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"Architectural Sustainability in Kuwait: A case study of Traditional House Architecture"

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Abstract:

Traditional architecture is the global trend that designers from all around the world are following. Kuwaiti traditional house is the result of the cultural and environmental conditions in Kuwait in the past that could not be avoided. It owns a lot of features including; social, environmental and economic impacts. In this study, Al-Bader house was taken as a case study for a traditional house where the features were analyzed besides a statistical analysis that was conducted for the opinions of both architects and local occupants in Kuwait.

Keywords: Architectural Sustainability, Traditional house, Kuwait.

1. Introduction

Recent advances in different fields such as design and construction have caused far reaching changes to the globe. This has had a negative effect on the surrounding built environment. In its part, architecture has a tremendous role in shaping the local environment and also plays its part in causing consumed resources and waste and emissions released.

Architectural sustainability is concerned with the importance of varying the manner people build and live in related to the surroundings. The goal is to reduce the buildings negative environmental effect by moderation and efficiency in the use of development space, materials and energy through efficient use of renewable as well as natural resources with no disturbing the environment or harmful the nature.

Long ago, natural resources for example earth, sun and wind were used to protect mankind as the building covering was the most important component used for protection as of the severe climate. Dependence was on passive energy and natural resources. Passive energy is involving utilization of the natural energy basis for economical reasons, environmental and healthy within buildings.

In Kuwait, local conventional buildings face challenges during adapting the concept of architectural sustainability. Integrating modern building methods and materials that are environmentally friendly as well as keeping cultural identity is a task that the Architectural Engineering Construction (AEC) field must confront.

The study is concerned on identifying the potential of architectural sustainability characteristic in one kind of traditional building: house in Kuwait.

The researcher will address the different areas pertaining to architectural sustainability in local Kuwaiti houses. These areas include (Sustainable location advance, Water usage, Energy effectiveness, building materials as well as Indoor environmental superiority) these are considered the main elements and techniques to achieve sustainability.

The methodology used in this study will include a questionnaire for architectural designers and the building occupants. Also a case study will be utilized to achieve more substantial data.

2. Literature review

2.1 Overview

Kuwait has gone throughmany transitional events all along its history like a nation-state. The oil discovery in Kuwait in the year of 1938 is one of these main transitions, which resulted in social, economic, architectural, and political transformation. The oil discovery played a key role into setting Kuwait's political importance, future developmental strategy and economical affluence. The consequence was a rapid country revolution from alittle medieval Sheikdom into a modern state (Mahmeed, 2007).

In Kuwait, an important consideration which featured within the elder houses design was affording privacy as well as security during the light for the division of women as well as men like a cultural thought. Furthermore, houses were divided to a pair of divisions: one for men in front of the street, and the additional is isolated also setback to women (Mahmeed, 2007). Thecourtyard was observed as a significant environmental and social component within conventional houses Kuwaiti. Courtyards have a character during the house structure during the courtyard functionality within cultural situation (Lewcock, (1978); Al-Bahar, (1984); Al-Bahar, (1985)). The courtyard implementation that was seen like an architectural creativity

symbol within sustainable plan has been discarded during Kuwait ever since the fourteenth century in favorite of international manners.

2.2 Sustainable design

Thesettings in that human life is taking place and attract the architecturalimportance that is extremely changeable culturally. It is significant to identify which environment elements or features are important. Those important elements have to be exposed, not assumed (Rapoport, 1999).

There are a lot of indicators of sustainable building plan. Amongst these (Smith, 2001); a) Making sure that the management systems of the building are not over-complex and user friendly, b) Reducing the utilize of the fossil supported energy when the energy made during the material, construction as well as transport procedure as well as energy utilizing through the lifetime of the building, c) Identifying opportunities for create onsite renewable electricity, such as Building Integrating Photovoltaic (BIPV), d) Creation greatest utilize of active or passive solar energy as using cooling /heating structures that are fine adjusted for the occupants requirements through air conditioning utilizing only in extraordinary circumstances.

