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Exploring Problematic Issues of Housing Design in Hot Humid Climate: Libyan Case

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Abstract

Contemporary housing has suffered from several problematic issues in hot humid climate, therefore; this paper aims to highlight the environmental, social and economic issues of contemporary housing in hot humid region. The methodology depends on questionnaire that helps to discover these problems which are facing users in their housing and case study on contemporary housing for people who has experience of living in two kinds of housing: traditional and contemporary housing. The significance of the study is related to comprehensively detailed presentation of these issues which affect the user`s comfort, user`s needs and the cost of living. The main objective is to reduce increasing these problems in future as well as pay attention to the specialists in the aim to develop environmental, social and economic solutions for future housing in hot humid climate. The results of this paper will be useful for users and specialists as well as author in order to find development sustainable solutions in future studies.

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Sıcak Nemli İklimdeki Konut Tasarımı Sorunları Üzerine Bir İnceleme: Libya Örneği

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Öz

Çağdaş konutlar, sıcak nemli iklimde çeşitli sorunlarla karşılaşmaktadır. Bu nedenle bu çalışma, sıcak nemli bölgedeki çağdaş konutlarla ilgili çevresel, sosyal ve ekonomik sorunların ortaya çıkartılmasını amaçlamaktadır. Yöntem, geleneksel ve çağdaş konutlarda konut sakinlerinin karşılaştığı sorunları anlamaya yardımcı olan ve iki tür konutta da yaşama deneyimine sahip kullanıcılara yönelik bir anket çalımasını içermektedir. Çalışmanın önemi, kullanıcının rahatını, kullanıcının ihtiyaçlarını ve gelecekte yaşanacak sorunları daha da azaltmak için yaşam maliyetini etkileyen bu konuların kapsamlı bir şekilde sunulmasıdır. Aynı zamanda, sıcak nemli iklimde gelecekteki konutlar için çevresel, sosyal ve ekonomik çözümler geliştirmeyi amaçlayan uzmanlara da yol göstermektedir. Bu çalışmanın sonuçları, gelecekteki çalışmalarda sürdürülebilir çözümleri bulmak için kullanıcılar ve uzmanlara faydalı olacaktır.

1. INTRODUCTION

In the last decade the developed world suffers from environmental and economic housing issues that lead to high energy consumption, therefore many sustainability strategies in coldest countries call for reducing building energy consumption to the lowest levels on residences. On the other hand, Arab countries have a harsh climate, which is extremely between hot dry and hot humid climate. In the past, most traditional Arab houses had unique features of vernacular architecture which helped people to live comfortably with their local environment and met their social needs. Thus, housing reflected their identity, culture and people's needs. Unfortunately, after urbanization due to population growth, urban expansion and economic development, everything has changed in the built environment of urban cities, specifically in housing due to following the contemporary world in their experience and their characters of form, without considering differences in the climate, local environment and social needs. Therefore, this study aims to highlight the principal environmental problems of contemporary housing. The research methodology will dependent on questionnaire and case study in the aim to discover the problems of environmental, social and economic which are facing people in the contemporary Libyan housing in hot humid region. The results of the study will present comprehensive results for environmental, social and economic issues which are important for future studies.

2. LITERATURE REVIEW

2.1. The sustainable housing in developed countries

From environmental point of view, Europe countries identified the problematic issue of housing as, energy consumption and its impact on the environment. Therefore, most building have 30% of energy consumption in the UK, and 40% in EU, moreover the main sources of energy consumption in homes are heating/cooling, lighting and hot water, in that case, this issue will increase in future and consume more energy. Erhorn, (2014) However in the United States most building consume of 70% electricity while commercial buildings consume double between (1980 -2000) and this issue will be increase by 2025 approximately 50% of electricity consumption. Shortly, the world consumption will increase in the coming years if does not decompose environmentally. Steinbock, (2006) As a result, in the developed world, energy consumption and its bad effect on the environment are considered as one of the biggest problems that housing sector is facing from the perspective of sustainability.

2.2. The sustainable housing in Arab countries

In the beginning, the big problem of the "westernization" as author of Kite (2011) mentioned has taken place in architecture form as well as urban cities in the most Arab cities. The "westernization" occurred after the political independence of Arab world, so the western

model established in the most cities which constriction with western technology even the urban planning of street and public spaces was all based upon the standards of the western style. According to that, traditional form had fade and the Muslim identity effected by modern style as well as the culture of Muslim people, this issue appeared due to destruction the traditional cities, and it had taken place. At this time, modern cities have neglected the traditional historic centers, as result, Kite `s study finding that; first, there is a gap between the traditional planning and contemporary planning in Arab cities. Second, most traditional historic architecture has been deteriorated by modern architecture or by modern planning. Kite, (2011). On other hand the study of Al Sayyed (2011) analyzed the problematic issue of contemporary housing in Arab world as he pointed out the way of building problems using modern materials instead of local materials as Rasem Badran *(he is a contemporary architect who is using the traditional theory in contemporary design*) so he used to transform elements of traditional architecture into contemporary forms by using technology Al sayyed,(2011). Moreover, the study of Pugnaloni (2014) presented the issue of the modern building which does not consider the climate condition of hot zone, which led to designing a poor indoor environment that have negatively impact on the human being and the environment, as well as increasing energy consumption, impact the environment, and the cost of people living. Pugnaloni, (2014) Furthermore, Waziry (2004) presented some important criteria that are available in contemporary housing which does not provide privacy at several levels of; first the contemporary housing dose not separate visitor spaces from family spaces as it done in traditional housing. Second, contemporary housing does not provide visual privacy from outside by visual insulation of windows and balcony because he focused on sustainable architecture in the Islamic perspective Waziry (2004) Finally, Hassan Fatty (1986) (he is the most famous Arab architect who using the traditional theory in traditional design, AL Sayyed, (2011) criticized modern buildings due to the use of modern materials that are not suitable for the environment however he call for using traditional solution which rely on local environment by using natural martial and reflect social culture in his projects (without using technology). Hassan Fathy, (1986) As a result of the problems identified in the hot zone are; first, using modern materials which led to high energy consumption, second loss of privacy inside and outside the building.

