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**OPTIMIZING SPACE EFFICIENCY IN SMALL
DWELLINGS: A STUDY OF INTERIOR DESIGN
STRATEGIES AND SOLUTIONS - CASE STUDY IN
BAGHDAD, IRAQ**

Karam Raad Abdulkareem NAWRES

Master's Thesis

Supervisor

Asst. Prof. Dr. Erinc ONBAY

İstanbul, 2024

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The thesis titled OPTIMIZING SPACE EFFICIENCY IN SMALL DWELLINGS: A STUDY OF INTERIOR DESIGN STRATEGIES AND SOLUTIONS - CASE STUDY IN BAGHDAD, IRAQ prepared by KARAM RAAD ABDULKAREEM NAWRES and submitted on 00/06/2024 has been **accepted unanimously** for the degree of Master of Science in Architecture.

Asst. Prof. Dr. Erinç ONBAY
Supervisor

Thesis Defense Committee Members:

Asst. Prof. Dr. Erinç ONBAY	Department of Interior Architecture and Environmental Design, Altınbaş University	_____
Asst. Prof. Dr. Birsen COŞKUN ÖZTÜRK	Department of Interior Architecture and Environmental Design, Altınbaş University	_____
Prof. Dr. Osman ARAYICI	Department of Interior Architecture, Mimar Sinan University	_____

I hereby declare that this thesis/dissertation meets all format and submission requirements of a Master's thesis.

I hereby declare that all information/data presented in this graduation project has been obtained in full accordance with academic rules and ethical conduct. I also declare all unoriginal materials and conclusions have been cited in the text and all references mentioned in the Reference List have been cited in the text, and vice versa as required by the abovementioned rules and conduct.

Karam Raad Abdulkareem NAWRES

Signature



DEDICATION

First and foremost, I dedicate this thesis to God Almighty, my devoted family, and my close friends. Dr. Erinc, my professor, you have been my mentor and advisor during my academic career. Many thanks for that. My mother You were and still are a source of happiness, strength, and support. God bless you and keep you safe for me. My dad, you are a source of security and direction. My brother Haron and sister Sarah, you two are my two hands. With your encouragement, I was able to overcome many difficulties. Bashar, my husband, you are my constant companion and source of support. My darling daughters (Dana and Mas), you are the source of my perseverance and drive for success. Many thanks for that.



ABSTRACT

OPTIMIZING SPACE EFFICIENCY IN SMALL DWELLINGS: A STUDY OF INTERIOR DESIGN STRATEGIES AND SOLUTIONS - CASE STUDY IN BAGHDAD, IRAQ

NAWRES, Karam Raad Abdulkareem

M.Sc., Architecture, Altınbaş University

Supervisor: Asst. Prof. Dr. Erinc ONBAY

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The goal of the research is to better the living circumstances of Baghdad, Iraq, residents who live in small apartments. It looks at how well contemporary interior design methods work in small homes and how well they work in Baghdad. The study also looks at culturally aware design ideas that combine contemporary space-saving methods with classic components. Understanding the challenges faced by small-scale home occupants, reviewing design methods, investigating cultural effects, and determining how design decisions affect living standards are among the research goals. Because it offers information on sustainability, cultural preservation, and space optimisation, the study is important for urban planning, design, and architecture. One qualitative case study and one survey are part of the research technique. Descriptive statistics are used in the data analysis; content validity and Cronbach's alpha guarantee the study's validity and dependability. The case study centres on a single Baghdad home and demonstrates how to make the most of available space with additions like multipurpose furniture, under-stair storage, and well-placed lighting. All things considered, the report offers doable suggestions to architects, designers, and legislators to increase occupant well-being and increase space efficiency in compact homes.

Keywords: Small Dwellings, Iraq Housing, Space Optimization, Tiny Houses, Interior Design, Baghdad, Space Efficiency.

ÖZET

KÜÇÜK KONUTLARDA ALAN VERİMLİLİĞİNİN OPTİMİZASYONU: İÇ MEKAN TASARIM STRATEJİLERİ VE ÇÖZÜMLERİ ÜZERİNE BİR ÇALIŞMA - IRAK, BAĞDAT'TA VAKA ÇALIŞMASI

NAWRES, Karam Raad Abdulkareem

Yüksek Lisans, Mimarlık, Altınbaş Üniversitesi

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Araştırmanın amacı, küçük dairelerde yaşayan Irak, Bağdat sakinlerinin yaşam koşullarını iyileştirmektir. Çağdaş iç tasarım yöntemlerinin küçük evlerde ne kadar iyi çalıştığına ve Bağdat'ta ne kadar iyi çalıştığına bakar. Çalışma ayrıca çağdaş alan tasarrufu yöntemlerini klasik bileşenlerle birleştiren kültürel olarak bilinçli tasarım fikirlerine de bakar. Küçük ölçekli ev sakinlerinin karşılaştığı zorlukları anlamak, tasarım yöntemlerini incelemek, kültürel etkileri araştırmak ve tasarım kararlarının yaşam standartlarını nasıl etkilediğini belirlemek araştırma hedefleri arasındadır. Sürdürülebilirlik, kültürel koruma ve alan optimizasyonu hakkında bilgi sunduğu için çalışma, şehir planlama, tasarım ve mimari için önemlidir. Bir nitel vaka çalışması ve bir anket araştırma tekniğinin bir parçasıdır. Veri analizinde tanımlayıcı istatistikler kullanılır; içerik geçerliliği ve Cronbach'ın alfa'sı çalışmanın geçerliliğini ve güvenilirliğini garanti eder. Vaka çalışması tek bir Bağdat evine odaklanır ve çok amaçlı mobilya, merdiven altı depolama alanı ve iyi yerleştirilmiş aydınlatma gibi eklemelerle mevcut alandan en iyi şekilde nasıl yararlanılacağını gösterir. Her şey düşünüldüğünde, rapor mimarlara, tasarımcılara ve yasa koyuculara kompakt evlerde sakinlerin refahını artırmak ve alan verimliliğini artırmak için uygulanabilir öneriler sunuyor.

Anahtar Kelimeler: Küçük Konutlar, Irak Konutları, Alan Optimizasyonu, Minik Evler, İç Tasarım, Bağdat, Alan Verimliliği.

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1. INTRODUCTION

1.1 BACKGROUND

Baghdad and many other Iraqi cities have adopted new patterns of converting various land uses, in particular open spaces and green areas, into residential neighbourhoods since 2003, the year democracy arrived [1]. As a result of these new patterns, smaller urban subdivisions have been created, offering smaller property sizes than those that were available before 2003 [2].

Modern design methodologies are based entirely on the specialized knowledge needed to handle the space planning of any residential building. The reflection of a way of life is inextricably linked to space planning, architecture, and the decorative arts [3]. The process of creation is included in interior design. People's lives are richer, more comfortable, safe, healthy, productive, and organized because to creative interior design [4]. For architects and designers, interior design is a necessary talent and an integral part of residential space.

The interior design of a home should blend exclusivity, comfort, beauty, and usefulness. Considerations should also be made for contemporary, premium materials for interior design, contemporary modular furniture that can be customized to meet the needs of any client, multipurpose built-in appliances, extensive lighting systems, and distinctive textile components [5].

Comprehending the unique obstacles encountered by inhabitants of compact homes is crucial for formulating efficacious remedies. These difficulties cover a broad range of topics, including accessibility, aesthetics, sustainability, and cultural and geographical preferences. Lack of sufficient living space in small homes frequently limits occupants' movement and general quality of life [6].

The interior design of small dwellings requires specialized design in order to fulfil the desired purpose within the given space. This should involve striking a balance between the spaces in the moving paths and the mass of the furniture and other objects. The visible space elements that do not fit into a single element that contains all the other concealed elements should also be minimized. In order to maximize the use of tiny spaces, minimalism design also emphasizes the need for the design to simplify the ultimate form of the space [7].

Moreover, accessibility issues are linked to the effective use of space in compact homes. Creating inclusive living environments requires designing areas that are usable by everyone, including those with disabilities. This inclusivity makes sure that everyone can live peacefully and independently in their homes, regardless of their physical capabilities [8].

Baghdad's living spaces are designed and used in large part due to cultural influences. Iraq has a rich cultural past, and the design and arrangement of homes are frequently determined by traditional beliefs. It is crucial to maintain cultural identity in contemporary living environments since it not only honors the community's history but also makes sure that inhabitants have a sense of belonging [9].

1.2 PROBLEM STATEMENT

Individuals who reside in small dwellings may only have a minimal amount of internal room for living or working. Small dwellings address the need that future construction should prioritize increased functionality over increased size. However, confined interior areas can give rise to unpleasant emotions like oppression and discomfort. Furthermore, poor lighting, poor air quality, and other issues are typically encountered in confined indoor spaces [10].

The arrangement and use of living areas are greatly influenced by cultural variables. Cultural preferences and contemporary design principles frequently collide in Baghdad, which makes it particularly difficult to create environments that are both functionally sound and attentive to cultural differences. It is imperative that interior design solutions maintain cultural identity while maximizing space efficiency in order to be widely accepted and functional [11].

It is essential to use resources as efficiently as possible when building and maintaining small homes. To make sure that space optimization doesn't result in environmental degradation, sustainable practices are essential. A complete approach to space optimization includes investigating eco-friendly materials, energy-efficient designs, and waste reduction measures [12].

Even with these important additions, more targeted study that is especially suited to the particular circumstances of Baghdad, Iraq, is still required. A thorough examination is necessary to understand how the design of compact residences intersects cultural influences, accessibility requirements, aesthetics, and sustainability issues. In general, the difficulties

brought on by a lack of space in urban settings, particularly in fast expanding cities like Baghdad, call for a sophisticated comprehension of the complex problems at hand.

1.3 RESEARCH OBJECTIVES

The primary goal of this study is to improve the well-being and living circumstances of Baghdad citizens who live in small dwellings. This can be reached through achieving some objectives which are:

- a. Determination of the particular difficulties experienced by Baghdad inhabitants who live in small dwellings while taking cultural preferences and space restrictions into account.
- b. Evaluation of the suitability of current interior design techniques used throughout the world to maximize space efficiency in small dwellings and the analysis of their application in the Baghdad.
- c. Exploration of the culturally sensitive design solutions that integrate traditional elements with modern space-saving techniques, ensuring a harmonious blend of functionality and cultural relevance.
- d. The assessment of how well these design choices enhance the standard of living for people living in small dwellings while taking comfort, accessibility, and aesthetics into account.
- e. Providing actionable insights and practical advice to architects, interior designers, and policymakers in Baghdad, with the goal of improving space efficiency in small dwellings.

1.4 RESEARCH QUESTION

- a. How do we make small spaces as efficient as possible?
- b. How can small spaces be made less harmful to the environment and residents?
- c. What is the psychological impact of living in small spaces, and how do we adapt to it?

1.5 RESEARCH SIGNIFICANCE

Urban regions across the globe are facing the difficulty of supporting expanding populations in constrained dwelling areas. Baghdad is a prime example of the problem that many heavily populated cities face. This study, which focuses on making small homes as space-efficient as possible, is extremely important for social well-being, urban planning, and design. The results of this study can be used by urban planners to inform housing and urban development policy. By putting these solutions into practice, we can alleviate housing issues, create more

sustainable urban areas, and enhance community well-being. Moreover, the results of the study will help to advance environmentally friendly design and architecture techniques. Architects and designers can promote eco-friendly practices in the built environment by reducing the demand for new structures by concentrating on optimizing existing areas.

Through the addition of empirical insights into the fields of urban planning, cultural studies, and interior design, this research enhances scholarly discourse. It offers a foundation for additional study, inspiring academics to investigate related problems in various settings and improve upon preexisting theories.

1.6 THESIS STRUCTURE

The thesis is containing of six chapters coordinated as the follows:

- a. Chapter One: The introduction and contextualization of the study problem—which aims to maximize space efficiency in small dwellings in Baghdad, Iraq—within the larger global urbanization concerns will be discussed. The importance of solving this issue will be underlined, particularly in light of cultural influences and sustainability. A precise study plan will be provided by outlining the particular goals and research questions in this chapter. As a means of laying the groundwork for the upcoming chapters, the research's purpose, parameters, and methods will also be covered. The final section of the chapter will provide an overview of the thesis's general organization, assisting the reader in understanding the upcoming material.
- b. Chapter Two: In the second chapter, the body of research on space optimization in urban settings will be thoroughly reviewed. This section will examine the problems with urbanization that quickly expanding cities face, highlighting the particular issues that are pertinent to Baghdad, Iraq. We'll talk about how culture affects interior design and living areas, how to maximize space in small dwellings globally, and how to combine traditional and modern design features. The literature evaluation will also cover subjects including sustainable urban housing practices, inclusion, and accessibility. In order for the current study to meaningfully contribute, gaps in the literature will be discovered.
- c. Chapter Three: This chapter provides an outline of the research methodology which used in this thesis.
- d. Chapter Four: This chapter shows the implementation details of the proposed methodology and the results obtained.

- e. Chapter Five: case study
- f. Chapter six: Conclusion, recommendation, and future work



2. LITERATURE REVIEW

This chapter highlights the previous literature concerning with the design of small dwellings. It overviews the terminology of "small dwelling". Moreover, it shows the potentials and challenges related to small dwellers. It also reviews some studies about the typology and spatial configuration of small dwellings. Finally, it provides some case studies from the literature about the spatial plans of existing small dwellings or micro-apartments in different regions around the world such like USA, EU, and Middle East.

2.1 SMALL DWELLING DEFINITION

Small dwellings refer to "living in substandard conditions in extremely small residential units." These kinds of apartments may not be completely functional and typically only offer the most basic amenities, such as a kitchen, bathroom, and bedroom. [13]. A "small dwelling" is a small living space that is usually less than 30 square meters. The majority of people believe that this is sufficient room for a bed, kitchen, bathroom, and living room—basic living necessities. With space at a premium and real estate costs high in cities, the concept of a compact dwelling is gaining traction. The concept behind these apartments is to use as little living space as possible for necessities. Reducing energy use, resource consumption, and building expenses is the aim. When it comes to how they work, small dwelling can be separate units or set up so that several units share shared areas like a kitchen and bathroom [14]. In addition, they are seen as a good solution to the lack of affordable housing in many big towns [15]. As long as they follow city building rules, these micro-units can be anywhere from less than 250 square feet to 500 square feet in size. There aren't separate bedrooms; the living and sleeping areas are mixed. However, the bathrooms and kitchens are fully stocked. Micro-unit communities put a lot of thought into amenities like common gathering areas that encourage people to get to know each other and build a feeling of community [16].

Small dwellings, or micro-apartments, originated with the German concept of Wohnung für das Existenzminimum (Apartment for Existential Minimum), which was developed in the 1920s. The idea behind this was to make types of affordable homes that use space efficiently while still meeting minimum quality standards [17, 18]. One of the primary subjects of discussion during the Second Congress of the International Congress of Modern

Architecture, held in Frankfurt in 1929, was the issue of minimum-sized residences. The congress talked about the smallest homes that could be built and how to make design ideas that are based on logic and cost-effectiveness official. The rise of micro-apartments in the West was accelerated at the start of the twenty-first century by social initiatives such as the "Tiny House Movement" in the US and the inclusion of small houses in international building standards [19]. While Western approaches are often focused on the market and don't allow for much flexibility, in the East, especially Japan, micro-apartments and small dwellings focus on making the space feel as big as possible by bringing natural light and the outside world inside, and they also allow for flexibility in space and furniture [20].

2.2 THE NEED FOR SMALL DWELLINGS, POTENTIALS, AND CHALLENGES

Small dwellings could help solve a lot of social and environmental issues. For many reasons, small dwellings are better for the environment than big houses [21]. They are also more affordable and come with lower household costs, which makes them an answer to the overcrowded housing problem. Crawford and Stephan did a study in Australia that showed a small dwelling could cut life cycle greenhouse gas emissions by 70% per person compared to a normal Australian home [22]. Small dwellings tend to use and build up with fewer resources and energies. This is because they use natural, used, or recycled materials more often [23]. Also, small dwellings can make living a simpler life easier and more appealing. But Hooper et al. [24] said that for the small dwellings to be as environmentally friendly as they can be, they need to be carefully planned and built using eco-friendly materials and building methods that use less energy. Even though Cohen [25] agrees that small dwellings generally use less energy, water, materials, and other resources than regular homes.

Studies that have already been done on small dwellings have looked at a lot of different topics, such as why people want to live in them, what stops them, and how they affect society and the environment. "Going tiny" can be done for many reasons, but for many, the main ones are a strong desire for freedom and mobility, fewer belongings, and a simpler, more environmentally friendly life [26]. Cost savings and a sense of community were also often found to be very important drivers [27]. Some other things that seem to motivate people are a mild interest in design [28], a desire for new experiences or to be curious [27], and the drive that comes from wanting to break through institutional barriers or actually doing so. Other reasons included a dislike of renting or flats, retirement, health issues, owning a home,

and even the necessity for additional space for your family by Shearer [29] and Shearer and Burton [26]. However, these reasons were not among the highest ranked. The only studies that could rank the reasons why people live in tiny homes were the ones by Shearer and Burton [26] and Boeckermann et al. [28]. Both studies found that lowering costs is the main reason people live in tiny homes. A simpler life or caring for the environment came in second, and more freedom came in third [26].

Affordability, location, and lifestyle are the three main things that affect how well micro flats are received and how quickly they grow. People who live in micro-flats believe that by building smaller homes, more apartments can be added to a building, which lowers the price of each apartment [15]. The primary draws of the micro unit are its affordability, as well as its seclusion and proximity. Since the micro units often rent for 20 to 30 percent less, many people who want to live in them are seeking for ways to save money on rent. Additionally, the opportunity to live alone and the "hip" fashion neighborhoods where micro units are typically found pull them in. [16].

There isn't as much research on the problems and challenges of living in a small dwelling as there is on the reasons people do it. Shearer [29] also said that people didn't have enough information, room, or privacy. The COVID-19 pandemic may also have an effect on people's interest in small dwellings, which needs to be carefully looked into. Because of the pandemic, we now do a lot more in our homes, which means that building that is strong and adaptable is important for our health and well-being [30]. An earlier study by Amerio et al. [31] found that people who lived in small dwellings or small apartments less than 60 m² during the COVID-19 lockdown were more likely to show signs of depression. D'Alessandro et al. [30] came up with some new ideas for building resilience that are good for tiny houses, like having a terrace. Others, like having more than one bathroom, are not usually met by them. Another issue that COVID-19 emphasizes is working from home, which can have both good and bad effects on health, even in regular housing [32].

2.3 TYPOLOGY, INTERIOR DESIGNS, AND SPATIAL CONFIGURATIONS OF SMALL DWELLINGS

A lot of research has been done on micro-apartments to find better and more environmentally friendly ways for people to live in smaller areas. Researchers Jessica Adorno and others [19] have examined small homes as places to live for young workers and have considered tiny

houses, micro-units, co-housing communities, micro-communities, and more. In a research titled "Definition of small dwellings," the British Property Federation states that sharing, co-living, and compact living are examples of this type of small living space. This categorization is based on the disparities in exterior housing unit sizes as well as the inclusion or absence of specific facilities and extras within the apartment. It still lacks clarity, though, as it provides no information regarding the buildings or the locations that were examined. In general, different types of micro-apartments can be categorized by a number of factors that depend on the topic at hand. Some characteristics that can be used to group small dwellings together are:

- a. Surface area: Tiny homes are typically 15 to 30 square meters in size. This factor allows for the grouping of tiny dwellings into floor designs measuring 15, 20, 25, or 30 square meters.
- b. Functionality: Because small homes can accommodate a variety of user needs, they can be categorized as flexible, segregated, or single-space units.
- c. Structure: Different room configurations, such as bachelor apartments, studios, or one-bedroom apartments, are possible in small homes.

It is evident that several terminology (structural, functional, etc.) are frequently used to characterize small homes, and that there is a lack of clarity and consistency because some phrases have comparable meanings. It is clear that small dwellings often only have basic services like a kitchen and bathroom because they are so small. They could not even have a bathroom or kitchen in certain situations. This is precisely one of the causes for the lack of a precise classification system for small homes as of yet.

Simon Richmond's research focuses on ways to make a small living space look bigger and more comfortable [20]:

- a. Internal sight lines and views: Making the inside of a room look bigger by extending the views is possible by using partial-height walls (like screens), connecting internal openings (like windows and doors) in a way that follows the rules of enfilades, and using "open" staircases.
- b. Increasing the height of spaces and rooms: It seems like space is endless up there because as the height of the room goes up, the upper edge of the interior moves out of the normal horizontal range of perception.

