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THE IMPACT OF SOCIO-CULTURAL FACTORS ON THE
FORMATION OF TUTI ISLAND HOUSE- SUDAN

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MASTER OF SCIENCE THESIS

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**THE IMPACT OF SOCIO-CULTURAL FACTORS ON TUTI
ISLAND HOUSE- SUDAN**

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Bayan Yousif Omer ELBASHIR

Signature



Dedicated

To my country Sudan

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The Impact of Socio-Cultural Factors on Formation of Tuti Island House- Sudan

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Department of Architecture

Master of Science Thesis

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Cultures and lifestyles develop in accordance with the trends of globalization and technological progress in the world, so some cultures disappear, while new ones appear with different features. Recently, most people are adopting new cultures, forgetting their original and traditional cultures, which affects individuals' identity and roles in society. Besides, this influence can extend to their houses and environment, and researchers in this field believe that people's culture can be reflected through their buildings and the structures of their urban settlements. Since ancient times, architecture has been a means of embodying the culture of different peoples through houses and the way they are organized; The lifestyle of its inhabitants and their traditions can be imagined. In Sudan, ethnicities differ, and cultures and traditions are diverse, but with the colonial movements in Sudan, Western cultures began to spread in it, which led to a change in the elements of Sudanese culture; This, in turn, included a change in the systems and forms of

houses in Sudan. The research aims to study the relationship between cultural and social values and the formation of traditional homes in Sudan. The houses in the study area have a traditional style and clear cultural values, and their community is characterized by social unity. This research used the descriptive-analytical method to study household models and used data collection techniques such as interviews and questionnaires. The results showed that culture and social life affect several aspects, such as the family structure, privacy, the role of women, and social interactions, and their effects were reflected in the formation of home spaces on Tuti Island. The result also addressed the fact that the house spaces were designed in accordance with the beliefs and values of Sudan. Finally, the research called for preserving Sudan's heritage, which includes the architectural features of the forms of houses. In addition, The study sought to set rules that would protect Sudanese concepts and values of the culture in Sudan. Besides, the research encouraged researchers to enhance their efforts in social and cultural sustainability issues.

Keywords: Culture, social life, house formation, privacy, family.

Sosyo-Kültürel Faktörlerin Tuti Ada Evinin Oluşumuna Etkisi- Sudan

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Kültürler ve yaşam tarzları, dünyadaki küreselleşme ve teknolojik gelişme trendlerine göre gelişir, bu nedenle bazı kültürler yok olur ve yenileri farklı özelliklerle ortaya çıkar. Son zamanlarda, çoğu insan toplumdaki kimliğini ve rollerini etkileyen özgün ve geleneksel kültürlerini unutarak yeni kültürler benimsemektedir. Ayrıca bu benimseme, insanların konutlarına ve çevrelerine kadar uzanabilir. Bazı araştırmacılar, insanların kültürünün yapılar ve kentsel yerleşimler aracılığıyla yansıtılmış olabileceğine savunmaktadır. Antik çağlardan beri mimarlık, farklı halkların kültürünü, konut ve organizasyon biçimleriyle somutlaştırmanın bir aracı olmuştur; Konut sakinlerinin yaşam tarzları ve gelenekleri tahmin edilebilmektedir. Sudanda etnik kökenler, kültürler ve gelenekler çeşitliliğe sahiptir ve bu çeşitlilik Sudan'a özgü bir kültür oluşturur. Fakat Sudan'daki sömürgeci hareketlerle birlikte Batı kültürleri yayılmaya başlamış ve bu da Sudan kültürünün unsurlarında bir değişikliğe yol açmıştır;

bunun sonucunda Sudan'daki konut sistemlerinde ve biçimlerinde değişiklikler oluşmuştur.

Araştırma, Sudan'da kültürel ve sosyal değerler arasındaki ilişkiyi ve geleneksel evlerin oluşumunu incelemeyi amaçlamıştır. Çalışma alanındaki evler geleneksel bir tarza ve belli kültürel değerlere sahiptir ve toplulukları sosyal birlik ile karakterizedir. Bu araştırmada ev modellerini incelemek için tanımlayıcı-analitik yöntem kullanılmış, görüşmeler ve anketler gibi veri toplama teknikleri kullanılmıştır. Sonuçlar, kültürün ve sosyal yaşamın aile yapısını, mahremiyeti, kadınların rolünü ve sosyal ilişkileri etkilediğini ve bu etkilerin Tuti Adası'ndaki konut alanlarının oluşumuna yansıdığını göstermiştir. Ek olarak, ev alanlarının Sudan'ın inanç ve değerlerine uygun olarak tasarlandığı gerçeğine de değinmiştir. Son olarak, araştırma, ev biçimlerinin mimari özelliklerini içeren Sudan mirasını koruma çağrısında bulunmuştur. Ayrıca, çalışma Sudan'daki kültüre ait Sudan kavramlarını ve değerlerini koruyacak kurallar koymaya çalışmıştır. Ayrıca araştırma, araştırmacıları sosyal ve kültürel sürdürülebilirlik konularındaki çabalarını artırmaya teşvik etmiştir.

Anahtar Kelimeler: Kültür, sosyal yaşam, ev oluşumu, mahremiyet, aile.

1

INTRODUCTION

1.1 Literature Review

The word culture is one of the words used in different contexts, which is difficult to define it because it has enormous meanings. According to Malinowski, culture is a system of several components, including particular beliefs and behaviors [1]. As for White, a culture is a tool that helps individuals to shape and create their values and beliefs. He also gave another definition of culture [2]: *"It is a comprehensive system of knowledge, habits, and other things which man receives together."* Copley emphasized culture as the values held by members of particular societies, and in his view, culture is often associated with the lifestyle and habits of members of a specific society. As for society, it refers to a system of interrelationships related to those who share a common culture [3]. The society is also a word that carries several definitions, and from Cope's point of view, *"it is a kind of social harmony, and this closeness can be a region, a family or a tribe,"* and the "society" in its meaning may refer to a particular social class, such as high classes of society or some religious sects [4]. Also, it has requirements that must exist, such as living as one unit in a particular area, in addition to having their own relationships and laws. Chinoy underlined that societies, in general, possess social systems with characteristics, the most important of which are interdependence, cooperation, and the strength of social connections among them [5].

With regard to the relationship between society and culture, Gill asserts that culture must be able to integrate and emerge, and there is no culture without society, and the culture could be affected by society's beliefs, ideas, and values [6]. The way of life of society could be defined as culture and is also the outcome of the relations of that society. It varies between communities because any society

has different identities and elements. Besides that, it could express the history and origins of a society as it is considered a transmission from one generation to another, and when it moves, it could acquire additional new characteristics. Culture consists of several components: the language, aesthetics, and attitudes of individuals, religion, and social relations. These components play a fundamental role in scientific explanations of daily human reality because they are essential in social reality [7]. The traditions that exist in societies are the transmission of social and cultural beliefs and customs between generations, and the general concept of this word is taken from the Latin meaning *"a something headed over"* [8]. According to Nelson and Grabaum, tradition is *"what gives symbols, stories, and memories"* [9]. Every society in the world bears a characteristic or mark that distinguishes it from other societies [10]. Traditions are also considered customs, beliefs, actions, and civilizations that were inherited by humans or the successors of their ancestors. In the past, traditions were transmitted orally between individuals, and the word may refer to some artistic heritage or customs of societies and governments [11]. The importance of customs and traditions lies in forming the identity of individuals and strengthening the bonds between members of the same society and different generations [12]. Ekeh emphasized in his book that customs and traditions are among the most important factors that lead to the emergence of standards that create culture [13].

Many researchers have argued about the relationship of architecture with culture and society, the most important of which is Rapoport. He considered that architecture is a symbol and an indication of the existence of social-cultural relations and linked the sustainability of traditional architecture to the availability of cultures and traditions in society [14]. Some researchers have studied the relationships between culture, society, and architecture; In Barrie's view, the house is the place where people practice their customs and traditions. The house can be considered a place that provides a living and cultural space, whether it is for one family or several families [15]. Mallett considered the house as an essential space for cultural activity and social expression [16]. From Rapoport's point of

view, the houses are material artifacts bearing cultural characteristics in their features [17]. Errington also argued in this regard, asserting that houses are made up of symbols based on society's values and culture. He also argued that houses are symbolic of the universe through the arrangement of their spaces [18]. Mazumdar stated that houses carry a socio-cultural concept besides being originally a dwelling; also, he asserted that homes reflect morals, values, cultural beliefs, and social organizations [19]. Askarizad, in his study on the impact of culture on architecture, emphasized that the house is a picture of human behavior with his social and cultural environment [20]. Oliver also emphasized that and summarized the reflection of the culture in architecture in one sentence: *Settlement patterns could reflect the cultural and social structure of the region* [21]. Robbins asserted that by looking at a dwelling, the cultural background of its inhabitants could be identified: *"Only by endeavoring to understand the values of people can we get an insight into what shelter means"* [22]. Oliver confirmed the importance of studying the relationship between architecture, society, and culture, as he considered it necessary to meet the world's needs in the future [21].

In Sudanese studies, there are not enough references related to the subject of the impact of culture and social life on houses in Sudan, but there are studies in the region around Sudan, for example, Egypt; and there, the cultures are similar to the Sudanese traditions in the northern regions. One of the famous researchers in the field of traditional buildings and their relationship to the region's culture is Hassan Fathi, who expressed in his book "The Architecture of the Poor" that, The house in the Nubian region is a reflection of the Egyptian culture that exists in the region [23]. Petruccioli who discussed Hasan Fathy's works; he affirmed that it is necessary to achieve harmony between the physical architectural aspects and the socio-cultural values of individuals [24]. Moreover, El Sayed stressed that the features of the traditional house reflect the culture of its users [25]. In addressing the importance of the subject, Ahmed stressed in his article the importance of the social-cultural background to the user and its great impact on the satisfaction of the residents of the house [26]. Asante stated that the Nubians in southern Egypt

and northern Sudan had preserved the old constructions methods in an attempt to preserve the cultural heritage of the region, which confirms the mutual influence relationship between culture and architecture at the end of his study [27]. Salama, through his article, emphasized the impact of cultural and social changes on spatial transformations in courtyard houses [28]. In addition, Abdelkader confirmed that religious and social factors affect traditional houses in Egypt [29]. Architecture is a way of preserving peoples' heritage and culture, which Attia explained in his article, which dealt with the impact of heritage on interior architecture [30]. In her scientific paper, researcher Bassily explained the impact of cultural, social, and environmental factors, using local models of the built environment in Egypt. Through her analysis of these factors, she clarified the impact of each factor, whether environmental, social, or cultural, on homes and on the spatial distribution of buildings in neighborhoods. In addition, she analyzed the impact at the village level in the study area [31].

As for the impact of culture and social life on dwellings in other African countries, some studies dealt with this subject, including Mainan, who studied the influence of socio-cultural factors on the formation of homes in Nigeria using the Syntax theory and some selected models in his article. At the end of his study, he emphasized the impact of the factors on the composition of houses and housing in Nigeria [32]. In this regard, Ochapa adopted two research designs, namely survey research design and historical research, to answer his research questions related to the influence of Socio-Cultural factors on house form in Nigeria [33]. In Ikudayisi's article, the descriptive approach was used to explain the impact of African culture on architecture in various African regions, starting with the cultures of the pyramids in Egypt in the north to the customs of the Hausa tribes in South Africa. He also explained the importance of African culture, which is starting to fade away due to the rapid globalization movements in the world [34]. Among these previous studies was the need to conduct a study on Sudanese culture and life and its impact on architecture, because Sudan lacks studies that are concerned with this type. Most of the previous studies were descriptive studies

that followed the methodologies of case study and descriptive research in achieving the objectives of their study.

1.2 Objectives and the Purpose of the Study

In general, the study aims to identify and test the relationship between people's social and cultural aspects and the architectural form of houses in Sudan. Moreover, the research aims to find out how the spatial organization of these traditional houses is in harmony with the social and cultural system of the region. The purpose of this study is to examine the social and cultural factors that influence the formation of spaces in homes, and the objectives are as follows: (i) Revealing the social activities of the inhabitants living in the study area, (ii) finding out the culture and the traditions of case study's householders, (iii) understanding the formation of spaces and the organization of buildings in the study area (iv) and determining the social and cultural factors that affect the shape of their houses in the study area.

1.3 Hypothesis of the Research

Understanding built culture requires identifying the critical relationships between the cultural, social, and architectural aspects of an area. The study puts main hypothesis which is that the socio cultural factors influence the architectural formation of houses and the spatial organization of residential spaces in Sudan. The research will seek to prove this hypothesis through literary theories and methods. Careful and purposeful selection and analysis of related intangible cultures can explain the hidden characteristics of the island's built environment. Beside the main hypothesis the research has a sub-hypothesis which is the socio cultural factors could influence the formation of nuclear and extended family houses in the Island.

1.4 Scope of the study:

The research was initially studying the impact of culture on Central Africa in general, but the research faced many difficulties that prevented it from reaching

these countries. After that, a country from central Africa was selected, which is Sudan. it was decided to study the houses in the western region of Sudan, and for reasons related to the pandemic and the ability to reach the place of study, the field of study was changed to include the second proposal, which is the area of Tuti Island. As for the variable elements, they were more clearly identified. Instead of studying the impact of culture in general, the study identified the socio-cultural factors as variable factors in the research. This research is limited to the traditional Sudan houses and the socio-cultural characteristics of Sudan.

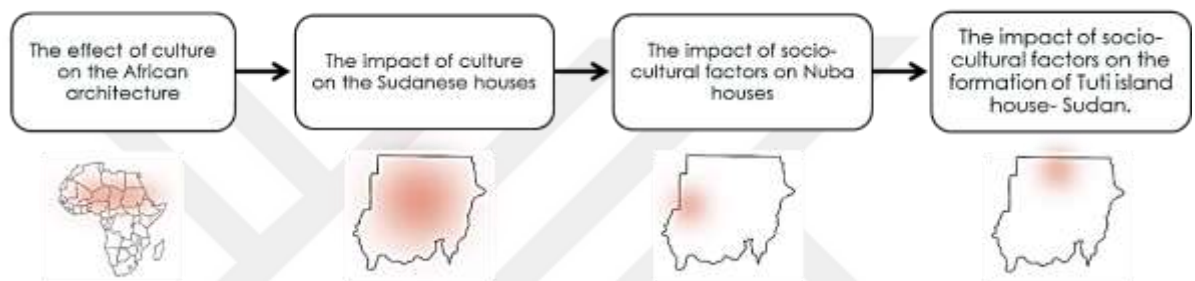


Figure 1.1 The thesis limitations

1.4 Methodology of the Research

This research is a case study research, and this type of research can be defined as an empirical research that explores a contemporary phenomenon of life[35]. The main purpose of this type of research is to describe and monitor a phenomenon that occurs in reality. Case study research can also be defined as a research approach used to build an in-depth and multifaceted understanding of a complex topic in a real-life context [35][36]. This type of research is used in a wide range, especially social research, and since the research depends on studying the impact of social relations and culture on an individual's house, this kind of research has been used to achieve the goal of the study. To examine the impact of the socio - cultural factors of Sudanese houses, the descriptive and analytical approach was used. The theoretical part was conducted on definitions and concepts related to socio cultural factors that affect houses. To obtain information and data about the study area, qualitative and quantitative research tools were used, such as a

questionnaire and direct interviews with householders on Tuti Island. In the spatial analysis section eighteen houses have been analyzed to give a general view about the houses in the island.

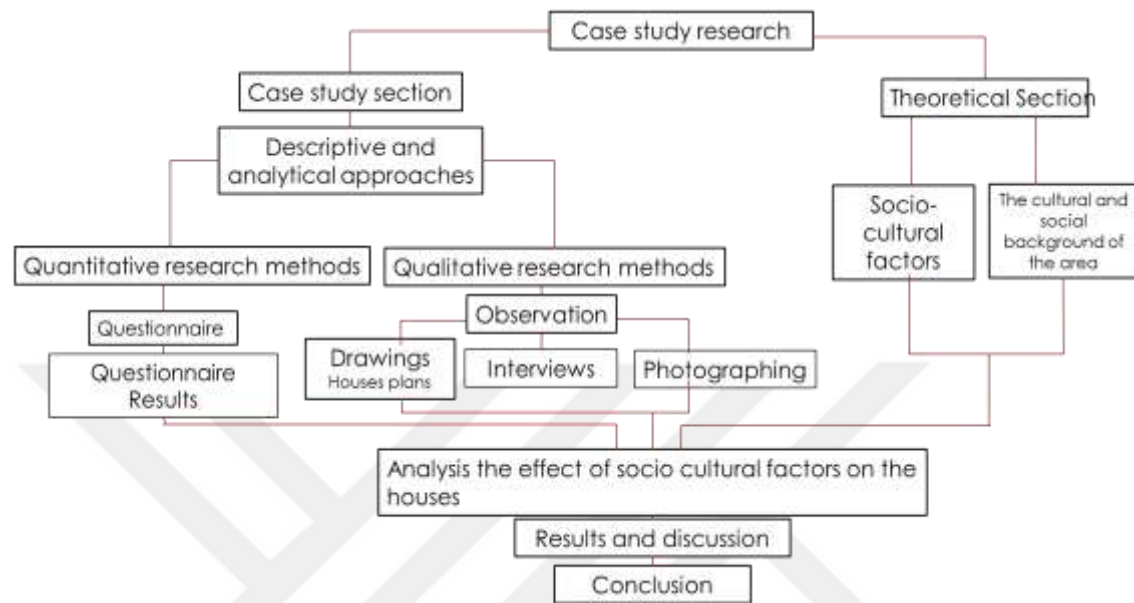


Figure 1.2 The thesis methodology

The field study was conducted to test the validity of the thesis hypothesis, and it tried to determine the impact of the socio-cultural factors on the formation of the house. The study results were compared with the help of evaluated graphs, and the results were obtained. Therefore, the study was shaped by data collection, analysis, synthesis, and results steps. With regard to the questionnaire form, it was designed based on the literary texts in the second chapter, and it contained five basic socio cultural factors: basics of needs, family structure, privacy, the role of women, and social interactions¹:

¹ The questionnaire sections will be detailed in the fifth section of the research.

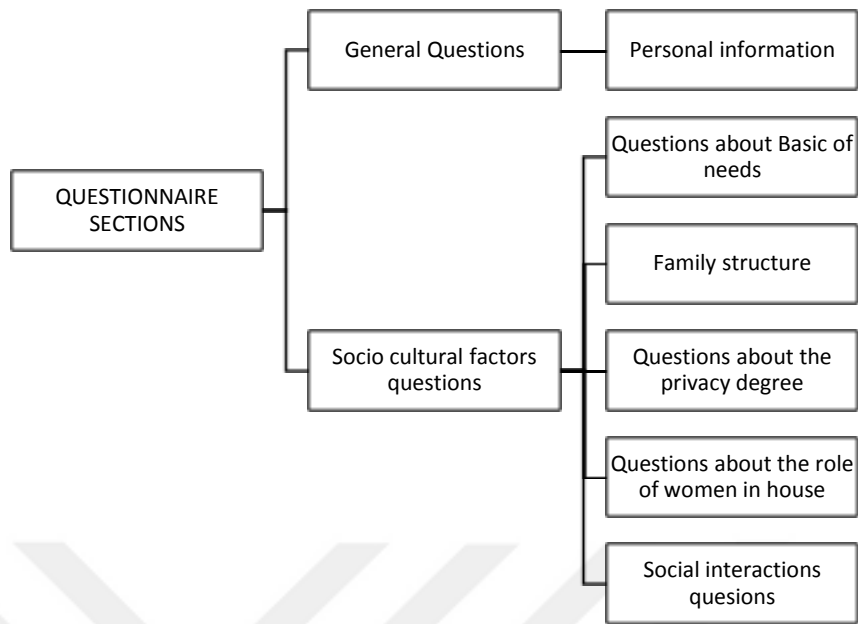


Figure 1.3 Questionnaire design

1.5 Contribution to the Knowledge

This research enhances the importance of the cultural background to general societies and Sudanese society in particular. In the previous studies and scientific research methods, the research attempts to confirm the relationship between house design and its users' cultural and social background. The goal of this research is to protect the areas that still carry in its features and design the Sudanese cultural identity. This dissertation is designed to deal with a study area that still preserves the Sudanese cultural spirit. Moreover, it presents an analytical method derived from previous studies and looks forward to being used in future studies in this field in Sudan; and this by using the relations that the study had emphasized them at the end of the research. In the end, the research emphasizes some of the essential elements that greatly contributed to the formation and design of the Sudanese house. Finally, the research seeks to include these socio-cultural factors in the building control regulations in Sudan.

2

FACTORS AFFECT THE FORMATION OF HOUSES

The house is not only a physical material on a plot of land, but it can express several meanings such as freedom and exclusivity. Some houses cannot be considered real houses because they are stuffy and stiff in their design and do not evoke a sense of safety and comfort. Architecture in general overlaps with many other fields, such as natural and artificial fields. The architectural space is the product of components that overlapped with each other and affected its formation. Researchers believe that the architectural area is a space formed due to environmental, historical, and cultural interactions that have accumulated over time. In the old buildings, we find that they were formed by environmental and topographical factors and carried a cultural character, and this is obvious in the way of its design; and the type of its materials depended on the topography and climate of the region. This chapter aims to clarify the aspects that affect the house's configuration through literary texts and the works on this field.

2.1 Factors Affecting the Architectural Configuration of the House:

Many factors generally affect the shape and composition of households, and some researchers have classified them into physical, economic, and social, cultural factors [37]. The physical factors include many factors like wind, topography, and other environmental factors surrounding the dwelling. In contrast, the economic factors include the financial conditions and the region's economic situation in general. As for socio-cultural factors, they include several elements, the most important of which are family, privacy, and others [38]. In the past, people were interested in the surrounding environment; their response to location, climate, and terrain was very high to reach physical comfort and a better indoor environment. Today many new influences have emerged after the urban growth

that the world is witnessing; These new influences may be far from people's culture and social life [39].

2.2 Influence of Physical Factors

The house is considered the result of relationships with the surrounding environment, and the result is modified according to the socio-cultural background of the inhabitants of the house [40]. According to Malahati, physical factors include several factors such as historical factors, structural factors, geographical factors, and climatic factors [41]. As for structural factors, they can contain structural systems and building materials. These factors affect the interior and exterior of the house form and may be affected by the topography and the economic situation as well. As for the historical factors, including the historical background of the buildings in the region, these buildings are a reference for local techniques and materials that are suitable for the environment [42]. Geographical factors include the natural environmental aspects, including the geographical location of the house, the topography of the area, and their impact on the traditional buildings. The houses of each region bear their topographical characteristics in terms of the choice of materials and the exterior shape of buildings. The houses are located in areas with a stone nature use stones as a primary building material. In addition to that, The houses could be affected in their formation by climatic factors where the weather factors cannot be controlled, but the architects can change the internal environment in the house by designing the house in a way that matches the external weather factors and choosing the appropriate building materials [43]. Wind, rain, and lighting factors are among the most critical factors that affect the design of buildings in the first place [44]. Buildings in hot areas are designed and built with materials that match to the temperature of the weather, as well as in rainy areas, where their roofs are designed with a slope to ensure the protection of the interior spaces in the house.

2.3 The Influence of socio-cultural factors on the Formation of the House

Socio-cultural identity is a precondition to forming individualism in life. It is based on the solidarity of language, land, and historical memory, the concept of the world, cultural traditions, and ways of life. At present, protection and shaping problems are generally recognized as salient in the architecture and design of the urban environment. Social and cultural aspects consist of various factors such as habits, lifestyles, and values that characterize a society or group [45].

The socio-cultural context is a multi-layered concept that includes a continuum from the deepest layers like beliefs and values to external layers such as representational activities and behaviors [46]. These two types are interconnected through the middle layers that facilitate the transition between the internal and external layers within a society or individuals. The layers overlap with one another, and fluid boundaries prevent conceptual separation or reduce the entire concept to a superficial layer. Moreover, the complex relationships between these layers lead to understanding the different cultural regions. Thus, to understand the relationships between culture and the built environment in terms of social and cultural features, the interrelationships between the social layers and cultural context must be explored [48][47].

After the modern effects of globalization in our world, many researchers in sustainable development conducted studies on culture and its impact on traditional buildings [48]. Rapoport considered in his book that: *the cultural and social factors are considered significant factors in forming structures*; He considered physical factors as secondary factors in terms of their effect on buildings [17][49]. Tognoli emphasized that: *“the home environment is more than just a physical place, but rather a place that meets human cultural and social needs,”* He also underlined that *“There is an influence of architectural spaces on the human being and his identity”* [50]. Furthermore, humans have an opposite effect on the configuration and formation of spaces in architecture [51]. Houses

and settlements are products of the cultural system and worldview and thus are parts of a single system; from the view of Marpaung, *The house cannot be seen in isolation from the settlement but must be seen as part of a complete social and spatial system* [52].

The culture of the individual creates a set of laws that contribute to the formation of the architectural form, and the result is a reflection of it. As for society, it contributes to the urban form of the settlements and defines their general shape. The structure produced by society represents a culture that can be passed on from one generation to the next [53]. People intend their environment through the aid of culture, a set of values, beliefs, worlds, and shared symbolic systems. In this way, the material product of a society is a sign of that society's culture and a sign of a strong relationship between society and emptiness [54]. In addition, each region with a cultural character extends its borders to its neighboring regions. Design is about giving symbols and spaces their meanings, which may be cultural, social, or historical. When the population's religious beliefs are strong in an area, the social and cultural elements could have special bases and criteria for determining the spatial arrangement. Social and cultural factors shape a picture of housing, and residents of regions can interfere in the development and formation of their concepts [55] [56].

These factors vary according to society and the habits of people and their way of thinking, and there are fixed and variable elements in these habits that change with different generations and times. Some sociology researchers consider that human beings' biological nature influences their behavior and cognition, which in turn affects the form of their buildings [57]. Socio-cultural factors are divided by Rapoport into five components: basic needs, family, privacy, the role of women, and social interactions [14].

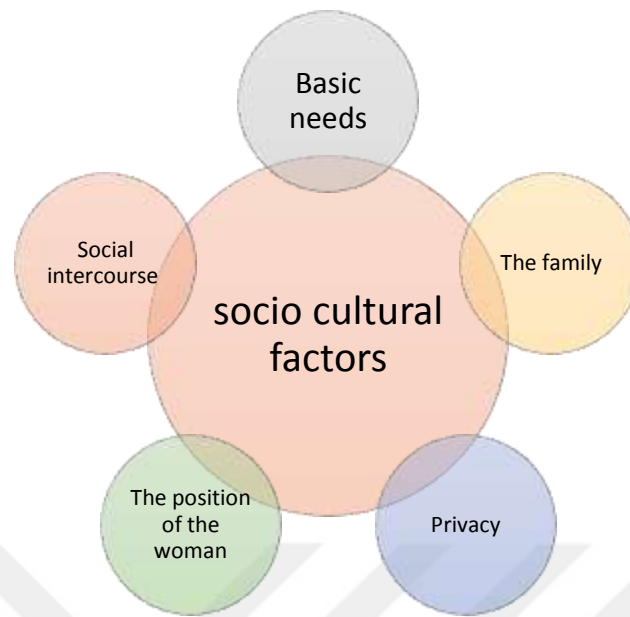


Figure 2.1 Socio-Cultural factors according to Rapoport Edited by Researcher [14]

2.3.1 Basic Needs Factor:

According to the Human Scale Development School developed by Manfred Max Neve², the basic needs of man are considered existential and stable needs for all humanity, and Max Neve has classified them as follows: protection. Passion. Perception. Participation. Identity. Freedom. Live. The following form illustrates these needs by this theory [58].

² Manfred Max-Neef is an economist who worked in many fields that related to the problem of development in the Third World .The model that he created of basic needs provides an approach could help the groups and individuals to meet their the requirements.



Figure 2.2 Manfred Max - Neef fundamental human needs [58]

There is another classification of basic needs, according to Maslow, where he categorized and placed the essentials in a hierarchy. This sequence contained five levels: *“physiological needs /safety needs/ needs of love /needs of appreciation/self-realization needs”* [59]. Maslow considered culture as a reflection of a person’s motivations in response to the effects of external agents imposed from the natural and built environment.

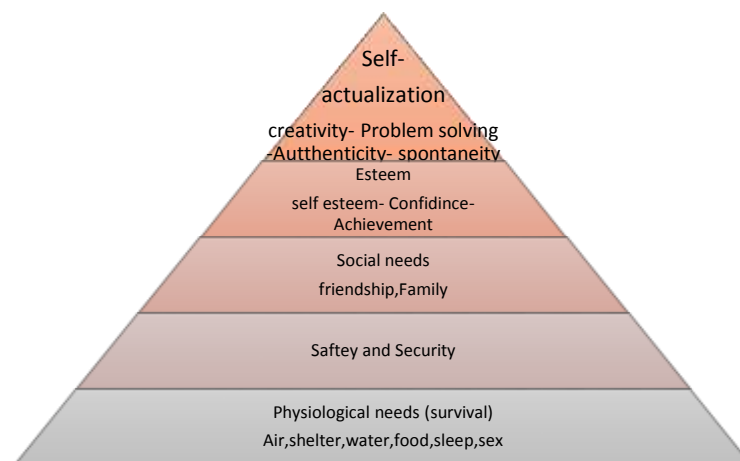


Figure 2.3 Maslow's Hierarchy of Basic Needs, Edited by Researcher [59]

Physiological needs included the needs of a person to live like food, sleep, and rest. Safety needs include such elements as security and protection. The needs of love have social needs such as relationships; appreciation needs include independence, status, and other qualities that can be achieved through a sense of freedom. The last thing in the hierarchy is the need for self-realization, which has included all the potential and growth of human personality [60]. The difference between the previous theories is the Maslow's theory can be more applied, because it contains several levels and covers all the basic and secondary needs that a person needs.

