

Housing and Displacement in Post-Conflict Zones: Planning Post-ISIS Mosul by the Eye of the Displaced

Zaid O. Saeed^{1*}, Avar Almukhtar¹, F. Henry Abanda¹ and J.H.M. Tah¹

¹ School of the Built Environment, Faculty of Technology, Design and Environment, Oxford Brookes University, Oxford, United Kingdom

*Corresponding author: Zaidosama94cpm@gmail.com

Abstract. Post-conflict reconstruction has been one of the most challenging themes for the AEC industry, urban designers and planners, and related decision makers, especially in complex urban contexts with sever destruction of existing infrastructure. The city of Mosul in Iraq is a case where there is an urgent need for reconstruction, in particular the housing sector after the massive destruction caused by the ISIS war 2014-2017. The war left the city with massive destruction in the infrastructure and with around 1M displaced seeking shelters in the neighbouring cities, most of them under the poverty line. The governmental efforts along with the NGOs are continuing to plan the return of the displaced. However, these plans are limited by economic drivers and lack an active participation of the displaced in planning the post-war housing sector of Mosul city. This paper is part of a comprehensive research that discusses a methodological framework for the reconstruction of Mosul city, specifically the housing sector. This study highlights the involvement of the displaced families in developing possible post-war housing paradigms based on their needs, requirements and desires. The main contributions include identifying the essential housing requirements, based on a sample from the displaced, as end-users. Most importantly, the study concludes with three developed housing paradigms.

Keywords: Post-conflict Housing; Displaced Involvement; Developing Countries; Mosul City

1. Introduction

War and conflicts continue to impact the urban fabric of cities. Destruction of the urban infrastructures in cities, especially housing infrastructure poses critical challenges to the revival of these cities after war and conflicts. This is could not be more evident as in Mosul city. Between 2014-2017, the city of Mosul witnessed one of the most savage and devastated attacks on humanity and identity within the urban fabric of the city. The war against ISIS regime turned the city into a battlefield, where the housing fabric of the city was a central element in the street war. Housing, in the city of Mosul, represented the majority of the destroyed urban fabric resulting in an estimated one million citizens being displaced. Today, the city still suffers from the consequences of the war with limited attempts for rebuilding the city due to the economic challenges that the country is confronting. On the other side, the displaced citizens have been distributed on temporary camps in neighbouring cities, and they are still looking for tangible solutions for their return. The government with the assistance of NGOs have put in place schematic plans for the reconstruction of the housing sector. The plans are mainly based on basic solutions, and limited to the economic aspects. These plans significantly lack an active involvement of the displaced families in planning the post-war housing sector of Mosul. Although, the displaced families are considered as the prospective end-users of the post-war housing, however, the initial post-war planning showed an extremely limited involvement of the displaced. Therefore, this study aims to demonstrate possible post-war housing proposals based on involving a sample of the displaced families in planning and developing the proposals, depending on the needs and requirements of the displaced. The study presents a background for the conflict, in section 2. In section 3, the study presents the methodological framework of this paper. Section 4 illustrates the primary data analysis of involving the displaced in outlining the features and characteristics of the desired proposals. Section 5 synthesis the schematic data with the housing regulations in Mosul city. Section 6 presents the developed proposals as a result of this study, lastly, section 7 concludes the study and discusses further research.

2. Background

2.1 Spatial Impact of ISIS War (2014-2017)

Throughout history, war and conflict have had severe impact on cities and their urban fabric. The attack is not only on people but also on buildings and cultural heritage areas [1]. Violent targets on Buildings that reflect historic values means targeting people's identity and sense of belonging [2]. Destruction of heritage and spatial fabric of cities is evident in many Iraqi cities [3]. Several cities in the country have become parts of the battlefield as a result of decades of war and conflict significantly impacting the spatial fabric, especially housing developments [4]. The housing condition continued deteriorating in several Iraqi cities due to the consequences of 2003 War, in particular, the lack of post-war planning and the economic condition [5]. The decay in the existing housing infrastructure reached a critical level after the advent of ISIS in several Iraqi cities as Al-Anbar, Kirkuk and the most affected Mosul city [6].

In June 2014, ISIS regime took control over the city of Mosul and announced the rule of ISIS over the city [7]. According to [8] report, approximately one million citizens were displaced in few months, while the remaining minority were obliged to follow the rule of ISIS. The city became a battlefield between the ISIS regime and the Iraqi army, which resulted in severe damages to the infrastructure of the city including the water and electricity facilities, road network, and most importantly the housing sector [9]. The report [10] indicates that the housing stock of Mosul city was the most affected among other Iraqi cities. Mosul city incurred 43% damage in the housing sector, while Anbar and Kirkuk cities incurred 19% and 7% respectively. Available governmental reports indicate that 60-70% of Mosul infrastructure were destroyed. The report [8] demonstrates that 15 neighbourhoods in western Mosul, including those within the Old City district, have been entirely destroyed. Eastern Mosul incurred less damage in the housing scheme. The study [9] estimates an approximate 500,000 housing units are required urgently to ease the return of the displaced families to the city. The study [8] estimates a \$1.1 billion is required for the rebuilding of Mosul city, essentially, for rebuilding the western side of the city which incurred most of the damage [8]. Today, the 1 million displaced are still looking for tangible attempts for the rebuilding of the city. With the majority under the poverty line, these families are still accommodating temporary shelters in neighbouring cities.

2.2. Understanding the Urban Fabric

The old Mosul is a traditional Islamic city with a historic urban centre [11-13]. The existing urban fabric in the city of Mosul can be classified into two main patterns. Traditional compact pattern and modern grid pattern [14]. The traditional compact pattern represents the historic Old City of Mosul, where the residential units follow an organic pattern of compact courtyard houses and narrow alleyways [11, 12]. The modern grid pattern forms the broad picture of the urban fabric in Mosul city, where the units of residence vary between Detached houses, Semi-detached and the most common Row-house [14, 15]. Figure 1 illustrates the city map of Mosul city and demonstrates the urban fabric of the old city.

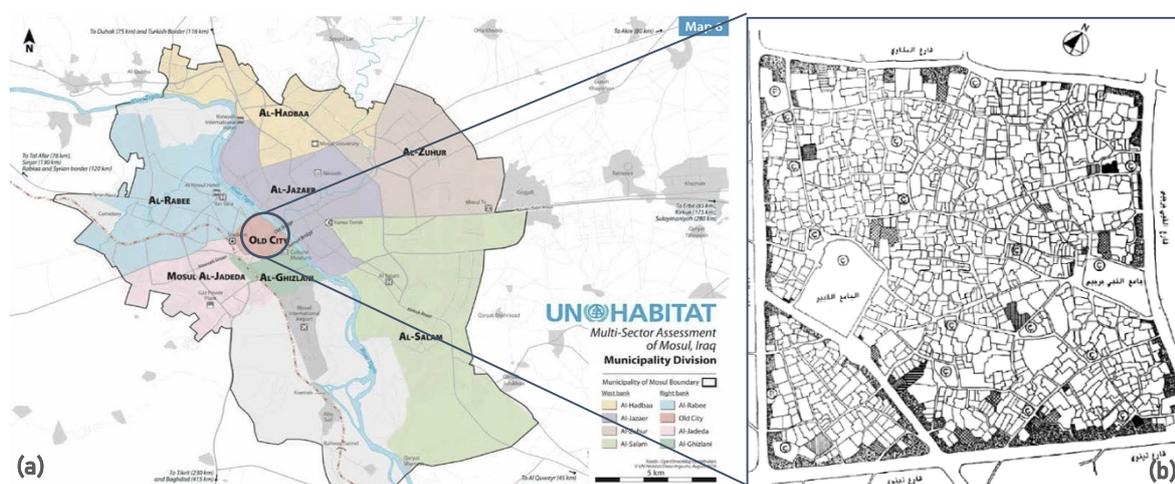


Figure 1. The Urban Fabric of Mosul City: (a) Mosul City Map [17], (b) Old City Map [13]

On the city scale, Tigris River divides the city into western and eastern banks. Each side is divided into four administrative sectors [16]. The western bank of the city accommodates the Old Mosul at which the city arose and expanded towards the East bank [12]. The city consists of 251 neighbourhoods. Eastern Mosul has 160 neighbourhoods, while the western side has 91 neighbourhoods, where five existing bridges link the two sides of the river [16, 17]. Figure 2 demonstrates schematic map of Mosul city and highlights the points of connection between the eastern and western side of the city.