- c. External sight lines and views: A view that goes outside, the line between the inside and outside worlds becomes less solid, and it seems like the inside goes all the way to the edge of what can be seen in the nearby area.
- d. Vertically stacked rooms and spaces: When rooms are connected vertically, the ceiling between them already divides the functions of the space, reducing the need for visual dividers.
- e. Vertical circulation: Vertical connections, like steps or escalators, do two things: they let light flow from one room to another and give the impression that the room is higher up.
- f. Split-level: Creating an uneven living space adds to its reflection; opening up the view from one level to the next makes more room seem available; and adding new levels not only makes better use of an existing space, but also "shares" light between rooms, gives the eyes a rest, and increases the levels.
- g. Rooms as circulation space: When space is organized in a way that lets furniture move freely and connects rooms next to each other, hallways may not be necessary.
- h. Voids: Adding empty spaces inside (atriums, skylights, and double-height rooms) decreases the useful space but makes the space look bigger because it has empty spaces.
- i. Natural lighting: It is very important that the micro-apartment let in natural light. The atmosphere is better, and the objects look farther away or wider because they are "whitened."
- j. Multi-use furniture and spaces: Spaces and items that are flexible can be used in a variety of ways to meet people's changing needs. Not only do they make small rooms look bigger, but if needed, they can also cut down on the number of things around the room. Furniture that can be changed can help with flexibility. Partitions that slide and fold can also be used.
- k. Custom furniture and built-ins: Adding furniture and other things to the inside gives the impression that the room is longer and wider.

While looking at different micro-housing cases for her study, Jessica Adorno [19] comes up with a few more ideas that support Richmond's:

- a. Open plan: The impression of more room is created by combining several functional units into one complete space without any internal walls.

- b. Transitional outdoor spaces: By using terraces, balconies, verandas, and porches, homeowners can extend their homes' functions to the outside, giving people the chance to socialize outside.
- c. Large windows: A lot of natural light can come into a building through clerestory windows or big windows on the outside, especially in corners and zenithal angles.

Nevertheless, there are other factors that can help make a small dwelling more comfortable such like [14]:

- a. Bar-counter instead of a dining room: It is possible to avoid eating at the dining table and make some extra room by putting a bar counter along the edge of the kitchen.
- b. Shifting the view towards the border of the space: Being near the floor, a wall, or the ceiling when looking at the space from one of the edges makes it seem bigger by showing the whole size of the area.
- c. Storage space: It's easier to store things and "declutter" a living space when you use areas that are rarely or never used because they are harder to get to.
- d. Reflective surfaces: Utilizing shiny surfaces, mainly mirrors, makes the inside look bigger.
- e. Circular connection: By carefully arranging rooms in a circle, you can create the illusion of a moving space that, because it's not see-through, looks bigger than it is.
- f. Perceptive potential of color: Some colors, like light and cold ones, make a room look bigger, while dark and warm ones "close" the space and make it feel smaller.
- g. Dematerialization of surfaces: By adding clear walls inside, rooms can be physically separated to block out noise and smells that you don't want, but they can still look like they're linked.

2.3.1 Typology of Small Dwellings (Micro Apartments) According to the Structure of the Rooms

Some researchers [14] proposed a type of micro apartments based on a hypothesis from the study "Micro Apartments - Achieving Spatial Comfort in Substandard Living Conditions." The study's authors found that for minimal spatial comfort in a micro apartment, it is "necessary to have a resting space (bed) with the possibility of using shared space for food preparation and personal hygiene" [13]. This concept served as the foundation for the first tiny apartment prototype, known as Type 1. The other categories (kitchen, bathroom, etc.)

were developed by progressively adding space to satisfy the users' basic physiological needs (see Figure 2.1).



Figure 2.1: Typology of Micro Apartments According to the Structure of the Rooms. 1) Type 1 - [LR] + K + B, 2) Type 2 - [LR + B] + K, 3) Type 3 - [LR + K] + B, 4) Type 4 - [LR + B + K], 5) Type 5 - [LR + B + K + BR] [14].

- a. Type 1 - [LR] + K + B: This type of micro apartments has a single room that can be used for many things. It's where basic living tasks like sleeping and doing daily tasks are set up. Sharing facilities, like a kitchen and bathroom, are available outside of the basic housing unit. These are used for things like making meals, keeping clean, and going to the bathroom. Co-living and student housing are the main types of places that use this kind of space organization because people choose to share certain services. The idea of co-living encourages residents to get to know each other and lowers the cost-of-living areas while still giving residents privacy in the basic housing unit. This kind of small flat is usually part of a bigger housing complex or building where people live together. Within this type of living arrangement, the living space can be shaped like a "capsule" and is generally placed next to the shared area that has the kitchen, bathroom, and relaxation areas for everyone. Co-living apartments are based on the idea that people should share rooms and resources, so a room for one person is usually seen as part of a larger living

setup. In a co-living apartment, on the other hand, each tenant's room is mostly their own private and useful place, so it can be thought of as a very small micro apartment (see Figure 2-2).

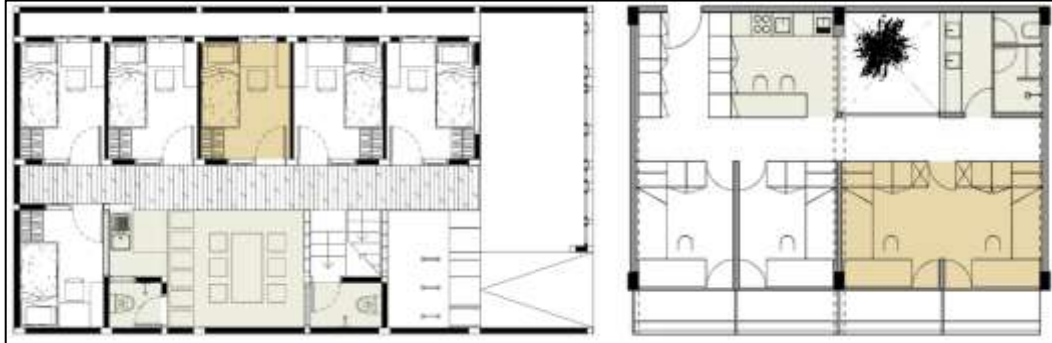


Figure 2.2: Type 1 - Micro Apartment with a Living Room (and Shared Kitchen and Bathroom Outside the Housing Unit) [14].

People from certain social groups may be more interested in this type of space organization, where kitchens and baths are shared. This way of life may appeal to young people looking for cheap housing in cities as well as people who like to socialize and feel like they are part of a community. Individuals who have flexible schedules and move a lot may also find living in a micro apartment with shared facilities to be convenient and easy. Some people may feel uncomfortable or think this idea isn't right for them, like those who need more privacy, strict hygiene rules, or specific needs when it comes to food storage room.

- b. Type 2 - [LR + K] + B: These kinds of micro apartments are open-plan, which means that the kitchen and sitting room are in the same room. Since the kitchen and living room are in the same room, furniture that can be used for more than one thing is usually used. One example of this is a table that can be used for both work and eating. In this type of micro apartment, the bathroom is not inside the main living area. This means that the renter has to use a public bathroom somewhere in the building, usually on the same floor as their neighbors. Basic cleaning items like a shower cabin, toilet and washbasin are usually in these 'external' bathrooms, but they can be used by anyone. This kind of micro flat can be a good way to live in cities, especially for single people. As the bathroom is shared, it is important to be able to be flexible with when and how you schedule showering, personal cleanliness and using the facilities. To make shared areas easier to use, there must be enough places to store personal hygiene items (see Figure 2.3).



Figure 2.3: Type 2 - Micro Apartment with a Combined Living Room and Kitchen (and a Shared Bathroom Outside the Housing Unit) [14].

This kind of tiny apartment doesn't happen very often, and there are a few reasons for that:

- a. Residents may not find it useful or helpful to have a bathroom outside their apartment. They would have to leave the apartment to use the bathroom, which can be awkward, especially at night or when it's raining.
- b. Having a bathroom outside the apartment can also make it harder to stay clean. Residents would have to use a shared bathroom on a regular basis, which would mean that it would need to be cleaned and maintained for multiple people.
- c. Using a shared bathroom can make it harder for residents to be private and close, especially when they need to use the toilet or shower.

Sharing a bathroom with other people might not be okay for all social groups, but it might not be as much of a problem for groups like students, young professionals just starting out their careers and getting used to new living situations and a tight budget, people with lower incomes who can find cheaper housing this way, and people who like to interact with others.

- c. Type 3 - [LR + B] + K: This kind of micro apartment has a kitchen that is outside the room and is shared with other people who live in the same building or complex. Because the kitchen is shared instead of having a separate kitchen for each room, this idea makes good use of space and resources. It can accommodate a variety of types of residents, including singles, young workers, students, travellers, and people who like the ease of living with other people. This type of micro apartment usually has lower running costs than bigger apartments or units with their own kitchen and bathroom. This makes them more affordable, especially for people on a tight budget or who want to lower their housing costs. A shared kitchen makes it easier for residents to get to know each other

and can be used for getting together for food, talking, and sharing ideas. On the other hand, having a kitchen can make it less private and intimate because people may have to deal with noise, smells, or random meetings with other people who use the kitchen. One clear problem with this type of micro apartment is that the residents don't have full control over the kitchen space. This means they can't make it fit their needs and could lead to problems with sharing kitchen appliances and utensils, kitchen use schedules, and keeping the space clean. If you're shy, sharing a kitchen with other people might make you feel awkward. They might want their own kitchen where they are in charge and can be alone. For outgoing people, this kind of tiny apartment can be a chance to meet new people and make friends (see Figure 2.4). They can have fun talking and getting to know other people who use the kitchen.



Figure 2.4: Type 3 - Micro Apartment with a Combined Living Room and Bathroom (and a Shared Kitchen Outside the Housing Unit) [14].

- a. Type 4 - [LR + B + K]: An open floor plan makes a small place feel bigger and makes the most of the space that is available. This is often used in micro apartments that have a living area, kitchen and bathroom all in one room. To make the most of the room, furniture and other parts of the home are often made to be multifunctional, foldable, or built-in. The area can change throughout the day to meet the needs and patterns of use by using tables, chairs, beds, and other furniture that can be moved around easily. In this type of micro flat, the kitchen is small and has only the most basic appliances, like a sink, cooker, fridge and storage space. This is so that you can make simple meals in a small space. In this kind of micro apartment, the bathroom can be physically separated from the rest of the space or only partially divided, like with a curtain or wall. The bathroom usually has basic toilets, sinks and shower cabins. In some cases, the bathroom is split into a separate

shower area and a toilet with a washbasin. This makes better use of space because two people can use different facilities at the same time. Compared to the other types of micro flats, this one gives its residents the basic things they need to live comfortably (see Figure 2.5). But, like other types, it has some problems that become clear when you use it. Residents may not feel as private when there aren't any different rooms. Micro flats are usually only big enough for one person or a couple. They aren't good for big families or lots of people living together. Some people may feel squished or trapped in a small space, especially if they are used to living in bigger rooms. Keeping personal items safe can be hard, so people come up with creative ways to do it, like hiding things in furniture, under the bed, closets, on shelves above doors, in drawers under stairs, and so on.



Figure 2.5: Type 4 - Micro Apartment with a Combined Living Room, Bathroom and Kitchen [14].

- a. Type 5 - [LR + B + K + BR]: This type is different because it has a separate bedroom. People who want to sleep away from other things they're doing in the flat may find the bedroom useful because it gives them privacy and a different space to sleep. In contrast to other rooms, the bedroom can be on a loft or in a niche in the wall, if the room's height and shape allow it. A regular bed, cupboards for storing clothes, and other bedroom-like things can be in this room. But the bedroom can also be built on a platform (mezzanine) above the area that is used for daily tasks, like an office or a place to sit. Space for storage or even extra functions, like a kitchen or bathroom, can be set up below the platform. A 'Murphy bed' can be unrolled from a closet or a part of the wall to make a sleeping area. A bed can be pulled out from a platform on the floor.¹⁵² Most of the time, these beds are

folded up during the day to make room for other things. At night, they are quickly unfolded for sleeping. The bedroom can also be built into a niche in the wall, which gives you more privacy and space. There is a curtain, a moveable wall, or just a screen between the bed area and the rest of the room (see Figure 6.2). Micro apartments with a separate bedroom can be good for single people, couples, or even small families who want their own sleeping area but still want to save space and live in a smaller house.



Figure 2.6: Type 5 - Micro Apartment with a Combined Living Room, Bathroom, Kitchen, and Bedroom [14].

2.3.2 Key Aspects in Spatial Configuration of Small Dwellings (Micro Apartments)

Any place that can be lived in has a layout that affects how it can be used and what it can do. This is also true for micro apartments, where each part is important for making the whole area work and serve different purposes. There are many factors that affect how micro flats are set up, and Vijayalaxmi [33] has talked about a few of them as follow.

- a. **Area:** Micro-units can be anywhere from 400 to 200 square feet and come with a kitchen, a bathroom and a specific storage area. The size may change depending on the rules in a certain area or region.
- b. **Furniture:** Furniture is an important part of how a micro room is set up and how it works. Micro flats usually have furniture units that take up little space, can be used for more than one thing, are strong, and don't need much upkeep. Even though the furniture in each micro apartment is custom designed and made, these are some of the most popular types of furniture systems:

Dynamic furniture like Murphy beds (as shown in Figure 2.7a) could make the space inside a room feel bigger. Other perfect example of a dynamic furniture is the Goliath table (see Figure 2.7b) transforming into a magnanimous dining table with available specifications. Moreover, when it comes to furniture, a minimalist style makes areas look bigger in smaller

rooms. An alternating-tread staircase includes storage cabinets (see Figure 2.7c). A loft room can be made with this type of storage in apartments with high ceilings. In addition, with the Micro Kitchen, one can put all of the kitchen appliances under the counter and still have room for six square feet of space. To cook, cool, and clean, three 24" units are in charge. Micro kitchens (see Figure 2.7d) have all the power of full-sized equipment in a small package. They are designed to fit into small spaces without any problems. There is a microwave oven, a regular oven, a dishwasher, an induction hob and a refrigerator that can act as both a fridge and a freezer. All of the tools are stored in drawers. By using micro-kitchens, the full cooking experience is completed by a downdraft hood and a kitchen sink with a garbage disposal.



Figure 2.7: Dynamic Furniture Used in Small Dwellings or Micro Apartments: a) Murphy Bed; b) Expanding Table; c) Staircase; and d) Micro Kitchen [33].

- a. Plants: The placement of plants in a tiny apartment is important for many reasons, including cleaning the air and making the space feel more alive and welcoming. Another problem is that it's hard to grow plants in a micro room because there isn't enough sunlight. Low-maintenance plants and ways to grow plants that take up little room are: Snake plants can grow tall even in places where light doesn't reach very well (see Figure 8.2a). They are one of the easiest pets to take care of and can have the biggest impact on the air quality in an apartment. Other plants that do well in low light have the same effect

on the flat: It is best to keep philodendron, spider plants, and peace lilies away from pollution without giving them a lot of light. Too small of pots can grow these plants. A large tea cup-sized pot is too big. Also, climbing vines could be used with a plant table (see Figure 8.2b).



Figure 2.8: Plants Used in Spatial Arrangements of Micro Apartment: a) The Snake Plant and b) Plant Table with Climbing Vines [33].

- a. **Openings:** In normal homes, doors and windows that swing open and shut need a certain amount of room to swing fully open and shut. In micro flats, where every square inch count, these kinds of spaces need to be thought about. You'll need smarter doors and windows that give you more elbow room in a micro flat so that you have enough room. Being well lit is very important in micro apartments, which are built in towns in very close quarters. Because of this, windows need to be smart so they let in enough light and air flow without compromising the residents' safety or privacy.

In regular homes, sliding doors are used for things other than the front door, but in micro apartments, they're a great way to save room. With slide doors, you can save the space that normal doors need to swing open and shut. Also, the traditional Japanese door, which is also called a shoji door (see Figure 2.9), slides along the wall and is made up of wooden frames with paper windows inside them instead of glass or wood. This saves a lot of room and doesn't cost much, which is another important thing to think about when it comes to micro apartments. Usually, these doors are used to block out noise or make different rooms in a tiny apartment feel separate. Moreover, many of the micro flats that are already built have a single full-height window in the living/sleeping area that lets in natural light and leads to a balcony. It's now easy to clean and get to.



Figure 2.9: Shoji Doors Used in Interiors [33].

2.4 HISTORY OF SMALL DWELLINGS

The notion of compact dwellings is not novel. In the past, numerous small residences were scattered across the terrain of various Western nations, including the United States. Before the implementation of zoning regulations and contemporary banking practices, it was customary for individuals to construct buildings only within their financial capabilities. Historically, compact dwellings not only provided a cost-effective housing option, but their architectural plans also considered the use of locally sourced construction materials, the climate, and the natural environment. Notable instances of vernacular small home designs encompass the frontier log cabin, bungalow, cottage, shotgun house, and camp (Krista, Evans. 2018).



Figure 2.10: The Frontier Log Cabin.



Figure 2.11: Bungalow.

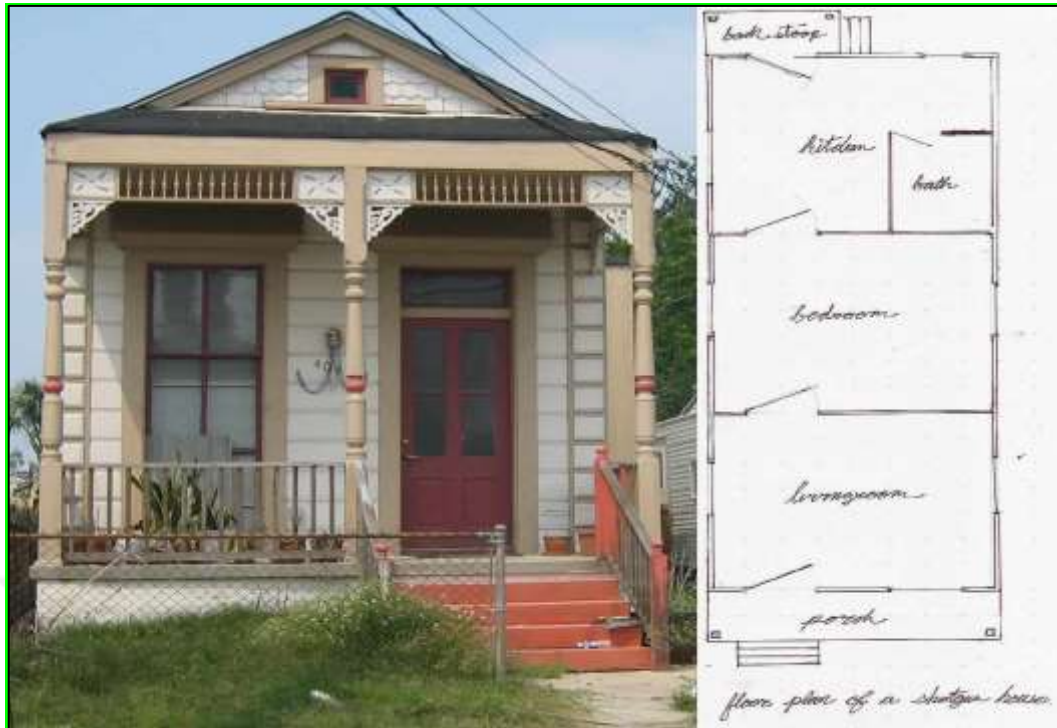


Figure 2.12: Shotgun House Plan.

Before the widespread implementation of zoning regulations, it was customary for a sizable primary residence to have smaller housing units constructed on the same premises. These diminutive structures historically fulfilled diverse functions, such as providing lodging for visitors, servants, or enslaved individuals, accommodating elderly parents, assisting newly married couples who were not yet financially capable of owning their own residence, or enabling the primary homeowner to generate rental income from tenants. The implementation of this traditional method, which permits a range of housing sizes within a community, led to the creation of neighbourhoods that were more socially and economically diverse compared to the currently zoned communities. Given the prevailing economic conditions in the USA, it is arguable that it is prudent for communities to revise existing zoning regulations to permit the lawful inclusion of these small homes, now referred to as accessory dwelling units (ADUs), once more. Throughout various periods in American history, including the present, there has been a scarcity in the accessibility of reasonably priced housing. This issue was particularly noticeable soon after World War I, leading to the establishment of the Architect's Small House Bureau in 1919. Its purpose was to aid returning veterans in acquiring their own homes. This organisation offered architectural blueprints for compact residences designed for narrow plots measuring 30 to 50 feet in width, at a minimal cost, to prospective home constructors. With the widespread adoption of the

industrial assembly line as a popular method of production, affordable housing packages became prevalent. As an illustration, Sears and Roebuck provided more than 400 compact residential mail order home-kits that encompassed all the essential construction materials and could be conveniently transported by train. With the increasing popularity of automobiles and assembly line production, a new form of inexpensive housing called the mobile home emerged. Modelled after compact railway carriages, mobile homes were manufactured in large quantities and gained popularity among lower socioeconomic groups. In 1976, federal regulations were implemented to establish manufacturing standards for these types of homes. Consequently, the term "mobile home" was substituted with "manufactured housing". Ultimately, the phrase "modular home" was embraced to denote dwellings that were manufactured in bulk using modular components in factories, offered at an affordable price, and could be conveniently transported for on-site assembly (Krista, Evans. 2018).

