing materials and bigger spaces to accommodate electric appliances. Several issues were also discussed such as bathroom and kitchen utilities and how important it is to have a proper drainage system. Problems and technicalities such as water-proofing were

[24] During the meeting other sustainable and environmental solutions for locals' current problems within their desert vernacular houses were discussed. For example the possibility of installing biogas tanks for bread and cooking ovens, the concept of compost (dry toilets), solar water heaters and solar photovoltaic collectors. In addition, showing alternatives for finishing materials and techniques made of natural components that are available in the local environment in Balat, which can be used as an alternative to ceramics tiles and plastic paintings.

also discussed and technical advice and solutions were explained during this design discussion. This workshop ended with one alternative that matched what the majority of the people needed. The aim was to create a flexible model design that could solve current problems in traditional mud brick houses and accommodate modern living facilities that the young generation was looking for.

It was expected that the use of 2-D drawings would not be a successful way of approaching Balat community. While starting working with them sketching on the ground, it appeared that locals have the ability to draw and imagine because that is the way they usually design their houses.

Figure 3.11 Design process with locals through modelling focus group workshop.

Figure 3.12 A sample for a house designed by locals.

Figure 3.13 Discussions during modelling focus group workshop.

Figure 3.14 Discussions during participatory meetings.

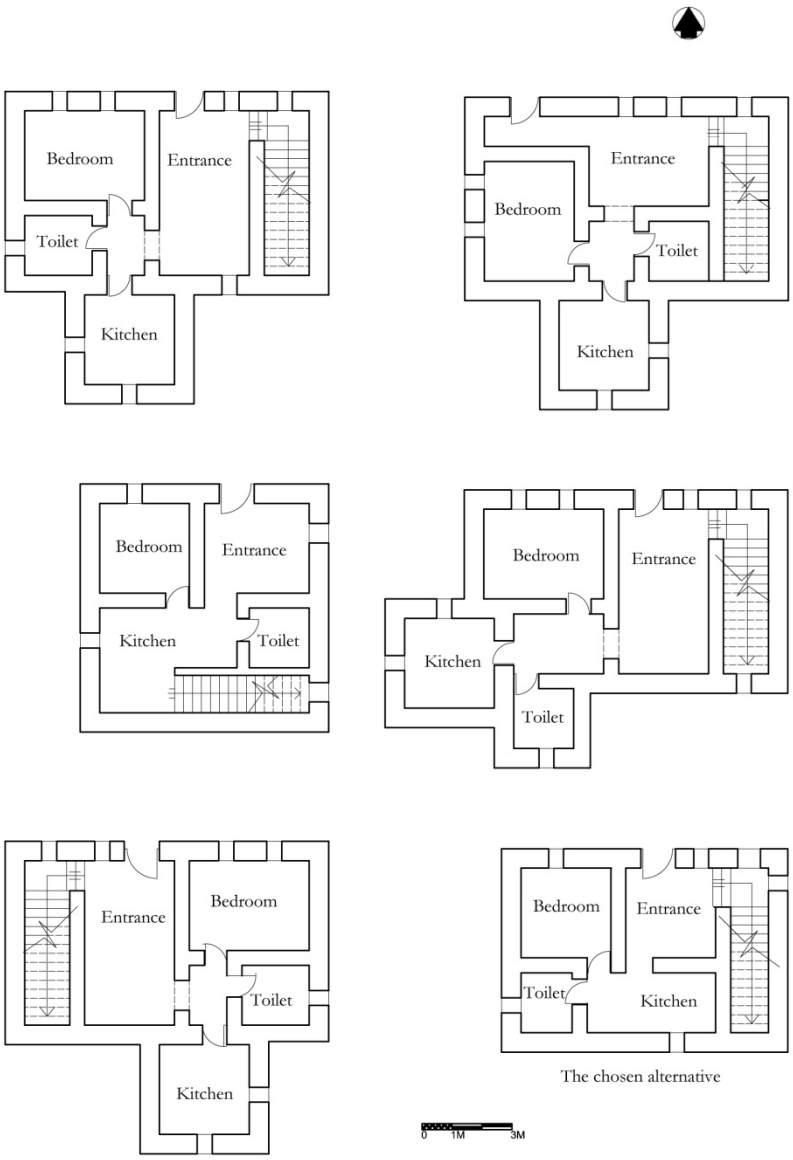


Figure 3.15 The figure shows the neo-desert vernacular model house alternatives which were designed by Balat locals. One of the alternatives was chosen for the construction phase and one of the rooms was built.

3.5.6 Pilot physical model house test

The last phase of the transdisciplinary participatory action research was the implementation of the building phase in collaboration with Balat local inhabitants. A local carpenter and a local builder offered to participate and be paid for their effort. Thirty-three persons from among Balat locals agreed to participate in the whole building process (31 men and 2 women) working for 20 days in shifts. They were paid for their effort for 5 working hours per day. I prepared the raw materials for building with the help of experience from locals. This phase will be explained in detail in chapter five.

3.6 Chapter conclusion

This chapter discussed the case study methodology adopted as a methodological approach to achieve the main goal of the research, to solve the thesis problems. It also describes the path followed to answer the research questions. The case study methodology comprises three main methods (collection of historical data, a survey and transdisciplinary participatory action research). Each method includes several tools and techniques for collecting information. Ways of analyzing the data gathered from different research tools was also discussed in this chapter.

4. Balat the desert town-case study analysis

4.1 Introduction to the chapter

This chapter presents the analysis of the case study carried out in the town of Balat. In order to carry out this analysis, it was essential to learn about certain aspects of the town's history, its importance in the Western Desert oases, and its potential for future development. After discussing the findings about these aspects, the documentation of the key characteristics of the Balat vernacular will be described in terms of architecture and of urban and building technology. Some factors relevant to social, cultural and economic analysis will be introduced as well. To document the town and explain the above mentioned aspects, architectural drawings, 3d models, pictures and maps were also prepared, despite the challenge that had to be met to produce or locate them. They, too, are presented in this chapter. The site investigations in Balat started in January 2008 and ended in March 2011. During this period, site work was done in consequent phases.

4.2 Location, history and topography of Balat

Balat was chosen as the location for the case study not only because it provided an example of a desert vernacular settlement appropriate for the explanatory phase of the case study, but even more because of its historical, architectural and topographical significance. This study thus follows the admonition of Yin (2009), Stake (1995) and Feagin, Orum, & Sjoberg (1991) to select a case study location so as to maximize what can be learned in the period of time available for the study. In this regard, there are several factors that made Balat the suitable choice over other possible desert settlements.

1- Balat still maintains its cultural and historical identity, with its concomitant architectural features and details.

2- Field observations revealed that sixty percent of the town is still in a physically stable condition, and that the degree of demolition is minimal compared to villages and towns in other desert oases.

3- Site investigation showed that thirty percent of the town[25] is still inhabited, and a life style typical for farming, baking, practicing rituals, socializing, grinding wheat and oil pressing still exists.

4- There are no signs of vandalism and no replacement of traditional architecture by new concrete houses within the old town. People are keeping their traditional dwellings and some inhabitants are still maintaining their old dwellings, even if they have left them to live in new concrete ones outside the old town.

5- Balat was declared a protected site by the Egyptian Supreme Council of Antiquities in 2007. This protected the town from violent acts or demolitions and provided for control of any change in its character.

6- My personal interest in Balat[26] is also influenced by its distinctive artistic appearance, aesthetic, architectural qualities and urban typology. I see it as a rescue case.

---

[25] This percentage was obtained by comparing the number of inhabited houses in January 2008 in the old town of Balat with the total number of houses. The figures and facts were provided by the Balat local municipality from census reports. This percentage varies every year due to the gradual departure of inhabitants from their homes in the old town of Balat.

[26] Using Stake´s inclusive definition for case study: "A case study is defined by interest in individual cases" (Stake, 1995).

There is an additional reasons justify the choice of Balat for a case study of desert vernacular architecture in the Western Desert of Egypt. It is the strength, observed during the preliminary site investigation, of the locals' willingness to support the research idea, which thus increases the possibility of success in investigating the thesis arguments. These reasons will be discussed in detail here in sections four and five. In conclusion, Balat was chosen as a place, a memory and an embodiment of an idea about desert vernacular architecture in Egypt.

4.3 Balat as location for the case study

The small town of Balat (25° 34 ′N, 29 °16 ′E), built at the eastern entrance of the Dakhla[27] Oasis, is situated at the junction of two old caravan routes in the western Egyptian desert (Bard & Shubert, 1999). Records refer to Balat as early as the fourteenth and sixteenth centuries, with the name Balat having meanings in Latin and Greek, and including reference to a palace, a paving stone, or a Roman path[28]. The Egyptian medieval historian Al Maqrīzī (1364 – 1442); mentioned Balat in his writings as a visitor to the town. He described the inhabitants' traditions and their habits there (Maqrīzī ,1898).

---

[27] The Dakhla Oasis is one of the five principal oases located in the Western Desert of Egypt (Siwa, Baharia, Farafra, Dakhla and Kharga). It is located approximately 800 km SE of Cairo. Several studies have discovered that the Dakhla Oasis has been inhabited since prehistoric times. Like the other oases in the Western Desert, Dakhla covers an area of about 3,000 km² and there are about 30,000 acres of agricultural land. Many of its 70,000 inhabitants are farmers growing rice, peanuts together with mulberry trees, date palms, figs along with citrus fruits in gardens.

Source: summary from (Mubarak, 1887, Jackson, 2002 & Balbo, 2006) together with the *Bulletin of the French Institute of Eastern Archaeology-1998*, French Institute for Oriental Archaeology in Cairo.

[28] Summary from an archive search dated from the 10th and the 12th centuries at the National Archives of Egypt (NAE).

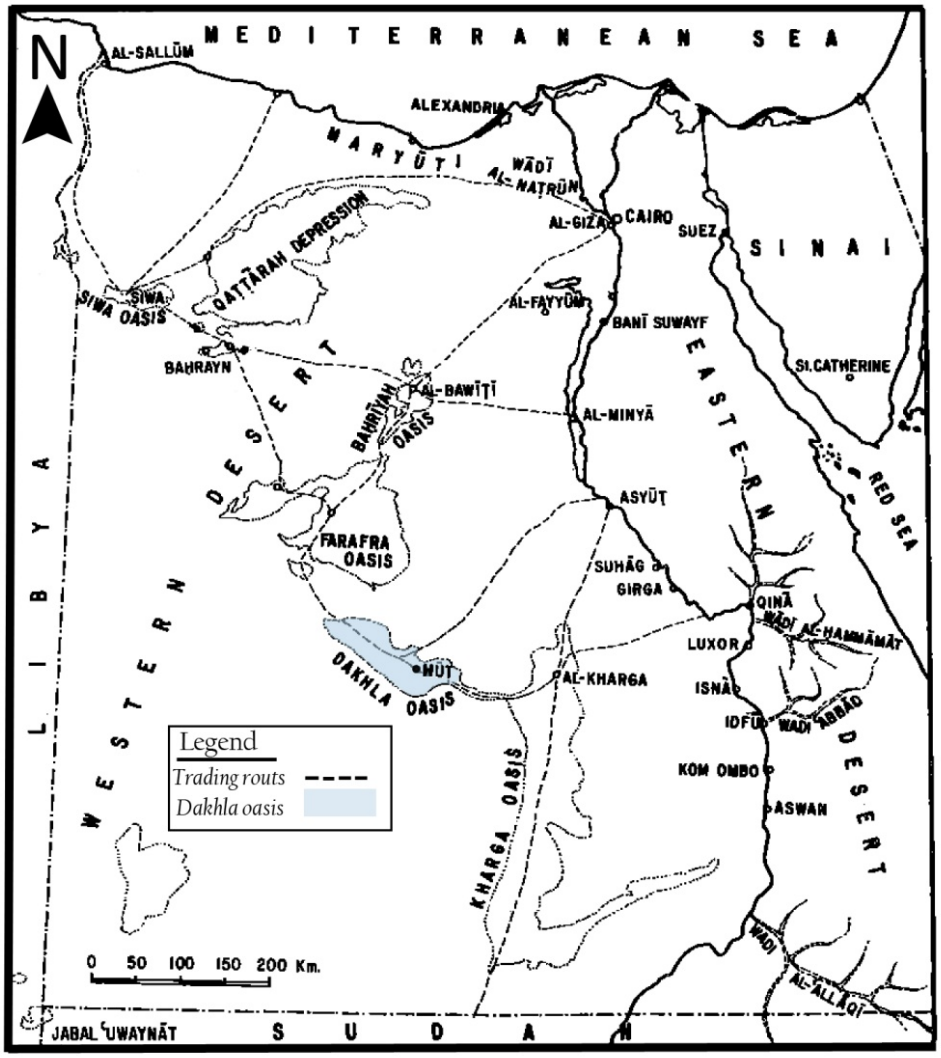


Figure 4.1 Edited map of Egypt, showing the location of the Dakhla oasis in the Western Desert.
Main map source: Fakhry, Ahmed (1973). *The oases of Egypt*. Vol. 1, Siwa Oasis. Cairo.

Balat is 22 kilometres from Mut, the capital city of the Dakhla oasis, and around 800 kilometres from Cairo, the capital of Egypt. Balat was a major old kingdom in the oases (Pantalacci, 1998) and was considered the chief town and headquarters for the governor of the oases in Egypt at the end of the Old Empire (2350/2150 BC) (Gunn 1925 & Krieger, 1976). [29]

Within 2 kilometres around the existing town, archaeological remains have been found of the temple of Mut dating from the New Kingdom, five mud-brick Mastabas (Stepped pyramid tombs) of the Sixth Dynasty, and, from the First Intermediate Period (c. 2181-2040 BC), governors' tombs and residences, as well as tombs of the Greco-Roman period. In this area, too, traces of Neolithic settlements have also been found[30]. The importance of this site is thus found in the exceptional historical situation of an Egyptian settlement far from the Nile valley, and in the fact that this offers a unique opportunity to study an urban system of long-term historical significance (Bard & Shubert, 1999).

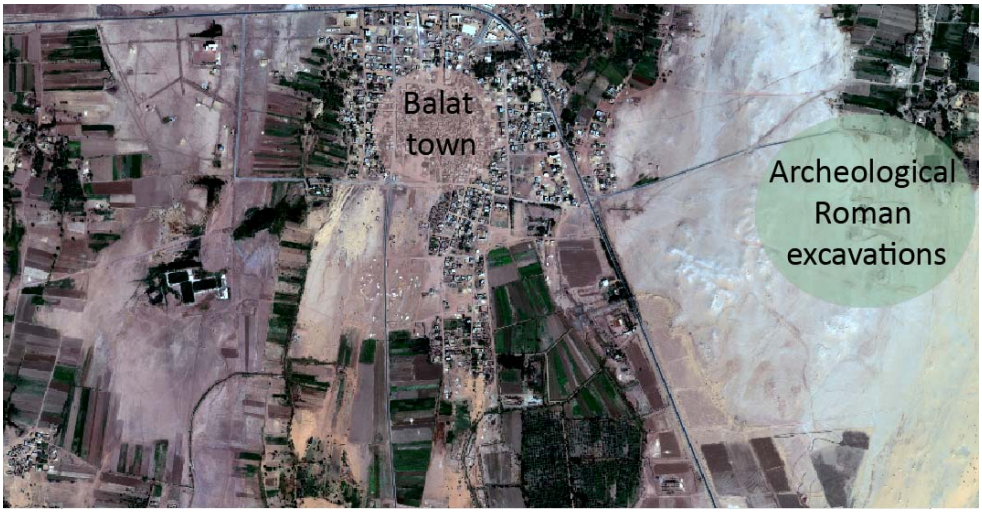


Figure 4.2 Illustrations for the location of the archaeological sites near Balat.
Source: Geo-eye –Satellite image. Captured October 2009.

[29] P.Posener Krieger, The archives of the temple Funeral Neferirkare-Kakai, BdE 65, 1976 451; and B. Gunn, ASAE 25, 1925, p. 242 and 245-246.

[30] Summary from the Bulletin of the French Institute of Eastern Archaeology Vol.1 (1901) and Vol.95, (1998). French Institute for Oriental Archaeology in Cairo IFAO.

Balat today has not changed in its structure since medieval times. The locals in the town have in fact stated that their town started before 651 A.D, the date of the Muslim Arab conquest of Egypt.

The original location of Balat, like that of most desert settlements, was on one of the main trading routes. These settlements provided traders with needed goods where they could also sell their products (Mubarak, 1887 & Shehab, 2009). Balat was a stop for an important trading route, Darb el Taweel (Mubarak, 1887). Later Harding King[31] discovered traces of the Darb El Tawil trading route near Balat. He claims that Balat was an important entrance to the Dakhla oasis. He also discovered Roman wells along the Balat pass (King, 1912 & 1913).

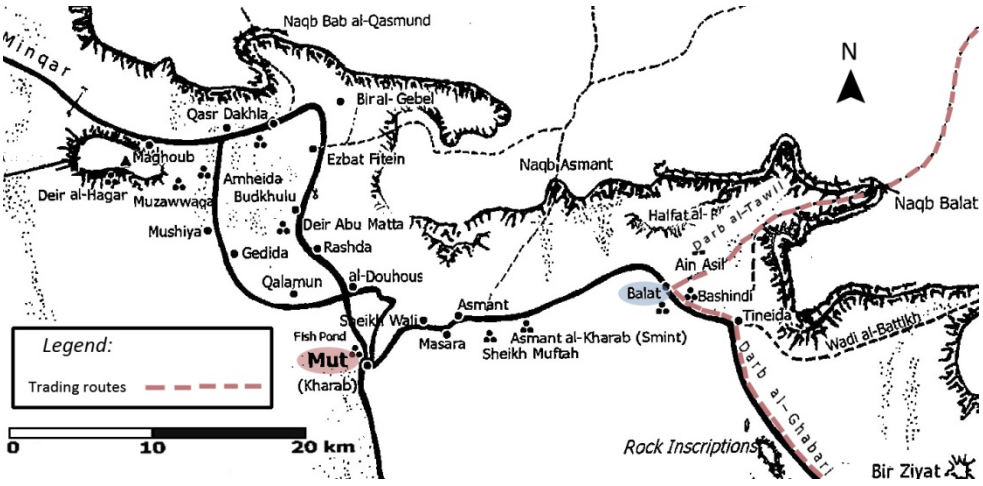


Figure 4.3 Edited map showing the location of Balat and the trading routes.
Main map source: Vivian, Cassandra (2000). *The Western Desert of Egypt.* The American University in Cairo Press.

[31] William Joseph Harding King (1869-1933), was an explorer who made several camel trips to the North African deserts. In 1900 and 1908 he was in Western Sahara and in 1909-1912 he explored the central portions of the Libyan Desert (comprising the desert of western Egypt, eastern and southern Libya, and north-western Sudan). He reached the Dakhla oasis and discovered trading routes in Balat in 1909. He made an accurate map of the Libyan Desert based on information gathered from natives. King published several articles in the Geographical Journal and wrote a book about his travels, published in 1925 (See King 1903, 1912 & 1913).

According to Frank Bliss, the first family to settle in Balat in modern times was founded by a man named El-Balati, before the eighteenth century. He was a carpenter. This family was then followed by Shuheit, a metal merchant from near Marrakesh (Bliss, 1985 & 1998). By the eighteenth century, Shuheit's descendents were living in Balat (Bliss, 1998 & Vivian, 2000, p. 195).

Another story of origins mentioned by Balat inhabitants is that some said that their town was named after a Roman family with the name Balata, while others said the name was El-Balaty. They added that the dry wells within the town are from Roman times. Locals have called their town the Islamic town of Balat since medieval times.

Jacques Hivernel also provided historical background for Balat in ethnological studies that he started in Balat in the 1980s. He assumes that there is a correlation between such a name and the ancient occupation during the Roman and Greek times. Hivernel states in his study that Balat is basically structured around four family tribes. These four families basically originated from an ancient group of people who travelled with caravans, and another tribe that originated from the oasis of Kharga (Hivernel, 1996).

In 1819, Drovetti counted a thousand souls in Balat (Drovetti, 1822). According to the Central Agency for Public Mobilization and Statistics in Egypt, Balat's population was about 5,100 in 1996 and about 6,500 in 2006. An environmental assessment done in 2007 for secondary cities by Egypt's Infrastructure Improvements Project projected a growth of 10,000 by 2030[32]. According to the 1996 census, 37 percent of the population is illiterate, 17 percent is literate, and the remaining 46 percent are in schools. 34 percent of the populations are farmers; 18 percent are teachers, 13 percent are in commerce, and 35 percent are employed in administrative governmental work.

[32]Project report published by National Organization for Portable Water and sanitary Drainage (NOPWADA) July 2007. Egypt infrastructure improvements project, secondary cities environmental assessment. Environmental assessment report for the New Valley Governorate. El Mounira and Nasr El Thowra villages, Kharge oasis , Balat, El Gedida and Tanhidah villages in Dakhla oasis.

4.4 Social structure and social activities in Balat

In Balat, as in all desert societies, the basic social unit is the extended nuclear family. Balat inhabitants tend to live in extended–family compounds. Families may comprise married couples and their children, and may also include grand-parents, as well as brothers and sisters of successive generations. Family members live with separate sleeping, kitchen, and leisure spaces facing a common open area.

In old times the family structure was associated with mutual benefit, respect for beliefs and willingness to defend their town's territory. Such benefits affected the collective development of their environment and its resources; the clustering of the families in the Balat settlement facilitated sharing of the knowledge of the construction of appropriate forms of shelter.

There is a relation between daily social activities and temperature. People tend to avoid direct sun. They start their social activities before dawn. They make use of the first light, when it is still cool to walk. Men and young boys start their work on farms before the sun starts to shine strongly. Women start their day at the same time by visiting wells to bring water for daily house activities, cooking meals for men working on the farms, baking bread and feeding the animals. They usually gather to socialize and perform their housework together and tend to take care of the children at home. Some help their husbands with the farming. In such cases, the grandparents take care of the children. In old times and still, children play in the shaded alleys and in summer time like to play at night, especially when the moon is full. It is worth mentioning that this social structure is starting to change due to changes in the habits and ambitions of the young generation in Balat.

The main activity in Balat used to be and still today is farming. The inhabitants cultivate cereals, vegetables and fruits, especially the palm date. Carpentry and blacksmithing are secondary crafts.

4.5 Values studied within the case study

According to Bernard M. Feilden "the values of a conservation site or monument could be classified into three main categories, Emotional, Cultural and Use values". (Feilden, 2003, p. 9). The selection of Balat for the case study was based on the importance of these three values for those living in the settlement. Feilden's classification of values provided guidance for analyzing the customs in Balat.

Emotional Values were investigated using a questionnaire and structured interviews done on site, both with inhabitants still living in the old town and with those who had moved outside. These investigative tools revealed that the elderly and the majority of youth still have strong place attachment feelings and a sense of belonging

to Balat - the old town - even those who had left their old town and were living on the edge of the town in new concrete houses. They still respected and venerated their old dwellings. For them these buildings reflected their history, traditions and cultural roots.

In terms of Cultural Values, Balat is exceptional compared to the rest of the towns in the Western Desert, since it had been a stopping place on trading caravan routes. This placement enabled the area to be connected to other civilizations and this enriched the local culture. Cultural values in Balat are revealed in aesthetic, historical, archaeological, architectural, building technology, scientific and urban artefacts.

Use values such as functional, economic, social, educational and political aspect are also present in Balat. For example Balat is a remarkable example of a place that can provide educational and research opportunities. Due to its rich history, Balat has provided fertile soil for the study of etymology, archaeology, and of social and economic history.

Based on all the above values, some significant characteristics and features of Balat will be explained in detail due to their significance, meaning and importance.

4.5.1 Environmental building performance

Inhabitants have long tended to adapt their dwellings to the tough desert climate. In a hot dry region like that where Balat is located, inhabitants are quite aware of passive cooling techniques. Such applications in their houses are based on cumulative previous experience and trial and error. The construction solutions adopted using available local materials decrease the processing and transportation costs of building materials. Thus the building outcomes are less energy-demanding and more environmentally friendly than many modern solutions. The environmental building characteristics in this section will be analyzed on the urban, architectural and structural levels.

When looking at the Balat urban fabric, one will find urban spaces are of different sizes, with the amount of shaded areas varying from one functional space to another. The large un-shaded piazzas function to draw the air current from the small shaded or semi-shaded areas, providing a flow of cold air currents within the town's narrow streets through a stack effect. This urban configuration provides shade and continuous air circulation for ventilation, especially during hot summer days.

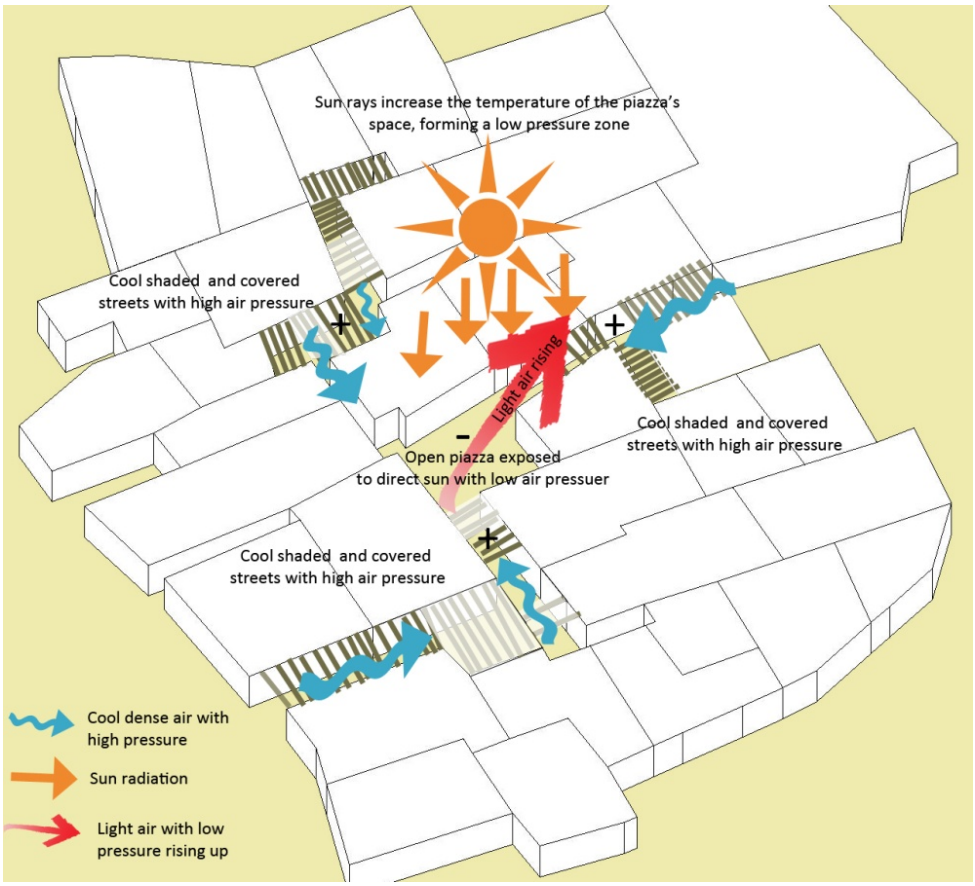


Figure 4.4 Illustration of a large un-shaded piazza in Balat which is always exposed to direct sun. This piazza functions to draw the air current from the small shaded or semi-shaded areas or streets, providing a flow of cold air currents within the town's narrow streets through a stack effect. Warmer air (with lower density) in the open piazza rises and escapes at higher level, while colder air (with higher density) from the shaded narrow streets or covered spaces enters the piazza and replaces warm air, creating an upward air stream. This helps in natural ventilation and increases air flow rates within the town, especially during hot and still days (See Cain & others, 1976., Fathy, 1986., Allard, 1998., Ghiaus & Allard, 2005).

Figure 4.5 Big un-covered piazza.

Figure 4.6 Small semi-shaded piazza.

Figure 4. 7 Example of semi-shaded alley.

Figure 4. 8 Example of semi-shaded street.

Figure 4.9 Example of shaded alley.

Figure 4.10 Example of shaded street.

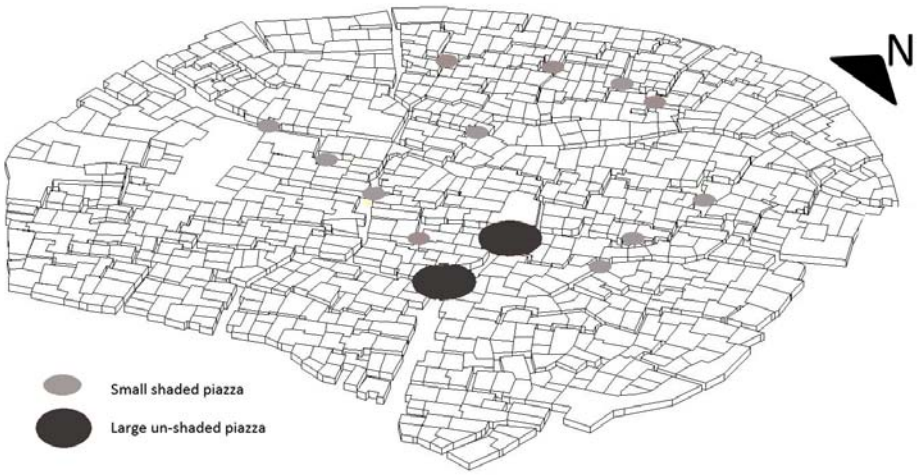


Figure 4.11 A 3D map showing samples of piazzas' hierarchy in Balat.

As regards the environmental characteristics of the architecture, the buildings' south and west exterior walls are usually shaded to avoid the unbearable heat of the sun, especially in summer. Architectural ventilation solutions are also a unique aspect of Balat houses. Bottomless pottery vessels are inserted into the ceilings of the last floor during construction in places where these holes can serve both as skylights and ventilation openings. They allow pleasant air to flow down from the roof floor to the ground floor. In addition, all these openings also serve as smoke exhaust ducts, for example, for bread ovens or kitchens if placed on the ground floor. When it is cold on winter nights or during a sand storm, the openings can be closed by a piece of pottery or by a cotton pillow. The staircase shafts or interior courts also serve to create ventilating air flows.

Figure 4.12 Bottomless pottery vessels serve both as skylights and ventilation openings.

Figure 4.13 Staircase shaft function as wind catchers.

Figure 4.14 Example of shaded facades in narrow alleys.

The dimensions of openings (windows) normally range from 35 cm × 40 cm to 40 cm × 50 cm. Some are placed facing north to capture pleasant winds on summer nights and the others face south for warm sun in winter. People tend to close the windows firmly with cotton pillows whenever needed to protect them from glare, sand storms and strong winter winds.

Figure 4.15 Different windows / openings in Balat houses.