2.3. The sustainable housing in Libya

Libya has a harsh climate, which is extremely hot dry in the south and hot humid in the north. In the past, most traditional Libyan houses had unique features of sustainable environmental solutions which helped people to live comfortably with their local environment and met their social needs. Thus, housing reflected their identity, culture and people's needs. For example, the Courtyard House (*Housh*) is a coastal house. This type of housing is located primarily in

coastal cities, such as Darna and Benghazi in the east and Tripoli in the west. This sort of housing reflects the culture, heritage and identity of the city from the 16th century until now. The urban fabric of the old city is characterized by a group of court yard houses, which are separated by public and private space. Courtyard houses have an irregular form with a courtyard shape in the square. Moreover, most houses have one façade that opened in to narrow streets providing shadow and facing the desired wind. Finally, this type of housing reflects the idea of people's needs for separate private and public spaces Gabril, (2014). Unfortunately, after urbanization due to population growth, urban expansion and economic development, everything has changed in the built environment of urban cities, especially housing due to follow the contemporary world in their experience and their characters of form, without considering differences in climate, local environment and social needs (Sasi 2013).

Additionally, in the last four decades, contemporary housing has been constructed in all Libyan cities. These houses were designed by a foreign company, the housing has two floors with a garden around them as well as it include high walls, in order to provide privacy for residents, and there is no courtyard inside the house and most of the materials are concrete and steel which are used for the roof, columns and floor, while hollow cement blocks are used for the walls Shawesh, (1996,). Conversely, the issue with this type of housing, as Shawesh indicated, is that "*Most, if not all, projects fail to a greater or lesser extent to respond to the needs of the user, particularly where large families are involved. The essential requirements of adequate space are rarely considered. The traditional, culture and social background of the residents are not considered. Climate and local building materials are disregarded*" Shawesh, (1996). Furthermore, regarding the housing issue Sasi (2013) suggested that the same housing is built in all cities, without considering differences in climate, culture and needs. Moreover, foreign experts studied the social life in the capital, Tripoli and applied it to all coastal and desert cities. Thirdly, inadequate funding for housing projects led to most of the houses not being completed. Finally, in the last two decades, the lack of housing has become a considerable problem facing all Libyan cities and led to new families building rooms on top of their parent's homes. (Sasi 2013)

Figure 1 Libyan housing issues Source: Sasi, 2013

In the study of Elwefati (2007) the author criticized the cotemporary concrete buildings in Libya which were not suitable to the local climatic and led to other problems such as uncomfortable indoor spaces and had a high energy-consumption. In other hand the author

highlighted the advantage of traditional houses which were responsive to the local environment. Unfortunately, the result data were shown that, the cooling of the modern housing depended on artificial air conditioning especially in the summer. According to this study follow the western architecture led to losing identity of the local architecture Elwefati, (2007)

Figure 2 Contemporary house in Tripoli Source: Elwefati, 2007

Figure 3 Contemporary house in Gharyan Source: Elwefati, 2007

The study of Almansuri (2010) discussed the problem of new construction of Libyan housing in Tripoli city from the angle of energy consumption, as the flowing; "*it applied without complete understanding of their side effects."* Almansuia (2010). Therefore, it presented the issue of a new form and construction which have many environmental problems such as; indoor spaces rely on the mechanical air conditioning to provide thermal comfort. Moreover, designing the housing without consideration of the local environment has a huge side effect. Almansuia, (2010) the research paper of Nura (2011) exposed the problem of housing as the most important problem facing Libyan country. The study explained some issues of low income and population growth which help to increase housing problem in many Libyan cities Nura (2011). In the general case, the most common issue of Third World Countries is still the high cost of the houses and the low income which help to emerge other problems in the aim of providing own houses. In the same way Azlitni (2009) explains the issue of new design of the contemporary buildings which have no courtyards and have glass facades with decorated materials. Azlitni, (2009) in paper of Alzubidi (2002), she criticizes the use of concrete structure and materials that are inappropriate with the local environment. She aimed to view the significant details such as; materials, construction systems, walls thickness, type of roofing, openings, etc. in goal of how could these details or architectural elements created thermal comfort spaces in the hottest arid regions Alzubidi, (2002) , Azzuz (2000) also had same view as he said in his work that; "*Outside experts where brought in. They played a major role in the shaping of the now exiting environment*. *without proper understanding of or empathy for the*

cultural, social and religious characteristics of a country, western technologies, often innocently but forcefully and efficiently propose the direct use of Western mass production" (Azzuz, 2000,) Therefore cultural values as Aburouna (2010) mentioned here should be reflected inside the housing more than outside. However, the issue of modern Libyan housing losing their value of local culture as he mentioned here *"modem housing design did not appropriately consider these local cultural values"***.** Aburouna, (2010)

3. METHODOLOGY

The research methodology is divided into two steps; i Questionnaire and ii Case study. First of all, the Questionnaire have been given to the sample of people who live in coastal region in Libya and take advantages of their answer in the aim to discover any environment, social and economic problems. The results of the questionnaire were analyzed based on each type of housing; specifically, Traditional Housing (TH) and contemporary housing such as Apartment (AP) and Villa (V) as shown in (figure; 4).