Currently, the terms "mobile home" and "manufactured home" are frequently employed interchangeably to refer to this particular category of housing. Despite providing a cost-effective housing option for lower socioeconomic groups, mobile homes were immediately met with opposition from community members who not only deemed them visually unappealing, but also believed that they brought along the issues commonly associated with poverty, such as crime and declining property values. Mobile homes, in contrast to traditional stick-built homes, typically lose value over time due to their manufactured components, making them a depreciating asset. This is not conducive to safeguarding property values. Thousands of American communities implemented zoning laws to prohibit mobile homes or small homes below a certain square footage. These laws were intended to exclude mobile homes and the lower socioeconomic classes typically associated with them from residential neighbourhoods. In addition, municipalities established zoning regulations specifically for mobile home parks in order to confine low-income individuals to restricted and frequently undesirable areas within urban regions. The opposition towards mobile homes and the people who live in them has contributed to the implementation of land use regulations that pose challenges for the integration of tiny and small houses in urban areas. The historical notion of the "American dream" significantly influences the development of small house living. In the early stages of the United States, possessing land was equivalent to being a citizen. Over time, individuals without land gained complete rights. Nevertheless,

the societal expectation linking homeownership with safety and steadfastness has persisted (Krista, Evans. 2018).

Historically, popular housing types in America have included standardised company housing, intricate Victorian homes, and suburban homes with expansive lawns. However, due to the current economic and cultural conditions, owning a large home on a spacious lot is no longer practical for many people. Wages have remained at a constant level without growth, the size of families has decreased, and the number of individuals living alone has increased. Nevertheless, the desire to own a detached dwelling on a separate piece of land, rather than being a tenant, continues to be a significant cultural motivation known as the "American dream." Due to this prevailing social convention, it is probable that the ownership of tiny and small houses is seen as a more appealing and cost-effective housing option compared to living in apartments. The tiny house dwelling has gained popularity as a counterculture movement, while also providing a feasible option for homeownership for many individuals. Many argue that our current economic system is leading to suboptimal socioeconomic outcomes. There is an increasing acknowledgment that individuals have limited genuine leisure time to fully appreciate the most important aspects of life, such as personal connections and fulfilling occupations. Contemporary work settings frequently undermine crucial elements of a fulfilling life, such as quality time spent with family and loved ones, opportunities for creative expression, engagement in advocacy efforts, and the pursuit of self-fulfillment. This realisation has prompted certain individuals to gradually embrace lifestyles that incorporate elements of an alternative economy. The appeal of tiny and small living is growing as it allows individuals to live comfortably on a lower income and prioritise non-monetary values. The tiny house movement can be loosely associated with the alternative communities that emerged in the 1960s and 70s due to its focus on alternative lifestyles. While the current tiny house movement may not have the same sense of community as previous alternative communities, it still aims to create simplified and meaningful lifestyles that prioritise people, relationships, and value systems (Krista, Evans. 2018).

Moreover, the origins of certain contemporary tiny house designs were formulated within these alternative communities. Residents of counterculture communities occasionally constructed distinctive compact edifices, including geodesic domes, hay bale residences, and repurposed buses transformed into living spaces. Today's Tiny Houses on Wheels (THOWs)

and architecturally innovative small homes incorporate several of these design elements. Moreover, the current surge in eco-villages, which integrate numerous principles from early intentional communities but emphasise environmentally sustainable living, indicates that the alternative communities of the 1960s and '70s had a lasting impact rather than being a temporary trend. Individuals are actively seeking alternative living arrangements that enable them to lead purposeful and comprehensive lives within a system that is widely seen as oppressive. Many individuals perceive living in tiny houses as a possible means to attain a counterculture way of life (Krista, Evans. 2018).

Table 2.1: The Evolution of Tiny and Small House Living.

Tiny/Small House Term	Concept	Modern Adaptation
Vernacular Small Home	Historically, small homes that took local building materials and traditions into account are common. Examples include the frontier log cabin, bungalow, cottage and camp.	Renewed interest in sustainable and locally sourced building materials.
Accessory Dwelling Unit (ADU)	An ADU is a smaller housing unit on the same property as a main or primary dwelling. ADUs traditionally served such purposes as housing for servants, elderly parents, and newlyweds. Sometimes termed alley or granny flats, ADUs are experiencing a resurgence in popularity.	ADUs are seen as a potential solution to create more affordable housing options near urban centers.
Prefabricated Small Home Kits	In order to address a post WWI affordable housing shortage, companies such as Sears and Roebuck sold popular small home mail order home-kits, which included all necessary building materials and could be easily delivered via train.	Prefabricated tiny homes are gaining popularity due to faster construction times and potentially lower costs.
Mobile Home	Shortly after the advent of the automobile, the mobile home emerged. Mass produced and easy to deliver, the mobile home offered an affordable housing solution to poorer classes. The term "manufactured housing" replaced the "mobile home" when federal regulations enacted manufacturing standards for such homes in 1976. However, the terms are still used interchangeably to describe this type of smaller home, which frequently faces community opposition.	Manufactured homes continue to be an affordable housing option, but face challenges with stigma and regulations.

Table 2.1: The Evolution of Tiny and Small House Living “Table Continued”.

Counterculture Living	In the 1960s and 70s counterculture living arrangements grew in popularity that promoted values such as communal living and environmental stewardship. Precursors of today's tiny house designs arose during this era: such as buses converted into dwellings, small geodesic domes, and hay bale homes.	DIY (Do It Yourself) tiny house construction and alternative building materials are hallmarks of the modern tiny house movement, inspired by counterculture values.
Tiny House	The tiny house movement arose during the early 2000s to address a variety of concerns: such as quality of life factors, environmental concerns, and rising debt. Though there is no formal definition, many advocates contend that a tiny house is 400 square feet or smaller.	Tiny houses can be stationary or mobile, but face legal and practical challenges due to zoning restrictions and lack of dedicated tiny house communities.
Tiny House on Wheels (THOW)	Tiny houses on wheels (THOWS) offer both downsized and mobile living and have come to be associated with the tiny house movement itself. However, THOW dwellers are often at a loss for where to put such structures due to current zoning and land use laws.	Tiny House communities and innovative legal solutions are emerging to address the challenges faced by THOW dwellers.

2.5 THE EVOLUTION OF CITIES AND THE EMERGENCE OF SMALL HOUSES, ALONG WITH THE PUBLIC'S RESPONSE TO THIS TREND

The concept of living spaces has been a significant factor in determining the challenges and well-being of human beings. It has transcended its natural limitations. Previously, we resided in a diminutive dwelling constructed from basic materials, but now we possess mobile residences. Recently, we disrupted the natural order and combined it with artificial structures. Throughout history, we have created living spaces that range from natural rock caves to man-made structures carved out of rocks. These spaces have been designed to seamlessly integrate with the surrounding environment, but they have undergone significant changes in the past few centuries (Arch2O, 2022).

During the early stages of Chinese civilizations in 3500 BCE, the inhabitants of Banpo had established a self-sustaining settlement. The homes were cylindrical dwellings made of mud and wood, featuring thatched roofs. They covered an area of 40 square metres, with a central space dedicated to a fire pit. During the same period, in Catal Hüyük, Turkey, we

implemented an organic method for determining the layout of living areas. The city comprised a conglomeration of rectangular, flat-roofed dwellings tightly clustered together, forming a unified architectural entity devoid of streets or passages. The residents traversed rooftops and accessed their dwellings by descending through the roofs using ladders. The average dwelling had a spacious floor area of 30 square metres, featuring built-in furniture such as benches, ovens, and storage containers. The conspicuously small living spaces have been present throughout history in all regions of the world, up until recently (Arch2O, 2022).



Figure 2.13: The Banpo Settlement in China, Dating Back to 3500 BCE, Featured Houses Constructed from Mud and Wood, Topped with Thatched Roofs.

Today, the collective approach has remained largely unchanged, but life has become significantly more diverse and complex from a broader perspective. We are currently engaged in a shared obligation for sustenance, which bears some resemblance, albeit without explicit awareness. As our knowledge and approach have grown, it is likely that our physical boundaries have also expanded, causing us to become more distant from those around us. The spatial expansion can be attributed to the existing socio-economic structure, which has led to the repurposing of spaces and the emergence of new occupations. These spaces are now being utilised by mechanical and digital devices to assist us in sustaining our needs.

From the inception of the earliest urban settlements in Mesopotamia and Egypt until the 18th century, there existed a balance between the majority of the population involved in agricultural pursuits in rural areas, and small urban centres where economic activity revolved mainly around trade markets and small-scale manufacturing. Because agriculture was underdeveloped and showed little progress during this time, the proportion of people living in rural areas compared to those living in urban areas remained stable. However, with the

advent of the agricultural and industrial revolution in the late 18th century, this connection was ultimately severed, leading to an extraordinary increase in urban population throughout the 19th century and continuing to expand steadily to the present day. This exponential growth led to a significant increase in global energy consumption, which in turn resulted in a corresponding increase in carbon emissions. The Industrial Revolution played a crucial role in shaping the shift in human settlement patterns and socio-economic organisation. Subsequently, any region that adopts an industrialised socio-economic framework and follows a growth pattern will undergo urbanisation. According to the United Nations, by the end of 2008, approximately 50% of the global population was expected to reside in urban regions. By 2050, approximately 64% of the developing world and 86% of the developed world are projected to become urbanised. Based on the existing trend, urbanisation would entail a continued growth of urban areas, leading to an imbalanced allocation and exploitation of resources (Arch2O, 2022).

Regardless of their economic class and social status, humans in their authentic biological state rely primarily on energy and vital resources for survival. Ascending the economic hierarchy not only grants us access to energy, resources, and technology, but also provides us with the freedom to exploit them. An example of such exploitation is the excessive expansion of living spaces. Despite the exponential growth of the world population, individuals have managed to increase their average living space from 140sqm in the 1950s to 250sqm presently, despite the fact that family sizes are decreasing.



Figure 2.14: The Tiny House Village in Olympia, Washington, Comprises 30 Compact Dwellings, Along with a Communal Garden, a Shared Area Equipped with Showers and Laundry Amenities, as Well as Living and Dining Spaces.

Urban expansion, as we understand it, is influenced by socio-economic factors. Consequently, whenever the economic framework is impacted, the entire social framework experiences instability. The 2008 economic crisis served as a catalyst for the emergence of the tiny house movement, an architectural social movement. It is a direct reaction to the inherent instability of contemporary society's structure. Currently, the construction of a house has a significant and far-reaching effect on both the natural environment and the economic resources. These two reasons fundamentally drive the Tiny House Movement. Following the economic crisis, a substantial proportion of individuals experienced the unfortunate consequence of losing their residences, employment, and retirement savings. These circumstances caused them to question the existing state of affairs and search for affordable yet habitable spaces (Arch2O, 2022).

The 2017 Boeckermann study examines the motives and degree of satisfaction of tiny house residents in America, Canada, Australia, and New Zealand. Preliminary findings suggest that small-house living is driven mainly by reduced expenses, a simpler way of life, and more freedom and mobility. Of these, and controlling for house size, cost, ownership, and demographics, a simplified lifestyle turned out to be the only one statistically significantly related to an increase in delight with tiny house living.

Table 2.2: The Motivations and Satisfaction of Tiny House.

Motivations for Tiny House Living	Tiny House Satisfaction
• Reduced costs were the most salient motivation, with 71.9% of respondents strongly agreeing that it was a key reason for living in a tiny house. • Desire for a simplified lifestyle with less consumerism (65.6%) and increased freedom and mobility (51.6%) were the next two most influential motivations. • Sustainability and environmental concerns, interest in design, sense of community, and empowerment were less prominent motivations among the respondents.	• After controlling for house features and demographics, the desire for a simplified lifestyle was the only motivation significantly associated with higher satisfaction with tiny house living. • Other motivations like reduced costs, freedom, sustainability, community, design, and empowerment were not found to be significantly related to satisfaction. • Demographic factors like sex, race, ethnicity, education, and income were also not associated with satisfaction, except for age, where older respondents (40-66 years) were more satisfied than younger ones (19-39 years).

The study provides insight into the main reasons behind the tiny house movement and how these reasons relate to smaller, more general satisfaction with small house living. According to this study, its findings show that the simplified lifestyle with less consumerism, more than reduced expenses or increased freedom, is the major determinant factor for satisfaction among small house owners. These findings will be useful in learning the motivations behind and advantages of the tiny house movement to policymakers, homebuilders, and even the general public. The only demographic element associated with increased tiny home pleasure was older age; attributes of its tiny house, like size, cost, ownership, and time in resident had little effect on satisfaction. It's the desire for a simpler, less consumerist lifestyle that, more than a small house per se, appears to be driving contentment (Boeckermann, 2017).

Statistics

- a. According to Tiny Home Builders, a significant shift in the movement is the transformation in the individuals responsible for constructing the homes. The market is undergoing a rapid transformation from a landscape dominated by DIY houses and a limited number of builders. The proportion of builders to DIYers is likely to be greater than 75% to 25%. The percentages were inverted and potentially even more skewed in favour of DIYers a few years ago.

- b. Marketplace reports an 84% surge in sales of tiny homes in the last two years.
- c. Based on the 2016 Survey of Home Buyers and Sellers, the median age of first-time buyers is 32 years old, and 60 percent of them do not have children (DYKSTRA, 2022).

2.6 TINY HOUSES BEFORE AND AFTER THE TWENTIETH CENTURY

The exact emergence of tiny house living, especially in the US, is difficult to ascertain, as some sources trace its origins as far back as the late 19th century. Yet, the origins of the modern movement can be traced back to the 1970s, when artists such as Allan Wexler started exploring the idea of residing in a small living area. During the same time period, there was a surge in the publication of books discussing the concept of tiny houses, as proponents advocated for the idea of simplifying living spaces and embracing a lifestyle of minimalism. A prominent figure closely associated with the movement is Jay Shafer. In 1997, Shafer commenced the construction of a diminutive abode measuring 90 square feet, designed to be mobile on wheels. After a span of two years, he finished composing "The Small House Book", in which he discusses his deliberate choice to construct a diminutive dwelling. The small dwelling he owned garnered significant acclaim, being prominently showcased in prestigious media platforms. Additionally, his literary works achieved notable success, becoming highly sought-after publications on the renowned online marketplace, Amazon. Shafer is often recognised as the pioneer and influential figure in the Tiny House Movement, earning him the titles of "Founder" and "The Godfather" of Tiny Houses (Generator, 2023).

In the early 2000s, contemporary small dwellings started to emerge in various states. Individuals were attracted to the minimalist lifestyle, from which the tiny house movement originated. People were adopting a more minimalist and meaningful lifestyle, which is closely associated with the concept of living in tiny homes. Some individuals may contend that the tiny house movement is merely a passing trend and will cease to exist within a few years. Contrarily, the movement is still gaining momentum as individuals from various generations embrace the notion that adopting a minimalist lifestyle and reducing their living space can result in an improved quality of life. Over time, a multitude of concepts for miniature dwellings have surfaced, ranging from repurposed shipping containers transformed into residences to mobile tiny houses. Moreover, the younger demographic perceives small houses as a cost-effective housing alternative, as indicated by a Global Tiny Homes Market report, which forecasts a nearly \$4 billion increase in the market from 2022

to 2023. Concisely, the tiny house movement is displaying no indications of deceleration and will persist as a prevailing trend in the forthcoming years (Generator, 2023).

During the year 1000 BC, the Mongolians introduced "Yurts" or "Gers" as efficient and portable dwellings. During the year 500 BC, Native Americans utilised tipis, which were compact dwellings that possessed the dual qualities of being both portable and impervious to water. Additionally, these structures exhibited exceptional resistance to heat. During the 1800s, a style of houses known as "Shot Gun Houses" emerged in the southern region, heavily influenced by Haitian architecture (DYKSTRA, 2022).



Figure 2.15: Yurts or Gers.

2.7 RESIDENTIAL CLUSTERS IN TINY HOUSES IN CANADA IN THE YEAR OF 1976

At the height of the mid-1970s, the small home movement in Canada was still at the threshold, though a number of pioneering residential clusters or communities were just beginning to take shape, especially in British Columbia and Ontario. These small, owner-built houses were between 200 and 600 square feet in area, sited on common property, and sought more affordably priced, ecologically sensitive, and self-sufficient lifestyles (Millward, 2008).

Table 2.3: Examples of Early Tiny House Communities That Emerged in Canada in the 1970s.

Communities	Founding Years
Tin Can Beach	Early 1970s
Findhorn Foundation (Ontario)	1970s
Kootenay Tiny House Village	Mid-1970s
Off-the-Grid Tiny House Community	1970s

By 1976 residential clusters of small homes had not been a major element of the Canadian urban scene. Instead, what more than a quarter-century of Canada's post-war period could be defined by was rapid, sprawling suburban expansion and construction of large, single-family detached homes rather than smaller and more compact residences. Through this period, the dominant pattern in Canadian cities was low-density, automobile-oriented suburbs on the urban periphery. Government policies and programs, including mortgage subsidies and building highway infrastructure, made suburban growth possible. The effect of all these forces was that, instead of compact subdivisions of small houses, most of the new residential construction in the 1970s consisted of single-family houses on large lots. Although there doubtless were some scattered instances in some towns across Canada of small clusters of housing, these were probably pretty rare in both scope and number. The single-family suburban house was the normative residential living arrangement based on both cultural and financial sensibilities of the day (Millward, 2008).

It wasn't until the late 20th and early 21st centuries that the concept of tiny houses and other alternative, smaller forms of residential structure really began to take root in Canada. Interest has grown dramatically in recent years with the growing tiny house movement, concerns about urban growth and sustainability, and changing demographic and lifestyle choices. However, in 1976 groups of small residential homes were barely a blip on the Canadian metropolitan landscape (Millward, 2008).

2.8 CASE STUDIES OF SMALL DWELLINGS IN DIFFERENT COUNTRIES

2.8.1 The Nakagin Residential Tower with Capsules in Tokyo

There are many interesting micro-dwellings, and some say the Nakagin residential tower with pods in Tokyo is the first of its kind in the world (Kurokawa, 1972). The micro-unit has an entry in the corner and a window on the other side. The unique thing about this answer is that the space is very narrow because of the bed and the cabinet's sizes. The capsule wasn't

meant to be used for things like making food or doing laundry. This living unit's main purpose is to provide a place for up to two people to rest, work, clean themselves, and live. Figure 10 shows that the living space inside the ship is 2.5x4m (10m²) in size.

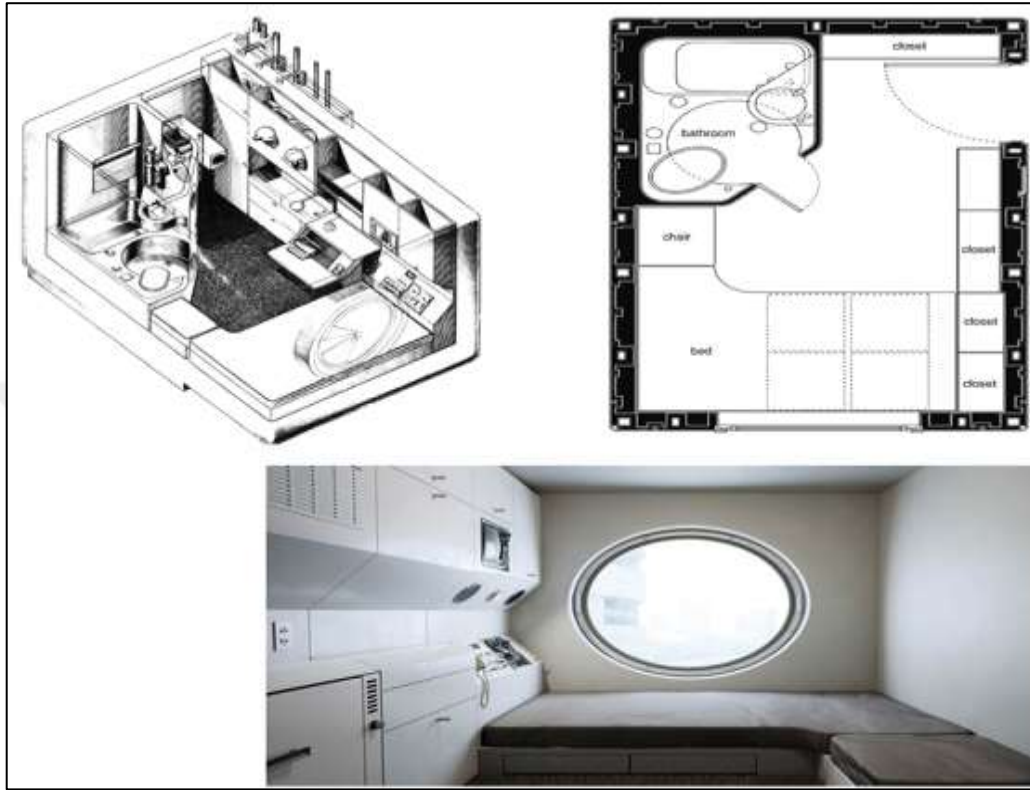


Figure 2.16: Nakagin Capsule Tower, Tokyo [34].