This theory was used to organize the performance in architecture. In previous theories, the physical needs were considered for the individual, but Maslow classified needs into factors, non-physical needs, and physical needs in this theory. Labatot describes architecture as follows: *"The architecture builds on tangible and intangible aspects and needs."* This theory is emphasized in the psychology of the environment, and it is recognized in the human world because architecture fits many dimensions of human life. Since man is a set of needs and desires, architecture is a process linked to these two, and its spaces are organized and created according to cultural, social, and historical perceptions [61].

There are many studies linking Maslow's hierarchy of needs to the built environment. Israel used Maslow's hierarchy of needs to plan the user's living spaces to determine the character of the place from the users' ecological roots and their cultures [62]. The user satisfaction in a house depends on economic or social status; public housing units in urban areas can satisfy only the physiological needs of the residents because psychological needs require a high economic situation. [63]. Banham suggested classifying residential spaces into three levels: shelter, house, and home; and home is more than just a physical structure; it represents deep social structures [64]. The shelter includes the basic and primary needs at the base of the hierarchy, while the house includes the needs of security and belonging; As for the home, it fulfills all the needs found in Maslow's pyramid.

	Level of cognitive	Levels of residential space
1	 The diagram shows a pyramid with two levels highlighted. The top level is labeled 'Self-actualization' and includes: morality, creativity, spontaneity, problem solving, lack of prejudice, acceptance of facts. The bottom level is labeled 'Esteem' and includes: self-esteem, confidence, achievement, respect of others, respect by others.	Home: Symbol of success Abstract ID (Luxury, Elite renovation)
2	 The diagram shows a pyramid with two levels highlighted. The top level is labeled 'Love/Belonging' and includes: friendship, family, sexual intimacy. The bottom level is labeled 'Safety' and includes: security of body, of employment, of resources, of morality, of the family, of health, of property.	House: Comfort, practice Family wellbeing (Western-style, Cosmetic renovation)
3	 The diagram shows a pyramid with one level highlighted. The bottom level is labeled 'Physiological' and includes: breathing, food, water, sex, sleep, homeostasis, excretion.	Dwelling (Shelter): Survival necessity (Studio, Standard)

Figure 2.4 The Classifications of Terms Shelter, House, and Home According To Maslow's Hierarchy [64]

2.3.2 Family Structure Factor

The family can be defined as a group of people who are related by kinship, and the ties could be marriage or adoption [65]. At first, families mostly consist of two principal components: father and mother, then families start to grow and reproduce [66]. According to Bogardus, “The family is a social system aimed at the upbringing of man.” The importance of the family lies in the possibility of satisfying the specific needs of individuals, and these needs may be physical or moral. Interconnected families also contribute to the improvement and development of society [67]. The family structures have several types, and among the most important structures prevalent in the Eastern and Arab regions are the extended families and the nuclear families. In extended families, the family consists of parents and children and other members such as uncles and grandparents [68]. This type of family is characterized by cooperation and mutual support among the members, with a group and joint activities. The men do some work such as home repair and construction at the same time as women do some

activities such as preparing meals together and sometimes there are tasks between men and women together. As for the second type, the nuclear family consists of parents and children [69]. Extended families are considered complex and differ from nuclear families in many aspects. They tend to be more ethnically diverse, often containing multiple generations and subfamilies. The extended family culture is widespread in eastern countries, but this concept is less in Western cultures. Hosseini emphasized that the relationship between men and women and privacy against strangers are the main effects of social and cultural factors in the formation and formation of spaces. The influence and powerful role of social and cultural patterns on the concept of these homes is evident as their most crucial characteristic [70]. The family structure is one of the most critical factors affecting the establishment of the home, as it affects the number of family members, the culture, and the society to which they belong. The structure of the family and the arrangement of family members affect the distribution and organization of spaces in the house. The number and type of family are affected by the culture of the area in which the family lives.

2.3.3 Privacy Factor

Privacy is a necessity and a requirement for individuals in different societies [71]. Rapport emphasized that "Privacy can exist without walls or doors." Also, privacy can be defined by "avoiding and regulating interpersonal contacts" [68]. The culture of individuals and societies is reflected in privacy, and beliefs are considered the main determinants of classifying private and public spaces. In eastern societies, the internal division of the house follows the beliefs of individuals, the front and floor parts of the houses are reserved for males, and the internal spaces and upper floors are occupied by women [72]. Interior spaces have high privacy in European societies, while exterior spaces have lower privacy [73]. Privacy is affected by the home culture in Islamic societies, and most of the concepts of privacy come from prevailing Islamic beliefs [74]. Islam demands the necessity of separating women from men in the spaces in its rulings. Bachelard

stressed the necessity of separating the areas of men and women and separating the internal and external spaces between the home and the surrounding environment [75]. In addition, privacy affects the spatial organization of spaces, whereby spaces are divided into degrees according to privacy and space needs. In traditional Muslim houses, privacy consists of four layers: privacy between neighbors, privacy between male members and females, the required privacy between family members within the home, and individual privacy, as in Figure 2.5 [76]. The spaces divide into several levels in terms of privacy degree: spaces with public privacy level, spaces with semi-public privacy level, spaces with private privacy level, and spaces with semi-private privacy level [77].

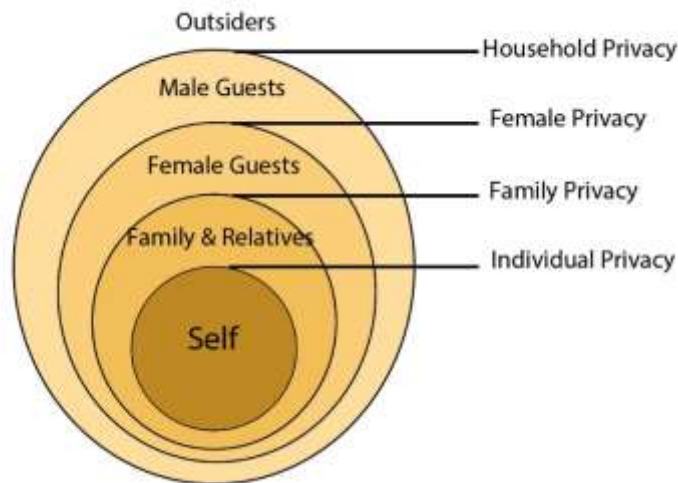


Figure 2.5 Layers of Privacy in Muslim's House, Edited by Researcher [76]

Various architectural treatments help achieve the house's privacy, such as the design and location of the main entrance, window designs and sizes, the location of courtyards, and the creation of spaces through using the required separation[76]. To ensure the family's visual privacy, entrance doors must be positioned in a specific way to maintain high levels of privacy for the spaces, and family spaces must be kept out of the sight of foreigners [78] Furthermore, windows must be designed according to specific standards so that their height should be above the users' eyes to provide greater visual privacy [79].

2.3.4 The Role of Women Factor

The word of a role is defined as a set of characteristics defined according to the social system and any role that has a clear influence in society, and any individual has specific tasks and roles to perform [80]. Rosaldo divided society according to culture and gender practices in daily life into two areas, a general area for males; A particular area for females who are isolated from participating in social networks. This division operates as part of larger ideological systems used to constrain women's behavior within a given region [81]. Women constitute the majority of society, and women play an influential role at the level of society and the family. The primary role of women is to build and care for the family, and managing the home is often a woman's task [82]. Since ancient times, they have also played an influential role in managing household responsibilities because most of them have leadership qualities and multiple roles in the house. Of the areas that women perform in the home, feeding, maintenance, and establishment of family systems, they are considered primarily responsible for dividing tasks among individuals in the house [83]. Anggriani asserts that women greatly influence architecture and organization of the internal spaces, especially in the traditional house. A lot of literature on traditional dwellings talked about the role of women in the family and considered them a reference in determining the type, location, and arrangement of spaces in the house. Female body sizes are also used to determine the size of rooms, space-forming elements, and furniture such as kitchen furniture [83]. The house is one of the architectural works resulting from a human culture whose physical form and spatial arrangement are affected by the culture of the individuals who reside in it. The importance of the role of women in the family system is reflected in contributing to the planning of roles in the home. Social regulations in some areas indirectly require women to have higher privacy, and this requires giving the women special space. In some cultures, as African and Eastern cultures, some spaces are reserved for women only. Many consider the kitchen to be a ladies-only area. It is designed in a way that obscures the direct view from the entrance. Women also play a great role in the

sustainability of building culture, especially traditional architecture, as they make significant contributions to adapt homes to modern needs, and thus play a main role in decisions to adapt modern-style housing [83] [84].

2.3.5 Social Interactions Factor

Social interaction is one of the concepts dealt with in relation to cities, planning, and the arrangement of houses and streets. Communities that live close to each other have more opportunities for social interactions and thus an increase in opportunities for communication. The environment and the location of houses are critical factors for social interaction [85]. Cooper confirmed that there is a relationship between increased proximity between houses and the rate of social contact. Regarding this issue, he explained that "we consider the settlements whose inhabitants live close to each other are more socially interactive than those who live far from each other." He also emphasized that the residents of the outskirts of neighborhoods are more isolated than others [86]. The social interaction between small communities belonging to a particular tribe increases more than large societies in which there is a diversity of sects. Fromm emphasized the effect of social interaction or social norms on the behavior of individuals and the distribution of spaces. He also affirmed that common areas between residents, such as playgrounds and public facilities such as mosques, squares, and clubs, increase opportunities for social interaction between members of the same community [86]. Moreover, Mamaghania asserted that increasing the presence of citizens in space could increase the opportunity for social interactions, also has a direct relationship with the utility of space, and desirable and good space increases presence. Activities in common spaces show that people have created special traditions and customs to maintain social relationships [87]. The external squares are a representation of customs, traditions, and social relations. Other functions of traditional yards include leisure, daily visits, exchange of news and information, informal education, transfer of expertise, and charitable affairs. Markets create a strong network of social relationships by creating unity and the relationship

between elements and performance, Mosques in public places can gather different people to perform religious duties as well as to communicate.

2.4 Chapter's Conclusion

At the beginning of this chapter, there were some attempts to identify the factors that influence the house's composition. The factors affecting the home can be divided into two main parts: physical factors and social and cultural factors. Each type contains several other factors that affect homes' internal and external characteristics. The physical factors included many factors such as structural, climatic, historical, and geographical factors. Structural factors showed how buildings are affected by the quality of the materials used. Historic factors included the history of the area and how it influenced the shape of the current buildings. Geographical factors included several factors, including the nature and location of the topographical area.

As a conclusion of this chapter, the socio-cultural factors have to do with the house's composition. Literary texts dealt with this interrelationship between the formation of buildings and these factors. The concept of social culture included several internal, external, and middle layers. The internal layers relied on individuals' religious concepts and beliefs, while the external layers included customs and traditions. According to Rapoport the socio-cultural factors were divided into several factors, which are as follows: basic needs, the family, the status of women, and social interactions. Furthermore, The literary texts explained the influence of individuals' religious and cultural background, lifestyle, and social stratification on the social-cultural factors.

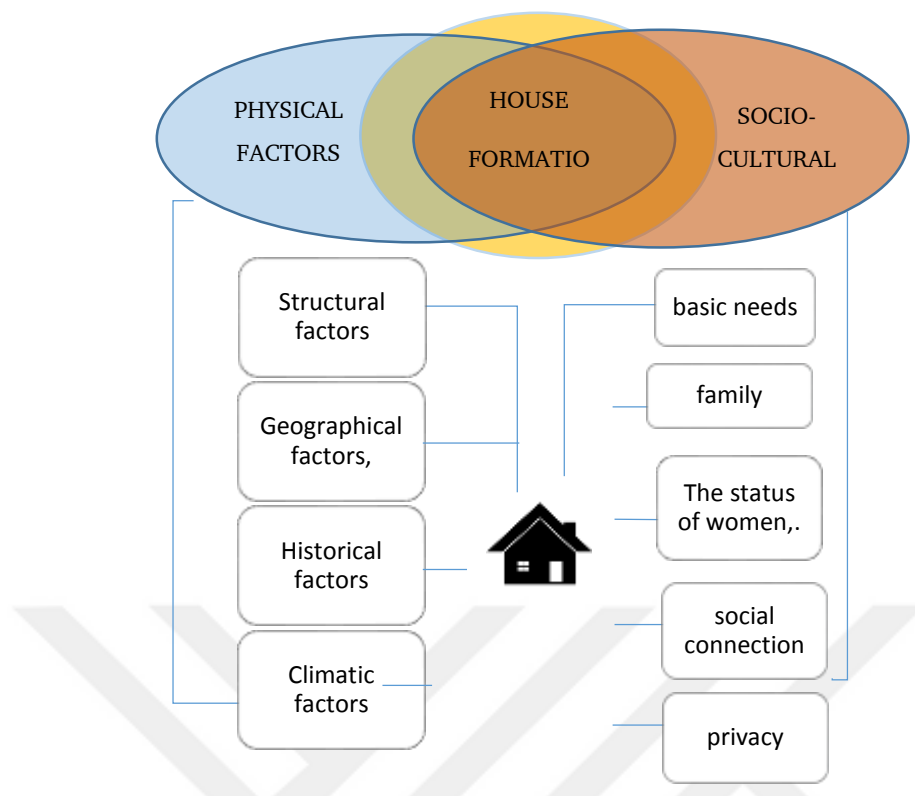


Figure 2.6 The Relationship between House Formation and the Influenced Factors, by the Researcher

“The Homelands may be colonized in someday”... “But the identity and culture of the individual will stay forever”... “Sudan is a mix between African culture and Arab culture, and to understand its culture, you have to think sometimes from an Arab side and the other from an African side....”

ELtayeb Salih³, My country Sudan, 2005.

Since the research subject is related to the influence of cultural aspects on architecture, it was necessary to give an overview of Sudan, its people, its cultures, and the way of life there. The unit's main objective is to grade the reader and give him an introduction before starting to explore the impact of socio-cultural factors on architecture. Topics were divided according to the research title, which included four basic concepts: Sudan, culture, social life, architecture. The three topics will be discussed and listed in the previous order.

3.1 Information about the Study Area

3.1.1 Site

Sudan is located in Northern Africa between 8 latitudes and 23 North, and it has land borders with the following countries: Egypt, Chad, Libya, Eritrea, Ethiopia, and Southern Sudan [88]. As for the terrain in Sudan, is flat plains interspersed with several mountain ranges in western Sudan. In addition, It contains the longest river in the world, which is the Nile River, where it is composed of the confluence of the Blue Nile and the White Nile in the city of Khartoum, and it flows north through Egypt to the Mediterranean Sea [89].

³ Eltayeb salih is a Sudanese novelist and writer, he wrote several novels and books about the Sudanese culture, his novel “The way to north” is considered as a one from best 100 novels over the word.

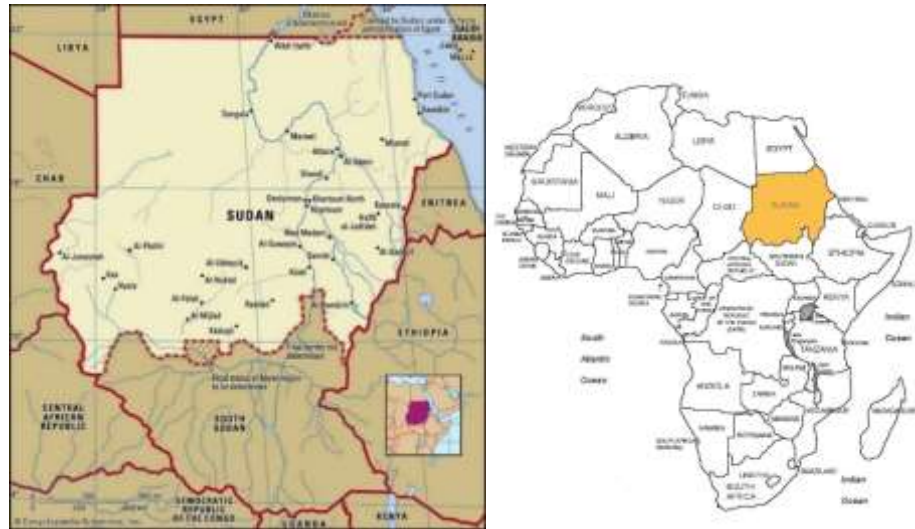


Figure 3.1 The Site of the study area

3.1.2 The Climate of the Study Area

The climate of Sudan is considered a semi-desert climate; The central and northern parts contain arid desert areas, and from the famous desert is the Nubian Desert in the north [90]. The autumn in Sudan lasts for four months, from June to September, and the summer extends to six months. The areas in Sudan suffer from Haboob's sandstorms⁴, which can completely block out the sun's rays; Sunshine duration is considered as very high across the country, especially in deserts and dry areas [91].

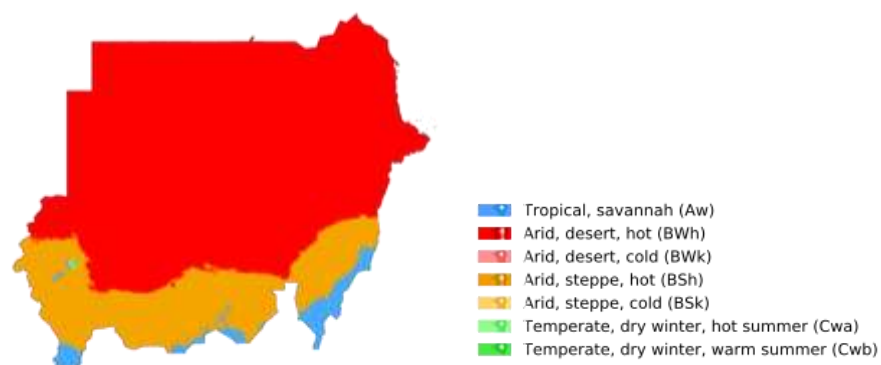


Figure 3.2 The Climate of the study area

⁴ (Haboob) It is the prevalent name in the local language for the dust wind in Sudan

3.1.3 Population

The population of Sudan was 37.9 million in 2013, and according to the Sudanese estimate; before the separation of South Sudan, the number was about 45 million, as the north contained 37 million and the south contained 8.2 million, where the percentage of women was 48% [92]. Population growth increased in the 1980s but declined after that; in 2008, the annual growth percentage was estimated at 2%. More than two-thirds of Sudan's population lives within 500 kilometers of Khartoum [93].

3.2 Culture in Sudan

3.2.1 Sudanese Cultural Legacies

There are many opinions about the concept of culture, and researchers varied in defining its meaning. The culture means *“all the heritage in speech and behavior, with the possibility of reviewing the nation to take what is appropriate for the age and its development.”* Sudanese culture is the sum of those elements that enter into the formation of Sudanese society and distinguish it from others cultures [94]. It contains many behaviors and beliefs, as there are about 65 ethnic groups and 75 tribes in Sudan, and it contains many geographical differences, ranging from sandy deserts to tropical forests [95]. Some research indicates that while most of the country's citizens coexist in an interactive and well-connected manner with their land and religion, Arab and African identity prevails over the general Sudanese personality [96].

Sudan extends over a wide area from southern Egypt to the equatorial regions of central Africa, which has led to the existence of different races, cultures, and religions. Still, Islam forms the cultural background for most of the population of Sudan, especially the center and the north. In comparison, the culture of the south, Southeast, and West Sudan were formed from African cultures [97].

By Looking at the map of Sudan figure 3.3, it can be noted that there is a diversity of geographical environments [94]. The connection of these environments with

each other creates a series of cultural patterns in which there is a diversity of what is in them. The traditional cultural living patterns of the population have been adapted to suit each group to exploit the environment in which they live. On the coasts and beaches, there are the hunters, while in the east, there are Bedouins with their camels. They are also found on the borders of the desert and savannah in the northwest. In addition to these, there are shepherds who move with their cows to follow the rain areas, water sources, and pasture between the north and south of the savannah [95]. The farmers of the rainy plains settle in the middle of the country, and also, there are farmers in different regions of Sudan who are settled on the shores of the Nile and its tributaries. As for the life of the tribes of the southern region, it is traditionally linked to the jungle, in which the practice of agriculture makes the life of those tribes similar to that of the other tribes of Sudan.

The customs and traditions are broadly identical among the main tribes of northern Sudan: the Nuba, the Halfawein, the Mahs, the Danglah, the Saqqut, the Shakan, and the Jali [98]. The Nile is the main link for most of the tribes of Sudan, as the majority of the people of Sudan live in the Nile Basin, which extends from South to the north; This link could add a unique cultural touch to each tribe that passes its land, and that is why there are folk songs that revolve around the river; Besides that, the floods in Sudan express an essential part of the culture of Sudan [99]. The following map in Figure 3. 3 shows the distribution of tribes in Sudan.

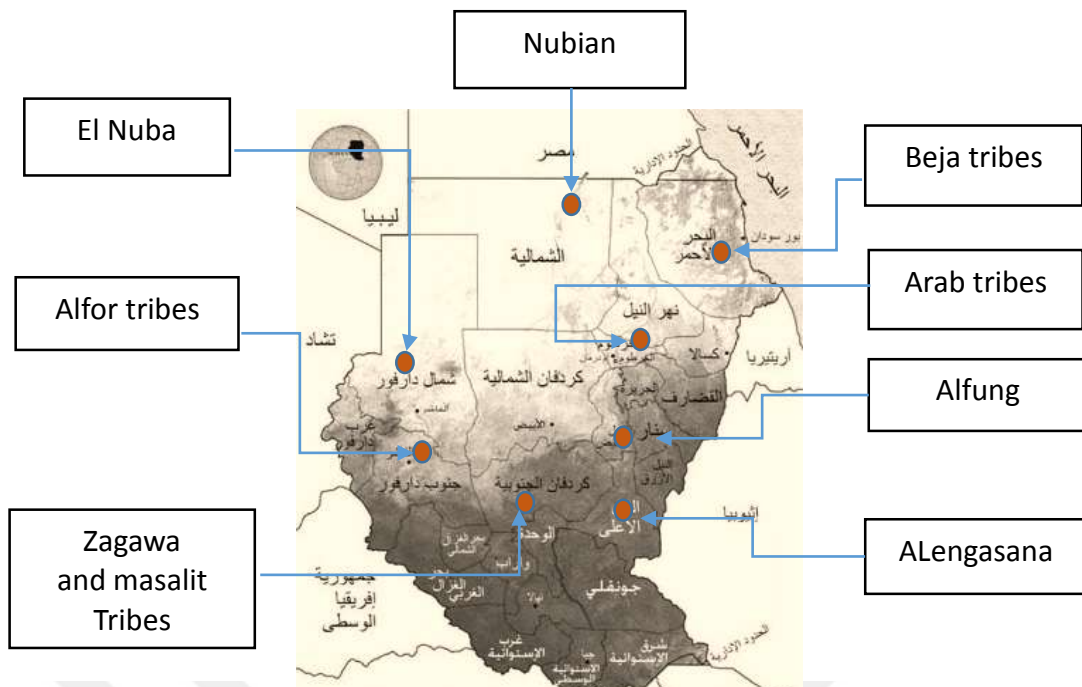


Figure 3.3 Sudanese Tribes

Sudanese tribal culture is known for its different nature, extreme generosity, conservatism, and general religiosity that connects the individual to society. Sudanese society is open and characterized by simplicity in dealing, the most famous of which is sharing the food between neighbors during Ramadan and special occasions. Sudanese communities are linked to religious occasions such as Eid al-Fitr, Eid al-Adha, Ramadan, and social events, and each of them has its customs and rituals [100].



Figure 3.4 Some tribes from western Sudan⁵

⁵ Clothes in western and southern Sudan differ greatly from the rest of the regions.

3.2.2 Sudanese Traditions

Numerous Sudanese traditions and customs could define and shape society. The customs in Sudan are related to all daily life matters, starting from clothing and drinking to all rituals such as marriage, wedding, dance, and a new baby's birth, and every Sudanese tribe has unique traditions and customs [101][102]. Making scars on the face is an ancient Sudanese custom carried out by members of the tribe, and these scars differ according to the tribe to which the individual belongs, so different tribes have distinct signs [103]. However, some people still do it, especially in rural areas; these scars are considered a sign of bravery among men, while they are considered a sign of beauty for women. The Shilluk or Dinka tribe make scars with cross lines shape on their forehead. At the same time, the Ja'ali tribe makes long lines on their cheeks. In the southern regions of Sudan, women's bodies are exposed to scars to clarify their marital status and the number of their children. In most areas of Sudan, women mark their lips for aesthetic purposes [104].



Figure 3.5 Sudanese traditional face scars

Most Sudanese wear traditional or western costumes, as the traditional costumes vary according to the geographical region. The traditional Sudanese dress worn by men in the northern, eastern, and central regions is the Jalabiya, which is a loose-fitting, long-sleeved, collarless garment. Older men wear a large turban and scarf, and the clothing may be white, colorful, or striped; These outfits are made

of fabric and vary in thickness, as they change according to the seasons and special options [105].



Figure 3.6 Traditional Sudanese clothes

For Sudanese women, the Toop is the official dress in most regions. The Sudanese dress is a long piece of cloth, and this piece could be plain, striped, or formed. Women use it to cover their clothes and their heads. In the rural western regions, People wear little cloth or no clothing [106].

3.2.3 Languages

Sudan is one of the most varied countries in which there is a diversity of languages and races, and its people speak more than 115 languages and dialects. Until the middle of the last century, Arabic was the official language in the northern part of the country, and in the south, English was the common language, with many other local languages. Most of the inhabitants of the north are from Arabs and African roots, while South Sudan contains pure African tribes. After the "Arabize" movement, southern people resented replacing the indigenous languages with the Arabic language [107]. One of the local languages in Sudan is the Rattan language; besides, there are other regional dialects and languages, including the Bedouin language, a Cushitic language, and the Nilotic languages [108].

3.2.5 National Identity

National identity is a matter of the ancient Sudanese tribes in Sudan, where most Sudanese tend to show off with their tribes. The state's borders do not follow the geographical divisions of its different tribes, which in many cases extend to neighboring countries. An example of that the Nubian tribes, as it extends to Egypt and some tribes in western Sudan [109]. Since the 1960s, Muslims in the North have tried to forget a Sudanese national identity based on Arab culture. The diverse and multiple cultures in southern Sudan and western Sudan, including many cultures, were ignored. This greatly angered the southerners, which was one of the reasons that led to the separation of southern Sudan [110].

3.3 Social Life

3.3.1 Social States and Sects in Sudan

Sudanese society is divided into several sects, with northern Sudanese enjoying greater access to jobs and educational opportunities. Sudanese classify each other according to the race and tribe they belong to. There is solidarity and interdependence of members of the same tribe or the owners of the same ethnic race [101]. In many Sudanese tribes, class and social status are traditionally determined by birth. In some cases, the upper classes require much intelligence and education to maintain their position. Society is also divided according to race, color, social group, and educational status. In terms of jobs, workers formed the lowest rung on the social ladder and were not allowed to marry other classes [102] [113]. In the southern and western regions, owning much livestock is considered a sign of the family's wealth and social standing. Many social practices exist in the life of the Sudanese society, and these practices have deep roots in the life of the Sudanese society; they represent an important aspect of its cultural heritage, customs, and traditions [101].

3.3.2 Gender Roles in Sudanese society

Sudanese society is considered a patriarchal society because males are preferred over females, in which women are generally given inferior status to men. Males also have priority and authority in various matters. In the past, most jobs were monopolized by men, but now the percentage of working women is increasing, reaching 35%. Because of Sudanese traditions and society, men and women lead separate lives. Men meet in clubs, and women often meet at the house [114]. The political and social transformations that happened in the Sudanese society have left their clear effects on the Sudanese family, and the roles of men and women have changed greatly. It was natural for these changes to affect the status of women. As for roles, women take care of all the household chores that raise children. As for men, they must work to meet the needs of their families. In some Sudanese villages, women help in agricultural work with their families. In recent years women can work more freely in cities and urban areas [115]. The women participate in making family decisions, regulating the family economy, and taking part in the community's social, economic, and political activities. Yet, it is still suffering from the remnants of the past and the man's control over it and his limited view and support of it.

3.3.3 Marriage, Family, and kinship

Marriages in Sudan, in rural areas, are arranged by the family, as they make matches between cousins; It is preferable to marry relatives, and it is not permissible for them to marry outside the tribe [116]. Among the matters that are taken into consideration in marriage is the social and economic status of the individual, and most tribes in the north and center do not allow their daughters and sons to marry from the western and southern tribes [117] Between the members of the tribe and the same sect, the parents conduct negotiations; The person applying for marriage must be financially sufficient and able to support the family; The husband offers the appropriate dowry [118]. The age of marriage in

Sudan varies by region and family. Girls get married in villages from the age of 14, but in cities and urban areas, girls get married after their university studies [119]. In urban cities, the marriage system has undergone significant changes. The marriage pattern shifted from the inner form, which is from within the kinship group - to the external form, which is outside the kinship group. This change resulted from the major economic and social transformations that occurred in society after independence and led to the emergence of an urbanization movement and expansion in urban centers [118]. From other manifestations, the process of choosing a wife is no longer confined to the family, but rather the individual seeks to choose his life partner, and the issue of the girl's marriage has become a family issue far from the influence of relatives. Cities have also witnessed a change in marriage ceremonies in cities in terms of the rituals accompanying the marriage process and how it is performed.



Figure 3.7 Sudanese traditional wedding ceremony

3.3.4 The Formation of the Sudanese Family

There are five types of family structures: the nuclear family, the family with one guardian, the extended family, the surrogate family, and the hereditary family. According to tradition and social lifestyle, most Sudanese families are extended and nuclear families. The interdependence of its members distinguishes Sudanese families like other African families. The concept of extended families is widespread

in most of the rural areas of Sudan. [120] This type of the family consists of parents, children, and other individuals such as grandparents, uncles, and aunts. Grandparents or parents reserve or buy a plot of land, and it should be large enough to build houses and residential spaces for themselves and their children; This custom prevails in villages and regions whose members belong to one tribe. [121]. In this type of family, the father or grandfather has the authority over all the individuals in the house. There are basic functions for any member of this type of family, and the members of the families participate in some activities such as cooking, eating, and receiving guests. The women in this house raise and take care of the children. Grandfathers and grandmothers have a great role in transmitting traditions to their future generations through this type of family.