As for structural environmental characteristics, generally the buildings are all constructed using materials available in the local environment and that are suitable for extremely harsh desert conditions. Local wood logs from acacia trees, palm ribs and branches are used for roof construction, while clay is used for mud brick casting in wall construction. Mud bricks are an environmentally friendly material, as they are constructed from earth and can be recycled easily and returned to earth. The coefficient heat value of mud is very low so the heat transmission is low, which helps in keeping the houses cool in summer and warm in winter.

The average thickness of external mud brick walls in Balat ranges from 35 cm to 80 cm. Thick walls serve as heat insulators, create natural thermal regulation and provide protection against the extreme temperatures that build up between the outdoor and indoor climates.

Figure 4.16 Cluster of houses in Balat showing the wall thickness of a second floor and a roof floor.

May mentioned in his study that thick mud brick walls serve houses well in winter, as they absorb heat, store it for around eight hours, and release it during the night. He added that in summer heat absorption sometimes causes problems (May, 2010). Corroborating this explanation, locals tend to open windows for cross ventilation on summer evenings to get rid of warm heat transmitted from the walls. This leads them also to use ingenious systems for air traps; for example, having a courtyard as a wind catcher is found in Balat houses. Staircase shafts, too, function as wind catchers or as wind scoops.

In conclusion, desert vernacular mud brick buildings have evolved methods over the ages through trial and error. Because of the environmental solutions devised over the years, these buildings have managed to meet day to day requirements while maintaining thermal comfort.

4.5.2 The typological identity of Balat

Typology in Balat can be explained in terms of elevation, form, urban layout, spatial relationships, structural types, geometry and the composition of buildings' mass. The modelling and sculpting of earth is a form of typology language and main feature in Balat's earth dwellings. This typological response to the desert environment produces colours and forms that harmonize with the surrounding environment and natural setting.

An analysis of the composition of the buildings shows that some parts of the houses overlap each other and stretch out on top of one another. A part of a house can extend over a street or a small alley. Another house can extend over the roof of a neighbouring house. At other times, overlapping structures are intentionally constructed to connect houses from inside and from the roof tops in large extended family clusters. Such compositions can be extended along the whole town, forming an artistic piece of architecture. These configurations are regulated by custom and laws, as mentioned in Chapter two. This attribute in typology is also reflected in the floor plans of the buildings, the size of the rooms, and in the location of doors and openings.

The roof terrace floors have a special typology. They form a multipurpose system in which spaces are easily brought together to make up an elaborate floor plan for a house and form a complex volume when connected with neighbouring roofs. Sometimes a flat roof can serve as a floor for an upstairs dwelling.

Figure 4.17 Typological response to the desert environment in Balat produces forms that harmonize with the surrounding environment and natural setting.

Figure 4.18 The location of the town with its natural topography helps in creating another dimension for the typology and composition of Balat's dwellings masses and shapes.

Figure 4.19 Spatial relationships forms a special typology for houses' elevations in Balat.

Figure 4.20 Composition of masses and typological architectural formation of dwellings in Balat. Inhabitants adjusted local materials to the purpose of connecting houses in delicate relations among houses' roofs.

Figure 4.21 Modelling of earth is a form of typology language, a main feature in Balat's earth dwellings.

4.5.3 Aesthetic and artistic characteristics

From the point of view of aesthetics and form, Balat can be considered a distinctive piece of sculpture, characterized by a highly distinctive aesthetic architecture appearance. In interviews with Egyptian architects (Hassan Fathy's former students) they mentioned that Fathy used to call Balat the bride of the desert. Buildings there are like carvings done by sensitive thinking hands that curve every piece to function in a certain way. The curved streets take you smoothly around the town, where you find smooth building surfaces with no sharp edges and no pointed corners.

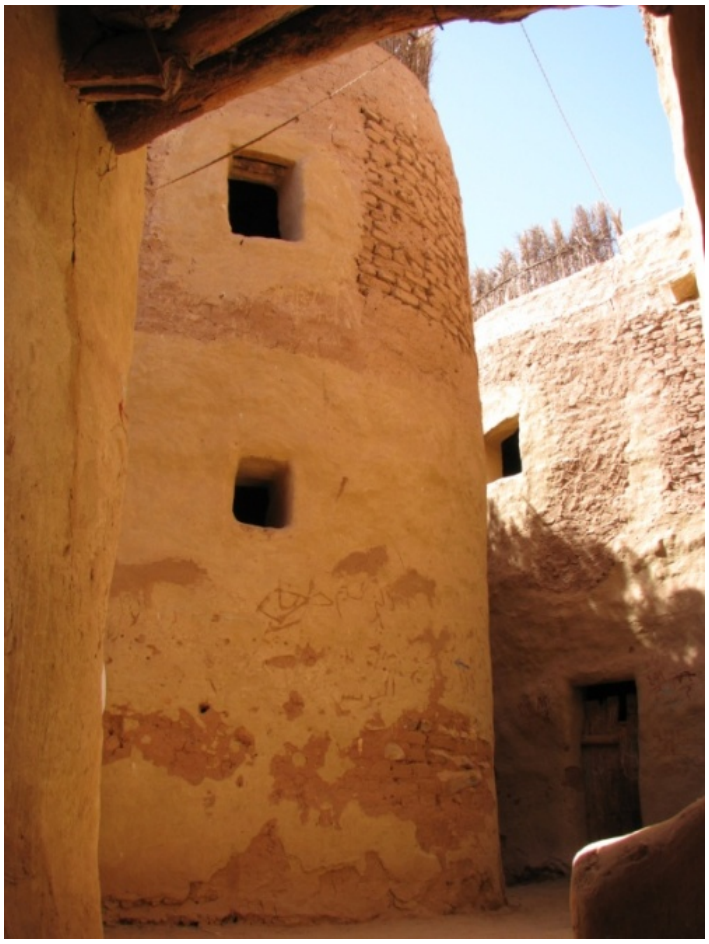


Figure 4.22 Rounded corners and curved streets in Balat.

The rounded and built-in mud brick benches (Mastaba) are a common feature in front of almost every house inside the town. In addition to their functional purpose, such benches add a special aesthetic touch to the streets, as they change the view along the walkways inside the town. In the words of Hennery Glaissie, aesthetics in vernacular tolerate forms that may be considered only in part as serving a useful function (Glassie, 2000).

Figure 4.23 Built-in mud brick benches (Mastaba) is a main feature in the streets in Balat. They add an aesthetic touch to the townscape.

Figure 4.24 Built-in mud brick benches with small niches for candle lamps carved smoothly in walls.

Figure 4.25 Roof floor with several rooms built as mud sculptures.

Figure 4.26 Smooth and curved openings and a staiscase in a house in Balat.

Figure 4.27 Decorations with smooth curves in building facades in Balat.

Wherever you wander in Balat you find sculptured parapets, and house entrances with decorated forms. The scale and the proportions are very human because a human scale of measurements has been applied and building is carried out by hand, which also adds a human touch. A smooth texture is created in the final plaster by the use of silt and fine clay in different tones of earth colours. This final touch fulfils an aesthetic function: it causes structures to blend with the environment and gives a warm natural feeling.

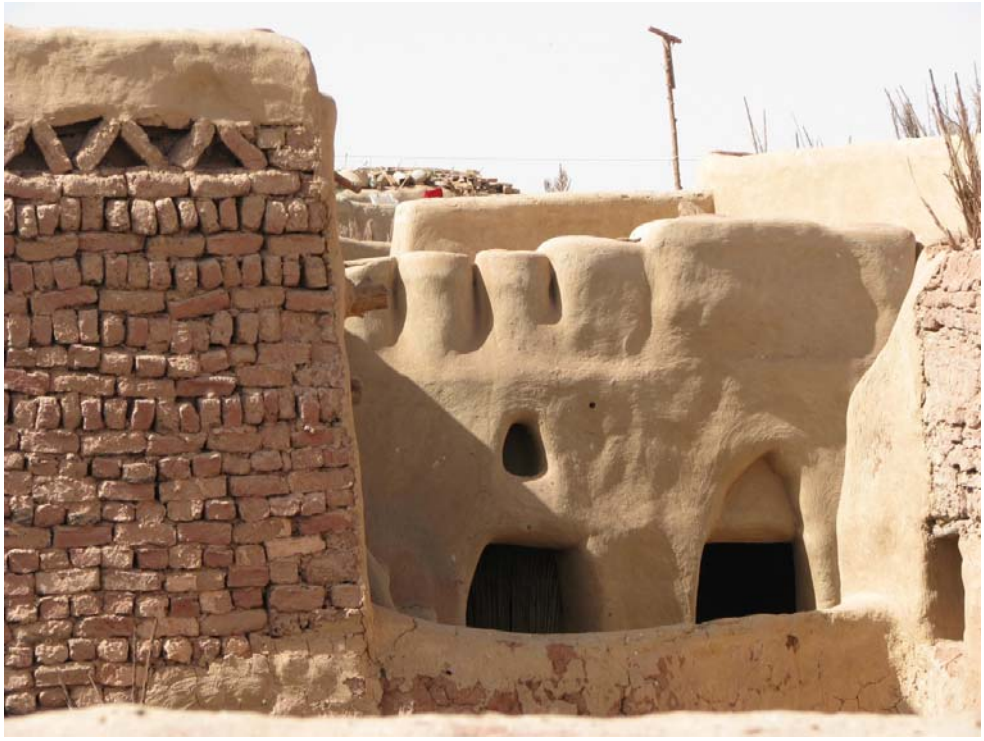


Figure 4.28 Parapets, openings and wheat storage are pieces of hand sculptures in Balat.

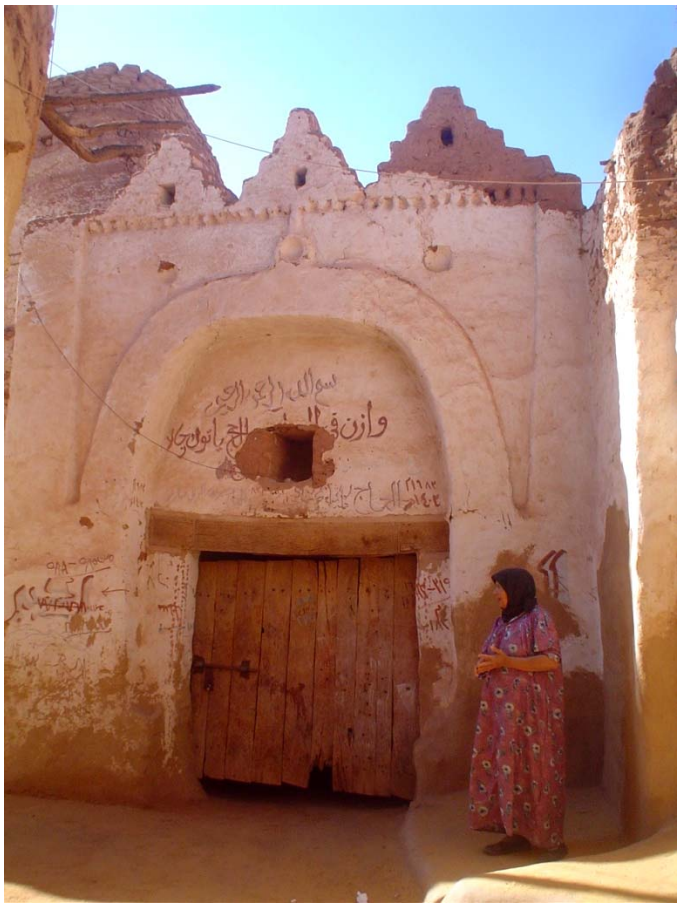


Figure 4.29 A house facade in Balat shows the human scale and aesthetic proportions.

Using earth as the primary building material provides a harmonious atmosphere, adding another aesthetic value, not only to the overall scheme of the town but to the interior of the houses as well. This material is used in everything, even in furniture such as shelves and cupboards. When making such furniture, inhabitants experience pride in their skills and in their ability to decorate their own interior environment. In addition, this creates house interiors that are artistic environments containing living sculptures linked to the functional spaces of their homes.

Women in the Balat community have always had highly aesthetic concerns. This is evident in the care they give to interior and exterior decorations. Women play a major role in the continuity of this decoration tradition.

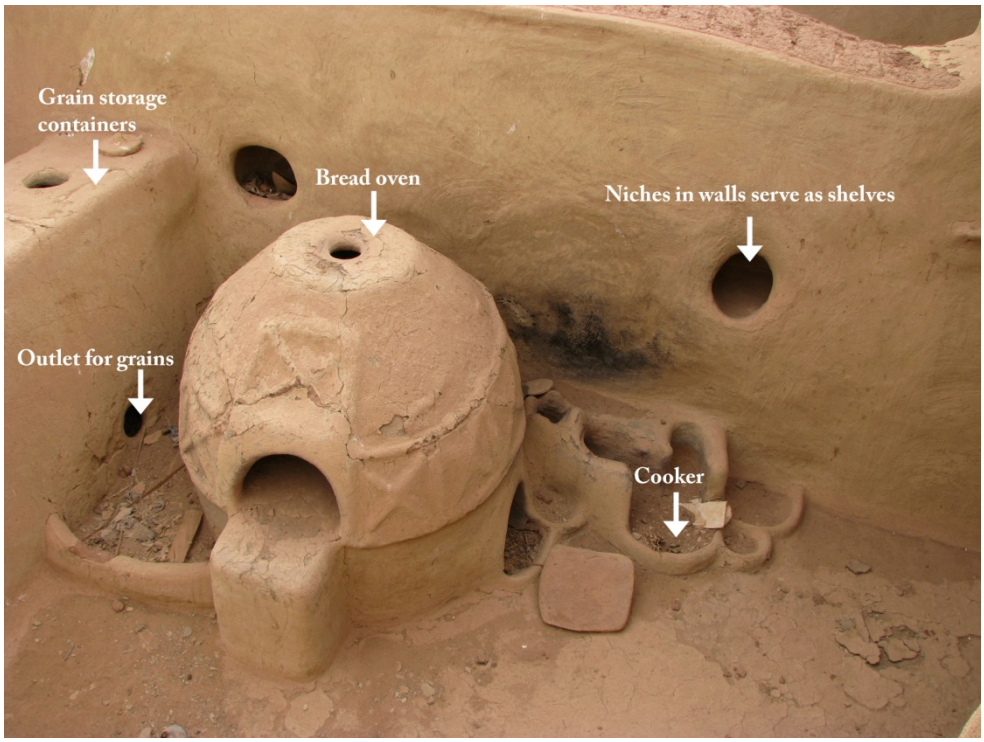


Figure 4.30 Functional elements such as ovens, cooking stoves and cookers are made of earth and are pieces of sculpture

Figure 4.31 Shelves are also made of earth in Balat.

Figure 4.32 Examples of furniture made of clay in a deserted house.

Figure 4.33 Examples of furniture, curved smooth walls, and of an opening made of clay in a deserted house.

4.5.4 Architecture and design features

Housing design was also analyzed in this study in terms of culture and way of life. The method of analysis was based mainly on on-site observations combined with a detailed documentation of specific facts about desert vernacular building techniques. The analysis revealed that the architecture arises from a rare mixture of tradition and a variety of personal preferences. The insights from the present analysis strongly confirm the argument of M.Biligi Denel in "Maxims and traditions" that vernacular housing reached a high level of design perfection and that is particularly due to the use of maxims together with traditions in the building process (Turun, 1999).

The houses forming Balat provide more than just functional answers to essential life needs. Due to their flexible geometry they also have the potential to respond to future requirements. While traditions have always played a role in the design configuration, sticking to their traditions has never caused inhabitants of Balat to deny the need for continuous development and growth for their buildings and for the whole town as well. The architectural design in Balat has reached a high level of precision through an ever-evolving building process; inhabitants get the most use out of spaces to fit their needs, even as those needs change. This is obvious in the spatial arrangements in houses.

The design and construction process in itself is simple and clear, although the final result might be complex when built in a vernacular fashion. The process begins with a mason builder being called in. His experience and detailed knowledge of building rules is needed to start the work. Since everyone has a general knowledge of these rules and steps, the family and the builder discuss together issues such as the size of the house, the layout, the relation between the house and the street, together with the site and the placement of the staircase. This discussion must take place before starting the building process. Inhabitants participate not only in the design of their house but in the building process as well.

The next step to building the house is to sketch the floor plan with the placement and outline of rooms on the ground using units of measurement established with reference to the human body. In some houses a shallow trench 10 to 20 cm deep is dug for the wall foundation. Other houses are built with local rock foundations of 50 cm. Balat dwellings consist of two or three stories of mud brick constructions. The houses normally consist of 2 to 12 bedrooms or more - the number depending on the number of family members - in addition to the space allotted for kitchen, toilet, storage and living. Special zones for a bread oven, wheat grinder and small chicken coop have their place in the house. The drawings below show examples of three houses of different sizes.

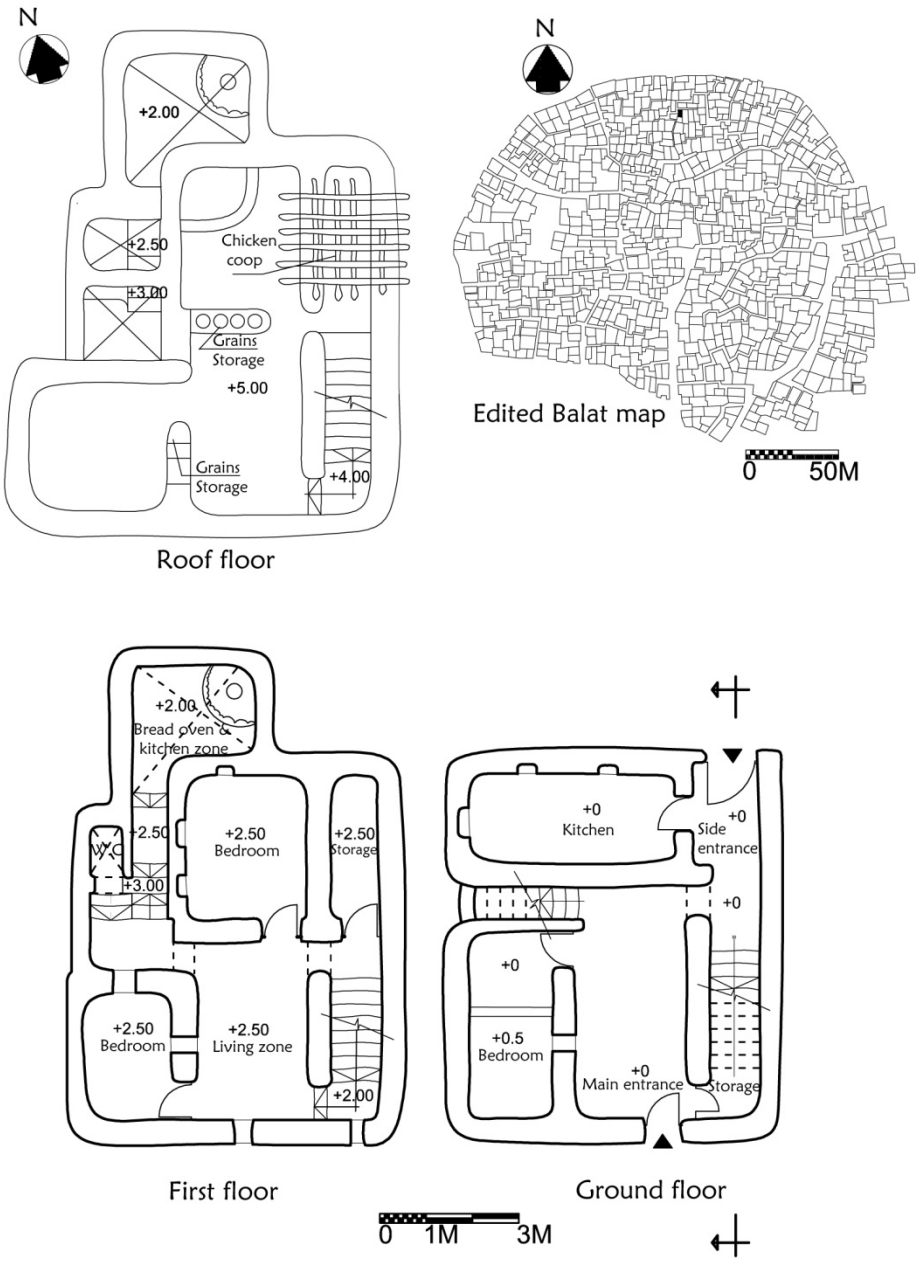


Figure 4.34 Small family house for 6 persons.

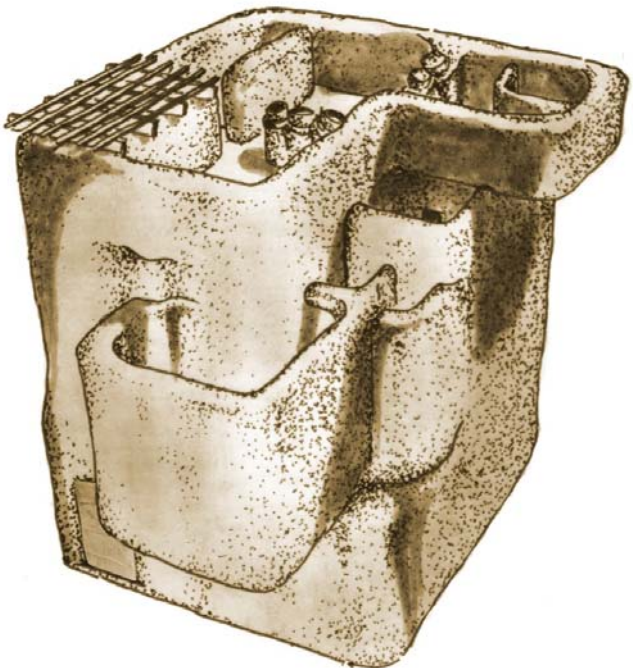


Figure 4.35 3D model of a the small-family house showing the mass composition of the house.

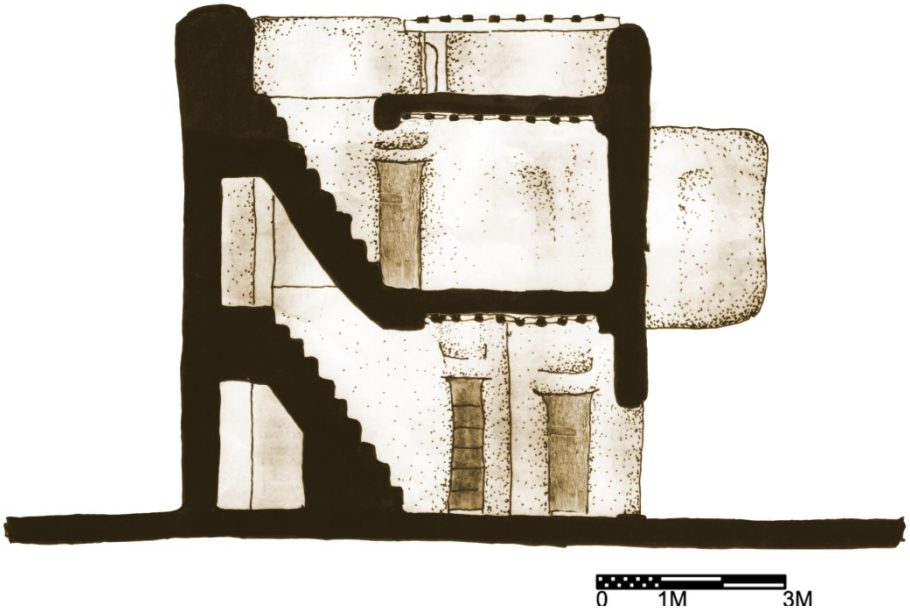


Figure 4.36 Section in the small-family house showing internal heights.

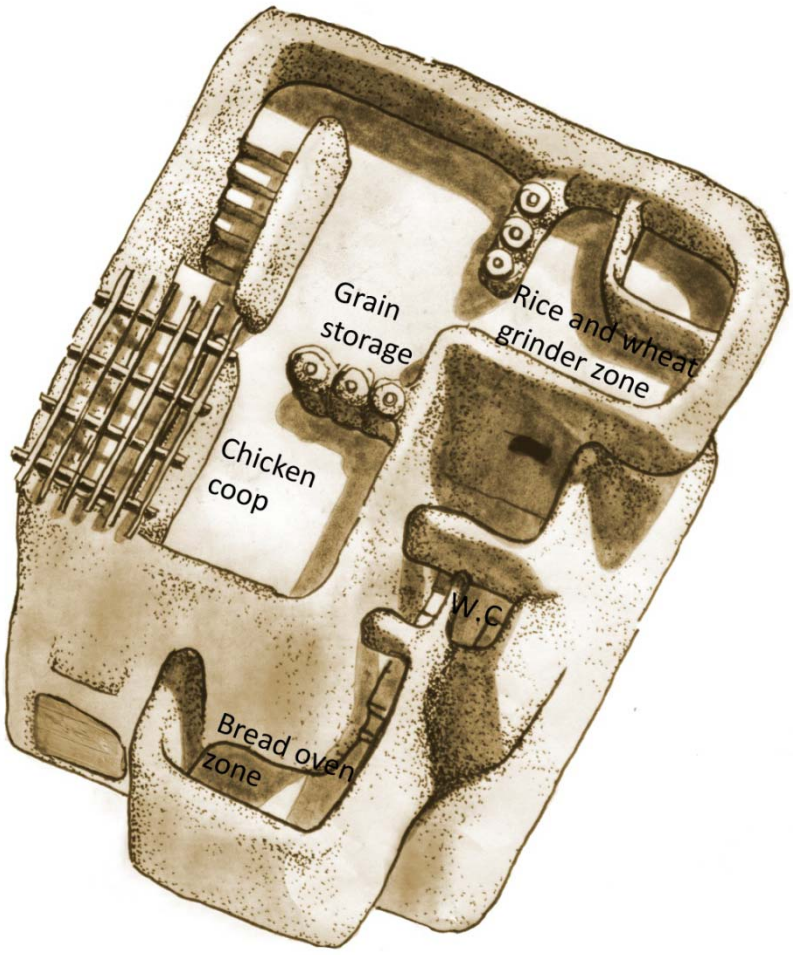


Figure 4.37 3D model of the small-family house showing roof floor functional spaces.

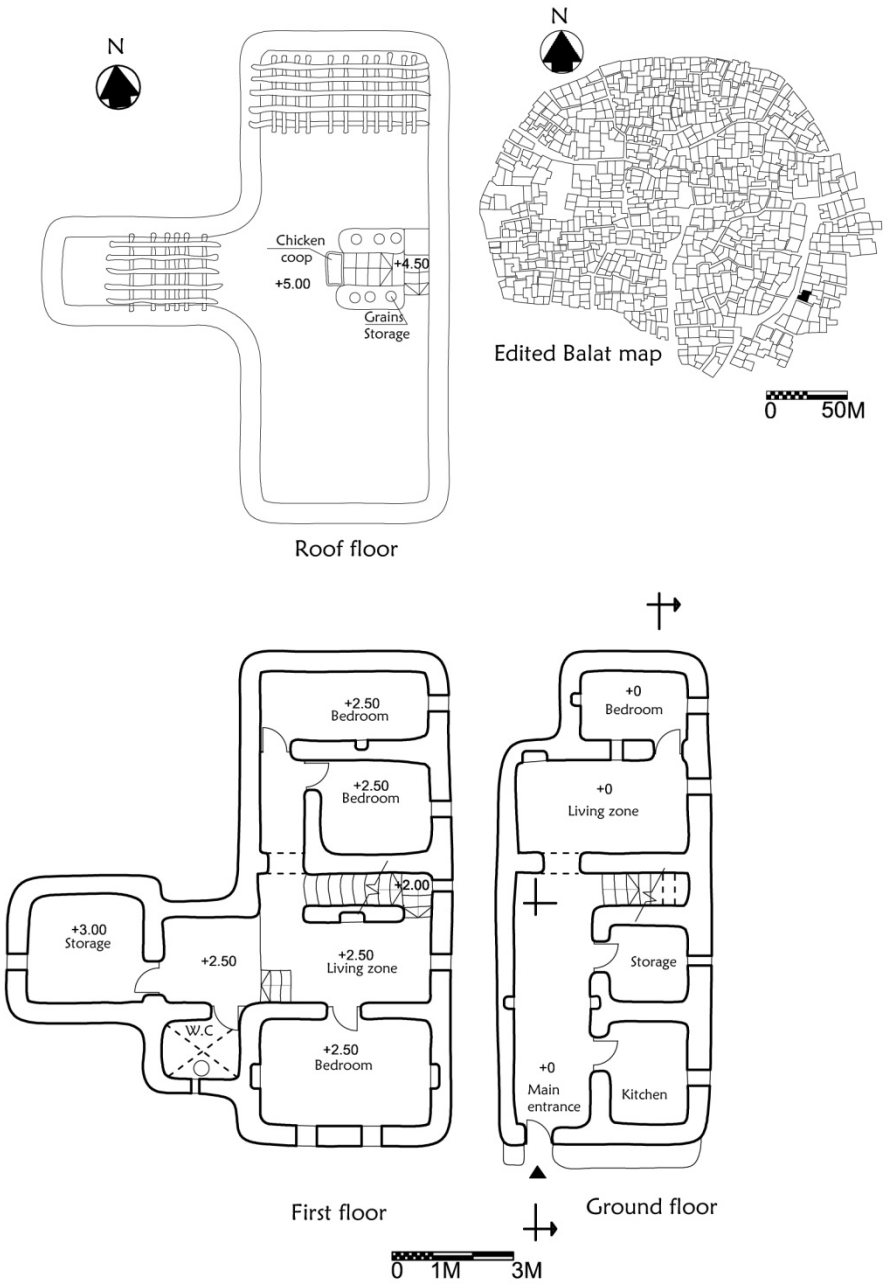


Figure 4.38 Medium-size family house for 10 persons.

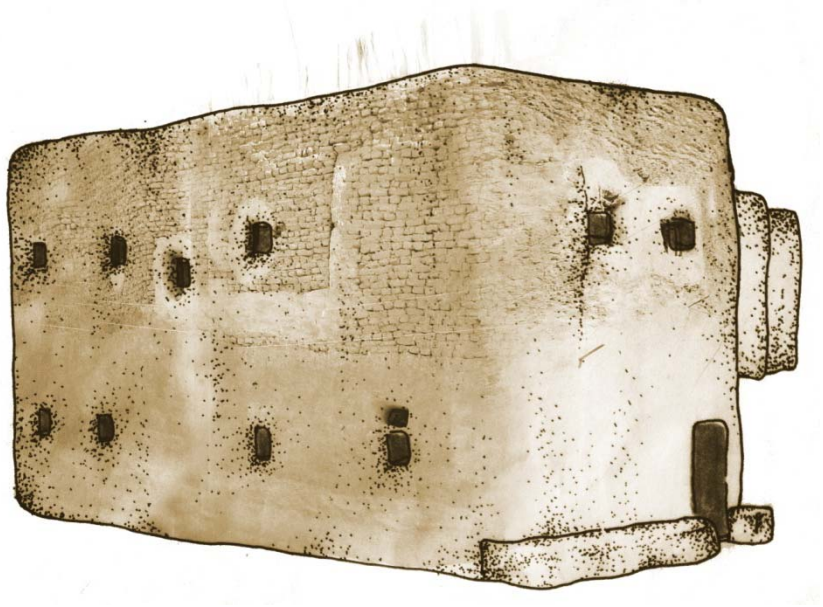


Figure 4.39 3D model for the medium-family house.