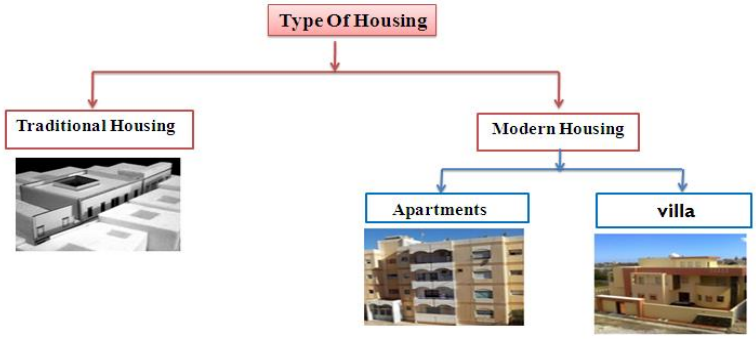


Figure 4 Type of housing

In order to achieve the goal of this study, several important questions have been established. The questions in the study have two purposes: first to identify the problems that people have faced in various sorts of housing. Second, to identify the treatments that will be used in propose housing in future. These strategies are also particular to the elements which were developed at the beginning of this study, such as environmental, social and economic elements, as demonstrated in (figure 5)

In the beginning, questions were designed by the researcher to gain a greater understanding of user's experiences of housing. Therefore, questionnaire was applied to number of people most of which were living in Libya and an online system was used to get the answers (social media groups) as presented in (Fiqure 6).

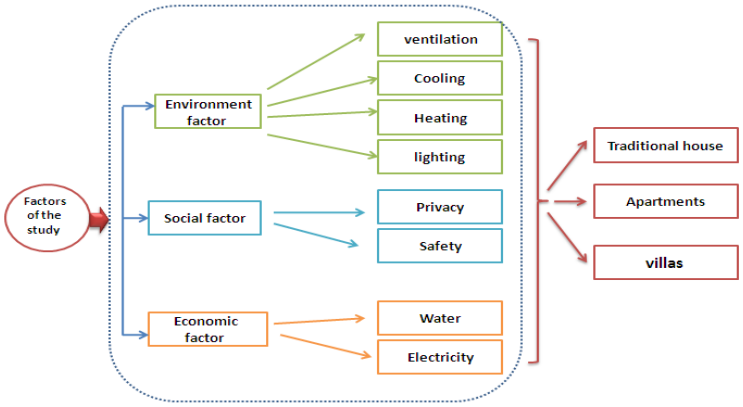


Figure 5 Types of factors

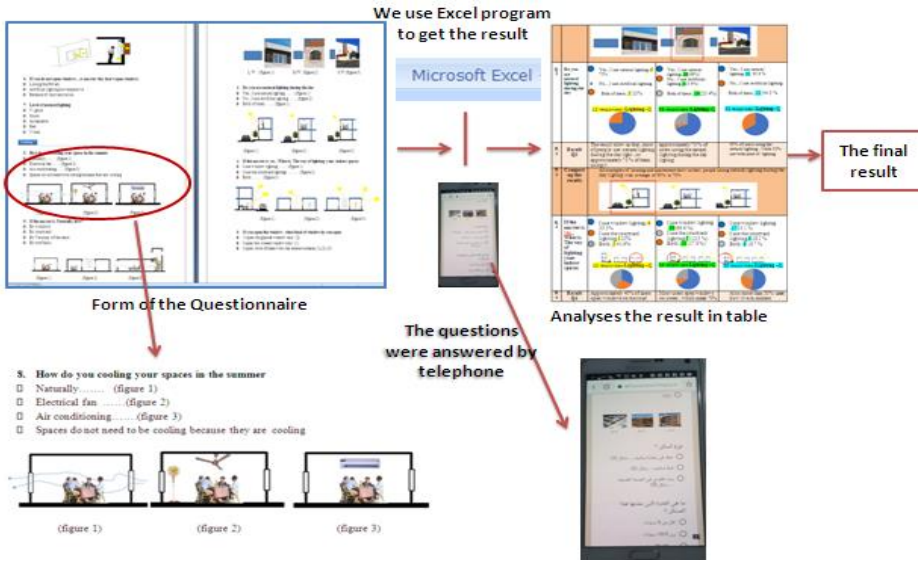


Figure 6 Result of the questionnaire

3.1. Data discussion and analysis

3.1.1. Environmental factor

This section of the study examines the users opinion about main environmental systems such as cooling, ventilation, heating and natural lighting, as it illustrative in the following part;

a. **Cooling system:** The result of the cooling system shows that 90% of users in TH are using air conditioning to cool their spaces; however, 60% of users in AP use air conditioning to cool their spaces, while 80% of users in V use air conditioning to cool their spaces as presented in (Figure 7).

Figure 7 All users cooling their spaces by opening window on street more than other ways

b. **Natural ventilation system**: All users in TH apply natural ventilation and 90% ventilate their spaces by using windows. Roughly 80% of users use natural ventilation in their spaces, while 20% use artificial ventilation. Approximately 90% of residents open windows to ventilate places. However, in V 95% of users employ natural ventilation in their spaces. Moreover, 90% of people who live in these sorts of houses use natural ventilation via their windows as presented in (Figure 8)

c.