2.8.2 Mubarak Housing, Egypt

The example is in Kafr Sheikh City, next to the School of Agriculture and between the neighborhoods of engineers and doctors. A house with five floors above the ground floor is used as an example. There are eight rooms on each floor. Styles come in only two different types. The first and second types each have two rooms: a living room, a patio, a kitchen and a bathroom. Figure 30 shows that the first type has a net area of 46 m² and the second type has a net area of 55 m². [50]

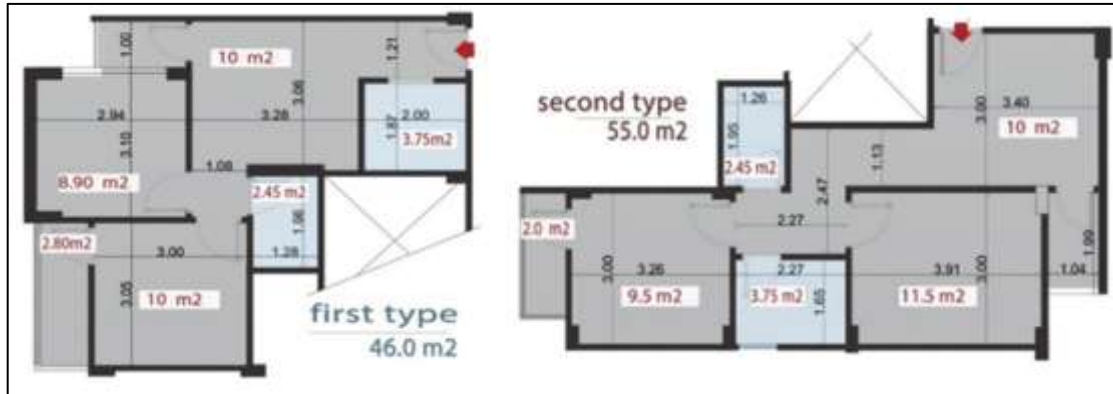


Figure 2.17: Plan of Two Types With Two Rooms, Living Room, Terrace, Kitchen And Bathroom [50].

The researchers offered some optimization steps for achieving design flexibility in this case study [50]. The living room or the extra bedroom can be used to practice or load the receiving activity. The study of exclusion and exploitation shows that the living room should not be included because it is very likely that the living room and reception area will be used at the same time. The extra bedroom could be used instead. In times of high occupancy, the sitting room can also be used as an extra space for the front desk. Figure 2.31 shows that to be true.

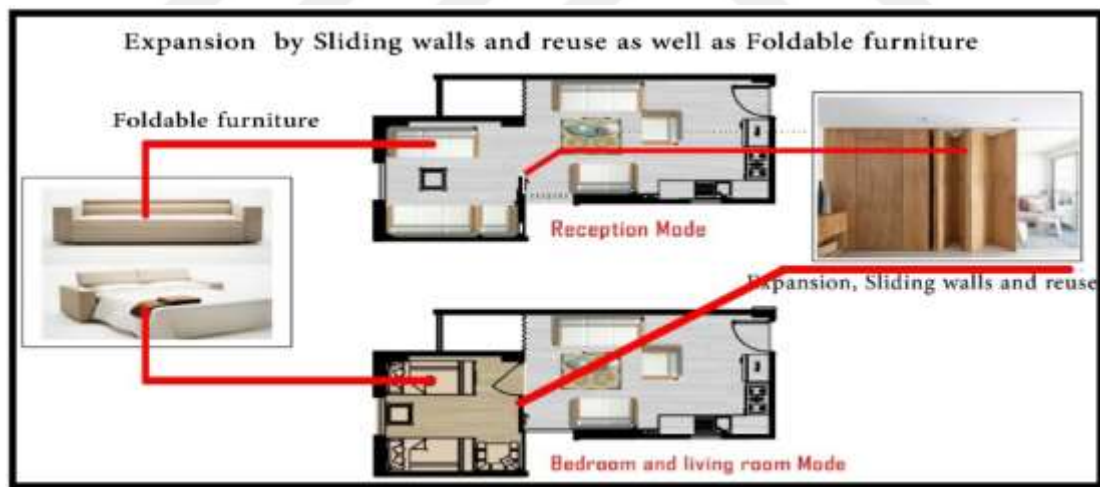


Figure 2.18: Reception and Bedroom Rearrangement [50].

The master bedroom got a terrace that was used for "sitting in the open air" activities. It became impossible to do things like "sitting in the open air." Using big folding windows like the ones in Figure 2.32 can add to the bedroom space if the design is flexible enough.



Figure 2.19: Bedroom as a Terrace With Large Windows [50].

The living room or bedrooms are both good places to study. Based on the exclusion/exploitation analysis, using a foldable table in the sitting room is better for better air flow and natural light, as seen in Figure 2.33



Figure 2.20: New Study Zone By Foldable Furniture [50].

The dining action can be done in the kitchen or living room. Two different methods can be used by using an open plan as a flexible building method. 1) an easy-to-fold eating table 2) A eating table that stays in place, like the one in Figure 2. 34.



Figure 2.21: Alternative Dining Table Places [50].

A big problem is that the units don't have enough space for all the different sizes of families. Instead, the brand-new units can be planned with different types of areas, as shown in Figure 2.35.

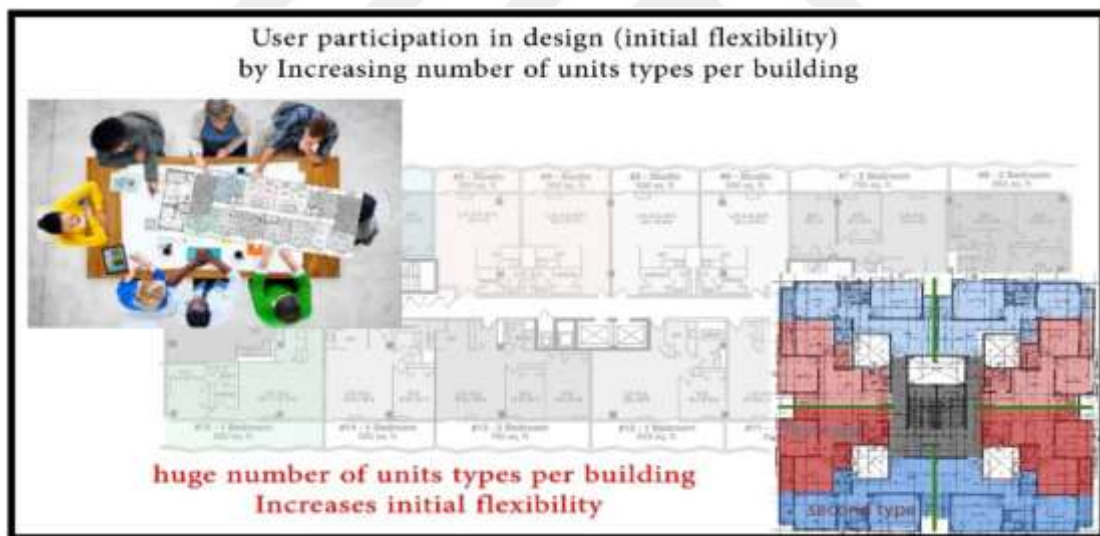


Figure 2.22: Couple of Unit Design Types [50].

2.8.3 Nabeel AL KURY'S house

The house of Nabeel AL KURY is distinguished by a smaller façade of 7 meters, resulting in more elongated and narrower spaces within the building. It additionally has a private corridor at the side door. The ground floor, first floor, and roof are the three levels of this house. The first story comprises three bedrooms, a hall, a bathroom, and balconies; the

second floor comprises a store and roofs; and the ground floor comprises a hallway, a hall, a bedroom, a kitchen, parking, a garden, and a bathroom. [37].



Figure 2.23: The Plans of Nabeel ALKURY'S House in Baghdad, by the Researcher.



Figure 2.24: Photos Show the Façade of Nabeel ALKURY'S House in Baghdad.

2.8.4 Hussein ALKHAYAD'S house in Baghdad

This house is distinguished by its smaller size and side entry without a hallway, which lessens the family's privacy. The ground floor, first floor, and roof are the three levels of this house. The first level has three bedrooms, a hall, a bathroom, and balconies; the ground floor has a guest room, a hallway, a hall, a bedroom, a kitchen, parking, a garden, a W.C., and a private bathroom for the main room [37].

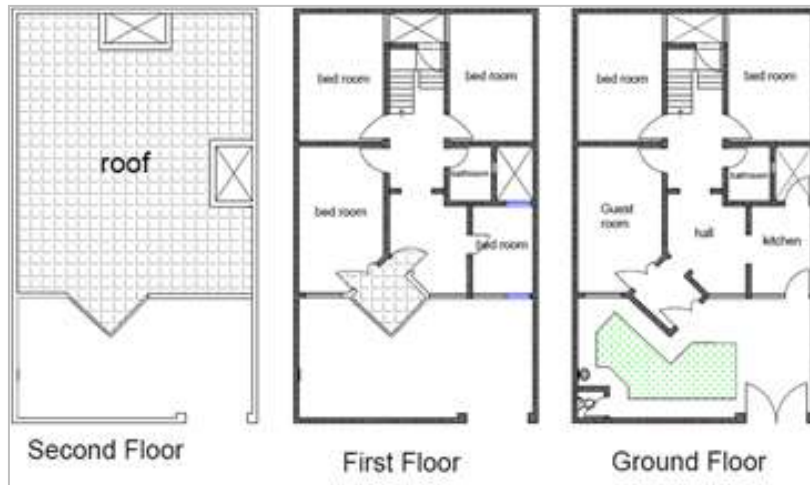


Figure 2.25: The Plans of Hussein ALKHAYAD'S House in Baghdad, by the Researcher.



Figure 2.26: Photos Show the Façade of Hussein ALKHAYAD'S House in Baghdad.

2.8.5 The Lifehaus project in Lebanon



Figure 2.27: The Lifehaus Project in Lebanon [38].

An ongoing housing revolution is taking place in the heart of Lebanon. The Lifehaus initiative revolutionises conventional ideas of modest living by combining ecology with technology, agriculture, and self-reliance in the creation of inventive homes. The Lifehaus is the inaugural 100-percent, self-sustaining residence in the Middle East, employing recycled and repurposed construction materials and traditional building techniques. Lifehaus residences will have on-site water collection and recycling, self-generation of electricity and power, and a greenhouse installed in each home. By employing Passive Annual Heat Storage technology, Lifehauses will autonomously regulate their temperature, eliminating the need for fossil fuels. Passive Annual Heat Storage is the retention of solar heat by soil. The soil around a partially submerged residence is seen as an integral component of the building's thermal infrastructure. Several feet above the top of a subterranean facility, an insulation/watershed umbrella is erected to shield the soil directly surrounding the structure from typical temperature changes. This procedure maintains a consistent thermal mass of the building, therefore guaranteeing both lower temperatures during the summer and higher temperatures during the winter [38]

2.8.6 Zahraa ALBUNDI'S house in Baghdad

This house has a smaller façade than the last house example in Baghdad. It also lacks a corridor at the side door, which lessens the family's privacy. This home, like the previous

residences in the upper phase of Baghdad, is composed of three floors: the ground level, the first floor, and the roof. The first level has three bedrooms, a hall, a bathroom, and balconies; the ground floor has a guest room, a hallway, a hall, a bedroom, a kitchen, parking, a garden, a W.C., and a private bathroom for the main room [37].



Figure 2.28: The Plans of Zahraa ALBUNDI'S House in Baghdad, by the Researcher.



Figure 2.29: Photos Show the Façade of Zahraa ALBUNDI'S House in Baghdad.

2.9 SMALL DWELLINGS IN BAGHDAD

2.9.1 Significance of a House for Iraqis and How do they Perceive Space

For Iraqis, the house is a place infused with much culture and social life. The house is just like a building but also it reflects their ideals, customs, and way of life. Just as has been elaborated by the above literature, the classical Iraqi courtyard house portrays the importance

of space to people and in determining the social and cultural of the Iraqis' culture. The home, to an Iraqi, is a haven that projects his basic values—not merely a place in which to live. The courtyard is a multifarious area supporting family events, religious practices, and social contacts, and constitutes a major element of the typical Iraqi house. Designed to meet the social and cultural demands of the occupants, it is a place where one can live privately yet in community (Haraty et al. 2019).

The 2019 Haraty study focuses on space in the traditional Iraqi courtyard house as organized spatially to distribute rooms and layout rooms in such a way as to suit the needs and wants of the occupants. The importance of space in the Iraqi setting is further evidenced by the segregation of guest areas from family ones, respect for privacy, which has a use incorporating religious and cultural aspects. This study has been interpreted as meaning the lack of the traditional courtyard house in present Iraqi architecture has increasingly made the built environment disjointed from people's social and cultural needs. This makes it important that preserving and utilizing the concepts of the traditional courtyard house in building the modern Iraqi houses ensures that the notion of space remains a significant aspect of the Iraqi residential experience.

Last but not least, for Iraqis, space is an offering that is both culturally and socially significant in the house. Therefore, this concept has been relatively important to establish the design and function of the traditional Iraqi courtyard house. If these thoughts can be kept within modern Iraqi architecture, then social cohesiveness and cultural identity of Iraqi people can also be retained within modernism (Haraty et al. 2019).

2.9.2 The Origin of Fragmentation in Baghdad

The fragmentation of large housing units into smaller units is a phenomenon that was previously unfamiliar to Iraqi society. Traditionally, Iraqi families preferred larger housing units that provided ample comfort and all necessary amenities. However, due to the prolonged housing crisis in Iraq, exacerbated by weak laws and inadequate municipal oversight since 2003, people have started dividing their homes for various reasons. These reasons include economic factors resulting from the low standard of living, affecting over 36% of urban households, as well as social factors due to increased household size resulting from high population growth rates. As a result, the housing unit is no longer adequate for a family consisting of 10-12 members. This has led the head of the household to divide the

housing unit among his children in order to achieve independence. Personal motivations are an additional factor influencing the standard of living, specifically when homeowners choose to divide and sell their properties in what is commonly referred to as real estate speculation. Furthermore, governments neglect the housing requirements of the population. Presently, we are confronted with a genuine humanitarian crisis: residing in cramped living quarters that lack the essential standards of human decency (*Al-Adab Journal*, 2020).

A research has been done in 2020 in Baghdad, representing the fragmentation of large homes into smaller units as a driver of population growth and increasing demands for housing in the area. The paper looks into morphological changes in the urban environment and social and economic elements that impact this kind of fragmentation process, considering using appropriate planning and policy decisions in properly controlling such development. Such results can be used to assist the creation of sustainable housing policies in Baghdad and help guide the decision-making process so that fragmentation is done in a coordinated manner to answer the physical and socioeconomic needs of the population (*Al-Adab Journal*, 2020).

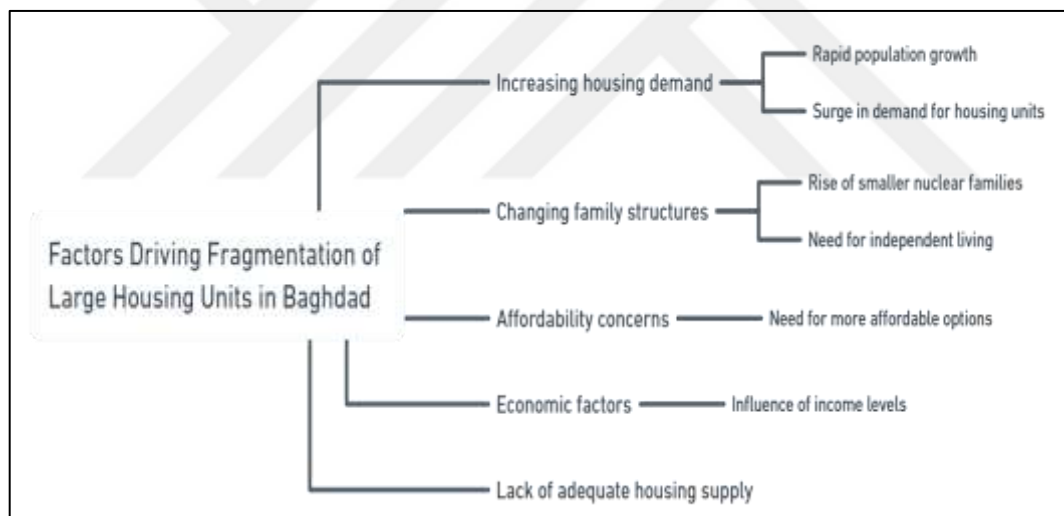


Figure 2.30: New Study Zone by Foldable Furniture [50].

Among these very social and economic elements, the need for comprehensive housing policies and planning strategies to cope with the changing housing needs of the people of Baghdad has been underlined by managing to interpret the continuous process of the fragmentation of big house units in the city.

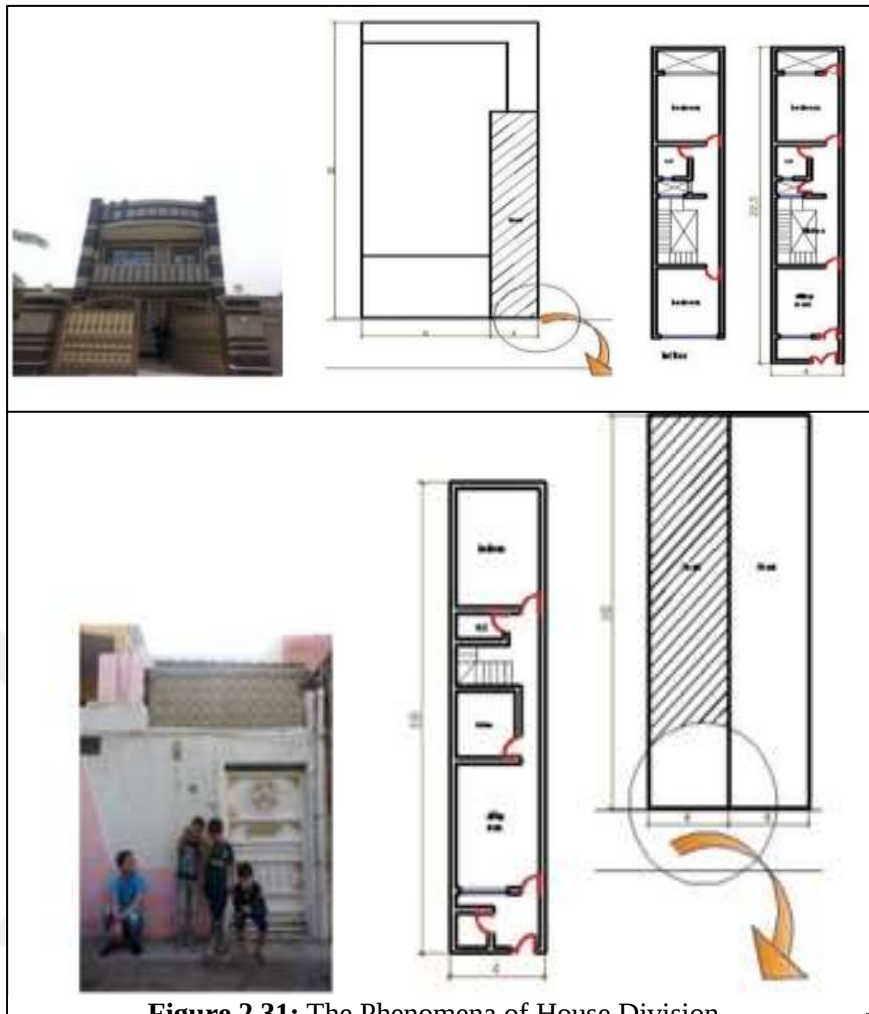


Figure 2.31: The Phenomena of House Division.

Table 2.4: Urban Planning Challenges in Baghdad Due to Housing Fragmentation.

Challenge	Description
Lack of Housing Standards & Regulations	Unclear rules lead to uncontrolled fragmentation, creating poor living conditions.
Inadequate Infrastructure & Services	Increased density strains existing water, electricity, and transportation systems.
Preservation of Urban Character	Fragmentation alters the city's visual identity, impacting historical and cultural aspects.
Socio-Economic Disparities	Fragmentation may worsen social inequality, disproportionately affecting low-income residents.
Lack of Comprehensive Planning	Piecemeal approach to fragmentation ignores long-term consequences for the city.
Enforcement Challenges	Implementing regulations is difficult due to informal modifications to housing.