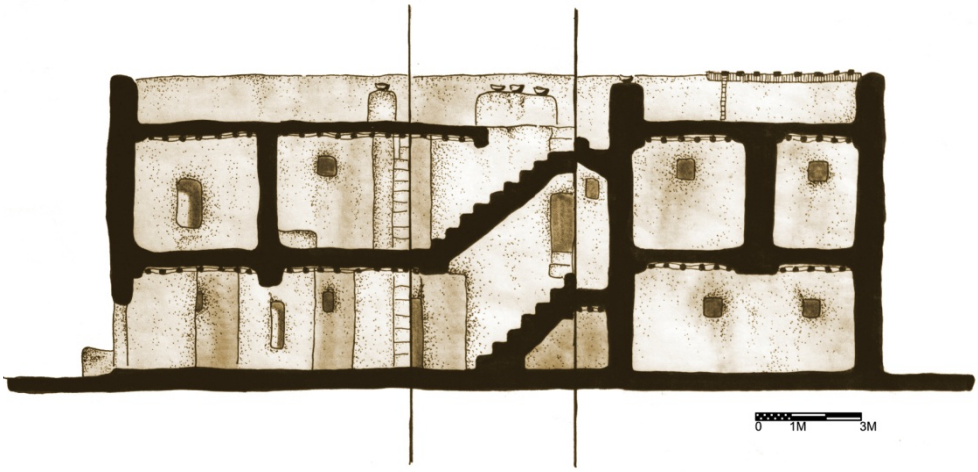


Figure 4.40 Section in the medium-family house showing internal heights.

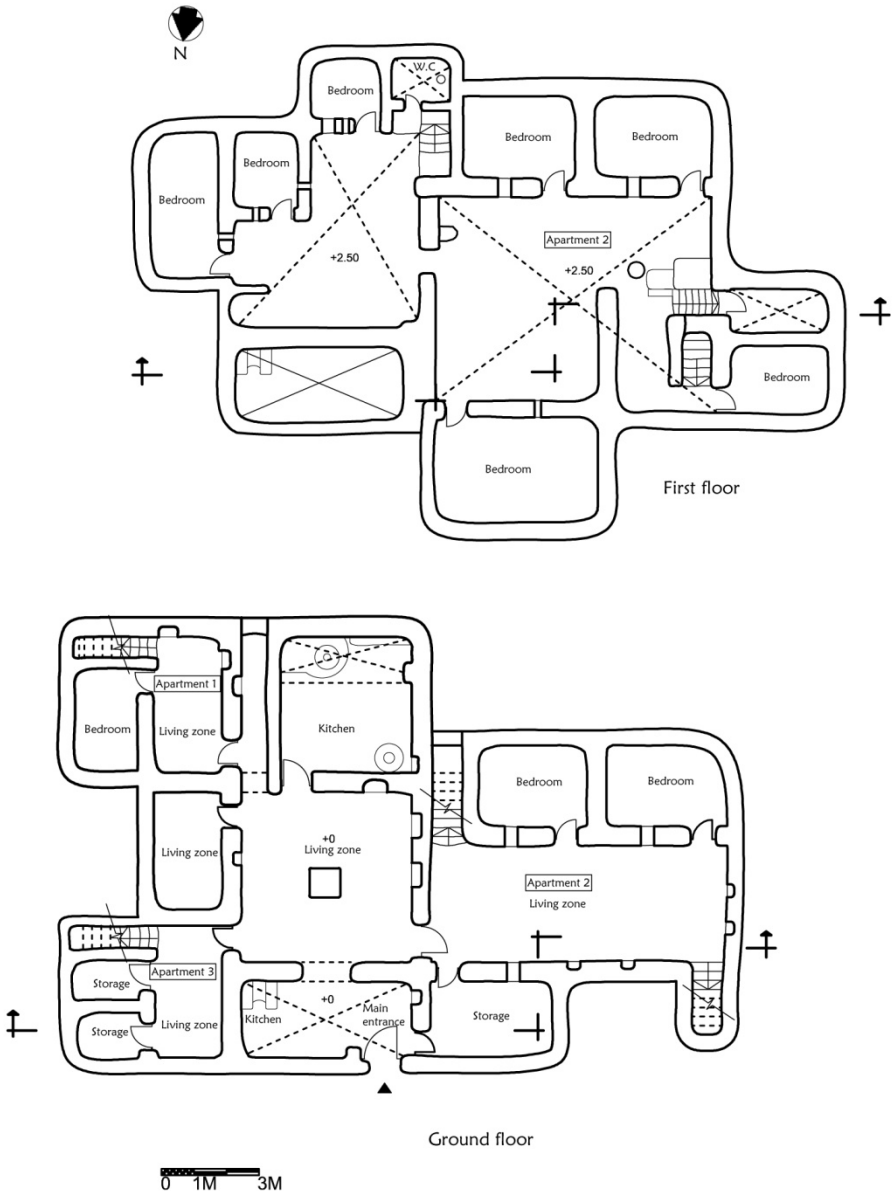


Figure 4.41 Extended-family house for 20 persons, where three small apartments are within this large house. The ground floor shows the three apartments while the first floor above shows apartment number two.

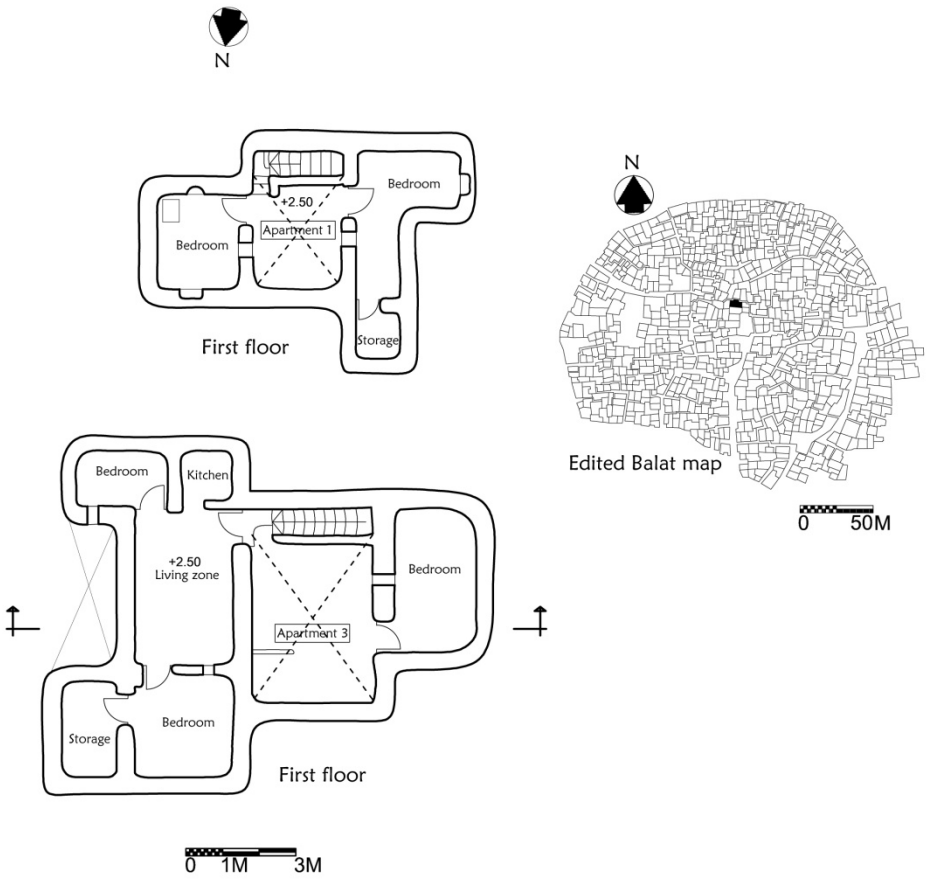


Figure 4.42 First floor plans for the same extended-family house showing apartment one and three.

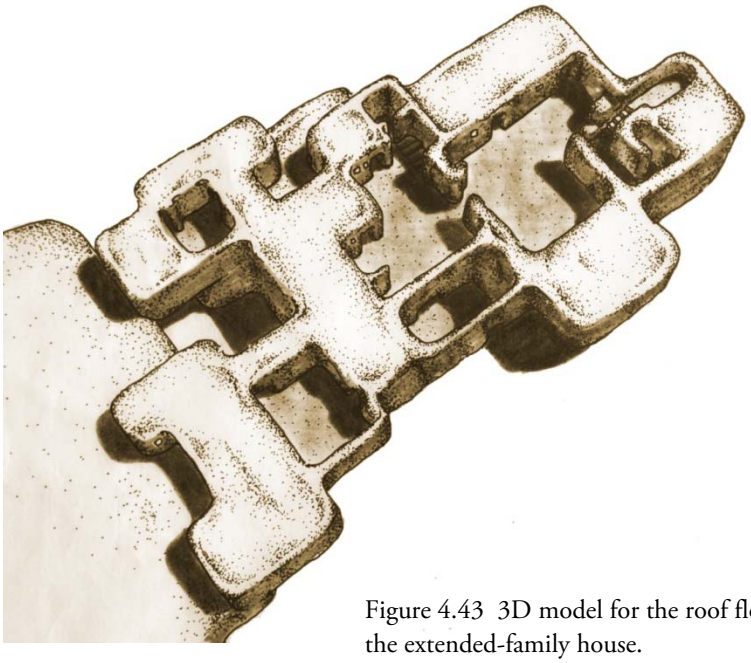


Figure 4.43 3D model for the roof floor of the extended-family house.

Figure 4.44 Section in the extended-family house showing internal heights.

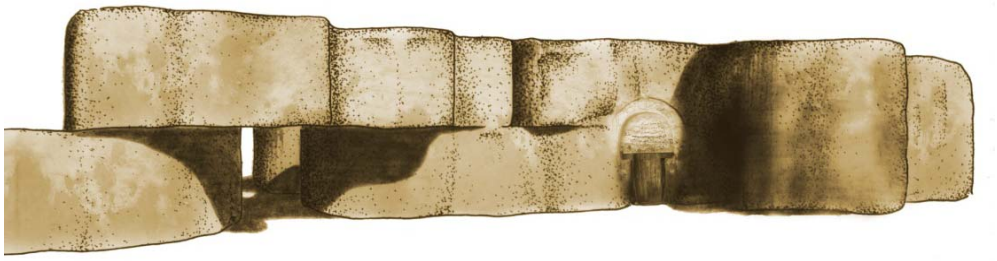


Figure 4.45 3D model of the exterior facade of the extended-family house.

Normally large extended-family houses have a main hall in the centre for family gatherings, meals and socialization. There is a common large kitchen and bread oven for the whole family and a small kitchen in each apartment as well. As is illustrated by the floor plans above, although there are many similarities in the architectural designs of the houses, no two houses look the same. Variety in room arrangements and use of areas allow for designs that respond to the needs of the inhabitants. The level of simplicity or complexity of the house design depends on the occupants' demands. In some houses, such as that of the mayor's family, you can find a degree of complexity that is derived from the diverse needs for a large extended family living together and functional office space for the administrative uses of the mayor.

Generally, there is great flexibility in changing the functionality of spaces. Adding rooms and extending houses both horizontally or vertically are common, easy and affordable. For example, when the children grow up and decide to marry, depending on the available space and the family's financial situation, the parents add another room for the newly married couple or they build another attached house with an internal connection. There is also flexibility in the functional use of space. For example, the entrance hall on the ground floor is normally employed for multiple functions. It can be used as dining area, sitting area or at night as sleeping area on cold winter days. Minimal furniture helps in the flexible change in functions. Another example is the roof floor. It serves as a place for sleeping on summer nights. Mud pots for storage of grain and mud bread ovens have their own spaces on the roof floor, as does the chicken coop. Grain storage has always had a very particular meaning especially in old times. Inhabitants store the grain and other food essential to the family's survival for the whole year.

Figure 4.46 Examples of the functions of a roof floor. Dry toilet with no roof covering and small chicken coop.

Figure 4.47 Mud pots for storage of grain on the roof floor.

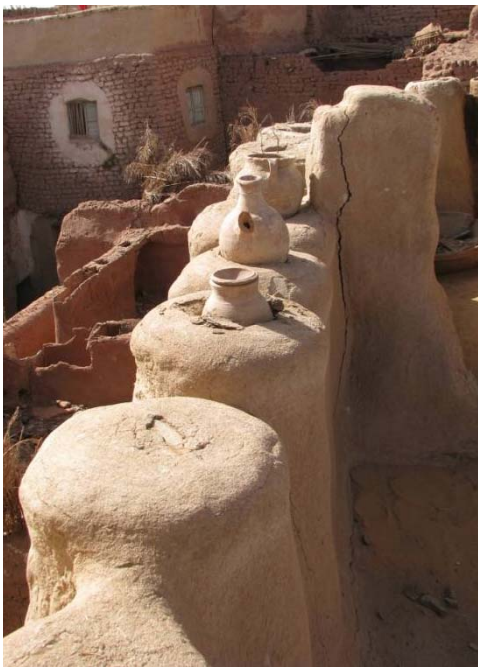


Figure 4.48 Another example of mud pots for storage of grain on the roof floor.

Figure 4.49 Small chicken coop in the roof floor.

As shown by the examples above, the roof floor is an important part of the house with many facilities for conveniences and daily activities. To provide a natural fence around the roof floor, long palm tree branches are used. For more privacy, tall exterior fences (parapets) made from mud brick are built. They reach up to 1.5 metres and are designed with high openings used for ventilation and to make it easy to look through and keep an eye on the community members' comings and goings. Above and beyond the view from the street, ringed by high parapet walls, are sleeping porches, which inhabitants use as mentioned on summer nights.

Figure 4.50 Example of exterior fences (parapets) in the roof floor made from mud brick .

Figure 4.51 Fences around the roof floor made from long palm tree branches.

The ceilings inside the houses are normally low, about 2.7 meters. The internal courts have higher ceilings, reaching up to 3.5 meters. In semi-public places such as the mayor's courthouse, the ceiling is higher and reaches 4.5 meters.

Figure 4.52 Interior fisheye shot of the mayor's courthouse showing different ceiling heights.

The majority of the toilets were found to be dry toilets (compost) and to be either semi-covered or with no roof covering in order to allow air circulation to get rid of bad smells. The lack of covering also allows sun rays to speed up the process of drying the waste and killing any bacteria. The toilet is normally located on the mezzanine level between the ground and the first floor. It takes a rectangular shape with the door opening at one end and the toilet hole at the other end, a form that ensures the privacy needed because normally the toilet had no doors. The orientation of the toilet is usually in the opposite direction from the prevailing wind.

Figure 4.53 Dry toilet (compost) with roof covering from palm ribs and leaves for shade. The toilet has an opening in the bottom of this tower to collect the wastes when they are completely dry twice a year. The wastes are used as soil fertilizers or fuel for ovens.

Each family adds certain ornaments, drawings, phrases from Qur'an, and verses from poems and even sometime sculpture details to decorate their houses on the outside and inside.

Figure 4.54 Both Qur'an phrases and the house owners' names are always written on the entrance of the house. Both the owner and his wife's names are written.

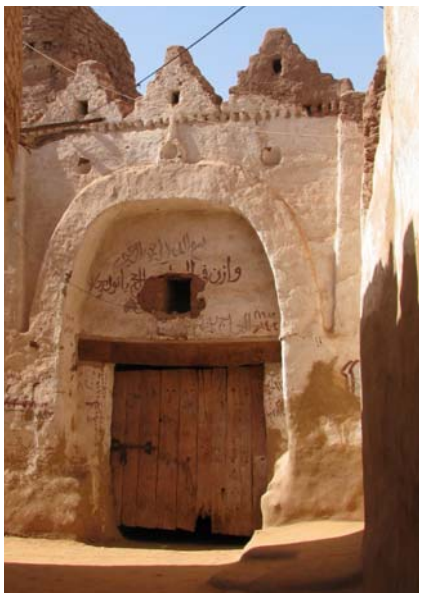


Figure 4.55 Ornaments, verses from Qur'an and sculpture are details for houses' exterior decorations.

Figure 4.56 A verse from a poem welcoming visitors used as interior calligraphy decoration.

One can also find drawings on the facades of houses describing the pilgrims' route to holy Mecca. This has a special meaning for the inhabitants and is a symbol of pride before neighbours and passers-by. It tells about when the house owners made the sacred pilgrimage to Mecca.

Figure 4.57 Façade ornament decorating pathways with Qur'an calligraphy.

Figure 4.58 Façade ornaments. The boat and the camel are symbols of the means of transportation on the pilgrimage.

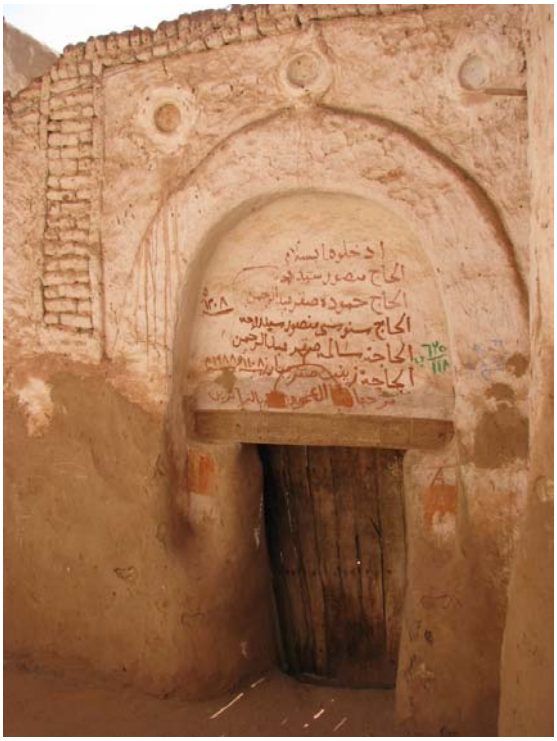


Figure 4.59 Exterior shot of the mayor's family residence with ornaments and calligraphy on the main entrance.

Wooden doors are a special feature of Balat's architecture. They usually include a wooden lintel with inscriptions stating the date of construction, the owner's name, the builder and the family's ancestry. These inscriptions provide a unique documentation of the buildings and give an added heritage and archaeological value. Some dwellers prefer to add phrases or verses from the Qur'an as a blessing to the house.

Figure 4.60 Verses from the Qur'an on one of houses' entrances as a blessing to the house.

Figure 4.61 A door lintel where the date of construction of the house, the builder, the carpenter, the owners' names and family ancestry are inscribed.

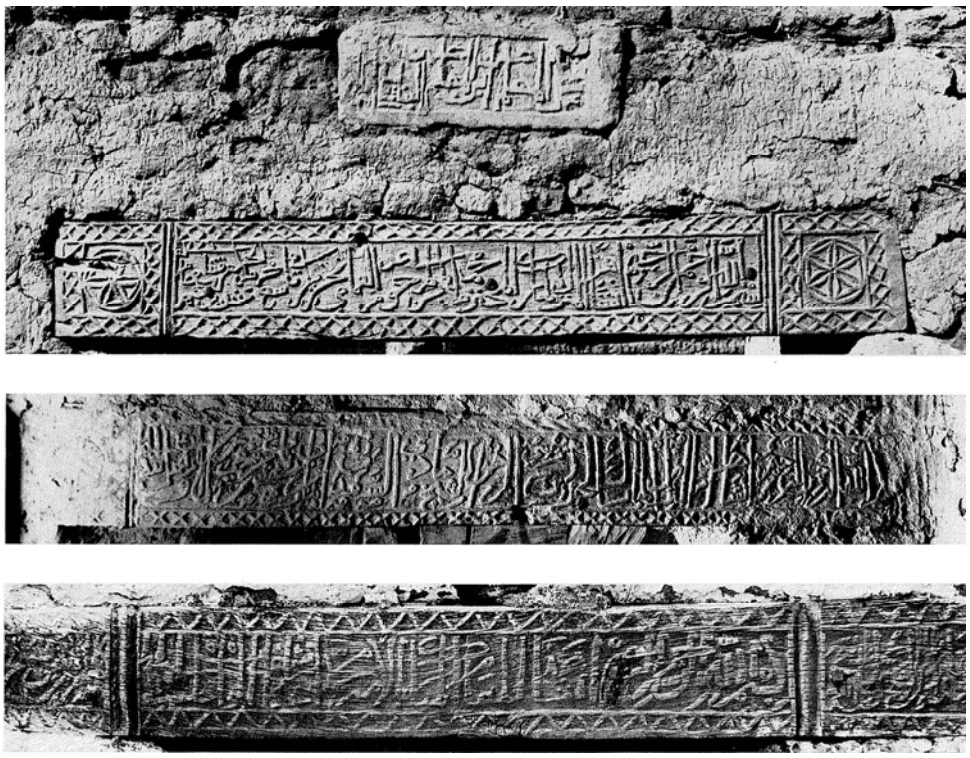


Figure 4.62 Samples of door lintels of Balat houses where the date of construction of the house, the builder, the carpenter, the owners' names and family ancestry are inscribed. Unfortunately only now five door lintels still exist in the whole town, the rest were either stolen or sold by inhabitants as authentic pieces to tourists.
Source: Hivernel, Jacques Etude (1996). *Balât, Etude ethnologique d'une communauté rurale* . Institut français d'archéologie orientale le Caire.

Figure 4.63 Mayor's courthouse entrance door showing special door design and craftsmanship in using local materials. Photo taken during site survey in 2009.

Figure 4.64 Mayor's courthouse entrance door photo taken in 1981.
Source: Hivernel, Jacques Etude (1996). *Balât, Etude ethnologique d'une communauté rurale* . Institut français d'archéologie orientale le Caire.

Houses are not only the remarkable buildings in their architectural design but public buildings such as mosques or mayor's courthouse (Diwan) has a special architectural identity as well. The design reflects the intention of locals to show their accepted values in the community together with the functional purpose of such buildings.

Figure 4.65 Exterior facade of the mayor's courthouse (Diwan). Architectural details served in giving a distinctive identity to the buildings.

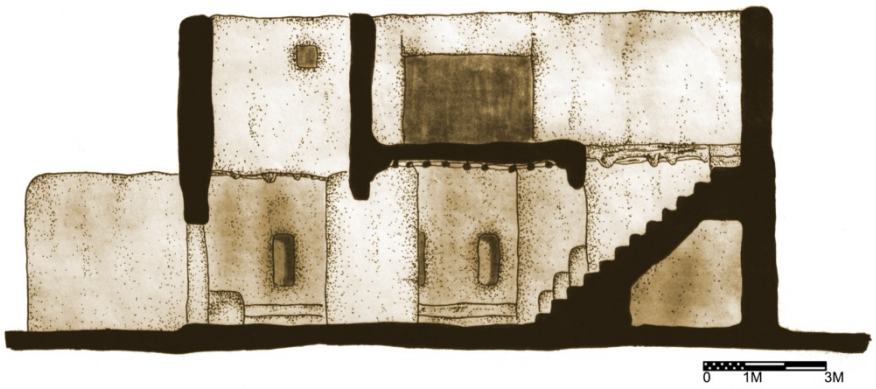


Figure 4.66 Section in the building showing the height of the internal court and gathering hall serving the function of the building.

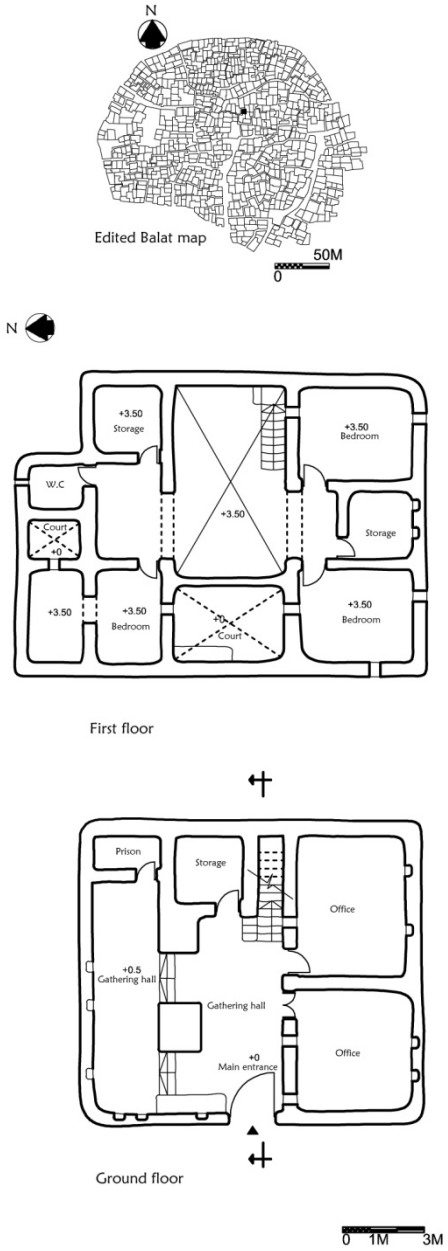


Figure 4.67 The mayor's courthouse plan, showing the relations between spaces according to their functional activities.

Figure 4.68 Laser scanning point clouds for the mayor's courthouse. Laser scanning measurements were used as an experimental measuring tool in Balat. One can get accurate measurements for vernacular buildings compared to manual sketches.

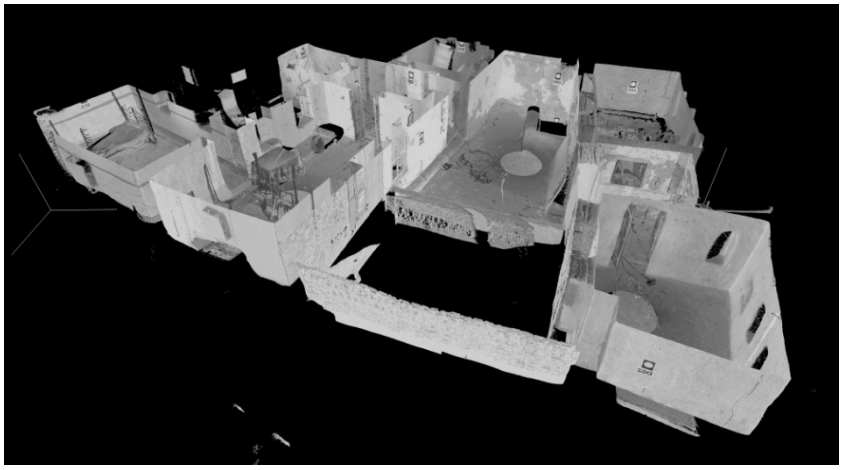


Figure 4.69 3D experimenting model for the mayor's courthouse and part of his family residence. It was formed as a test from row scan clouds without post processing. It shows the possibility to trace the walls and get accurate drawings or to develop such row material in other architectural software. 3D laser scanning makes it possible to get accurate measurements which will help in the future to get precise documentation for vernacular buildings.

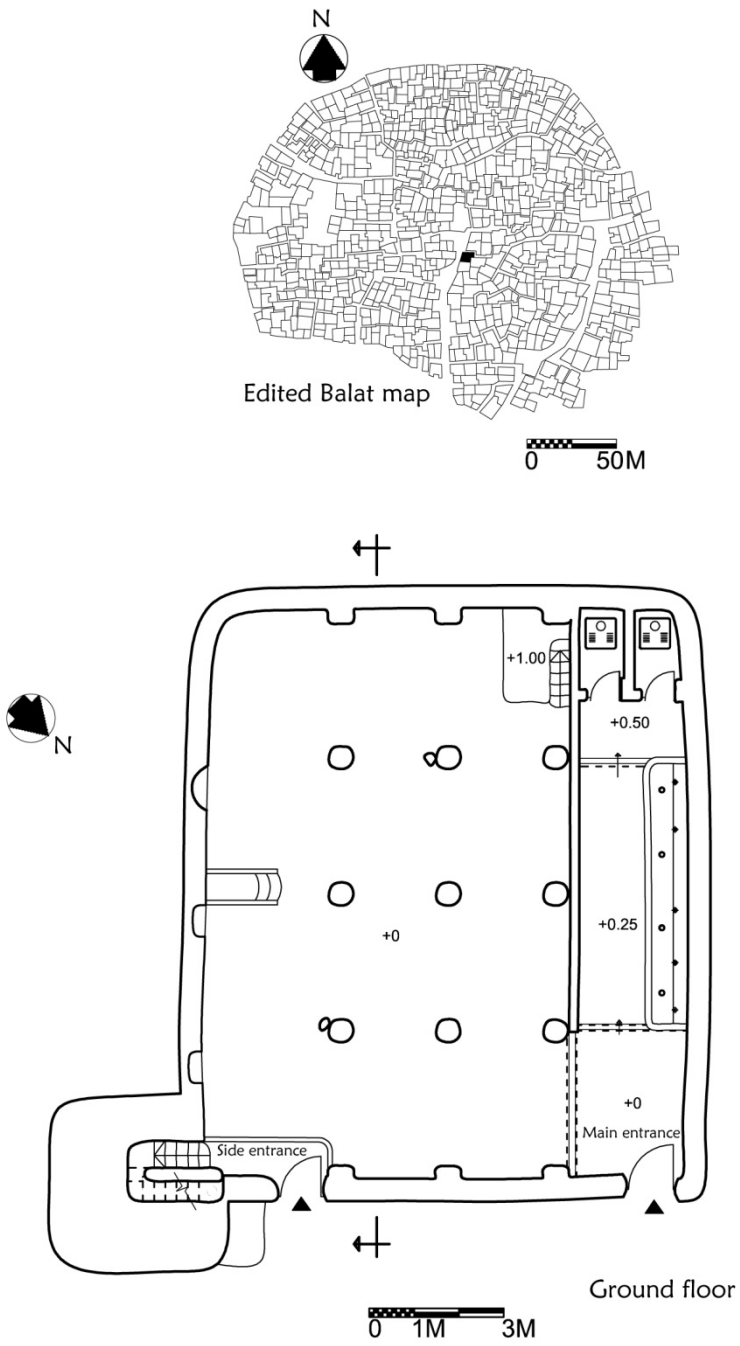


Figure 4.70 Plan of the mosque and its location in the town map. It is located near a main piazza where the water well is located and used for ablution.