As for single families, they are concentrated in cities and urban areas, and the family consists of the father, mother, and their children, and this formation is called a nuclear family. This family often lives in separate housing units such as a villa or an apartment [118]. Socialization in Sudan still follows some traditional methods, and educational institutions have new roles that play an important role in this field. The influence of the new culture is visible in modern families, which is the nuclear family. At the same time, the community's heritage and culture play an essential role in this field; this type of family began to appear after the development and change that took place in the cultures and societies in Sudan.

3.3.5 The Relationships between Individuals in the Sudanese Society

Relationships in Sudanese society vary and include the relations of relatives, the relationship of neighbors, and the relations of the people of the same tribe. Among these relationships, the spirit of teamwork or working through the group has its dimension and its psychological, religious, and social roots rooted in the life of the Sudanese human since ancient times, which was taken from the African heritage. The relationship between neighbors is an essential component of the Sudanese personality in general and the Muslim personality in particular. Because one of the elements of the Muslim community is they have a coherent community in all

aspects of life. In the relations that link between the members of one tribe or one community, we find many activities and events that are held and organized on a continuous basis such as: group dancing, group hunting, movement with livestock, or group movement. Also, one of the characteristics that distinguishes these relationships that they help each other in the construction works, this is called Nafeer. The basis of the work of the Nafeer so is the Arab Islamic heritage that constitutes a huge asset in the customs and traditions of the human being in Sudan.



Figure 3.8 Examples of cooperation between individuals (Nafeer)

3.4 Chapter's Conclusion

This chapter aimed to give background on the study area, the behavior and culture of the Sudanese person, and his social life. An overview of some cultural customs and lifestyles has been given to achieve this goal. The chapter was divided into three sections: an introduction to Sudan, a section on Sudanese culture, and a final section dealing with the social aspect. The figure shows the chapter' sections. The previous information in the unit showed that lifestyles and cultures differed greatly, and diversity occurred due to variations in ways, religions, and languages. In the first section, general information was given about Sudan's location, population, and climate in general. The cultural section included information on values, languages, and ancient and current Sudanese customs, such as dance and

religious rituals. At the same time, the social section contained information about the social roles of both genders, male and female in Sudanese society. The chapter also included some marriage rituals in urban and rural areas, and an overview of the types of families spread in Sudan was given.

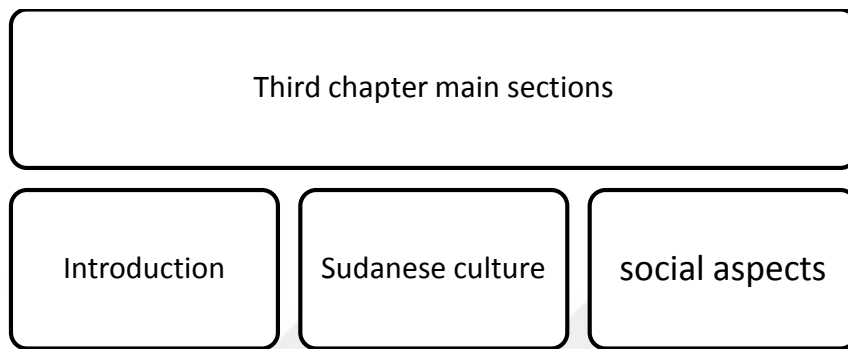


Figure 3.9 The Main Sections of the chapter

TRADITIONAL HOUSES IN SUDAN

The fourth chapter aims to give an overview of the traditional houses in Sudan. In the previous chapter, three out of four basic research concepts were identified: Sudan, social life, culture. In general the Sudanese architecture included colonial movements and modernity movements, and it is still facing globalization trends and new building materials developed for the purpose of preserving its concepts and cultures. A Sudanese house is originally a place whose formation depends on the cultural sides of the community and the traditional local building materials. The local residents are the ones who lay the foundations and rules in its design and define its features and characteristics. Some organizations in Sudan are trying to restrict the shape of the Sudanese house and put in place special laws that are not suitable for the cultures of householders. The chapter will discuss the challenges and stages that faced Sudanese architecture as an introduction, and it will also give an overview of the Sudanese traditional houses in different regions of Sudan.

4.1 Historical Background about Architecture in Sudan

To clarify the most critical Sudanese architectural features, some periods affected Sudan's architecture through a sequence of epochs must be studied. Sudan's architectural identity began with the beginning of the first Sudanese civilizations, even contemporary architecture today influenced by these periods. The following are the architectural periods that have passed in Sudanese architecture [122]:

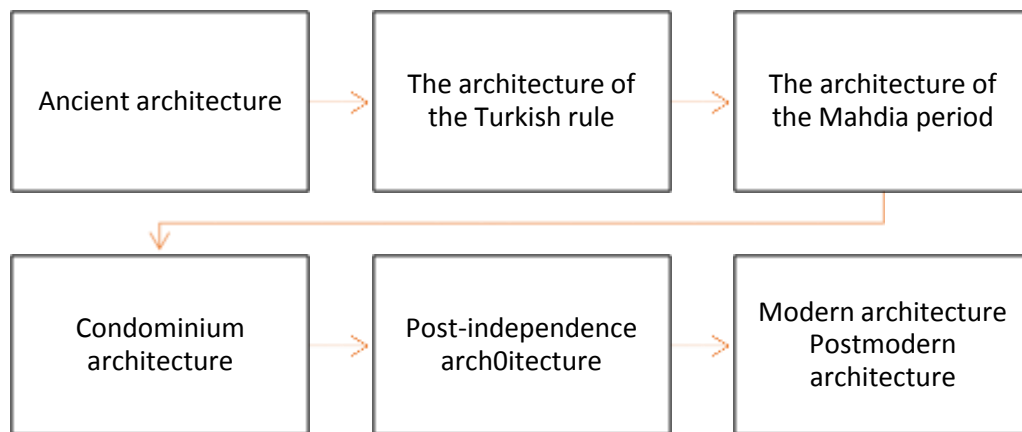


Figure 4.1 The architectural periods in Sudan

4.1.1 Ancient Architecture in Sudan

The ancient Sudanese architecture was built by the kings of the Kingdom of Meroe in Nubia in the 3rd century BC. Nubia was famous for the abundance of building pyramids, as the Nubians believed that their kings were living gods; When the Nubian kings died, they had to be buried with their possessions in significant burials built with mud and stone material; The giant Nubian pyramids are located in Meroe and Nuri in Sudan [123]. The ancient Nubian architecture in Sudan had a strong relationship with some other civilizations, such as the Greeks and Romans; Thus acquired some architectural cultures in the formation and building materials [124]. The buildings of this era were used as temples and shrines to kings in the ancient Meroitic period, represented in the pyramids, the temples of the Musawwarat⁶; Those features were also drawn on the walls with drawings of the ancient Nubian language, which is telling about that era and its events [125].

⁶ Al-Musawarat Al-Sufra, is a large Meroitic temple complex in modern Sudan, dating back to the early Meroitic period of the 3rd century BC.



Figure 4.2 Ancient architecture in Sudan

4.1.2 The Architecture in the Turkish rule

In this period, the general architectural features for building materials were mud, stone, green bricks, lime, and wood. The building materials differed from each other according to the economic situation of the residents, as the first buildings that appeared in this period were straw houses. The residential quarters were constructed on one feature; the architectural blocks were generally large, appearing in one inconsistent architectural form [126]. Besides, the citizens were supplied with wood to assist them in building to remove the houses of kashab, al-Zarayeb, and al-Qatati⁷. During this period, the building materials bricks and stones were transported from Soba to Khartoum by boats, and the Khartoum Directorate building and the mosque were built there. The administration stressed the need to deepen foundations, increase the width of walls, and regulate roads [127]. One of the areas that the Ottomans were interested in was Suakin. In 1849, Suakin was affiliated with the Ottoman Empire, and its citizens also belonged to it[126]. The following figure shows some buildings that were in that time.

⁷ These are names in the informal language in Sudan for traditional buildings that are made from local materials



Figure 4.3 The architecture of the period of Turkish rule

4.1.3 The Architecture in the Mahdia Period

When Khartoum fell into Imam al-Mahdi's hands, he commanded to transfer the capital from Khartoum to Omdurman. He also ordered the evacuation of the old capital and the building materials to be transported to Omdurman. Thus, Khartoum's commercial and cultural importance decreased [128]. The city of Omdurman's planning was organic and irregular, as the city quickly grew up without prior planning. English historians' writings had given a glimpse of the situation that prevailed; The streets were narrow and winding, except for those long streets that represent vertical axes for various political and commercial purposes; The middle section was also considered the center of the city, where there were places of authority, government buildings, the dome of Imam al-Mahdi, the Great Mosque and many public buildings were there [129]. The character of this period was an Islamic one that greatly affected the houses in their internal division. The Mahdi had constructed a wall around this section. In this period, The houses became built of mud, bricks, and stone in place of those that were constructed with straw.

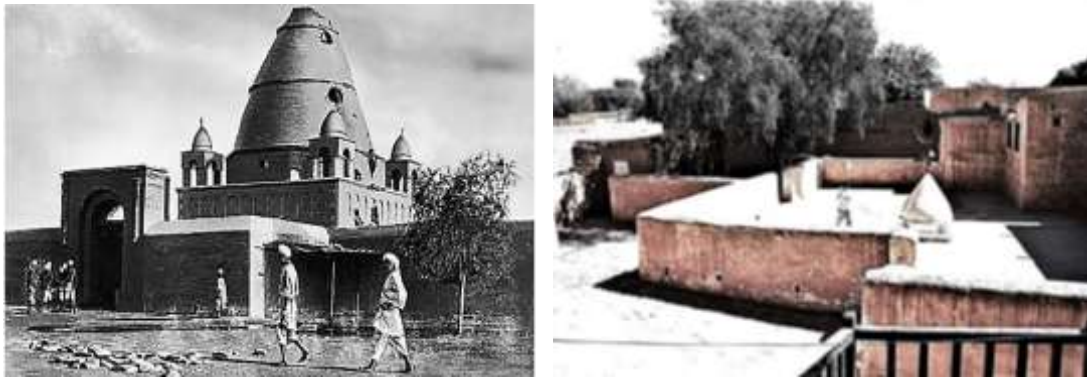


Figure 4.4 The architecture in the Mahdia period

4.1.4 Architecture in English-Egyptian Period

This period is considered one of the periods that have the most effect on Sudanese architecture, and its influences still exist until this moment. The capital was moved from Omdurman to Khartoum again in this period, and Kitchener was appointed as a general governor of Sudan [130]. The occupying power has begun to lay down laws and regulations to adjust the architectural and urban development. This authority was the first to enact laws and regulations to control buildings in Sudan as it divided the residential areas into four classes, or sometimes three classes. The class division depends on the population's economic situation; and they were as follows: the first class for the high-income people, the second class for those with middle income, and the third class for the people with low income [122]. Redbrick construction spread during this period after the development of Sudanese brick ambushes. In addition, many unique characteristics of the buildings showed, such as the elements of the vast columns used in houses that indicate luxury.

4.1.5 Post-Independence and Postmodern Architecture Periods

The Post-Independence period is arose after the independence of Sudan ,and at this stage, a group of buildings that combined modern architecture and traditional architecture appeared. Besides, the architects used some of the foundations of green -architecture based on natural means, and some of them built bases for the development of Sudanese architecture. They also used some of the construction

techniques and materials left by the English in the subject of construction buildings [131] [122]. Postmodern architecture was not associated with a political period like the previous Sudanese architectural periods, but it was affected by world globalization and the blind imitation of modern buildings without attention to the climate and culture of Sudan. New building materials spread in Sudan, such as glass panels, and some architects used iron more than concrete, and ceramics were introduced in the new finishing materials; Red bricks and wood continued to be used, but these materials were replaced by new materials [132].



Figure 4.5 Postmodern architecture period [132]

4.2 Traditional Houses in Sudan

It cannot simply give a definition for the traditional Sudanese house because Sudan contains many cultures and also has many ethnicities and tribes. Every race and tribe has different cultures and social life from the other. From the differences in the existing cultures, the variation arose in the Sudanese homes' formation as in figure 4.7. Each region of Sudan has its character, and to study the Sudanese house, we must divide the Sudanese areas and study each region separately. To identify the houses in Sudan, architects divided them according to their geographical location as Omar set apart in his article into five sections: the houses of the eastern region, the houses of the western region, the houses of the middle region, and the houses of the northern region [133].

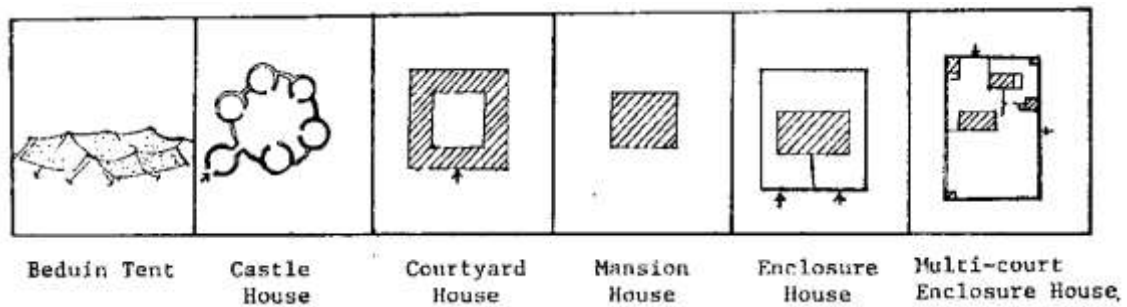


Figure 4.6 The types of Traditional houses in Sudan

4.2.1 Houses in Eastern Sudan

Houses in eastern Sudan contain several types of houses with different formations because various tribes live in the east. Among these tribes are the Rashaida tribes, the Hadandawa tribes, and the Bani Amer tribe. Among the types that are unique in their design and composition from other kinds of houses are the House of Shaar and the houses of Suakin. The House of Shaar⁸ is still preserved its composition and culture; The Rashaida tribes live in this type of house, and they are tribes that migrated from Saudi Arabia to Sudan more than a hundred years ago [134].

(i)Tent House: One of the Al Rashaida tent characteristics is the separation between genders in the house's space. The tent is easy to install and move from one place to another. Besides, It is woven and expresses the Arab culture in particular. The materials that are used in the Rashaida tent's construction are the wooden branches of trees and colorful covers of animal hair [135]. The Beja puts the protection of women in the first place of their concern due to wars in ancient times; For this reason, The tent is structured with a low entrance to block the vision[136].

⁸ "The House of Shaar" or "bayt elshaar" It was known by this name because these tents are made of goat hair and sheep's wool. The Bedouins use this type because it is easy to carry during their travels.



Figure 4.7 Tent House

(ii) Suakin traditional house: Suakin was an essential port of Sudan and was a major trading center for the Ottoman Empire, as it was the largest port on the Red Sea. For that reason, the attention has been paid to this city and its buildings. The traditional house in Suakin, Islam, was the main factor in its design; and the house was divided according to its members' marital status. The concept of the Suakin house has been taken from the houses in the Arabian Peninsula, which is characterized by their adaptation to the climate. The houses consist of two or three floors, and they could be considered as private spaces [137]. The house's ground floor contains the men's spaces, while the rooms on the upper floors contain bedrooms, and part of them is designated as living rooms. The houses in Suakin include special windows called Mashrabiya⁹. Its design allows users to obtain complete privacy with the possibility to enjoy watching the movement of pedestrians. Relatives live in close groups in the city, and some of them share a single plot of land [138].

⁹ Mashrabiya windows are windows with an Islamic style and they are spread in the Islamic regions, like Saudi Arabia.

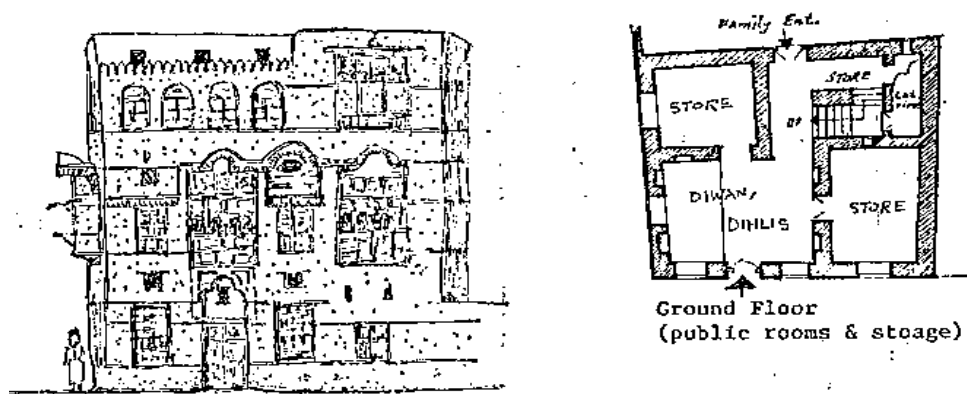


Figure 4.8 Suakin traditional house

4.2.2 Houses in central Sudan

Most of the houses in central Sudan are extended and nuclear families, where family members live under one roof or live near each other. In central Sudanese regions, newlyweds are accommodated in an existing family unit where a particular part of the house is made for the new family. The responsibility of managing the house rests with the older man [133]. The new family could contribute to the family, and they could pay some of the cost of living for the family. The house is divided according to the number of families, where each family has a special section, and each section contains bedrooms and an inner courtyard for the family. These inner areas are used for sleeping at night, receiving guests, and some other purposes. The outdoor salon is one of the common spaces for the male members [139].



Figure 4.9 Houses in central Sudan

4.2.3 Houses in northern Sudan

One of the most significant houses in northern Sudan is the Nubian House. The Nubia tribe is a tribe extending between Egypt and Sudan, and the Nubians people had to build their homes on the banks of the Nile. They live in groups in more than 70 extended villages between Egypt and Sudan [140]. The Arab and Islamic culture influences the Nubian house in northern Sudan, and this appears in the formation of the spaces of the house and the separation between women and men in the house; Also, the house is characterized by the internal yard, a multi-use space for the family; The Nubian house consists of two parts, a general or public section and a private section [141]. The public section contains the guest's rooms, while the private section contains the bedrooms of home users; the rooms are open to the courtyard to get light and to allow for the northern winds prevailing cold and access to the house spaces. The courtyard is used as a living room for house users and is also used to sleep on hot nights.



Figure 4.10 Houses in northern Sudan

4.2.4 Houses in Western Sudan

The houses in west Sudan represent the feature of the architectural characteristics of the region's people. The western Sudanese designed their houses, and they have evolved the houses from the animal wastes and straw it even reached to a brick red to finishing the internal spaces. The configurations of houses in western Sudan are similar to the dwellings in western African countries, where typical African tribes live. The mountains in the south-central part of Sudan are famous for their circular-plan houses [142]. The building blocks are constructed with a roof with

a conical thatched, then the units of houses assemble in a ring form. The inhabitants of the Nuba Mountains live differently due to their isolation from the rest of the neighboring regions, and they still preserve their customs and traditions. Most of the Nuba Mountains inhabitants are farmers, and they raise livestock [143].

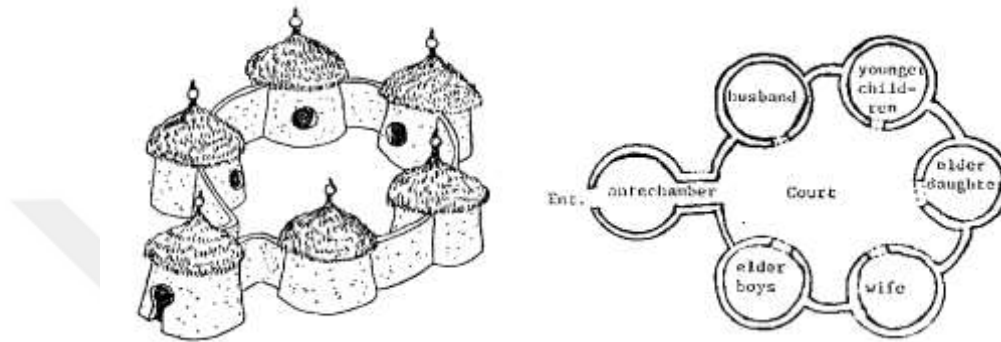


Figure 4.11 Houses in western Sudan



Figure 4.12 Nuba houses

4.3 Houses in Urban Areas in Sudan

After the British colonial movements, the housing systems in the urban areas and cities have changed and now it follow the Ministry of Urban Planning. This ministry sets laws and requirements for buildings and streets and defines the built environment and features of the Sudanese city's urban design. Since the English rule was a law to regulate the buildings, this law was amended in 2008 to be Commensurate with the Sudanese houses requirements list [130]. Organization buildings reasonably have the effect of substantially on the houses' identity, where

commitment as stated in which the directives are applied laws of by planners, engineers, designers, and executives. The regulation of building often contains the primary laws and the rules.

Additionally, the list dictates terms more specifically afford on housing and other subjects, such as pedestrian roads and parking places, the heights of buildings, and the number of floors. The building law has an apparent effect on establishing a Sudanese architectural identity. House and residential lands are classified into many classes [144]: First-class houses, Second-class houses, and Third-class houses. The plots of the third-class houses have an area of 300 square meters, while the second-class houses have an area of 400 square meters. First-class homes can reach 800 square meters per plot of land. The following table shows the difference between the first, second, and third class houses in urban areas. The following table 4.1 shows the differences between classes [144].

Table 4.1 The division of housing classes in the urban areas in Sudan

	First-class house	Second-class house	Third-class house
Plot size	800 square meters.	400 square meters.	300 square meters.
Floors	Five floors.	Three floors.	One floor.
The planning			

4.4 Factors Affecting Sudanese Houses:

As we mentioned before in this chapter, the Sudanese traditional houses went through several periods that affected it. In addition, several factors affect the architectural form and composition of buildings in Sudan, and these factors can

be physical, economical, or cultural, social, as follows [145] [146] [147] [148] [149]:

(I) The physical factors: They include historical, climatic, and structural factors:

As for the historical Factors: Every architecture style has a unique and matchless characteristic, and any building in this world has its unique historical imprint. This exclusivity comes from its origin and historical background, and it could come from the transfer of the concepts and thoughts from one generation to another. Sudanese historical background contains a lot of ancient kingdoms, such as the Kush kingdom Merew kingdom. According to history, many African and Arabs tribes moved and settled in Sudan. Nowadays, a lot of buildings are still used some historical symbols in their external and internal design details.



Figure 4.13 The Using of the Sudanese historical symbols in internal and external design

For the climatic factors, Sudan is a hot country located on the equator; As is in most African countries, the climate is one of the factors affecting the formation of homes, where materials are chosen to suit and adapt to the hot African climate. Most of the materials are earth materials such as clay, straw, and wood. Besides, there are a lot of materials from nature, such as animal wastes. Mud architecture is one of the most important houses that characterize the Central African region, such as Chad, Togo, Guinea, and Kenya.

As for the functional and structural factors; as a result of the diversity of social, economic, and political activities, new buildings appeared; the function also affected the appearance of the external attic, besides the emergence of advanced structural techniques that affect Sudanese houses and are affected by reinforced concrete. The architectural property depends on the techniques used in it. The use of modern machinery and skilled labor has resulted in high quality, time, and effort savings.

(II) Economic Factor: The economic factors significantly affect the formation of the internal and external house, where the economic status of a person determines the number of rooms, the number of floors, and the type of construction materials, and we find in Khartoum the economic level is higher compared with the rest of Sudan as a result of the presence of industry and trade, the opposite is in the form of buildings in general and the emergence of modern buildings In the capital, you find building materials consisting of black henna, aluminum, glass, and others.

(III) Cultural and Social Factors: The society's culture in the past was related to the human understanding of creed and religion. In turn, it was reflected in residential houses design on the external and internal levels .But with the intertwining of cultures, negative aspects of social change and residential customs that led to the emergence of a contemporary residential environment were bound to a Western thought that was not related to the Islamic approach and from the Westernization manifestations of the glass facades in the buildings .Customs depended on collective participation, determining social relations based on individual and ethnic affiliation such as large courtyards, dividing houses into two parts, and clubs and squares.

The religion is one of the most critical factors that affect the formation. The houses in Sudan are designed according to many religious standers. Most Sudanese homes are directly affected by the Islamic religion, which is evident in the privacy and separation between men and women. It also affects the house's location, so many prefer to set up their homes near mosques.

4.5 Chapter's Conclusion

To understand the nature of Sudanese architecture, it was necessary to conduct a brief review of it, which included the periods that architecture went through in Sudan. Architecture passed through several periods, including ancient architecture, architecture during the Turkish rule, architecture in the Mahdia period, the architecture of Anglo-Egyptian rule, architecture in the post-independence and modernity period. In general, Architecture in Sudan is divided according to the region it belongs, as the structure of buildings and houses in the south, north, west, east, and central Sudan differs from each other, as mentioned earlier in this chapter. The building materials used, the external shape, the distribution of spaces, and their number differ from one area to another. Sudanese houses is affected by several factors, including cultural, religious, environmental, historical, and structural factors. All of these factors combined had an impact on the formation of the final result of the Sudanese house. The following diagram illustrates these factors:

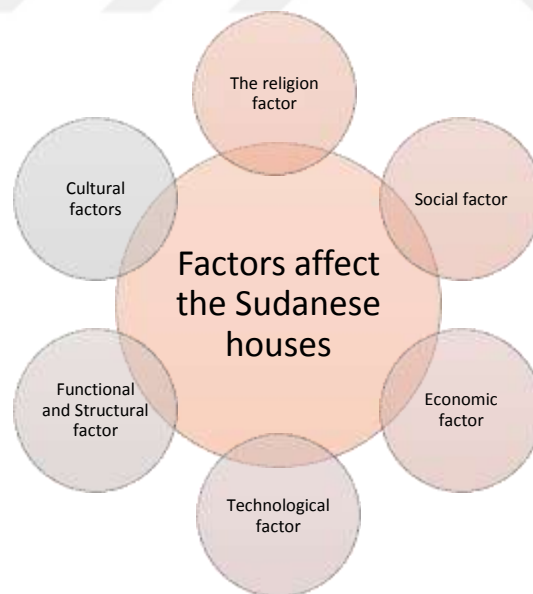


Figure 4.14 Factors that affect Sudanese houses

CASE STUDY- TUTI ISLAND

Spatial studies related to human social, cultural, and psychological behavior are not simple but rather require empirical work and theoretical knowledge. This case was chosen from among four other cases, where the criteria were based on previous studies in the field of architecture and heritage. They were as follows: (i) must be in an urban area that is still related to its heritage and culture, (ii) The area is not subject to planning and state-building regulations, and it has its own urban structures (iii), and the dwellings are must be built by the local inhabitants in the area. The location of the case studies was selected according to the previous criteria follows the houses of the Nuba Mountains in western Sudan, the Nuba houses in the north of Sudan, the houses of Gezira state in the middle of Sudan, and the houses of Tuti Island. These locations are clarified in Appendix-A. Initially, houses in the Nuba Mountains were chosen as a case study, but for reasons related to the pandemic, the security situation in Sudan, and access to the case's location, the case study had changed to the second choice, which was Tuti Island houses.

5.1 Introduction to the Case Study

Tuti Island is one of the essential islands in Sudan, and its unique location has made it an attention focus for many researchers. Tuti Island is located in the middle of the Blue Nile, overlooking the three principal cities in the state of Khartoum, which are Khartoum, Omdurman, and Bahri; The Island is inhabited by people from the Nubian Al-Mahas tribe and some different races; The locals on the island called themselves the Tutians [150]. They are very generous people, but they are also known for their sensitivity and sometimes hostility to foreigners. The people believe to be all related to a 16th-century sheikh known as Arbab al-Aqaed; although the inhabitants of Tuti enjoy a high level of education, and many of them occupy important positions in various institutions, the island has been left

without development or planning to protect its social connections and heritage [150].



Figure 5.1 Aerial views of the island

5.1.1 The Location of Tuti Island

Tuti Island is located in Sudan, specifically in Khartoum state, in the middle of the Blue Nile [151]. The island is an area formed in the southeastern with a crescent shape by sedimentation. The island's location is considered a privileged location as it is located in the middle of the three cities of Khartoum. The island is 1,260 feet above sea level, with a total area of four square kilometers [151]. The way to reach to the island is through the Tuti Bridge, which was built in 2009; In the past, people used boats to reach the island from other cities [152].



Figure 5.2 The Geographical location of Tuti Island



Figure 5.3 Tuti bridge -The main access to Island

5.1.2 History of the Region

The island inhabitants are from the Maha's tribe, whose members belong to the northern Nubian regions of Sudan. The Nubians of the Maha's tribe intermarried with the Arabs who came on caravans. Their official language is Arabic, and besides that, they speak some local Nubian languages. History confirms that the first settlement on the Island was in the sixteenth century. In that time, Al-Mahas migrated to it after the fall of their kingdom in the north [153]. The Island passed through several stages. At first, it was inhabited by some individuals until the end of the sixteenth century when the sheikh Arbab and his assistants founded the first mosque on the Island; This mosque was the beginning of the expansion of the residential environment on the Island, But this did not last long [154]. With the departure of the sheikh, the importance of the Island gradually decreased, and this situation continued during the Mahdia period and the period of Ottoman rule until the capital was transferred to Khartoum during British colonialism. The importance of the Island increased after that, and some public services have entered the Island. The British government was concerned with education in that period, so some schools and a health center were established on the Island [155] [156].