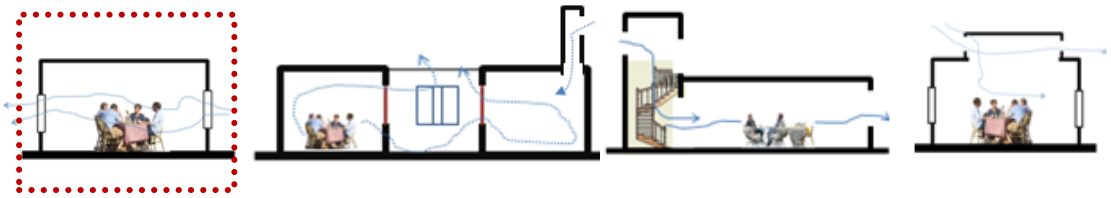
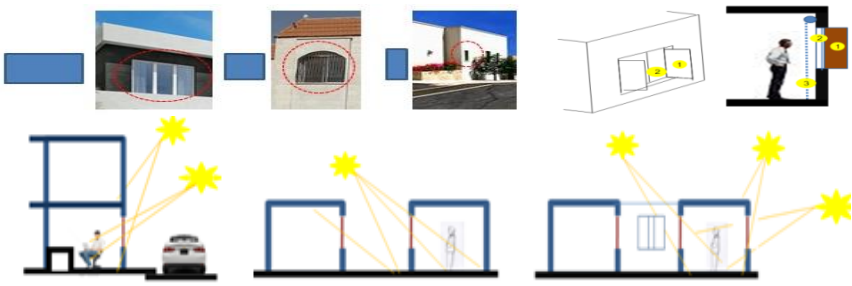


Figure 8 Approximately 90% of users in a different kind of housing using the windows to ventilation their spaces

d. **Heating system**: Users in AP depend on electrical energy to heat their spaces with an average of 75%, more than 75% of the users in V are using electrical boilers, while 25% are utilizing air condition, which means that the users depend on electrical energy to heat their spaces, with an average of 100% as shown in (figure 9).

Figure 9 All users how to live in two kinds of housing and apartment using electrical boilers in the same average of 75%, while other using air condition with average between 12% and 18%. **Note**; users depending on electrical energy to heating their spaces by average of 100%

e. **Lighting system**: Approximately 70% of users in TH are employing natural lighting during the day. They are lighting their space by means of the windows, which face on to the streets. 65% of users are using natural lighting, while 30% use both types of lighting. Additionally, more than 50% of users who live in the modern housing are employing windows that open on to the streets, in contrast to windows, which open in the courtyards.



On two kinds of AP and AP users prefer to use windows that are open on the street.

Figure 10 All users using mid-size windows between 70% and 80%, the results show that users open windows on the street without covering them. While the users in traditional housing open the glasses windows only.

3.1.2. Social factor

The main social factors that studied here were privacy and safety, in the aim to discover why users are closing their windows during the day time, surrounding the villa with a high wall and closing most of their balconies as it illustrative in the following part;

a. **Privacy system**: More than 80% of people in the TH prefer a partition between women and men in their spaces. As a result, 60% of users said the level of privacy is very good, while 40% said it is good. The design of the house achieved privacy with respect to the central courtyard, in windows that open inwards and regarding the indirect entrance. Virtually 70% of apartments are surrounded by walls, while 30% do not have walls. Indeed, most windows with a degree of 70% obscure the vision. The reason that users do not like to be seen by neighbors revealed an average of 50%, whereas 40% prefer to close out windows (figure 3.9 as shown in form 1). Furthermore, virtually 85% of new housing (V) have fences, while 15% do not have fences. Practically 35% of users have glass windows (3) and fences which obscure the vision, whereas 25 % of houses have walls that obscure inhabitants' views. Moreover, 24 out of 65 users, which means 35% of all users close the windows during the day. Their reason for that was that practically a third of users do not like to be seen by neighbors, whilst 60% of users prefer to close windows for no obvious reason.

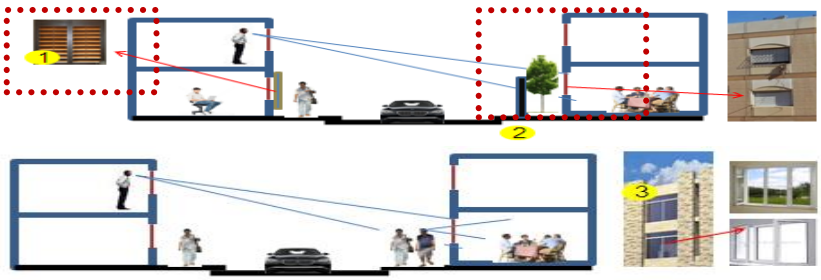


Figure 11 Privacy system analysis 1**;** 58% of users in TH have windows that obscure the vision, while 35% of users in AP have windows that obscure the vision. However,60% of V have walls

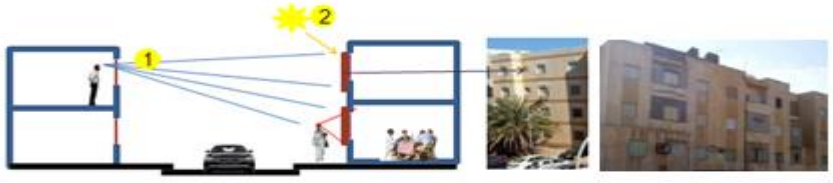


Figure 12 Privacy system analysis 2; 45% of users don't like to be seen by neighbours, while 40 % of users prefer to close windows without any reason.

b. **Safety system:** 85% of users in TH are satisfied with the degree of safety, although they made several modifications. However, the result shows that 50% of users in AP prefer to live near their relatives. 30% of users made their homes more secure by enclosing their balcony, while 35% prefer to close off their balcony, close their windows (wooden windows) and build high walls. Additionally, 70% of users in AP employ a high fence, closed balcony and closed windows.