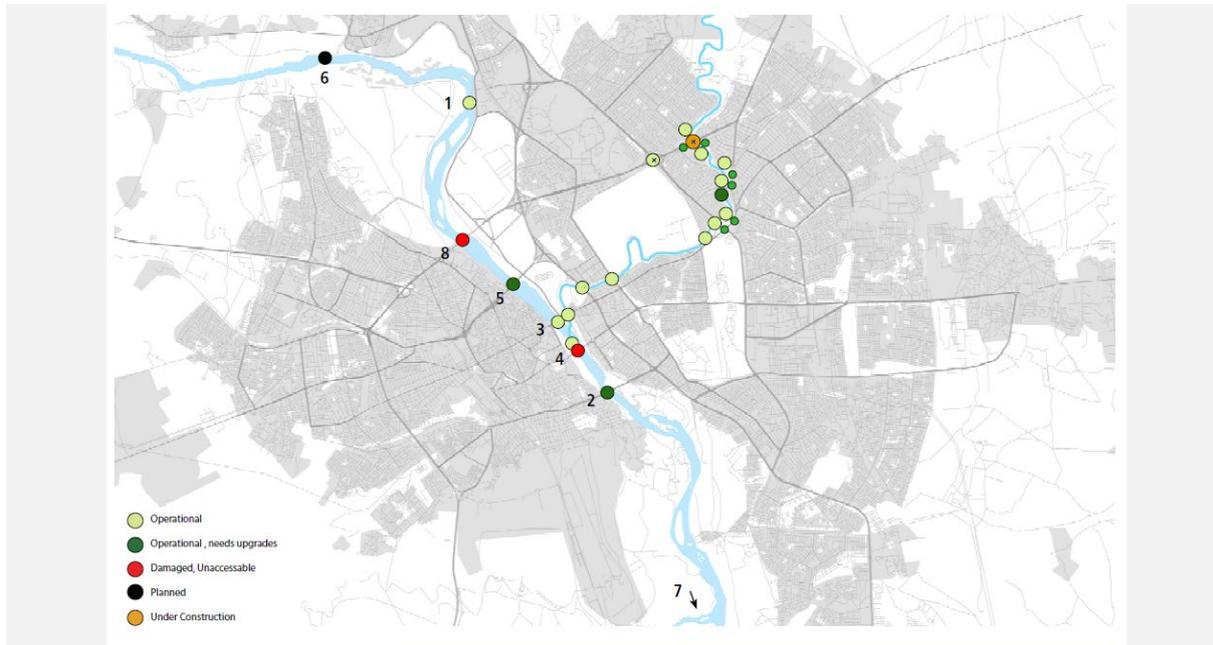


Figure 2. Schematic City Map of Mosul City [16]

The residential zones are distributed within the urban fabric of the eight administrative sectors of the city. This includes, for example, AL-Hadbaa, Al-Zuhoor and AL-Rabee districts [16, 17]. Most of the districts adopts grid urban configuration, where the housing units are distributed in rectangular blocks and divided by horizontal and vertical streets [14, 16, 17]. The Old City district located in front of Tigris River, considered as the principal core of the city, which has developed and expanded throughout the history of the city [13]. Figure 3a illustrates an aerial view of a typical residential district in the city of Mosul with rectangular blocks of Row-house units divided by streets and green areas, while figure 3b illustrates a layout plan example of the same concept.



Figure 3. Housing Pattern: (a) Aerial View [16], (b) Schematic Housing Layout [16]

In general, the western bank of Mosul city has been the most affected by the ISIS war. The urban pattern including the traditional compact and the grid patterns have incurred severe damages in the housing infrastructure [17]. As indicated by [10, 16, 17] the level of damage requires an urgent and newly-constructed housing units to overcome the shortage of housing in the city, specifically the western side.

2.3. Understanding the Architectural Typology

On building scale, the architectural typology of the housing in Mosul varies among the urban districts of the city. In traditional urban districts, specifically the Old City district, housing units are distinguished by irregular forms of compacted units that differ in size, form, and height. In these patterns, the spatial configuration of the internal spaces embraces the principal of a central open-to-sky space known as “courtyard” [12, 18]. The courtyard is enclosed by living spaces forming a unique house typology known as “courtyard house” [18]. Figure 4a demonstrates an example of a traditional courtyard house in the old city district of Mosul. On the other hand, the majority of the residential districts in the city of Mosul adopt the pattern of Row-house typology [15-17]. Row-houses, in the city of Mosul, are characterized by regular rectangular form attached from all sides, where the standard plot area ranges between 150-200 sq.m, depending on the number of family members as well as bedroom number [19, 20]. Figure 4b illustrates an example for a Row-house typology in the city of Mosul.

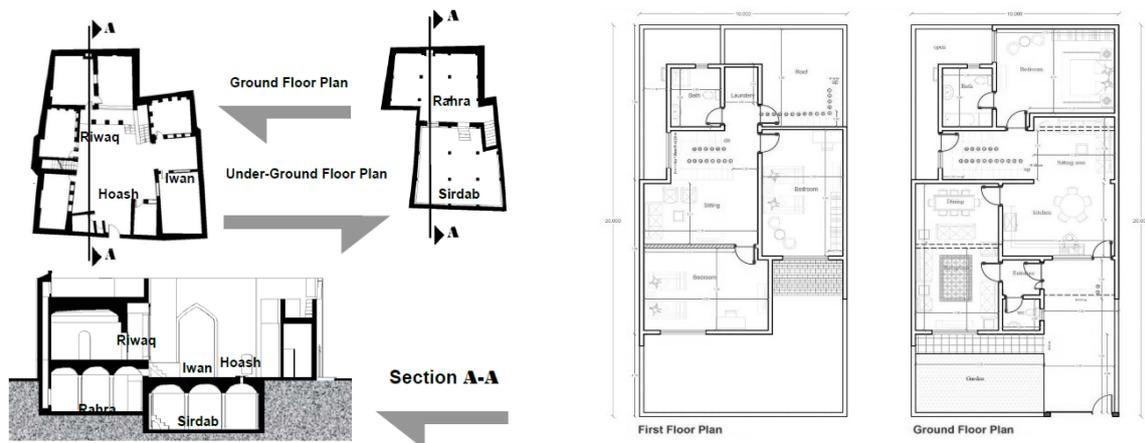


Figure 4. Housing Typology: (a) Courtyard House Example [18], (b) Row-house Example

The architecture of housing in the city of Mosul reflects the social ideology and the identity of the local community, as well as adopts the principles of Islamic Architecture [19]. The conservative façade with limited exposure to outside, the introvert spatial configuration, and the plain external walls exemplify the features of a typical traditional housing unit in Mosul [12, 18]. In general, a single housing unit dwells an average of 5-6 members according to the Iraqi Ministry of construction and Housing [20, 21]. A typical housing unit includes 3-4 bedrooms, one kitchen area, one communal area, and one living space and, as well as other facilities such as a bathrooms and storage room [20, 21].

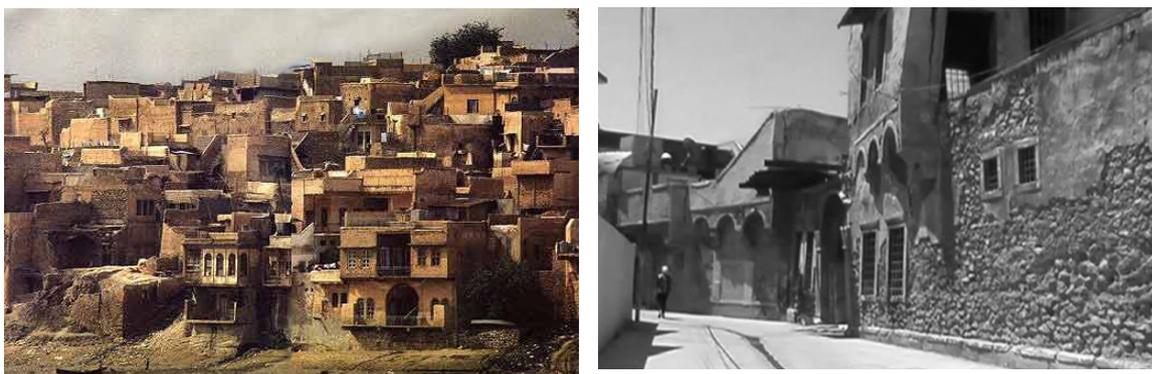


Figure 5. Architecture of Mosul City: (a) Houses overlooking the Tigris River [12], (b) Old City Houses [12]

On details scale, unique architectural elements reflect the architectural identity in the historic city of Mosul. For instance, the arched gateway, stripped arched windows, wall ornaments and local marble finishing represent the identity of the local architecture. [12, 18, 19]. Figure 5 demonstrates examples of local architecture in Mosul city. Generally, the urban scheme and architecture in the city of Mosul reflects the layers of history that the city passed through from the emergence of the old city to several urban expansions and ending by the present city.