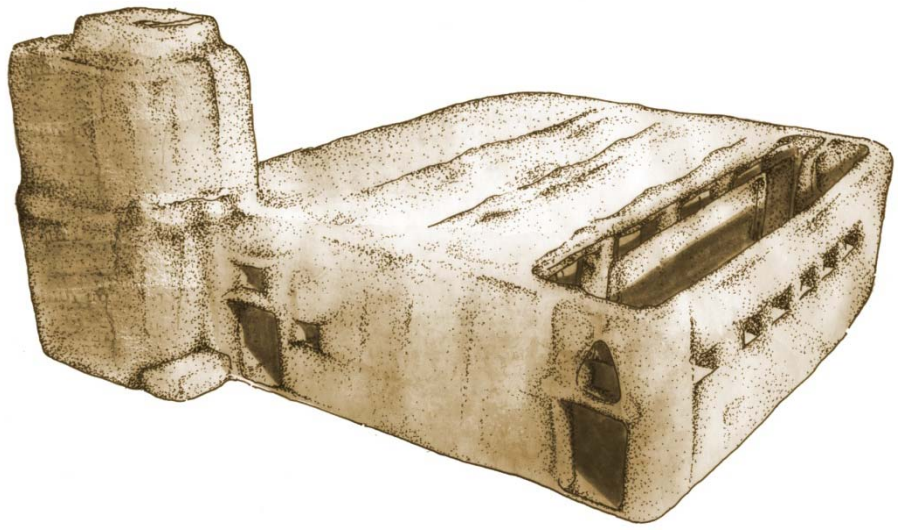


Figure 4.71 3D model of the oldest mosque in Balat, showing the respect for human proportions and the adaptability of the architectural form to the functional activities inside the mosque.

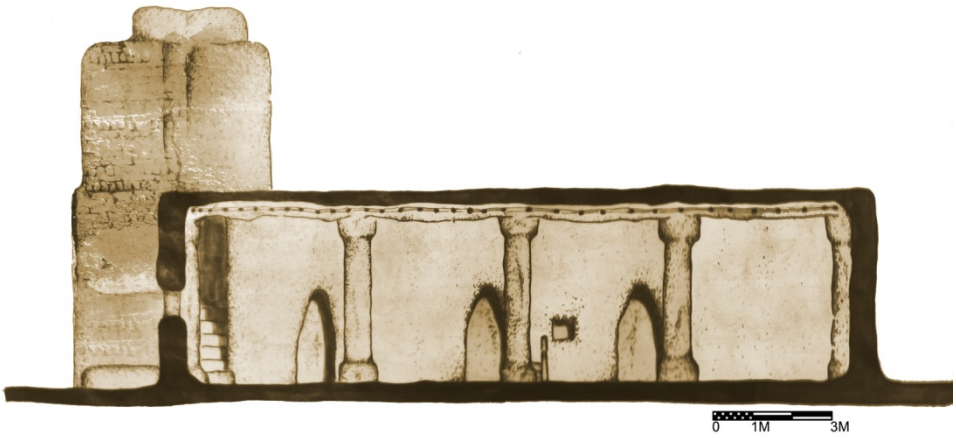


Figure 4.72 Section in the mosque showing the internal height and the proportions in comparison to the minaret.

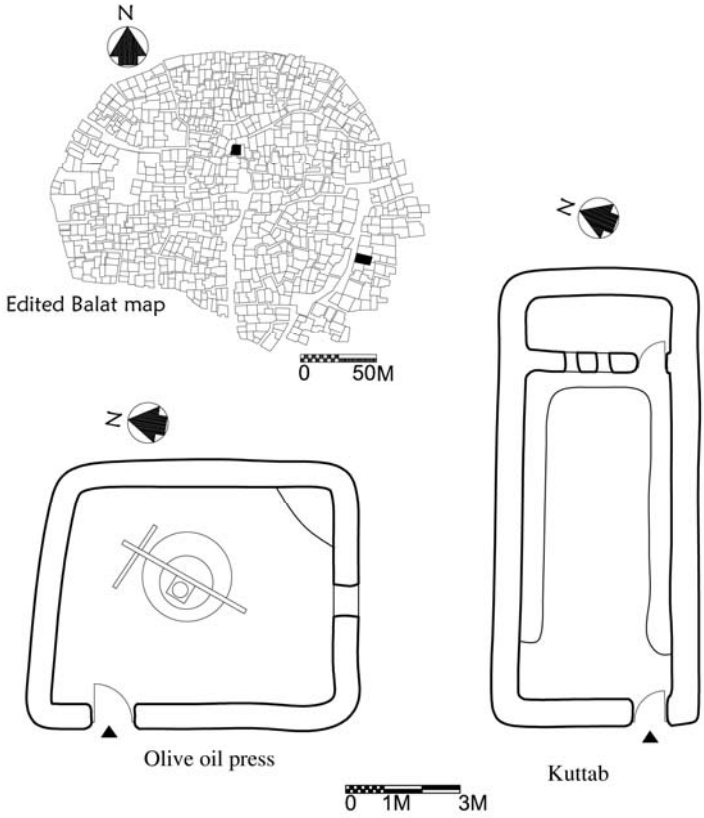


Figure 4.73 The olive oil press and the Kuttab (school for children) in Balat, examples of public functional buildings.

Figure 4.74 The olive oil press in Balat.

4.4.5 Urban characteristics

The urban character of Balat shows the layered accumulation of artefacts bearing witness to centuries of vernacular knowledge applied in accordance to Sharia's laws and to local rules customary in desert communities. The settlement of Balat, as for many other desert settlements, started with selecting an appropriate hill on which to build dwellings. The aim was to safeguard the houses from enemies and to have high observation points. Since security in old times was a major concern, the towns often had compact winding covered streets with low ceilings. Balat locals mentioned that such street configurations forced warriors to fight on foot and not mounted on horses and camels. As a result, invaders could not penetrate the inner parts of the settlements.

There are three main elements in the planning system in Balat:

- Public buildings like religious buildings (Mosques).
- A ring road (called Dayer El Nahya) that surrounds the whole settlement.
- A hierarchy of a network of streets.
- A dense and compact cluster of houses.

An urban survey was one of the methodology tools applied to gain an understanding of the configuration of the town. It was used to document the current situation in terms of building materials, building conditions and degree of deterioration. The below maps are produced based on site survey, together with data obtained from the General Organization for Physical Planning, Ministry of Housing, Utilities and Urban Development in Egypt.

Figure 4.75 Edited map of current building materials for Balat showing the change to using concrete and fired bricks on the outskirt of the town.

Figure 4.76 Edited map showing void and solid spaces in Balat showing the compact and dense urban setting of the town.

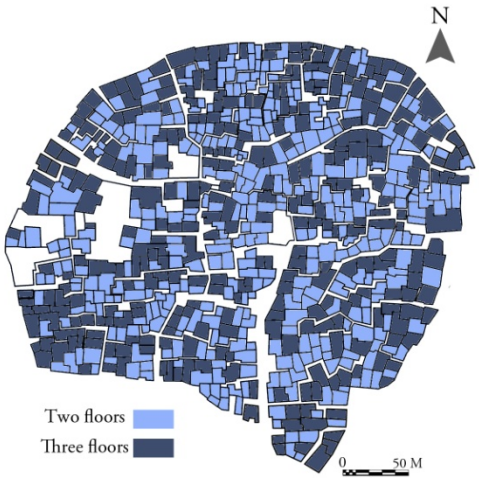


Figure 4.77 Edited map of current building heights in Balat showing homogeneity in building heights all over the town.

Figure 4.78 Edited map of current building conditions in Balat showing degree of deterioration within the town core.

The general urban fabric is compact, a dense cluster of structures with winding covered streets. This urban configuration serves several purposes. It allows the air to flow smoothly inside the entire town and the curved corners of the buildings filter out sand and dust from sand-laden winds during sand storm seasons. The town's configuration of structures and spaces also provides coolness, as this compactness provides shade on the majority of walls and over the streets, and protection from the sun. The streets have different widths; this hierarchy of street sizes controls the speed of winds and helps in ventilation of the inner house courts as well. Tunnelled streets within Balat are interrupted by openings where shafts of light penetrate dark interiors.

Several activities, especially blacksmithing and carpentry, are relegated to the peripheral areas of the town for the sake of noise and to avoid health hazards. The cemeteries are located at the edge of the residential area in the southern direction and there is a special place for mausoleums. The weekly market is also located outside the residential core because it requires large areas that are not available inside the village. This placement also ensures the privacy of the residential areas and reduces noise for the settlement. All such urban correlation systems derive from Sharia's regulations and rules of custom.

Figure 4.79 Graveyards and mausoleums on the south side of Balat.

Balat consists of a cluster of houses; all are different in size but with a similar character. In the town there are public facilities including 3 mosques, 2 main wells, a Kuttab (Qur'an school that provides elementary education for children), grocery shops, a mayor's courthouse, 3 main olive oil presses and 3 main grain mills. The mosques are usually situated beside the wells for the purpose of providing water for ablutions. This affects the configuration of the town by forming central piazzas where the well is located, with the mosques and neighbouring houses surrounding these piazzas. This open space helps in bringing the water up from the well and also provides a place for social gatherings for the town inhabitants, especially after Friday prayers; they talk, exchange their crops and discuss their life issues.

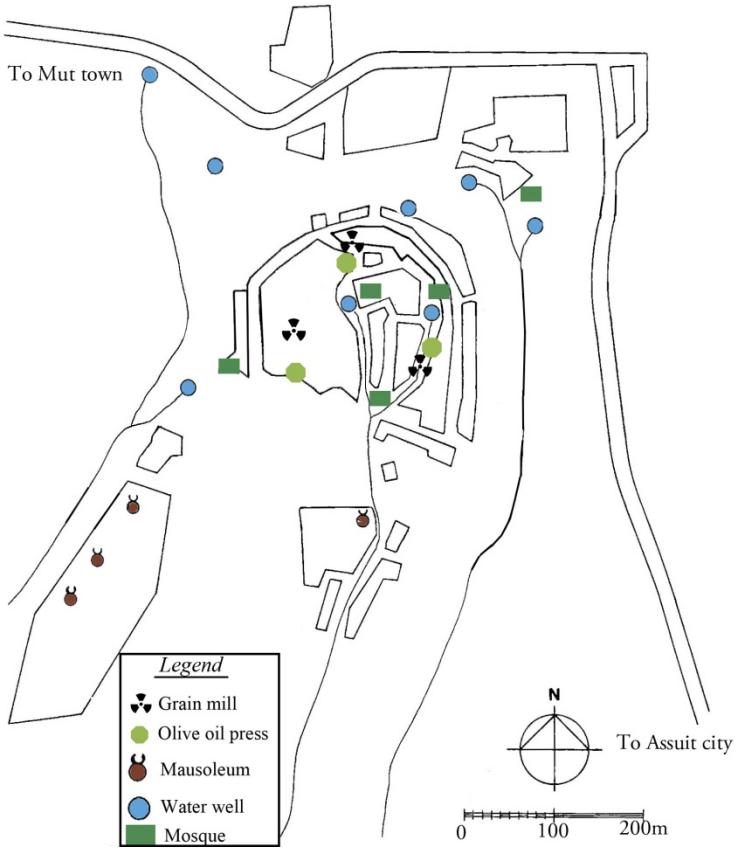


Figure 4.80 Edited annotated map after Hivernel, Jacques (1996), showing the relation between wells and mosques in Balat together with the location of other public facilities. Source: Main map source: Hivernel, Jacques (1996). *Balât, Etude ethnologique d'une communauté rurale* . Institut français d'archéologie orientale le Caire.

Figure 4.81 Panoramic shot of Balat from a watch point inside the town.

Figure 4.82 Street network in Balat.

One can easily see the hierarchy of spaces that results in changes of size and form from public, semi-public, semi private to private zones. There are a series of designed spaces with different usages in front of the houses. Starting with the category of public spaces, we find the weekly market area on the periphery of Balat. It is a common space where locals and dwellers from neighbouring towns and villages meet to trade. The second category is the semi-public space such as piazzas in front of mosques, where wells are usually situated. Inhabitants use theses piazzas for social gatherings during feasts, wedding festivals and weekly meetings after Friday prayers. People meet to chat and spend some time together to socialize and update each other on recent news.

The third category is the semi-private space. Such zones are commonly found in front of the houses where built-in mud brick benches (Mastaba) is found attached to the façades of the houses. The function of such seating for men is to have short siestas during midday in summer when the sun is hitting strongly and it is difficult to work on the farms. The other main function is to provide a place to welcome guests and offer them a drink without disturbing the privacy of the house (privacy is a prime concern in the Balat community). Also it is a favourite place where men gather in the afternoons in summer to chat, socialize and solve problems or on feasts and other social occasions where neighbours can meet and talk, again without disturbing the privacy of the house.

The fourth category is the private urban spaces. These spaces are situated in family alleys; sometimes they are shaded and sometimes not. Normally large extended families have a private alley from which one enters a single family house. The alley is connected directly to the main street. Usually this connection is closed by a door to ensure the privacy of this family space. The purpose of this zone is to accommodate private household activities such as washing clothes, doing dishes and sometimes cooking and baking. These alleys thus function to allow ladies to meet and perform such activities together outside their houses. At the same time they ensure the privacy they need.

It is the custom that each family takes good care of the adjacent main street and the built-in mud brick benches. They maintain them by plastering with mud and sprinkling fresh sand over the street and seating to keep them clean and beautiful all the time. This is to be done normally every month and before feasts.

There is also a hierarchy in the town's network of streets. Differences in street widths depend on the number of houses opening on that street, the importance of the street as a main or secondary route around or within the town, and according to the street's function. Such rules again are controlled by the Sharia'a regulations and rules of custom. The streets are divided into three types, the first type is the open-ended street (Dayer El Nahya), which is considered a semi-public right of way. It is the widest street in the town's network of streets and in old times it was designed to be wide enough for two fully packed camels or donkeys to pass. The second type is the semi-private streets and third is the private alleys. The private alleys are closed at the end normally by a house door (cul-de-sac).

Figure 4.83 Example of a well-maintained semi-private alley with built-in mud brick benches.

Figure 4.84 Example of a private family court where baking , washing and grinding wheat take place .

Figure 4.85 Example of a private family shaded alley.

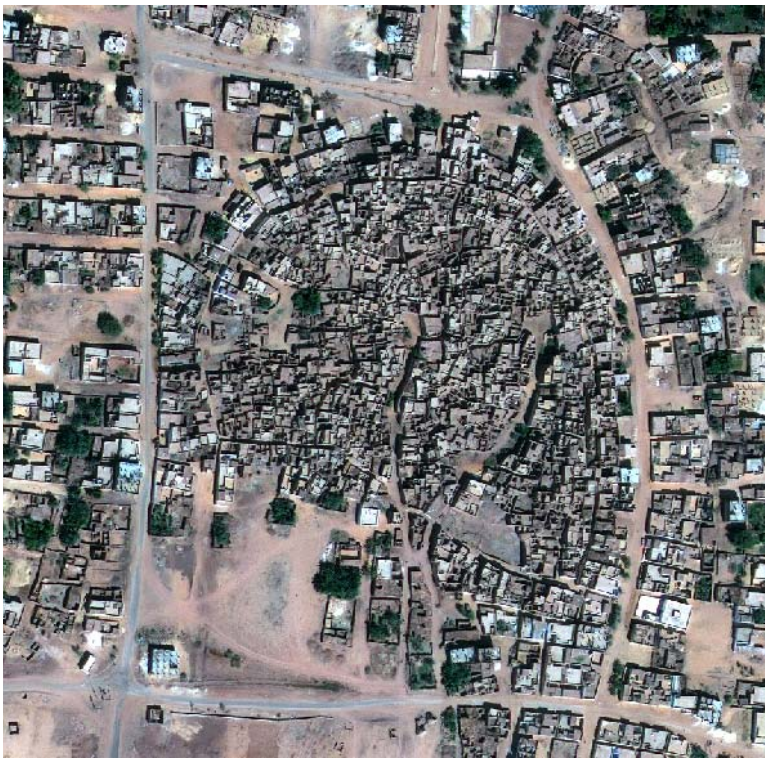


Figure 4.86 Satellite image showing the Balat town layout.
Source: Geo-eye captured October, 2009.

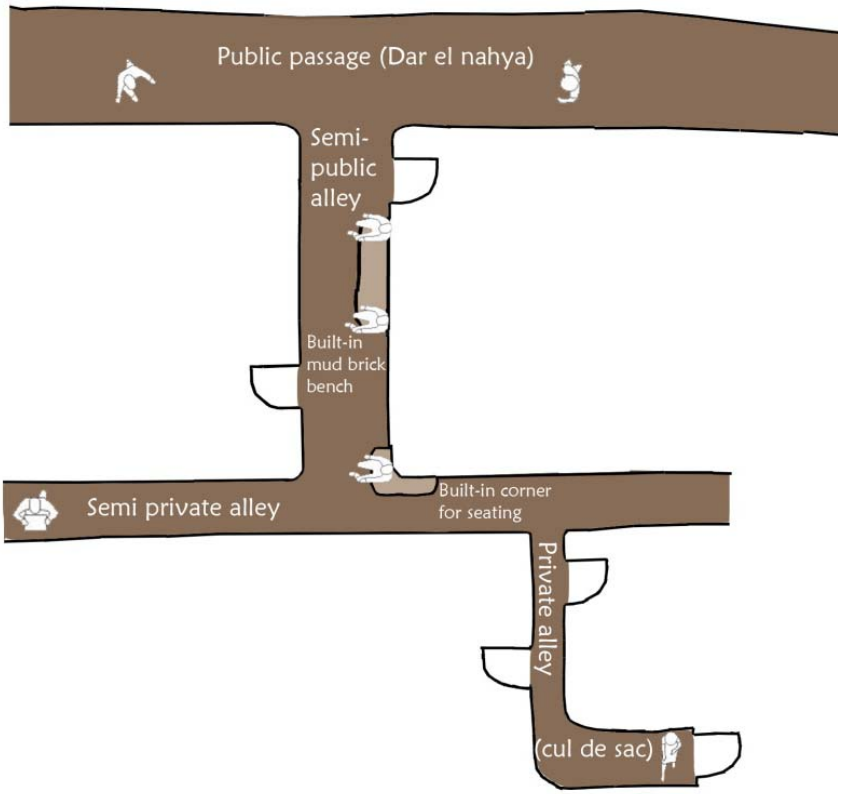


Figure 4.87 Sketch showing the hierarchy of streets in Balat and the built-in mud brick benches of two different kinds, corner and along the wall.

It is rare to find sharp corners along the town streets. Inhabitants tend to build smooth curved edges on the corners of their houses and intersections of streets. When asked about the reason for this, inhabitants gave no definite answers. Mostly they tend to be concerned with creating vistas wherever one goes around the village and with creating a wider view along the roads. Moreover a smooth rounded corner was easy in old times for donkeys and camels to navigate within the city streets, especially when returning from the farm loaded with goods.

Green areas are normally behind the houses, where people tend to cultivate some basic herbs for cooking and to give a nice smell to the air. Acacia trees, fruit trees and palm trees are planted on the periphery of the town to be used for building purposes and for their fruit. Some small gardens are located in the centre of the village for domestic purposes but that is not a common feature.

Figure 4.88 Domestic plants in the backyards of houses.

4.5.6 Cultural and social characteristics

Cultural and social characteristics need to be considered in this analysis as they give insight into the physical setting, explain many variables and clarify the reasons for specific characteristics of the built environment. Rapoport mentioned in his book *House form and culture* that "The house form is not simply the result of physical forces or any single causal factor, but is the consequence of a whole range of socio-cultural factors seen in their broadest terms." (Rapoport, 1969, p. 47). The vernacular in Balat is a record of the lifestyle of the past when inhabitants were trying to find a sustainable way of life, just as they are trying to now. Vernacular in Balat exhibits the potential of the local community to organize spaces, evolve a strong architectural base and enrich their lives through their own local culture.

There are some unwritten and unrecorded rules in Balat. Many traditions, including building customs, were not recorded and are instead handed down from one generation to another by word of mouth. There tends to be hardly any differentiation between standard norms, ethics and cultural values. Local community traditions are a mixture of all behaviours and attitudes that manifest themselves in every single aspect of daily life. During the documentation of cultural and building traditions, it was often mentioned by the inhabitants during interviews that when a family decides to construct a new house, they call their neighbours and relatives to

help. They share together all the building process, starting with the casting of mud brick and ending with the preparation of the acacia wood logs for roofing. If the house owner does not have a farm of his own from which to get the wood, he can ask a neighbour or a relative to get him the beams needed for construction. In return he offers another crop or he is offered the wood as a gift.

The ladies help in carrying the mud bricks while men work on the construction of walls, stairs and roofs. As soon as the ground floor is finished, all the ladies together start plastering the walls, both inside and outside. They also plaster the stairs and ceilings. After finalizing the construction work, the family that owns the house prepares a big meal and invites those who shared in the building construction. The building process in itself can be described as a kind of edifice and construction ceremony. It is a festive event and a celebration that everyone looks forward to.

One of the most significant cultural phenomenon in Balat is that buildings were not isolated, a characteristic that distinguishes them from the single-purpose units that we can see nowadays in the newly constructed buildings on the periphery of the old town. In addition, vernacular houses used local materials, and did not import materials from elsewhere as is done in the modern buildings. Most houses were considered centres for producing the materials needed by the local community in Balat. The whole Balat community was often self-sufficient, producing among themselves all the basic necessities of daily life.

4.5.7 Structure and construction characteristics

The responsibility for construction is allocated to men in the first instance and to women in the second, but both genders receive help from each other at crucial stages in the construction.

Mud brick, acacia wood logs and palm ribs are the basic construction materials in Balat dwellings. The structures consist of thick bearing walls with wooden roofs. Normally using materials from the same climatic zone fits into the local environment perfectly. Use of locally available material has environmental advantages. Mud bricks as a construction material have low environmental impact in their production, are renewable and degrade naturally when discarded.

Room sizes are very limited due to limited availability of long wood logs. The same goes for ceiling heights, as the higher the ceilings the thicker the bearing walls must be and this reduces the room areas as well. The flexible structure system in Balat makes it easy to connect the houses together. It offers possibilities of extension in different correlated configurations. This correlated and compacted structure adds another important feature to the structure of the town as a whole; that is, houses support each other structurally.

Figure 4.89 Roof structure made from acacia wood logs and palm ribs.

Figure 4.90 A part of a deteriorated house showing wall thickness made from mud bricks.

4.5.8 Time and age characteristics

The date when the oldest dwellings originally in Balat were constructed is not exactly known in the literature. From the doors' lentil inscriptions, the oldest houses appear to have been constructed in the 16th century while the oldest mosque dates back to the 18th century.

Figure 4.91 Arabic calligraphy inside the mosque says "The mosque was built in 1125 H.C. It was renovated by Prince Khalil Aga El Habashy in Safar 1242 H.C. It was plastered by Mohamed Abdl A'al in Rabia I 1412 H.C and re-plastered in Sha'aban 1429 H.C".

4.6 Building know-how in Balat

Mete Turan states in the preface to his book *Vernacular Architecture* that vernacular know-how is not a single phenomenon; it requires study of the specific cultures which employ its numerous forms. He added that it also needs to be studied beyond its merits without overlooking the limitation, defects and failures (Turan, 1990).

Know-how in Balat practice is a mixture of what is known and what is inherited. It is a merging of the collected wisdom and experience of the society and the norms that have become accepted as appropriate to the local desert environment. Also it has to do with the inherited knowledge of aspects of the natural environment such as climate, topography, seasonal variation, natural hazards and sustainability. Without doubt the influence of beliefs, observances, rituals and respect for ancestors and divinities also affect building norms and values in desert societies.

The know-how of building phases in Balat cannot be seen only as being born out of local materials and technology. It is an accumulation of knowledge, awareness, understanding and the locals' instincts and intuition, as well as their close relation to the environment. It is a responsiveness to climate mixed with reflections on customs and the community lifestyle, together with the search for compromise and solutions to, or transformation of, the available resources. Moreover we cannot deny the collective wisdom and experiences given by elders to their society as well as norms that are appropriate to the built environment. The know-how also includes the knowledge of the natural environment, including the harsh weather conditions, topography, the surrounding natural hazards and knowledge of what will provide the sustainability of their town in that environment.

The current problem is that the transmission of building know-how will disappear very soon. Youth rarely inherit this tacit knowledge from seniors. Young generations who are supposed to be part of this transmission cycle and to continue this building tradition are often no longer interested in the vernacular tradition of housing. Documenting the intangible oral heritage of this know-how is thus a necessity. Protecting this transmission of building knowledge from discontinuing is a challenge in contemporary time.

4.7 Mud brick and building technology in Balat

Dethier mentioned in his book *Down to Earth* that from the time when mankind first gathered together in villages about 10,000 years ago, unbaked earth has been one of the main building materials used on all the continents of the world. He mentioned the ancient Egyptian civilization as one example.

The structures of Balat dwellings are made of sun dried mud brick cast manually on site[33]. Mud as a walling material has been claimed to be the oldest and most widely used form of vernacular construction (Wright, 1991, p. 15). This traditional building material fits the inhabitants' needs well. It is available wherever a house is to be built. Thus it is almost free of cost. As for labour, it requires only one builder to set the upright foundation for the ground floor and his mission is completed. The rest is erected by the house owner together with his family and neighbours or relatives. As the Egyptian Architect Hassan Fathy said of mud brick constructions, " A house is essentially a communal production: one man cannot build one house, but one hundred men can easily build a hundred houses." (Fathy, 1973, p. 121).

The technology of making mud brick is inherited from ancient times in Egypt. Inhabitants in Balat choose the best soil for mud brick casting. There are common places they tend to go and get the mud from. They are nearby their farm lands on the periphery of the town. They choose these locations because they are places where grazing animals are taken every day to graze. As a result, the soil is full of animal manure. Moreover it is far from the farming land, where the upper layer of the soil is salty or recently affected by fertilizers.

Mud bricks are cast in wooden moulds which vary in size according to use. The moulds should be wet and the mud mixture is damp. Sand or loose soil is sprinkled on the ground first to prevent the raw mud bricks from sticking. The process starts by adding water to the soil to achieve the proper consistency, plasticity and workability. Straw and dung are added to increase malleability and impermeability. Finely chopped rice or wheat straw is mixed with the mud to act as shrinkage compensator and for reinforcement. This helps the entire mud brick block to dry evenly from inside and from outside. It also increases compaction, which reduces cracks and keeps the brick more solid. The straw is taken from the fields and stored after harvest. Winter straw is used because it is better than that from spring growth.

---

[33] Video filming was the main tool for documenting mud brick technology in Balat. Questions were asked during filming to obtain additional explanations about building techniques and know-how. Dialogues between me and the Balat inhabitants during video filming were transcribed and analysed.

In the literature it is mentioned that straw acts as a binder, incorporated into the mix and that it makes the mud easier to tread and to handle when casting. Moreover it strengthens the wall, slows down erosion, helps combat shrinkage and reduces cracking (Wright, 1991, p. 27 & Warren, 1999). Traditionally the proportion of straw in the mud mixture is determined by sight and the feel of the mixture.

Dung is also added to this mixture. It was mentioned in the literature that dung acts as a binder and also as an added protection against moisture penetration (Wright, 1991, p. 31). It was also mentioned in *Vernacular architecture of West Africa* that adding manure and straw to earthen mortar helps microbial products to cement particles of earth and the fermentation of these organic elements reinforces the materials' cohesion (Bourdier & Trinh, 2011, p. 87).

Locals mix the clay either by hand, by foot or with wooden sticks in a pit and then leave it to mellow for a day or two. Thereafter, the material is ready to harden into a durable building material for casting.

The final step consists in pressing the mix into wooden moulds that have neither base nor top. The mud mixture is smoothed by hand from the top and the mould is lifted off to be used for the next brick. The standard wooden moulds for ground floor bricks are 30 cm x 15 cm x 15 cm. Other sizes used include 25 cm x 15 cm x 12 cm for first and second floors and roof fences. The cast bricks are left in the sun to dry before using and flipped on all faces every day to make sure that they dry on all sides. The bricks are laid foundation up. The process continues to the window sills, then door lintels, then the ceiling and then left to dry. Also normally from 5 to 15 persons help in the building phases. In Balat two men can cast from 700 to 1,000 blocks per day.

Timber is sometimes placed in the corners of the walls diagonally to reinforce the corners if needed. After finishing the walls, acacia logs are put in place as the bearing structure for the roof covering. Then a layer of scheduled palm ribs are used to cover the spaces in between the logs. Then dry palm leaves are sprinkled on the structure to cover any small spaces. A layer of mud mortar is poured over the roof. A layer of mud brick is placed on this structure and then a layer of about 10 cm of mud plaster to create a flat surface. A final layer of dry sand of about 2 cm is sprinkled over the plaster-covered bricks.

For the wall plastering, manure is added to the plastering mixture. It does not smell inside the house, but insects do smell it and this odour keeps them away from eating the straw inside the bricks or causing any holes inside the walls, ceilings and floors. Straw is added in small amounts to the plastering mixture as well. It makes the mud easier to handle and tread by hand when plastering. For the rendering, people mix fine sand with water. Usually coloured soil enhances the variety, providing several tones for plastering.

Women in Balat help in laying the floors, as well as in the final mud rendering and decorating of the walls. This final layering using fine silt or clay protects the walls from bad weather conditions and fulfils aesthetic functions as well.

Generally, it is preferred to build in late winter or early autumn because summer is very hot and high temperatures can cause cracks in the mud bricks due to dryness.

4.8 Chapter conclusion

The chapter discussed in detail different aspects of the vernacular in Balat. It describes the experiences of the inhabitants of the town as they construct their vernacular dwellings, time after time, following long-held traditions and customs. The chapter shows that vernacular in Balat is also a flexible building process that is responsive to changing needs. The process is based on accumulated knowledge transferred from one generation to the next. Unfortunately, the transfer of this traditional building know-how is about to stop and not be continued by the present generation.

The investigation described in this chapter is intended to deepen our understanding of the challenges facing the town and of how and why its inhabitants are destroying an invaluable desert vernacular tradition in Balat by deserting the old dwellings and building new settlements with concrete structures. Understanding the many assets of the vernacular in Balat puts into our hands insights into the essence of the problems the inhabitants face and the threats to their heritage. It can be concluded that the lesson from the past is not that the mud brick dwellings are striking structures, but that the essence of desert vernacular is in the inherited attitudes of social and physical development that the desert vernacular embodies.