2.3 Sustainable environmental context

There are a rising number of the researchers, from different disciplines, whose purpose is to expand methods to attain a sustainable environment. Since the seventeenth century, researchers from several fields have had an extensive standing interest within different traditional buildings features; on the other hand, there is a nonattendance of methodical study to the relationship among sustainability and traditional buildings. This paper is dealing specifically through the next five areas (Alkhalidi, 2013):

- To focus on a number of features, that are determined through various factors, as well as economic, social, cultural and religious aspects, that reflect authentic local architecture in addition to its relationship through a sustainable environment;
- The meaning of the traditional buildings during communicating its identity and authenticity, focusing on several traditional buildings components like a medium of determining the physical surroundings, how they are understand, associated or combined with each other as well as how they form the performance of the consumer;
- The relationship connecting the traditional buildings, mainly dwellings and homes, and sustainability. Subjects explored during the section contain: how people use and perceive their home, the form of family space, and how many architectural features replicate the social position;
- During the analysis and description of the architectural features, it will be focus on that the traditional buildings, converse the residents' private attributes in addition to cultural characteristics for example ethnicity, social status plus family values.
- The connection between sustainability and traditional buildings is interpreted in a different way, according to the culture, social status and the time. The findings supply a conceptual framework to considerate the cultural classification of sustainability and traditional buildings.

2.4 Kuwaiti traditional house

The suggestions and symbols enclosed within the conventional Kuwaiti house art were not an accident. Al-Wail (2003) stated that desert character, its unkind being as well as human happening were the modest Kuwaiti craftsman considers whose remembrance was tattooed via the merciless desert environment; it is ardent heat and unkind sun. Al-Wail required comfort during the pleasant dark sky through its moon in addition to stars, moreover drew of them bright symbols which he competently abilities during his unspoiled nature and the medium of his hands. The corresponding impression is expressed through the entire selection of native Kuwaiti art that assisted via its contact during neighboring cultures, controlled for beautifully imprison the reaction of the environment and neighboring nature in addition to represent the method of life of people.

The traditional Kuwaiti house is described through its uncomplicated plan which fits completely to the limited surroundings. The configuration in addition to organization of interior room was contingent at the social as well as economic condition for Kuwaiti family living in it; although mainly houses had quite austere character obvious within their basic as of the exterior. During the indoors, the concept is obvious within the uncomplicated geometric forms implementation, the local flora

drawings and several engravings without representations of living things and humans as this is not allowed in Islam (Alhazim et al., 2013).

The traditional Kuwaiti house really appreciated the traditions, local society plus standards drawn from the teachings of Islam and from old wisdom. One of the distinguishing characteristics is the sheltering in addition to the protection it gives for the solitude of the residents and the interior atmosphere that is intended to be into obvious contrast with the external environment. This is particularly correct to the Women in the house, like the general Islamic teaching considerate in the area that women ought to remain in so far as probable for the house also just depart it while there is not an additional option. In addition, they must be protected as of strange male look, as well as the guests (Wali, 1990).

Therefore, the concentration on the house was to the internal. That required stability connecting the strict require to confidentiality, particularly females' moreover Islamic as well as the Arab obligation for the kindness. This was attained during the separation of the courtyard addicted to dissimilar places of changeable capabilities open of single or numerous sides on different rooms, moreover given that open however divided spaces of female as well as male occupants for equally exist as well as receive visitors (Alhazim et al., 2013).

2.4.1 Architectural elements of the traditional Kuwaiti house

Traditional Kuwaiti house architecture was for a great degree spontaneous as well as improvised because of the need for scientific proficiency in addition to the important reliance at local as well as instinct skills obtained during continuous performs. Little financial capability as well as the restricted resources obtainable locally to structure had their state of the architecture environment. In spite of, that was a victorious instance of a structure that fixed completely in the merciless desert weather in addition to reacted adequately on the essential require of the residents (Abdullah, 1986).

During the opinion of the researcher, the traditional Kuwaiti house rudiments are consequently the creation of the interaction connecting the occupants, the social surroundings and the natural environment. The architectural information was all formed in reaction and as a result to the unfriendly natural surroundings. Rudofsky(1964) confirmed that the largest part of the conventional houses are the theoretical plus the practical reaction for human interaction through the surroundings, moreover that these conventional houses were constructed with no architects within the modern sense, that indicates devoid of the precise as well as strict recent architectural system. The traditional Kuwaiti house specificity lies precisely within this improvised, spontaneous and unsophisticated form of building thatdemonstratedin the next sections.