3. Methodology

This study is part of a comprehensive research concerned with developing a methodological approach for the post-conflict reconstruction of Mosul city. The research has been conducted in three consecutive stages: stage 1 investigated housing systems and requirements in the city of Mosul, by the perspective of the displaced citizens, aiming to develop possible post-conflict housing proposals. Stage 2 attempted to formulate a genuine housing prototype, derived from the developed proposals, and based on a set of qualitative data by a spectrum of housing experts. Stage 3 inspected the feasibility and functionality of the formulated housing prototype, using a BIM-based inspection. This study focuses on stage 1. The study discusses housing requirements, by the perspective of the displaced citizens as end-users supported by related literature. The study aims to develop possible post-conflict housing paradigms derived from the needs and requirements of the prospective end-users. Figure 6 shows the methodological framework of the study.

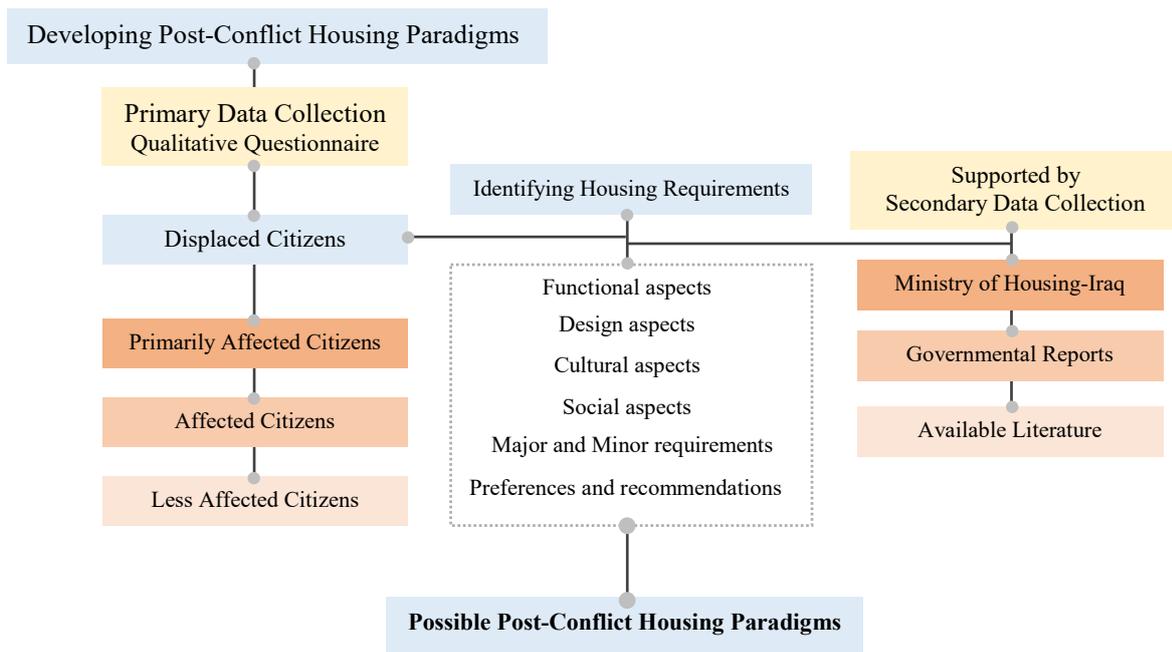


Figure 6. Research Methodology

3.1. Primary Data Collection

The objective of the primary data collection was to develop possible housing proposals derived from housing requirements, major and minor needs, and also, cultural and social perceptions of the affected citizens as end-users, thus, delineate possible housing paradigms. A qualitative method in the form questionnaire represented the primary data collection. The secondary data collection guided to the content and structure of the questionnaire. The questionnaire targets citizens affected by the ISIS war. This involves three main categories:

- Majorly affected: citizens displaced due to massive destruction of their homes.
- Affected: citizens displaced due to primary housing damages, destruction, or general insecurity and city infrastructure deterioration.
- Less affected: citizens incurred less damage to housing and private properties.

The participants and their categories were identified with the assistance of the Ministry of Migration and Displaced-Iraq, which provided access to registered displaced through their official website. The questionnaire involved 10 questions focusing on various housing aspects such as average family number, the number of bedrooms per family, spaces requirements, besides, the social and cultural aspects such as the preferable level of exposure to outside, spatial configuration preference, spaces distribution, and also the degree of privacy and internal circulation manner.

3.2. Secondary Data Collection

The primary data collection was supported with housing reports issued by the ministry of housing as well as available governmental reports in order to provide a thorough understanding of housing aspects of the city, this includes identifying the housing system, average family number, average bedroom number, standard plot sizes, and housing regulations. The secondary data were utilized to provide a framework for analysing and synthesising the results of the primary data collection. The primary data were triangulated with the secondary data to identify possible post-conflict housing paradigms for the city of Mosul. The synthesis of the primary and secondary data led to the development of possible post-conflict housing paradigms, based on the needs and requirements of the displaced citizens.

4. Primary Data Analysis

The questionnaire has been distributed with assistance of the Ministry of Migrants and Displaced-Iraq, which provided a list of officially registered displaced. The questionnaire has been sent to a 34 displaced family by online means, focusing on their living experience in Mosul city as end-users. Question 1 of the survey asked the participants to classify the incurred damage level due to the consequences of the ISIS war, while Question 2 attempted to specify the housing typology of the participants. Question 1 and 2 attempted to indicate the most impacted housing typologies in Mosul, as the literature showed no data regarding this aspect. The results of Question 1 and 2 have been interrelated to assess the damage level incurred to each housing typology, and therefore, indicate the most affected housing typology.

Figure 7 demonstrates an interrelated bar-chart between the housing typology and the damage level incurred to each typology as indicated by the participants. The responses have indicated that **Row House** typology formed **50%** of participants housing, **Detached House** formed **23.5%** of participants housing, while **Semi-detached House** formed **20.6%** of participants housing. **Courtyard House** formed only **5.9%** of participants housing. Three Row-houses have been classified as **severely damaged**, and Four as **partially damaged**, while the remaining Row-houses incurred **less or minor damages**. Subsequently, Three Detached houses have been classified as **Majorly damaged**, and one as **severely damaged**, while the remaining incurred **minor damages**. **Row House** typology was identified to be the most affected among other typologies, representing **75%** of the severely damaged, and **50%** of the partially damaged, as well as **56%** of the less damaged houses.

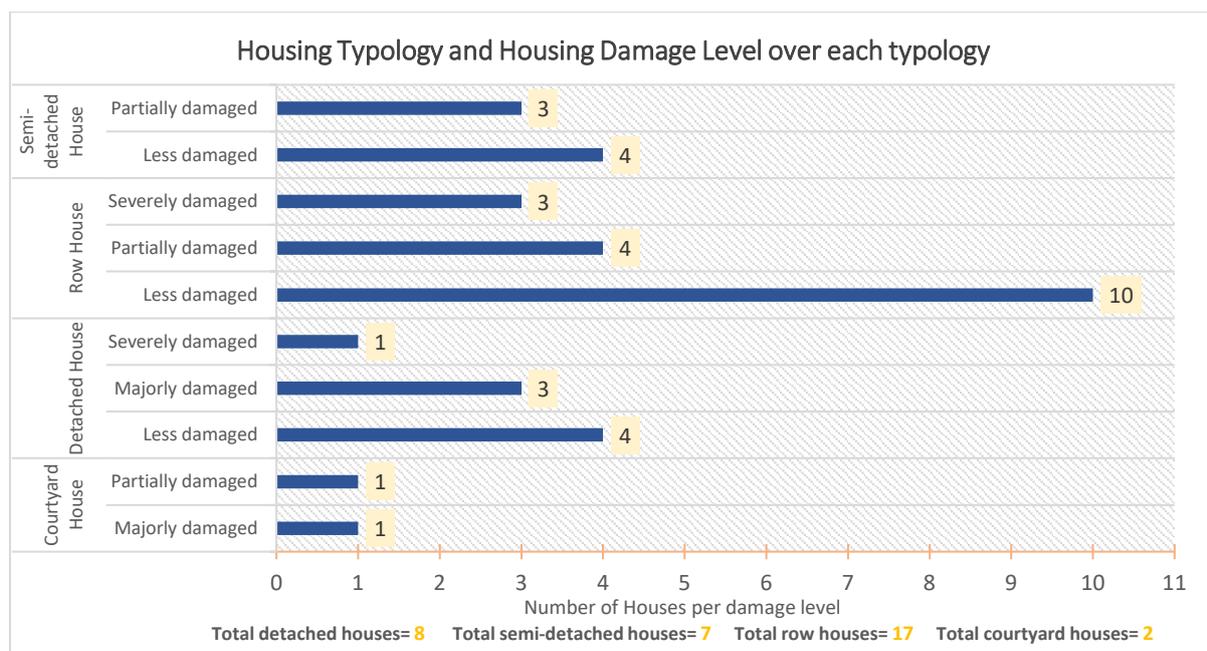


Figure7. Housing typology and damage level over each typology

Questions 3 and 4 asked the participants, respectively, to identify the number of family members that used to dwell the same housing unit, as well as the number of bedrooms at that housing unit. The questions 3 and 4 aimed to find the average family number in Mosul, and also average bedroom number. Consequently, the resulted values can be adopted in designing the housing proposals based on Floor Area per Persons or Persons per Bedroom approaches in housing. Figure 8 presents a scatter plot graph combining the family number and the number of bedrooms given by each participant. The blue spots represent the number of family members provided by each participant; the responses ranged between 2-10 family member, where **32%** of the responses indicated six family members, while **26.5%** indicated five family members. Thus, **5.76** formed the average family number. The yellow spots represent bedroom number given by each participant; the responses ranged between 2-8, where **47%** of the responses indicated four bedrooms, while **26.5%** indicated three bedrooms. Thus, **4.12** formed the average number of bedrooms.