5. Towards a discussion and conclusion for the conservation model

5.1 Introduction to the chapter

This chapter presents a discussion of current problems and future threats to desert vernacular architecture based on the findings of the case study. Since the vernacular heritage is at present under threat all over the world, the chapter also takes up the central issue of the vernacular identity and discusses aspects of the threats to vernacular architecture that are reflected in the problems discovered in Balat.

Also described in this chapter is the process of planning and constructing the physical neo-desert vernacular model house according to the conservation model developed for thinking re-vernacular in contemporary terms. Although the physical model is not the final result of the thesis, its construction provided many important insights for evaluating its main goal: the development and application of the conservation model that allows the full involvement of local inhabitants. The chapter ends with the thesis conclusions, a discussion of the results achieved and recommendations for further research.

5.2 Local identity and ethnic insularity

Lefaivre and Tzonis in their book *Critical regionalism* highlighted the notion of using architectural elements to represent the identity of a group occupying a piece of land. They were interested in developing the awareness of regional architecture. They said: "Regional architecture is an idiom having a distinct identity and being associated with an identifiable group, and having this association used for further manipulation of the group's identity" (Lefavire & Tzonis, 2003, p. 11). Today the vernacular identity in the Western Desert is vanishing gradually day by day. The table below shows the situation in 2008 in the five main Western Desert oases (Siwa, Baharia, Kharga, Dakhla, and Farafrah) based on the site investigations carried out at that time.

Table 5.1 Desert vernacular architecture, current situation in the five main desert oases in the Western Desert of Egypt.

Oasis	**Main cities**	**Description of current situation**	**Current status**
Siwa	Shali	Totally deserted. Degree of deterioration is severe. Parts of the city are falling apart.[34]	
Baharia	El-Bawiti	The city core is totally deserted, few inhabitants still living on the periphery. Parts of the city are gradually deteriorating.	
Kharga	Sendadeya	The city no longer exists. Only ruins remain.	

[34] Although a project for preservation and enhancement of cultural heritage was carried out in Shali between (2005 and 2007) that didn't help in decreasing the deterioration rate of the city.

	Main cities	Description of current situation	Current status
	Old Kharga	Vernacular mud brick houses are being replaced with concrete or fired brick houses.	
Dakhla	Mut	Only traces of the vernacular mud brick houses still exit and the rest are ruins.	
	Al-Qasr	Totally deserted. Parts of the city have deteriorated or are falling apart.[35]	
Farafrah	Qasr El-Farafrah	Part of the city is deserted and deteriorating gradually while the rest of the city is still inhabited.	

Quoting Rovero and his colleagues from their research in Shali city in the Siwa oasis on 2009.

"Today the citadel looks like an incredible succession of ruins, walls that rise up isolated to be about to fall down, houses that can be distinguished only by a few crossings of walls and little windows. In this context some remains of the city walls stand up molded according to the morphology of the hill and giving rise to a wavy strip that makes them so evocative" (Rovero & others, 2009, p. 2492).

The loss of each of these towns is significant since each oasis has a distinctive character and identity. Moreover every settlement in the same oasis is different from the others. The iconic appearance and distinctiveness of desert vernacular architecture are thus gradually disappearing.

[35] There is an ongoing restoration project in Al Qasr that started as early as 2003, however, the town is still deteriorating and important buildings are falling apart (see Fred Leemhuis, Dakhla Oasis Project reports from 2005 till 2010).

Figure 5.1 A mosque minaret in the Siwa oasis.

Figure 5.2 A mosque minaret in the Dakhla oasis.

Both figures show the same architectural element - a mosque's minaret - but the design and building technique are very different, thus providing examples of the distinctiveness of the architectural identity of each oasis even for the same functional architectural element.

Figure 5.3 Shaded alley and a room bridging a street (Sabat) in Balat in the Dakhla oasis.

Figure 5.4 Shaded alley and a room bridging a street (Sabat) in Al Qasr in the Dakhla oasis.

The two figures show examples of shaded alleys (Sabat) in two different towns within the same oasis. The pictures illustrate the same concepts of covering an alley to provide shade and of building an extra addition over this alley to connect two houses. We can observe, however, the different representation of the same concept in two different architectural solutions, giving individual identity to each town.

The study's preliminary walking interviews in several Western Desert cities in January 2008 revealed what appeared to be an increasingly common norm among young inhabitants: they seemed to pay little attention either to their cultural or local social identity as it is reflected in the distinctiveness of the architecture and urban formation of their vernacular dwellings. This attitude, which was seen again in structured interviews and questionnaires in Balat during 2009-2010, is paradoxical because these young people also expressed pride in the old vernacular dwellings and an appreciation of their ancestors' vernacular mud brick houses. Nevertheless, they were more attracted to modernistic ideas and to globalised trends and influences in architecture. On the other hand, both structured and walking interviews in the present study also revealed that the elderly living in Balat have distinctive cultural expressions for their vernacular dwellings and they still feel attached to their place. Such evidence indicates a clear sense of locality for this group.

In Balat this sort of overwhelming adoption of modern urbanization concepts by the young and the use of industrialized building materials is greatly endangering ethnic desert vernacular in the town. Moreover, it is threatening the continued appreciation of cultural values and architectural identity within Balat. The danger is that in the future such adoption of modern building approaches will be increasing common and that, without a keen sense of conscious respect for desert vernacular values, Balat will be transformed into an open-air museum of the past heritage or into ruins, as is the case in many other desert vernacular settlements.

Site investigations have also shown a clear impact of urban growth and sometimes of the economic resources provided by the Balat locals who have migrated to large cities or abroad. The impact is seen in the importation of the ideas of using industrialized materials foreign to the local environment. In his ethnological study of Balat begun in 1989, Jacques Hivernel stated that the recent changes in Balat have occurred through the improvement of communication, the introduction of electricity, the construction of new roads, television and migration (Hivernel, 1996).

The issue of regionalism in the Western Desert is important in this context. Regionalism is a natural reflection of peoples' thoughts, beliefs and daily life practices. To re-think regionalism and the attachment to the local identity, it is necessary to apply a bottom-up approach. That is, an approach is needed that recognizes the value of the physical, social and cultural identity. It does not attempt to impose the sort of top-down strategy applied previously in several trials by architects, planners and social anthropologist to solve the issue of local identity and regionalism. Commanding inhabitants and locals to embrace ideas and thoughts has proven to be a failure over the years (See Benjamin & Nathan, 2001 & De Villiers & Sindane, 1993).

When discussing future plans for desert vernacular in connection to regionalism and the responsibilities of designers, decision makers and locals, Lefaivre & Tzonis argued that what we now call the critical regionalist approach only looks at the architecture of identity. They added that it only recognizes its values in projects demarcated or distinguished within the physical, social and cultural norms or constraints of a particular area (Lefaivre & Tzonis, 2003). This quandary illustrates the limits of previous work and the challenge professionals face today: in sustaining the local identity of desert vernacular architecture they must also respect the desert inhabitants' own wishes and ambitions for their future.

Both the tangible and intangible aspects of desert vernacular architecture are important parts of the locals' sense of their history and heritage. The relation between the materiality represented in mud brick houses and the immateriality represented in culture and traditions are gradually being destroyed. The old compact urban fabric is disappearing in locals' new way of building. The natural loop of inheriting old traditional building techniques will die out in a short period of time as

it is not being documented. The young and future generations will no longer be capable of building with the old techniques; as a matter of fact some already now are not able to. This is not only the case in Balat but, as Prieto mentioned in his article, many indigenous cultures and traditions have disappeared in many parts of the world when the link to the traditional knowledge and values formerly passed from generation to generation has been broken (Prieto, 2005).

5.3 Balat's future through native eyes

Locals in Balat who moved out of the old town to live in the modern concrete houses are losing parts of their cultural and traditional identity. The regional values are now starting to be mixed with various perceptions of modernity, which pose yet another risk to the original desert vernacular values. Desert vernacular in Balat sets an example of harmony not only between dwellings and dwellers but also between the built milieu and the natural environment, a harmony which is often ignored in their newly built modern houses. In addition, advanced technical facilities in the new concrete houses have formed a new cultural barrier. It prevents people from returning to their traditional houses. From interviews with locals who are living now in concrete houses in Balat, it became clear that in their opinion going back to live in mud brick houses without modern facilities represents going back to old-fashioned housing and living forms that they no longer feel are acceptable.

Interviews in the present study also indicate that the young in Balat are afraid they will be looked down upon if they live in mud brick houses. They worry that others might perceive them as poor and their houses as old-fashioned. They do not want to be associated with those who cannot afford to build with concrete or with the elderly who are not willing to move out of the old town. Although youth still value and respect their ancestors' dwellings, they cannot see mud brick houses the way they are now as a solution for their future housing. The young are seeking a more ambitious way of living and they feel that, to cope with new living demands, they need modern housing that provides more facilities such as those they found in big cities.

This attitude is seen in the Balat community, especially among the youth. They look at new concrete buildings as a means of fulfilling their ambitious desires for a better, more modern future. In doing so, they tend to disregard any cultural or climatic environmental concerns. The young still have a sense of belonging to the old town, especially those who are still living there, but their ambition for a better future is stronger than their positive feelings about the old town. They cannot see themselves still living in mud brick houses. They want to be modern. For them modernization means to live in a concrete house that has better living facilities and conveniences.

From the questionnaires in this study I can conclude that the majority look at Balat with pride while the minority describes Balat as ruins and as an old-fashioned town. Inhabitants like to talk about the old days, especially seniors. They describe the way they used to live, cook, store food, bring water from wells, build their houses, bake bread, celebrate in feasts, weave their clothes, etc. They look at the old days with nostalgia and say that it is a pity that they are not enjoying the old lifestyle. Although they highlight socio-economic changes that have happened in the last 30 years, they also state that their impact is high and rapidly influencing their old town.

5.4 Building with concrete as a manifestation of desert vernacular problems

Oliver mentioned that in the modern world, vernacular traditions are fast disappearing or are subject to accelerating social and cultural change (Oliver, 2006). Bourdier & Trinh claimed that the last thirty years have witnessed a rising condemnation of social and environmental ills associated with standardized technologies within vernacular societies (Bourdier & Trinh, 2011). The authors of *Spectacular Vernacular* highlighted this problem, mentioning the problems that arise from "claims that the technological modesty of traditional people is not voluntary but a reflection of backwardness, of inferiority. This attitude is attacking adobe (mud brick) worldwide." (Bourgeois, Pelos & Davidson, 1989, p. 157). In another study it was argued that vernacular architecture is often subjected to urban decay, socio-economic degradation and poor living conditions, and that this is not only a risk on historical, cultural, but also on social and economic levels (Lefaivre & Tronis, 2003). Pearson argued that "Western industrial society has spawned international architectural images, modern technology and new materials to build anonymous slab block apartments often ill-adapted to local social and climatic conditions."(Pearson, 1995, p. 121).

In the Egyptian desert oases, it is becoming more and more common every day for inhabitants to demolish their old mud brick vernacular houses and build new concrete houses instead. Such a phenomenon is the main manifestation of the current change in attitudes, perceptions, desires and economic circumstances. Close observation in Balat has shown that such factors have changed the building typology in contemporary housing there, just as other studies have shown such changes to have affected the Western Desert in general.

The new generation on the other hand, expressed a desire to follow the new trends and live in concrete houses regardless of any problems this might entail. The perception that concrete houses are modern and you have to upgrade your living standard is a new cultural norm among youth in Balat that is affecting their attitude

towards the old town. There is a notion among Balat locals that concrete constructions need less maintenance compared to mud brick houses.

Howard Davis wrote in the preface to his book *The culture of building* that during his travels he noticed both the beauty of vernacular traditional architecture, and the ways it has been mixed deeply by real local cultural and economic forces have transformed into ubiquitous concrete frame, re-bar and concrete block buildings. In his opinion this has become the new global vernacular (Davis, 1999). May argued that it will not be possible to house future generations in concrete blocks due to several considerations including climate change (May, 2010). Minke had the same opinion as May; he mentioned that it has proven to be impossible to fulfil the immense requirements for shelter with industrial building materials, i.e. brick, concrete and steel, or with industrialised construction techniques (Minke, 2006, p. 11).

5.5 Problems that make inhabitants tend to abandon their houses in Balat

In Egyptian oases, residents with adequate economic resources are tending to replace their vernacular traditional homes with other ones constructed mainly from fired brick, cement or with concrete skeleton buildings. Sasidharan mentioned in her research "vernacular architecture as a changing paradigm" that "the central factor of every vernacular settlement is the culture and socio-economics." (Sasidharan, 2008, p. 1). From my analysis of interviews with Balat inhabitants, it appears that the main reason for such changes is inhabitants' desire for more comfort, better hygienic conditions and easier and more long-term maintenance for their houses[36]. New homes have less dust, and it is easy to integrate electricity and other services into

[36]The local municipality in Balat helped with providing electricity and telephone cables together with water pipes twenty years ago to the old town of Balat. Inhabitants living in houses located on the periphery of the town were able to have plumbing installed in their houses. While the rest of the houses share common water taps from common supply locations within the town. That was not convenient for the rest of the inhabitants in terms of daily household needs. The municipality was afraid that any leakage in the plumbing system might result in disastrous consequences and houses might collapse due to water-vulnerable mud brick construction materials. On the other hand electrical wiring and telephone cables were easily provided to houses within the town. Satellite dishes can be noticed sitting on the roof tops of some houses. That was not enough for locals and not satisfactory compared to what they can find in concrete houses.

them. Local desert inhabitants leave their houses because they suffer from many common problems in their vernacular dwellers, including:

1- They need electricity for electrical appliances such as computers, stoves and refrigerators.

2- They need a good water supply and drainage systems.

3- They need to avoid structural cracks and to exert less physical effort in regular maintenance of their houses.

4- They need natural gas for their cooking and baking stoves.

5- They need more safe houses in case of rain and earthquakes.

6- They want to get rid of insects such as white ants or termites that are destroying their houses' structure by eating wood in roofs and fibres inside mud bricks.

7- They need larger spaces inside their houses, which traditional structures cannot offer all the time.

8- They need to make use of the land value and build more than two or three stories.

9- Finally as locals see it, they need a shiny modern look for their houses and they want to use modern materials such as ceramic tiles and cladding to produce a look like that in cities.

5.6 Old and contemporary claims against modern demands

As architect and planner J. C. Moughtin wrote:

"Earth and mud architecture is often described as impermanent and therefore as an inferior method of building. Yet unbaked earth has been used for many thousands of years, not only for housing, but for some of society's most prestigious development. Great ziggurats, pyramids, religious and public buildings have all been constructed from this material." (Crouch & Johnson, 2001, p. 27).

Although many young Balat inhabitants assume mud brick housing is only used in poor rural areas, there are examples of airports, embassies, hospitals, museums, banks and factories that are made of earth. Dethier argued that building a home with unbaked earth in no way reflects on the social class of an owner. He added that, on the contrary, since earth is available to rich and to poor alike, shame is completely irrelevant (Dethier, 1983, p. 69).

William Facey mentioned in his book *Back to Earth* that in these days earth buildings are associated with poor rural communities and a symbol of primitiveness and backwardness, regardless of the fact that one third of the world's population live in earth buildings (Facey, 1997). Steen & his colleagues, too, argue that in much of the world, earth has been viewed as a poor man's buildings material. They add that limited perception fails to take into account that it has been used to construct the most elegant palaces, as well as worship buildings such as churches, temples, and mosques (Steen, Steen, & Komatsu, 2003).

Gallo mentioned in his studies in microclimate that in modern times, building materials such as cement, steel and bricks are highly energy intensive. His studies show that the embodied energy costs as well as running costs can be significantly reduced by climate-responsive building design (Gallo, 1998). Moreover, from global climatic concerns, as John May stated, every cement bag produces one and a half bags of carbon dioxide (May, 2010). It may not be appropriate to adopt these new concrete houses as they are built now as readymade solutions for contemporary desert architecture and a way of living in desert towns and cities.

Problems with concrete houses were revealed by my on-site temperature measurements and also by a questionnaire with inhabitants who had recently moved into concrete houses on the periphery of old Balat. They stated that it was very hot in summer inside their concrete houses compared to their traditional houses. Some of them tended to move back to their old mud brick houses in summer, especially

during morning periods. Temperature measurements in February recorded a 15 degree average difference between a mud brick house and a concrete house during midday. If it was 20 degrees inside the mud brick room; it was 35 degrees in a similar concrete house during the same time period, while in July a 20 degree average difference was recorded. Although inhabitants felt the difference in thermal comfort when they moved to new concrete houses, they were still happy with the shine and look of their modern lifestyle.

Jerome and her research colleagues argued in their research "The architecture of mud" that concrete buildings have cooling and heating requirements that were nonexistent in vernacular traditional mud brick construction. In their research they tackled the same challenges with residence problems faced within desert vernacular mud brick houses in Yemen in Hadhramaut dated back to the mid of the 16th century (Jerome, Chiari & Borelli, 1999).

Figure 5.5 Outdoor temperature measuring loggers in Balat.

Figure 5.6 Indoor temperature measuring loggers in Balat.

Although research has proved that earth is a versatile and convenient building material (Dethier, 1983), earth (mud brick) as a building material has been erroneously characterized as being poor, fragile, old-fashioned and primitive. Mud brick can, indeed, be fragile and easily damaged by water as it can swell, slip and lose its compressive strength (Jerome, Chiari & Borelli, 1999). However, scientific research had found solutions and remedies for these dangers. The table below shows a summary of some problems and suggested solutions that I found relevant for the case study problems. See Norton, (1986), McHenry, (1989), Elizabeth & Adams, (2000), Minke, (2000, 2006 & 2009) and Rael, (2009).

Table 5.2 Shows problems with mud brick and remedies suggested in this study.

Problem	**Remedy/solution**	**Effect**
Water damage and destabilization caused by water erosion.	Mixing mud plaster with lime powder, cactus mucilage, corn husks, whey and animal manure or urine.	Improves resistance and impermeability.
Time-consuming production process.	Simple manual hydraulic machines.	Produces a large number of bricks.
Lack of compactness.	Hydraulic machines.	Produces more compact bricks than those cast manually and increases compressive strength.
Growth of microbes and insects from adding straw.	Adding dry / natural fibres and using the hydraulic machines to render the bricks more compact.	Eliminates the need for straw fibres, consequently preventing white ants and termites.
Shrinkage and cracks.	Adding silt and sand in a certain measured proportion together with natural fibres such as animal hair.	Increases the binding force of the mud brick mixture, thus reducing cracking, shrinkage and erosion when exposed to rain.

5.7 Vernacular or un-vernacular vernacular

The concept of vernacular in desert oases is currently becoming ambiguous due to inhabitants' recent choices of building and construction processes. What people build now in desert communities using concrete creates a situation that is complex and difficult to evaluate. As Chase argued, vernacular structures are viewed by researchers with nostalgia and affection because they are associated with ways of traditional living. He added that vernacular dwellings have become outmoded now due to technological changes in vernacular societies (Chase, 1986). There is a sudden fracture in the cumulative desert vernacular building tradition that has harmed desert vernacular settlements in Egypt for the last 30 years. The question now is: Are the dwellings built recently by local inhabitants with imported industrialized building materials now to be considered desert vernacular buildings?

Concrete cannot today be claimed to be a local available material; however, in a few years' time it might be claimed to be part of the local building tradition. Inhabitants in Balat or similar desert vernacular settlements will have developed a tradition of building with concrete, just as they used to build with mud.

Here the debate in the thesis addresses the deeper meaning of the concept of the desert vernacular. Here desert vernacular is defined as a sustainable loop, a way of improving the life of the community according to their needs, and of using the available local materials that best suit the climate and local environment. Concrete is not an available local material. Locals do not have the building know-how to construct with it. The vernacular tradition of trial and error to reach the best result is not applied in the process of building with concrete. The main problem, as Hassan Fathy stressed earlier, is not the issue of using the local material but the prejudices ranged against it and the interest in using industrialized building materials such as the cement they use now (Steele, 1988).

One could argue that the new houses built in local desert communities either with concrete or fired bricks are manifestations of current contemporary means to satisfy modern needs that their old mud brick houses sometimes do not satisfy. I claim that this product cannot be called vernacular. Vernacular is a continuing and sustaining intellectual building process. It is the brilliant use and adjustment of local materials. It is the urban patterns and the configuration of buildings that have emerged from the interaction with the physical environment. It is an ageless and timeless way of building. It is the fusion of culture, tradition, religion and inherited beliefs reflected in the building product. It is the accretion of human knowledge and the continuous loop of accumulative experience of reacting with the environment. It can be concluded that it is all the above factors that are not found there in the recent building product using industrialized materials.

Vernacular is always the reflection and implementation of the building process to meet needs. It has always been a direct response and interaction with the living environment. As De Filippi argued in her research on Dakhla oasis in Egypt, preserving the vernacular built heritage means dealing with its "living" environments, not only the built-up sites (De Filippi, 2005). Mahdy also argued that conservationists should not, and cannot discredit the desires of local communities, their efforts to develop or their dreams of modernization. He suggested an inclusive analytical methodology in defining the scope and nature of the current vernacular heritage situation in Egypt (Mahdy, 2009).

5.8 Thinking re-vernacular

In the book *Vernacular Architecture in the 21st Century* the authors looked at the future of vernacular. They proposed that by ridding themselves of the shame and feeling of underdevelopment and backwardness, vernacular dwellers would be able to see themselves as sources of architectural know-how and as an active part in the determination of a sustainable future. It was also stated in this book that vernacular technologies, materials and forms can be applied in contemporary designs (Asquith & Vellinga, 2005).

Although the new generations have tended to leave the vernacular towns and villages to build with concrete, it is still possible to revive the concept of building with the desert vernacular traditional know-how. I claim that it is time to start revitalizing the old techniques before they vanish forever. Seniors still have the cumulative knowledge of different aspects of building. The use and application of vernacular knowledge needs to become a more urgent topic of discussion, and new methodological approaches, combining tools from different disciplines, should be developed to assist housing research today to support desert vernacular in the future.

The clue to dealing with this situation is to formulate vernacular traditional knowledge in terms that satisfy inhabitants' current needs and aspirations. Such a reformulation will allow us to map the future of vernacular heritage onto desert settlements. Once vernacular is not seen as a static building form, but as one that is constantly evolving and reacting to changes in the communities that shaped it, then preserving its future can be manageable. Rapoport described vernacular architecture as possessing an open-ended nature which gives it a special quality in enabling inhabitants to accept changes and make adaptations (Rapoport, 1969).

This type of desert vernacular, both in Balat and many other desert vernacular settlements, is a rich source for contemporary desert architecture. It represents solutions that show maximum adaptability and flexibility of design. It is still possible to learn and benefit from the approach of the traditional building that acknowledges the interdependence of buildings and the physical environment, but it must be

documented before it is lost. Vernacular provides an example of sustainability based on inherited traditional knowledge and preserving it into the future. Heidari and Wally argued that desert vernacular still has much to teach us, as it always develops a typology of fundamental common sense (Heidari, 2010 & Waly, 1996). Oliver[37] discussed in his writings the importance of preserving vernacular architecture because he believes that using traditional vernacular wisdom, renewable building resources and local skills are the economically effective and culturally appropriate solutions to world housing problems.

5.9 Learning from Fathy and risk perception

Examining Fathy's experience with both traditional and vernacular architecture was very instructive for the present research. Although his trials to revitalize and develop vernacular and traditional building techniques in Egypt were successful in many ways, they were rejected to some extent by local communities with whom and for whom he had been working (See Fathy 1973 & Steele, 1998 &1997). The approach adopted in this thesis is different from Fathy's, though it has gained much from his experiences.

The participatory action research (PAR) approach applied in this project provided a way to reach locals and to work together with them in building the neo-desert vernacular model house. It provided an approach that allowed me to work with locals and for locals and for much of the work to be done by locals. Inhabitants in Balat were given the chance to create, develop, adjust and select what suited them best. It did not entail a relation between an architect and a client. It led to a relation more like that between colleagues having different skills to offer each other. The choices and the decisions were made by locals at the end of every discussion. Sometimes I proposed a solution to facilitate solving a technical problem; at other times, they proposed one. Sometimes I initiated a discussion for a certain alternative to problem-solving, but the final decision was always given to locals. It was a risk to try this approach but the strength of acceptance from locals was the guarantee that the approach would succeed.

In Fathy's approach, by comparison, not only were vernacular methods advocated but also traditional means of construction with mud brick. He used traditional architectural elements such as arches, vaults, domes, screens and thick walls in adjusting earth construction to be economical to construct and to be comfortable in

[37] See Oliver work listed in the thesis references 1987, 1997, 2003, 2006 & 2007.

both summer and winter. Discussing a famous example from Fathy's work experience in New Gourna, Morgan mentioned that it was Fathy who designed the village mosque, market, square and individual houses according to needs and preferences of residents (Morgan, 2008). Although inhabitants were involved in the design, they did not move into these houses due to several cultural and social aspects that had not been taken into consideration in Fathy's designs (Kennedy, 2004). In the present study, by contrast, social and cultural aspects were a prime concern from the beginning of the research. This approach enabled me to interact with the community with an understanding of their behaviour and beliefs throughout the research project.

5.10 Potential, challenges and future possibilities in Balat

Balat vernacular cannot remain forever the same. Its inhabitants cannot be asked to be rigid tenets of what went before. Balat is a living community that should proceed with a natural human development based on memories of the vernacular traditional experience and a sense of place.

Despite the fact that some of the inhabitants still do not see thinking re-vernacular as a solution for their future, there proved to be strong support for the idea. This support was the criteria for choosing Balat, as was discussed earlier in Chapter four. Such strength of support became clear from the following evidence that was gathered in the preliminary studies:

1- From questionnaires and interviews there appeared to be a strong willingness on the part of the inhabitants to develop their town and preserve their old desert vernacular traditions if their houses provided what they needed and if their current problems within vernacular dwellings were solved.

2- There is still social life to be observed in the old town, documented and learned from.

3- Inhabitants still value their old dwellings even though they are abandoning them and there is no violent or intentional demolition of their old houses.

4- Oral traditions are still kept by seniors; thus there was a potential for documenting the old intangible ways.

5- The co-operation of the government to preserve the town was seen as a possibility for keeping the building traditional ways alive. This was further supported by the declaration of the town as a protected site where Balat inhabitants were not allowed to add to their houses or maintain them except with traditional materials.

6- Some inhabitants who left their mud brick houses still used them as storage places or guest houses. Some rented them out as a source of income. That was seen as a strength and acceptance of the need to keep maintaining or using mud brick houses.

It is important to mention that in Balat the main challenge was to document the tangible and the intangible desert vernacular know-how before it disappeared or died with seniors. As a result of taking on this challenge, there are possibilities now to encourage people to preserve their building tradition and continue using it.

The results of the questionnaires were, however, encouraging. They showed other reasons that the thesis conservation model could be applied with success in Balat:

- 80 % agreed that living in mud brick houses is more comfortable than in concrete houses.

- 95 % agreed that mud brick houses are better in summer than concrete houses.

- 92 % agreed that mud brick houses are better in winter than concrete houses.

- 84 % agreed that if the same facilities in concrete houses (water, drainage, gas, etc.) were available in the mud brick houses, they would move back.

- 77 % chose to build with concrete in the future instead of mud brick.

- 69 % chose to build with concrete for their children in the future.

- 98 % are proud of the mud brick houses in old Balat.

Analyzing the above questionnaire data showed that the majority are aware that mud brick houses are better and more appropriate for their desert climate. However, the answers to two questions showed that the thesis model could be applied in Balat to deal with the current challenges to vernacular:

- 92 % wanted to move to concrete houses if they had the money to do so.

- 85 % of those living in mud brick houses suffer from structural cracks, termites and lack of other proper facilities.

As these responses indicate, the locals tend to move into concrete houses due to problems in providing their mud brick houses with modern facilities such as proper plumbing (water and drainage) in toilets and kitchens. On the other hand there was a strong tendency to consider remaining in the vernacular traditional dwellings if these houses were improved to match their needs. It was also deduced from the data that financial considerations also played a role in enabling inhabitants to build with concrete; mainly that the poor inhabitants were unable to move into concrete houses even if they wanted to.

From the analysis of these findings, the research developed the concept of supporting a desert vernacular building tradition for future vernacular houses. The research

created a methodology for conserving desert vernacular building know-how through setting a method for documentation and learning from the vernacular tradition and through also taking such traditions a step further so that they could be adopted for future applications. The section below will discuss the neo-desert vernacular model house application based on this methodology.

5.11 The neo desert-vernacular model house

After finishing the design phase (described earlier in Chapter three), the next step was to build the physical model house. The building phases started with choosing the site for construction. It was agreed in a meetings with the local municipality, NGO and community representatives from Balat that the northern edge of the old town was a proper location. This decision-making process ensured the involvement of the community. The site selected was on the periphery of the old town and on the main road to the newly built concrete houses. The location also provided the chance for local inhabitants to pass by and follow the building phases on their daily journeys from and to their farmlands. One hundred square meters were donated by the local NGO for the model and the local municipality facilitated building permits and thereafter followed the work flow and progress every other day.

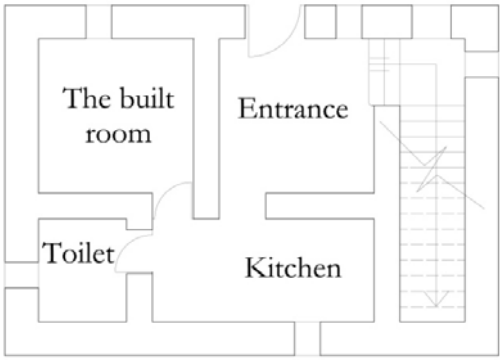


Figure 5.7 The figure shows the chosen neo-desert vernacular model house alternative which was designed by Balat locals. One of the house's rooms was built.

Full involvement and participation of the locals was essential since the aim was that any decisions within the neo-desert vernacular model house should favour their long-term interests and should never go against them. Another aim was to give youth a central role so that they could contribute actively beside the seniors whose role was to guide the building process and share their wisdom about building procedures. During the construction, youth expressed their desires to have large areas for the rooms and high ceilings. They suggested certain finishing materials for flooring and walls. Both youth and seniors were asked to share their knowledge and carry out the building process in return for incentives and daily wages. Technical assistance was provided by the researcher whenever needed during the construction process.

The neo-desert vernacular model house was not based on just creating and supporting a process that produces dwellings resembling traditional houses. The concept is deeper. The model house was seen as a means of incorporating inherited intangible values in ways that respond to contemporary needs. The aim was thus to build on the traces of the old vernacular tradition and map them onto the future. Building the model house was based on collaboration with inhabitants. It prioritized their ideas, desires and needs and used the accumulated knowledge of many generations together with technical assistance from the researcher to solve current problems. Hinds argued in his research around this point that the approach to the past only becomes creative when the architect is able to go into its inner meaning and content. He added that it can be dangerous when vernacular is reduced to resembling pastime architecture and just focusing on form (Hinds, 1965).