2.4.1.1 Courtyard

The internal courtyard is ordinary architectural components create in the majority early civilizations for instance Rome, very old Egypt and Western Asia. Distinctiveness of the Islamic internal courtyards is the truth that they appeared like an architectural reaction as well as implementation of the Islamic principles that control introversion as well as modesty. The Islamic buildings were for imitating this restriction as well as form as bleak a difference as probable through the external circumstances. This environmental compare is one for the fundamental regulations necessary Islamic architecture; that is wherever the commencement of the interior courtyard formed from within the conventional Kuwaiti house (Dostal, 1970).

It was stated via Dostal(1970) that the courtyard is described as a house lung. It is certainly the most important passage to the citizens of the house, particularly females who hardly ever put foot exterior the house. That is the architectural standard which encourages the bashfulness supported via Islam, in addition to struggles for achieving compromise among the need to privacy within a house and the Arab hospitality. Traditional Kuwaiti houses the entire contained single or extra open courtyards within that were bordered with walls for delimitating the borders of a house in relation to the exterior environment in addition to neighbor's houses as well as drive the message which within those ramparts is a confidential room which no violated.

The internal courtyard was delimited via diverse rooms neglecting them completely by their windows as well as doors for stressing the need of privacy in addition for facilitating the association among different house divisions. The walls immediate a courtyard were generally relatively high thus they rather sheltered the house of dust and strapping winds that is an additional proof to the conventional Kuwaiti house great compatibility through the natural surroundings (Al-Azmy, 2000).

2.4.1.2 Wind towers

That is not possible for talking about the conventional Kuwaiti house with no mention of the very significant constructional component which is the 'Wind tower'. Wind towers were critical means to soften the contact to the desert's burning heat. Wind towers were moreover extremely tall or fairly tall, both expensively built or else presenting just the necessary essentials in addition to lastly they were moreover built from coral rocks or mud blocks but they the entire communal the ability to be strong, strong, regardless and stable of every extra decoration, they were very beautiful and eye charmed (Wahbi, 1987).

Usually, a wind tower were located at the house top moreover might reach in so far as 15 meters in high, moreover every house accustomed for containing single or extra towers conditional at the requirement in addition to the owner financial capacity. Two types were ordinary within the traditional Kuwait houses that are wind scoop in addition to wind tower (Alhazim et al., 2013).

Primary, wind tower is the cubic form also completely open as of all directions as well as capable for entrapping cold air during every way. The wind tower structure is involving wind approaching from single way as well as approaching the air within the room through unknown duct within the ramparts. Furthermore a hot air which was created inside the room as well as receptacle at the duct summit is free during the duct into contrary way which of an inlet ducts similar to a tube of the vent. When the wind way is changing, the wind way in going in a channel also escaping during the contrary way moreover varies. The force within the air that travelled within the channel increased speed, furthermore the air improved the velocity of a cold air flow incoming as well as transfers a hot air away shapes a cooler present within a room, as well as within this method the room is air habituated. Along with while the air exchange is not required after that the cover up of a wind tower is blocked (Alhazim et al., 2013).

Subsequent, the wind dipper is a rectangle character in addition to open as of just one way air flood. The wind dipper function was just for letting during the air as of exterior in addition to provide it into the rooms beneath although concealed channel within a wall. It is generally located through its unlock boundary in front of northwest or north sides for holding way air stream. Windows during the rooms must be reserved open thus that an air pressure presses on out a hot air inside a room during windows or the door, that is not required to the wind tower like the air inflow is pressed away during the wind tower (Al-Hajji, 2004).

They were the Persian discovery which establishes its manner to Kuwait during the deal in addition to economic relatives which the pair of countries accustomed for entertains among each other, in addition to during the relocation for several relatives which were living all the time the Persia coast moreover decided to resolve during Kuwait. Ever more, the wind towers turned into the essential Kuwaiti architecture component. The extremely name specified for these structures during Arabic: Bagdeer is coming as of Persian moreover means equally wind scoop in addition to wind tower (Alhazim et al., 2013).