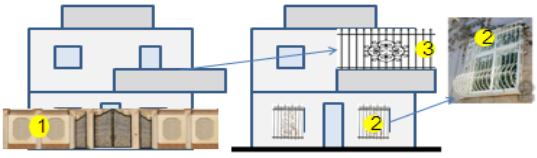


Figure 13 Between 33% to 68% using all solutions that achieve the safety goal in their housing or apartments

3.1.3. Economic factor

The issue of economic factor determined in two things water and electricity needs especially after the war of 1911. Thus, this part of study discovers the issue of economic factor as the following part;

a. **Water system**: Concerning this issue, 40% of people who live in TH said the level of water is poor. As a result, 90% buy water from the private sector. That means people face another problem concerning water availability. However, 60% of users in AP pay water bills to the government, whilst, 40% did not pay. Regarding the availability of water, 70% of users said it is available, while 40% of users buy their water. Finally, 75% of users in V said that water is available, whereas 25% said it is not available. Consequently, 30% of users buy the water, while approximately70% have wells.

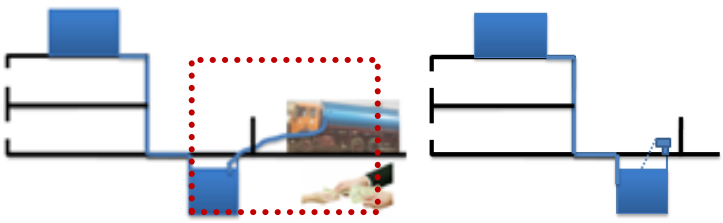
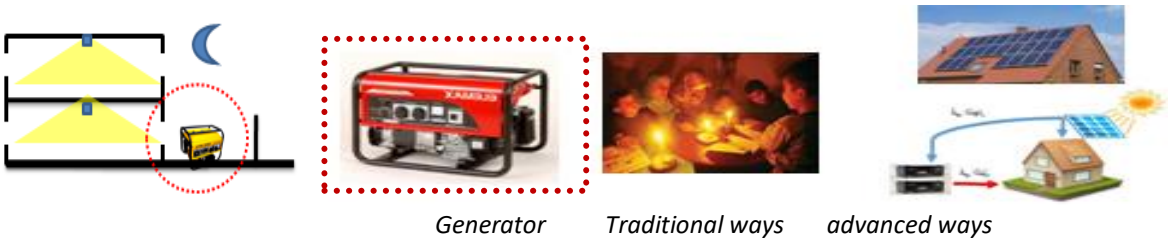


Figure 14 most users, buy the water

b. **Electricity system**: In the case of war now, 65% of users in TH are lighting their housings by means of traditional ways of candles, while 40% of them are lighting their houses by generator. All 56 users who stated that the electricity is not available presently are lighting their homes using generators (80%), whilst 20% of users are lighting their housing via traditional ways. However, 56% of users said that the electricity is not available currently. In addition, 28 of 56 users who said that the electricity is not available at the moment are lighting their homes using generators (80%), whereas 20% of users are lighting their housing by means of traditional ways.



Generator *Traditional ways* *advanced ways*

Figure 15 Electricity system; Most users are lighting their houses by means of generators

3.1.4. People's needs

People in different types of housing have various needs. First, people need privacy and safety solutions as essential elements. Second, they need solutions for lighting and ventilation systems. Third, they prefer housing with gardens more than courtyards. Finally, they prefer high fences in contrast to low fences.

3.2. Case study and methodology

The case study area is in DERNA city in the coastal area of hot -humid climate in northeastern in Libya on latitude 32 north and longitude 22 east. It is limited by Mediterranean Sea in the north and Green Mountain in the south. The old traditional city located in the center of the contemporary city and the case study housing is located near the old city in three areas around it as will illustrate later. (Sasi 2007) the average of temperature is 19.4 Celsius degree and about 252 mm of rain falls annually.

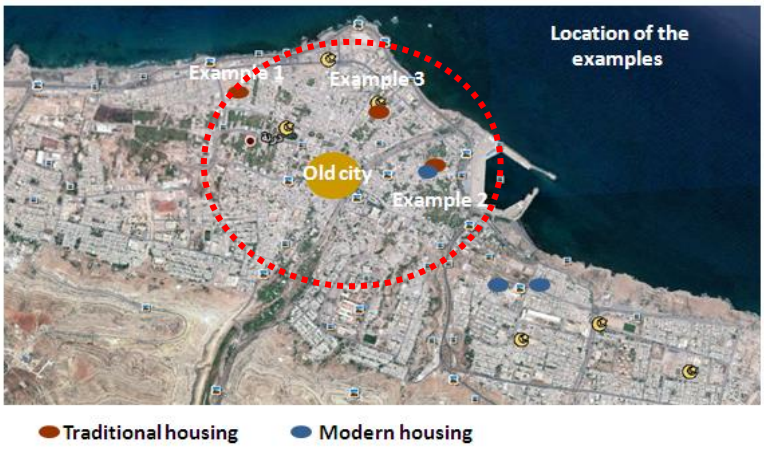


Figure 18 Location of case study housing

There are typically two types of houses in Derna city; i) Traditional houses and, ii) Contemporary houses**.** Traditional courtyard housing in Derna were built before the advent of the Ottomans 1711 by the local population, so they used the nature local materials of stones, trees, soil etc. according to their social need and culture. The building was a residential adjacent building with one or two floors, featured by a central courtyard which was the main space for social interaction between family members. The courtyard provided a healthy environment for users related to natural ventilation, cooling, heating and lighting. The building structure was Load-bearing walls; this structure holds only two floors not more. Wall thickness ranges from 40-50 mm, additionally were built by limestone with mortar and most of them were painted in white as well as using the wood in a limited manner in the formation of roofs and openings. Almajri, (2010). There are two kinds of contemporary housing in Derna; Apartments and Villa. These kinds of housing have emerged after urbanization in the beginnings of 1970s. Villa mostly consists of two floors, while the Apartments consists four to eight floors, including balconies and service courtyard. Moreover, the structure includes concrete columns, ceilings and floors as well as concrete block spreader.