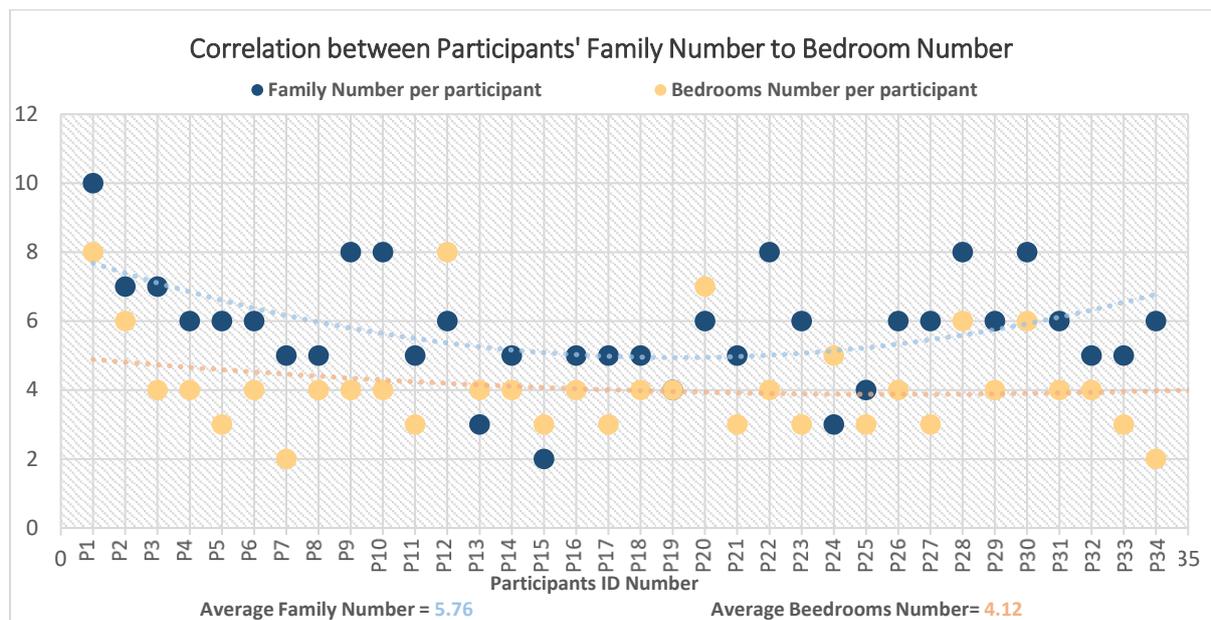


Figure 8. Average Family Number and Average Bedrooms Number in Mosul City

Respectively, Question 5 presented standard components for housing and asked the participants to classify these components based on necessity and preference. This particular question aimed to identify the essential housing requirements, and also the major and minor day to day needs, as the participants represent a sample of the targeted users of the proposed housing paradigms. Figure 9 demonstrates the degree of necessity and preference of each function, space or area, as classified by the participants. The responses have indicated that spaces such as the **bedrooms** and **kitchen** appeared to be the most necessary from the viewpoint of the participants, followed by the **living room**, **main hall** and the **bathroom**. The indicated spaces, from the viewpoint of the participants, represented essential needs to exist in a housing unit. On the other hand, the responses have indicated that spaces such as **office room**, **playing room** and the **laundry room** appeared to be less necessary from the viewpoint of the participants, and represented minor needs for the day to day activities of the affected sample. Also, the participants have preferred a **front yard** system with a sufficient **garage area**, rather than a **back yard** system or a traditional internal courtyard system.

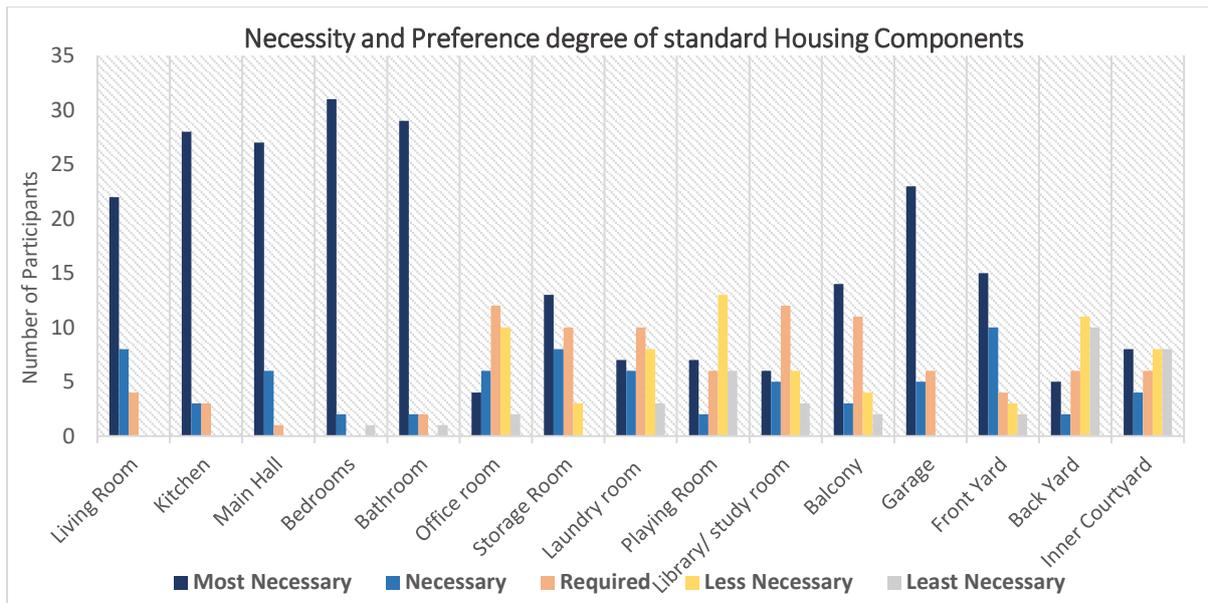


Figure 9. Necessity and preference degree of standard housing spaces

Question 6 attempted to identify the preferable spatial configuration (distribution of spaces) from the viewpoint of the participants. This question intended to analyze the social and cultural perception of the participants regarding the distribution of the internal space, areas and functions. The participants have been asked to identify their preferable spatial configuration, as illustrated in figure 10. The participants tended to prefer **Option 3**, which is a combination between an extrovert and introvert spatial configuration, where **35.3%** of the participants preferred **Option 3**. While **32.4%** preferred Option 1, likewise, the remaining **32.4%** preferred Option 2.