Haider(1995) exposed that a wind towers set out more back during history than equal Persia. Traces about these constructions were establish that time reverse to an Assyrian time when the dynasty had increase its law above the greatest element at the Middle East following the Sumerian society in addition to the Babylonians in Hammurabi. That construction was as well create during Persia during Arg-E-Bam nearYazd. This premature shape was identified as wind dippers. It was essentially the tube which composed the air in addition to complete utilize of an exterior pressure for thrust it all along the mechanism; the air after that increased speed inside a tube also travelled downward into a rooms. These essential constructions were afterward residential to complicated wind towers.

3. Methodology

As stated earlier, the main aim of this paper is to address the different areas pertaining to architectural sustainability in local Kuwaiti houses. This aim will be achieved through both qualitative and quantitative analysis where the main features of a chosen Kuwaiti traditional house (case study) will be analyzed besides conducting a statistical analysis for the opinions of both the occupants and architectural designers among traditional houses.

3.1 Quantitative approach (Questionnaire)

In this part of data collection, two questionnaires were prepared in order to gather the information from both the specialists (architects) and from the users (occupants).

3.1.1 Participants

The participants in this study were a total of 50 local architects, 39 men and 11 women as well as 30 local residents 17 men and 13 women. The average academic level was B.A with a Kuwaiti nationality for both types of participants. Architects were mostly working in the construction and design field with a (72%) while the remaining was working in the design field. For the local residents, 88% of them were living in single houses and 12% of them in apartments.

3.1.2 Procedure

At first, the participants have completed a paper-pencil questionnaire gathering demographic information. Participants were asked to provide their own opinion in the form of a note at the end of the survey. For the local residents, the selection was random and depending on the acceptance of them toward such process. For what regards the architects, appointments were arranged with each office. At the start of the questionnaire, all the participants were asked to allocate their location and describe it. The data was collected from the questionnaire sheets and listed on an excel sheet in order to transfer it into SPSS software to be analyzed.

3.2.3 Study measures

The main study measures were the social, environmental and economic impacts as well as the main features of the Kuwaiti house. The Likert scale was used in the multiple answers.

3.2 Qualitative approach (case study)

3.2.1 Al-Bader House Overview

Bait Al Bader is an old Kuwaiti houses, which represents clearly the distinctive architectural style of old Kuwaiti houses in terms of its social, cultural, economic and climatic solutions. It also represents a distinctive style in relation to architecture planning and local building material.

Bait Al Bader is as well among the little traditional houses which survived the destruction of the elderly city. The house was constructed between 1837 and 1847 via Abdul Aziz in addition to Abdul Mohsin Yousef Al-Bader a pair of old Kuwait important merchants. It was tacked over through the National Council for Culture, Department of the Arts and Letters of Museums as well as Antiquities of the heirs of Al-Bader family. During 1976 it was utilized as a impermanent venue of the Kuwait National Museum furthermore now is the most important office for the musical heritage Department.

4. Results and Discussion

4.1 case study analysis

4.1.1 Sustainable site development

It is situated within the AlQiblah region (Al-Bader quarter) also neglects the Gulf western side. Bayt Al-Bader is the prime architectural instance depicting the economic and social lifestyle of the rich commercial family in the old Kuwait. Also it is during great condition because of the strong materials used within its construction that preserved it during the years.

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Figure 1: location of Al-Bader House

The development on the house was made in order to focus on the importance of such traditional house in the Kuwaiti context; the development was on the way to the northern side where the shaded and ventilated area is survived.

4.1.2 Water usage

The following figure shows the water well (yellow spot) on the plan of Al Bader house where it locates in the kitchen courtyard where most of water use exits. This wall or the Jelleb was an important water source establish in almost each house. It was frequently within the courtyard also provided generally salt water of a household cleaning in addition to washing services.