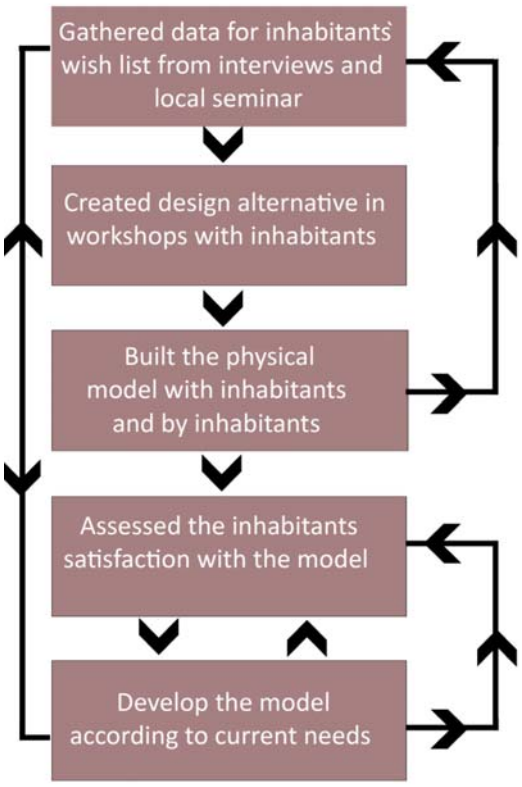


Figure 5.8 The figure shows the process followed to reach the phase of implementation for the physical model house. It started with gathering information related to Balat locals' needs and aspirations. Applying the wishes in a design alternative for a house was the next step; it was designed by the locals as well. After that came the building phase, which was followed by the assessment of the trial model, hoping that the vernacular cycle of continuous developing of needs and aspirations continues in that way.

In *Building without Borders* the author justified the importance of using natural local building materials and building methods in contemporary vernacular buildings rather than costly imported materials such as steel and concrete. They mentioned that local natural materials such as earth, timber and stone are easily obtained, energy efficient, low in toxicity, safe and durable. They added that the advantage of using local material and methods is that it allows the use of existing work force of craftsmen and skilled locals and that it also reduces costs compared to procedures using imported building methods and materials (Kennedy, 2004).

Moore advised that, in designing for desert architecture, extremes of temperature, aridity and availability of water must be taken into consideration. He added that, for people to live comfortably in any desert location, certain design elements should be addressed such as including local materials and considering site orientation for favourable wind (Moore, 1999, p. 12). Such advice was considered in the design and implementation phase of the model in Balat and made it possible to take advantage of local's knowledge and vernacular experience.

Some modifications and simple environmental solutions were feasible to be applied to the building materials to solve currently faced problems. The table below shows the technical and environmental solutions used for enhancement of traditional building technology. These solutions applied to the neo-desert vernacular model house are a result of a literature study together with advice from and experience of locals.

Table 5.3 Showing problems and remedies for current building material problems.

Problem	**Way of solving**	**Results**
Lack of strength of mud bricks.	Adding sand in a 1/6 proportion to the mud mixture (Minke, 2006).	More compact mud bricks.
White and black ants.	Treatment by spraying vinegar on the wood and mud-brick walls. Pepper and cinnamon was sprinkled in room corners. Also a local tip was planting mint around the house.	Prevention of ants from eating fibres inside the mud bricks and wood logs.
Water leakage.	Linseed oil added as final layer after mud plastering (Minke, 2006).	Protection of the external walls from water.
Water leakage.	Linseed oil mixed with light mineral oil for varnishing wood logs (Minke, 2006).	Protection of the wood surfaces and formation of a water proofing layer.
Water in foundations and external walls.	Adding lime[38] powder to the mud mortar of the stone foundation and the final plastering layer.	Protection of the foundation from water in case of leakage from plumbing and the external walls from rain water.
Foundation and footing settlement.	Soil replacement with a layer of compacted sand.	Prevention of soil settlements.

[38]Lime is used as a breathable plaster and paint to both adorn and protect earthen and stone walls from weather and abrasion (Steen, Steen & Komatsu, 2003).

The neo-desert vernacular model passed through 10 phases. During planning and construction, all ten phases of application of the model (described below) were completed, thus fulfilling the primary aim of the research. The project thus allowed the locals to share their experience of using the vernacular building tradition while making adaptations to solve current problems. In my opinion one of the advantages of this phase of building the neo-desert vernacular model house is the opportunity to allow the young both to participate in and to see the vernacular traditional techniques. It provided a chance to show what the seniors could give from the past and what the youth could create for the future. It was also a chance to revitalize the concept of co-operation among family members and neighbours. For example, the group that participated in the wall construction phase were from the same family and they asked their neighbours and close friends to come and participate. This is how it used to be in old times in Balat.

Due to the limitation of the scope of the research and of time for this thesis, the entire house could not be finished. Although it would have been useful to have a completed house, what was more important to complete was the construction phases mentioned below. Completing all steps in the conceptual conservation model for thinking re-vernacular allowed us to test the application of this theoretical framework. This helped in verifying the applicability of the neo-desert vernacular concept and in applying the transdisciplinary participatory action research. The soil replacement and foundations of a 100 square meter house was completed and one room was built and finished. The ten steps are listed and discussed below:

Figure 5.9 The site during construction for the neo-desert vernacular model, showing the foundation of the house and the room during construction.

5.11.1 Phase one (mud brick casting)

Mud bricks were caste in parallel with digging and soil replacement. Based on the local seniors' advice, the clay from the digging was not used for casting the bricks. Their local experience was identical to the recommendations from a soil analysis that was carried out. The locals advised that the clay could be brought from a nearby location on the southern edge of the town. That used to be the location from which they normally brought clay because there the soil is homogenous and rich in animal manure.

The casting applied typical traditional techniques except that a portion of sand (1:6) was added to increase the compaction of the brick and avoid later structural cracks. Fine short straw was used and long thick fibres were avoided as recommended by local seniors. They mentioned that straw helps conduct moisture from the centre of the mud brick blocks, thus preventing cracking and also that it dissolves easily. It was advised to use goat manure rather than cow or donkey manure in the mud mixture as it dissolves easily and produces the desired consistency.

The proportions used for the mud casting were the following: for every cubic meter of clay, 25 kilograms of chopped soft rice straw, 25 kilograms of goat manure, 1/6 cubic meter of fresh soft sand and 1 to 1.5 cubic meters of water.[39] The components were mixed well and left to ferment for two days while kept moist. Straw or sand was sprinkled on a flat surface on which the bricks were to be placed. The mixture was then packed into a wooden mould and then removed from the mould. The process was repeated several hundred times. The bricks were left in the sun to dry thoroughly and were turned on all sides.

[39] A technical search was made in the literature to find ways to improve the results in mud brick casting. The authors in *Vernacular Architecture of West Africa* stated that too much clay can cause mud bricks to dilate in humidity, and then contract and crack when meeting dry air. Also they noted that too much sand makes the earth crumble and vulnerable to erosion, especially in contact with rain water (Bourdier & Trinh, 2011).

Figure 5.10 Preparing mud, straw, manure, and water for brick casting.

Two mould sizes were used, a newly designed mould of 50cm x 25cm x 15cm and the traditional one of 25cm x 15cm x 12cm. The larger size was developed on site to facilitate and speed up the building process. The brick produced was used in the foundation only as it was too heavy to use at higher levels. A Balat carpenter helped in designing the wooden form of this brick mould. Two alternatives were designed and, after trying both, locals decided which was more convenient.

Figure 5.11 Kamel, the local carpenter in Balat, while working on implementing the new mould of size 50cm x 25cm x 15cm .

Figure 5.12 Mud brick casting using the first alternative of the mould and the representatives from the local municipality visiting the site to follow the work in process.

Figure 5.13 Mud brick casting using the second alternative of the mould. Youth were responsible for mud casting in shifts following seniors' instructions.

Figure 5.14 Mud brick drying in the sun. The bricks were flipped on all faces to ensure they dried completely from all directions.

Twenty thousand small-sized bricks were cast and four thousand of the large size. Eight persons helped in the mud brick casting, working for twenty days in shifts, with one person producing from seven hundred to one thousand pieces in seven working hours per day.

5.11.2 Phase two (soil replacement)

A soil test was performed to determine the depth where the proper soil was located. In general the soil in Balat is loamy. According to the soil test report, it was decided to dig 2 meters and add fresh compacted sand in layers to avoid any soil settlement. Settlement is a common problem in the houses in old Balat. It causes structural cracks in walls, which in turn affects the safety of the houses.

Figure 5.15 The site while digging.

Figure 5.16 The site after digging.

Figure 5.17 The site during soil replacement with fresh sand layers.

Figure 5.18 The site during soil replacement and compaction.

5.11.3 Phase three (Drawing the house plan)

After the soil replacement phase had been completed and before the construction of the foundation was begun, representatives of Balat locals together with representatives from the municipality and the local NGO participated in drawing the house plan. The old technique of drawing the design on the ground was used. Some discussions arose after drawing an initial plan, and minor changes were made based on suggestions from locals relating to the orientation of rooms to make use of pleasant winds.

Figure 5.19 Drawing the house plan on the ground using the vernacular way.

Figure 5.20 Discussions leading to suggestions for changing the rooms' orientation on site.

5.11.4 Phase four (construction of footings)

From investigations inside Balat, it was observed that the oldest houses had been built on stone foundations. Such houses are currently in better condition than the ones build more recently with only 50 cm depth for the wall foundation. Local limestone was used to build 50 cm high stone wall footings, while 30 cm of mud brick was added over the stone to increase wall footing height to 80 cm. The dimension of the mud brick footing was 50 cm x 25cm x 15cm. In the foundation mortar, lime was added to the traditional mixture as a waterproofing agent.

Figure 5.21 The stone and brick footing.

Figure 5.22 Lime is mixed into the footing mortar.

5.11.5 Phase five (wall construction)

Mud brick walls three and a half meters high were constructed using the small-sized bricks. The traditional vernacular way of placing the bricks was used. A local builder helped in the wall construction assisted by three youth from Balat from the builder's family. Before the work started, a senior builder volunteer came for one day to give instructions to the junior builder and the three youth helping him.

Figure 5.23 Wall construction phase.

Figure 5.24 Windows and niches during wall construction.

5.11.6 Phase six (roof making)

The roof was built in the traditional way, except that wood logs from local casuarina trees were used in place of the typical acacia[40] wood, which was not available in good quality. There are few acacia trees available in Balat today. The casuarina logs were to be treated with linseed oil to protect the fibres from white ants. Five casuarina logs were used for the room's roof. They were set to rest perpendicular to two walls and parallel to the other two. Palm reeds were placed over the logs and perpendicular to them. The reeds were tied together with rope with minimal spaces between the reeds. Palm leaves were spread on top of the reeds to cover any small spaces. A layer of mud bricks was placed on top and a mud mortar layer was spread atop the bricks as a finishing surface. Lime was added to the last mortar layer as waterproofing agent.

Figure 5.25 Treating the casuarina wood.

Figure 5.26 Placing the wood logs on the walls.

[40]Good acacia trees were not available because they are no longer planted and the available trees are used by locals for charcoal. Sale for charcoal is a growing business now in Balat as acacia wood produces good quality charcoal and can be used for different purposes such as fuel for furnaces.

Figure 5.27 Palm reeds placed in a perpendicular manner over casuarina logs.

Figure 5.28 Placing palm leaves on top of reeds.

Figure 5.29 Applying the mud brick and the mortar layers.

5.11.7 Phase seven (plastering)

Internal plastering was done in the traditional way using a mixture of 70% clay and 30% sand with some straw added for binding. For the external plastering, lime was added as a waterproofing agent with proportions of 65% clay, 30% sand and 5% lime. Plastering was applied to an approximate thickness of six centimetres. The mixture was placed on the walls and applied by hand with enough force to cause it stick to the walls. This layer of plaster was then smoothed using wet hands for both the internal and external walls.

Figure 5.30 Plastering layer is thrown on the walls.

Figure 5.31 Plastering layer is smoothen by wet hand.

5.11.8 Phase eight (rendering)

External sand rendering of the walls was done in both the traditional way using manual techniques and with plastering trowels. The traditional way was used to show the difference in comparison to the new and to prove that it still can be used. With the traditional way, the render mixture is only composed of sand mixed with water, while with the plastering trowels, gypsum was added to the sand. Gypsum helps in giving a fine, smooth and flat surface with rigid corners. The rendering layer is a thin layer of a two cm thickness. Ladies normally are responsible for the rendering layer in the traditional way. They have mastered the technique that gives the curved finish and the smooth corners to the walls.

Figure 5.32 Exterior wall rendering with the help of Balat ladies using traditional manual techniques.

Figure 5.33 Exterior wall rendering using plastering trowels.

5.11.9 Phase nine (laying floors)

Several suggestions for floors were discussed with locals during the construction phase. Different alternatives included the use of ceramics, terracotta tiles, wood sheets and sand tiles. Sand floor tiles were chosen for the interior floors because they were available, made from local materials and cheap as well. It was easy to place the sand tiles over a sand layer and then gently tap into place using a hammer.

Figure 5.34 Floor making using sand tiles.

Figure 5.35 Sand floor tiles after finishing.

5.11.10 Phase ten (carpentry)

The windows, the door to the room and a cabinet were designed, and made from local wood by a local carpenter. The door was similar to the traditional doors from the wood of a local tree. The window and cabinet designs had been discussed earlier by locals. Different alternatives had been suggested and the most appropriate and functional one was chosen for implementation.

Figure 5.36 Local carpenter while hanging the cabinet door inside the room.

Figure 5.37 The window designed by Balat inhabitants and made by a local carpenter.

Figure 5.38 A senior local carpenter fixing the traditional door made from local wood.

Figure 5.39 The built room of the neo-desert vernacular model house during different work phases.

Figure 5.40 The finished room.

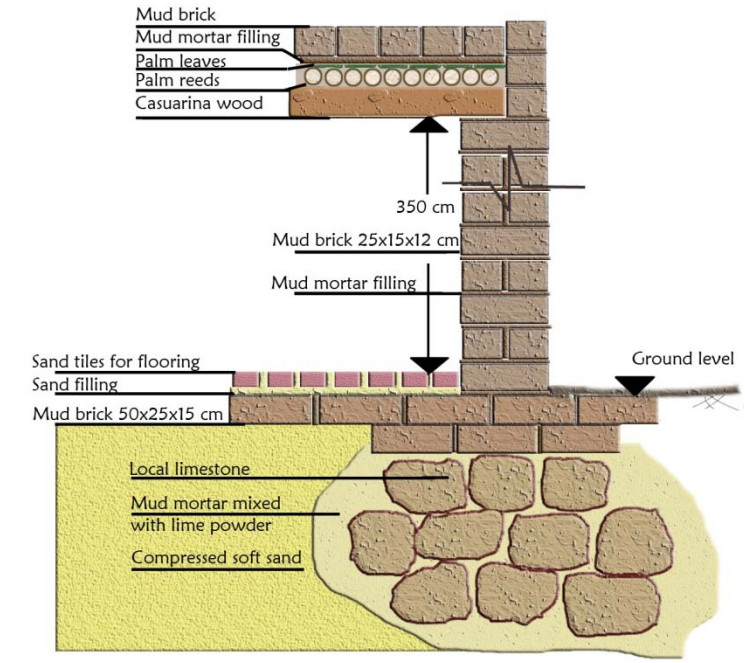


Figure 5.41 Cross section in the room of the neo-desert vernacular model house.

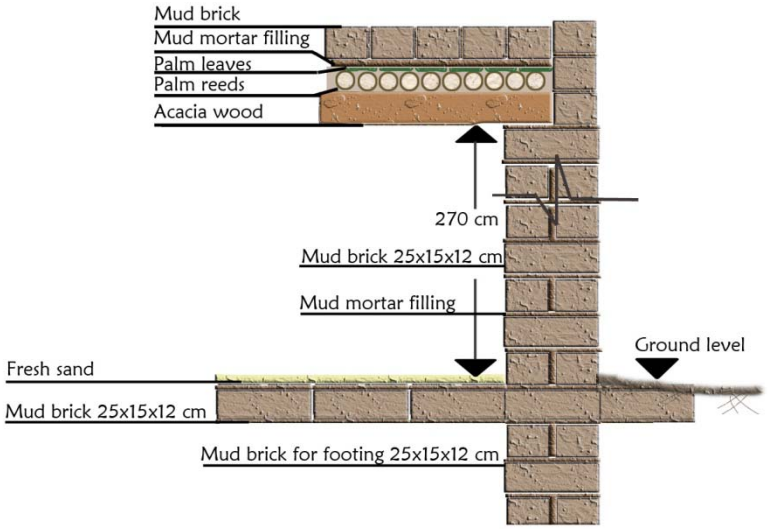


Figure 5.42 Cross section in a vernacular mud brick house in Balat to show the modification with comparison to the room of the neo-desert vernacular model house.

5.12 Model evaluation

In this building experience, local inhabitants had the feeling that they were sharing in the building process. They were involved in all building steps and they felt that their experience and tacit knowledge was valuable. They addressed their current problems using traditional housing techniques. Discussions about technical solutions were many and advices was shared when needed.

Fifteen inhabitants (eleven males and four females of ages 18 to 55) were interviewed after the building phases were completed. They were asked about their impressions, likes and dislikes. Eight of the participants were living at the time in concrete houses and seven were still living in the old town. Ten of them had participated in the building process and the other five had only followed the work process.

The questions asked were:

1- Do you think the physical model room represent the look that you aim at for your future housing?

2- Do you think the model room is better than an equivalent concrete one?

3- Is the building process flexible and the result as durable as for a concrete house?

4- Do you intend to continue thinking of building with concrete in your future houses?

The below quotes are from the interviews.

Kamel 55-year-old man, the town carpenters:

"I hope the idea will work. I like having the positive aspects of concrete houses in a mud brick one."

Mohsen 35-year-old man, a history teacher

"I liked the idea so much. I am enthusiastic to see this house when it is totally finished. If it works, I will be the first to adopt the idea."

Mahmoud 18-year-old teenager

"I am not sure yet that I will build with mud brick. I participated in this building process; I found it interesting and easy to build. I need to see the rest of the house to decide."

Om Saber 52-year-old lady

"As you can see, the young girls don't know how to plaster. Although I am getting old and it is becoming tiresome to do rendering and plastering, I am glad that I participated in this house because now I am teaching my daughter-in-law how to do plastering."

Ali 23-year-old man

"I am glad that I participated in the building process. I found it easy to build. It needs some physical effort no doubt but we help each other and we were singing all the time during work so I enjoyed this experience. It is the first time for me to learn how to build like the old houses in Balat."

The interviews show willingness from locals to continue using the old techniques if they provide ways to solve their problems. It was hard for some of them to decide because the partially completed model house did not show the whole image of a house built with traditional techniques that at the same time had all the facilities they needed. However, the interview responses indicate that the idea of the project should be continued, that there is in fact a possibility of acceptance by the locals and that there is hope of saving the desert vernacular in a sustainable development cycle.

5.12.1 Thermal measurements

Site temperature measurements were performed to compare the room built in the neo-desert vernacular physical model house (room A) with an equivalent room in a concrete house (room B). The sample room B was selected to match the area and the orientation of room A and thus to ensure a degree of accurate comparison of temperature measurements. The figure below shows readings taken in July for indoor and outdoor temperature in the two rooms.

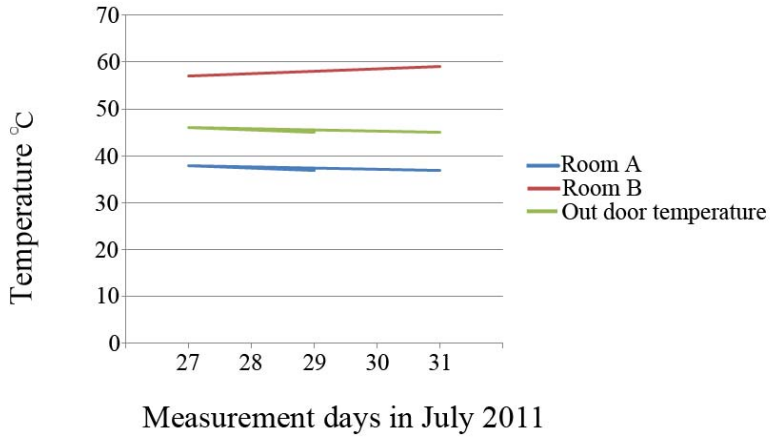


Figure 5.43 The concrete room shows higher temperatures compared to the neo-desert room.

The measurements recorded more than 20 degrees difference between the two rooms. It was of average 37 degrees in room A when it was of average 58 degrees in room B. Such type of thermal measurements needs further precise measurements along the whole year, but at least that gives an indication for difference in indoor temperature. Such recorded temperature matches with the personal experience of Balat locals living in concrete houses. They feel it is hotter in summer days inside their concrete houses compared to their old mud brick houses. In the book *Down to Earth* the author states that unbaked earth constructions (such as sun dried mud brick) guarantee the best thermal comfort because they provide natural regulation between indoor and outdoor temperature. Compared to concrete structures, there is a sharp distinction due to heat loss and the overheating properties of concrete (Dethier, 1983). The site measurement results agree with these facts.

5.12.2 Mud brick lab tests

Thermal properties, water resistivity and compression tests were conducted[41] for mud brick samples. Three samples were chosen, one from a 100-year-old mud brick house in Balat, one from recently cast mud brick in Balat and one from the neo-desert vernacular model. The aim of these tests was to check the current properties of mud brick and to see whether the properties were improved during the trials of the neo-desert vernacular model work.

Table 5.4 Showing the comparison of sample (A) from the 100-year-old house, sample (B) from newly cast mud brick and sample (C) from the neo-desert vernacular model house.

	Sample A	Sample B	Sample C
K = Thermal conductivity	0.337	0.347	0.44
C = Specific heat	1.76	1.6	1.9
D = Thermal diffusivity	0.19	0.215	0.225
R= Thermal resistance	2.9	2.89	2.27
ρ = Density Kg/m3	1774	1732	1403

The lab test shows an improvement in some of the mud brick properties of the types used for the model house. These tests give an indication of the feasibility of improving traditional building materials to give better quality. The evaluation, measurements and lab tests were tools used to stress the importance of continuing this idea and taking it into further development and implementation on a wider scale.

[41] All the lab tests were conducted at the Housing and Building National Research Centre (HBRC) in Giza, Egypt. The water resistivity and compression tests for the three samples were not successful and showed no significant results. That is an indication that more research is needed in enhancement of mud brick properties.

5.13 Chapter conclusion

Chapter five describes the final step of implementation and the core outcome of the thesis: a new conservation model for thinking re-vernacular in contemporary terms. The goal of the model is to provide a means of meeting the challenges of increasing the awareness and acceptance of desert vernacular and of continuing this tradition in a contemporary context. The research also attempted to provide a means to apply the model and test it in towns such as Balat. In this chapter the discussion was based on the argument that desert vernacular buildings should not only be seen as charming reminders of an era that is gone but that they are a record of a lifestyle, tradition and culture. The chapter discussed why desert settlements are dilapidated and deserted and why it is urgent to conserve desert vernacular.

Based on the present investigation, it is argued that desert vernacular should be adapted and transformed according to people's current needs. No one can deny that human beings always seek improvement of their living conditions. The attractiveness of new building materials and new facilities has encouraged inhabitants in vernacular settlements to search for alternatives. However, the rapid improvements offered by modern life sometimes blind people to the advantages that vernacular architecture can still offer them.

The construction of the neo-desert vernacular physical model house was the last step in the transdisciplinary participatory action research method. This step shows that it is possible to build today based on the old knowledge while still adapting housing to the inhabitants' new aspirations. It is possible to build an adaptive housing model for the harsh desert climate that preserves the traditional ways and the vernacular knowledge and helps people to adapt and develop the vernacular knowledge to suit current needs. It is still possible to develop a model that can preserve and document the past and conserve the vernacular in the future.

The physical model was not meant to be a prototype or blue print to be replicated. It was a trial to gain insights into specific ways to revitalize the desert vernacular building know-how concepts and to help make them sustainable and adaptive to current and future needs. The implementation of the physical neo-desert vernacular model house was meant to be a catalyst for a way of building that the inhabitants could continue.

5.14 Thesis conclusion

We live in a world that contains a wide variety of vernacular buildings. Egypt is a country with some of the finest examples of desert vernacular architecture in the world. Although there is an awareness that vernacular is suffering all over the world, the patterns of caring for this treasured heritage often show little understanding of its true value.

The present research has hopefully helped to clarify how the desert vernacular architecture in the Western Desert in Egypt is suffering from gradual physical deterioration of buildings, abandonment of dwellings and in some places, intentional vandalism. This dissertation has investigated how desert vernacular settlements are changing due to rapid change caused by technological, socio-cultural and socio economic factors. It has given an account of how such settlements are suffering from urban decay due to economic degradation and poor living conditions. It has also pointed out that the majority of the built desert vernacular heritage is either not documented or lacks professional documentation. Moreover, important vernacular buildings are often not listed by local authorities and sometimes laws for their protection are not effective or strictly applied. The thesis argued that the best way to conserve the desert vernacular heritage and solve the current problems is to map, manage, and monitor its future.

This study set out to determine the threat to the continued transmission of the know-how of desert vernacular building technology. It was found that seniors and master builders are passing away without passing on their knowledge to the younger generation, who are seldom eager to take over these traditions. As a consequence, the ancient intellectual store of knowledge of desert vernacular architecture that has survived for years is now in danger.

The study also highlighted the effect of uncontrolled demolition of vernacular dwellings by some locals and the replacement of traditional houses with new houses using modern industrial materials. This tendency will gradually lead to the deterioration of an important part of desert vernacular history. Moreover, the study uncovered many of the problems behind why inhabitants in desert vernacular settlements found it easier to adopt ready-made modern solutions rather than improve their vernacular dwellings.

Throughout the thesis investigations, it was evident that craftsmen, builders and locals in desert vernacular settlements with a lifetime of knowledge can still be found today, but may be not be around tomorrow. The thesis stressed that traditional desert vernacular skills have been developed, perfected and handed down for generations to produce what we see today. It also stressed, however, that what we call the timeless desert vernacular will disappear if not conserved for future generations. Here what we call local, traditional, conventional and handmade will disappear

gradually and at that point the true meaning of vernacular vanishes. The study pointed out that responding to the local environment and human needs is currently in a crisis in the face of modernization and globalized consumption based on demands for a new life style.

Despite this situation, the research found that desert vernacular architecture with its intact traditions is still alive in some places within the Western Desert of Egypt. It has shown that the typical process of constant repair, renewal or even additions and changes continue as a normal response to the constraints of the economic and social situation. It is such findings that give the confidence to hope that research can lead to positive new developments in the improvement and conservation of vernacular architecture there.

The outcome of the literature study showed that techniques for repair and restoration have been developed over the last years as researchers have started to show an interest in vernacular architecture. For example, several previous research studies were done to cover technical aspects of repair and restoration of mud brick structures. Others relate to research on maintenance or dealing with monumental vernacular objects, while the majority has focused on rehabilitation. However, in my opinion it is difficult to force people to return to their old towns and villages if they no longer satisfy their needs. Also in my opinion, while such approaches helped in preserving the old vernacular heritage, they did not help in keeping the essence of vernacular, that is, its ability to develop, sustain and preserve its own techniques as has been the case for centuries. I argue that repair and abandonment can only be solved if the sense of belonging increases and people feel more attached to their place. This is what the thesis tried to stress.

This thesis thus approaches conservation of desert vernacular from a different perspective than that of precious research. It looks at the future of existing vernacular desert settlements. My belief is that to conserve and preserve the desert vernacular tradition, a bridge should be created between the past vernacular wisdom and the knowledge needed for the future of vernacular. The thesis based its argument on the fact that desert vernacular continues to evolve in a harmony that unites the lessons of the past with the experience of contemporary practices and brings knowledge to form the future. It is this kind of knowledge that this research tried to conserve.

Returning to the question posed at the beginning of this study, it is now possible to state that the thesis created a way to conserve desert vernacular architecture through suggesting a theoretical methodological approach to helping locals maintain a sustainable loop of a vernacular building tradition that continues to develop and to hand down to the next generation knowledge as it has been used to be for centuries.

The application of this methodology will hopefully contribute to the necessary improvement in the conservation of the tangible and intangible vernacular architectural heritage. If desert vernacular know-how can be perpetuated, it will not only preserve the old but will be a solution for future desert vernacular as well.

One of the most significant contributions of this study is that the methodology followed is flexible; this provides an opportunity to define a methodological approach that can be useful for many different desert vernacular communities suffering from the same or similar problems.

The second major empirical outcome is the successful application of the theoretical methodological approach. Through applying the theoretical conservation model for thinking re-vernacular in contemporary terms, it was shown that it is possible to resolve problems in ways that can help the future development of the desert vernacular heritage. The approach provided the means to carry out a workable practical example to encourage locals to continue applying their vernacular know-how solutions. The model application helped in solving the current identity problems prevalent in desert vernacular settlements. It showed the locals that they have the possibility to respond to the future with adaptations that can focus local attention on the significance of the vernacular architecture that is integral to their local culture.

It is important to mention that the full result of applying the transdisciplinary participatory action research method can only be fully appraised after repercussions of the project in Balat have been investigated with regard to its ability to meet the inhabitants' current needs. In this context, it is appropriate to stress that building the sample room succeeded in giving the locals a chance to build according to vernacular knowledge of traditional dwellings, as well as to develop new methods.

The idea of the physical neo-desert vernacular model house was not intended to be a prototype but rather a kind of verification of the concept that it is possible to modify the current desert vernacular houses. This method provided additional evidence through the on-site building trial of the neo-desert vernacular model. The application of the model showed that it is still possible to adapt the vernacular method of building through trial and error. In vernacular, one can try various approaches without penalty since unsatisfactory outcomes can easily be corrected. It is a building approach that is reversible, and every trial counts on learning from a previous mistake or correcting an undesirable design.

The present study also makes contributions to approaches and practical methods for documenting desert vernacular constructions and the building technique know-how that produced them. The study has gone some way towards additional contributions through producing maps using orthorectified satellite images integrated with land survey. It has also produced architectural manual drawings together with laser

scanning point clouds for several sample buildings in Balat, thereby assisting in our understanding of important aspects of the role of documentation in preserving the evidence of current desert vernacular and in learning from this evidence for future vernacular applications.

The present findings add substantially to our understanding of and open a channel to look at desert vernacular as a mine in which we can still excavate to learn a great deal about the desert environment and future housing solutions. Such solutions can connect the environment with its natural building materials to be used by the local community. It also can give guidance and solutions to politicians and policy makers who are struggling to find effective alternatives for desert communities' housing problems. The outcome can lead to cheap modern housing in traditional terms and will improve the future houses by making them more environmentally friendly and modern.