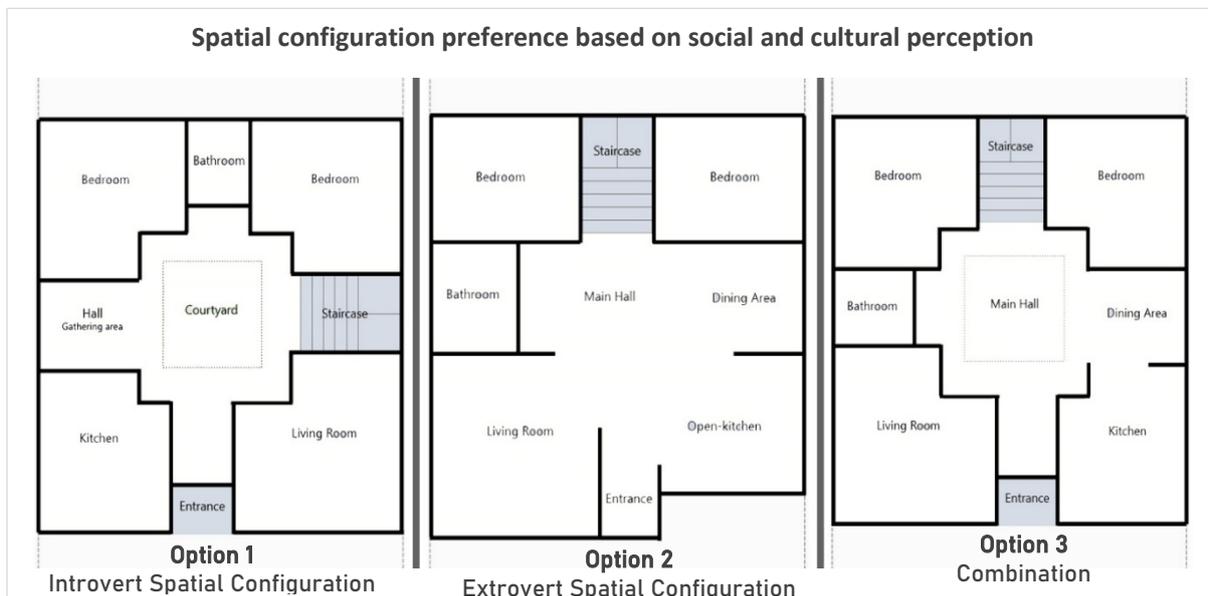


Figure 10. Spatial configuration preferences by social and cultural perception of the displaced families

Subsequently, Question 7 asked the participants to specify their preferable degree of privacy as well as the preferable circulation manner, as illustrated in figure 11. This question reinforces the analysis of Question 6, and also focuses on the aspects of privacy and internal movement manner. The responses have indicated that **50%** of the participants preferred **Option 3**, which represents a semi-conservative circulation manner with a moderate degree of privacy. However, **41.2%** of the participants preferred **Option 1**, which represents a conservative and highly private configuration. Only **8.8%** of the participants preferred an open-plan circulation with low privacy as **Option 2**.

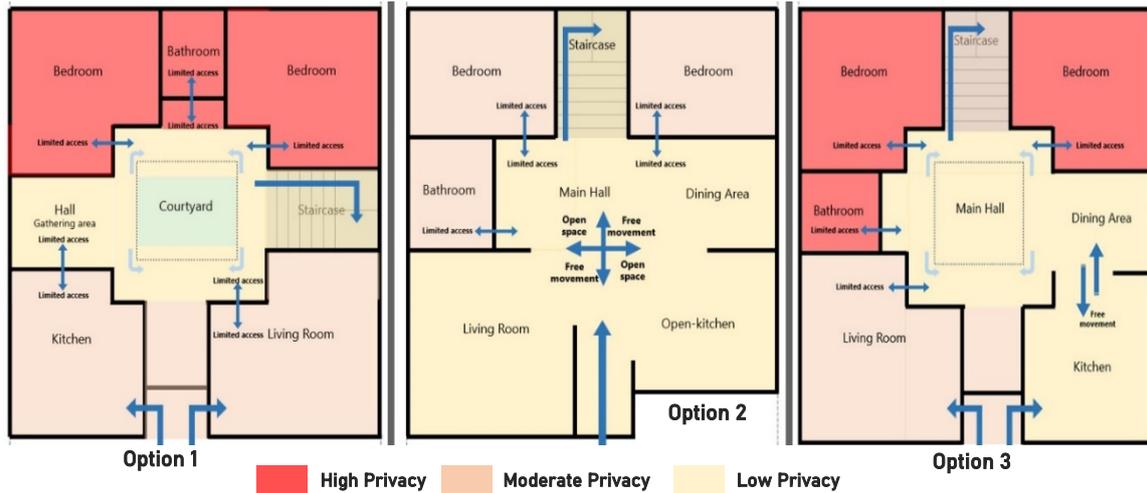


Figure 11. Privacy Degree and Circulation Manner preferences by the displaced families

Question 8 turned the focus on the external elements, specifically, the criteria and characteristics of the house façade. This question aimed to determine the appropriate architectural fashion for a housing façade in Mosul, considering the cultural dimension and the local architectural identity from the perspective of the participants. Respectively, Question 9 highlighted the social and cultural aspects, and also privacy considerations of designing a house façade, considering the preferences and views of the participants. This question attempted to identify the preferable degree of privacy, as well as exposure to the outside. The results of Questions 8 and 9 have been interrelated to indicate the preferable architectural fashion for a house façade in Mosul, and also to determine the preferable degree of privacy and exposure to be achieved in that façade. Figure 12 demonstrates an interrelated bar-chart combining different architectural fashions, along with the preferable degree of exposure and privacy associated with each architectural fashion, as determined by the participants.

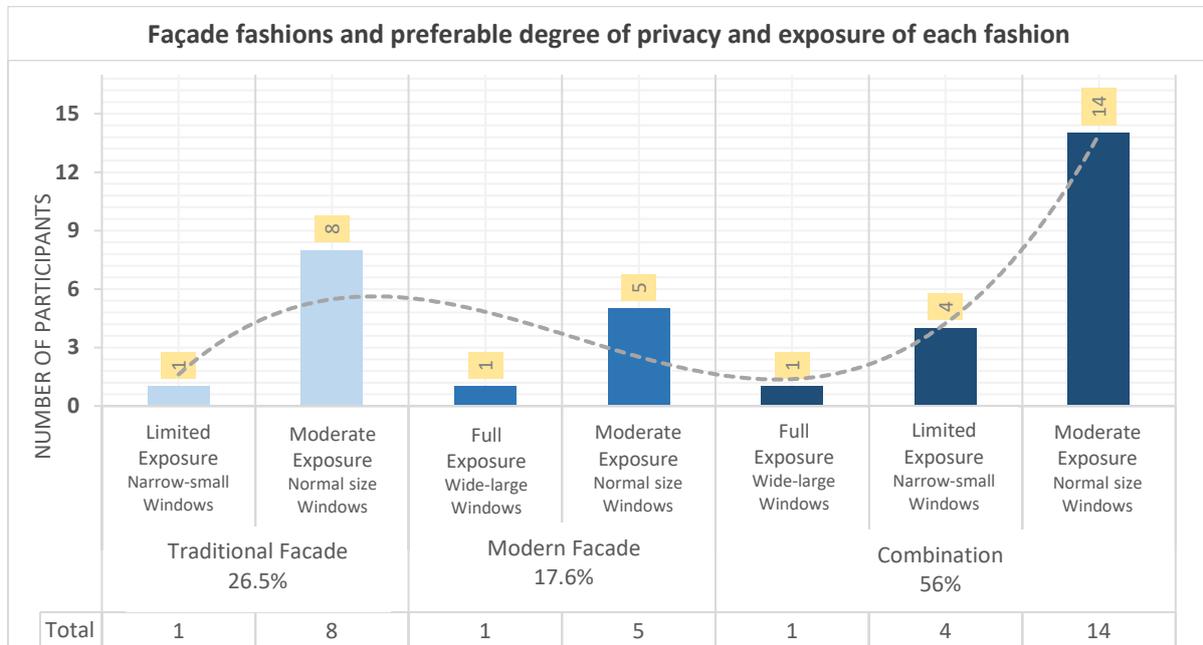


Figure 12. Façade fashions and preferable degree of privacy and exposure of each Fashion

The responses have indicated that **56%** of the participants have preferred a **combined façade** with the majority preferring a **Moderate Exposure** to the outside. While **26.5%** of the participants have preferred a **Traditional façade** with almost a complete consensus on **Moderate Privacy** and **Exposure**. In contrast, only **17.6%** have preferred a **Modern façade** with **Moderate Privacy** and **Exposure** to the outside. The majority have identified the **combined façade** as their preferable fashion. This particular fashion represents a combination between contemporary façade configuration and the local architectural identity exemplified by traditional façade elements such as the arched gateway, wall patterns, and the distinct Mashrabiya windows. Also, the majority of the participants have preferred a Moderately degree of privacy and exposure to the outside, exemplified by standard-sized windows overlooking the outside front yard area, rather than narrow-small windows with limited exposure.

The last question highlighted the most common building materials of the construction of housing in Mosul city and asked the participants to indicate the most compatible building material with the climatic and environmental conditions of the city, depending on their living experience as previous residents in the conventional houses of the city of Mosul. The majority of participants have indicated that a **Combination of Materials** as the most suitable building material for the context of Mosul city, where **50%** of the participants have preferred this option.