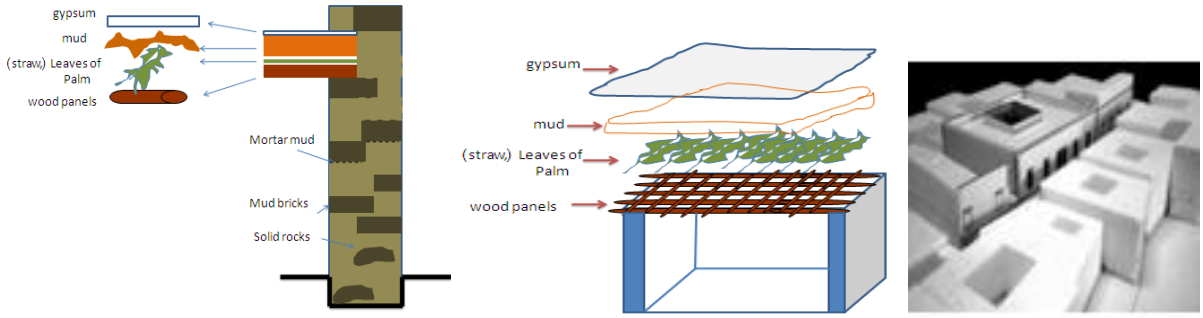


Figure 16 Materials of traditional housing in DERNA city (Redrawing from original source of Almajri, (2010).

Figure 17 Structure of the contemporary building http://itcadel.gov.ly

In this study, houses were selected for people who have experience of living in both kinds of traditional and contemporary houses. These houses were analyzed by some factors and compares with contemporary housing. The methodology of a case study part depended on analyzes three traditional and three contemporary houses. This part of the study consists of environment questions which have been asked in term of lighting, ventilation, cooling and heating and social questions of privacy and safety. The method depends on; asking users about previous factors, moreover, comparing the traditional houses with contemporary houses in the aim to know the reasons why users choose their answers.

In the following table illustrated brief analysis of the contemporary building according to the users' answers and according to their experience of living in both kind of housing traditional and contemporary;

Table 1 Analysis and Result

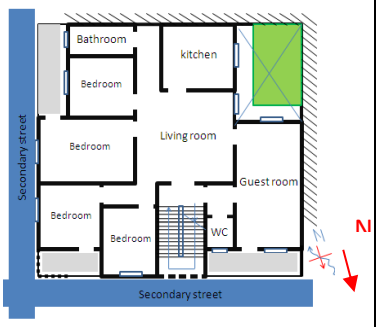
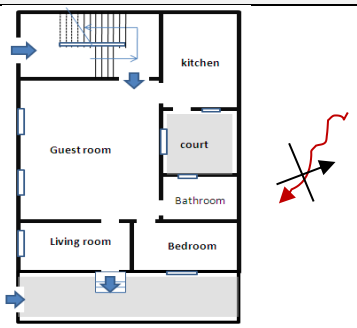
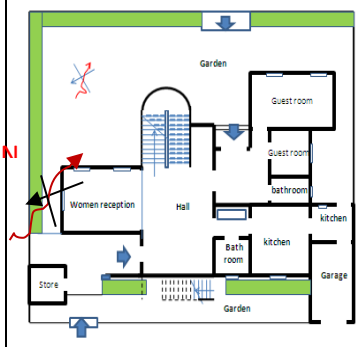
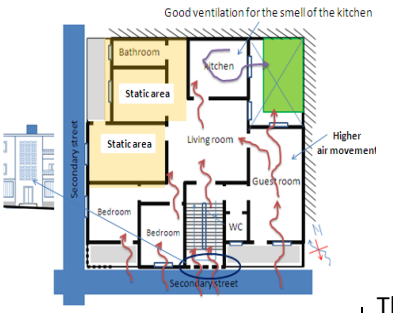
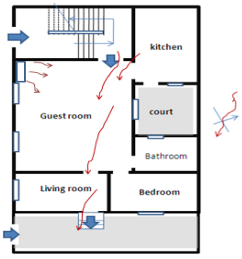
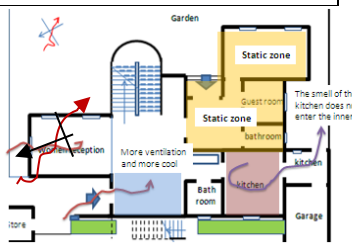
	Case Study House one	Case Study House two	Case Study House three
The structure			
	-Modern style that was built in 1970`s -It has two apartments -It has service courtyard -Concrete structure system Consists of concrete columns, roof and floor. while the walls are built by Concrete Blocks which covered by cement mortar *	-Modern style -Outward openness -The curt has only a service function -It has four apartments -Concrete structure; Consists of concrete columns, concrete roof and concrete floor. *	-Modern style with garden and high wall -Two floors (Villa) -Same concrete structure system
Ventilation and cooling			
	Good ventilation due to air flows through windows and stairs	The air conditioner is used for cooling, and the users don't comfortable with the ventilation of the rooms because the kitchen fumes enter to other spaces.	The spaces overlooking the northern and northwestern façades are characterized by good ventilation. While the southern rooms are semi-static.