Such urban planning problems require a multiform strategy of suitable housing policies, infrastructure improvement, and service development, as well as an integration of the fragmentation process into a more general framework for urban planning that puts the issues of sustainability and livability to the fore (*Al-Adab Journal*, 2020).

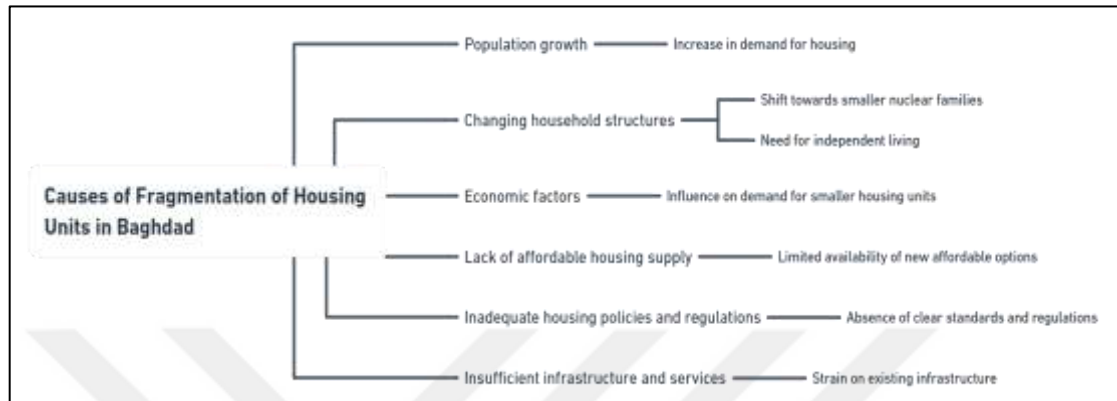


Figure 2.32: The Primary Causes of the Fragmentation of Housing Units in Baghdad.

The main causes—from demographic changes to economic factors—have therefore combined to underline the need for a comprehensive, integrated approach in tackling the housing crisis in Baghdad. In that respect, these causes detail in elaborate depth why, among many other integrating factors, housing units in the city remain fragmented.

One of the primary factors contributing to the ever-growing economic gap of Baghdad is the fragmentation of housing units in the city. Rising demand for more affordable housing resulting from the widening gap between the rich and poor segments of the population has compelled many residents to divide larger, costlier homes into smaller, relatively affordable apartments. It is furthered by gentrification and displacement, a lack of access to new affordable housing complexes, and the predominance of practices of informal housing among its lower-income residents. It is in this fragmentation that spatial separation and burdening on infrastructure and public services call for much-needed, thorough housing policies and inclusive urban development strategies to solve the problems related to rising income inequality in Baghdad.

The approach was very strong, with a look at how the scatter occurred for big homes in Baghdad. Spatial Analysis has therefore mapped the morphological changes in the urban environment, hence exposing the event of creation of smaller dense dwelling areas arising out of fragmentation. Extensive data accumulation on the socio-economic front was done

and analyzed which pointed out that there is existence of demographic rise of 25 per-cent in the city from, 2010-2018 along with trend of smaller nuclear homes. Another massive poznation factor found was the expanding economic differences; the rich sections could afford big homes whereas the lower-income people divided their houses to provide more reasonably priced dwelling quarters. While a detailed review of the policy brings out the absence of clear criteria and coordinated planning approaches that allowed uncontrolled fragmentation of the housing units, the interviews with stakeholders gave insightful analyses of views, experiences, and challenges faced by many stakeholders. The study further revealed that this fragmentation has grossly overstretched the city's infrastructure and public services, which were not designed for this kind of density and housing diversity. The multifaceted approach, in conjunction with the comprehensive results of the present study, offers new and significant insight into the complex dynamics underpinning the fragmentation of large housing units in Baghdad, thereby underlining the need for an overarching and integrated solution to resolve pressing housing problems (*Al-Adab Journal*, 2020).

Ali, S tends to focus on the development of the dwelling typologies that stand in Baghdad, Iraq during the past two centuries. Investigation on the modernity effect on conventional Baghdadi homes and architectural and spatial qualities of residential constructions would pose to be one of the key research focus areas.

Table 2.5: Housing Typology Analysis: Baghdad.

Period	Years	Characteristics
Late Ottoman Rule	1880-1917	* Central courtyard * Inward-facing design * Privacy elements (mashrabiya)
British Mandate & Monarchal Gov.	1917-1958	* Blend of traditional & Western styles * Introduction of balconies * More outward-facing layout
Republican Era	1958-2003	* Heavily influenced by modern Western architecture * Open spaces * Reduced traditional spatial hierarchy
Parliamentary Era (after 2003)	2003-present	* Fragmentation of larger houses * Decreased privacy due to unit division

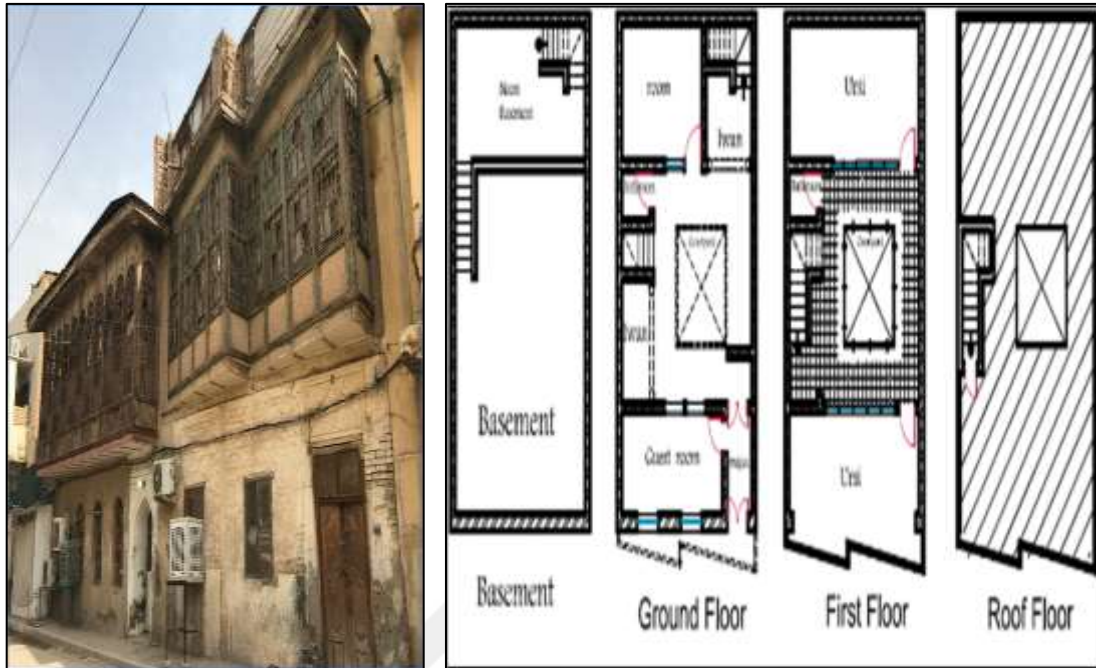


Figure 2.33: Late Ottoman Rule.

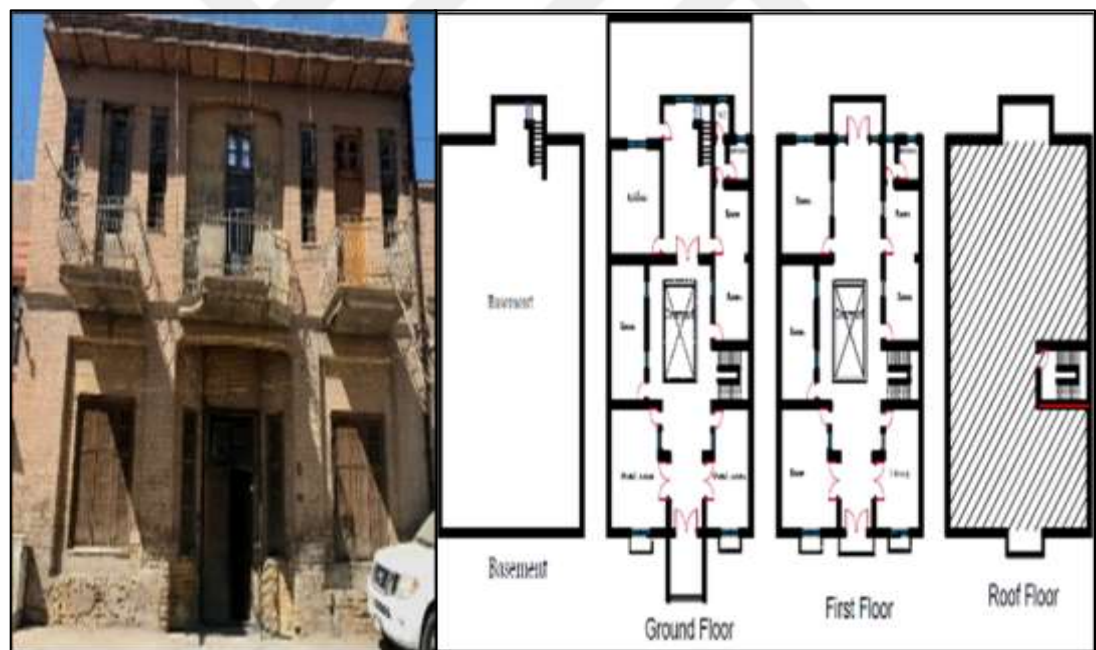


Figure 2.34: British Mandate & Monarchal Gov.

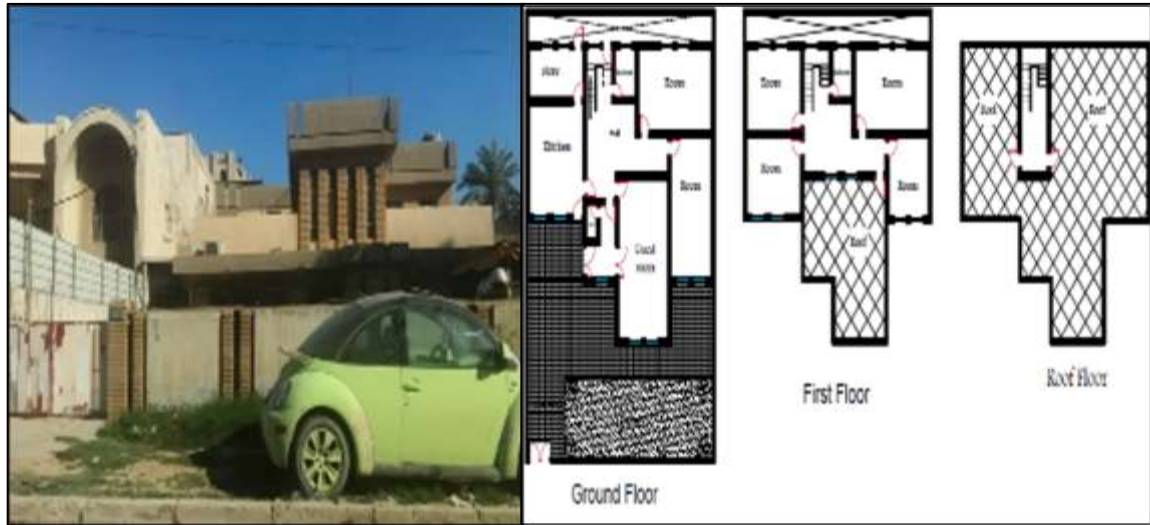


Figure 2.35: Republican Era.

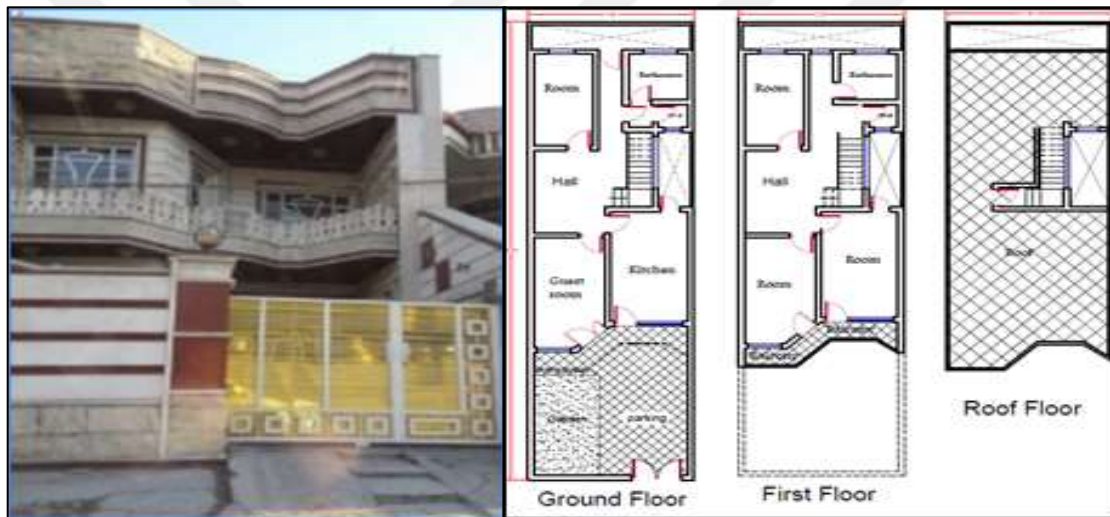


Figure 2.36: Parliamentary Era (after 2003).

Analysis of housing typology during the parliamentary era from 2003 to the present: The Extended Dwellings

The Qais AL-MAAMORY house and the Abdul AL-RASHEEDY house have been chosen for analysis in the paper. The houses in this phase are of an extended type with small areas, resulting from the subdivision of larger houses into smaller ones. Additionally, they incorporate design features and ideas from other countries. Typology Analysis: The architectural style of houses during this period has undergone significant transformations compared to those of previous eras, primarily due to the societal complexities resulting from changes in the Iraqi government. Following the year 2003, significant monetary and social transformations occurred, which were also reflected in the residential units and urban

landscape of the local area. During this time, there was a notable occurrence of residential units undergoing a process of transformation and becoming fragmented. The political and economic changes had an impact on urban legislation, including the introduction of a law in 2004 that permitted the construction of an additional floor for residential purposes. Furthermore, the construction and design of housing units in extremely small areas of 50, 75, and 100 square metres has resulted in a negative impact on the urban landscape of the city. A multitude of residential parks have undergone a conversion process, resulting in the creation of compact residential dwellings. Due to the consequences of subdividing the large housing units into smaller residential units. The typical layout of elongated residential units (also known as extension house type) is a design that relies on a sequential arrangement of spaces, progressing from public areas to more private ones in a sequential manner. The various regions intersect due to the transition between permeated spaces and the reduction of movement spaces, resulting in an overlap with the remaining spaces. Consequently, access starts from the entry area into the kitchen and extends to the living areas, which then connect to the bathrooms and bedrooms (Ali, S. 2020).



Figure 2.37: The Plan of QAIS ALMAAMORY House in Baghdad.



Figure 2.38: The Facades of QAIS ALMAAMORYS House.

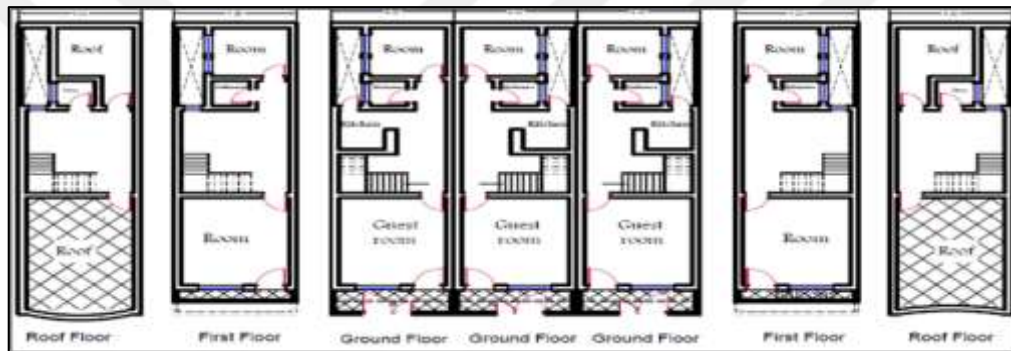


Figure 2.39: The Plan of ABDUL ALRASHEEDYS House in Baghdad.



Figure 2.40: The Facade of ABDUL ALRASHEEDYS House.

2.9.3 The Single Cultural Residence in Baghdad After 2003

One such 2017 research tries to discover and understand the worst events happening in the metropolitan environment of Iraqi cities, particularly the invasion of the architectural design of the single house in the city of Baghdad subsequent to 2003. It is an event many academic academics, critics, and cultural circles who drew attention to the influence of political and cultural developments have not appropriately investigated (Ghada, 2017).

The study intends to define the impact of the phenomena on architectural design for an individual house in Baghdad and then explain the degree of spread of encroachment in dwellings based on objective, social, and economic examination. Theoretically, the framework was established to extract the research indicators—economic, social, and design—and, consequently, improve them based on an in-depth analysis of the evolution of the urban house in Baghdad over the 20th century. Twelve samples from two residential districts of different residential areas—Palestine Street and Al-Sadr City—the social and economic level of the residents, along with their dwellings having undergone changes and divisions, have the indicators applied to them. This was undertaken in order to ascertain how the design level of each individual house in Baghdad changed following 2003.

The results presented that this type of illegal division exists in both Baghdad districts, usually ineffectual, non-functional, and sometimes without proper ventilation. The phenomena spread throws the spotlight on the need for certain aspects in the ways of partitioning and alteration of dwellings to be widely scrutinized to limit the phenomenon and revive the residential culture of the city (Ghada, 2017).

2.10 THE EFFECT OF COLOR, LIGHT, CEILING HEIGHT AND FURNITURE

a. Effects of Colors

Color is essential in design and has the ability to greatly impact the atmosphere of a room. It possesses the capacity to visually augment, delineate, and utterly transform the ambiance of a room, particularly in compact or restricted areas like tiny houses.

In general, skillfully employing colors in a confined area can effectively generate the perception of expanded space and dimension. Employing light and neutral hues on the walls, ceilings, and floors will create an illusion of increased brightness and spaciousness in the

room. moreover, employing bright and vibrant colors strategically can effectively delineate distinct zones within the area, while avoiding a sense of overcrowding.

Considering the various styles of tiny houses, ranging from rustic to shabby chic, it is important to adopt a customized approach when selecting colors that will complement the space [53].

Nevertheless, there are some general guidelines that can assist in creating an effective color scheme for any small house:

Table 2.6: Color Considerations for Small House.

Consideration	Description	Impact on Small Space
Light and Cool Colors	opt for white, gray, beige, etc.	Create a modern minimalist look, avoid overwhelming complexity, and make the space feel larger.
Warm and Cool Color Combinations	Combine warm and cool tones with pops of bright hues	Achieve an eclectic or bohemian aesthetic.
Avoiding Dark Colors	Avoid dark or bold colors	Can make the space feel smaller as they absorb light.
Color Harmony	Choose colors that complement each other	Create a balanced and unified appearance.
Light Walls	Use light or white walls	Make decorative items stand out.
Neutral Colors	Utilize neutral colors	Enhance brightness and create a welcoming atmosphere.
Pops of Bold Color	Use pops of bold color strategically	Add life and character without overwhelming the space.
Muted Furniture Tones	opt for furniture in muted tones	Introduce texture without creating clutter.

b. Effects of lighting

Table 2.7: Impact of Lighting on Interior Design [57].

Lighting Type	Perception	Impact	Designer Consideration
Natural Light	Spaciousness	Increases perceived spaciousness	Maximize natural light when possible.
	Privacy	May decrease perceived privacy	Balance natural light with strategic use of window treatments for privacy control.
	Overall Impression	High natural light with adjustable artificial lighting is preferred.	Design for a combination of natural and artificial light.
Artificial Light	Clarity	Improves clarity and perception of detail	Use task lighting for specific areas requiring focused light.

Table 2.7: Impact of Lighting on Interior Design [57] “Table Continued”.