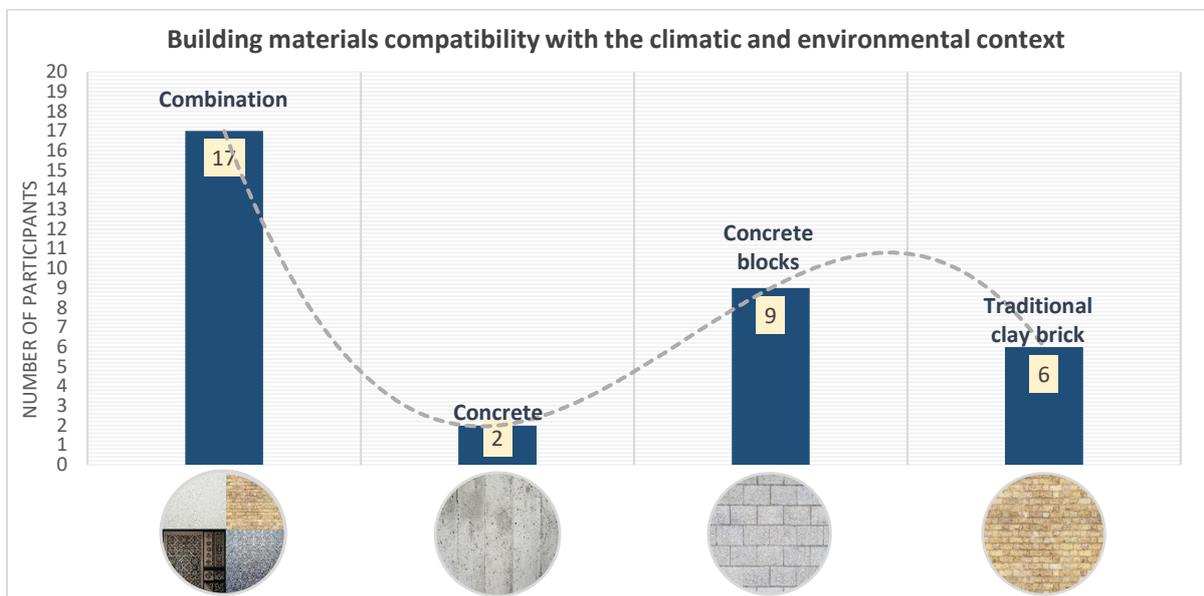


Figure 13. Building materials compatibility with the climatic and environmental context of Mosul city

On the contrary, only **6%** have preferred the **Concrete** as a building material, while **26.5%** of the participants have pointed out to the **traditional clay brick** as the most suitable building material. The remaining **17.6%** of the participants have preferred the **Pre-casted concrete block**. The **Combination** of Materials refers to the use of various building materials in different proportions to achieve a high degree of user satisfaction, and also suit the climatic conditions of the city, as reported in figure 13.

The analysis of the primary data collection has demonstrated the preliminary housing requirements, needs and preferences by the perspective of the displaced citizens. The primary data analysis outlined a spectrum of housing aspect to be considered in planning post-conflict housing, as identified by end-users. The results of the primary data analysis will be, in section 5, synthesised with the regulations and standards of housing of Mosul city as defined by ministry of housing and governmental reports. The synthesis will guide to the development of possible post-conflict housing paradigms, that fulfils the preliminary needs and preferences of the displaced citizens.

5. Data Synthesis and Findings

Primary data analysis highlighted the essential housing requirements, social and cultural considerations, and also, design aspects of a housing unit such as distribution of spaces, preferable circulation manner and degree of privacy. Ministry of Construction and Housing provided a manual of housing standards for the cities of Iraq, and also, a guide for housing policies. The standards and policies provided by the Ministry of Construction and Housing, along with the available reports regarding the housing of Mosul city, will be incorporated with the primary data to develop possible housing paradigms.

In regards to the housing typology in the city of Mosul, the governmental reports along with the primary data analysis have indicated Row House system as the main housing typology in the city. According to the Ministry of Construction and Housing, the standard plot size of a residential block of Row Houses varies between 150 sq.m to 300 sq.m with an average of 200 sq.m for the majority of the houses [16, 20, 21]. Accordingly, the average plot size (10X20=200 sq.m) will be adopted, in this study, for the formulation of possible housing paradigms. Figure 14 demonstrates the results of Question 1 and 2 of the primary data collection accompanied with the standards of Row House system, as indicated by the Ministry of Construction and Housing-Iraq.

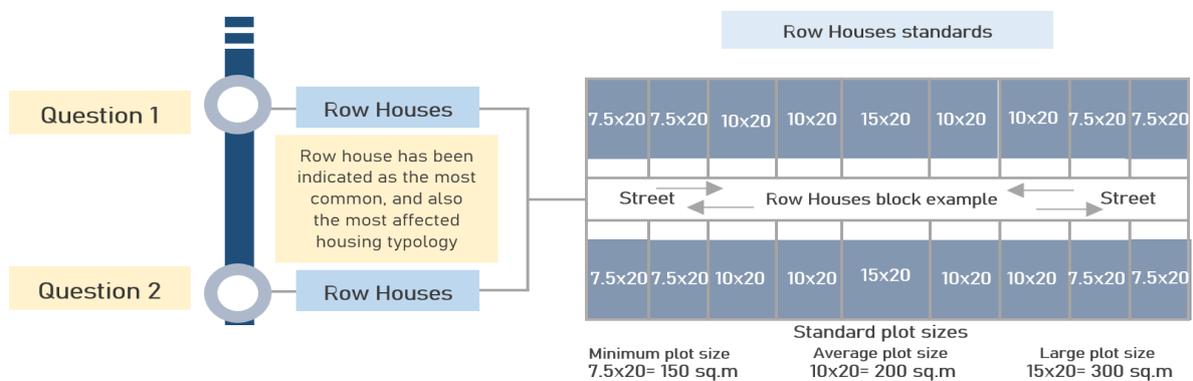


Figure 14. Housing Topology and Standard Plot Sizes [20-21]

Respectively, the primary data analysis indicated an average family number of 5.76 and an average bedroom number of 4.12 per family. Ministry of Construction and Housing indicates an average of 5-6 members per family in Mosul city, with an average of 3-4 bedrooms per unit. The housing standards provided by the Ministry of Construction and Housing indicates minimum and recommended areas of the external and internal components of a housing units, depending on the average family number. According to the primary data results, the average of 6 members per unit was adopted to indicate the minimum and recommended spaces area, as shown in figure 15. As defined by the Ministry of Housing, the essential spaces and the average recommended areas for each space will be adopted in this study.

Spaces	Minimum Area (sq.m)	Recommended Area (sq.m)
Main Bedroom	15 sq.m	20 sq.m
Bedroom 1	12 sq.m	18-20 sq.m
Bedroom 2	12 sq.m	18-20 sq.m
Bedroom 3	12 sq.m	15-20 sq.m (child bedroom)
Living room	18 sq.m	20-25 sq.m
Main Hall (family area)	18 sq.m	18-20 sq.m
Kitchen	12 sq.m	15-20 sq.m
Main bathroom	3.5 sq.m	9-12 sq.m
Bathroom 2	3.5 sq.m	6-9 sq.m
Storage room	6 sq.m	6-9 sq.m
Circulation	15 sq.m	15-20 sq.m (with staircase)
Total built-up area	125-130 sq.m	160-175 sq.m
Outdoor area (front yard+ garage)	20 sq.m	20-25 sq.m
Total Area	145-150 sq.m	180-200 sq.m

Figure 15. Space requirements and standard area per spaces [20-21]

According to the preceding findings, three schematic plans of a Row House typology were developed in line with the housing policies of Mosul city and in accordance to the recommended standards [20, 21]. The distribution of spaces, in the three schematic plans, reflects a combination between an extrovert and introvert configuration as indicated by the end-users in the primary data collection. Also, the three schematic plans reflect a moderate degree of privacy exemplified by a semi-open circulation manner, as preferred by the end-users. This stage considered the social and cultural preferences of the end-users, and synthesized these preferences in the configuration of the three schematic proposals. The schematic plans, demonstrated in figure 16, represents the results of Question 6 and 7 in the primary data collection accompanied with the findings of the two preceding stages.