Table 1 Analysis and Result (continued)

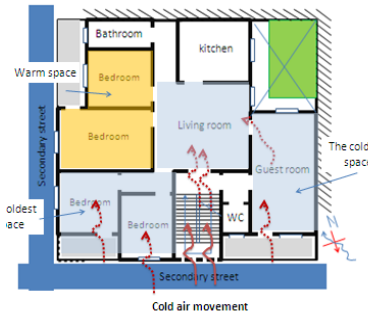
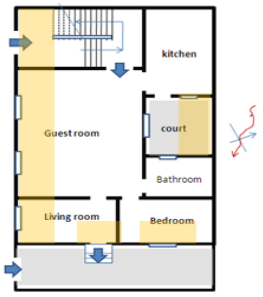
	Users opinion about comparing between contemporary housing and traditional housing		
Users opinion	▪ Users thought that; contemporary housing is better than traditional housing, because the stairs hall helped to provide good ventilation in north façade.	▪ Users thought that; traditional housing is better than contemporary housing because rooms of traditional housing were cool in summer. The wood materials that was used for roof and the thickness of walls, which has good for in insulation helps to cool the room.	▪ Users thought that; traditional housing is better than contemporary housing because, the courtyard and its Local materials helped to create a good system.
Heating	 Cold air movement The movement of cold air creeps through the gaps of doors and windows help to make the rooms very cold	 However, routing to the south provides warmer spaces that allow the sun to enter in the winter, so users prefer the warmer of the traditional house due to thermal mass of the local materials which was used at the time.	 The traditional house is better than the contemporary house in the heating system due to the good insulation of the structure and local materials

Table 1 Analysis and Result (continued)

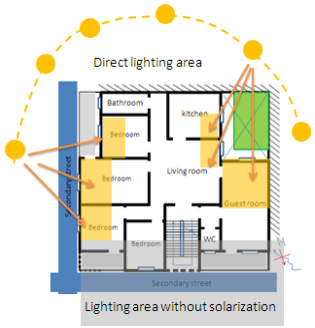
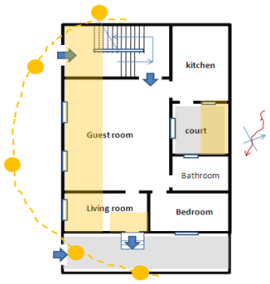
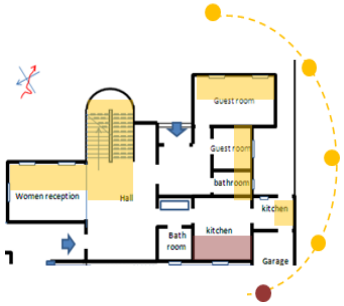
Users opinion	**Users opinion about comparing between contemporary housing and traditional housing**		
	Users said that rooms of the traditional housing were warm in winter, and the traditional house is better than contemporary housing.	Users said that the traditional housing is better than contemporary housing in heating system.	Heating system in traditional housing is better than contemporary housing.
Lighting	Natural lighting  Contemporary housing has a good natural lighting during the day time	Natural lighting  Although all the space gets direct solar radiation, users prefer the lighting provided by the inner courtyard	Natural lighting  All rooms have a good share of sunshine.
Users opinion	**Users opinion about comparing between contemporary housing and traditional housing**		
	Both of housing have a good daylighting.	Users said that the traditional housing is better than contemporary housing in providing heating system.	the traditional housing is better than contemporary housing

Table 1 Analysis and Result (continued)

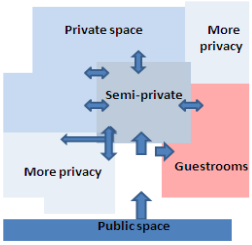
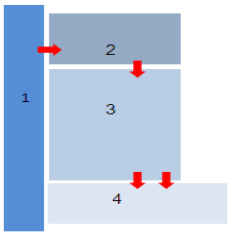
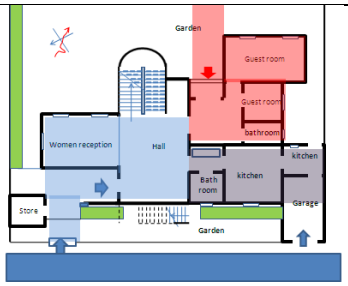
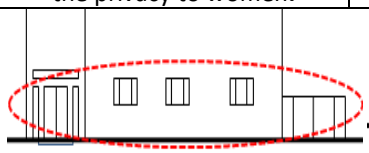
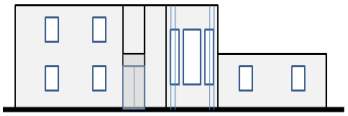
Privacy	 The users prefer this system in the functional distribution of rooms	 Incorporate in the privacy of space, and it had a good privacy in spaces as users said.	 Space for men Space for women Service space
Users opinion	▪ Users do not prefer the privacy of traditional housing ▪ The reason for that answer; The privacy of the rooms is not good	▪ Users prefer the privacy of the traditional housing more than contemporary housing. ▪ The reason for that answer**; they** like to sit in courtyard as it provides the privacy to women**.**	Users prefer a traditional house privacy more than a contemporary house.
Security	  The north facade is safe, but the east facade is not because the terrace is low and unprotected	  The contemporary housing more safe than traditional housing as users said.	  High wall and Low windows with protection
Users opinion	**Users opinion about comparing between contemporary housing and traditional housing**		
	the contemporary housing was not safe.	Users opinion that, the contemporary housing is safe more then traditional housing.	contemporary housing is safe