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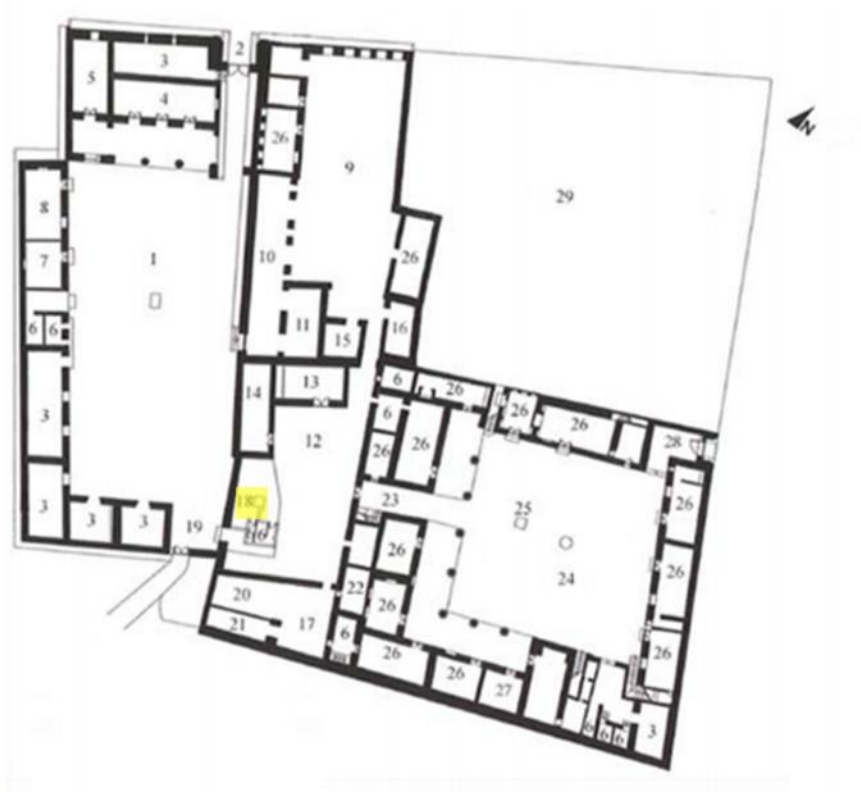


Figure 2: plan of Al-Bader House

4.1.3 Energy efficiency

Environmentally, the courtyard is creating a microclimate via bringing nature for the house heart and providing the cool shaded freedom. It also hands out like a buffer of sandstorms within harsh desert areas. The courtyard utilizes the land proficiently, that in turn is allowing for the energy conservation. The next figures illustrate the courtyard of Bait Al Bader.

Figure 3: courtyard of Al-Bader House

Figure 4: another view on the courtyard

Figure 5: trees at Al-Bader House

4.1.4 Building materials

Bait Al-Bader was constructed of adobe as well as Coral Sea rocks. Its ramparts are solid also painted by stucco. Significance beams were utilized within the ceilings that rise four meters. The following are the most important used building materials.

1- Clay
2- Coral stones
3- White cement

Figure 6: wooden door and use of white cement

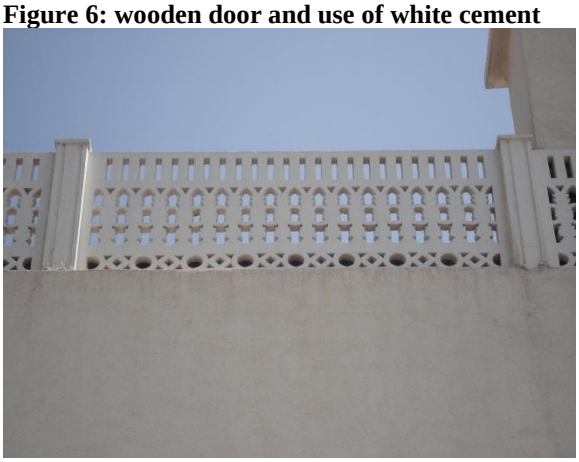


Figure 7: Coral stones

Figure 8: use of clay and white cement

4.1.4.1 The roof

As shown in the following figures, the next materials are what used in Bait Al Bader.