	Orderliness	Can create a more ordered feel	Implement layered lighting with ambient and accent lighting to define space.
	Privacy	May increase perceived privacy (especially compared to natural light)	Consider dimmers and task lighting to control light intensity for desired privacy levels.
	Overall Impression	Effective when used strategically to supplement natural light and create desired ambiance.	Design with a variety of artificial lighting options to create different moods and functionality throughout the day.
		Consider the combined effects of natural and artificial lighting on various aspects of a space, including spaciousness, privacy, clarity, and orderliness.	Design with a focus on user experience and how lighting can enhance the overall functionality and mood of the space.

c. Effect of ceiling height

The height of the ceiling has a large impact on how residents perceive spaciousness and general satisfaction in their tiny houses. The high ceiling makes it quickly open and expansive, so the perceptions of the house are much more pleasant. Additionally, wider floor plans tend to appear more open compared to linear floor plans. However, open floor plans may introduce distractions and noise for individuals sensitive to sensory overload. On the other hand, increased spatial depth, which refers to the number of rooms and areas in a structure, has been shown to have a calming effect on social emotions and psychological well-being. Individuals residing in areas with more spatial depth tend to experience fewer negative effects from crowding, likely because they have more options for regulating their social interactions. Therefore, when designing tiny houses, it is important to consider the preferences of the residents and carefully plan the height of the ceiling and the arrangement of the floor plan to create a sense of spaciousness and meet the needs of the occupants [58].

d. Effects of Furniture

Furniture is an essential component of an apartment, occupying a significant portion of the floor space. Due to the limited space in apartments, the demand for multipurpose space-saving furniture is increasing, the presence of furniture can greatly impact how the space can

be perceived within a room. Arranging furniture strategically can create visual illusions that make a space appearance larger than its actual size.

The issue of small spaces can be addressed through clever solutions such as multifunctional furniture, modular furniture, and well-designed space, all of which enhance space efficiency. Multifunctional furniture is also referred to as space-saving furniture, transformable furnishings, or multipurpose furniture. Multifunctional furniture is a type of furniture that serves various activities and purposes at the same time. This type of furniture has been designed and used for centuries but the true value has been unnoticed until recently. Furniture for multiple purposes can be transformed into different forms.

Some furniture needs some skills to be modified, and this type of pieces can be fairly expensive since they can be used for almost every purpose. Multifunctional products like furniture that can be folded, stacked, or transformed are a great solution to maximize limited spaces. An apartment is a shelter, a house for many people, and houses need to offer the need of its residents to bring them comfort and peace and to offer a healthy and good environment. Because of the limited space in densely populated cities, furniture needs to be of multiple functions [56].

3. METHODOLOGY

3.1 INTRODUCTION

The major goal of this study is to determine the particular difficulties experienced by Baghdad inhabitants who live in small dwellings. It also tends to evaluate of the suitability of current interior design techniques used throughout the world to maximize space efficiency in small dwellings and the analysis of their application in the Baghdad.

In accordance with Kothari and Garg [51], research methodology is a technique for methodically resolving the research topic. It can be thought of as a science that investigates the methods used in scientific investigation. It consists of the several methods frequently employed by a researcher to look into his study problem, along with the justification for each method. This chapter covers the approach used to conduct the full research process. This chapter's particular topics include the research design, demographics, sample, sampling strategy, data gathering methods, and data analysis techniques.

3.2 STUDY METHODOLOGY

In descriptive research, data are gathered to test hypotheses or to provide answers to questions about the current situation of the study's subject.

The examination of attitudes, opinions, demographic data, conditions, and practices is a typical focus of descriptive research. The survey research method was used as the research methodology for this investigation. The survey is an effort to gather information from people who are part of a population in order to figure out where that population stands right now in relation to one or more factors. When done well, knowledge survey research can yield very useful information. It includes carefully planning and carrying out each step of the research process.

The primary data for the study came from the distribution of questionnaires to those involved in architectural and construction sector. In order to enhance the questionnaire for the research, a review of preceding studies, textbooks, and journals was used to identify the numerous attempts that have been made in the past to analyze and examine the difficulties which face the development of small dwellings. The relevant literature that explored research and publication on the subject served as the secondary sources of information.

In surveys, large population samples can be used to collect data. They are useful for gathering demographic data regarding the composition of the sample. There are many different types and quantities of variables that can be studied; surveys are easy to create and run; and conclusions can be reached very quickly. Surveys can also shed light on attitudes that are typically difficult to analyze using observational approaches. But it's important to keep in mind that polls just provide estimates of the true population; they don't truly measure anything. However, surveys are frequently ineffective when understanding the historical context of a phenomenon is required. It was noticed that biases may arise, either in the type and specificity of the responses that are obtained or in the failure of the intended participants to reply. Another sort of error is when respondents purposefully underreport behavior to distort survey results or hide inappropriate behavior. Finally, respondents may find it difficult to assess their own behavior or recall the circumstances surrounding it [52].

The research will be bolstered by a qualitative case study to elucidate the issue of small dwellings in Iraq and investigate possible remedies. The case study will analyze the present housing conditions in Iraq, with a specific focus on the socio-economic difficulties encountered by those residing in small dwellings. By employing a qualitative case study methodology in conjunction with a survey, the study will be enriched as it will yield a full comprehension of the pertinent issues. The project aims to gather data from inhabitants residing in small dwellings, commonly known as tiny houses, in order to provide practical suggestions for enhancing housing conditions in Iraq. In summary, employing both qualitative case study and survey methodologies will guarantee a comprehensive examination of the issue, resulting in the discovery of efficient remedies for tackling the difficulties encountered by individuals residing in small dwellings.

3.3 RESEARCH DESIGN

An investigator's choice of study components and the creation of certain design features are known as research design. A research design does not consist of an organized, sequential, step-by-step methodology. Normally, research is planned logically while taking into account its potential applications. The goals of the study are taken into account when selecting research components. Research hypotheses serve as the cornerstone for building a research project. The following elements make up a study design: sample strategy, research tools, research approach or procedure, and statistical techniques.

The first of the study's five phases is a proposal for defining and identifying the problems, setting objectives, and formulating a research strategy. As part of the research's second phase, which also included a literature analysis concerns with the related topics to the thesis objective. The study's third phase involves developing a questionnaire and distributing it to a sample of individuals working in the architectural sector. The questionnaire is designed in a way that makes it simple for survey participants to provide answers that help to achieve the objectives of the study. The fourth phase was the distribution of questionnaires. The analysis and discussion of the data were the main topics of the study's fifth stage. Then the study will be enhanced by integrating a case study with the questionnaire as a qualitative study methodology. Figure 1 is a flowchart that shows how the research investigation is progressing.

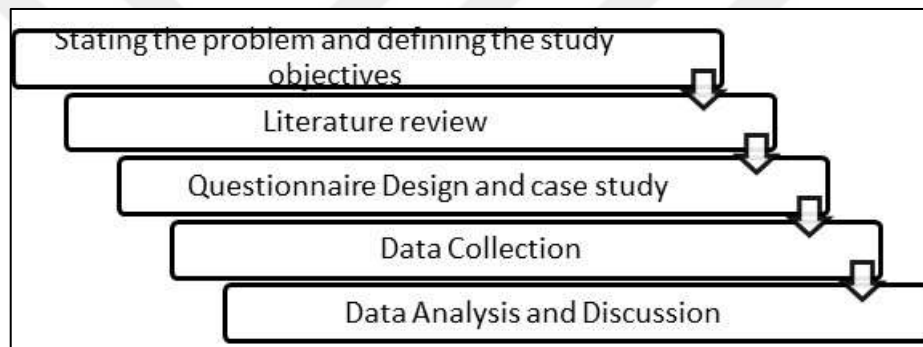


Figure 3.1: Research Flow Chart the Researcher.

3.4 STUDY POPULATION AND SAMPLE

The population of the study questionnaire consists of managers and department heads employed by some organizations in Iraq's construction sector. It also will include some inhabitants of small dwellings in Baghdad. The researcher handed out 150 questionnaires, and 95 of them were returned, yielding a valid response rate of 63.33% for the analysis.

As for the case study will provide a comprehensive examination of a house located in the New Baghdad neighbourhood in Baghdad Governorate. This house is not suitable to accommodate the family that occupies it, which consists of five individuals. Due to several reasons, the first of which is the incorrect exploitation of spaces in terms of furnishing, materials used in finishing, colours, lighting, failure to exploit internal skylights properly, and failure to exploit effective and appropriate storage solutions for such spaces.

3.5 DATA COLLECTION

A variety of data sources were used during the study's research. The current study's theoretical and applied elements are built upon one another. Theoretically, for the current investigation, the researcher drew from pertinent scientific studies. On the practical side, data are gathered, assessed, and hypotheses tested using a descriptive and analytical technique.

On the practical side, a descriptive and analytical approach is used to gather data, analyze it, and test hypotheses.

There are two categories of data collection techniques:

- a. Primary source: A questionnaire was created specifically to gather primary information about all the research variables and the demographics of the research sample in accordance with the research objectives and previous empirical studies. In addition to a case study data obtained from direct interaction with individuals.
- b. Secondary source: The study's theoretical framework, model, and assumptions were developed using books, journals, and theses.

3.6 QUESTIONNAIRE DESIGN

The survey contains both open-ended and closed-ended survey items. Open-ended questions can be used even if a complete list of possible responses cannot be compiled since they allow examination of a number of potential topics arising from a situation. Contrarily, closed-ended questions reduce discrimination against the less literate (in self-administered surveys or interview questionnaires), are quick and simple to complete, are easy to code, record, and statistically analyze outcomes, and are easy to report results.

Only closed-ended questions were used in the creation of the questionnaire due to their advantages. Two major sections comprise the questionnaire.

- i. Section One: Demographic Variables

The demographic information was gathered using closed-ended questions and five different characteristics, including gender, age, educational attainment, employment position, and experience.

- ii. Section Two

This section investigates the role of furniture, light source, and color in small dwelling., materials to be used in small dwelling construction, the psychological impact of living in small dwellings, and the designs that people would like to have in their dwellings.

The second segment of the questionnaire's replies are based on a Likert scale of five ordinal ratings of agreement with each topic from (1 to 5), as stated in the sections that follow. The choice of this simple scale was driven by the need to simplify the survey for respondents, allow analysis of the data obtained, and determine the relative weight of the possible responses. The use of the Likert scale to comprehend respondents' views or sentiments is crucial. The responders are required to rate the degree to which the question or statement most closely matches their opinions.

Accordingly, depending on their perceptions, the respondents select one of the following: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

3.6.1 Purpose of Each Question in Questionnaire

Table 3.1: The Purpose of Questions.

Question Number	Purpose
Demographics	
Age, Gender, Position, Experience	Establish participant background and potential design knowledge
Education Level	Gauge comprehension level of design concepts
Experience with Small Dwellings & Design	Assess direct experience with small living spaces and design involvement
Opinions	
Furniture, Light & Color	
1. Storage Furniture	Assess perceived effectiveness of storage solutions
2. Furniture Size & Arrangement	Gauge impact of furniture choices on perceived space
3. Furniture Arrangement	Assess perceived impact on flow and functionality
4. Color of Furniture	Gauge perceived impact of furniture color on space size
5. Natural Lighting	Assess perceived impact of natural light on space size
6. Artificial Lighting	Assess perceived impact of artificial lighting on aesthetics
7. Lighting Color Coordination	Gauge perceived impact of coordinating lighting color with aesthetics
8. Color & Visual Perception	Assess perception of color's role in affecting perceived space size

Figure 3.1: The Purpose of Questions “Table Continued”.

9. Light Colors	Gauge perceived impact of light colors on making space appear larger
10. Color Gradation	Assess perceived impact of color gradation on creating depth and dimension
Sustainability	
11. Small Dwelling Resource Efficiency	Gauge awareness of resource-efficiency potential
12. Affordability & Sustainable Materials	Assess perception of affordability of sustainable materials
13. Material Availability	Gauge knowledge of sustainable material availability
14. Environmental Consciousness	Assess importance of eco-friendly construction
15. Return on Investment (Sustainable Materials)	Assess perception of long-term benefits outweighing initial cost
Psychological Impact	
16. Sociability in Small Dwellings	Assess perception of impact on sociability
17. Restriction & Annoyance	Gauge perception of feeling restricted and annoyed in small spaces
18. Security in Small Dwellings	Assess perception of security concerns in small spaces
19. Privacy in Small Dwellings	Assess perception of privacy challenges in small spaces
20. Neighborly Protocols	Explore importance of cooperation in managing shared spaces
Evaluation of Design Solutions	
21. Mobile Tiny Houses	Gauge interest in the concept of mobile, compact dwellings
22. Flexible Room Usage	Assess interest in flexible room usage
23. Repurposing Existing Spaces	Assess interest in repurposing existing spaces for new functions
24. Open Floor Plans	Assess preference for open layouts
25. Multi-Use Spaces	Assess preference for combined-function rooms
26. Adaptable Dwellings	Explore interest in dwelling modifications without major structural changes
27. Internal Expansion	Gauge interest in expanding living space internally
28. Merging Exterior Space	Assess interest in expanding living space by merging with exterior areas
29. Ceiling Height	Gauge preference for maximizing ceiling height for a more spacious feel
30. Natural Lighting	Assess preference for maximizing natural light
31. Multi-Use Furniture	Assess interest in using furniture that serves multiple purposes

Figure 3.1: The Purpose of Questions “Table Continued”.

32-36. Combined Living Spaces	Assess preference for combining living areas (kitchen, living room, bathroom) into single spaces
36. Dynamic Furniture	Assess interest in space-saving furniture like Murphy beds and expanding tables

The questionnaire covers most aspects of space efficiency maximization within the small houses of Baghdad. It probes into locals' perceptions of space, their uses attached to and for space, their tastes for architectural details, and experiences with a number of layouts. In addition, it considers issues of environmental consciousness and sustainable materials use. Normally, the questionnaire should provide insightful data in helping to understand what is required and the preferences of the residents in small houses in Baghdad.

3.7 DATA ANALYSIS

The procedure of data analysis is for looking through, cleaning up, manipulating, and modelling data to uncover pertinent information, draw conclusions, and support decision-making. In many different disciplines of business, science, and social science, data analysis takes on many forms and employs a wide range of procedures under a variety of titles.

Descriptive statistics with percentages, frequencies, means, and standard deviations are used to characterize all the research variables and questions to meet the first and second research objectives, as well as to assess the level of dedication and satisfaction of the research variables.

3.8 VALIDITY AND RELIABILITY

Content validity is the capacity of an instrument to measure a wide range of characteristics of a phenomenon under study. To ensure the sincerity of its paragraphs, to obtain their comments, to rephrase some paragraphs and make the required changes, and to carefully strike a balance between the resolution's substance in paragraphs, it is necessary to measure validity and dependability.

At first, content validity was attained through a review of the literature. The following stage involves further validating the content by having practitioners and researchers assess the preliminary instrument for bias, ambiguity, and relevance to the topic or phenomenon being studied. Academic reviewers with expertise in architectural engineering accurately

completed a macro review that encompasses all the research constructs in order to assess the clarity of the questionnaire and produce a coherent research questionnaire. The questionnaire was sent to a few reviewers in order to confirm the authenticity of its paragraphs, get their input, reword a few, and make the necessary changes.

The most used measure of internal consistency, or reliability, of scale items is Cronbach's alpha, which was developed based on research conducted in the 1940s by Guttman and associates. The dependability of this investigation was estimated using Cronbach's alpha.

It is necessary to convey all findings that have been investigated in accordance with the goals and provide insight into problem-solving. This part needs to include the research findings together with their statistical significance levels. Tables, graphics, figures, charts, and photos can all be employed as descriptive aids for presenting the results. To ensure comprehensibility and clarity, it is better to depict numerical findings as a bar diagram. The Appendices must also have the tabular form of the result, which is represented by the bar diagram in the text.

4. RESULTS AND DISCUSSION

4.1 INTRODUCTION

In the modern world, where living spaces are getting smaller due to factors like urbanization and economic trends, maximizing space efficiency in compact homes has become a major concern. This study focuses on understanding how residents perceive and make use of limited space in small dwellings. To gain a detailed understanding of their experiences, a Likert scale questionnaire will be used as the primary research method. This tool allows participants to express the intensity of their agreement or disagreement with various statements, going beyond simple yes/no answers. The statements will cover topics such as how effectively they utilize available space, the functionality and sufficiency of their storage solutions, and their overall satisfaction with their dwelling's ability to meet their needs. By analyzing the range of responses on the Likert scale, this study aims to identify successful space-saving strategies and areas for improvement in small space design to enhance functionality and overall well-being.

4.2 INTERNAL CONSISTENCY (RELIABILITY):

The passage acknowledges Cronbach's alpha, a well-established measure developed by Guttman and colleagues in the 1940s, as the most prevalent method for assessing the internal consistency (reliability) of items within a scale (Tavakol & Dennick, 2011). This study employed Cronbach's alpha to estimate the instrument's reliability.

- a. Validity and Reliability Testing of the Field Study Tool: The researcher conducted validity and reliability testing for the survey questionnaire following its initial design as follows:
- b. Survey Validity: Survey validity refers to measuring whether the survey questions measure what they are intended to measure, in order to ensure the scale's ability to accurately measure what is supposed to be measured. This was calculated by finding the square root of Cronbach's Alpha Coefficient, as shown in Table (4.1).
- c. Survey Reliability: Survey reliability refers to the stability of the survey results and their lack of significant change if redistributed to sample individual's multiple times over specific time periods under the same conditions. The researcher verified the survey's reliability through Cronbach's Alpha Coefficient, as shown in Table (4.1).

Table 4.1: Cronbach's Alpha Coefficient.

Sections	Cronbach's Alpha	N of Items
The role of furniture, light source, and color in small dwelling	.508	10
Materials to be used in small dwelling construction	.490	5
The psychological impact of living in small dwellings	.493	5
The designs that people would like to have in their dwellings.	.696	16
All sections	0.602	36

- a. It is evident from the table that the value of Cronbach's Alpha for the survey statements, which numbered 36, was 0.602.
- b. This indicates a low level of survey reliability, which may be attributed to the lack of clarity in some statements and differences in responses among some sample individuals.

4.3 STATISTICAL METHODS (DESCRIPTIVE STATISTICS) USED IN THE STUDY

After reviewing the survey forms, the researcher encoded the data and entered the answers into the computer using the statistical program (SPSS). Some statistical tests were used in this research such as:

- i. Percentages and frequencies were used to analyze the personal variables of the research sample.
 - ii. Means and standard deviations.
 - iii. Person correlations
 - iv. One-sample t-test was conducted to determine the significance of the difference in the sample mean towards the independent and dependent variables of the study from the midpoint of a Likert scale (3), representing the neutral response.
- a. Describing the characteristics of the study sample according to the gender variable
- It is evident from Figure (4.1) that the majority of the selected sample for the study are females, accounting for 56% of the total sample size of 115 individuals, while the lesser proportion in the sample was males, accounting for 44%.

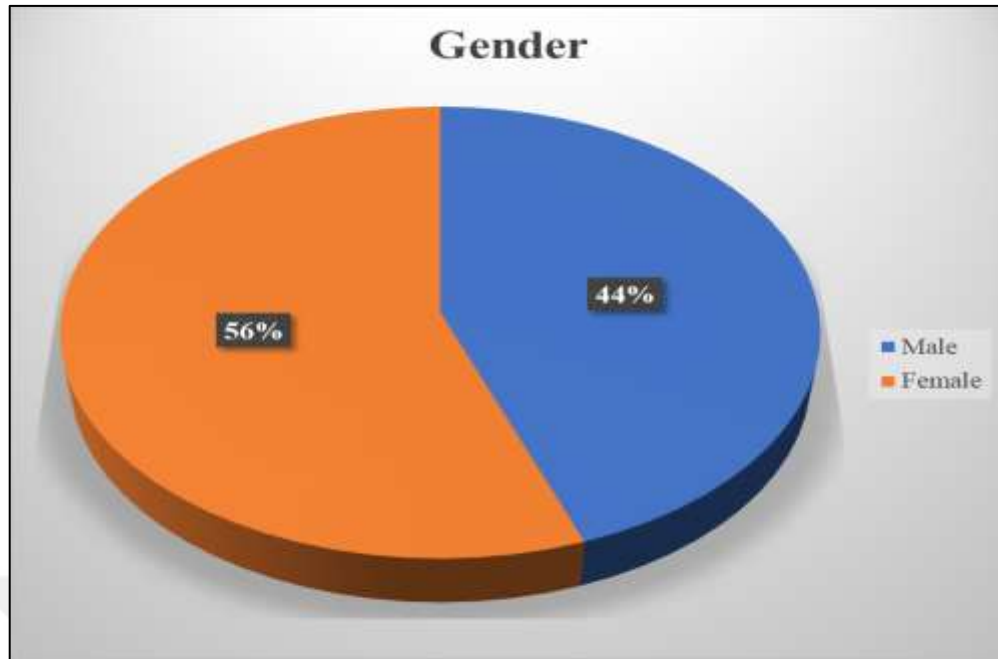


Figure 4.1: Describing the Characteristics of the Study Sample According to The Gender Variable.

b. Describing the characteristics of the study sample according to the age variable

The data in Figure (4.2) reveals that the largest segment of the study sample falls within the 30-40 age range, making up 62% of the total 115 individuals. In contrast, only 5% of the sample are above 50 years old, while 33% are between the ages of 22 and 30.