Table 1 Analysis and Result (continued)

Result	**According to the users' answer;** ▪ The traditional housing has good lighting and heating system. ▪ The contemporary housing has good ventilation and cooling. ▪ The ventilation is excellent as well as the rooms are cooling all summer time in contemporary housing more than traditional housing. In winter the contemporary housing is very cold. ▪ Users prefer contemporary housing to live in more than traditional housing ▪ The users do not prefer housing with courtyard, while they prefer house with an outdoor balcony, because the yard brings dust.	**According to the users' answer;** ▪ The contemporary house has bad ventilation and is considered as dark spaces as users said. ▪ Users prefer to live in traditional houses more than contemporary houses ▪ The only reason to demolish the traditional building is that; inability of traditional building to vertical expansion.	**According to the users' answer;** ▪ Traditional housing better than contemporary housing in lighting, ventilation, cooling and heating system. ▪ The reason for good indoor environment as user said is that; building materials and courtyard ▪ The traditional house is better than the contemporary house in terms of privacy. ▪ There are no disadvantages of the traditional house except the inability of the house to add new floors. ▪ Users prefer to live in traditional housing with courtyard. Users understand the important role of courtyard after they moved to contemporary housing

4. MAJOR FINDINGS AND RESULTS

The findings are divided into two; i) the findings gathered from questionnaire and ii) the findings gathered from case study as presented in the following;

4.1. Major findings in Questionnaire This study highlighted the problems associated with contemporary and traditional Libyan houses in hot humid regions. In this case, the environmental problems have been identified in relation to four important elements: natural ventilation, cooling, heating and lighting. Moreover, the social problems were also addressed in two parts of privacy and security; finally identify the economic problems of water and electricity shortages. As a result, the questions covered all the previous factors and the finding presented the housing issue that users have faced as;

I. Most houses are not warm in winter; therefore, people are heating their spaces by means of electrical boilers with an average of 75%in AP, 80% in TH and 75 %in V).

II. The poor of cooling systems made people depend on electrical energy (90% of users in TH are using air conditioning to cool their spaces, 60% in AP, and 80% in V)
III. The lack of electricity made users dependent on small generators with an average (40% in TH, 97% in AP, 80% in V).
IV. The problem of privacy and safety resulted in people creating numerous solutions, such as high walls, covered windows and balconies. All solutions (90% of covered windows in TH, while these solutions have been done with an average of (65% in AP and 55% in V).

As consequence users in contemporary housing are suffering from poor cooling and heating system, therefore they depended on air conditioning which led to high energy consumption. The contemporary house does not provide the required of privacy and safety therefore, users develop solutions to meet their needs of privacy and safety such as, high walls that surrounding their housing, covered balconies and they do not open the windows during the day. Moreover, they need alternative solutions of providing electricity and water especially during a period of civil war.

4.2. Major findings in case study housing: In this study, houses were analyzed for people who lived in traditional houses then moved to contemporary houses (*They have the experience of living in two types*). Through analysis the contemporary houses, many important points were concluded in the system of lighting, ventilation, cooling and heating and other factors. The traditional houses were also compared with contemporary houses to identify the reasons for why users choose their answers, thus results summed up as the follows;

I. Contemporary housing has poor design in creating a suitable environment in terms of natural lighting, ventilation, cooling and heating system. Users answered depending on the comparison with their traditional houses, except one house (case study housing one which provided good ventilation and cooling in the summer as mentioned before.
II. Therefore, users rely on air conditioning to provide cooling (except one house) and electric heater to provide heating, which means consumes energy to provide comfort to users.
III. The lighting is acceptable for the users of contemporary houses, but they claimed that it is less than the lighting level in the traditional house.
IV. They need to solve the problem of privacy rather than provide safety for the contemporary house.

As a result of case studies, environmental problems exist with poor design of lighting, ventilation, cooling and heating system. On the other hand, there are problems as the social issue related to providing privacy and safety system. Finally with issue of lack of water and electricity, users need solutions for solving these problems and reduce their suffering.

The identification of environmental, social and economic issues comprehensively helps to develop effective solutions in future studies, as well as for the designers to reduce these problems in their future design if they consider. It is obvious that the right solution depends

on the right diagnosis of the problem. For future work, the authors will develop a guideline which includes sustainable solutions to the environmental, social and economic problems of the contemporary houses in the hot humid climate.

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Eman Atti Sasi graduated from University of Omar Mukhtar, Derna, city, Libya in 1997. She worked as teacher in High Institute in Engineering Department between 1999-2002. She was an Assistant Professor at the University of Omar Mukhtar in 2002. Completed her MsC in Istanbul Cultural University between 2003-2007 in Istanbul, then worked as a Lecturer in the Department of Architectural Design and Urban Design between 2007 -2013. She has 3 books published, (all books relate to university lectures that benefit the student in landscape architecture, urban design and Summary of Master's Thesis) The second edition will be republished next summer. Now she is PhD student at ÇANKAYA University from 2014.

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Her scholarly interests cover sustainable architecture, ecological design theories, performance evaluation and building simulation. She has a substantial track record in improving the energy performance of buildings, and deep knowledge of performance assessment strategies that may be used in the building process. Her research has been focused on performance evaluation techniques (particularly building performance simulations), improvement of performance evaluation during design process, and exploring integration possibilities of performance simulation tools into design process. Regarding the pursuit of improved energy performance, she has published a range of papers published on the subject of the robustness of low-energy design, and the prospects for improving the process by implementing sensitivity analysis. She participated in several national and international research projects as a “senior expert” in the related field.