1- Chandal
2- Bascheel
3- Bowari
4- Mud layer
5- Plaster

Figure 9: roof structure

Figure 10: roof structure

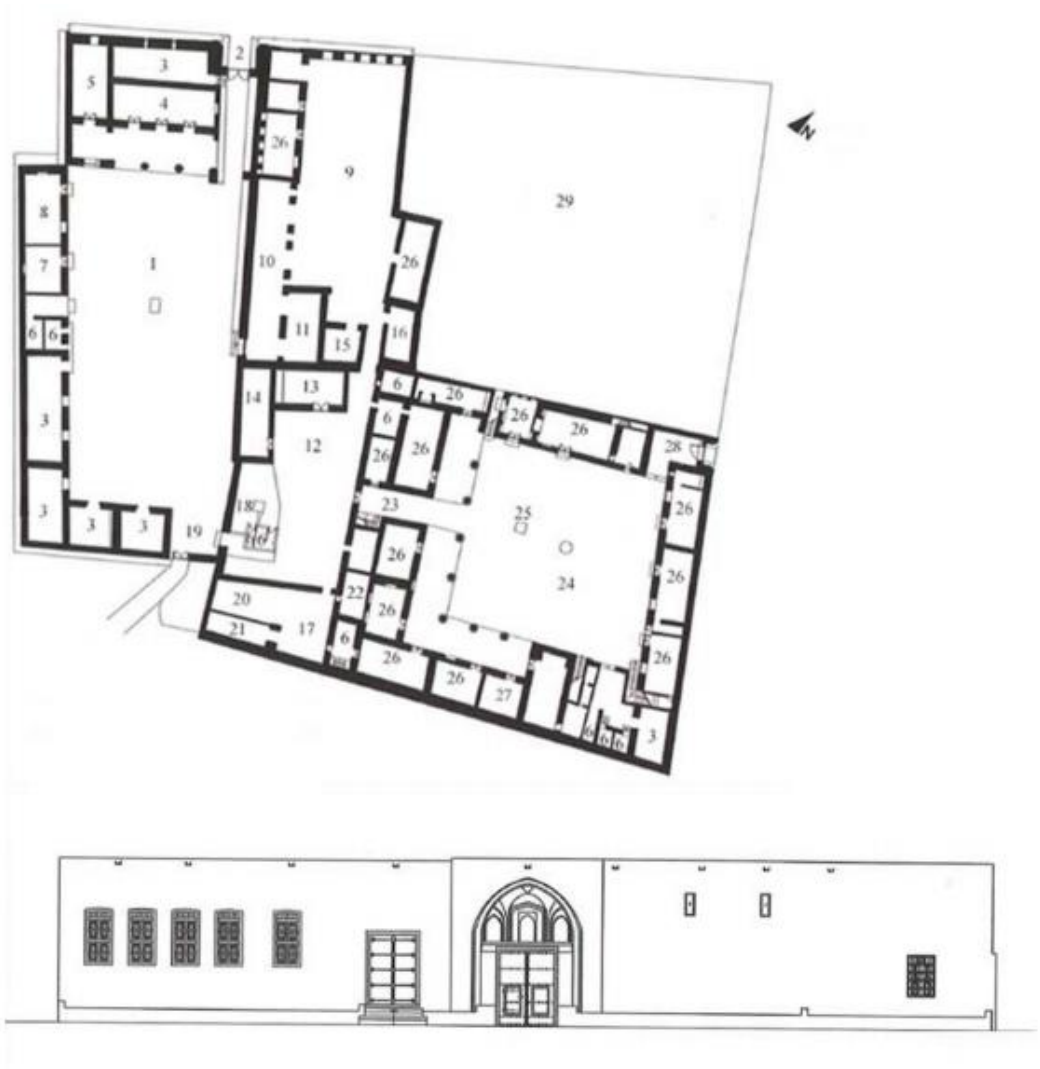
4.1.5 Indoor environmental quality

In this section, the environmental quality is existed in the used materials and the division of the house. The original design of the house consists of 5 open courtyards:

1- Men reception courtyard - housh al diwanyya
2- Women courtyard - housh al harim
3- Kitchen courtyard - housh al matbakh
4- Animal's courtyard - housh al ghanam
5- Business courtyard - housh al amarah

The existence of those courtyards at each part of the house creates what can be named as buffer zones for the shading, ventilation and natural lighting; it also takes advantage of all the natural environmental and climatic conditions.