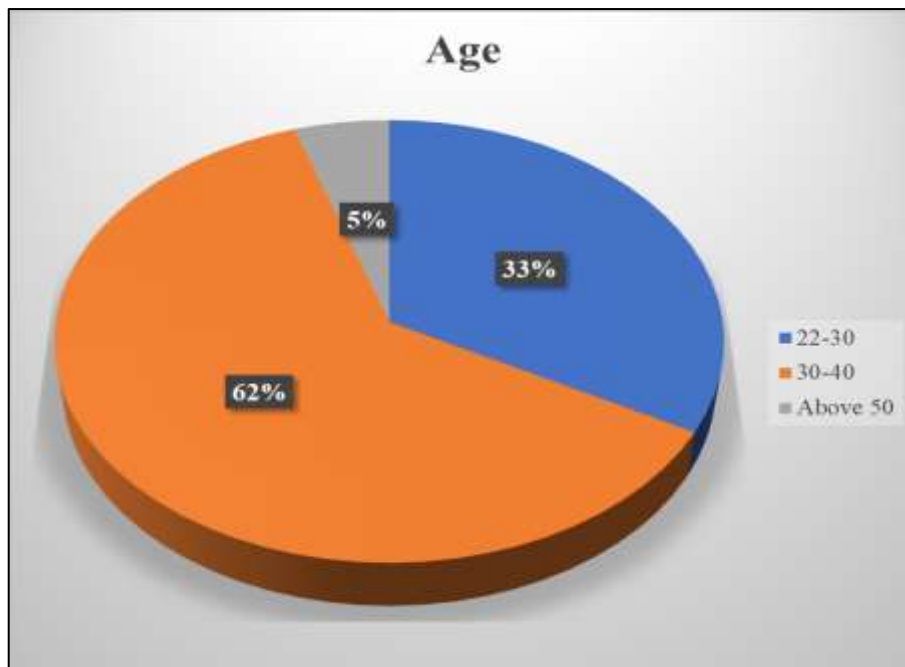


Figure 4.2: Describing the Characteristics of the Study Sample According to the Age Variable.

c. Describing the characteristics of the study sample according to the position variable

The information presented in figure (4.3) indicates that the majority of the study sample belongs to the "other positions" category, comprising 41.73% of the total 115 individuals. In contrast, only 6% of the sample are categorized as Head Department, while 25.21% are Senior Engineers, 16.52% are Junior Engineers, and 10.43% are Managers.

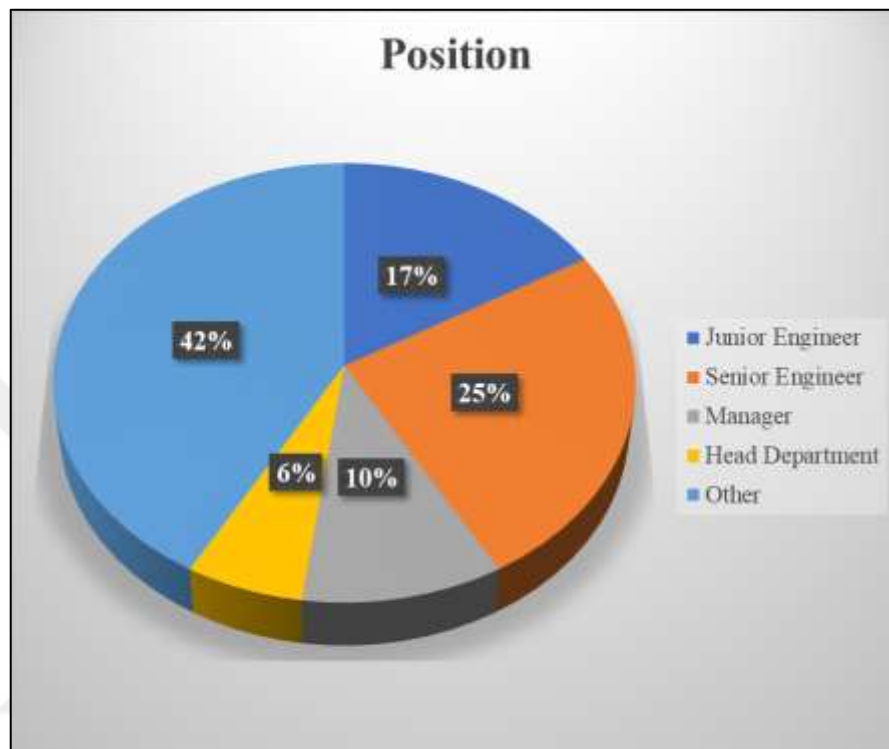


Figure 4.3: Describing the Characteristics of the Study Sample According to the Position Variable.

d. Describing the characteristics of the study sample according to the Experience in Architectural Engineering variable

The information presented in figure (4.4) indicates that the majority of the study sample belongs to the "Have no experience" category, comprising 49.56% of the total 115 individuals. In contrast, only 20% of the sample are categorized as 1:5 years, while 12.17% are Above 10 years, 9.56% are 6:10 years, and 8.69% are Recently Employed.

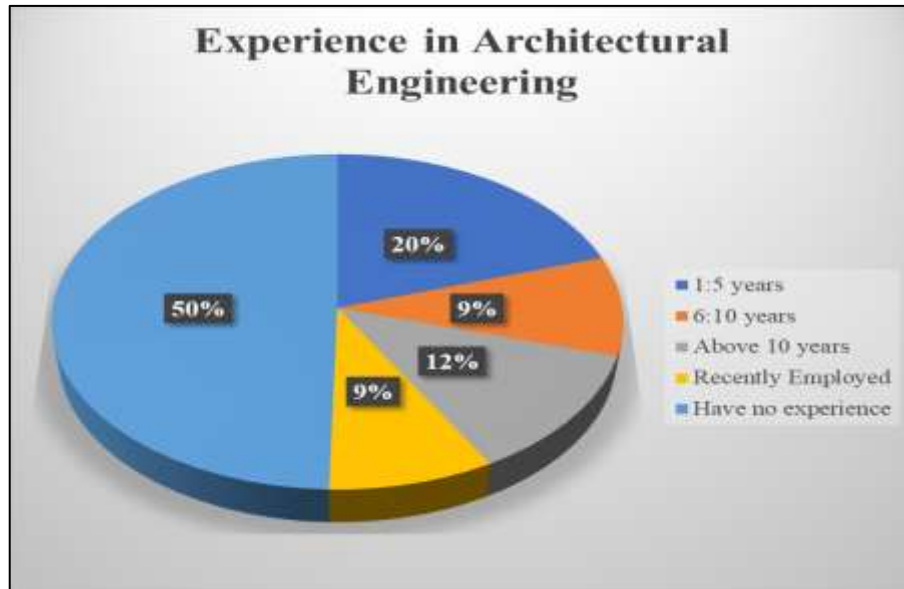


Figure 4.4: Describing the Characteristics of the Study Sample According to the Experience in Architectural Engineering Variable.

e. Describing the characteristics of the study sample according to the Education Level variable.

The information presented in figure (4.5) indicates that the majority of the study sample belongs to the "Graduate Degree (Masters, Ph.D.)" category, comprising 55.65% of the total 115 individuals. In contrast, only 33.04% of the sample are categorized as Bachelor's Degree, while 6.08% are High School Diploma and 5.21% are (Other levels) category.

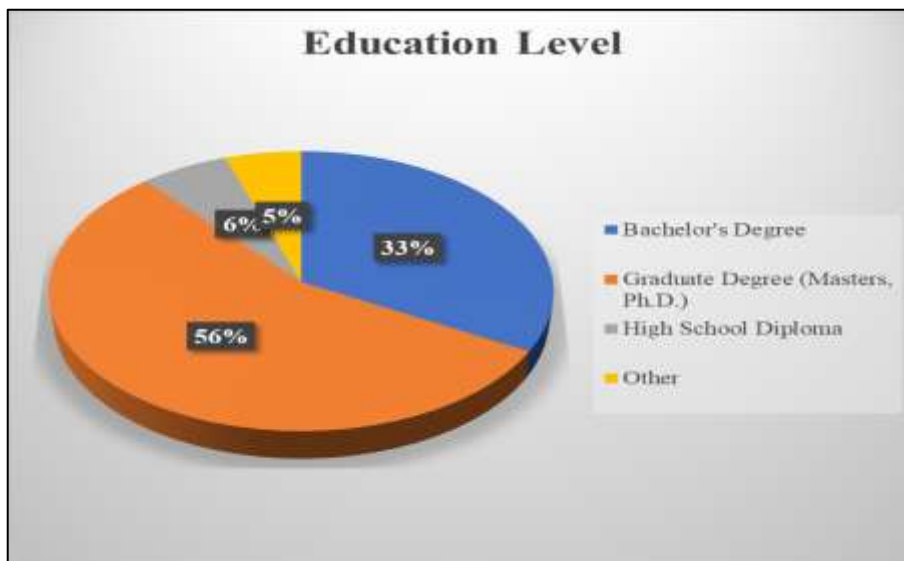


Figure 4.5: Describing the Characteristics of The Study Sample According to the Education Level Variable.

f. Describing the characteristics of the study sample according to People who have participated in the design of small dwellings variable.

It is clear from figure (4.6) that the majority of the study sample did not participate in the design of small dwellings, representing 52.17% of the total sample size of 115 individuals. In contrast, a smaller proportion of the sample participated in the design of small dwellings, accounting for 47.82%.

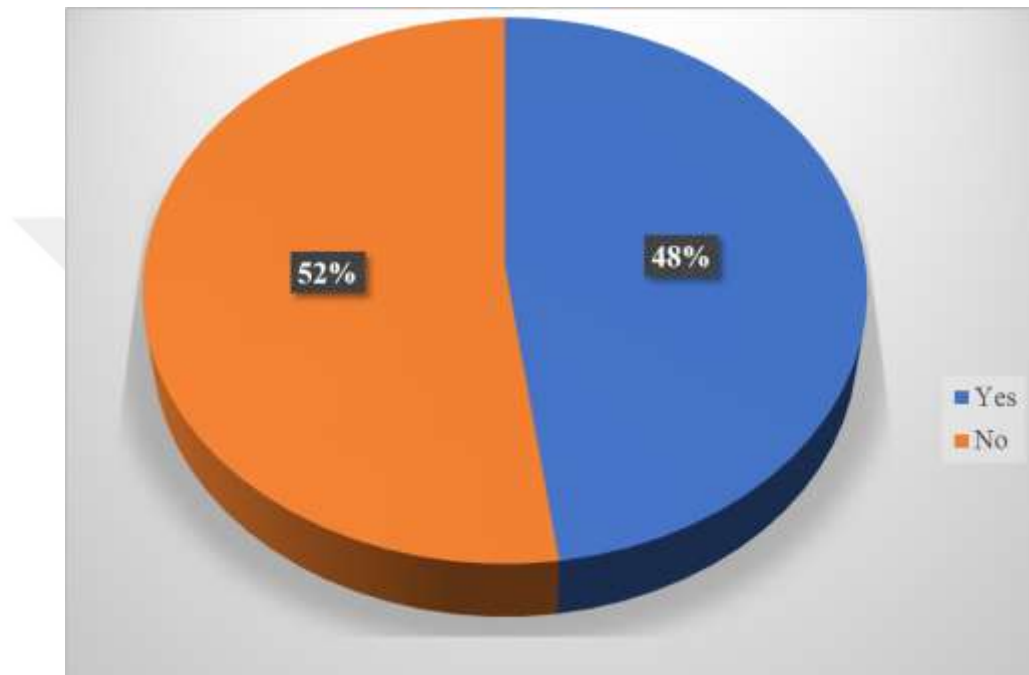


Figure 4.6: Describing the Characteristics of the Study Sample According to People Who Have Participated in the Design of Small Dwellings Variable.

g. Describing the characteristics of the study sample according to People who have experienced with living in small dwellings variable.

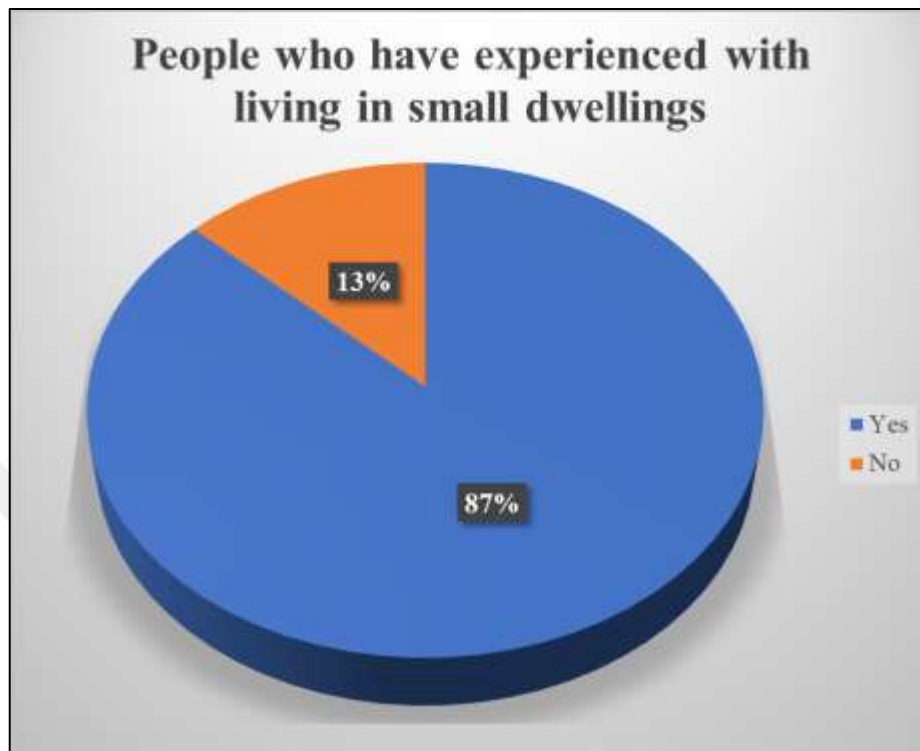


Figure 4.7: Describing the Characteristics of the Study Sample According to People who have Experienced with Living in Small Dwellings Variable.

5. CASE STUDY

5.1 INTRODUCTION

The popularity of “tiny houses” has significantly increased in recent years. This can be attributed to the rising prices of land and housing all over the world, as well as the growing emphasis on the preservation of the environment. In addition to offering people the possibility to embrace a more straightforward way of life, compact housing offers practical solutions to a variety of problems, including overcrowding, excessive environmental impact, and resource waste management. One definition of a “tiny house” describes it as a dwelling that is compact and has a relatively small footprint. There are even some examples of tiny houses that are quite small. Because of the limited area available, recycled materials are frequently used in buildings. This helps to save money and reduces the amount of damage done to the environment. Designs should thus be able to incorporate efficiency as much as possible to use up the little space that is available. Compromising features such as under-stairs cupboards, loft beds, foldable beds, extendable kitchen benches, and other similar features may serve the end of this effort [53].

Given that housing is one of the most basic human habitation needs apart from food, drink, and clothing, the demand has increased in Iraq for a while. A variety of reasons have caused this increased demand in housing, including migration, changing trends for culture and lifestyle, and the growing number of individuals, particularly in the capital, Baghdad. Living conditions in Iraq have become very difficult due to several complex factors and issues. Besides, the generalizing of the tiny house idea and how space is allocated has become visible [54].

This section will provide a comprehensive examination of a case study related to a house located in the New Baghdad neighborhood in Baghdad Governorate. This house is considered an example of the nature of small houses that have begun to spread recently. Through the analysis of this house, it was found that it is not suitable to accommodate the family that occupies it, which consists of five individuals. Due to several reasons, the first of which is the incorrect exploitation of spaces in terms of furnishing, materials used in finishing, colors, lighting, failure to exploit internal skylights properly, and failure to exploit effective and appropriate storage solutions for such spaces.

Illustrations will be showcased for the following components: Interior plan final model, Entrance, sitting room, Bedroom, Kitchen, Stairs and Storeroom.

The analysis of each image will focus on the effective utilization of geometric points in the house design to maximize space and achieve the concept of small houses. Besides, the evaluation will identify any deficiencies in the engineering design that hinder the optimal implementation of the small house idea. Finally, the analysis will propose suitable engineering solutions to address these design gaps.

5.2 CASE STUDY: A TINY HOUSE IN THE NEW BAGHDAD NEIGHBORHOOD

Iraqi cities have witnessed during the past two decades, especially Baghdad. A growing housing crisis as a result of rapid population growth, internal migration, and the slow implementation of housing projects. This led to an increase in demand for existing homes and a reduction in the area of residential units. Small house designs became popular as homeowners began subdividing and selling their properties, often for financial reasons. In some cases, families resort to dividing the house to meet the needs of their children and their growing families to provide them with independent housing without having to buy a new home [55].

The houses, which were originally between 200 and 400 square meters in size, were divided into smaller units of no more than 50 and 70 square metres. The common design of elongated residential units (extended dwelling type) has become a design that depends on the sequence of spaces from the general sequence to the private sequence [55].



Figure 5.1: The Phenomenon of House Division [55].

The proposed house is located in the New Baghdad area (which is located in the southeastern part of the city of Baghdad, on the Rusafa side). It is considered one of the densely populated residential areas, and the New Baghdad area is characterized by being a mixture of religions and sects, as it is inhabited by Muslims in addition to a large percentage of Christians.

The total area of the house is 352 m². The house was divided into three houses, the first with an area of 92 m², the second with an area of 160 m², and the third with an area of 100 m². The first house, which had an area of 92 square meters, was taken and analyzed.



Figure 5.2: Google Earth for Selected House.

The interior plan of the house shows the concept of multiple floors interconnected by internal stairs and supports the traditional concept of a separate floor plan that relies on walls to separate spaces from each other, which is considered preferable to some because it gives each space its own privacy and distinguished from the rest of the spaces, figure (5-3) shows the internal plan of the house.

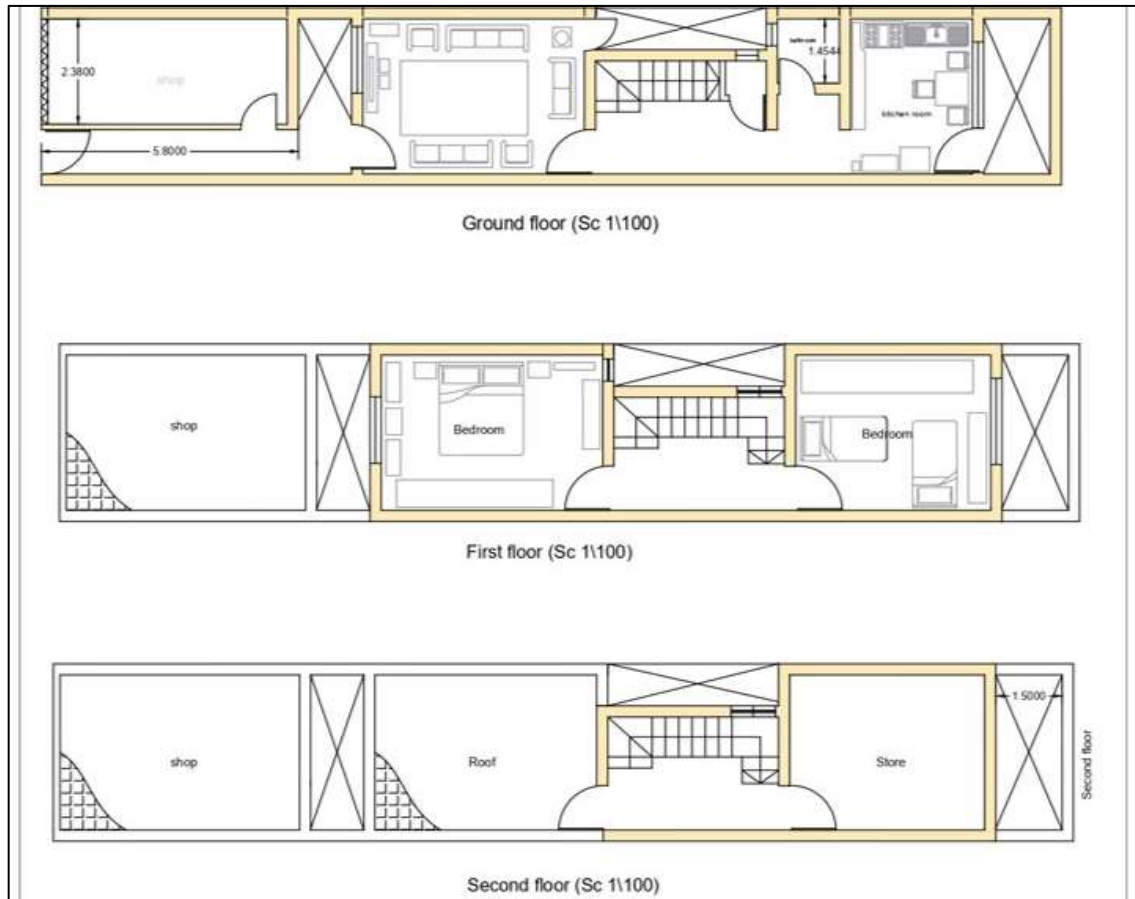


Figure 5.3: Interior Plan Model Before.