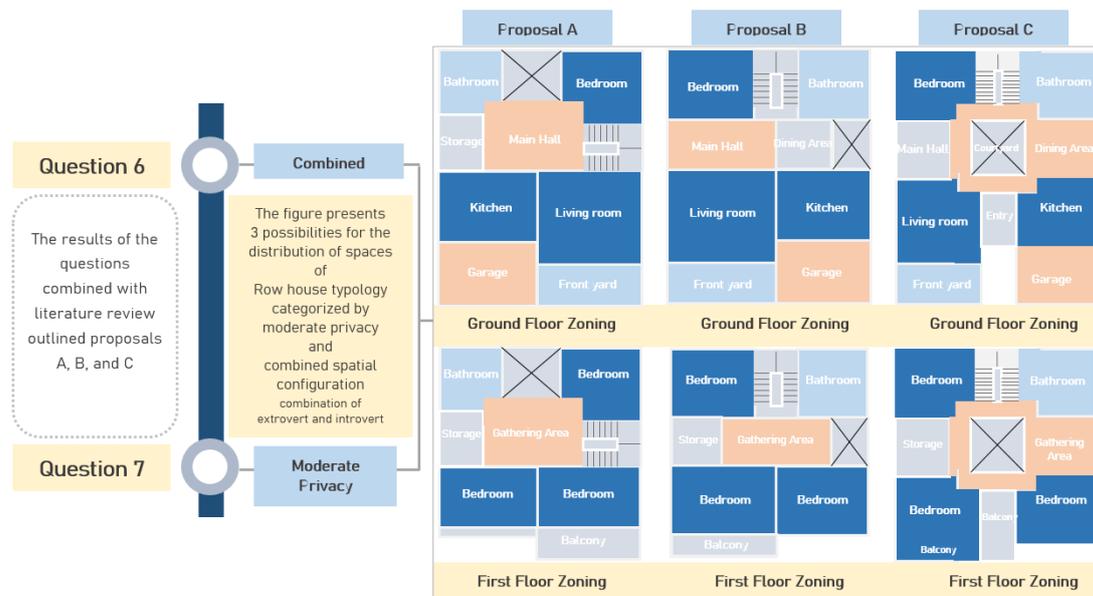


Figure 16. Schematic house layouts and recommended distribution of spaces

In regards to the façade elements and degree of exposure to the outside, the primary data analysis has indicated that end-users preferred a moderate degree of exposure as well as a combination of traditional and modern façade elements that preserves the local identity in a contemporary manner. The studies [12, 18, 19] discussed the features and elements of housing facades in the city of Mosul. These studies along with the regulations of housing provided by the government and the results of primary data collection, were adopted in developing a schematic façade for each of the schematic proposals of the previous section. Figure 17 presents the process of outlining the main façade for each of housing units.

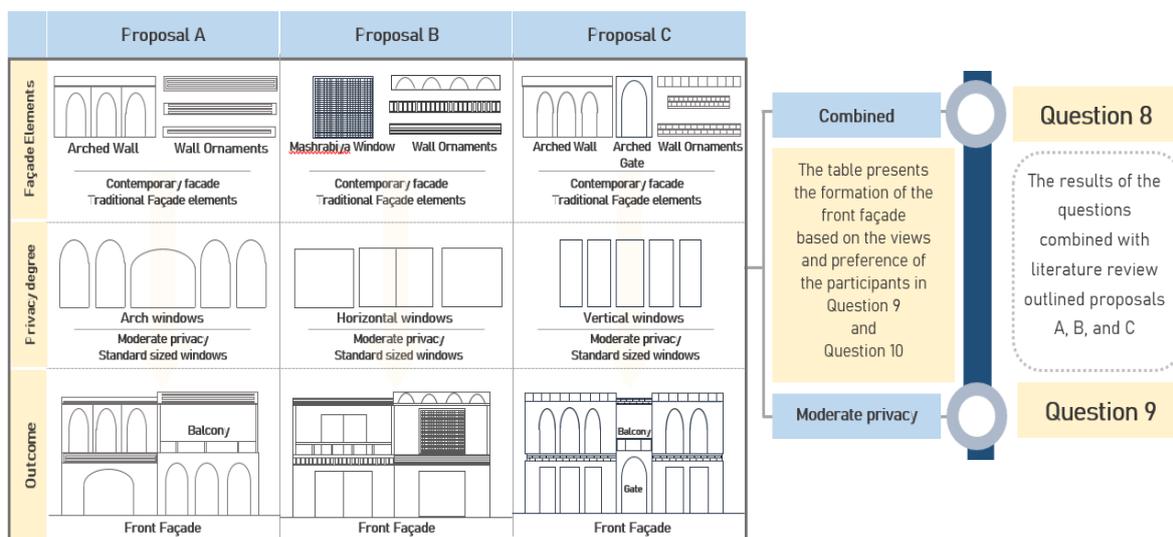


Figure 17. façade elements and recommended degree of privacy

Based on the living experience of the end-users, a combination of building materials was recommended to correspond to the climatic and environmental conditions of the city, as presented in figure 18. The primary data analysis has indicated that a combination of local brick covered by layers of paint, and glass windows screened by local iron ornaments better suits the climatic conditions of the city compared with concrete block walls and marble finishing or cast-in-place concrete structures which are other common methods locally. In regards to the building regulations, there are no strict policies regarding the use of specific building materials, and therefore, the combination of materials indicated by the end-users will be implemented in developing the housing proposals.

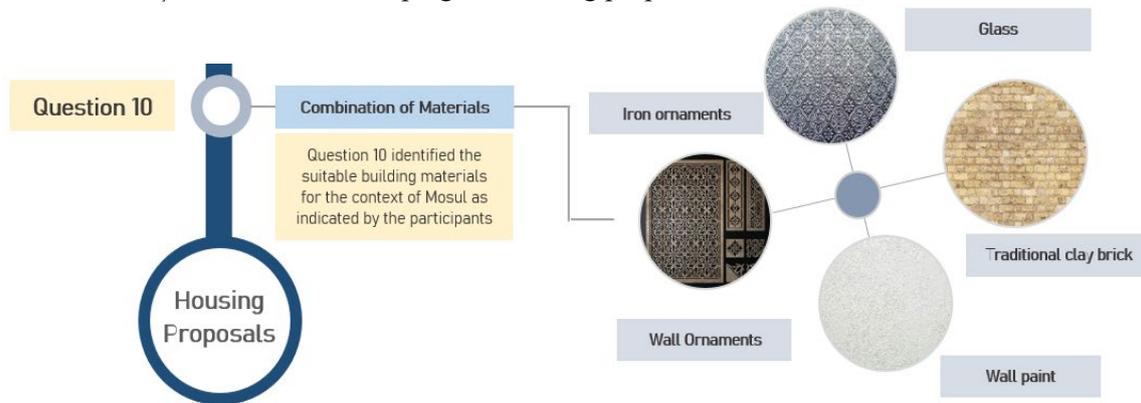


Figure 18. Material combination in response to the climatic and environmental conditions

The essence of this study lay in the importance of involving the displaced in the process of planning the post-war housing of Mosul city. The study aimed to outline possible post-conflict housing proposals based on the needs and requirements of the displaced, as an attempt to formulate practical and functional paradigms rather than temporary and improper proposals. The synthesis of primary data with housing standards and policies in Iraq generally, and the city of Mosul specifically, resulted in the development of three housing proposals based on the involvement of the displaced families as well as housing regulations and standards in the city of Mosul.

6. Housing Proposals

The process of formulating possible post-conflict housing paradigms resulted in the development of three housing proposals. Based on Row House Typology, the proposals adopted the average plot size, recommended spaces area, and housing regulations as identified by the Ministry of Construction and Housing. Also, the proposals addressed the essential housing requirements, preferable distribution of spaces, circulation manner and degree of privacy as indicated by the displaced families.

Figure 19 presents the three housing proposals resulted by this study. All the proposals have addressed the findings of the previous sections, at the same time, the proposals differ in some aspects such as the circulation manner, façade combination and degree of privacy. Proposal A reflects a conservative spatial configuration with more private circulation manner. Façade combination implements traditional elements based on the concept of arched windows with large exposure to the outside. Proposal A tends to represent a prevalent Row House configuration in the city of Mosul.

Proposal B reflects a function-based spatial configuration with optimum utilization of spaces as well as flexible circulation manner between the spaces. The façade implements a combination of traditional and modern elements with moderate exposure to the outside. Proposal B tends to represent a functional housing paradigm with more flexibility in the inner and outer envelope of the housing unit.

Proposal C reflects a traditional spatial configuration that is seen in some traditional houses in the city of Mosul. The introvert configuration of spaces and the centralized circulation manner represent the main features of a traditional house in the city. Façade combination implements traditional elements with limited exposure to the outside. Proposal C tends to represent the features and characteristics of a traditional house unit in the city of Mosul, as presented in figure 19.