Limitations due to the lack of time and scope of the present research have opened a gate to recommendations for further research. These recommendations are based on the findings that indicate that there are many possible avenues of research and many problems that need to be addressed, investigated and worked on.

What made this thesis different from previous research is first that it deals with the desert vernacular problems in an active and practical manner with locals' contributions in essential research steps. Second it looks at the future as a means to protect the existing desert vernacular values and its past heritage. Third the thesis is an attempt to preserve a living vernacular building tradition that is about to vanish or disappear.

Conservation in my opinion is not just preserving vernacular buildings by freezing them as museums for the coming generations. The spectacular feature of vernacular is its continuous loop of development of building traditions. The process should be continued and not stopped at its present limit. This is why the thesis is tackling how to preserve this development as a sustainable concept.

Finally the thesis is an attempt to ring the alarm that signals that it is about time for individuals, researchers and decision makers to take the initiative and look seriously at creative solutions to protect the inherited desert vernacular architecture. It is still hard to predict the future, but what can be predicted is that there will be serious challenges if the current situation continues.

5.15 Thesis recommendation for future research and lessons to learn

This research has exposed problems and introduced more questions than were posed in the beginning of this study. There are areas that deserve further investigation. As a researcher, there is a specific scope and time limit to this research project, so it is unlikely that my work would have solved all the problems associated with this area of study. Therefore, based on the research findings, suggestions are made below about how this work can be continued and, whether there are areas that deserve further investigation.

5.15.1 General methodological procedure

Below are recommendations and suggestions for procedures for conservation action work or research to save distinctive desert vernacular settlements, as a continuation of the research of this thesis.

1- Establish research criteria for listing and documenting significant vernacular buildings or vernacular built areas in inhabited settlements.
2- Design research approaches for detailed urban, architectural and structural surveys and for inspection of buildings and areas and of these buildings' current status.
3- Establish research in investigating the importance of listing significant buildings or areas of important value.
4- Establish further research for using laser scanning technology as a measuring tool for precise documentation of complex vernacular structures.
5- Continue research into the importance of using local materials, local knowledge and local skills to ensure regional appropriateness of the vernacular building outcome.
6- Design conservation areas worth being maintained and enhance their character and integrity using value analysis.
7- Develop further techniques for training new builders and craftsmen to use the inherited vernacular traditional building. That will help in keeping the know-how knowledge alive.
8- Train local planners, architects and urban administrators in conservation techniques for traditional vernacular structures.

9- Establish an advisory body from local community or regional authorities to help in maintenance, advice and action conservation procedures when needed.
10- Empower the local inhabitants in desert vernacular communities in enhancing vernacular building technologies that will increase the chances for spreading this tacit knowledge more widely and effectively
11- Establish flexible, reflexive and interactive conservation programs with a local operating mechanism, putting into consideration that such vernacular settlements are living societies.
12- Design manual controls and design guidelines for future vernacular settlement establishments with respect to old ones and respect vernacular differences from one region to another.
13- Involve responsible bodies from the government in designing manual controls and guidelines (item 11) together with academics with expert knowledge in cultural and built vernacular heritage conservation, as well as NGOs and representatives from the civil society with interest in conservation of local knowledge related to desert vernacular settlements.

5.15.2 More methodological and action ideas specifically for Balat

1- Encourage proper and sensitive economic uses of buildings, rehabilitation and adaptive re-use of buildings whenever possible. Moreover facilitate adding facilities such as electricity, natural gas, sewage and water systems (eco sanitation) with sensitive solution that avoid any leakage that might destroy fragile mud structures. This will help the whole town be alive and will facilitate the continuation of regular maintenance.
2- Create detailed and precise documentation for all notable and valuable buildings, in addition to create detailed documentation and recording of intangible social habits, not only documentation related to vernacular building traditions and building process. Include documentation of life style, daily activities and local crafts.
3- Set up laws and regulations that encourage people to buy cheaper land if they will build with vernacular traditional materials, higher prices if they will build with concrete.
4- Focus on empowering people through emphasizing the relation between historic vernacular values and the local inhabitants' needs and aspirations. Encourage and reward the locals who have traditional materials skills by showing that these skills are needed in the conservation processes.

5- Balat town should not be looked upon only as protected area; it should be managed by effective maintenance and managed enhancement plans created with local involvement.
6- Involve the locals in any conservation process and build on the local traditions that support the historical values.
7- Support programs for public education about the historic values of their built environment while developing supportive advice or finances to help house owners to manage their historic valuable houses.
8- Set financial loans and other incentives for locals in vernacular dwellings to encourage them to keep maintaining their dwellings.

5.15.3 Lessons to learn from the experience in Balat

1- One should not underestimate the awareness of people in desert vernacular societies. They know what is happening around them in the rest of the world. Although they seem isolated by nature in their desert oasis, media plays a vital role in keeping them connected to outside world.

2- As an architect and conservationist one had to keep the balance between nostalgic and romantic feelings towards vernacular heritage and the rights of people to develop their lives within their old vernacular dwellings.

3- When many are involved in the decision-making of any action research project, the process takes long time to reach a proper decision.

4- Time should be given to locals to express themselves and time is essentially needed to listen to what they have to say about their housing or building problems and their needs as well.

5- Locals should be looked at as agents capable of analyzing their own situation and designing their own solutions.

6- Locals should be regarded as owners of their knowledge.

References

Cited literature

Abaza, Mona (1999). Reviewed work(s): "Balat: Etude Ethnologique d'Une Communaute Rurale by Jacques Hivernel". *British Journal of Middle Eastern Studies*, Vol. 26, No. 1, pp. 117-119. Published by: Taylor & Francis, Ltd. Stable.

Allaby, Michael (2006). *Deserts*. New York: Chelsea House Publ.

Allard, Francis (red.) (1998). *Natural ventilation in buildings: a design handbook*. London: James & James.

Altschul, Bob (2007). "Overview of the world's deserts, department of geography and regional development". *Annual report summer 2007.* University of Arizona.

Amer, Elsayed & Almumen, Adel (2002). Planning and Design of Environmental Settlements: A Case Study of Kuwait. *The Postgraduate Journal of Architecture, Planning & Landscap*e, Vol. 5, No. 1. University of Newcastle upon Tyne.

Asquith, Lindsay & Vellinga, Marcel (2005). *Vernacular Architecture in the 21st Century Theory, Education and Practice*. Taylor and Francis.

Atiya, Farid S. & Jobbins, Jenny (2003). *The silent desert. I : Bahariya & Farafra oases*. Cairo, Egypt: Farid Atiya Press.

Baladi, Lara (red.) (2000). *The desert.* London: Thames & Hudson.

Balbo, Riccardo(2006). Shape, culture and environment: a lesson of urban design from Dakhleh oasis –Egypt. *The 23rd Conference on Passive and Low Energy Architecture*. Geneva, Switzerland, September 6-8.

Bard, Kathryn A. & Shubert, Steven Blake (red.) (1999). *Encyclopedia of the archaeology of ancient Egypt*. New York: Routledge.

Bernstein, Rebecca Sample, & Torma, Carolyn (1991). "Exploring the Role of Women in the Creation of Vernacular Architecture". *Perspectives in Vernacular Architecture*, Vol. 4, pp. 64-72.

Biggs, Stephan (1989). "Resource-poor farmer participation in research: a synthesis of experiences from nine national agricultural research systems."*OFCOR Comparative Study Paper 3*, (2nd Edn), International Service for National Agricultural Research, The Hague, Netherlands.

Bliss, Frank &John, Osing (1985). *Oases of Egypt*. v. 3.

Bliss, Frank (1998). *Kharga and Dakhla oases*. American University in Cairo Press.

Bourdier, Jean-Paul & Trinh, T. Minh-Ha (2011). *Vernacular architecture of West Africa: a world in dwelling*. Abingdon, Oxon [England]: Routledge.

Bourgeois, Jean-Louis, Pelos, Carollee & Davidson, Basil (1989). *Spectacular vernacular: the adobe tradition : text by Jean-Louis Bourgeois, photographs by Carollee Pelos, historical essay by Basil Davidson*. New York: Aperture.

Brown, Valerie A., Harris, John A. & Russell, Jacqueline Y. (red.) (2010). *Tackling wicked problems through the transdisciplinary imagination*. London: Earthscan

Brunskill, Ronald William (1985). *Traditional buildings of Britain: an introduction to vernacular architecture*. London: Victor Gollancz in association with Peter Crawley.

Brunskill, Ronald William (2000). *Vernacular architecture: an illustrated handbook*. 4th ed London: Faber.

Bryant, Antony & Charmaz, Kathy (red.) (2010[2007]). *The SAGE handbook of grounded theory*. Pbk. ed. Los Angeles [i.e. Thousand Oaks, Calif.]: SAGE Publications.

Cain, Allan., Afshar, Farroukh., Norton, John & Daraie, Mohammad (1976). "Traditional cooling systems in the third world." *Ecologist*, Vol. 6, No. 2.

Carsjens, Gerrit Jan (2009). *Supporting strategic spatial planning: planning support systems for the spatial planning of metropolitan landscapes*. Diss. Wageningen : Wageningen University, 2009.

Charmaz, Kathy (1983). *The grounded theory method: An explication and interpretation in Contemporary field Research: A Collection of Reading*. Robert M. Emerson, ed., Boston: Little, Brown and Company, pp.109-128.

Charmaz, Kathy (2006). *Constructing grounded theory: a practical guide through qualitative analysis*. London: SAGE.

Chase, John (1986). "Unvernacular Vernacular: Contemporary American Consumerist Architecture". *Design Quarterly* ,No. 131, pp. 1-3+5-32. Walker Art Center.

Cornwall, Andrea, & Jewkes, Rachel (1995). "What is participatory research?" *Social Science & Medicine*, Vol. 41, No.12, PP. 1667–1676. Elsevier Sciences Ltd. Great Britain.

Correa, Felipe & Silvetti, Jorge (2009). *Invention/Transformation ,strategies for the Qattara/Jimi oasis in Al Ain*. Harvard GSD/ Abu Dhabi Culture & Heritage. Cambridge.

Crouch, Dora P. & Johnson, June Gwendolyn (2001). *Traditions in architecture: Africa, America, Asia and Oceania*, Oxford University, New York.

Damluji, Salma Samar (1992). *The valley of mud brick architecture: Shibām, Tarīm & Wādī Hadramūt. Reading:* Garnet.

Davis, Howard (1999). *The culture of building*. New York: Oxford Univ. Press.

Dasch, E. Julius (red.) (1996). *Encyclopedia of earth sciences*. New York: Simon & Schuster Macmillan.

De Filippi,Francesca (2005*).* "Sustainable living heritage conservation through community-based approaches". *UNESCO University and Heritage 10th International Seminar forum, "Cultural Landscapes in the 21st Century*". April 11-16, Newcastle upon Tyne.

De Filippi, Francesca (2010). *Architettura e culture costruttive a sud del Mediterraneo. Le città oasi egiziane*. Aracne, Politecnico di Torino, Roma.

Dethier, Jean (red.) (1983). *Down to earth: adobe architecture: an old idea, a new future: based on an exhibition at the Centre Georges Pompidou*. New York: Facts on File.

Drovetti, M. le chevalier (1822). "Itinerary of an Excursion to the Valley of Dakela". *In New Voyages and Travels*, Vol. 7. Sir Richard Phillips and Co, London.

Du Camp, Maxime (1987). *Un voyageur en Egypte vers 1850: "Le Nil" de Maxime Du Camp*. Paris: Sand/Conti.

El-Gohary, Yousry (1976). *North Africa, Historical and regional geography study*. Mansha't El-Maaref publisher, Alexandria.

Elizabeth, Lynne & Adams, Cassandra (red.) (2000). *Alternative construction: contemporary natural building methods*. New York: Wiley.

Facey, William (1997). *Back to earth: adobe building in Saudi Arabia*. Riyadh: Al-Turath in association with the London Centre of Arab Studies.

Fakhry, Ahmed (1973). *The oases of Egypt*. Vol. 1, Siwa Oasis. Cairo.

Fathy, Hassan (1973). *Architecture for the poor: an experiment in rural Egypt*. Chicago.

Fathy, Hassan (1986). *Natural energy and vernacular architecture: principles and examples with reference to hot arid climates*. Chicago: Published for United Nations University by the University of Chicago Press.

Feagin, Joe R., Orum, Anthony M. & Sjoberg, Gideon (red.) (1991). *A Case for the case study*. Chapel Hill: University of North Carolina Press.

Feilden, Bernard M. (2003). *Conservation of historic buildings*. 3. ed. Oxford: Architectural Press.

Fink, Arlene (2009). *How to conduct surveys: a step-by-step guide*. 4th ed. Los Angeles: SAGE.

Flyvbjerg, Bent (2006). "Five misunderstandings about case-study research". *Qualitative Inquiry*, Vol. 12, No. 2, pp. 219-245: Sage Publications.

French Institute for Oriental Archaeology in Cairo (1998). *Bulletin of the French Institute of Eastern Archaeology*.

Gado, Tamer & Osman, Medhat (2010)."Investigating traditional natural ventilation methods used in El-Dakhla Oasis, old village". *Intelligent Buildings International*, Vol. 2, No, 4, 2010, pp. 267-285(19). Earthscan.

Gallo, Cettina (1998). "The utilization of microclimate elements". *Renewable and Sustainable Energy Reviews*, Vol. 2, pp.89-114.

Garcias, Jean-Claude, Dethier, Jean & Meade, Martin (1985). "Return to earth" *The Architectural Review*, No. 1064, pp. 62–68.

Ghiaus, Cristian & Allard, Francis (red.) (2005). *Natural ventilation in the urban environment: assessment and design*. London: Earthscan.

Giddy, Lisa L. (1987). *Egyptian oases: Bahariya, Farafra, Dakhla and Kharga during Pharaonic times.* Warminster: Aris & Phillips.

Givoni, Baruch (1994). *Passive and Low Energy Cooling of Buildings*. New York, Van Nostrand Reinhold.

Glassie, Henry H. (2000). *Vernacular architecture*. Philadelphia: Material Culture.

Goffman, Erving (1974). *Frame analysis: an essay on the organization of experience*. [New ed.] New York.

Gramberger, Marc (red.) (2001). *Citizens as partners: OECD handbook on information, consultation and public participation in policy-making*. Paris: Organization for Economic Co-operation and Development (OECD)

Guelberth, Cedar Rose. & Chiras, Daniel D. (2003). *The natural plaster book: earth, lime and gypsum plasters for natural homes*. Gabriola, B.C.: New Society Publishers.

Hadorn, Gertrude Hirsch., Biber-Klemm, Susette., Grossenbacher-Mansuy, Walter., Hoffmann-Riem, Holger., Joye, Dominique., Pohl, Christian., Wiesmann, Urs. & Zemp, Elisabeth (2008). *Handbook of Transdisciplinary Research [electronic resource]*. Dordrecht: Springer Science + Business Media B.V.

Hakim, Besim Selim (1986). *Arabic-Islamic cities: building and planning principles*. London: KPI.

Hassanein, Ahmed M. (1925). *The lost oases.* London: Thornton Butterworth.

Heath, Christian, Hindmarsh, Jon & Luff, Paul (2010). *Video in qualitative research: analysing social interaction in everyday life.* Los Angeles: SAGE.

Heidari ,Sh (2010). "A deep courtyard as the best building form for desert climate, an introduction to effects of air movement, Case study: Yazd". *Deserts,* Vol. 15, pp. 19-26.

Hinds, Giedion (1965). "Regional Architecture for a Developing Country". *A.I.A.*Journal, pp. 31-37.

Hivernel, Jacques Etude (1996). *Balât, Etude ethnologique d'une communauté rurale.* Institut français d'archéologie orientale le Caire.

Hough, Michael (1989[1984]). *City form and natural process: towards a new urban vernacular*. London: Routledge.

Jackson, Robert B (2002). *At empire's edge: exploring Rome's Egyptian frontier*. New Haven: Yale University Press.

Jayyusi, Salma Khadra & Holod, Renata (red.) (2008). Handbuch der Orientalistik. Abt. 1, Der Nahe und Mittlere Osten = *The Near and Middle East. Bd 94, The city in the Islamic world*. Leiden: Brill.

Jencks, Charles (1988). *Architecture today*. London: Academy Editions.

Jerome, Pamela, Chiari, Giacomo & Borelli, Caterina (1999). "The Architecture of Mud: Construction and Repair Technology in the Hadhramaut Region of Yemen". *APT Bulletin*, Vol. 30, No. 2/3, pp. 39-48. Published by: Association for Preservation Technology International (APT) Stable.

Joy, Rick (2002). *Rick Joy: desert works*. Chicago: Graham Foundation for Advanced Studies in the Fine Arts.

Kennedy, Joseph F. (red.) (2004). *Building Without Borders: sustainable construction for the global village*. Gabriola, B.C.: New Society Publishers.

Khalili, Nader (1996). *Ceramic houses and earth architecture: how to build your own*. 4th printing. Hesperia, Calif.: Cal-Earth Press.

Khanghahi T.Hatami & Abdolmaleki, P. Y.panah (2011). "An overview of the Iranian vernacular architecture with particular reference of the air traps". *International Journal of Academic Research*, Vol. 3, No. 1, Part III.

King, W. J. Harding (1912). "Travels in the Libyan Desert". *The Geographical Journal*, Vol. 39, pp. 133-137;19*2.*

King, W. J. Harding (1913). "The Lybian Desert from native information". *The Geographical Journal,* Vol. 42, pp. 277-283; 320

Kolb, David A. (1984). *Experiential learning: experience as the source of learning and development.* Englewood Cliffs, N.J.: Prentice-Hall.

Krech, Shepard, McNeill, John Robert & Merchant, Carolyn (red.) (2004). *Encyclopedia of world environmental history*. New York: Routledge.

Kroeber, Alfred Louis (1952). *The nature of culture*. Chicago: Chicago University Press.

Lawrence, Roderick (2004). "Housing and heath: from interdisciplinary principles to transdisciplinary research and practice". *Futures*, Vol. 36, no. 4, pp. 487-502.

Lawrence, Roderick & Després, Carole (eds.) (2004). "Futures of Transdisciplinarity". *Futures*, Vol.36, no.4, pp. 397-526.

Lefaivre, Liane & Tzonis, Alexander (2003). *Critical regionalism: architecture and identity in a globalized world.* Munich: Prestel.

Longstreth, Richard W. (red.) (2008). *Cultural landscapes: balancing nature and heritage in preservation practice*. Minneapolis: University of Minnesota Press.

Mahdy, Hossam (2009). "Preliminary Notes on the Vernacular Heritage in the Arab Region". *The vernacular and the multicultural dialogue the annual meeting of ICOMOS*. Rimetea, May 19-24.

Maqrīzī, Aḥmad ibn ʻAlī (1895). *Mawaiz wa al-'i'tibar bi dhikr al-khitat wa al-'athar* ,Vol. 1. Bulaq. National Archives of Egypt.

Marchand, Trevor Hugh James (2009). *The masons of Djenné*. Bloomington, IN: Indiana University Press.

May, John (2010). *Handmade houses & other buildings: the world of vernacular architecture.* London: Thames & Hudson.

May, John & Reid, Anthony (2010). *Buildings without architects: a global guide to everyday architecture.* New York: Rizzoli.

McCurry, Sally (1989). "Women in the American Vernacular Landscape." *Material Culture*, Vol. 20 No. 1, pp. 33-49.

McCurry, Sally & Adams, Annmarie (red.)(2000). "People, Power, Places". *Perspectives in Vernacular Architecture*, Vol. 8.The University of Tennessee press/ Knoxville, US.

McHenry, Paul Graham (1989). *Adobe and rammed earth buildings: design and construction*. Tuscon: Univ. of Arizona Pr.

Minke, Gernot (2000). *Earth construction handbook: the building material earth in modern architecture.* Southampton: WIT Press.

Minke, Gernot (2006). *Building with Earth: Design and Technology of a Sustainable Architecture*. Basel: Birkhäuser - Publishers for Architecture.

Minke, Gernot (2009). *Building with earth: design and technology of a sustainable architecture.* 2., rev. ed. Basel: Birkhäuser.

Moore, Suzi & Moore, Terrence (1999[1993]). *Under the sun: Desert style and architecture*. Boston, Mass.: Bulfinch.

Morgan, William N. (2008). *Earth architecture: from ancient to modern*. Gainesville: University Press of Florida.

Mountz, Alison, Moore Eli B., Brown, Lori. (2008). "Participatory Action Research as Pedagogy: Boundaries in Syracuse". ACME: *International E-Journal for Critical Geographies*, Vol.7, No. 2, pp. 214-238.

Mubarak, Ali (1887). *Tawfiq's New Plans (al-Khitat al-Tawfiqiyya al-Jadida).*Vol.17. Bulaq. National Archives of Egypt.

Mumford, Lewis (1955). *Sticks and stones: a study of American architecture and civilization*. New York.

Norton, John (1986). *Building with earth: a handbook*. London: Intermediate Technology.

Oei, T. I., & Zwart, F. M. (1986). "The assessment of life events: Self-administered questionnaire versus interview". *Journal of Affective Disorders*, Vol. 10, pp. 185-190.

Oliver, Paul (1987). *Dwellings: the house across the world*. Oxford: Phaidon.

Oliver, Paul (red.) (1997). *Encyclopedia of vernacular architecture of the world*. Cambridge: Cambridge University Press.

Oliver, Paul (red.) (1997*). Encyclopedia of vernacular architecture of the world*. Vol. 1, Theories and principles. Cambridge: Cambridge University Press.

Oliver, Paul (red.) (1997). *Encyclopedia of vernacular architecture of the world*. Vol. 2, Cultures and habitats. Cambridge: Cambridge University Press.

Oliver, Paul (1997), *Encyclopedia of vernacular architecture of the world*. Vol. 3, Cultures and habitats, Cambridge University Press, Cambridge.

Oliver, Paul (2003). *Dwellings: the vernacular house worldwide*. London: Phaidon.

Oliver, Paul, (2006). *Built to meet needs*: cultural issues in vernacular architecture, Architectural Press.

Oliver ,Paul (2007). "Shelter and society, Vernacular Architecture in its Cultural Contexts". *General Studies Lectures, Engineering Towards Development and Change*. University of Addis Ababa, Faculty of Technology.

Pantalacci, Laure (1998). "Epistolary documentation of the governor's palace in Balat-'Ayn Asil". *Bulletin of the French oriental institute of eastern archeology*. *BIFAO* - 98, pp. 303-315.

Pearson, David (1995). *Earth to spirit: in search of natural architecture*. San Francisco: Chronicle Books.

Piaget, Jean (1970). *Main trends in interdisciplinary research*. London.

Pohl, Christian & Hirsch Hadorn, Gertrude (2007). *Principles for designing transdisciplinary research: proposed by the Swiss academies of arts and sciences.* Munich: Oekom.

Prieto, Valeria (2005). "Vernacular architecture and intangible heritage in Mexico". Place – memory – meaning: preserving intangible values in monuments and sites. *ICOMOS 14th general assembly and scientific symposium*.

Rapoport, Amos (1969). *House form and culture*. Englewood Cliffs: Prentice-Hall.

Rael, Ronald (2009). *Earth architecture*. 1st ed. New York, N.Y.: Princeton Architectural Press.

Reason, Peter & Bradbury, Hilary (red.) (2001). *Handbook of action research: participative inquiry and practice*. London: SAGE.

Richardson, Vicky (2001). *New vernacular architecture*. London: Laurence King.

Ringbom, Sixten (1984). "Vernacular architecture & cultural identity". *Seminar on vernacular architecture.* Finnish National Commission for UNESCO, Helsinki.

Rovero, Luisa., Tonietti, Ugo., Fratini, Fabio., Rescic, Silvia (2009). "The salt architecture in Siwa oasis-Egypt (XII–XX centuries)". *Construction and Building Materials,* Vol. 23, pp. 2492–2503.

Rubin, Herbert J. & Rubin, Irene S. (2005). *Qualitative interviewing: the art of hearing data*. 2. ed. Thousand Oaks, CA: Sage.

Rudofsky, Bernard (2008). *Architecture without architects: a short introduction to non-pedigreed architecture*. Albuquerque, N.M.: University of New Mexico Press.

Saleh, Karim (2003). *Geomorphologic inventory and survey of the fourth time in the Western Desert of Egypt*. The Egyptian geographical association in Cairo.

Sasidharan, Priya (2008). "Vernacular architecture-changing paradigms". *The 8th International Seminar for Vernacular Settlements: ISVS*, India.

Schijns, Wolf., Kaper, Olaf E. & Kila, Joris (2003). *Vernacular mud brick architecture in the Dakhleh Oasis, Egypt, and the design of the Dakhleh Oasis*. Training and Archaeological Conservation Centre, Oxbow, Oxford.

Senosiain, Javier (2002). *Bio-architecture*. Architectural Press, Oxford.

Shehab, Saad (2009). *Patterns of traditional architecture left in the Western Desert of Egypt.* Analytical and competitive study. Dar El Wafaaa puplisher, Alexandria.

Shils, Edward (1981). *Tradition*. Chicago: Univ. of Chicago P.

Sibbet, David (2010). *Visual meetings: how graphics, sticky notes, & idea mapping can transform group productivity*. Hoboken, N.J.: John Wiley & Sons.

Sidnell, Jack (2010). *Conversation analysis: an introduction*. Chichester: John Wiley & Sons, Ltd.

Somerville, Margaret & Rapport, David (2002). *Transdisciplinarity: Recreating Integrated Knowledge.* McGill-Queen's University Press.

Sommer, Robert (1977). "Perspectives on environment and behaviour: Theory, research, and applications". *Action research*, pp. 195-203. In D.Stokols (Ed.). New York: Plenum Press.

Spradley, James P. (1979). *The ethnographic interview*. New York: Holt.

Stake, Robert E. (1995). *The art of case study research*. Thousand Oaks, Calif.: Sage.

Steele, James (1988). *Hassan Fathy.* New York: St. Martins Press.

Steele, James (1997). *Architecture today*. London: Phaidon.

Steen, Athena, Steen, Bill & Komatsu, Eiko (2003). *Built by hand*. Salt Lake City, Utah: Gibbs Smith.

Stokols, Daniel (2006). "Toward a Science of Transdisciplinary Action Research". *Am J Community Psychol*, Vol. 38, pp. 63–77. Springer Science and Business Media, Inc. 2006.

Thompson, Paul (1978). *The voice of the past: oral history*. Oxford: Oxford U.P. Tilley, Christopher (red.) (2006). *Handbook of material culture*. London: SAGE.

Turan, Mete (red.) (1990). *Vernacular architecture: paradigms of environmental response.* Aldershot: Avebury.

Ultav, Zeynep, Sahl, Sare (2004). "Hassan Fathy and Sedad Hakkı the two characteristics and two architectural view". *Gazi university faculty of architecture and engineering publications*, Vol. 19, No. 4, pp. 365-374.

Vellinga, Marcel, Oliver, Paul & Bridge, Alexander (2007*). Atlas of vernacular architecture of the world*. New York, NY: Routledge.

Vivian, Cassandra (2000). *The Western Desert of Egypt.* The American University in Cairo Press.

Waly, Tarek (1996). *In quest of an approach for existence in desert architecture*. 1st ed. Bahrain. The Arab association for printing and publishing.

Warner, Nicholas (2010). Book reviews, "Vernacular Mud Brick Architecture in the Dakhleh Oasis, Egypt and the Design of the Dakhleh Oasis Training and Archaeological Conservation Centre. Oxford, Oxbow (Dakhleh Oasis Project Monograph 10)". *Journal of Archaeology of Egypt/Egyptology*.

Warren, John (1999). *Conservation of earth structures*. Oxford: Butterworth-Heinemann.

Wells, Camille (red.) (1986). *Perspectives in vernacular architecture.2*. Annapolis, Md.: Vernacular Architecture Forum.

Wells, Camille (1986). "Old Claims and New Demands: Vernacular Architecture Studies Today". *Perspectives in Vernacular Architecture*. Vernacular architecture forum, Vol. 2, pp. 1-10.

Wright, Adela (1991). *Craft techniques for traditional buildings*. London: Batsford.

Yin, Robert K. (1989). *Case study research: design and methods*. Rev. ed. Newbury Park, Calif.: Sage Publications.

Yin, Robert K. (1993). *Applications of case study research*. Newbury Park, Calif.: Sage.

Yin, Robert K. (2009). *Case study research: design and methods*. 4. ed. London: SAGE.

Zuber-Skerritt, Ortrun (1994). *Professional development in higher education: a theoretical framework for action research*. New ed London: Kogan Page.

Reading literature

Aas, Christina, Ladkin, Adele & Fletcher, John (2005). "Stakeholder collaboration and heritage management". *Annals of Tourism Research*, Vol. 32, No. 1, pp. 28-48.

Ali, Hikmat H., Al Nsairat, Saba F. (2009). "Developing a green building assessment tool for developing countries - Case of Jordan". *Building and Environment,* Vol. 44, pp. 1053-1064.

Al_Kahtani, ISSA A. M. & Al-Darzi, Suhaib Y.K. (2007). "Old and Modern Construction Materials In Yemen: The Effect In Building Construction In Sana'a". *Journal of Social Sciences,* Vol.3, No. 3, pp.138-142.

Almusaed, Amjad & Almssad, Asaad (2006). "Vernacular passive houses from Aarhus city". *PLEA2006, the 23rd Conference on Passive and Low Energy Architecture,* 6-8 September. Geneva, Switzerland.

Amer, Elsayed & Hamdy, Inaas (1998). "The Formulation of planning and Design principles for Building in desert climate; Application, the New Valley of Upper Egypt". *Alexandria Engineering Journal*, Vol.37, No. 1.

Barrow, John D. (2007). *New theories of everything: the quest for ultimate explanation.* Oxford: Oxford University Press.

Beltran, Javier (red.) (2000). *Indigenous and traditional peoples and protected areas: principles, guidelines and case studies*. Gland: IUCN.

Benjamin, Gerald & Nathan, Richard P. (2001). *Regionalism and realism: a study of governments in the New York metropolitan area*. Washington, DC: Brookings Institution Press.

Bliss, Frank (1998). *Artisanat et artisanat d'art dans les oasis du désert occidental égyptien.* Köln: Köppe.

Bog˘aç, Ceren (2009). "Place attachment in a foreign settlement". *Journal of Environmental Psychology*, Vol. 29, pp. 267-278.

Bose, Kamalika (2008). "Something Old, Something New: Amalgamations of the Vernacular in the Contemporary - a Historical Perspective in the case of Mansions in North Calcutta". *The 4th International Seminar for Vernacular Settlements: ISVS*. CEPT University, India.