5.1.3 The Climate of the Case Study

The main seasons in the island's climate are summer, autumn and winter. In summer, temperatures reach 40°, and summer continues from March to July, while autumn begins in Sudan from August to October, and the temperature during the season is moderate between 25-30°. This season is considered one of the most influential seasons on the island, as there is a possibility of flooding every year. The average level of rainfall in autumn reaches 80 cm. The Sudan season is characterized by moderate temperatures that can reach 20°. Sudan is affected by northeastern and southwestern winds, so windows are designed in homes in the northern and southern directions for the purpose of ventilation [157].

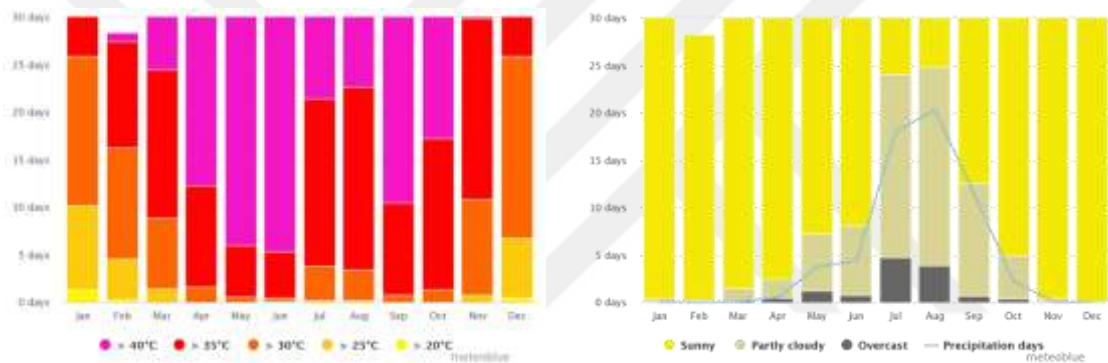


Figure 5.4 The climate of Tuti Island

5.1.4 The Natural Phenomena

Tuti Island suffers from natural disasters, namely floods and erosion [151][158]. The floods occur every year, coinciding with the autumn season on the island. Several factors affect the floods that occur; the most crucial factor is the low level of the island's surface, the strength of the Blue Nile rush, due to the increase in the rate of rain, or the presence of obstacles in the course of the river [159][160]. The second phenomenon that the island suffers from is erosion, where the rush of water causes carving to some of the island's edges [161]. The carving annually affects the areas overlooking the river, and this process has caused a loss of agricultural land [162].



Figure 5.5 The Natural Phenomena of Tuti Island

5.2 Socio-cultural Life on the Island

5.2.1 The Population and Age groups

Through the demographic information of the people of Tuti, there are on the island the present generations can be divided into four groups as follows [163]: The first generation: They are children, and their ages reach 15 years. The second generation includes young people aged between 16 and 30 years, and the third generation: adults aged between 30 and 60 years. Fourth generation: They are adults over 60 years old.

Table 5.1 Age composition according to 2013 Population Census [163].

Age group	15-0	30-16	60-31	60>	Total
The number	2532	3418	2102	377	8429
The ratio	30%	41%	25%	4%	100%

5.2.2 The Family in Tuti Island

According to the statistics, the number of families on the island is estimated at 2523 families, with an average family size of about seven members. Over the past years, the statistics figures show that the men's percentage has been decreasing, and the women's percentage has increased. The percentage of women was 45% in 1955, while the ratio of men was 55%. In 2013, the number of women was 48%, while the number of men was 52%. Where there has been an increase of 3%

in the percentage of women on the island in recent years, some residents left the island with the purpose of getting better opportunities [164]. Every family on the Island has its own family tree to show their origins, the figure shows some examples of family trees from Tuti.

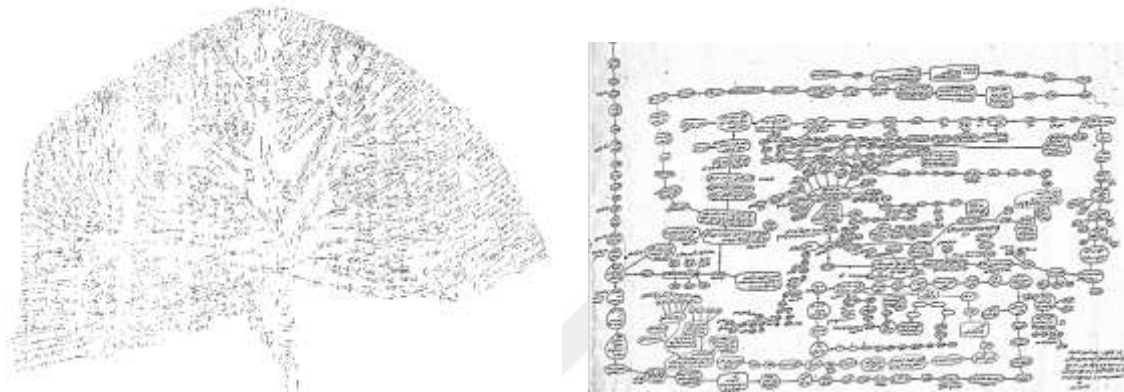


Figure 5.6 Examples of family trees

5.2.3 Social Characteristics of Tuti Society

The Tuti community is defined as a society characterized by solidarity, daily meetings, and strong bonds; The concept of family and its interdependence are among the essential concepts of people there. In fact, the community of Tuti Island is similar to the village community in that they care about each other; at the same time, they follow civilization and various life support systems [165]. The majority of these families live in houses close to each other, where any person seeks to live with their relatives in the same residential neighborhood. The individual is linked to society through several relationships, which may be a kinship relationship, a friendship relationship, or a neighborly relationship [166]. Since most of the ancestors of the current families in Tuti have lived on the island for centuries, there have been cases of intermarriage between family members, and this, in turn, has increased the bonding between families. The residents of Tuti always meet in joys and sorrows, and they also help each other in all areas of life. Usually, the meetings between individuals are happened according to gender and age group, where females of similar age groups meet with each other, the same thing happens

between males. These meetings often take place at home, outside, or in public places on the island.



Figure 5.7 The social characteristics of the people in Tuti

5.2.4 Cultural Characteristics of the Tuti Community

The Tuti community carries the Nubian culture, where clothing, cultural customs, and language, in the past, most of the village's residents worked in agriculture and grazing, as this profession was widespread in Nubia. After the development and the spread of education on the Island, many people left the agriculture works took new jobs. Today, enormous residences work in different professional fields, and some of them work in areas outside Tuti. The following table shows the percentage of each profession in recent years [167].

Table 5.2 The percentage of occupations for the inhabitants of the Island

The percentage of occupations of the inhabitants on the island					
Category	Employees and workers	Farmers	Retirees	Housewives	The Expatriates
Percentage	52%	4%	4%	33%	7%

The island inhabitants adopted other cultures from other Sudanese tribes that settled with them in the same area. The community of the Island holds cultural

activities in public places, such as dancing, singing, and performing some spiritual rituals. Other events can be held inside houses on the island and are often related to women. Cultural characteristics also include religious beliefs, as the island is considered an Islamic island that follows some Sufi orders. It can be said that the Tuti society is a society that bears in its characteristics the Sudanese Nubian culture and the Islamic culture.

5.2.5 The Role of Women

The role of women is one of the most prominent social indicators on Tuti Island. In the past, the women education was limited religious education for women conducted through mosques. During the last century, there was a positive change towards women's education on the island, which can be seen in the spread of formal education and the opening of girls' schools [168]. All this led to a lower illiteracy rate compared to the previous year. Women on the island are considered the first and major supporter of most members of society, and they occupy several jobs besides their job at house, such as agriculture and voluntary and community work on the island, and with the development of education, women have become occupations in health, education, and engineering.



Figure 5.8 The women in the Island

5.3 Spatial Analysis of Tuti

5.3.1 The Planning History

The actual beginning of settlement and residence on the island was when the immigrants came to Tuti at the beginning of the sixteenth century AD, and in 1691 the first mosque was built by Sheikh Arbab Al-Aqeed; The buildings in that period were built of mud and thatch, and the shape of the building was conical [154]. The building walls were made from mud, and people used a wooden pole in the middle; this kind is called Qutiya. In the years 1940, the island expanded not significantly, but the most critical aspect was the change of the style of the housing unit from a circular plan to a square shape [169].



Figure 5.9 The Quttiye form and mud house form

In 1962, there was an increase in the residential part built on the island from all directions, as the expansion was taking place radially from all directions. As for the year 1970, the increase was heading towards the northeastern and southwestern parts; meanwhile, there was a significant decrease in agricultural lands on the island. During this time, the streets were not apparent in their tracks because they didn't have responsible authorities in regards of planning the island [170]. In the years 1985, the residents made an expansion in the southern, northern and eastern sides. At the beginning of the 1990s, there was an increase in the population, which was reflected in the number of residents and thus affected the island's expansion[171]. After opening the Tuti bridge, the main streets

became more critical in allowing cars to reach from Khartoum and move freely on the island. A public transportation station was also established in the island's center to be in a central place for the island's residents. In different neighborhoods, particular yards were also established for parking cars[172].

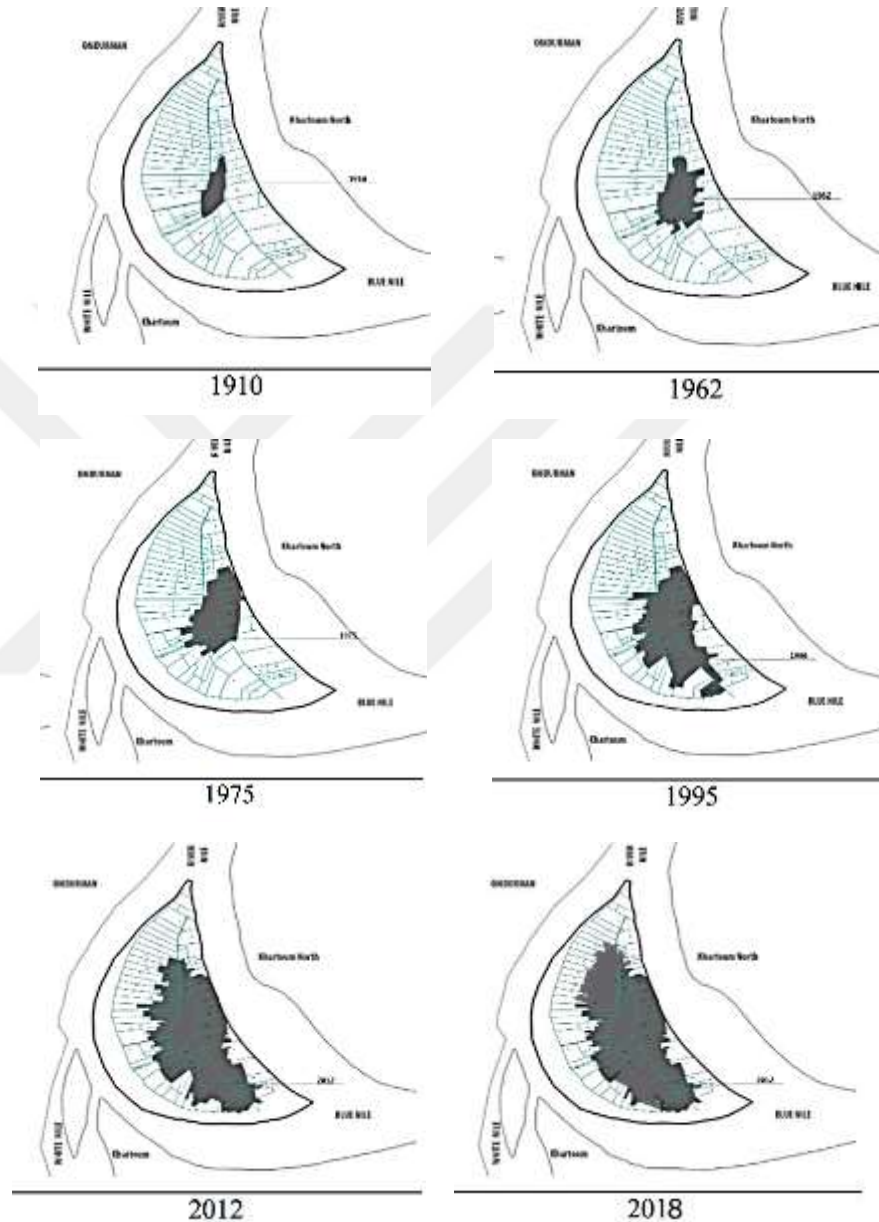


Figure 5.10 Urban Changes in Tuti Island from 1910 to 2018 based on Aerial Photos

5.3.2 Island Structures

The urban structure of Tuti is divided as follows: The structure called the ancient or old Tuti, the structure of the central region of Tuti, and the structure of the farms in Tuti [173].

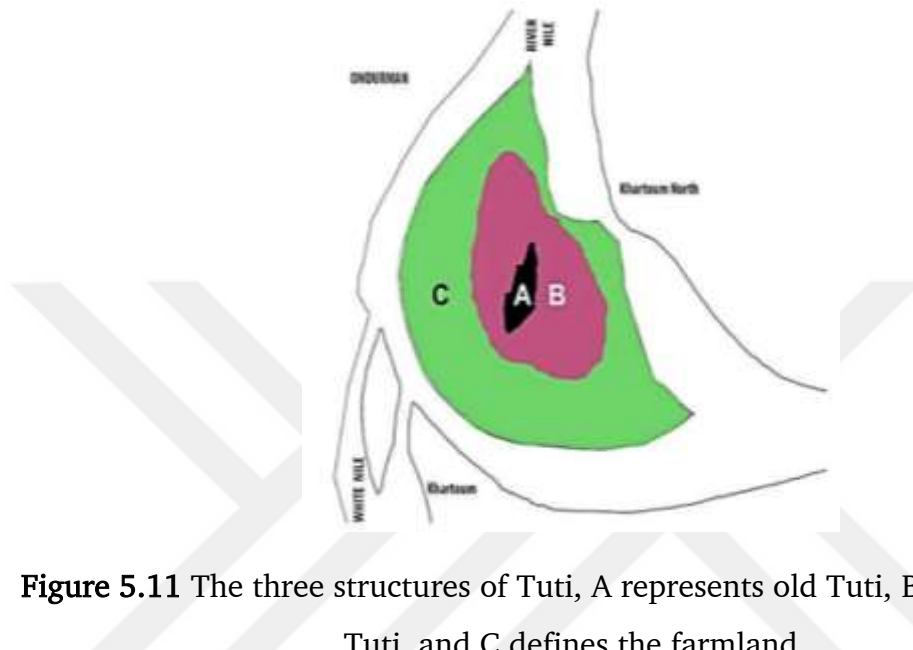


Figure 5.11 The three structures of Tuti, A represents old Tuti, B shows central Tuti, and C defines the farmland

The first urban structure contains the old area surrounding the mosque, which was built in the seventeenth century, and the area of this section is 210,000 square meters [174]. As for the first area, which is called Old Tuti, the buildings in the old area consist of one floor, and its streets are narrow and meandering, and the houses are attached to each other. The lands in that area are not officially registered in the state records, as they are inherited from one generation to another [175]. It is divided between individuals, and for this reason, we find urban accumulations in that area.



Figure 5.12 The Area of Old Tuti

The second urban structure is known as the Tuti Al-Wusta, and this area reaches an area of 2,310,000 square meters; This area surrounds the old Tuti and is characterized by the variety of its buildings in shapes and heights, and its streets have clear lines but at the same time are narrow and winding [173]. In fact, the area was previously used for agricultural purposes, and it turned to residential lands due to migration movements to Tuti Island. With the increase in the population and the arrival of new people to the village, the built areas increased.



Figure 5. 13 The Area of Central Tuti

The last section is Tuti farms with an area of 1470000 square meters; This part includes agricultural lands on the island, whose past areas were larger than the built environment in the present [173]. Further, it is an unplanned agricultural area; the residents distributed it among them according to the seniority of their

arrival to the island. In recent years the farms' regions have started to decrease in the percentage of their areas.

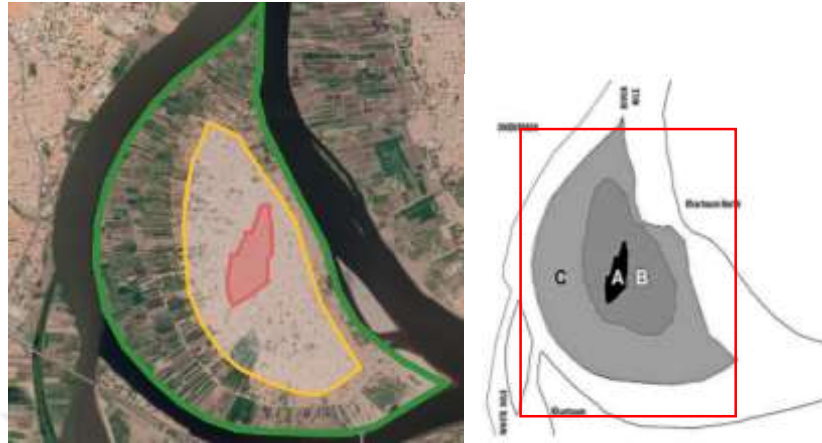


Figure 5.14 The farms' area

5.3.3 Tuti Streets

The streets in Tuti can be divided into two parts: main streets and alleys. As for the main streets, there are three main streets in the area: Station Street, Agricultural Ring Road, and Ten Street. Station Street extends from Tuti Bridge in the south to the island's center in the north. The ring road extends around the island and passes through the agricultural areas. As for Ten Street is considered an internal street in the neighborhood and extends through neighborhoods one and two. These streets are the main artery of movement on the island, from which alleys and lanes branch. As for the alleys, they differ according to the residential neighborhood and the area in which it is located. In the old area of Tuti, the width of the alley may reach a meter, while this width increases in the neighborhoods located in the middle area of Tuti, so the dimensions of the alleys reach two meters.

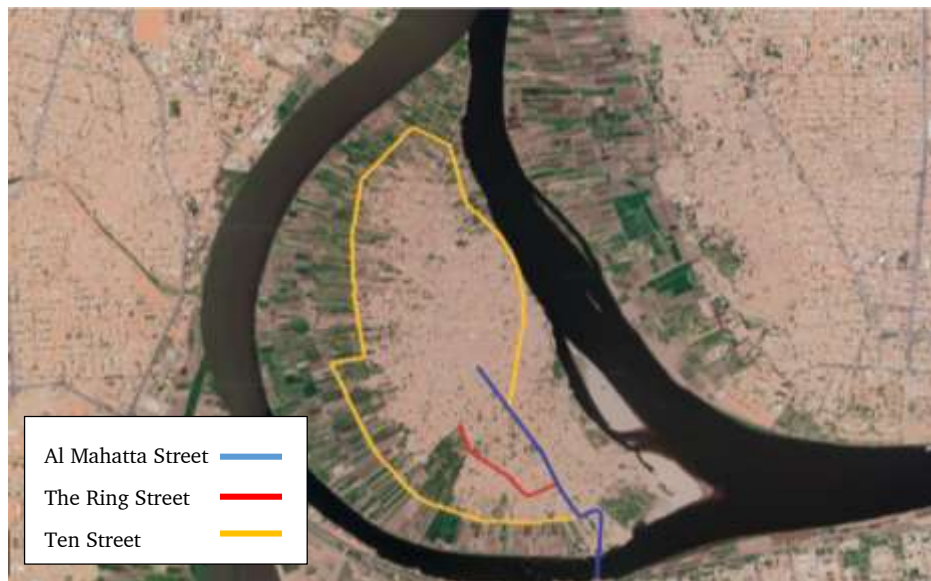


Figure 5.15 The photo shows the main streets in the Island



Figure 5.16 Al-Mahatta street



Figure 5.17 Alleys in old Tuti



Figure 5.18 Alleys in central Tuti

5.3.4 The Neighborhoods of the Island

The definition of a neighborhood could be a group of buildings in one housing area, and they are often similar in general characteristics such as height, materials used, and design method. Each neighborhood has different characteristics from the other neighborhoods. Residential neighborhoods are characterized by cultural and social features, which are shown through the details of the neighborhood planning and the houses' design. Hamdi mentioned that the neighborhoods on the island had been divided since 1975 into five neighborhoods [175]; namely, the first neighborhood, the second neighborhood, the third neighborhood, the fourth neighborhood, and the fifth neighborhood. The first one is located on the southern side of the island, and it is followed by the second and third in the north direction, and then the fourth and fifth districts in the same direction. The following figure shows the residential neighborhoods on the island.

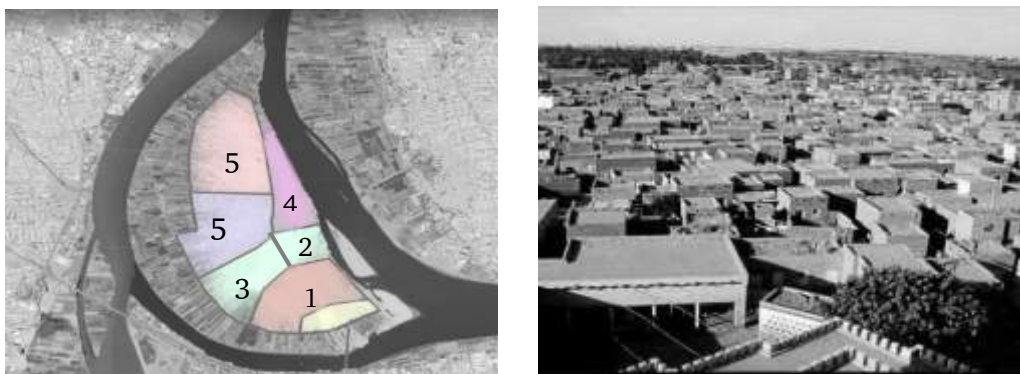


Figure 5.19 The division of the neighborhoods in Tuti Island

5.3.5 Spatial Analysis of the Houses in the Island

Houses on the island are divided into several types, detached or single-family, extended family, and multi-family houses. It isn't easy to define the house on the island of Tuti, as the houses differ according to the neighborhood in which they are located and according to the urban sector in which they are located. Due to the lack of references in this regard, it was necessary to conduct a field study to understand the island's houses. The field study included several points about the houses: the House's plan, the number of spaces, the type of spaces, the number of family members, the number of families in the house, the family members' religion, and the activities of inhabitants. The aim of compiling this data was to understand the residents' lives and their social and cultural lives within the home on the island. The study included eighteen of the island's houses; this number was determined based on previous studies that have researched topics similar to this type of research. The criteria for selecting houses from the neighborhoods in (Appendix-B) were: (1) It should express the characteristics of the neighborhood in that it is located. (2) The house inhabitants must be from the old inhabitants on the island. (3) The residence must be for a family with a clear family structure. (4) the house had built and designed by the family, and it has not been purchased. The table of the spatial analysis has four main elements which are house plan, a description part, the list of the activities, and external pictures of the houses.

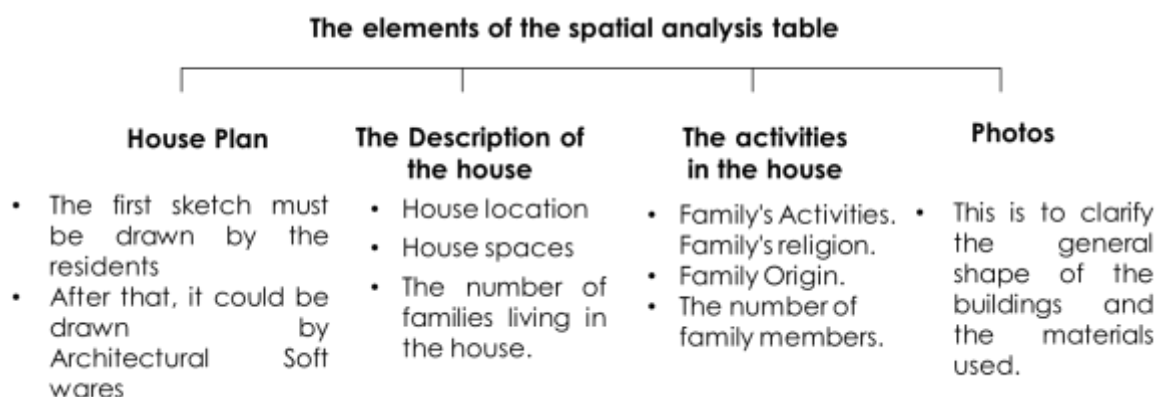


Figure 5.20 The elements of the spatial analysis of the houses

5.3.5.1 Analysis of the Houses in the Neighborhoods

Houses in the first neighborhood have a modern style, and the height of residential buildings ranges from one to three floors, while the height of commercial buildings reaches three floors. As for the colors of the houses' exterior walls, they differ from one house to another. Most of the buildings are built of concrete materials; as for the walls, red brick and terracotta bricks are used. The following example is for a house located in the first neighborhood of the island and consists of two floors. The Family members live on the ground floor, and it contains several areas are: rooms, a salon, hall, bathrooms, and kitchen. The upper floor is reserved for family relatives and their children. The house has three main entrances, an entrance for family members, an entrance for men, and an entrance for relatives. The house is considered an extended family house, but with a vertical extension. The activities in the house vary according to the space. Among the most essential activities in the house are the following: family meetings, sleeping, receiving guests, eating family gatherings, storing, preparing food, and cultural events. Since the thesis is concerned with the socio cultural factors, many data collected in this regard. For the basic of needs, the main activities in the house could express about them. These data will be used in the following section. From the following table, we could see the effect of each factor.

Table 5.3 An example for a House form the first neighborhood

Information	Plan	Photos	Socio-cultural factors
The location:  Houses spaces: 1 Girls bedroom ,1		 	Basic needs : Shelter, eating , sleeping, entertaining, personal needs. Family structure:extended family house.

Table 5.3 An example for house from the first neighborhood (continued)

Boys bedroom, 1 Master bedroom , 1 guest room 4 bathroom, 1 hall 1 Salon 1 kitchen , 1 women yard , 1 men yard .			Privacy: Separation between men and women , high walls, separation between families The role of women:most of the spaces are designed to fit women needs .most of the spaces are accessible by women Social interactions: This factor affected the house and determine its relation with the street the neighbors, and determine the spaces around the house. The social interactions in this area are less than other neighborhoods.
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Houses in the second neighborhood: In this neighborhood, the heights of the buildings vary from one to two floors. Most houses are built from red brick and without any finishing materials on the outside. The heights and shapes of the buildings are reasonably homogeneous because some buildings are built from local materials such as mud and wood. The following example is a house located in the second district of the island. This house consists of one ground floor and contains the spaces: bedrooms, hall, salon, kitchen, bathrooms, shops, and a side entrance for all family members. The family spaces are located in the inner part of the house, including bedrooms, kitchen, and women's courtyard.

As for the activities that this house contains, they vary according to each space, and the house members are from the old inhabitants of the island. The owner of this house works in the field of trade. Eight members live in the house, three males and five females. The family's structure consists of the mother, father, male, and children. Through the interview with the residents of this house, they confirmed that they carried out various activities that considered as the basic needs for the residents, including eating, sleeping, family gatherings, cooking, playing, and receiving guests; these activities take place in various places in the house. From the previous table there is a section that show the reflection of each factors on the house.

Table 5.4 An example for house from the second neighborhood

Information	Plan	Photos	Socio-cultural factors
Location:  House spaces: 2 Girls bedrooms, 1 Boys bedroom, 1 Master bedroom , 1 guest room, 3 bathroom, 1 hall, 1 Salon ,1 kitchen ,1 women yard ,1 men yard ,2 shops.		  	Basic needs : Shelter, eating , sleeping, entertaining, storing, sslling. Family structure: Nuclear family house Privacy: Separation between men and women , high walls, seperation between families The role of women: most of the spaces are designed to fit women needs, a separate yard is designed to fit women needs. Social interactions: This factor affected the

Table 5.4 An example for house from the first neighborhood (continued)

			house and determine its relation with the street the neighbors, and determine the spaces around the house.
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The houses in the third neighborhood: The third neighborhood is similar to the second neighborhood and is considered an extension of it, and it is separated from the second by Station Street. The buildings overlooking the main street range from one to two floors, while the houses inside the neighborhood consist of one floor. The colors used in the exterior facades of homes range from brick red to warm colors. Building systems range from load-bearing wall systems to reinforced concrete systems, and some houses use traditional construction techniques. The following example is of a house located in the third neighborhood of the island and contains the following spaces: bedrooms, salon, salon, bathrooms, and outdoor yards.

The house that we took as an example, contains several generations, including grandparents, fathers, and children. The head of this family worked in agriculture and was assisted by some of his sons. Eleven members live in this house, and they are distributed over three parts of the house. The number of male members is six, and the number of female members is five. Through the interview with the residents of this house, these residents perform various activities, including eating, sleeping, family gatherings, cooking, playing, and receiving male and female guests. These activities are carried out in many places in the house. Some spaces are multi-use; for example, the family could use the following spaces for sleeping: the bedrooms and external yards. As for receiving female guests, there is no specific place to receive them. As for male guests, they are received in the area designated for men only. As for the socio-cultural factors, they affect the house through the basic needs, family structure, privacy, the role of women, and the socio-cultural factors. For the basic needs they reflected in these needs: need to

shelter, eating, sleeping, personal needs, and entertaining. For the Family structure, the house contained an extended family and the house is divided according to the families' numbers. For the privacy the family did a separation between men and women, and they surrounded the house with high walls; besides, they divided the house into many sections to fit the families. As for the role of women, we could find most of the spaces are designed to fit women's needs, the women dominate three-part out of four from the house. Social interactions, this factor affected the house and determine its relation with the street the neighbors, and determine the spaces around the house.

Table 5.5 An example for house from the third neighborhood

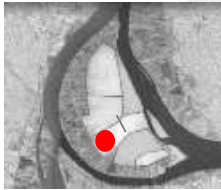
Information	Plan	Photos	Socio-cultural factors
The location:  Houses spaces: 4 bedroom , 4 bathroom, 1 hall , 1 Salon, 1 kitchen , 3 women yard ,1 men yard.			Basic needs : Shelter, eating , sleeping, personal needs, entertaining Family structure: An extended family house Privacy: The Separation between men and women , high walls, separation between families in the house and the type of the privacy. The role of women: most of the spaces are designed to fit women needs , the women dominate three part out of four from the house.