There is a quantity of the remarkable architectural characteristics within this house. Initially, are the conventional doors intricate through wooden carvings so far modest during their welcome; next, is utilization of the curves that formed the Liwan (shaded hole adjacent for the courtyard) about divisions of courtyard. Lastly, the Bagdir or wind catches that channeled air during a beam cooling the internal of the rooms. The figure below shows the detailed plan of Bait Al Bader, followed by the façade of this house.



Key: 1. AlDiwaniya Courtyard 11. Dar AlDebs 21. Dar AlSaa'f 2. Main Entrance 12.Kitchen Courtyard 22. Dar AlRomad 3. Store 13.Kitchen 23.AlDereeb (corridor) 4.AlDarAlMoraba'a 14. Dar AlAeish 24. Women Courtyard 5.Dar um Deresha 15. Dar AlRaha 25. Well 6. Toilet 16. Dar AlTamer (Dates Room) 26. Bed room 7.Room 17.Goat Courtyard 27. Binding books room 8. Dar um AlLewaq 18.Water Well 28.Side Entrance 9.AlEmara 19. Back Entrance 29. AlSadu house 10. Horses stalls 20. Cow house

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4.2 Survey analysis

The answers of both of the architects and occupants were listed in the following two tables.

Table 1: answers of the local residents

		Strongly Agree	Agree	Uncertain	Disagree	Strongly disagree
Social impact	Your house is open on the outdoor environment	29	3	_	21	2
	The courtyard is a gathering place	5	2	1	42	_
	You can see all the elements of the house from a particular point	7	23	_	17	13
	The women and men areas are separated	3	1	_	31	15
	There is a high level of privacy at the house	26	2	1	21	_
	You can see the cultural impact in the house	_	23	5	27	1
Environmental impact	The roof is playing a significant role in the shading and ventilation part	2	12	_	30	6
	The courtyard is the place where the sun and wind are entering the house	6	17	_	22	1
	The trees in the courtyard play a significant role in the shading	46	2	_	2	_
	The house is comfortable to live in due to the ventilation process	_	12	3	_	35
	The walls and ceilings are isolated form the environmental conditions	14	27	1	8	_
Economic impact	The water well plays a major role in conserving the energy as it is playing as a cooler element	_	31	_	19	_
	The consumed energy for heating and cooling is conserved due to the passive cooling and heating	1	12	_	12	25
	The used materials in the house is available from local sources and relatively inexpensive	2	_	28	2	32

Main features of Kuwaiti traditional house		
	Yes	No
Is there is a courtyard in your house	32	18
Is there is a water well	37	13
Is there is an area for the animals	36	4
Is there is a wooden elements at your house	33	17
Is there is a division between men and women spaces	12	38

Table (1) above shows the answers of the local residents, the answers to the social impact questions were mostly disagreed on the positive social characteristics of the Kuwaiti house with a 23% strongly agree 18% agree 7% uncertain, 53% disagree and 10% strongly disagree. On the environmental impact, 27% of them were strongly agrees 28% agree 1% uncertain, 25% disagree and 42% strongly disagree. The results to the questions of the environmental impact were 2% strongly agrees, 31% agree, 28% uncertain, 22% disagree and 38% strongly disagree. For the answers related to the characteristics of the Kuwaiti house, 60% of the answers were positive and 40% of them were negative.

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Table 2: answers of the architects

		Strongly Agree	Agree	Uncertain	Disagree	Strongly disagree
Social impact	Culture is the main factor that influences the design of traditional house	48	1	_	1	_
	The courtyard is existed at the middle of the house	44	6	_	_	_
	There are problems facing the design of traditional houses in terms of clients acceptance	45	4	_	1	_
	Contemporary houses are influenced by the traditional houses design	20	30	_	_	_
	There is a high level of privacy at the house	24	25	_	1	_
	traditional vernacular elements should be used in the contemporary Kuwaiti house	50	_	_	_	_
Environmental impact	The roof is playing a significant role in the shading and ventilation part	3	46	_	1	_
	The courtyard is the place where the sun and wind are entering the house	16	17	_	16	1
	The trees in the courtyard play a significant role in the shading	48	2	_	_	_
	The house is comfortable to live in due to the ventilation process	5	42	_	3	_
	The walls and ceilings are isolated form the environmental conditions	15	25	_	10	_
Economic impact	The water well plays a major role in conserving the energy as it is playing as a cooler element	1	44	_	5	_
	The consumed energy for heating and cooling is conserved due to the passive cooling and heating	3	39	_	8	_
	The used materials in the house is available from local sources and relatively inexpensive	14	31	_	17	_