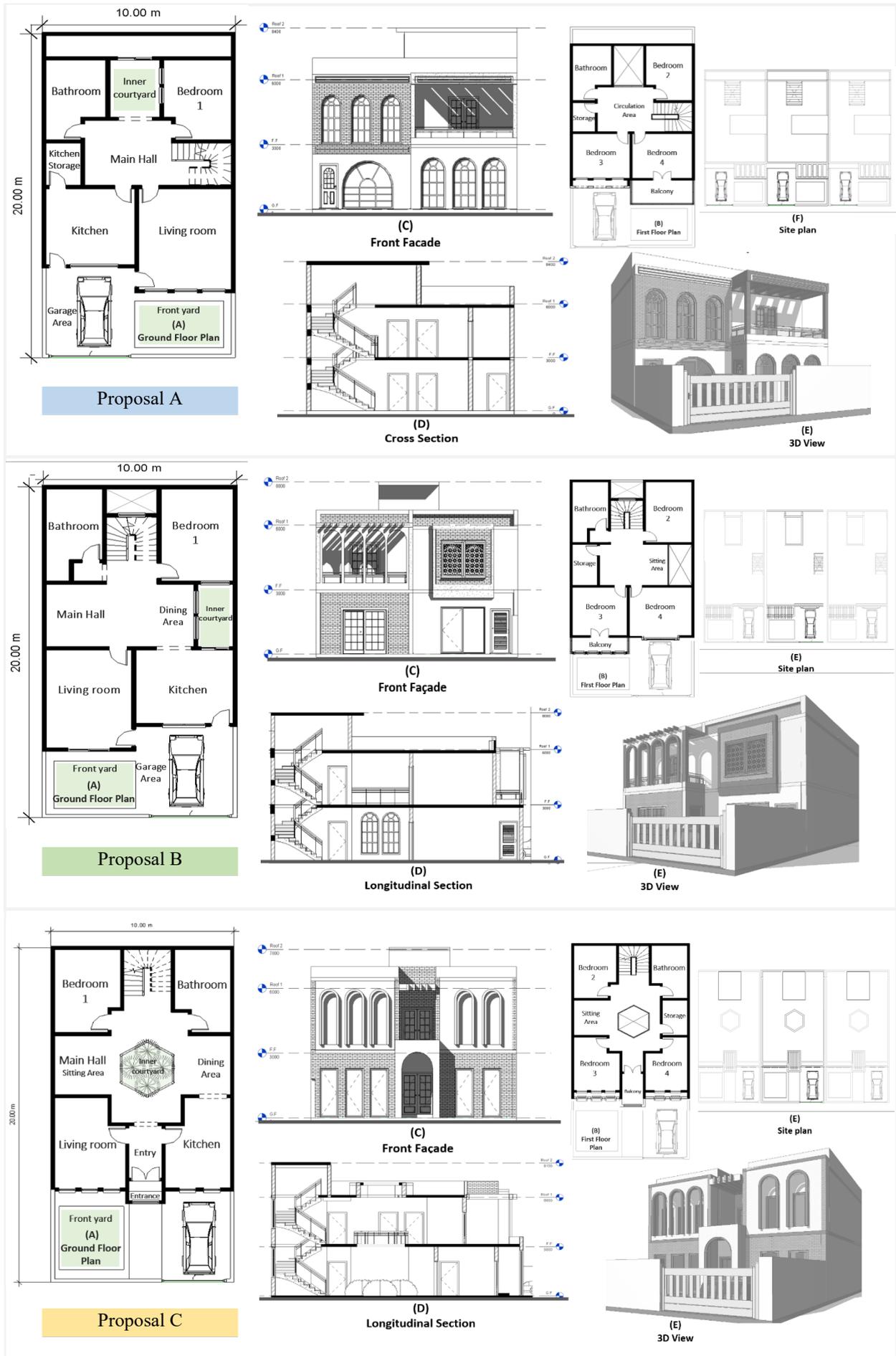


Figure 19. Housing Proposals: (a) Proposal A, (b) Proposal B, (c) Proposal C

Proposal A, B and C reflected the findings of this study and outlined the preliminary characteristics of possible post-conflict housing paradigms. These paradigms can be utilized as a reference point for planning post-conflict housing of Mosul City. The proposals highlighted the involvement of displaced families in outlining the features and characteristics of possible housing paradigms framed by housing regulations and standards of the city. The three proposals represented the most common housing typology in Mosul city, which is Row House typology. Also, Proposal A, B and C have adopted the average recommended housing standards as indicated by the Ministry of Construction and Housing. This include average plot size, average space requirements and average space areas. Although, the city of Mosul accommodates other housing topologies with less percentages such as courtyard houses and detached houses. Nevertheless, this study has focused on developing housing proposals that addresses the most common housing paradigm in the city of Mosul.

7. Conclusion and Further Research

After the massive destruction in the housing infrastructure of Mosul city. The war left the city with debris and an estimated 1M displaced. This study draws the attention on the essence of involving the displaced families in planning the post-war city of Mosul. The study aimed to address the preliminary housing requirements, needs and preferences of the displaced families, as end-users. This study has yielded the following points:

- Based on Row House typology, the displaced families have indicated the primary space requirements such as living spaces and desired bedroom number. Also, the families have outlined the preferred distribution of spaces on the floors of the housing units.
- In regards to the social and cultural dimensions, the displaced families have indicated preferred circulation manners in the housing unit, and also, the degree of connection with the outside in reflection to the cultural and social aspects in the city of Mosul.
- As end-users, the displaced families have identified preferred building materials that adapt with the climatic and environmental conditions of the city. Moreover, the families have addressed preferable façade elements that reflect the local identity of the city.
- The study presented three possible housing paradigms derived from the requirements and needs of the displaced as end-users and framed by the housing regulations and standards in the city of Mosul. These paradigms are an attempt to establish a start point for the planning of post-war housing reconstruction of Mosul city, based on the involvement of the displaced families.

This study has been taken further in a subsequent study focusing on formulating a competent housing prototype derived from the developed paradigms of this study. The later study demonstrates the process of crystalizing a housing prototype for the post-war reconstruction of Mosul city.

8. References

1. Almkhtar, A., *Conflict and urban displacement: the impact on Kurdish place-identity in Erbil, Iraq. Urban Disaster Resilience: New Dimensions from International Practice in the Built Environment*. 2016, London: Routledge.
2. Hussein, S.H., et al., *Urban regeneration through post-war reconstruction: Reclaiming the urban identity of the old city of Mosul*. 2019. **7**(1): p. 294-301.
3. Al Ani, M.Q.A.G.J.P.o.E. and N. Sciences, *Mechanisms of safeguarding urban heritage at risk-Mosul Heritage as case study*. 2020. **8**(4): p. 2459-2470.
4. Almkhtar, A., *Place-Identity in Historic Cities; The Case of Post-war Urban Reconstruction in Erbil, Iraq, in Urban Heritage Along the Silk Roads*. 2020, Springer. p. 121-136.
5. Samarrai, S. *Poverty rate reaches 41.2% in Iraq's liberated areas: WB*. 2018 [cited 2020 February 26]; Available from: <https://www.thebaghdadpost.com/en/Story/34082/Poverty-rate-reaches-41-2-in-Iraq-s-liberated-areas-WB>.

6. Gulmohamad, Z.K.J.G.s.s., *The Rise and Fall of the Islamic State of Iraq and Al-Sham (Levant) ISIS*. 2014. **5**(2).
7. Lafta, R., et al., *Living in Mosul during the time of ISIS and the military liberation: results from a 40-cluster household survey*. 2018. **12**(1): p. 31.
8. UNDP, *SCALING UP IN MOSUL*. 2017, UNDP.
9. Powell, V.J.A.M., *The destruction of Mosul*. 2017(147): p. 10.
10. WBG, *IRAQ RECONSTRUCTION and INVESTMENT*. 2018, World Bank Group
11. Hussein, F.I. and G.J.J.o.E. Al Slik, *Ornamentation and Modern Architecture in Iraq*. 2019. **25**(6): p. 117-124.
12. Yaqub, L.G., *The Impact of the Baghdad–Berlin Railway on the City of Mosul: Urban Form, Architecture, and Housing*. 2019, University of Cincinnati.
13. Hazim Al-Sofi, H.J.A.-R.E.J., *The Relation of Space Containment of Traditional Alleys with its Integration Degree (An Analytical Study of the District of Jame Al-Kabeer in the Old City of Mosul)*. 2008. **16**(5): p. 51-62.
14. Ali, T.H.J.A.R.E.J., *Microclimate Performance in Different Urban Fabric in Mosul City*. 2013. **21**(3): p. 111-118.
15. Al-Hafith, O., et al., *The impact of courtyard compact urban fabric on its shading: case study of Mosul city, Iraq*. 2017. **122**: p. 889-894.
16. Habitat, U., *The Initial Planning Framework For The Reconstruction of Mosul* 2019.
17. UN-Habitat, *CITY PROFILE OF MOSUL, IRAQ*. 2016.
18. Aldewachi, M.H.D. and M.A.M. Alkurukchi, *The Capability of Mosul's Traditional Dwellings to Satisfy Contemporary Housing Standards*. 2018.
19. Aldabagh, A., G.M. Younis, and M.J.A.-R.E.J. Jarjees, *The effect of Visual Characteristics of Domestic Spaces on Level of Choice for Daily Activity Routine—Evaluate Local Houses in Mosul City*. 2015. **23**(3): p. 74-94.
20. Housing, M.o.C.a., *Urban Housing Standards* 2010.
21. Housing, M.o.C.a., *IRAQ National Housing Policies* 2010.