Table 5.5 An example for house from the third neighborhood

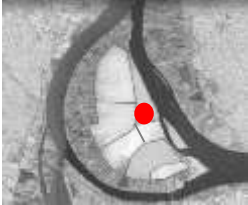
			Social interactions: This factor affected the house and determine its relation with the street the neighbors. Determine the relation between house's families sapaces.
--	--	--	--

Houses in the Fourth neighborhood: The old residents of the island live in the Fourth neighborhood, where the buildings are characterized by their narrow spaces. Most of the households here are houses for extended families, and they are one-story. Residents use various building materials, including clay, wood, and animal waste. Some houses have been renovated with materials considered modern, such as concrete. As for the spaces in the houses, it depends on the size of the extended family in the house. The following example is for a house located in the fourth arrondissement of the island. This house is inhabited by one families and contains the following spaces: bedrooms, salon, kitchen, bathrooms, storage, and outdoor yards, one of them for men and the other for women. The house has a main entrance for the members of the house.

The house in the following table is for a family with seven members, and the structure of this family consists of parents, three daughters, and two sons. The head of this family works in the private sector. Several activities are performed in this house, such as sleeping, eating, resting, cooking, storing, family meetings, receiving guests, and some cultural customs such as dancing, singing, and some special family occasions. As for the occasions, they can be held in multiple areas of the house, including the internal or external parts. The following table has some information about the house, such as the location, house's spaces, House plans, exterior photos, and a section containing the socio-cultural factors. The data that was collected was from the interviews and the observation that did. For the socio-cultural section, it contained the basic needs factor which is represented the

activities in the house. The family structure contained the type of family in the house. While the privacy factor showed the decisions that made in the house to provide the needed privacy. The role of women factor is shown through the great effort of the female members in designing and arranging the house spaces. The last factor is the social interactions factor and it determines the layout of the house and the exterior elevations of the house.

Table 5.6 An example for house from the fourth neighborhood

Information	Plan	Photos	Socio-cultural factors
Location:  House spaces: 1 Girls bedroom, 1 Boysbedroom, 1 Master bedroom , 1 guest room, 4 bathroom , 1 hall ,1 Salon ,1 kitchen ,1 women yard ,1 men yard.		  	Basic needs : Shelter, eating , sleeping, entertaining Family structure: Nuclear family house Privacy: Separation between men and women , high walls, seperation between families The role of women: the woman in this house helped in desined the house and most of the spaces are designed to fit women needs Social interactions: determine its relation between house and the street and the neighbors, the relation between the families inside the house.

Houses in the Fifth neighborhood: This neighborhood is divided into two sections; the first one is located in the area around the Grand Tuti Mosque, and its buildings have a prominent ancient architectural character. Local materials such as clay and wood are used there, and some ancient architectural forms such as arches and wooden architectural elements. In this section, Household materials are clay, bricks, and timber for roofs. The heights and shapes of the buildings in this section are relatively homogeneous because the houses are built from local materials. The second section of the fifth neighborhood has a new character, as there is a discrepancy in the number of floors that can reach two floors. This is an example of a house located in the fifth neighborhood of the island and contains the following spaces: bedrooms, salon, hall, kitchen, indoor and outdoor bathrooms, a private yard for men, and a private yard for women.

Table 5.7 An example for house from the fifth neighborhood

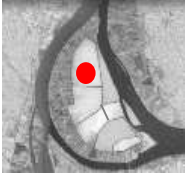
Information	Plan	Photos	Socio cultural
Location:  1 Girls bedroom , 1 Boys bedroom ,1 Master bedroom ,1 guest room, 4 bathroom ,1 hall, 1 Salon ,1 kitchen ,1 women yard ,1 men yard.		  	Basic needs : Shelter, eating , sleeping, entertaining Family structure:Nuclear family house Privacy: Separation between men in spaces and women in spaces , high walls and the clasification between privacy levels in spaces. The role of women:most of the spaces are designed fit women needs. The women's yard is designed to give the wonen a space to practice the cultural activities. Social interactions: This factor affected the house and determine its relation with the

Table 5.7 An example for house from the fifth neighborhood (continued)

			street the neighbors, and the design of the house put some space between house spaces and the neighbor spaces.
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After interviewing this house's residents, we found that six members live in this house, and the family structure consists of a mother, father, three daughters, and one son. The members of this house perform several activities spread over the house' spaces. The external yards are multi-use for sleeping, eating, meeting with the family, family visits, and performing religious and cultural rituals. In the house, the salon is used as a reception and as a sleeping area for their son. The back area of the house was used as a sleeping place for the family during the hot nights in Sudan. As for the socio-cultural factors, the impact of each factor was mentioned; the Basic needs of the family, the family structure was defined, the type of privacy, the role of a woman in the home, and social interactions, all of these factors were summarized in the table.

5.3.6 The Characteristics of the houses

Buildings are the most visible elements of urban design and include building forms, elevations, materials, colors, and textures, where these elements meet with each other to form what is known as the elements of visual design. The area of the houses on the island varies according to the number of families present in one plot of land. It ranges from 100 square meters to 700 square meters, and it is up to 700 square meters in some places. The participants who live in the old Tuti answered their lands ranged from 100 to 200 square meters; The lands, in general, pass down from grandparents to new generations. After the spatial analysis of the houses, it became possible to give a description of the houses on the island. In order to facilitate the process of describing the characteristics of the house, it was divided into several points as in the following figure.

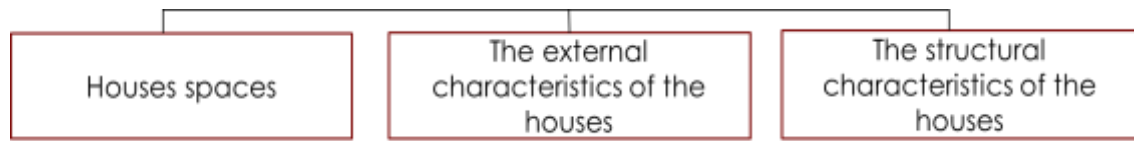


Figure 5.21 Characteristics of the houses

5.3.6.1 The spaces of Houses on the Island

Through the field study that was done and summarized in Appendix-B, there are essential spaces in most of the island's houses, and the spaces are as follows:

(i)The kitchen in the houses that were studied was an essential part, but its location varies from one house to another. Some kitchens are external and have a shaded area attached to them, and it is used as an additional area for cooking. In some houses, the kitchen could be inside the house. One of the main activities that take place in it is preparing food and sometimes eating. Some kitchens have their own storehouse attached to store dry food or store some utensils and oversized pieces that are not always used.



Figure 5.22 Examples of Kitchen from the Island

(ii)The bathroom, in addition to being used for personal hygiene, it is also used for washing clothes. As for the locations of the bathrooms, they can be found inside or outside the house. The internal bathrooms are designed for family members and female guests, while the external bathrooms are for men.

(iii)Yards in Sudanese houses are divided into internal yards and external yards or to front yards and backyards. The front yards are often designed for men in most homes, while women occupy back yards in households. Through interviews and observation, courtyards are used for several activities in island homes: in the morning, they are used for several activities such as cooking, receiving guests, and family meetings, but at night they are used for sleeping during the hot seasons in Sudan.



Figure 5.23 Examples of external yards

(iv)The rooms in the Sudanese house are one of the essential spaces in the Sudanese house. Sometimes they are used as a multi-use space. Their number is determined by the size of the family, the economic situation, and the family's culture. There is always a room reserved for the parents, a reception room, and restrooms for all family members. The rooms are used for sleeping and resting during the day. There is no specific room for eating in the island houses, and the people use halls or rooms to this purpose during the day and in the courtyards at night. The average room number on the island is three rooms, and it may reach five rooms for large families or one room for families with low income.



Figure 5.24 Some examples of the rooms

(iv) The halls are used as a multi-use space, they are used to receive guests and eat, and in some homes, they are used as an extra space for sleeping. It is used by family members or for female guests. It is connected to the house's rooms and the rest of the interior spaces and is considered a space that connects the house's spaces.



Figure 5.25 Examples of halls in houses

5.3.6.2 The external Characteristics of the Houses

The external characteristics of the houses depend on the styles, colors, and materials that differ in finishing and external appearance. As for the colors used in the external walls, they differ according to people's tastes. Some residents tend to earth colors such as brown and beige, and others tend to warm colors. Here are pictures showing the colors used on the exterior walls.



Figure 5.26 Exterior walls for houses with colors



Figure 5.27 Exterior walls for houses with no colors

From the general characters of houses on the island is the top parapet with no more than 50. The salons or divans are generally characterized by corridors with open arches.



Figure 5.28 Architectural formation of buildings from outside

The doors and windows are distinguished by high-rise doors and windows made of wood or iron with arches, as in figure 5.29.



Figure 5.29 The use of arches in doors and windows

External doors are one of the most critical components of the facade of the house, as they play an important role in it. In the past, wooden doors were used, and they began to disappear because the people replaced them with iron doors due to their strength and rigidity. Iron doors have become the most likely among the island's residents, and their designs and colors differ from one house to another.



Figure 5.30 Some of the doors designs

5.3.6.3 Houses Constructions Materials

On the subject of construction materials, People use different types of them. As for the foundation, stone and bricks are used on a large scale, and this is because the load-bearing walls system is the popular structural system. The ceilings on the island vary depending on several factors. The house's age, economic condition, and area affect the house's ceiling. Among the common types are concrete ceilings, beam-based ceilings, and traditional roofs (made of wood, mud, and some local materials), and the common roof is the Jack arch roof.



Figure 5.31 Jack arch roof



Figure 5.32 House roofs in mudhouses in Tuti

In the past, as for the walls of the buildings, the inhabitants used to build their walls from mud in the past. The use of red brick spread in Sudan after British colonialism. Some residents have introduced refractory bricks into their home building systems in recent years. For the floor finishes, there are several materials

that residents use them in their homes, including tiles, ceramics, porcelain, cement-sand mixture.



Figure 5.33 The use of clay in the houses



Figure 5. 34 The use of Red bricks in the houses

5.4 Analysis of the Influence of Socio-Cultural Factors on the Formation of the Houses on Tuti Island

To analyze the impact of socio-cultural factors on the island houses, sequential steps had to be followed. This process initially included designing the questionnaire and defining the sample size. The next step was to develop a method and mechanism for the used analysis method, and It included the data that had been collected. Through Using this method and sequencing, it was easy to conduct a discussion and analysis of thesis results.

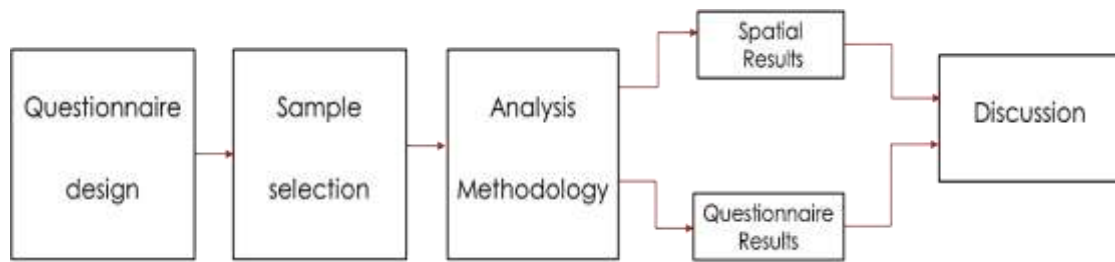


Figure 5.35 The sequence of the analysis steps

5.4.1 The Questionnaire Design

The questionnaire method is used to investigate the residents' opinions about the role of socio-cultural elements and their impact on the built environment in Tuti. Several questions have been prepared to find out the opinion of dwellers in terms of socio-cultural and its effect on dwellings design and forming of the plan of the whole Island. The questionnaire contained several aspects of social life, culture, and houses' features. Some questions of the questionnaire are designed according to LIKART Scale. Answers of the respondents are considered a crucial indicator of the importance of these factors within the case study and their influence on house design. Through theoretical studies, there are many definitions of the concept and components of socio-cultural factors. According to Rapoport, these factors divide into five main sections: the basic needs, the family structure, Privacy, The role of women, and social interactions. The questionnaire was designed to conduct the effects of the socio-cultural factor, and it was prepared according to the previous factors. The descriptive questions are questions that need answers containing identifying information. These questions aim to describe a phenomenon or research variables. In this research, descriptive questions revolve around the socio-cultural factors; this type is used in questions related to the residents' opinion on the extent to which the elements of privacy and social interactions influence the composition of the home spaces on the island. In the factor of basic needs, the questions tried to give a detailed. The descriptive questions are questions that need answers containing identifying information. These questions aim to describe a phenomenon or research variables. In this research, descriptive questions

revolve around the socio-cultural factors; this type is used in questions related to the residents' opinion on the extent to which the elements of privacy and social interactions influence the composition of the home spaces on the island. In the factor of basic needs, the questions tried to take detailed information about the residents' needs. As for the family structure factor, the questions aim to understand the formation of the families. As for the privacy factor the questions tried to figure out the degree of privacy and the privacy type. The questions of women's role were about the role of women in designing houses, they aim to describe the women's spaces. For the social interactions questions, it contained several subjects such as the distance from the Mosque, the space between the house and the neighbors, and the relation between street width and the social interactions. In this section, the LIKART Scale questions were used in the questions that need to popular opinions.

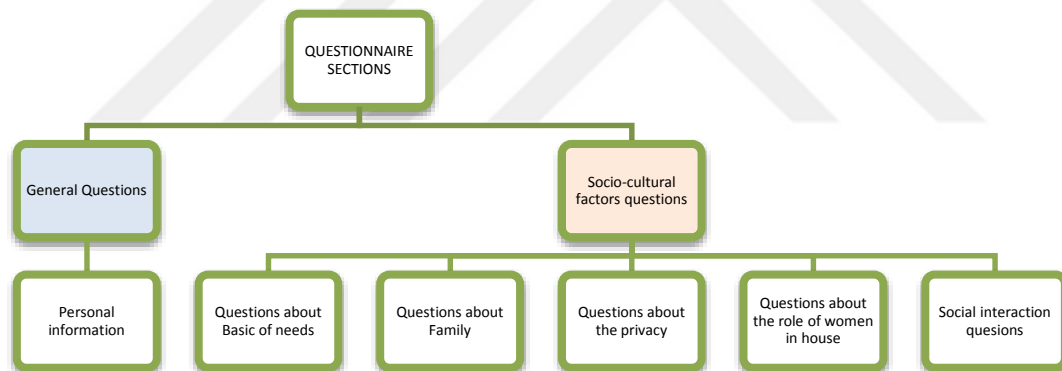


Figure 5.36 The questionnaire sections

Table 5.8 The Criteria for questionnaire' questions

socio-cultural factors	The Criteria for questionnaire' questions according to the previous literary theories	Questions
Basic of needs	- According to Maslow's theory, basic needs include: food, sleep, rest, protection, and the individual's special human needs¹⁰: - The questions will include whether the house provides spaces for these needs or not: Space for sleep/space for eating/space for cultural activities/space for rest/space for drink /A place that protects from environmental conditions	- Does the house provide you with the personal protection that you need? - Can you perform your religious rituals comfortably at home? - Does the house provide you with space for your personal needs? - Does your home provide you with your psychological needs, such as feeling comfortable and safe? - Does the house provide you with space for the sleep need? - Does the house provide you with a place to eat? - Where do your family members eat their basic meals? - Does your home provide for your cultural and social needs? - Does the house provide you with a place to perform your religious rituals?
Family	Through previous literary theories, the characteristics of the family affecting the home include these characteristics¹¹: - family religion, - family type, - family culture, - family structure, - The number of families.	- What is your family's religion? - How many families live with you in the same unit? - If more than one family is living with you, what is the type of kinship between you? - If several families are living with you, was the house divided according to the number of the families? - If there is more than one family, are some shared spaces in the house? - How many family members do you have? - Is the house designed according to your family members' number?
Privacy	The questions were based on the following theories¹²: - The culture and religion of the family determine the levels of privacy in the home. - In eastern Islamic societies, there is a separation of spaces between men and women. - The house is designed according to the purpose of protecting the woman in the house. - Privacy affects some of the architectural features of the house, such as fences, walls, and windows.	- Does your home design give you the privacy you need? - Is the house designed to provide the necessary privacy for women? - Do you consider your home is designed according to religious beliefs and customs that impose a special kind of privacy? - Is there a separation between the yards of men's and women's yards? - Is there a separation between the women's entrance and the men's entrance in the house? - Does designing windows and doors in your home give you the privacy you need? - Do bedrooms offer you high privacy in terms of design?
The role of women	From the literary texts¹³: - The Woman is considered as dominant in most of the spaces in the house - It is considered the primary user who is at the house most of the time - The houses are designed according to the cultural, psychological, and social needs of women - Women participate in house design - Women's culture affects the type of space and the way it is used	- Who had the most prominent role in defining and designing the spaces of your house? - Who can divide and arrange the interior environment in your home? - Is the house designed according to the needs of women? - What are the spaces that are considered private for women? - Are there spaces in your house for women to perform cultural rituals? - With the presence of female guests, should the male members be outside the house? - Where do you receive your female guests? - Is the front yard reserved for men to give female members their privacy with the rest of the house?
Social interactions	Groups belonging to a cultural or social and living in one area could influence the way the area is designed and planned in terms of¹⁴ : - street dimensions - Relationships between homes and public places - The distances between the neighbors	- Did your family choose the land based on the proximity and distance from the Mosque? - Is there enough space between your house and the neighbors? - Is your house located on a street less than 3 meters? - Are the neighbors around you from your relatives? - How many relatives live with you in the same residential neighborhood? - Where do you hold your events, such as weddings and other events? - What are the spaces that you share with your neighbors?

¹⁰ Sources , Some place like home: Using design psychology to create ideal place, Oliver , Built to meet needs.

¹¹ Sources , Housing and Family, Housing Theory, Culture and Housing.

¹² Sources , Privacy at home, The Effect of Religious Culture.

¹³ Sources , The Role of Women in the Layout and Interior of Bale.

¹⁴ Sources ,Shelter and society.

5.4.2 Sample Selections

The quantitative research requires conducting pre-prepared questionnaires and distributing them to the participants. The way that used in this research to determine sample size is to rely on published tables. These tables provide the sample size for a given set of criteria. Sample sizes would be necessary for given combinations of precision, confidence level, and variability [177]. The number of participants in the questionnaire was determined according to the island's population. The population reached 8429 people in 2013, and by calculating a 20% as increase, the total number would be around 10114. By Looking at the table and based on the population, we find that the number of participants should be 385 [178].

Size of Population	Sample Size (n) for precision (e)	
	±5%	±10%
500	222	83
1,000	286	91
2,000	333	95
3,000	353	97
4,000	364	98
5,000	370	98
7,000	378	99
9,000	383	99
10,000	385	99
15,000	390	99
20,000	392	100
25,000	394	100
50,000	397	100
100,000	398	100
>100,000	400	100

Figure 5.37 Sample selection

5.4.3 Analysis Methodology

Descriptive research is the most suitable and widely used for humanities and social studies. This type is based on some foundations, such as abstraction and generalization. It also takes many forms, such as a theoretical or field survey, content analysis, and case studies. The descriptive-analytical approach depends on studying the phenomenon that exists in reality and is concerned with describing it and expressing it qualitatively or quantitatively. The qualitative

approach describes the phenomenon and explains its characteristics, while the quantitative approach gives it a numerical description that shows the amount of this phenomenon, its size, or the degree of its connection with other phenomena. In this research, Tuti Island was taken as a case study to achieve the research hypothesis, and the two approaches were combined, both quantitative and qualitative methods. The qualitative method was based on observation, interviews, and photography. The qualitative method included a questionnaire based on theoretical studies and primary observation. To analyze the data, the theoretical studies, questionnaire results, and spatial analysis were used; this type of the analysis was based on the general survey of the region. The analysis and discussion were presented in points, based on the socio-cultural factors: they were as follows: an analysis of the basic needs factor, an analysis of the family factor, an analysis of the privacy factor, an analysis of the factor of the role of women and an analysis of the factor of social interactions¹⁵.

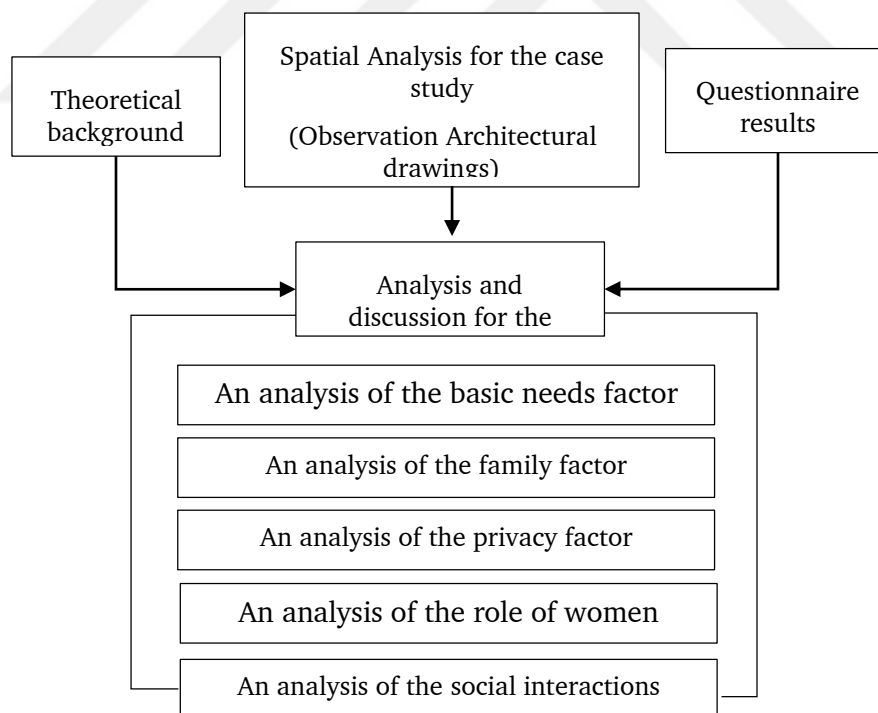


Figure 5.38 Analysis Methodology

¹⁵ This model was inspired by the analysis method that was done in the book: Utilization and Differentiation of Space: A Study of Social Factors Influencing House Design by Munira Daifalla.

5.4.4 Findings

The first section from the questionnaire was concerned with monitoring basic information about the participants. The main purpose of this section is to give information about the members participating in the survey. The benefit of collecting this information is to know which group was targeted and what their education level and age level are. Since this research includes an aspect of the humanities and social sciences, it was necessary to give the reader an overview of the participants. The research sought to collect information from both genders to know public opinion without bias towards a particular gender; The results show that 56.5% of the participants were males, and the percentage of females reached 43.5% and . As for the age groups the group (15-25) took the largest part of the participants, followed by the age group (26-35) with a percentage of 29.9, while the rest of the age groups (36-45), (46-55) and (56-) took these percentages: 19.3%, 18.0%, 22%. When the participants were asked about their educational level, the results were: University 43%, Secondary 21.8%, Intermediate 29.4%, Primary 4.9%, Other %0.8. The percentage of respondents from the Island's neighborhoods was as follows: 24.4% from the first neighborhood, 21.6% from the second neighborhood, 18.7% from the third neighborhood, 14.6% from the fourth neighborhood, and 20.6% from the fifth neighborhood .The houses on the island of Tuti are not only designed by architects, and the results confirmed this, as the participants affirmed that about 41.3% were designed by family members. While about 24.4% of their houses were designed by local builders, 21.5% were designed by architects, and 12.7% were designed by others.

5.4.4.1 Analysis for the Factor of Basic of Needs

Questionnaire Results:

When the participants were asked whether the home provides them with psychological needs, such as a sense of security and protection, about 81.2% answered yes, while 22.9% answered no. The Primary personal needs are considered part of the basic needs, and when asked whether their homes provide

them with these needs, about 75% answered yes and the other part no. The third question was related to the need for sleep. About 81.2% confirmed that the house provides them with this need. About 66% of the participants confirmed their homes provide them with a place to eat. The results showed a variety of places where the participants eat, and the spaces were: Yard or courtyard 17.9%, Living room 24.9%, kitchen 16.3%, Bedrooms 18.9%, Salon 14.0%, Other 7.8%.As for religious and cultural needs and activities, 95.6% confirmed that the design of their houses provides them with what they need to perform religious rituals. The figures 5.39, 5.40, 5.41, 5.42, 5.43, and 5.44 show the questionnaire results about this factor:

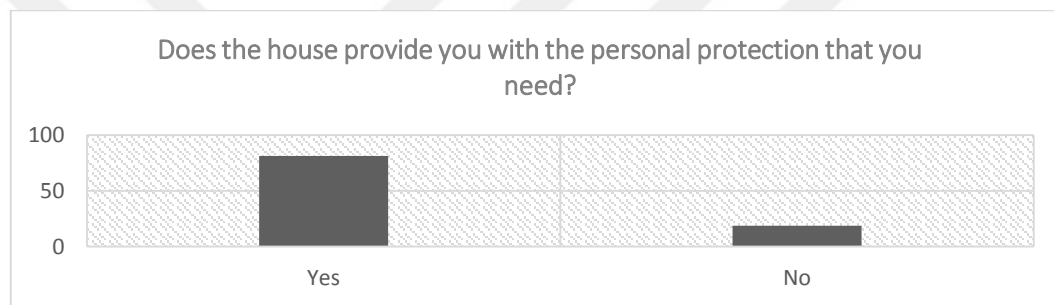


Figure 5.39 The personal protection need

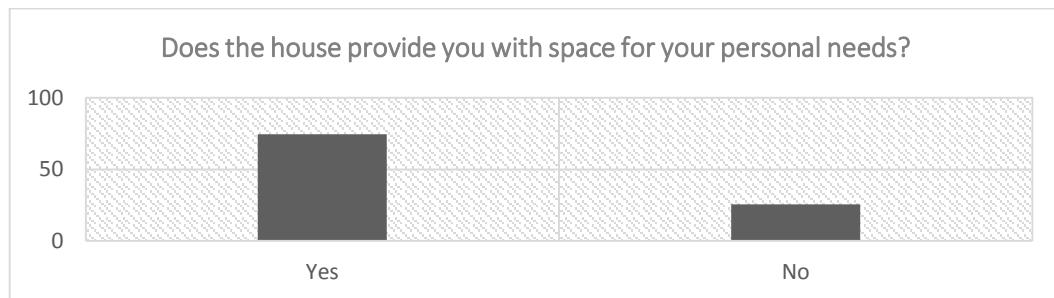


Figure 5.40 The personal needs

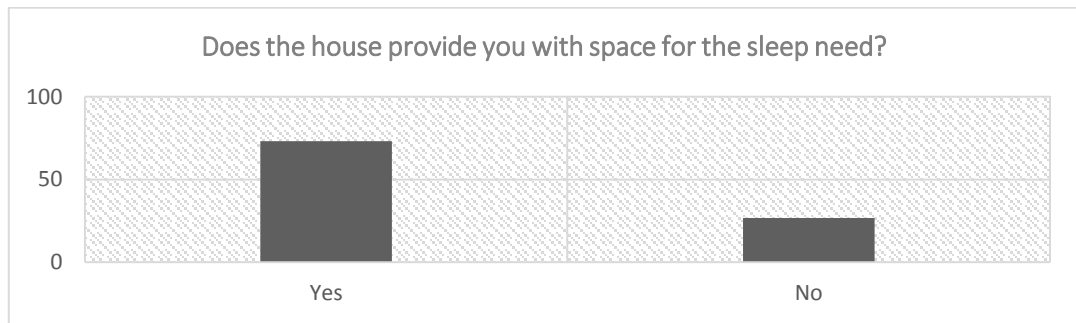


Figure 5.41 The sleep need

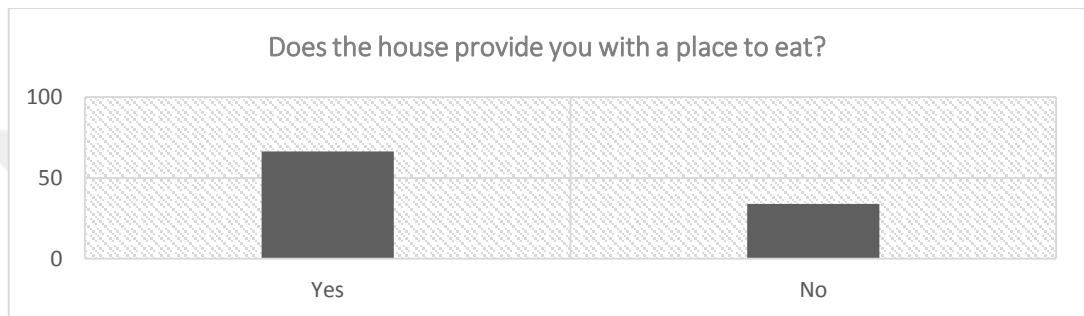


Figure 5.42 The need to place to eat

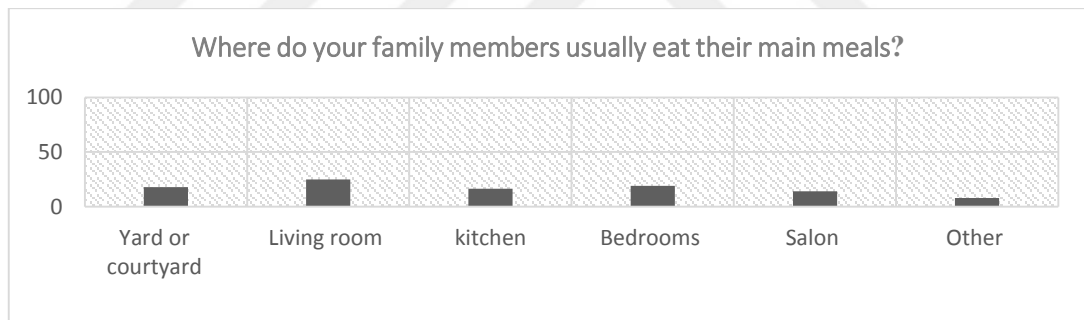


Figure 5.43 The spaces for eating need



Figure 5.44 The need to place to perform the religious and cultural rituals

The basic needs could be defined as everything a person needs in daily life, and these needs may be represented in the necessities of life. Human needs and requirements are the main reason for the existence and appearance of the architectural space. According to Maslow, these needs divide into three major categories: Self-fulfillment needs, psychological needs, and basic needs. As for the basic needs, the Tuti island person needs many elements that must be in his house. Many questions were asked to figure out his essential needs and their reflections. From the hierarchy, the primary basic needs represent in safety needs and physiological needs, and they are security, protection, safety, food, water, warmth, rest, activity, rest, and sleep.