Bowen, Gillian E. and Colin A. Hope (2000). "The Oasis Papers III". *Proceedings of the Third International Conference of the Dakhleh Oasis Project*. Oxford: Oxbow Books.

Briffault, Richard (2000). "Localism and Regionalism". *Buffalo Law Review* , Vol. 48, No. 1, pp. 1-30. Cornel University.

Brown, Frank & Tahar, Bellal (2001). "Comparative Analysis of M'zabite and Other Berber Domestic Spaces." *Proceedings of the 3rd International Space Syntax Symposium*. Atlanta.

Chalmers, Alan F. (1999). *What is this thing called science?* 3. ed. Buckingham: Open University Press.

Churcher, C. S. & Mills, A. J. (red.) (1999). *Reports from the survey of the Dakhleh Oasis, western desert of Egypt, 1977-1987.* Oxford: Oxbow Books.

Crocker, Edward (2009). "Understanding adobe". *The Secretary of the Interior's Standards and Vernacular Architecture*, e-articles retrieved in May.

Denyer, Susan (1978). *African traditional architecture: an historical and geographical perspective.* New York: Afrikana.

De Villiers, Bertus & Sindane, Jabu (red.) (1993). *Regionalism: problems and prospects*. Pretoria: HSRC.

Didillon, Henriette (red.) (1977). *Habiter le désert: les maisons mozabites*. Bruxelles.

Dikmen, Nese (2008). "Sustainable Development in Disaster Affected Rural Areas: The Case of Dinar Villages". *Proceedings of world academy of science engineering and technology,* Vol. 33.

Djalilian, Shahrbanoo & Tahbaz, Mansoreh (2009). "Minimization of energy consumption based on Vernacular Design Strategies". *Plea 2004, the 21th Conference on Passive and Low Energy Architecture,* September, 19-22. Eindhoven, Netherlands.

Drønen, Tomas Sundnes (2007). *Communication, conversion and conservation: the Dii meet the Norwegian missionaries : Northern Cameroon 1934-60*. Diss. Stavanger : School of Mission and Theology, 2007.

Duly, Colin (1979). *The houses of mankind*. London: Thames & Hudson

Elkholy, Ahmed (1991). *Communities in the desert. A methodology of, approach-A case study of the New Valley Zone.* Unpublished PhD thesis, Alexandria University, faculty of engineering, department of architecture. Alexandria, Egypt.

Erickson, Frederick (2004). *Talk and social theory: ecologies of speaking and listening in everyday life.* Cambridge: Polity Press.

Fakhry, Ahmed (1942). *Bahria Oasis*. Cairo: Government Press, Bulkaq.

Fakhry, Ahmed (1944). *Siwa oasis*. Cairo: Government Press, Bulkaq.

Fakhry, Ahmed (1974). *The oases of Egypt*. Vol. 2, Bahrīyah and Farafra Oases. Cairo.

Folch, Ramon, Camarasa, Josep M. & Acot, Pascal (red.) (2000). *Encyclopaedia of the biosphere: [humans in the world's ecosystems].* Vol. 11, the biosphere concept and index. Detroit, Mich.: Gale.

Gado, Tamer, Mohamed, Mady, Osman, Medhat (2010)."Investigating the intelligence of the low-tech earth architecture of the Sahara: A feasibility study from the western desert of Egypt". *Earthscan journals*, Intelligent Buildings International, pp 179-197.

Gerring, John (2007). *Case study research: principles and practices*. New York: Cambridge University Press.

Goffman, Erving (1986). *Frame analysis: an essay on the organization of experience*. Northeastern Univ. Press ed. Boston: Northeastern Univ. Press.

Gomm, Roger, Hammersley, Martyn & Foster, Peter (red.) (2000). *Case study method: key issues, key texts*. London: SAGE.

Groat, Linda & Wang, David (2002). *Architectural research methods*. Chichester: Wiley.

Groth, Paul (1999). "Making new connections in vernacular architecture". *Journal of the Society of Architectural Historians*, Vol. 58, No. 3, pp. 444-451. Architectural History 1999/2000. University of California Press on behalf of the Society of Architectural Historians.

Hamel, Jacques (1993). *Case study methods*. Newbury Park, Calif.: Sage Publications.

Harris, Lois R. & Brown, Gavin T.L. (2010). *Mixing interview and questionnaire methods*: *Practical problems in aligning data,* Vol. 15, No. 1. Practical Assessment, Research & Evaluation.

Heath, Kingston Wm. (2009). *Vernacular architecture and regional design: cultural process and environmental response*. 1st ed. Amsterdam: Architectural Press.

Hillier, Jean & Rooksby, Emma (red.) (2005). *Habitus: a sense of place*. 2. ed. Aldershot: Ashgate.

Holstein, James A. & Gubrium, Jaber F. (red.) (2003). *Inner lives and social worlds: readings in social psychology*. New York: Oxford University Press.

Honan, Eileen (2003). "Rethinking vernacular education in the Pacific". *Regional Conference on Rethinking Educational Aid* , pp. 1-12 & 20-22. Victoria University and University of the South Pacific, Fiji.

Hope, Colin A. and Gillian E. Bowen (eds) (2002). Dakhleh Oasis Project: *Preliminary Reports on the 1994-1995 to 1998-1999 Field Seasons.* Oxford: Oxbow books.

Islam, A. K. M. Kausarul (2003). *Patterns and changes of vernacular architecture in Bangladesh: an application of Amos Rapports' theory defining vernacular design*. Master thesis, KTH ,Stockholm.

Jaquin, Paul (2010). "How Mud Bricks Work- Using Unsaturated Soil Mechanics Principles to Explain the Material Properties of Earth Buildings - A year of research". *EWB-*

UK National Research Conference 2010 'From Small Steps to Giant Leaps...putting research into practice'. The Royal Academy of Engineering.

Joffroy, Thierry (red.) (2005). *Traditional conservation practices in Africa*. Rome: ICCROM.

Johansson, Erik (2006). "Influence of urban geometry on outdoor thermal comfort in a hot dry climate: A study in Fez, Morocco". *Building and Environment*, Vol. 4, pp. 1326-1338.

Jokilehto, Jukka (2002). *A history of architectural conservation*. New ed. Oxford: Butterworth-Heinemann.

Jorgensen, Danny L. (1989). *Participant observation: a methodology for human studies*. Newbury Park, Calif.: Sage.

Kahn, Lloyd (red.) (1990[1973]). *Shelter*. [New ed.] Bolinas, Calif.: Shelter Publications.

Kahn, Lloyd (2004). *Home work: hand built housing*. Bolinas, Calif.: Shelter Publications.

Karaosman, Selda (2008). "Vernacular design as the teaching tool of the ecological architecture". *Proceedings part II. Designing design education, design train congress*, pp. 256-268. 5-7 June, Amsterdam, the Netherlands.

King, W. J. Harding (1903). *A search for the masked Tawreks.*. London:

King, W. J. Harding (1913). "The Farafra Depression and Bu Mungar Hattia". *The Geographical Journal*, Vol.42, pp. 455-461;516.

King, W J Harding (1925). "The Dakhla-Owenat Road". *The Geographic Journal*, Vol. 65, No.2, pp. 153-156, (Electronic source).

Klaufus, Christien (2000). "Dwelling as representation: Values of architecture in an Ecuadorian squatter settlement". *Journal of Housing and the Built Environment*, Vol.15, pp. 341–365. Kluwer Academic Publishers. Printed in the Netherlands.

Knapp, Ronald G. & Lo, Kai-Yin (red.) (2005). *House home family: living and being Chinese*. Honolulu: University of Hawaii Press.

Kobusiewicz, Michał (red.) (2010). *Gebel Ramlah: final neolithic cemeteries from the western desert of Egypt*. Pozna´n: Institute of archaeology and ethnology, Polish academy of sciences (Poznan branch).

Kwolek-Folland, Angel (1995). "Gender as a Category of Analysis in Vernacular Architecture Studies". *Perspectives in Vernacular Architecture* , Vol. 5, pp. 3-10. Vernacular Architecture Forum, Gender, Class and Shelter.

Lejeune, Jean-François. & Sabatino, Michelangelo. (red.) (2010). *Modern architecture and the Mediterranean: vernacular dialogues and contested identities*. London: Routledge.

Lyons, Diane E. (2007). "Building Power in Rural Hinterlands: An Ethnoarchaeological Study of Vernacular Architecture in Tigray, Ethiopia". *Journal of Archaeological Method and Theory*. Vol. 14, No. 2.

Mahdavi, Ardeshir., Lambeva, Lyudmila., Shehayeb, Dina K. & El-Habashi, Alaa (2006). "A systematic approach to scientific study of traditional architecture". *PLEA2006 , the 23rd Conference on Passive and Low Energy Architecture*, 6-8 September. Geneva, Switzerland.

Mahgoub, Yasser (2001). "Traditional environments in a new millennium, defining principles and professional practice". *Second international symposium. Culture and space in the built environment,* 20-23 June. Amasya, Turkey.

Manoj Kumar Singh, S. M. (2008). "Bioclimatism and vernacular architecture of north-east India". *Building and Environment*, Vol. 44, No. 5, pp. 878-888.

Martin, Michael (2004). *Deserts of the earth*. London: Thames & Hudson.

McMinn, John & Polo, Marco (2005). "Sustainable architecture as a culture project". *The 2005 World Sustainable Building Conference*, September, 27-29. Tokyo.

Methta, Ji N. & Kellert, Stephan R. (1998). "Local attitudes toward community-based conservation policy and programmes in Nepal: a case study in the Makalu-Barun Conservation Area". *Environmental Conservation,* Vol. 25, No. 4, pp. 320-333. Foundation for Environmental Conservation.

Minault-Gout,Anne (1995). The miniature mastabas of Balat or secondary cemeteries of the mastaba II. *Bulletin of the French oriental institute of eastern ecology. BIFAO* 95, pp. 297-328.

Mumford, Lewis (1961). *The city in history: its origins, its transformations, and its prospects.* New York: Harcourt Brace Jovanovich.

Naqīb, Khaldūn Ḥasan (1990). *Society and state in the Gulf and Arab Peninsula: a different perspective.* London: Routledge.

Nercissians, Emilia, Fremerey, Michael (2008). "Vernacular Languages and Cultures in Rural Development: Theoretical Discourse and Some Examples". *Journal of Agriculture and Rural Development in the Tropics and Subtropics,* Vol. 109, No. 1, pp. 65-84.

Norton, John (1997). *Woodless construction: unstabilised earth brick vault and dome roofing without formwork*. Lund: Lund University, Lund Centre for Habitat Studies

Oliver, Paul (red.) (1969). *Shelter and society*. London.

Oliver, Paul (red.) (1976). *Shelter in Africa*. Pbk ed. London: Barrie & Jenkins.

Oliver, Paul (red.) (1976). *Shelter and society*. Paperback ed. London: Barrie & Jenkins.

Pallasmaa, Juhani (1986). "Tradition and modernity: the feasibility of regional architecture in post-modern society". *The Architectural Review ,* pp. 26-34.

Perks, Robert & Thomson, Alistair (red.) (2006). *The oral history reader*. 2. ed. London: Routledge.

Phillips, Adrian (2002). *Management guidelines for IUCN category V protected areas protected landscapes/seascapes*. Gland: IUCN.

Riessman, Catherine Kohler (1993). *Narrative analysis*. Newbury Park: Sage.

Rittle ,Horst & Webber, Melvin (1973). "Dilemmas in a General Theory of Planning". *Policy Sciences,* Vol. 4, pp. 155-169. Elsevier Scientific Publishing Company, Amsterdam-Printed in Scotland.

Rosenlund, Hans (1995). *Design for desert: an architect's approach to passive climatisation in hot and arid regions.* Diss. Lund: University.

Ruddin, Lee Peter (2006). "You Can Generalize Stupid! Social Scientists, Bent Flyvbjerg, and Case Study Methodology". *Qualitative Inquiry*, Vol. 12, No. 4, pp. 797-812, Sage Publications.

Santamouris, Matheos & Asimakopoulos, Demosthenes (red.) (1996). *Passive cooling of buildings*. London: James & James.

Saunders, Denys J. (1974). *Visual communication handbook: teaching and learning using simple visual materials*. Guilford: Lutterworth P.

Sholihah, B.Arif & Arif Ahmed (2002). "Communities empowerment: sustaining the vernacular settlement in the urban area". *The 2nd International Seminar on Vernacular Settlement.: ISVS,* India.

Silva, Kapilada (2002). "Conserving urban vernacular settlements in the new millennium: six strategies for success". *The 4th International Seminar on Vernacular Settlement: ISVS*, India.

Singh, Manoj Kumar, Mahapatra, Sadhan & Atreya, S.K. (2009). "Bioclimatism and vernacular architecture of north-east India". *Building and Environment,* Vol. 44, pp. 878-888.

Smith, Susan E, Willms, Dennis George & Johnson, Nancy A (red.) (1997). *Nurtured by knowledge: learning to do participatory action-research*. New York: The Apex Press.

Soleymani, Faraz (2005). "Sustainability of sustainable strategy". *The 2005 World Sustainable Building Conference* , September 27-29. Tokyo.

Sommer, Barbara Baker & Sommer, Robert (2001). *A practical guide to behavioural research: tools and techniques*. 5th ed New York: Oxford University Press.

Stacul, Jaro. (2003). *The bounded field: localism and local identity in an Italian alpine valley*. New York: Berghahn.

Stangl, Paul (2008). "The vernacular and the monumental: memory and landscape in post-war Berlin". *GeoJournal*, Vol. 73, pp. 245-253.

Stasinopoulos, Thanos N. (2006). "The Four Elements of Santorini Architecture, Lessons in Vernacular Sustainability". *PLEA2006 , the 23rd Conference on Passive and Low Energy Architecture*, 6-8 September. Geneva, Switzerland.

Steele, James (1997). *An architecture for people: the complete works of Hassan Fathy.* London: Thames and Hudson.

Stoklund, Bjarne (2003). "Ethnology and vernacular architecture: revisiting a classical field of study". *Ethnologia Scandinavia*, Vol. 33, pp. 5-20.

Stoppato, Marco C. & Bini, Alfredo (2003). *Deserts*. Willowdale, Ont.: Firefly.

Strauss, Anselm L. & Corbin, Juliet (1990). *Basics of qualitative research: grounded theory procedures and techniques*. Newbury Park, Calif.: Sage.

Tang, Runsheng, Meir, I.A & Wu, Tong (2006). "Thermal performance of non air-conditioned buildings with vaulted roofs in comparison with flat roofs". *Building and Environment*, Vol. 41, pp. 268-276.

Wagner ,Cesar & Naidu, Padma (2008) "Re-thinking the Vernacular Approach to Domestic Architecture in New Zealand". *The 4th international seminar on vernacular settlement. CEPT University*, pp. 14-17, February, India.

Wagner, Guy (1987). *Les oasis d'Egypte à l'époque grecque, romaine et byzantine d'après les documents grecs: recherches de papyrologie et d'épigraphie grecques*. [Le Caire]: Institut français d'archéologie orientale du Caire.

Wagner, Jon (2002). "Contrasting images, complementary trajectories: Sociology, visual sociology and visual research". *Visual Studies,* Vol.17, No. 2, pp. 160-171. Routledge.

Wamsler, Christine (red.) (2006). *Managing urban disasters*. Diss. Lund: University.

Whitaker, Dorothy Stock & Whitaker, Galvin (1997). Kurt Lewin: his dynamic and force field models in contemporary research, management and practice. Onsala: Samarbetsdynamik.

Wilson, E. Bright (1990[1952]). *An introduction to scientific research*. Dover ed. New York: Dover Publications.

Yin, Robert K. (1993). *Applications of case study research*. Newbury Park, Calif.: Sage.

Yin, Robert K. (1994). *Case study research: design and methods*. 2. ed. Thousand Oaks, CA: Sage.

Archives

- French Institute for Oriental Archaeology in Cairo.

1- P.Posener Krieger, The archives of the temple Funeral Neferirkare-Kakai, BdE 65, 1976, p. 451; and B. Gunn, ASAE 25, 1925, p. 242 and 245-246.

- The Egyptian National Archive in Cairo. Travellers' manuscripts.

1- Abu Abd Allah Muhammad al-Idrisi al-Qurtubi al-Hasani al-Sabti (12th century manuscript). *Kitāb Nuzhat al-mushtāq fī dhikr al-amṣār wa-al-aqṭār wa-al-buldān wa-al-juzur wa-al-madā' in wa-al-āfāq,* which in English would be *Recreation of the desirer in the account of cities, regions, countries, islands, towns, and distant lands.*

2- Muammad Abū'l-Qāsim Ibn hawqal (10th century manuscript). *Sūrat al-'Ard,* which in English would be *The face of the Earth*.

Project and workshop reports

Cardenas ,Virginia, Sulabo ,Evangeline, Domingo, Lorna, & Tan ,(2009). *The community-based participatory extension management (CBPEM) model: a key approach towards people empowerment a Key Approach Towards PeopleSoft empowerment* . ULB annual report. USM R & D 17 (1): 81-87.ISSN 0302-7937.

Dakhleh Oasis Project Annual Reports (2005-2010). Monash University.

De la Torre, Marta (red.)(2002). *Assessing the Values of Cultural Heritage*. Research report, The Getty Conservation Institute, Los Angeles.

Egypt infrastructure improvements project, secondary cities environmental assessment (2007). *Environmental assessment report for the New Valley Governorate. El Mounira and Nasr El Thowra villages, Kharge oasis , Balat, El Gedida and Tanhidah villages in Dakhla oasis*. Project report published by National Organization for Portable Water and sanitary Drainage (NOPWADA).

Global heritage fund biennial report 2009-2010, saving our global heritage for future generations.

Mayer ,Wolfgang (2008). *Developing Historic Cities – Valuing Cultural Heritage, Siwa Oasis as an example.* Alumniportal 12. /13. November, Workshop, Urban Development.

UNESCO-ICOMOS Documentation Centre, September (2009). Description of world heritage cultural landscapes with a bibliography based on documents available at the UNESCO-ICOMOS documentation centre, Italy.

UNESCO publication (1998). *Stimulating synergies, integrating knowledge*.Division of philosophy and ethics: Symposium on Transdisciplinarity, Royaumont Abbey.

Siwa Environmental Amelioration Project (May 1998 - October 2003). The Egyptian Italian Environmental Cooperation Program EIECP.

Oral sources

1-Discussions with the below mentioned experts concerning, their personal experience in Balat, the encountered current vernacular architecture problems in Balat and their vision for future possibilities there.

Dr.Salima Ikram: Professor of Egyptology and Archaeology. She is co-director of the North Kharga Oasis Survey project in Egypt.

Dr.Nairy Hampikian: Architect and lecturer in historic preservation, Islamic and Armenian history of architecture, and archaeology. She is the director of the USAID funded Bab Zuwayla Conservation Project in Egypt.

Rami El Dahan: Architect, has over 29 years of experience working in the Vernacular Architecture and the use of locally available construction material in Egypt.

Soheir Farid: Architect, has over 29 years of experience working in the Vernacular Architecture and the use of locally available construction materials in Egypt.

Dr.Tarek Waly: Architect and planner, director of the Cairo Urban Heritage Preservation Council. He has published nine books on traditional architecture and urban settlements as well as several studies and research papers on the same subject.

Michel Wuttmann: Research engineer in archaeology and restoration, member in the French archaeology mission in Balat, Dakhla oasis in Egypt.

Dr. Bahaa Bakry: Professor of architecture and urban ecology. He is an expert in desert architecture and environmental design in Egypt.

Dr.Fred Leemhuis: Professor of theology and director of Al Qasr restoration project in Dakhla oasis in Egypt.

Dalia Nabil: Interior designer and specialist in conservation. She carried out a research on mud brick architecture in Dakhla oasis in Egypt.

Riccardo Balbo: Architect and Lecturer. He had several publications on vernacular architecture in Egypt and other countries.

Dr. Francesca De Filippi: Architect and director of CRD-PVS, Research and Documentation Centre in Technology, Architecture and Town in Developing Countries, Italy. She carried out a research on mud brick vernacular architecture in Dakhla oasis in Egypt. She had several publications on vernacular heritage in Egypt and other countries.

Dr. Abdel Wahab Hanafy: Historian and lecturer. He had several publications on desert vernacular in Dakhla oasis and the Western Desert in Egypt.

Maha el Brence: Researcher, she carried out a research in social and cultural changes in Balat in Dakhla oasis in Egypt.

2- Discussions with local investors in Balat, Balat municipality personnel, Supreme Council of Antiquities' guards in Balat and tour guides. Names or details could not be mentioned for ethical concerns.

Web based sources

Although all the below websites were current at the time they were cited, websites and their contents are likely to change.

www.acsedu.co.uk. Retrieved May, 2009

www.ahram.org.eg. Retrieved November, 2007.

www.arts.monash.edu.au/archaeology/excavations/dakhleh/index.php#reports.

Dakhleh Oasis Project Annual Reports. Retrieved January, 2010.

www.britannica.com. Retrieved July 2010.

www. ema.gov.eg. Egyptian Meteorological Authority (EMA). Retrieved May 2009 & June 2011.

www.eoearth.org. Encyclopaedia of Earth. Retrieved January, 2008

www.ethnoarchitecture.com. Retrieved June, 2009

www.esrl.noaa.gov/psd. Earth System Research Laboratory. Retrieved June, 2011.

www.greenhomebuilding.com/vernacular.htm Retrieved September, 2009.

www.greenhomebuilding.com/vernacular.htm. Retrieved September, 2009.

www.globalheritagefund.org/annual_reports/2009_2010. Retrieved March, 2011.

www.international.icomos.org. Retrieved January, 2008.

www.jstor.org.

www.lib.berkeley.edu/ENVI/vernacular.html UC Berkley library Retrieved December, 2007.

www.nationalarchives.gov.eg. The Egyptian National Archives. Retrieved August, 2011.

www.unesco.org. Retrieved December, 2007.

www.vernaculararchitecture.com. Retrieved October, 2007.

www.vernarch.com. Retrieved November, 2007.

www.vernaculararchitectureforum.org. Vernacular architecture forum. Retrieved August, 2008.

Annexes

1- Interview form.
2- Questionnaire form.

©Marwa Dabaieh
LTH- Lund University
Department Architecture and Built Environment
Division of Architecture Conservation and Restoration
Notice:

Balat town-Dakhla oasis-Egypt
Year /Month /Day
Time: :
Male/ female Age:

Interview sheet

General info:

Family name: No. of Family members:

House area/no. of floors: The family source of income:

Type of house (mud brick/ others): Ownership:

Date of constructing the house:

Basic information:

1- For how long you have been living in the house?

2- Does anyone in the family have experience in building? Who?

3- How many people can take part in do-it-yourself building process?

4- How much time can people devote to building process?

5- Can you describe in details the building process?

6- From where you get the building materials and water necessary for mud casting?

7- At what time of the year you start building or do plastering for maintenance? Why?

8- How the houses normally extend?

9- What are the problems you are facing now in your mud brick house? Are such problems recent?

Household activities:

1- Where is the cooking done? Where are the utilities kept/ the food?

2- Where do you wash the dishes/laundry?

3- Where do you do the backing?

4- How far must one go to find wood for the stove?

5- How does the ventilation work in the house?

6- How and where to get the water for daily life activities?

7- Are there any other activities that take place in the court/in the patio?

8- How far family members live away from each others? *Observe distances to the closest house*.

©Marwa Dabaieh

LTH- Lund University

Department Architecture and Built Environment

Division of Architecture Conservation and Restoration

Notice:

Balat town-Dakhla oasis-Egypt

Year /Month /Day

Time: :

Male/ female Age:

Inhabitants' social activities in the town:

1- Where do you meet together with other town dwellers?

2- What tasks are done together with the neighbors?

3- Where do you go for shopping? Where is the market place?

4- Why are the houses located far /near from each other?

5- Where is the mosque, the school and the major courthouse located from your house?

6- Where do children play?

7- How far is the farm from the dwelling?

Other questions concerning housing wish list and Balat's future:

1- What are the improvements you would like to take in the house?

2- When constructing your new house, how much could you afford to invest?

3- What are the family's wishes as regard to home improvement?

4- What do you want to improve or change?

5- What did a concrete house offers for you more than the mud brick house?

6- Why would you want to live like that?

7- Do you think the old Balat town will grow?

8- What hopes do you have for the new town?

©Marwa Dabaieh
LTH- Lund University
Department Architecture and Built Environment
Division of Architecture Conservation and Restoration

Balat town-Dakhla oasis-Egypt
Year /Month /Day
Time: :
Male/ female Age:

Notice:

Questionnaire sheet

1- Do you feel comfortable in your house (Mud brick/Concrete)?

Yes No Neutral

2- Is it comfortable inside the house during hot summer days?

Yes No Neutral

3- Is it comfortable inside the house during cold winter days?

Yes No Neutral

4- Do you suffer from problems in your mud brick house?

Yes No Neutral

If yes, what problems are there in the house?

Electricity Pluming Structure crack White ants Others

5- If the same facilities are now offered in the old houses, will you move back?

Yes No Neutral

6- In the future will you build yourself, or you will depend on builders?

Yes No Neutral

7- What are the materials you are going to use? Why?

Sun dried mud brick Fired mud brick White brick Concrete Fired brick
Others:

8-What are the insulations you are going to add in your new house?

Electricity Pluming Natural gas Others

9- Are you going to build for your children or not?

Yes No neutral

10- If yes, in what way?

Mud brick Concrete Others

11- How you look at old Balat now?

Something old Traditional Ruins Others

12- What do you think about the electric energy offered now in the old house?

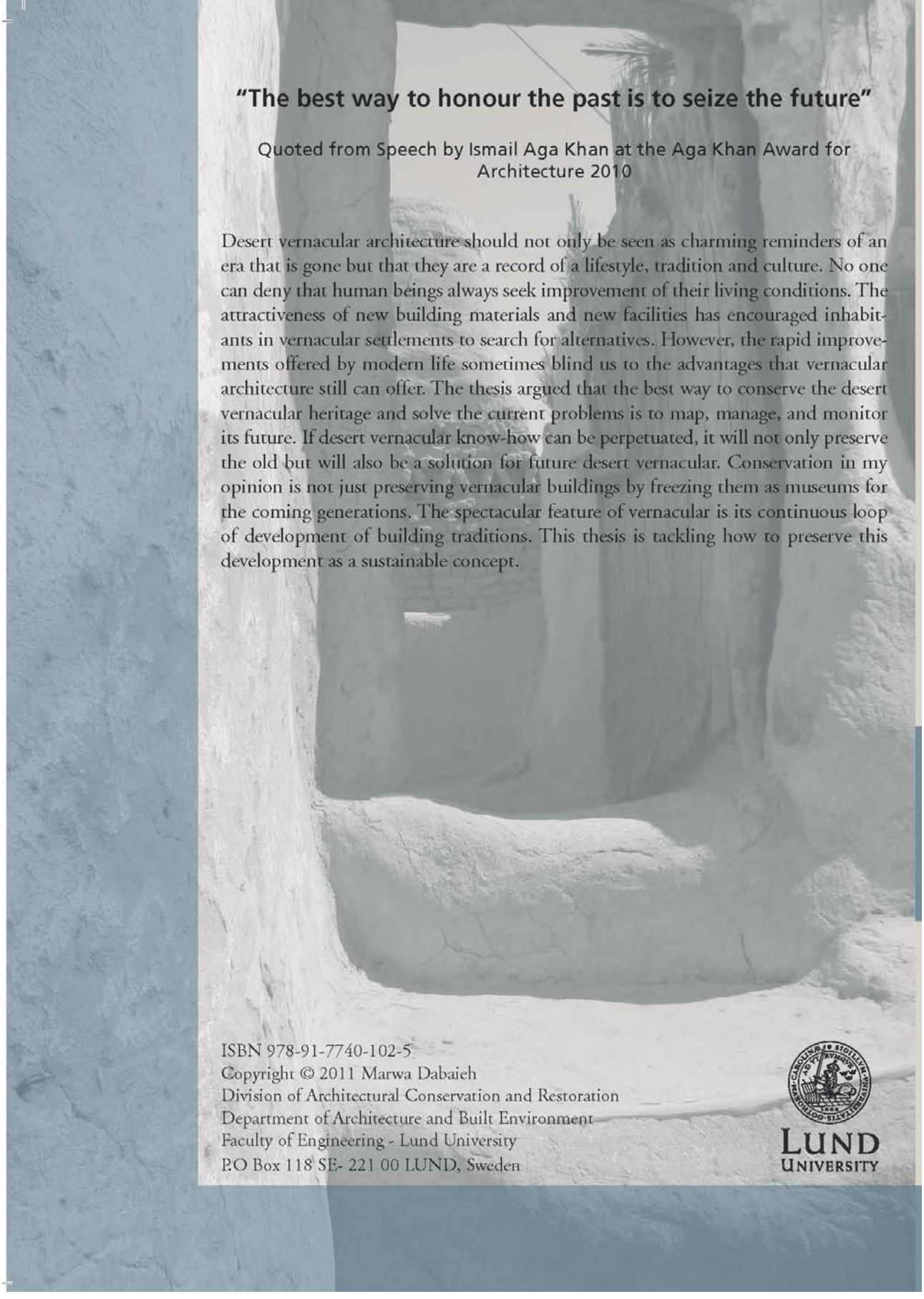
Sufficient Not sufficient Doesn't exist

13- Are you proud of living in the old mud brick house?

Yes No Neutral

14- If you have the chance are you going to move to concrete houses?

Yes No Neutral



"The best way to honour the past is to seize the future"

Quoted from Speech by Ismail Aga Khan at the Aga Khan Award for Architecture 2010

Desert vernacular architecture should not only be seen as charming reminders of an era that is gone but that they are a record of a lifestyle, tradition and culture. No one can deny that human beings always seek improvement of their living conditions. The attractiveness of new building materials and new facilities has encouraged inhabitants in vernacular settlements to search for alternatives. However, the rapid improvements offered by modern life sometimes blind us to the advantages that vernacular architecture still can offer. The thesis argued that the best way to conserve the desert vernacular heritage and solve the current problems is to map, manage, and monitor its future. If desert vernacular know-how can be perpetuated, it will not only preserve the old but will also be a solution for future desert vernacular. Conservation in my opinion is not just preserving vernacular buildings by freezing them as museums for the coming generations. The spectacular feature of vernacular is its continuous loop of development of building traditions. This thesis is tackling how to preserve this development as a sustainable concept.

ISBN 978-91-7740-102-5

Division of Architectural Conservation and Restoration
Department of Architecture and Built Environment
Faculty of Engineering - Lund University
P.O Box 118 SE- 221 00 LUND, Sweden

LUND UNIVERSITY