Main features of Kuwaiti traditional house		
	Yes	No
Do you believe there are problems facing the contemporary Kuwaiti house	33	17
Do you include traditional Kuwaiti vernacular elements in your house designs	40	10
do you think that environmental sustainability design is important	48	2
Do you think of using the local materials in your designs	39	11
Are you taking into consideration the privacy and the nature of Kuwaiti resident when you design a new house	45	5

Table (2) above shows the answers of the architects, the answers to the social impact questions were mostly agreed on the positive social characteristics of the Kuwaiti house with a 77% strongly agree 22% agree 0% uncertain, 1% disagree and 0% strongly disagree. The environmental positive impact was also 34% strongly agrees 52% agree 0% uncertain, 12% disagree

and 0.4 % strongly disagrees. The answers to the economic impact were 12% strongly agrees 76% agree 0% uncertain, 2% disagree and 0% strongly disagrees. For the answers related to the characteristics of the Kuwaiti house and the architects' tendency toward using traditional techniques in their design, 82% of the answers were positive and 18% of them were negative.

4.3 Discussion

The traditional Kuwaiti house owns a set of positive characteristics that distinguish it from the contemporary designs; for instance, the passive cooling and heating and energy conservation. Using the local materials is also one of the distinguished features of traditional houses that effect on the economic situation.

The acceptation of local residents toward living in traditional houses is a matter of study. From our study, it was noted that most of the residents do not even have a clue about what traditional house is about, they were in general unaware of the social, environmental and economic impact. This result can seriously have an effect on their acceptance in living in such houses.

For what regards the architects and designers, traditional house was a familiar concept, which indicates that universities and higher education is still engaged in studying the traditional approach. The wiling of architects toward designing such houses is a promising step.

5. Conclusions

This study came up with the following conclusions:

1. Kuwaiti traditional house has a great impact on the social life of Kuwaiti people where it is influenced by the culture, has privacy, gathering place (courtyard).
2. The environmental impact of the Kuwaiti house can be seen in passive cooling and ventilation, energy savings and shading.
3. The use of the local materials in building the traditional Kuwaiti house is one of the major economic impacts
4. The water well, animal's house and courtyard are some of the main features of Kuwaiti traditional house.
5. There is a matter of acceptance toward traditional houses by residents, while architects and designers have another opinion.

5.1 Recommendations for future work

This study could contribute on building a new framework to study the status of traditional trend in Kuwait. The future studies can contribute on this matter by considering new measures to be studied and evaluated in order to come up with more reliable recommendations.

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"الاستدامة المعمارية في الكويت: دراسة حالة للعمارة المنزلية التقليدية"

إعداد الباحث:

فيصل العتيبي، الهيئة العامة للتعليم التطبيقي والتدريب، الكويت

الملخص:

العمارة التقليدية هي الاتجاه العالمي الذي يتبعه المصممون من جميع أنحاء العالم. البيت الكويتي التقليدي هو نتاج الظروف الثقافية والبيئية في الكويت في الماضي والتي لا يمكن تجنبها. وهو يمتلك الكثير من المميزات بما في ذلك؛ التأثيرات الاجتماعية والبيئية والاقتصادية. في هذه الدراسة، تم اختيار بيت البدر كدراسة حالة لمنزل تقليدي حيث تم تحليل المميزات بالإضافة إلى تحليل إحصائي تم إجراؤه لآراء كل من المهندسين المعماريين والسكان المحليين في الكويت.

الكلمات المفتاحية: الاستدامة المعمارية، البيت التقليدي، الكويت.