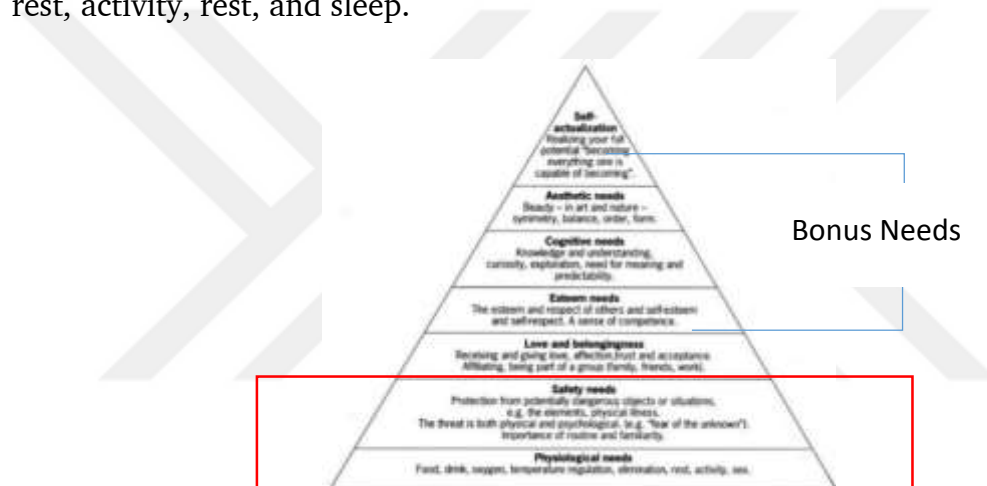


Figure 5.45 Basic of needs

Feeling safe is one of the needs, and 81.2% of the participants affirmed that. Primary personal needs like (Sex, defecate, etc.) 75% confirmed their places are designed according to these needs. Rest or sleep are considered the main physical needs in forming the house's spaces. For the need for food or eat, they were asked if they have places to eat, and 66% answered with yes. Yards, bedrooms, living rooms are places that island residents use for eating. In the Sudanese culture, there is no specific area to eat like the other cultures.

With regard to activities or religious needs such as praying, making ritual dance, entertaining and other activities, 95% confirmed that they enjoy these needs in their houses. After the sample confirmed that their residences provide them with

the following needs: food, protection, and other needs. Besides, they emphasized having the following spaces: kitchen, hall, and bathroom. All the previous information guides to result "there is a strong link between the basic needs, and the elements and the spaces of the house were the reason for its existence is the need. For example, the need for food needs a place for cooking, a place for eating, a place for washing hands. Also, sleep needs require a private place to rest. The protection need requires walls, ceilings, windows, and doors. In short, this means that every need represents a space. This table shows some needs and their architectural reflection in Tuti island house.

Table 5.9 Basic needs of the person in Tuti

The Need	The result
The need for a shelter that provides privacy consistent with the cultural background and social behavior.	a house
The need for a space that provides complete comfort and privacy	Bedroom-
The need for a place to entertain	living /yard
The need for a space to meet the human requests and social needs	/Divan/ Salon yards
The need for a place for the performance of rituals and cultural customs.	Courtyard
basic human needs - cooking need	bathr/Kitchen ooms

These needs are considered basic by extended families and nuclear families, and the results of those needs represent the spaces of the house, and their sum represents the Sudanese house on the island. The spaces in the extended house are as follows: Bedroom/yard/living room Salon / Diwan/yard for every family, Kitchen, and the number of the spaces determined according to the family

number. As for the spaces in the house with the nuclear family, they are Bedroom/Yard/living room /Salon / Diwan / Kitchen.

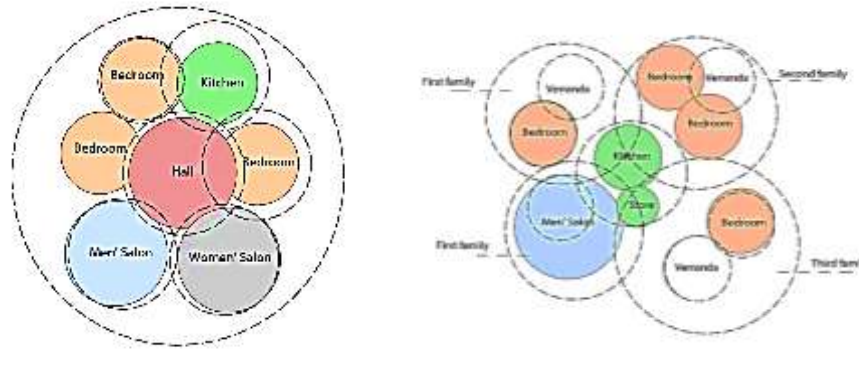


Figure 5.46 The basic needs for the nuclear family and extended family houses

5.4.4.2 Analysis of Family Factor

Questionnaire Results:

To document the influence of the family factor on the house, the family formation, the number of members and education level were analyzed. Islam is considered the common religion on the island, and the sample members confirmed this with a percentage of 99.2%. The number of families who share the same housing unit or land ranges from one family to more than three families. The results show: One Family 32.0%, Two Families 24.2%, Three Families 26.3%, and More Than Three Families 17.4%. Regarding the relations between families that live in one unit, 64% of the participants confirmed that they have kinship ties, while 24.2% confirmed that they have a friendship bond with them. 64% of respondents confirmed that their housing unit or land is divided according to the number of families. 61% of families who live together share some spaces in the house, while 38.6% do not share. In the question, How many members do you have in your family, the answers were: 1 member: 2.0%, two members: 3.4%, three members: 12.2%, four members: 19.8%, 5members: 27.1%, more than five members: 35.4%. 52.3% of the participant's houses were designed according to their family members' number, While 47.7% of the houses did not design based on the number

of family members. The figures 5.47, 5.48, 5.49, 5.50, 5.51, 5.52, 5.53 and 5.54 show the questionnaire results about the family structure factor:

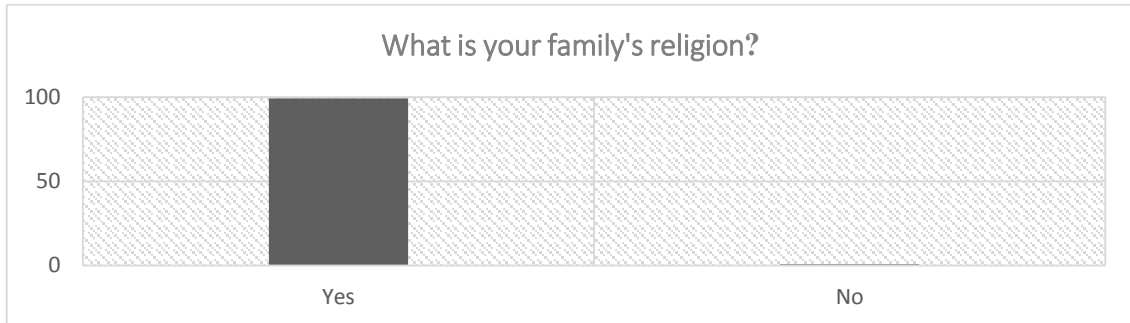


Figure 5.47 The family's religion

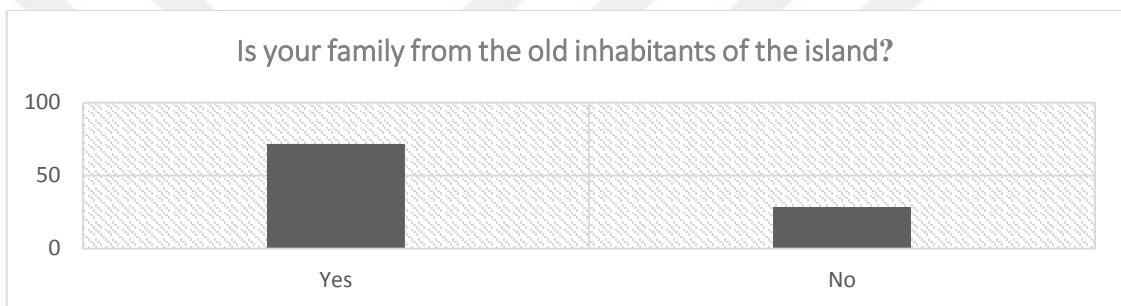


Figure 5.48 The origin of the family

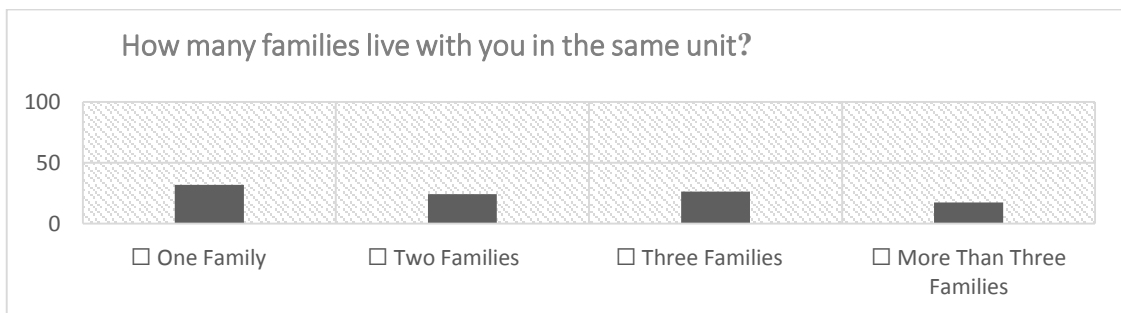


Figure 5.49 The number of the families that live in one unit

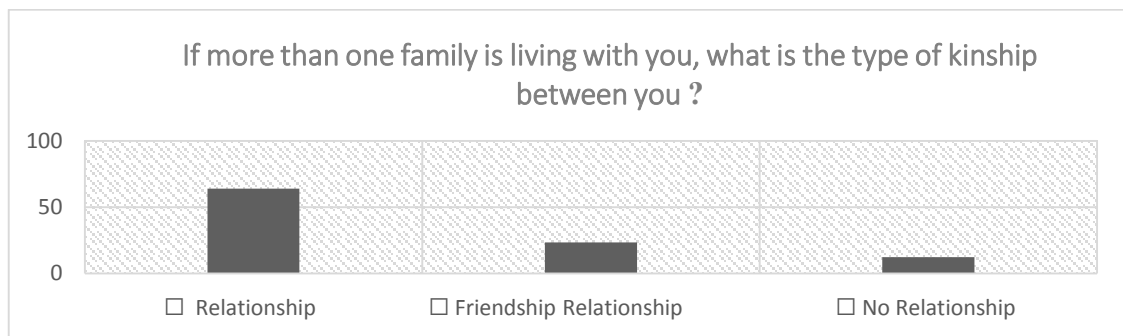


Figure 5.50 The relation between families

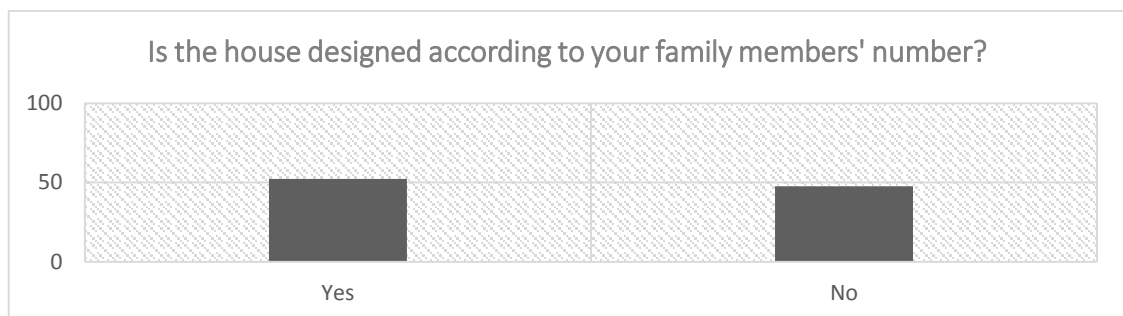


Figure 5.51 The design of house according to families' number

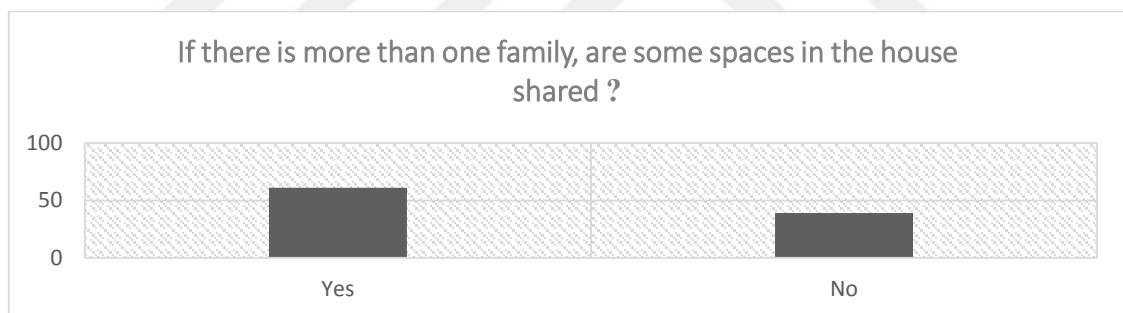


Figure 5.52 The shared spaces between families

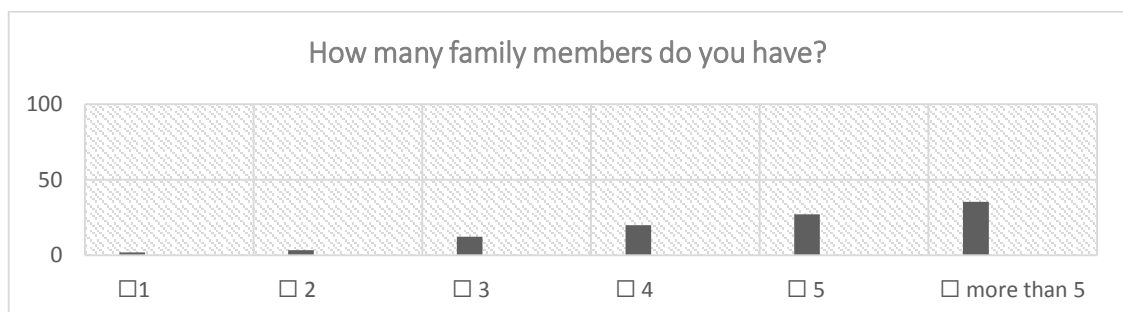


Figure 5.53 The number of the family members

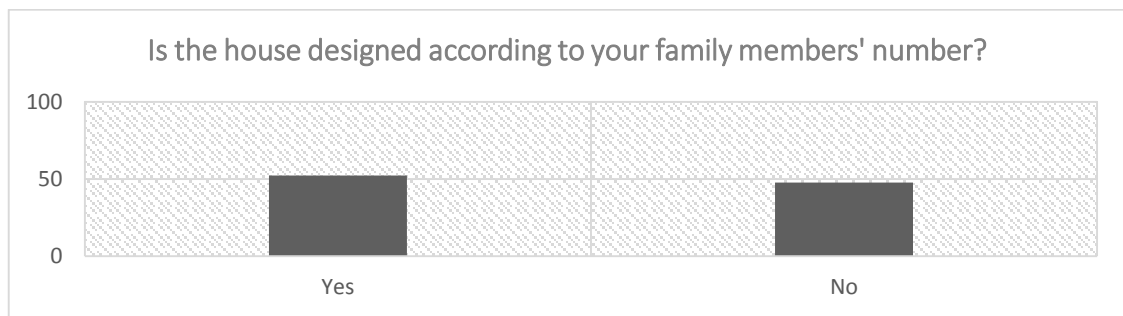


Figure 5.54 The designing of house according to family members

The family in sociology is a social term that combines two or more people related by kinship or marriage. From a functional perspective, the family includes the father, mother, and children. According to the questionnaire, there are many family structures on the island; The main ones are the nuclear family and the extended family. The results showed: 42.0% for one family, 24.2% for two families, 26.3% for three families, and 10.4% for more than three families. As for the relationships between families living in one unit, 64% of the participants confirmed that they have kinship ties, and 64% of the respondents confirmed that their housing units or lands are divided according to the number of families. Most of the old families on the island are extended families, following traditions and a social lifestyle, and their members are distinguished by their interconnectedness. This type of family lives in the old neighborhoods of Tuti and around the old mosque. The extended family structure consists of parents and children and other individuals such as grandparents, uncles, and aunts; Members of these families do joint activities, such as cooking, eating, and receiving guests. The home of the extended family is affected by marriage and polygamy. Some extended families share spaces, such as the kitchen, salon, and bathrooms, and these spaces are designed to be in a central place in the home, which was confirmed by about 61% of families. The following drawing shows an extended family's house living in the old Tuti, and there are two families living in the house. The house was divided

according to the number of families, taking into account the ease of access to the common spaces.

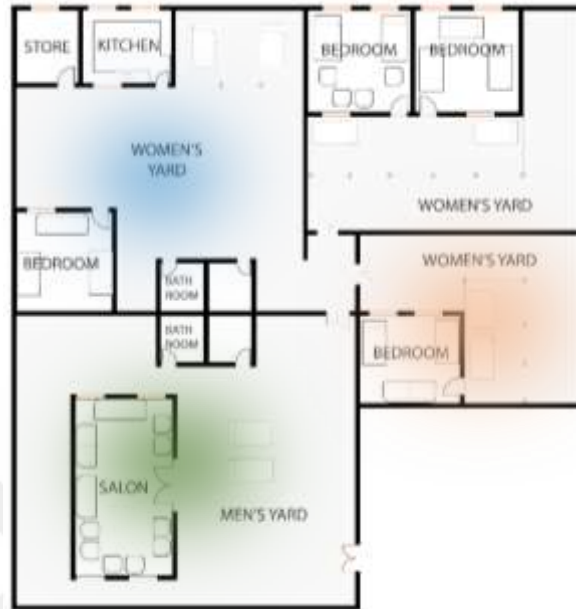


Figure 5.55 An example of an extended family house

In recent years, the nuclear family concept began to spread, and each family began to search for its independence and privacy. The nuclear families scattered and concentrated in new neighborhoods around the old Tuti district. The nuclear family, as mentioned before, consists of a father, mother, and sons. This type of family enjoys complete independence and often lives in separate housing units and it affected by the number of family members. The following figure of a house in the third district of the island for a nuclear family of 7 members includes the following spaces: bedrooms, bathrooms, salon, yards, and kitchen.



Figure 5.56 Example of nuclear family houses

Islam is considered the public religion on the island, and respondents confirmed this with a percentage of 99.2%. Most families are affected by religious beliefs, so the family's religion determines the shape of the house in terms of external walls, the direction of the rooms, the height of the windows, and the locations of the spaces relative to each other. Also, it could affect the family and control the relationships of its members with each other. Moreover, it determines the relationships between the spaces of family members where the families of the rooms are placed close to each other. When the participants in the sample were asked about the number of their family members, the average was 5-7 members, and it is considered as well as the average number of bedrooms ranges to 3 rooms, divided by family members and affected by the family structure, gender and number of members family. These departments can include the parents' rooms, the rooms of the female members, and the rooms of the male members.



Figure 5.57 The division of the rooms according to the family structure

5.4.4.3 Analysis of Privacy Factor

Questionnaire Results:

About 70% of the respondents confirmed that the design of their homes provides them with the privacy they need, while 30% of the participants do not believe that their homes provide them with it. The houses are designed so women could preserve their privacy, and the results confirmed this, with a percentage of 80.5%. 76.3% believe that they had considered religious beliefs regarding privacy when they designed their homes, while 37.7% do not think so. 84.9% have separate yards between men's and women's yards in their homes on the island. As for entrances, some have a separation between women's entrances and men's entrances, and 51.6% of sample members confirmed this. About 61% of participants think that the design of windows and doors provides them with the necessary privacy. 85.6% believe that the bedroom provides them with the privacy they need in terms of location and design. The following figures show the results:

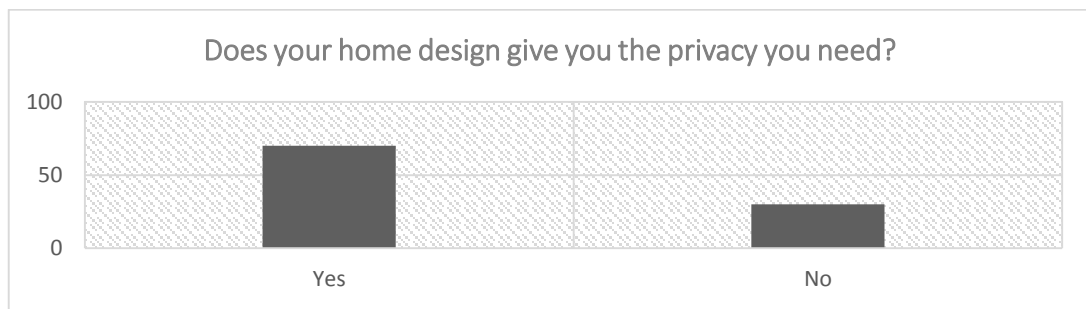


Figure 5.58 The house design and the privacy

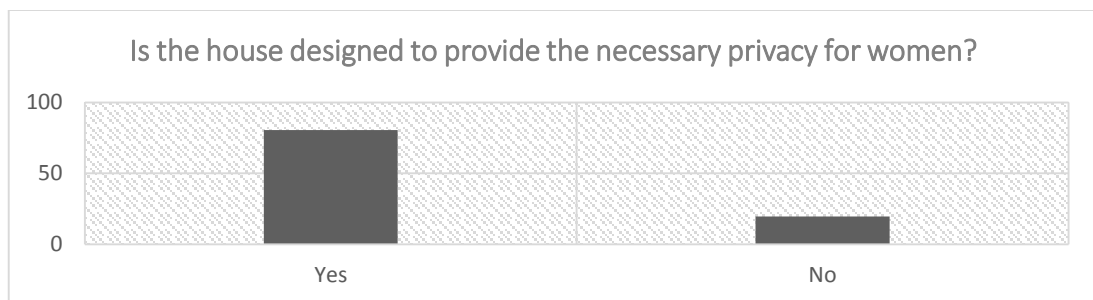


Figure 5.59 The house design and the privacy of the women

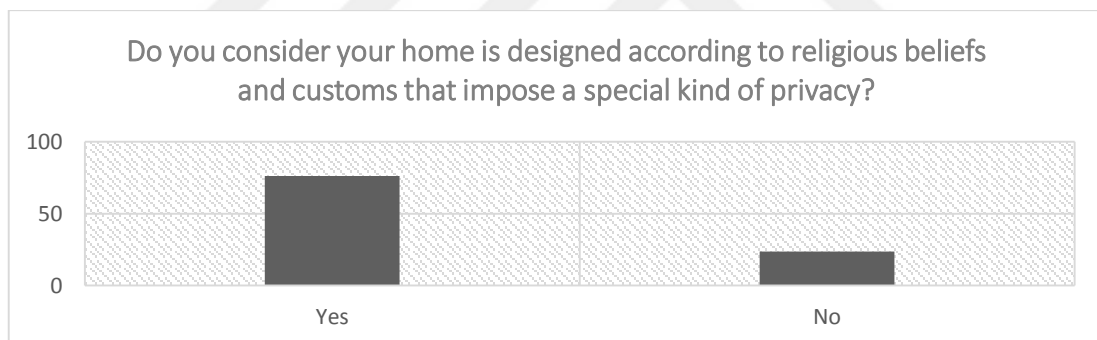


Figure 5.60 The designing of house according to the religious beliefs

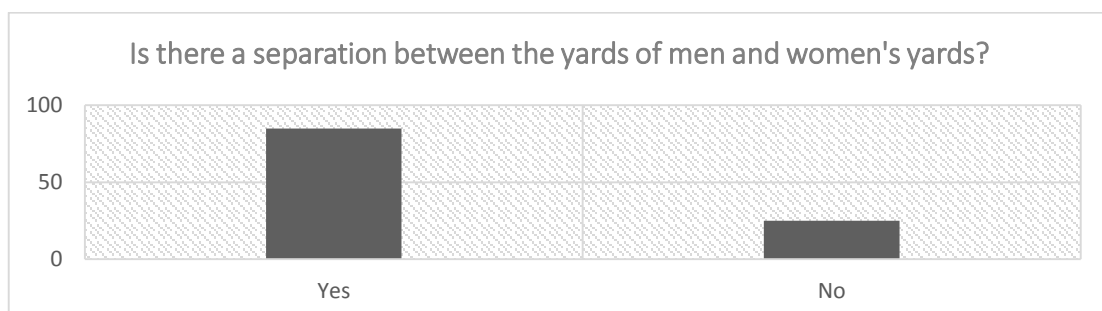


Figure 5.61 The separation between the yards of men and women's yards

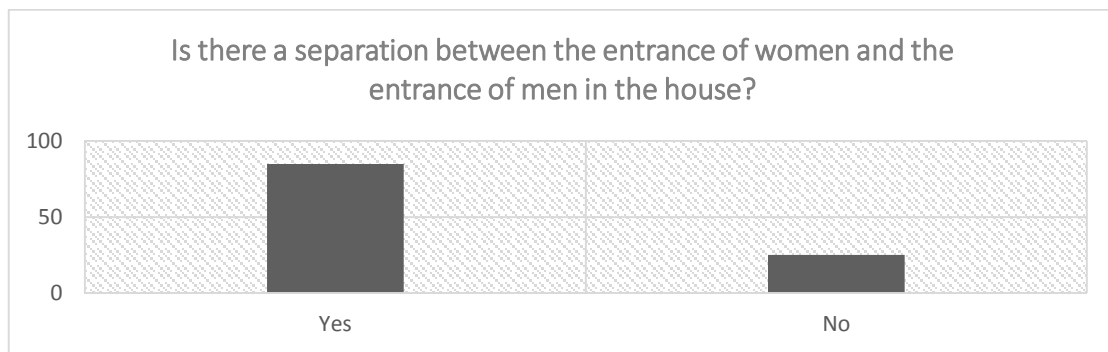


Figure 5.62 The separation between the entrance of women and the entrance of men in the house

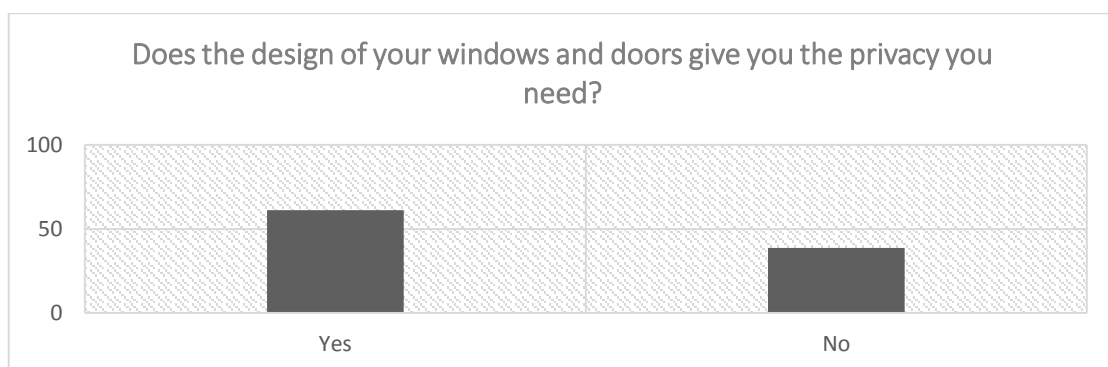


Figure 5.63 The design of windows and the privacy

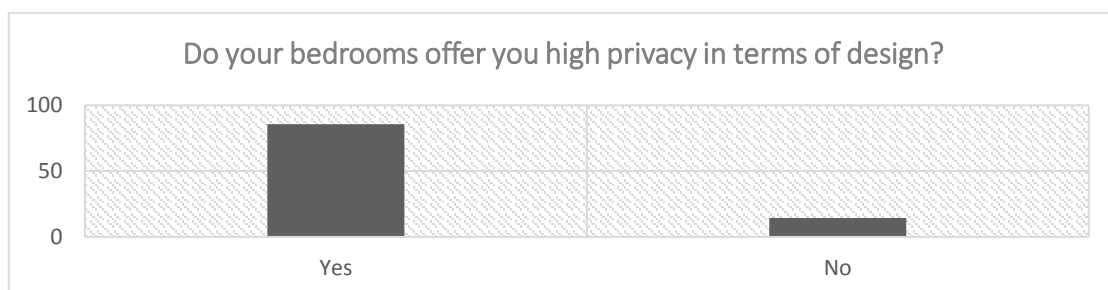


Figure 5.64 The designing of the bedrooms and the sense of the privacy

Privacy is one of the factors that the cultural background of a dwelling could be identified through it. The concept of privacy is reflected in the formation of homes on the island of Tuti. As mentioned before, an individual's cultural and social background determines the type of privacy, and it varies with different religions, beliefs, and ethnicities. Religion and sociocultural background are among the

determinants of privacy at the house. Several points were made in the questionnaire to determine the type and degree of satisfaction with privacy. The survey asked several questions about the degree of privacy in island houses, and satisfaction rates were relatively high. Through the results, most of the island's residents follow the Islamic religion by 99%. It requires providing high levels of privacy and some special requirements in the house, as the Islamic religion demands the separation of spaces between women and men. Moreover, it calls to hide the family spaces from the view of non-family members. This concept is so clear in nuclear families and extended families; wherein there is a separation between the places of women and men in the detached house. As for the extended house, there is isolation and separation between all family spaces from men spaces. Besides, some families allocate a particular space for male guests called diwan. It is a separate space from the rest of the house to preserve the woman's privacy. When respondents were asked if their homes offered them with privacy for their family members, about 72% answered yes. 84% believe that their homes provide the necessary degree of privacy for women regarding women's privacy. Privacy requires the design of the households units in a certain way. As for the matter of gender separation, there is a division between the women's entrances and the men's entrances, and this was confirmed by 51.6% of the respondents. Also, there is a separation with an 84.9% percentage in houses' yards in between men and women. When analyzing the chosen model, we note the allocation of front spaces for men and internal areas for family members and women. In addition, the example shows the separation between the entrances for men and women.

The separation between the women's spaces and the men's spaces in the house.



Figure 5.65 Dividing the yards by gender to provide complete privacy for women

The entrance is considered one of the necessities of the house because it preserves the sanctity of its residents, gives them a kind of privacy, and provides them with security and protection. It also has great importance in obscuring the view of those insides. It is noted that there is an indirect entrance in most of the island's houses because of its psychological importance for the residents. Regarding women's privacy in the house, separate entrances were designed to hide the women's spaces and keep them away from the main entrance to the house. This was confirmed by the participants in separating men's entrances from women.



Figure 5.66 The locations of main entrances as for the family entrances

As for spaces' privacy varies according to the type of space and the degree of privacy you need. Spaces that include women's areas need the highest degree of privacy. When the participants were asked whether their home provides them with privacy for family members, about 72% answered yes, and 85.6% answered yes when asked about their satisfaction with the privacy they receive in the bedrooms, which confirms that the rooms enjoy a high degree of privacy. There are several levels of privacy: private, semi-private, semi-public, and public. Every space needs a certain kind of privacy. Bedrooms and bathrooms can be classified as highly private spaces. As for the spaces such as the hall and living rooms can be classified as semi-private spaces. Men's spaces can be classified as semi-public spaces. The area around the house can be considered a public space. The following figure shows the classification of spaces according to the degree of privacy.

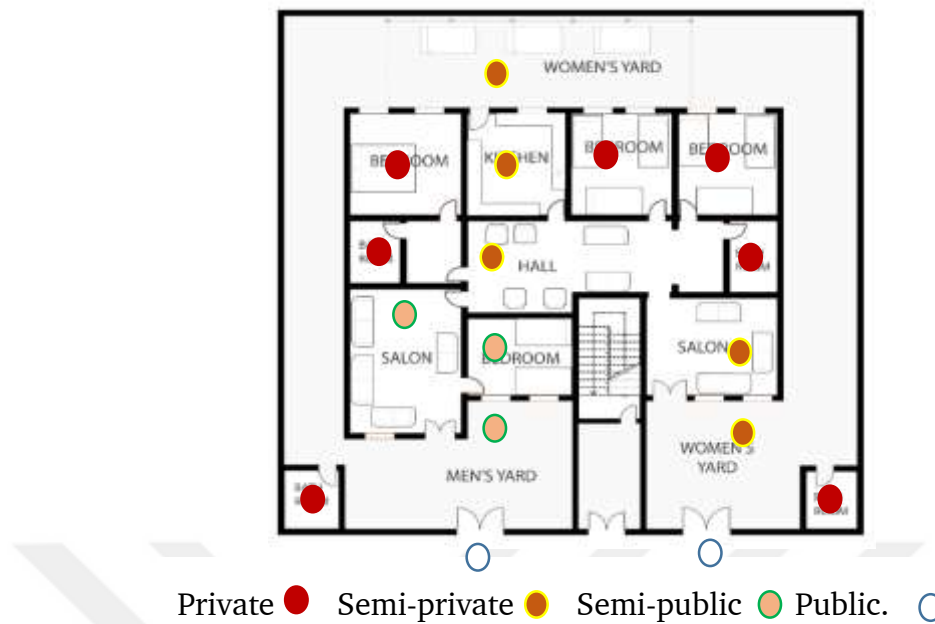


Figure 5.67 The division of the house in Tuti according to the degrees of privacy: Public, semi-Public, Semi private, Private

The design of the windows is influenced by the privacy factor, which in turn follows the Islamic faith. The windows' design, shape, and dimensions provide the home with the privacy it needs. Participants supported that view by as much as 61%. Most windows are up to 1.2 meters from ground level, and their shapes vary. Some of the windows of houses in the old neighborhoods are made of wood or iron, with no glass. The following figures show some window designs on the island.



Figure 5.68 The design of windows in terms of privacy

5.4.4.4 Analysis of Woman Role Factor

Questionnaire Results:

The results showed that women have an influential role in designing the house, with a percentage of 68.5%, while 31.5% believe that men have the most remarkable part. About 71% confirmed that women carry out the division of the internal environment in the island's homes. What are the spaces that are considered for women? You can choose more than one answer. 73% of the participants said that their homes provide special places for women to practice cultural customs and rituals. 78% confirmed that when they have female guests, the presence of men is restricted to outside the house, while the internal areas are specified for women. Women guests are received in several places in the house, and the answers were as follows in order: In the bedrooms 25.4%, in the living room (hall) 36.1%, In the salon 2.3%, In the women's yard 27.2%, In other places 8.8%. 33% of the respondents confirm that the front yards are allocated to men to give women more freedom.

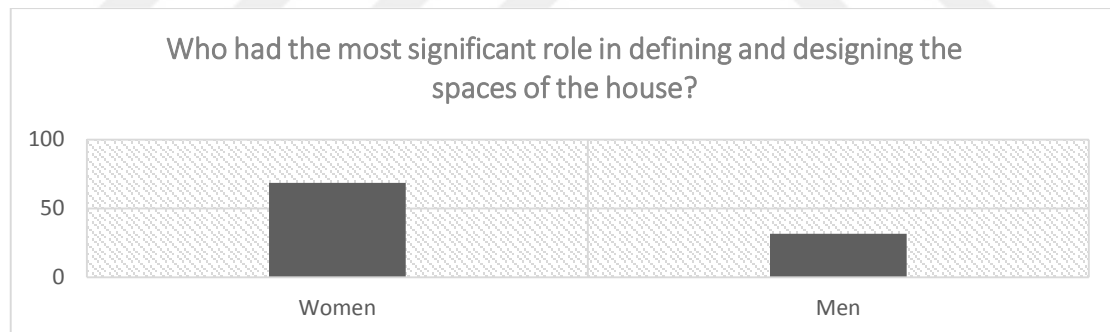


Figure 5.69 The role of woman in designing the house

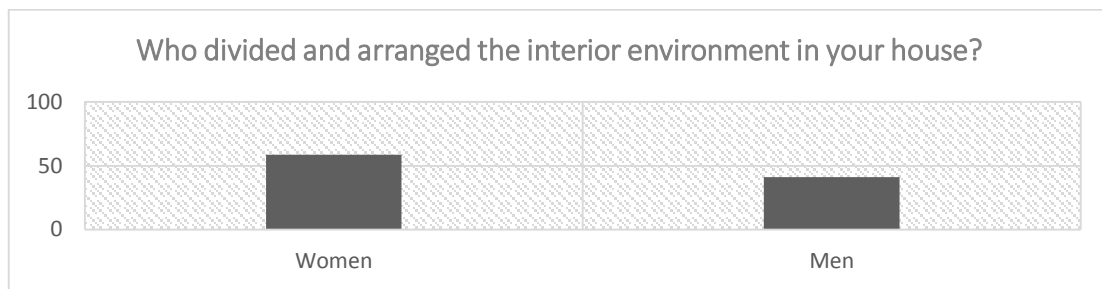


Figure 5.70 The role of woman in dividing and arranging the interior environment

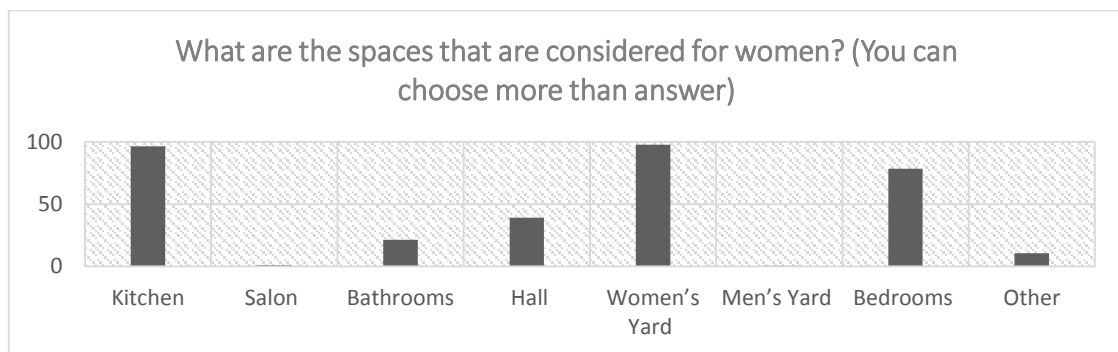


Figure 5.71 The spaces that woman dominate them in the house



Figure 5.72 The existence of spaces to perform the cultural rituals.

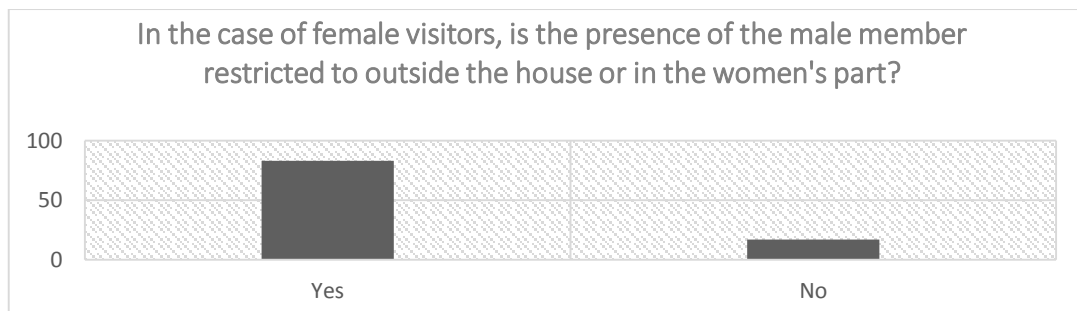


Figure 5.73 The female visitors and the house spaces

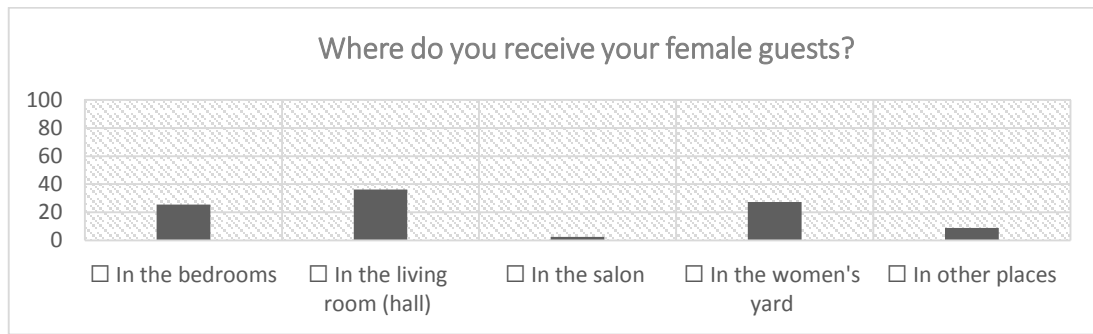


Figure 5.74 The receiving of the female guests

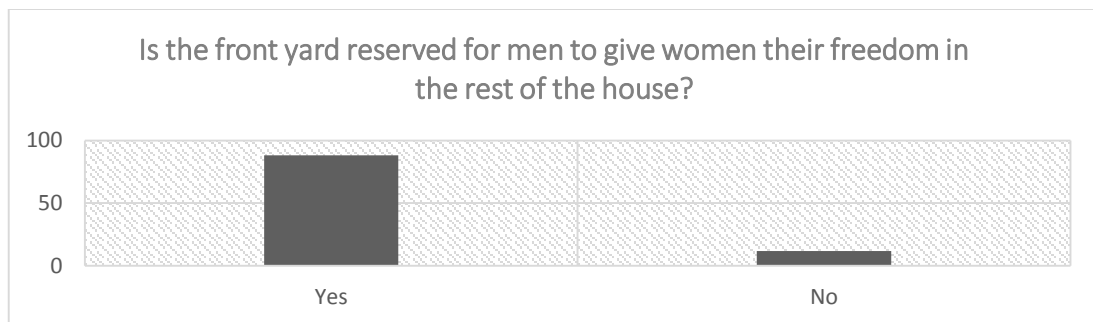


Figure 5.75 The female members and the front yard

Family members divide the work based on their roles, and the woman is responsible for the work inside the house, while the man takes care of the work outside the house. The woman on the island occupies most of the home's spaces and spends most of her time inside it. She performs various activities at home, where they take care of the house, cook, raise children, and hold family meetings.

The results confirmed with 68.5% that women play an influential role in designing the house, arranging the internal environment, setting tasks, contributing to the division of spaces, and determining their locations in the house. 73% of the participants emphasized that the design of houses on the island is influenced by the culture of Sudanese women, such as dancing, making traditional perfumes, and other Sudanese rituals and customs. All of these activities require the presence of separate spaces away from the men's sight, and for this reason, the women's section is placed in a manner that requires them to meet their needs. The participants expressed that the house's design agrees with the needs of women.

The women's yard is among the specially designed spaces where women practice most Sudanese rituals and customs. This area of the house is an essential part of any traditional house on the island. Women's guests are received in several spaces; the most important are the women's courtyard, the halls in the house, and some multi-use rooms. One of the spaces that are placed in the yard for women is the Sudanese kitchen, to expand the kitchen when there is an occasion or celebration, where foods are prepared there. The following examples are for women's yards in the extended family and nuclear family houses.

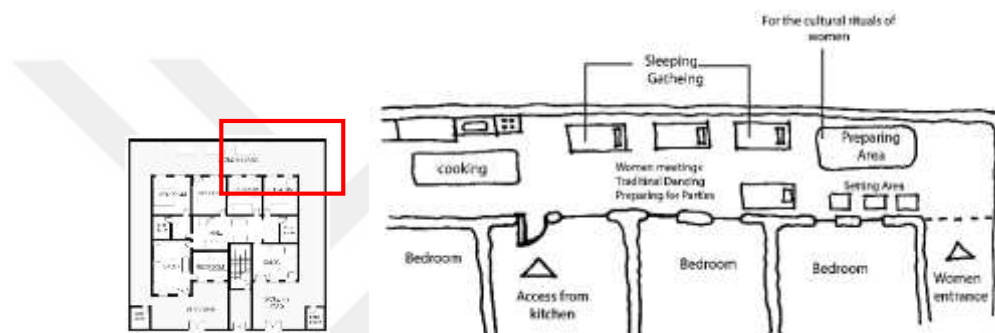


Figure 5.76 The Sudanese woman's yard in a nuclear family house

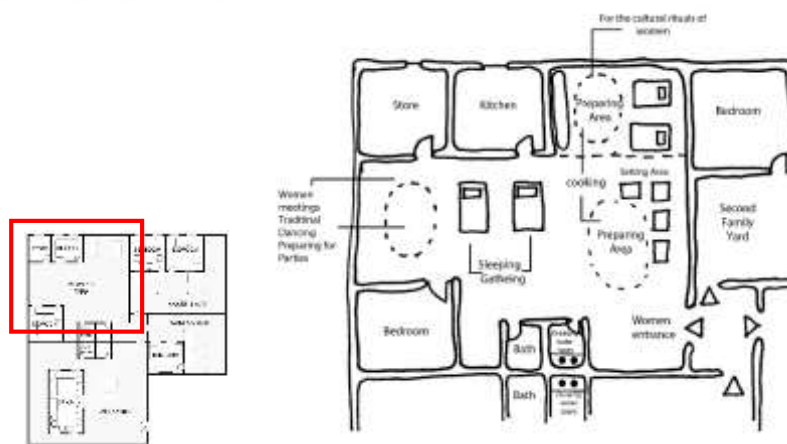


Figure 5.77 The Sudanese woman's yards in the extended family house



Figure 5.78 The Sudanese woman's traditional activities in the house

Women affect men's spaces as well, as they require the presence of men in their spaces, such as salons, boys' bedrooms, and men's outer courtyard. Sometimes they are required to be outside the house when there are occasions at home or celebrations.

5.4.4.5 Analysis of Social Interactions Factor

Questionnaire Results:

54.9% of the sample members, their lands were chosen based on their proximity and distance from the Mosque, while 45.1% did not consider the proximity to religious centers. 57.1% said they don't have enough space between their homes and the neighbors' homes, and about 42.9% confirmed that there is enough space between them. As for the alleys' dimensions, 76.3% of the sample members' houses are located on streets whose width is less than three meters. Individuals live near their relatives in groups, and the questionnaire's respondents confirmed this with a percentage of 68.5%. The number of relatives who live close to each other ranges from one to over five relatives in a single residential neighborhood. The results showed the number of participants' relatives who live near them: one relative 1.8%, two relatives 3.6%, three relatives 12.2%, four relatives 19.8%, five relatives 27.0%, More than five relatives 35.4%. The place for special events extends outside the resident's houses to include neighbors' spaces, streets, and some public squares on the island; this was confirmed after asking the participants about the location of their concerts. The results were: The neighbor's house %43.5,

the street %28.3, the clubs %15.3, In the public squares %3.6, Other %6.5. The people on the island share some public places, such as mosques, sports arenas, and clubs these areas are considered as social areas; The results were in order: Mosques 53.9%, Sports activities areas 16.4 %, Festivals and cultural activities 24.4 %, Areas 5.2 % other. Based on the participants' opinions, the streets on the island are used for social purposes. The percentages were as follows: 5 Agree 46.3% , 4 Agree 27.6% , Neutral 16.1% , 2 Disagree 13.5%, 1 Disagree 3.3%. The participants supported the idea that "narrow streets increase social interactions between the island's residents," and the results were as follows: 5 Agree 37.7 %, 4 Agree 33.3%, neutral 15.6%, 2 Disagree 11.2%, 1 Disagree 2.0%. Participants endorsed this view, which states: "The spatial organization increased the unity of the population on the island, especially in the areas around the old mosque," and the results were: 5 Agree 36.3%, 4 Agree 42.1%, neutral 10.1 %, 2 Disagree 7.5%, 1 Disagree 3.6%. The following diagrams show the respondents results about the social interactions factor.

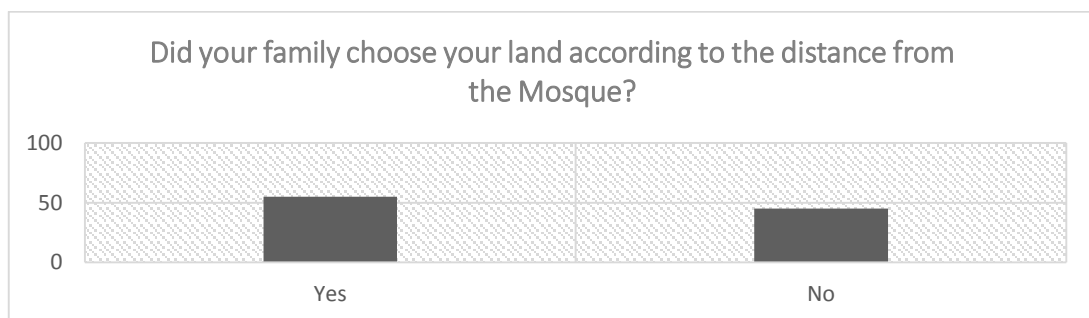


Figure 5.79 The choosing of the land according to the distance from the mosque

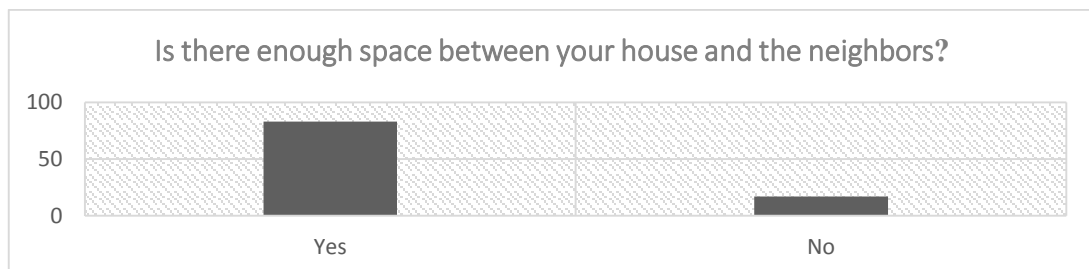


Figure 5.80 The spaces between house and the neighbors' spaces



Figure 5.81 The location of the house on a street less than 3 meters

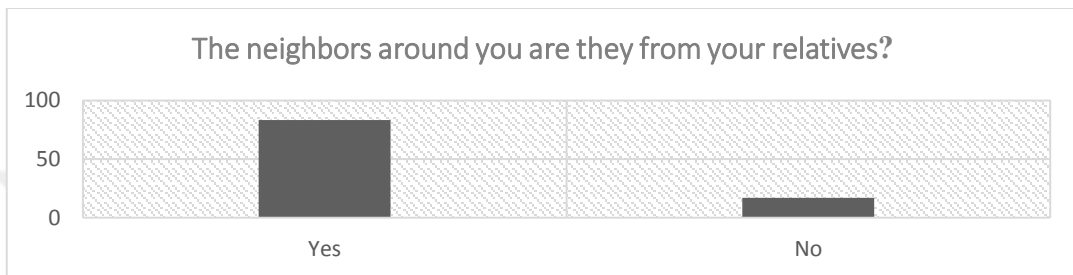


Figure 5.82 The living with the relatives in the same neighborhood

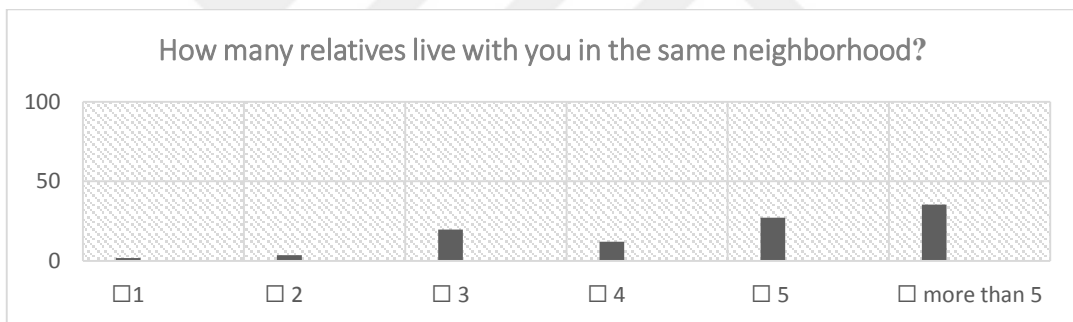


Figure 5.83 The number of the relatives who live in in the same neighborhood

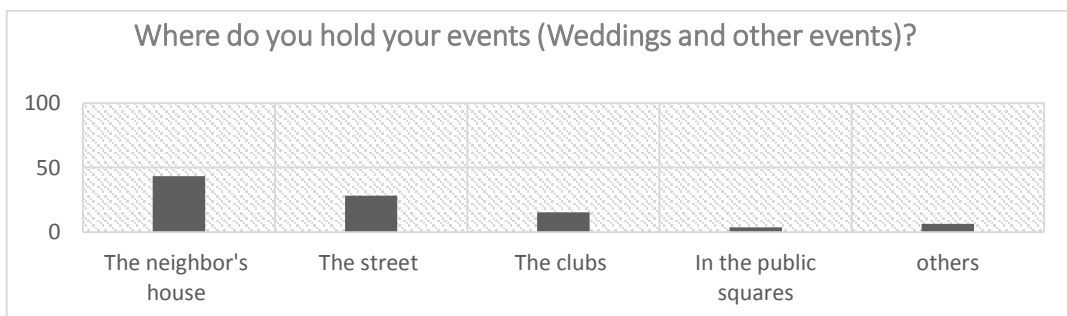


Figure 5.84 The spaces that used in holding events

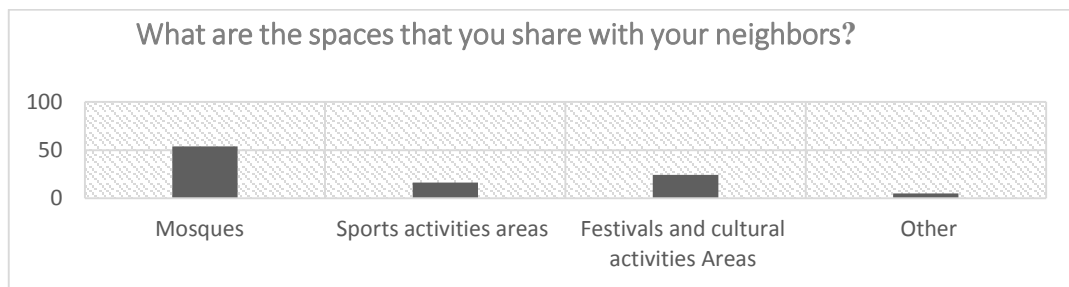


Figure 5.85 The spaces that could be shared with neighbors

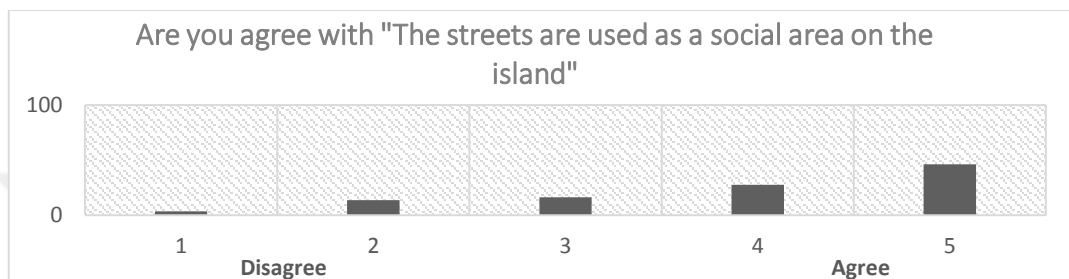


Figure 5.86 The using of the streets as a social area

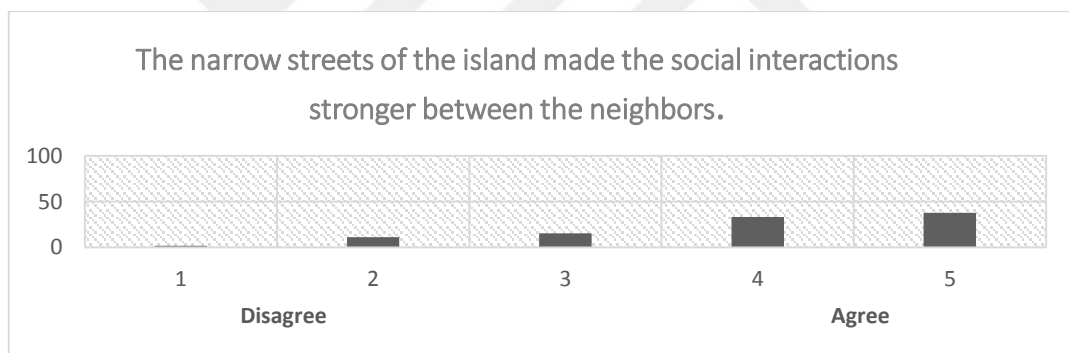


Figure 5.87 The relation between narrow streets and the strong social interactions

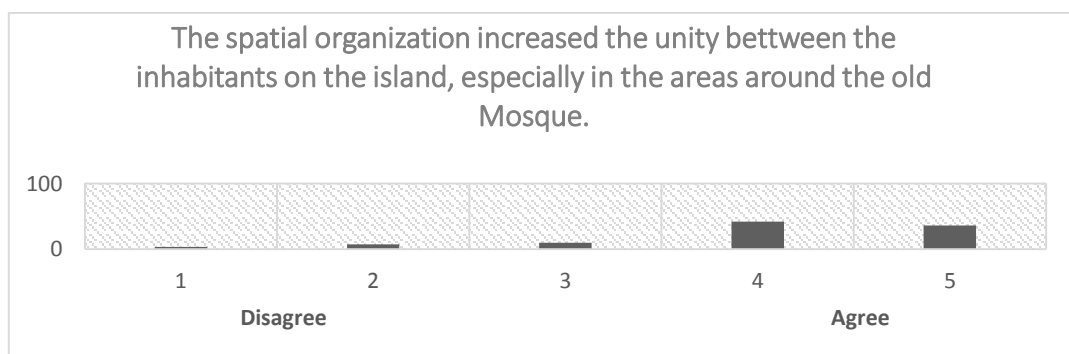


Figure 5.88 The spatial organization increased the unity between the inhabitants on the island, especially in the areas around the old Mosque

A neighborhood is a supportive community for its members, and social interactions are a complex system full of voluntary controls and standards between people. The relationship between social interaction and the urban form of the houses is reciprocal. In the island society, the person is related to his relatives, and most of them want to live next to their family and members of the tribe. The survey participants confirmed that they live with their relatives in the same residential neighborhood with a percentage of 68.5%. At the same time, the number of relatives living with them in the same neighborhood ranged from one to more than five relatives. This type of relationship resulted in the housing units being interconnected with each other. 57.1% said they do not have enough space between their homes and the neighbors' homes, which indicates the close distances between buildings. Looking at the urban fabric in the old residential areas, we can notice the convergence of the distances between the homes of families and the overcrowding of some houses, and the streets are considered narrow and with closed ends. Participants largely believed that the narrow streets increased social interactions between the island's residents. The results were as follows: 37.7% agreed, 33.3% agreed. As for Tuti Al Wusta, and by looking at the urban fabric, we notice that the streets are linear and that the residential plots have clear boundaries.



Figure 5.89 A nuclear family house in the central Tuti



Figure 5.90 An extended family house in old Tuti

The island is characterized by its narrow and winding streets. According to the study's statistics, many residents whose homes are located on streets less than 3 meters wide, with a percentage of 76.3%. Narrow streets in traditional areas lead to eye contact between neighbors, which leads to face-to-face social interaction. It also leads to interdependence and kinship relationships between individuals to influence the dimensions of the corridors. The participants confirmed that the streets and alleys are used as a social area and that their narrowness can increase the strength of ties between the people by 46.3%. Males hold social gatherings in the morning and afternoon and meet after prayer. Men gather on the island's

roads, and many people put Miziarah¹⁶ on the roads and in front of the houses on the island to water the passersby. The life of the alleys is one of the most important features of Tuti Street. In Ramadan, males of different age groups gather outside for the Maghrib and Iftar prayers, and people deliver food from many nearby homes. Passersby, who are late for breakfast at their destinations, are invited to join them.

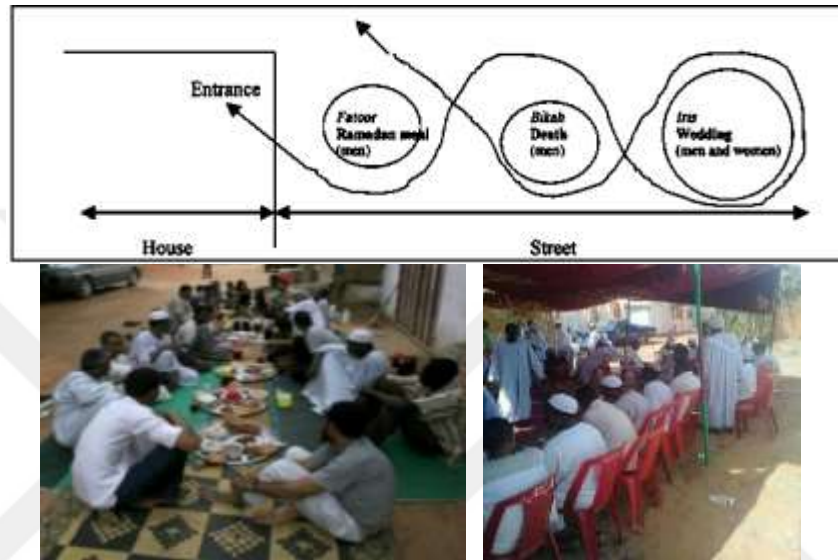


Figure 5.91 The Sudanese man's space extends outside the house to include the island's streets, squares, and clubs

Many social aspects and religious beliefs control the spatial organization on the island. Islamic faith shaped specific characteristics of the island's social and cultural patterns, but this influence was most evident in ancient Tuti. This fact was reflected in the study, where it was found that religion has a significant influence on housing design, especially in terms of its relationship to the house and the mosque and its orientation. Like other Islamic cities, there is a strong relationship between the local mosque and the islanders who prefer to have their homes near the mosques. In the past, there was only one mosque in Tuti, and residents were searching and competing to choose places near the mosque. The Old Tuti Mosque is the nucleus of the old Tuti scheme as it was considered the main center and

¹⁶ A place designed to put water.

cars in yards close to their houses. These squares are often located in the main places such as the island market and near mosques. All these plazas are social areas where people meet each other most of the people share the spaces of their neighbors on occasions or mourning ceremonies, and the invitees are divided into two classes, men and women, and the female guests are received in the house. In contrast, male guests are received in the neighbors' houses or on the streets around the house. Sometimes it extends to the streets of the house, and sometimes the island's public squares are used.

5.5 Chapter's Conclusion

This chapter's primary purpose is to investigate the influence of the users' social and cultural factors on the formation of the traditional houses. Various techniques were selected to determine the effect of elements on the built environment, and closed questions, interviews, and reviews were performed. This chapter provided an analysis of the users' impact and their cultural and social background on the house composition. This section includes information on the field study and its results. Moreover, the effect of each socio-cultural factor on the island was determined. This assessment of the residential social and cultural environment depends on the occupants.

As for the influence of these factors in the nuclear family house and extended family house, it can be summarized as follows: (i) The impact of basic needs factor: In the nuclear family house, where the basic needs are fixed in each house, and the needs are as follows: service/sleeping/eating / social needs and these needs are forms the spaces of the houses. Every family has its own basic needs, and the total needs of all the families represent the basic spaces in the extended family's home. As for (ii) the effect of the family structure: it affects both types, and it could influence the extended family's home in terms of dividing the house, the number of spaces, and dividing yards, and these parts are designed according to the number of families and their structure in the house. As for the nuclear family's home, the factor affects the house through the number and nature of

spaces, the internal division of spaces, and the size of the spaces in the house. (iii) for the Privacy Effect: it affects both types clearly: In the nuclear family home, the spaces for women are placed in the back part of the house, while the spaces for men could be placed in the front part of the house. In the extended families house, the family part is completely separated from the men's part. The entrances are also separated between men and women or designed in a way that preserves privacy. (iv) For the impact of the role of women: in both types, women play an important role in dominating and using most of the spaces in the house. The extended family house is divided according to the number of families. In addition, a special section is allocated for men so that women can have their freedom of movement in all parts. As for the nuclear family, house the spaces are arranged in a way that suits the woman's position, and the men's spaces are placed outside. (v)The effect of social interactions: As for the effect of this factor, it has more impact on the areas in which the houses of extended families are located, where most of the island's residents live in the form of family groups. In the central Tuti region, the effect of this factor is less, and this could be obvious in the width of the alleys and the distances between the neighbors. The following table shows the impact of cultural factors and their reflection on the architecture built in nuclear and extended family houses.

Table 5.10 A summary of the effect of the socio-cultural factors on the houses on the island

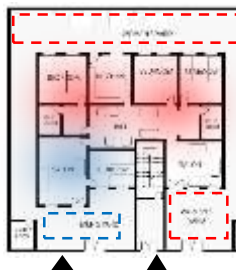
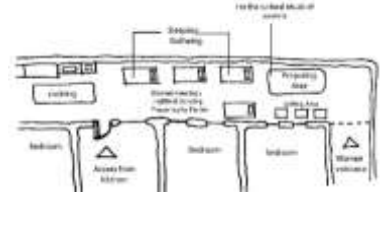
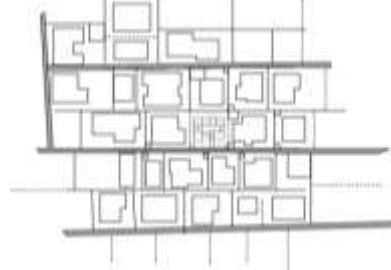
Socio-cultural factors	Factor requirements from literature review	Architectural Reflections	Result in the nuclear family house	Result in the extended family house
Basic needs	The need for a shelter that provides privacy consistent with the cultural background and societal behavior. The need for a space that provides complete comfort and privacy The need for a place to entertain The need for a space to meet the human requests and needs of social The need for a place for the performance of rituals and customs of cultural basic human needs - cooking need.	The human being has different needs all, and these control the existence of the Architectural spaces House, bedroom, yard/living room Salon / Diwan / Courtyard / Kitchen. In the nuclear family house: Bedroom/Yard/living room Salon / Diwan / Kitchen. In the extended family house: Bedroom, yard/living room Salon / Diwan/yard for every family, Kitchen (The number of the spaces determines according to the family number)		
Family structure factor	Designing the house according to: - the family structure - the number of the family members - family's cultural background - family's lifestyle - the family's religion. - Level of education of the family.	- The family structure affects the house design : - The extended family influences the division of the house, number of architectural spaces - The nuclear family only affects the number of architectural spaces - The number of family members affects the number of architectural spaces in a house - The number of rooms - Number of bathrooms		
Privacy factor	- Provide privacy that matches with the background of the family culture. - Provide different types of privacy: audio privacy and visual privacy. - The design of the house to provide complete privacy for each gender, whether male or female. - Taking into account the impact of the socio-cultural aspect on privacy requirements.	In the extended family house and the nuclear family house, there are: - a separation between men and women in several spaces, such as :Entrances, Bathrooms, Rooms, Yards. - The location of the spaces is affected by the type of privacy; the men's areas are located on the front of the house while women's spaces are inside the house. - Some additional features like high windows and high walls.		

Table 5.12 A summary of the effect of the socio-cultural factors on the houses on the island (continued)

The role of women factor	• The role of women in: ◦ Designing the house. ◦ organizing the spaces in houses • The effect of women's privacy on the division of spaces. • The effect of women's culture on the type of spaces.	• In both types: extended family house and nuclear family house, women play an important role in dominating most of the spaces and using most of the spaces in the house. • Women are considered as the main house user, and the spaces that woman occupies are the kitchen, lounge, Living room, Women's yard, Girls' rooms, Master bedroom, store, Bathrooms.		
Social interactions factor	• Determine Street shapes and dimensions • The composition of the houses • Determine the relationship of the house with the buildings around it and the environment surrounding it.	Social interactions between relatives affect the homes in ancient Tuti where: • The streets are narrow. • The distances between the neighbors are close. • The houses are close to the neighbors from all sides. As for the central Tuti region, social relations are considered moderate, and this affects the homes in: • The streets are clear and linear and are slightly wider than the old streets of Tuti. • There are distances between neighbors. • The urban structure is clear.		

The study's objective was to investigate the impact of socio-cultural factors on the formation of houses in Sudan, and Tuti Island was taken as a case study to achieve the research goal. The thesis used the descriptive-analytical method in an attempt to confirm the research hypothesis. In general, the study dealt with several subjects; the first section of the research included literary reviews of the theoretical aspects of the factors that influence house formation, including physical and socio-cultural factors. The physical factors included several elements such as climate, history, topography, and others. The factors included five basic elements: the family, basic needs, privacy, the role of women, and social interactions, and any factor had its own impact on the built environment. Moreover, the research provided a brief review of the culture of Sudan and the diversity of its tribes and factions, social life, marriage traditions, and some cultural rituals. In addition, it contained an overview of Sudanese architecture and the periods that passed through, types of traditional dwellings in Sudan, and houses in urban cities. Further, The research examined some of the factors that affected the formation of architecture, and it contained multiple elements. At the end of the research, it contained the main subject, which was the case study part, and it was divided into four sections that contained basic information of the study and the second part on the social and cultural life on the island. The third part contained a spatial analysis of the area. The last part contained the questionnaire results and a discussion of the impact of each of the factors on homes on the island. Finally, samples of plans for detached and extended family homes on Tuti Island were analyzed regarding socio-cultural factors. The validity of the study hypothesis was confirmed through the spatial investigative analysis of the research sample. Through the study, we can summarize the most important findings of the

study in these points, (i) Through this research, it is possible to prove the theories discussed in the first part of the research *“the house is the product of cultural and social factors, and the spaces are not only related to their physical features but have another dimension,”* This dimension is included the social cultural identity of the individuals. Through analysis the house’s structure and relation between houses and social cultural aspects of Tuti we could confirm Oliver’s concept that says *“The Settlement patterns could reflect the cultural and social structure of the society.”* With regard to the literary study and the results that have been reached, we find that through the use of the methods that were used in those previous studies, which is the descriptive method, with the help of some methods of investigation such as spatial analysis; It was possible to reach similar results proving the effectiveness of these factors on the formation of houses. Also from the findings, (ii) The shapes of houses in Sudan reflect the users' response to their environment, climate, and social and cultural values. Socio-cultural aspects played a major role in shaping house shapes in the local houses of Tuti Island. (iii) In recent years, changes have occurred in family structures and structures, which led to the emergence of a new urban structure on the island. (iv). The urban structure on the island follows the influence of socio-cultural factors, whereby the greater the social interactions, the more intertwined the urban formation of the area becomes. (v) There is a discrepancy between the forms and composition of houses due to the differentiation in social values. (vi) The island's identity did not depend on the external appearance but rather on cultural and social factors. (vii) The main social and cultural factors that influenced the formation of houses in Tuti are basic needs, family, privacy, the role of women, as well as social interactions. The influence of each factor was very clear in defining the features of the house on the island. In this research, (vii). The formation of the houses shows the impact of the concept of privacy on all types of houses on the island. Islamic culture has had a great impact in defining the features of privacy, (viii). The family structure factor was one of the factors that greatly affected the division and arrangement of external spaces in homes. (ix) As for the sub-hypothesis, its validity was verified

by analyzing the effect of cultural and societal factors on the extended family home and the nuclear family home. The effect differs greatly in the two elements of the family structure and the privacy element. In the nuclear family, the family structure affects only the number of spaces, but in the extended family, it affects the division of parts of the house. As for the privacy factor, we find that this effect is clear in the nuclear family house, where houses are designed and isolated in order to provide complete privacy for their members. Islamic religion and culture have had a tremendous impact on house forms and local building practices on Tuti Island. We can conclude the thesis results in the following diagram, which shows that the cultural background of the householders influenced the cultural and social factors, which in turn affected the design of the Sudanese house located on the island of Tuti. Where the beliefs, traditions, relationships, and cultural thinking of the people could affect and determine the basic needs includes cultural, material, and moral needs. It also affects the family structure factor by determining the number of family members and regulating the relationships between family members. As for the privacy factor, culture and beliefs influence it and determine the degrees and levels of privacy required in the spaces. In addition, it affects the role of women in the home by defining particular roles for women based on the cultural thought of the region. This effect extends to include the factor of social interactions. The relationships between families and social relations are determined and based on the background of the social region.

From this research, it is possible to deduce some relationships that can be used and relied on in future research. Through previous studies and literary study of texts and the general concepts, the research was able to make a conclusion for the previous discussion that there is an influence of socio-cultural factors on the formation of houses on the island. Here we can conclude and summarize the relationship between the basic variables of the research (basic needs, family structure, privacy, the role of women, and social interactions and the formation of houses in Tuti Island; the direct relationship could be clarified as follows:

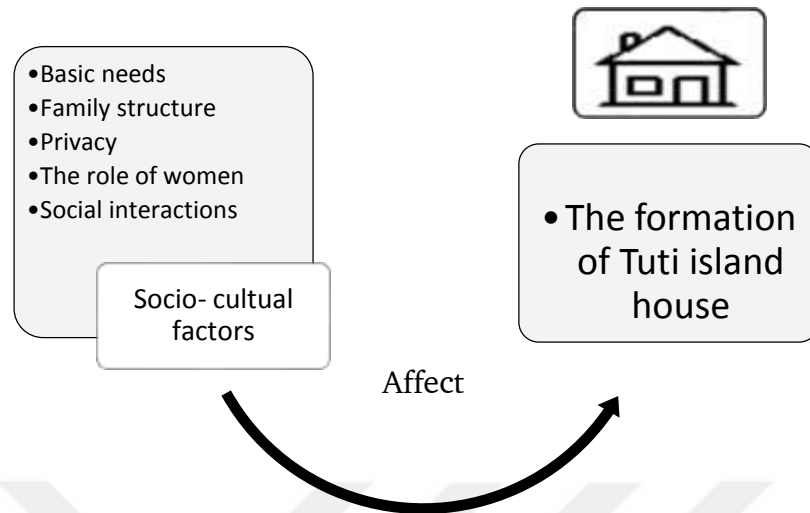


Figure 6.1 The relationship between the cultural aspects and the socio-cultural factors and the formation of the Tuti island house

The study shows us the importance of these factors that determine the identity of the Sudanese family. For practice, this research provides architects and designers with another level of understanding of the local built environment in Sudan. It also enhances spatial concepts and highlights the main important factor influencing the house's formation. Designers need to understand that culture is of paramount importance to promoting sustainable development. The knowledge gained from research can be applied or used in other research. This can be achieved through the use of the relationships that were inferred, and also by using the methods that were followed in this research. Also, researchers can use the research as a reference, because in Sudan it is difficult to obtain sources, and their collection requires many months and sometimes years.

In the end, the research calls for several recommendations and suggestions as following: (i) The identity of the ancient Tuti region must be preserved, and laws should be established that control the general appearance of the region in terms of the materials used and the heights of the houses. (ii) The urban structure of the old Tuti must be protected from radical change and included in the historical neighborhoods by authorities and the Ministry of Culture in Sudan. Moreover, (iii)

A mechanism should be put in place to preserve the three urban island zones. (iv) Today, agricultural areas are witnessing a decrease in their area, and many are converting farms into residential areas. The research calls for setting fixed ratios between the three structures of the Island, and further, a constant ratio must be between the built-up areas and the green areas that help in the climatic adaptation of the area. (v) The research recommends establishing social and cultural links between the old and new neighborhoods on the island. (vi) The research points to the adoption of the five factors as essential elements in the design and layout of island houses. (vii) Further, The planners must recognize that the traditional houses have a high social and cultural value, and Practitioners in this field should be familiar with the users' background. (viii) The research emphasized the necessity of sustaining and enabling these factors in building control systems in Sudan. (ix) The thesis reminds architects to take into account the socio-cultural background of the study when designing buildings.

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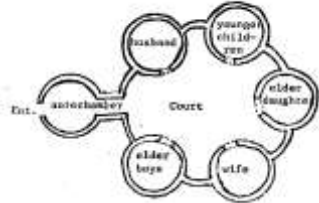
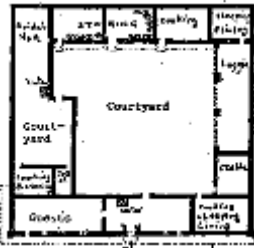
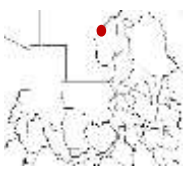
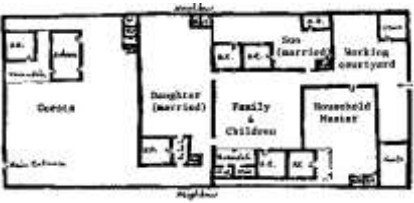
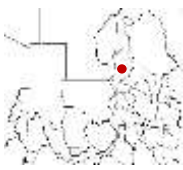
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THE SELECTION OF THE CASE STUDY AREA

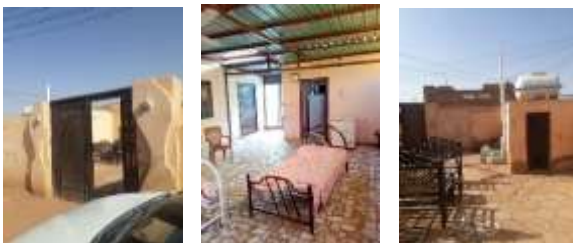
No.	The type of houses in the area	The location of the case study.	Map of the area	Previous works	Houses and building codes.
1. Nuba houses		The case study is located in the western region of Sudan. 		There are no previous works on this house	The design of houses doesn't follow building codes in Sudan.
2. Tuti Island houses		It is located in the central region. 		There are several master's theses and many articles.	The design of houses doesn't follow building codes in Sudan.
3. Nubian houses		It is located in the northern region of Sudan 		There are many works, especially in Egypt, which include local articles and international articles.	The design of houses doesn't follow building codes in Sudan.
4. The Gazira state		It is located in the central region of Sudan. 		There are several works, including two Ph.D. researches, one in the UK and the other in South Africa.	The design of houses doesn't follow building codes in Sudan.

THE SPATIAL ANALYSIS RESULTS

The Spatial Analysis Results

No	The Plan	Description	The activities in the house	Figures
1		House location: This house is located in the second neighborhood of the island. House spaces: The house contains a kitchen, a boys' bedroom, one bedroom for girls, a bedroom for the parents, and a salon and two bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam Family Origin: From the old inhabitants. The number of family members: 8	  
2		House location: This house is located in the fourth neighborhood of the island. House spaces: The house contains a kitchen, a children's bedroom, two bedrooms for girls, a bedroom for the parents, and a salon and four bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam Family Origin: From the old inhabitants. The number of family members: 7	 
3		House location: This house is located in the fifth neighborhood of the island. House spaces: The house contains three kitchens for the three families, seven bedrooms, Two halls, one shop, a salon, a store, and six bathrooms. The number of families living in the house: Three families.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam Family Origin: From the old inhabitants. The number of family members: 15	  

+		House location: This house is located in the third neighborhood of the island. House spaces: The house contains a kitchen, four bedrooms, a salon section, a store, and four bathrooms in the house. The number of families living in the house: Three families.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam Family Origin: From the old inhabitants. The number of family members:11.	
5		House location: This house is located in the fourth neighborhood of the island. House spaces: The house contains a kitchen, a boys' bedroom, two bedrooms for girls, a bedroom for the parents, two yards, a salon, and three bathrooms, two inside the house and one in the front yard. Besides, the house contains Two shops. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities, Family's religion: Islam Family Origin: From the old inhabitants. The number of family members: 11.	
6		House location: This house is located in the fifth neighborhood of the island. House spaces: The house contains a kitchen, a boys' bedroom, one-bedrooms for girls, a bedroom for the parents, a salon, a hall, two yards, and two bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities, commercial activities. Family's religion: Islam. Family Origin: From the old inhabitants. The number of family members: 10	
7		House location: This house is located in the first neighborhood of the island. House spaces: The house contains a kitchen, a children's bedroom, two bedrooms for girls, a bedroom for the parents, and a salon and four bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities, commercial activities. Family's religion: Islam. Family Origin: From the old inhabitants. The number of family members: 6.	

8		House location: This house is located in the fifth neighborhood of the island. House spaces: The house contains a kitchen, three bedrooms, a salon, three yards, one for males and two for females, and three bathrooms the house. The number of families living in the house: Two families.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities, commercial activities. Family's religion: Islam. Family Origin: From the old inhabitants. The number of family members: 9.	
9		House location: This house is located in the second neighborhood of the island. House spaces: The house contains a kitchen, a boys' bedroom, a bedroom for girls, a bedroom for the parents, and a salon and four bathrooms in the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities, commercial activities. Family's religion: Islam. Family Origin: From the old inhabitants The number of family members: 7.	
10		House location: This house is located in the fifth neighborhood of the island. House spaces: The house contains a salon, four rooms, a kitchen, back, side, and front yards, and two halls and three bathrooms. The second family lives in the back of the house. The number of families living in the house: Two families.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam Family Origin: From the old inhabitants. The number of family members: 12.	
11		House location: This house is located in the third neighborhood of the island. House spaces: The house contains a kitchen, a children's bedroom, two bedrooms for girls, a bedroom for the parents, and a salon and four bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam Family Origin: From the old inhabitants. The number of family members: 6.	

12		House location: This house is located in the fourth neighborhood of the island. House spaces: The house contains a kitchen, a children's bedroom, two bedrooms for girls, a bedroom for the parents, and a salon and four bathrooms inside the house. The number of families living in the house: Two families.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam. Family Origin: From the old inhabitants. The number of family members: 10.	
13		House location: This house is located in the fifth neighborhood of the island. House spaces: The house contains a kitchen, a children's bedroom, two bedrooms for girls, a bedroom for the parents, and a salon and four bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam. Family Origin: From the old inhabitants The number of family members: 9.	
14		House location: This house is located in the fourth neighborhood of the island. House spaces: The house contains a kitchen, a children's bedroom, two bedrooms for girls, a bedroom for the parents, and a salon and four bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam. Family Origin: From the old inhabitants. The number of family members: 7.	
15		House location: This house is located in the second neighborhood of the island. House spaces: The house contains a kitchen, a children's bedroom, two bedrooms for girls, a bedroom for the parents, and a salon and four bathrooms inside the house. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam. Family Origin: From the old inhabitants. The number of family members: 8.	

16		House location: This house is located in the first neighborhood of the island. House spaces: This house contains three rooms, a room for male children, a room for females, a room for parents, a multi-use room, and four bathrooms, three of which are internal and one external, a salon and a hall. There are also two front and back yards. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam. Family Origin: From the old inhabitants. The number of family members: 8.	
17		House location: This house is located in the fifth neighborhood of the island. House spaces: This house contains two bedrooms, a salon, an outdoor kitchen, front and back yards, and two bathrooms. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam. Family Origin: From the old inhabitants The number of family members: 6.	
18		House location: This house is located in the third neighborhood of the island. House spaces: This house contains two bedrooms, a salon, an outdoor kitchen, front and back yards, and two bathrooms. The number of families living in the house: One family.	Family's Activities: cooking, sleeping, receiving guests, family meetings, playing, entertainment, storing, resting, Cultural activities, religious activities. Family's religion: Islam. Family Origin: From the old inhabitants The number of family members: 5	

APPENDIX- THE QUESTIONNAIRE

The questionnaire

Date: ... /... /20 ...

A questionnaire to collect information for a master's thesis entitled: The impact of socio-cultural factors on the formation of the house on Tuti Island

Researcher: Arch.Bayan Elbashir

Master student at Yildiz Technical University

A. General Questions

1. Name:	
2. Gender:	☐ Male ☐ Female
3. Age:	☐ 15-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 55-
4. Educational Level :	☐ university ☐ Secondary ☐ intermediate ☐ Primary ☐ Other
5. The location of your house	☐ Neighborhood 1 ☐ Neighborhood 2 ☐ Neighborhood 3 ☐ Neighborhood 4 ☐ Neighborhood 5
6. The house is designed by :	☐ By myself ☐ By an architect ☐ By local builders ☐ Other

B.Socio cultural factors questions :

1. Basic Needs Questions:
a.Does the house provide you with the personal protection that you need? ☐ Yes ☐ No
b.Does the house provide you with space for your personal need? ☐ Yes ☐ No

c. Does the house provide you with space for the sleep need? ☐ Yes ☐ No
d. Does the house provide you with a place to eat? ☐ Yes ☐ No
e. Where do your family members eat their basic meals? ☐ Yard or courtyard ☐ Living room ☐ kitchen ☐ Bedrooms ☐ Other
f. Does the house provide you with a place to perform your religious and cultural rituals? ☐ Yes ☐ No
<u>2. Family Questions:</u>
a . What is your family's religion? ☐ Islam ☐ Other
b. How many families live with you in the same unit? ☐ One Family ☐ Two Families ☐ Three Families ☐ More Than Three Families
c. If more than one family is living with you, what is the type of kinship between you? ☐ Relative Relationship ☐ Friendship Relationship ☐ No Relationship
d. If several families live with you, was the house divided according to the number of families? ☐ Yes ☐ No
e. How many members of your family? ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ More than 5
f. Is the house designed according to the number of personal family members? ☐ Yes ☐ No
g. If there is more than one family, are some spaces in the house shared? ☐ Yes ☐ No
<u>3. Privacy:</u>
a.Does your home design give you the privacy you need? ☐ Yes ☐ No

b. Is the house designed to provide the necessary privacy for women? ☐ Yes ☐ No
c. Do you consider your home is designed according to religious beliefs and customs that impose a special kind of privacy? ☐ Yes ☐ No
d. Is there a separation between the yards of men and women's yards? ☐ Yes ☐ No
e. Is there a separation between the entrance of women and the entrance of men in the house? ☐ Yes ☐ No
f. Does the designing of windows and doors in your home give you the privacy you need? ☐ Yes ☐ No
g. Do bedrooms offer you high privacy in terms of design? ☐ Yes ☐ No
4. The role of women:
a. Who had the most prominent role in defining and designing the house's spaces? ☐ Women ☐ Men
b. Who divided and arranged the interior environment in your home? ☐ Women ☐ Men
c. Is the house designed according to the needs of women? ☐ Yes ☐ No
d. What are the spaces that are considered private for women? ☐ Kitchen ☐ Salon ☐ Bathrooms ☐ Hall ☐ Yard ☐ Bedrooms ☐ Other
e. Are there spaces for women to perform cultural rituals? ☐ Yes ☐ No
f. In the case of women visitors, is the presence of the male members restricted to outside the house or in the men's part? ☐ Yes ☐ No
g. Where do you receive your female guests? ☐ In the bedrooms ☐ in the living room (hall) ☐ in the salon ☐ in the yard

h. Is the front yard reserved for men to give women their freedom in the rest of the house?
☐ Yes ☐ No
5. Social contacts:
a. Was the plot of land chosen based on the proximity and distance from the mosque?
☐ Yes ☐ No
b. Is there enough space around your house and the neighbors?
☐ Yes ☐ No
c. Is your house located on a street less than 3 meters?
☐ Yes ☐ No
d. Are the neighbors around you from your relatives?
☐ Yes ☐ No
e. How many relatives live with you in the same residential neighborhood?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ more than 5
f. Where do you do your weddings and other events?
☐ In the neighbors' houses ☐ The street ☐ the clubs ☐ in the squares ☐ other
g. What spaces do you share with your neighbors?
☐ Mosques ☐ Sports activities areas ☐ Festivals and cultural activities Arenas ☐ Other
h. The streets are used as a social area on the island
5 4 3 2 1 I agree ☐ ☐ ☐ ☐ ☐ Disagree
i. The narrow streets of the island made the social relations stronger between the neighbors
5 4 3 2 1 I agree ☐ ☐ ☐ ☐ ☐ Disagree

PUBLICATIONS FROM THE THESIS

Conference Papers:

1. B.Elbashir, Ç.C.Türkyılmaz, A, Sungur, The role of culture and social life in formation houses in Sudan: The case of Tuti island, 6th International architecture and design congress, pP: 557. [E-ISBN: 978-625-7367-25-7]
2. Ç.C.Türkyılmaz, B.Elbashir, The Impact of Socio-Cultural Factors on the Form and Layout of Tuti Island House-Sudan, 5th. International Congress of Academic Research, pP:236, 237.[ISBN: 978-625-7813-71-6].