The plan underwent modifications to enhance space utilization, including relocating the door and incorporating an internal skylight for improved ventilation, optimized furniture arrangement, enhanced natural lighting, and suitable furniture selection, as depicted in the subsequent images.

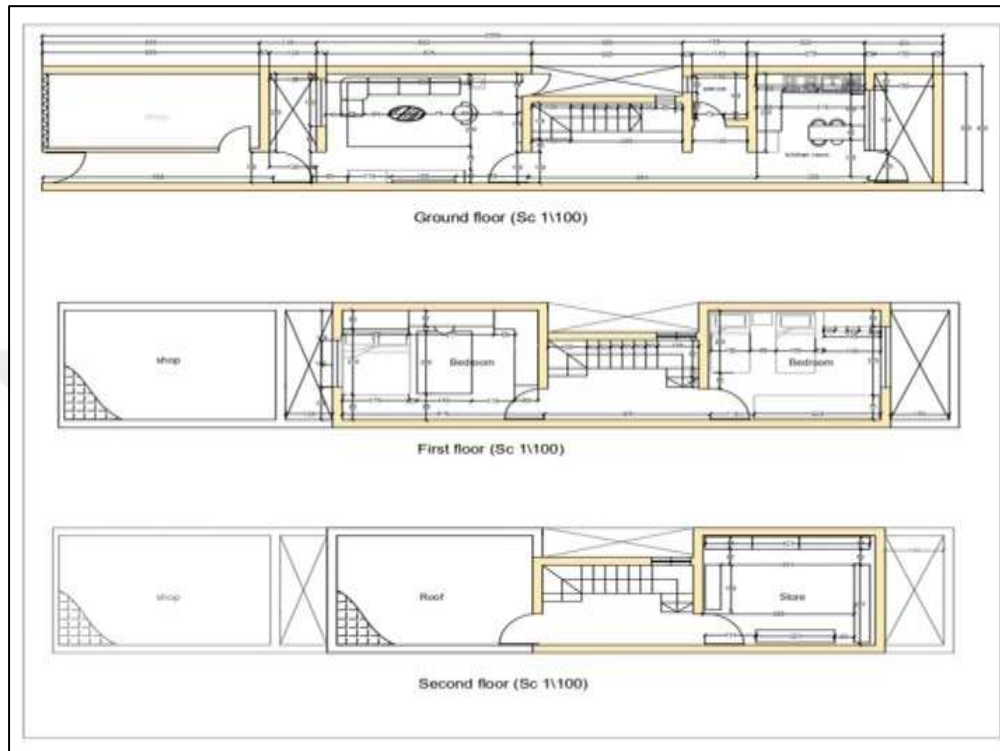


Figure 5.4: Interior Plan Model After.

Table 5.1: Details of Selected House.

Location	The New Baghdad neighborhood of the Baghdad Governorate in Iraq
Floors	3
Floors components	Ground Floor • Siting room • Kitchen First Floor • 2 Bedrooms Second Floor • Roof • Store
Total area	194.6 square meters
Area Ground	76 square meters (W.S.= 92)

a. Building materials used in hot climates

The extreme climate has a direct impact on the choice of building techniques and materials. Building materials can typically be categorized into two types: artificial and natural sources. Natural materials, such as timber or glass, are substances that are derived from living organisms or have undergone minimum processing. Artificial materials are produced in industrial zones through a series of human interventions, such as the manipulation of plastics and the use of petroleum-based paints. Both of these materials have specific uses and applications. The most prevalent materials, aside from tents made from flexible materials such as linen or skins, are clay, stone, and fibrous vegetation. People worldwide used these three materials concurrently to construct buildings suitable for their specific climatic conditions. Indeed, in these structures, stone is utilized as the main load-bearing components, while mud serves as a type of concrete and insulation to cover the space between them. "Wattle and daub" refers to a basic construction technique commonly employed in places with tropical climates or by Indigenous northern individuals as summer dwellings. Modern buildings, such as those made of fabric membranes, can be constructed using a flexible material and supported by either internal air pressure or steel cables [50].

Material choices in a hot climate are both crucial to thermal comfort and energy efficiency. They have high thermal mass, like clay and mud bricks, that influences the temperature

indoors by absorption during the day and release at night. Some of the very elements, such as stone and concrete, will provide additional strength and insulation for the building, while others, like steel and aluminum, lighten the load of weight on the structure and hence cool the building. Reflective material in roofs allows less heat to be absorbed. Insulation in the panels carries out better thermal insulation. Some elements, such as bamboo or thatch, would work well in this regard because of their good insulating properties. Ultimately, the vented façades allow for airflow, hence efficiently cooling the building envelope. All of the above points, when considered in the construction of structures, shall lead to the construction of buildings that are friendly and efficient in their operations under high-temperature conditions [51].

Table 5.2: Wattle and Daub vs. Mud Building Materials [52].

Feature	Wattle and Daub	Mud
Definition	Composite technique involving woven wooden strips and mud mixture.	Natural material used for construction.
Composition	Wood, mud, clay, straw, cow dung.	Mud, straw, sometimes other materials.
Thermal Properties	Absorbs heat during the day, releases at night.	Excellent thermal insulation.
Sustainability	Locally sourced materials, biodegradable, recyclable.	Minimal processing, low carbon emissions.
Resilience	Shows resilience in seismic activity.	Can be used in various construction methods.

a. Processing of ceilings externally and internally

Ceilings play a crucial role in maintaining internal thermal equilibrium by absorbing sunlight that enters through the roof and transferring it to the interior spaces. Prioritizing the architectural aspect, the roof is designed to ensure thermal comfort. The initial stage of achieving thermal insulation involves the application of external insulation, which is crucial. In some cases, a double roof is employed, and insulating materials like fiberglass and light bricks are used to prevent heat absorption by the roof. In certain nations characterized by hot climates, pitched and gable roofs are employed as external architectural features for interior design. These roofs offer several advantages, such as the elevated height of the interior area, which facilitates the upward circulation of hot air. The expansion of the roof surface results

in the dispersion of sunlight intensity across a greater area, thereby decreasing the average rise in roof temperature. Additionally, the implementation of semi-cylindrical or vaulted ceilings aids in maximizing the duration of heat reduction during daylight hours. It enhances the airflow velocity over the curved surface, hence improving the cooling wind's efficiency in reducing its temperature [53].

Internal and external wall treatment

Improper selection of materials and inadequate insulation cause walls to be the primary source of heat transfer from the outside to the inside. By utilizing appropriate materials and effective insulators, it is possible to attain thermal comfort within a vacuum and minimize energy consumption from energy sources. Notably, foam and glass wool are renowned materials for thermal insulation. Additionally, polyurethane and polystyrene panels are commonly employed. Furthermore, implementing aluminum windows with insulation and sealing the openings around the frame using polythene prevents rain leakage and enhances resistance against wind and dust. For optimal results, double glazing is preferable as it contributes to superior insulation and reduces heat leakage through the window by 50%. In addition to considering the choice of appropriate curtain materials, they also contribute to the task of providing additional insulation.

The concept of incorporating nanotechnology into paints is rooted in the process of chemical vapors condensing to create a layer adhering to the base material. This layer provides a surface that possesses the necessary protection or unique functional characteristics, therefore maximizing the advantages of paints [53].

The properties that nano coatings provide to materials Nanotechnology exhibits several functional characteristics, including thermal properties (e.g., thermal insulation, heat resistance, protection against ultraviolet radiation), optical properties (e.g., anti-reflection prevalent in the solar cell industry), mechanical properties (e.g., scratch resistance of surfaces), and biological properties (e.g., resistance to bacteria and pollutants, as well as protection against corrosion or rust). There exist several categories of Tanno paints based on their intended application and the specific purpose of the sensors incorporated into them. For instance, thermal Nano-paints which are thermal paints that exhibit a color phase transition within the temperature range of 30 degrees Celsius to 31 degrees Celsius. Initially, the paint is chilly in color and gradually transitions to a warm hue as the temperature rises. And Nano

wood paint which is a wood surface treatment that can be applied to wooden walls. It is a versatile paint primarily formulated with salt water and specifically designed for water- and fat-resistant wooden surfaces. It also incorporates a high-density chemical layer that is highly compatible with wood fibers, offering robust protection against climatic, bacterial, and moisture conditions [53].

Floor treatment

The selection of floor materials for achieving ideal thermal comfort of the internal furnace is influenced by the specific environmental conditions, such as cold or hot, as well as the elevation of the building's design floor. For instance, if the interior design is on the ground floor, there is a high likelihood of heat escaping from the floors. To address this, the floors are initially insulated with bitumen and then further insulated with folk under the last layer. In cold temperature environments, wooden floors and meters of treated Cork or HDF are selected to provide warmth, while in hot environments, marble, porcelain, or ceramic floors are used [53].

Natural Materials

The utilization of natural materials in interior design is emerging as a progressively significant trend. The premise is that adopting a lifestyle that minimizes waste and prioritizes the conservation of nature should be our foremost concerns. Examples of natural materials include jute, wicker, rattan, wood, thread, cork, stone, bamboo, and various more. Naturally occurring materials, which require less processing, have a reduced carbon footprint and are cost-effective [54].

Marble

Marble is widely regarded as a very adaptable and long-lasting type of stone. It enhances the magnificence, opulence, and maintains a cool temperature within. It is the most lustrous gemstone that is obtainable at reasonable pricing [54].

Natural Fibers

Furniture upholstered with natural fibers, such as organic cotton or linen, is a commendable option. It enhances the aesthetic appeal and provides a higher level of comfort to the environment. Furthermore, they possess hypoallergenic properties and exhibit resistance against dust mites. For rugged and rustic interiors, high-end Reed furniture is a suitable

alternative. Reed furniture exhibits superior resistance to heat and moisture compared to conventional wooden furniture, resulting in low care requirements. Reed furniture is suitable for outdoor use [54].

b. The influence of the hot climate on the choice of building colors

The choice of building colors in hot areas has a large role to play in the control of heat absorption, hence improving indoor comfort. Lighter colors, especially whites and pastels, have found much favor because they reflect a substantial amount of sunlight, reducing heat absorption compared with darker shades. This reflecting characteristic helps keep indoor temperatures lower, reducing the need for air conditioning and decreasing energy use both for economic and environmental benefits. Additionally, surfaces of lighter colors also enhance thermal comfort by allowing significantly less heat accumulation in the structure. Aesthetically, such colors may further improve the appeal of structures by harmoniously providing good looks in sunny conditions. Light colors on building exteriors, in a hot climate, turn out to be a very effective measure that could balance energy efficiency, the well-being of tenants, and aesthetics.

In such hot areas, high thermal comfort can be offered by such lighter-colored surfaces. The effects include the production of an atmosphere that remains in a more pleasant temperature, hence minimizing mechanical cooling systems. These hues ensure that the indoor environment remains at a lower temperature that creates conditions for improved indoor air quality due to the low humidity levels. Due to better reflection, there will be less absorption of heat; therefore, electricity becomes less expensive, and the environment is subjected to less battery. Brighter colors can also give more visual value to a space aside from engaging one's mental health. On the other hand, stable temperatures indoors are a necessity for comfort in warm climates, and light-colored surfaces are a prerequisite for such temperatures [53].

Table 5.3: Influence of Building Colors in Hot Climates [53].

Feature	Lighter Colors	Darker Colors
Heat Absorption	Reflect sunlight, reducing heat absorption.	Absorb sunlight, increasing heat absorption.
Indoor Temperature	Keep indoor temperatures lower, reducing need for air conditioning.	Increase indoor temperatures, requiring more air conditioning.
Energy Efficiency	Decrease energy use for cooling.	Increase energy use for cooling.
Thermal Comfort	Enhance thermal comfort by allowing less heat accumulation.	Contribute to higher indoor temperatures.
Aesthetics	Harmoniously improve the appeal of structures in sunny conditions.	May appear darker and less appealing in hot climates.
Indoor Air Quality	Create conditions for improved indoor air quality due to low humidity levels.	May contribute to higher humidity levels and potential discomfort.
Environmental Impact	Reduce carbon emissions associated with air conditioning.	Increase carbon emissions associated with air conditioning.
Economic Benefits	Lower electricity costs.	Higher electricity costs.

Dark surfaces absorb and reflect heat little and therefore heat up quickly, unlike light surfaces that reflect the sun's heat and therefore are less hot. Heat is also transmitted in the form of electromagnetic radiation (radiation) and is transmitted from a hotter body to a less hot body through a vacuum or through any transparent medium such as air or glass. The emissivity of a body is the ratio of the radiation emitted from it to the radiation emitted by a black body at the same temperature. Since the absorptivity of many materials for long waves differs from their absorptivity for short waves, we find a difference in the absorptivity of bodies from their emissivity. For example, buildings painted white have an absorptivity ranging between (10-30%) while their emissivity ranges between (80-90%), while this big difference does not appear in the absorptivity of shiny aluminum cladding used in wrapping buildings, for example, and so on.

Table 5.4: Shows the (Absorption) and (Emissivity) Coefficients for Some Finishing Materials and Different Paint Colors.

Material Finish	absorption	emissivity
Aluminium Foil polished	0.05	0.5
Galvanized Steel, bright	0.25	0.25
Whitewash. New	0.15-0.20	0.9
White. Dirty	0.3-0.35	0.9
Gray, green, brown, light colors	0.4-0.5	0.9
Black colors	0.7-0.8	0.9
Ordinary black paint	0.85-0.9	0.9
Cream brick. tile or plaster	0.3-0.5	0.85-0.95
Yellow or buff stone or plaster	0.5-0.7	0.85-0.95
Red brick stone or tile	0.65-0.8	0.85-0.95
Concrete tile	0.45-0.65	0.85-0.95
Glass	Transparent	0.85-0.95

5.3 REDESIGN OF INTERIOR DESIGN

5.3.1 Entrance

The main entrance of the house is the main facade that distinguishes the owners of the house and leaves a first impression on the guests. In small house, the entrance area is small, so some things must be considered:

- There is sufficient lighting at the entrance to the house.
- The trend is towards light colors instead of dark colors.
- Relying on small decorations Relying on the walls to coordinate hanging decorations more than placed ones.
- Using mirrors as an essential element, as they play a major role in reflecting light, gives a sense of spaciousness to the place.

In the proposed house, the entrance is a narrow corridor that does not give the impression of a defined entrance to the house. It lacks proper lighting. The arrangement of plants appears randomly with no use of the side walls. so, several suggestions can be made to achieve optimal use of space, such as:

Table 5.5: Entrance Makeover Interventions.

Intervention	Description	Purpose
Artificial Lighting	Increased use of spotlights and side lights	Improved lighting due to lack of natural light
Change colors	Use light colors and wallpaper	Choose light colors to give a feeling of spaciousness, using the colored gradient on the wall to break the feeling of continuity. The carpet defines the entrance in a light color with small decorations, and a plate on the wall.
Plants and Mirror	Added plants and long side mirror to the entrance	Plants add a sense of comfort, and adding a mirror helps create a sense of space



Figure 5.5: Entrance Before.



Figure 5.6: Entrance After.

5.3.2 Sitting Room

The first part of the house is the living room, which overlooks an internal courtyard that has not been properly used. The use of a dark-colored curtain that blocks the sun's rays and the small size of the window led to complete reliance on artificial lighting, a lack of ventilation, and not using natural plants that are a source of oxygen, reduce stress and tension, and improve air quality. Naturally, this causes discomfort and a feeling of tightness, in addition to not using the existing furniture properly, as large furniture was used that takes up a lot of space and lacks storage. In addition, wall colors were not used to give the illusion of more space in the house. Hence, several suggestions can be made for this living room to achieve optimal use of space, such as:

Table 5.6: Sitting Room Makeover Interventions.

Intervention	Description	Purpose
Skylight Relocation	Moved skylight from outside to inside the house	Increase natural light and ventilation
Skylight Windows	Installed side windows in skylights	Ensure unobstructed views from the skylight to avoid the rain to go throw it
Plants	Added plants to the living room	Enhance oxygen levels, reduce stress, and improve air quality

Table 5.6: Sitting Room Makeover Interventions “Table Continued”.

Window Treatments	Implemented window treatments	Maximize natural light, improve outdoor views, and create illusion of a larger space
Corner Sofas	Replaced existing sofas with corner designs	Optimize space utilization and improve traffic flow
TV Placement	Repositioned TV to face the sofas	Create a more functional layout for watching TV
Storage Solutions	Added storage areas	Organize living room essentials
Artificial Lighting	Increased use of spotlights and side lights	Improve lighting due to limited natural light
Pre-owned Furniture Arrangement	Strategically arranged existing furniture	Minimize visual clutter and enhance balance
Hidden Storage	Utilized unused space within furniture, under stairs, etc.	Create additional storage without compromising space
Color Scheme (60-30-10 Rule)	Applied 60% main color (walls, carpets, sofas), 30% accent color (curtains, side chairs), and 10% pop of color (cushions, artwork)	Create a cohesive and visually appealing space
Add suitable curtains	Use light and light-colored curtains.	To reflect light and create the illusion of a larger, more airy space, use light-colored drapes. Select light-colored, translucent materials to let in natural light into the space. Hang curtains correctly, as they should be hung at a sufficient distance from the walls and floor to give the impression that the ceiling is higher, and the room is wider. Floor-to-ceiling curtains can create height illusions and heighten a small room, maximizing vertical space and creating a taller appearance.



Figure 5.7: Sitting Room Before.



Figure 5.8: Sitting Room After.

5.3.3 Stairs

Drawer space is underutilized. We notice the lack of organization in storing items and the difficulty of taking them out when needed, in addition to relying on a single lighting source, which causes a feeling of distress.

Table 5.7: Under-Stair Storage Intervention.

Intervention	Description	Purpose
Under-Stair Storage	Incorporated drawers, shelves, and a sliding door to create a functional storage unit	Maximize space utilization by utilizing the often-wasted space under the stairs. This provides additional storage for various items, promoting organization and a clutter-free living area.
Mirror	Added mirror	Use mirrors to give a feeling of space and openness
Artificial Lighting	Increased use of spotlights and side lights	Improved lighting due to lack of natural light



Figure 5.9: Stairs Before.



Figure 5.10: Stairs After.



Figure 5.11: Storge Stairs [59].

5.3.4 Kitchen

The kitchen is one of the most important spaces in any house, as it is necessary to spend a long time in it to prepare food. more than, the proposed kitchen includes a designated dining area. One of the most important problems that the kitchen was facing, was the lack of natural

lighting and complete reliance on artificial lighting, that is, not exploiting the inner courtyard next to it, in addition to relying on a single source of artificial lighting throughout the space and not using sufficient lighting above the areas of use. As for storage, we note that no elements that support this function are exploited (shelves, cabinets), and due to the selection of separate pieces and their random distribution, this leads to their inefficiency. Not relying on the concept of the triangle of movement (is a concept for kitchen design that describes how the sink, stove, and refrigerator are arranged in relation to one another. The concept is to employ triangles to design a practical and effective arrangement that facilitates the cook's movement between these three sections (, in addition to the fact that the materials used are not standardized, insufficient, and unsustainable.

This table provides a concise overview of the modifications made to the kitchen, specifically highlighting the installation of marble countertops and the efforts to optimize natural lighting, storage capacity, and functionality:

Table 5.8: Kitchen Makeover Interventions.

Intervention	Description	Purpose
Iron-FramedGlass Window	Added a window with iron frame overlooking the skylight	Increase natural light penetration and improve air quality
Removable Roof with Windows	Installed a removable roof with windows	Enhance natural light and provide ventilation
Plants	Incorporated greenery	Improving the psychological comfort of users and being a source of oxygen, which improves the quality of the space
Storage	Using upper cabinets (wall-mounted cabinets that provide useful storage space, cabinet drawers, which are the most used, using a marble kitchen table designed specifically for space and filled from the bottom with drawers on all sides instead of a traditional table	Organize essential items, Ease of access to materials and maintaining general order

Table 5.8: Kitchen Makeover Interventions “Table Continued”.

Marble Table with Built-in Drawers	Installed a functional and elegant table with marble top and drawers	Provide additional storage space and enhance aesthetics
Proper Distribution	Lighting	
	Implemented a multi-level lighting plan, providing lighting sources above important activities (the main place for preparing and cutting food, the kitchen sink, the dining table, hanging cabinets), and it is preferable to use white light appropriate for this function.	Ensure optimal functionality

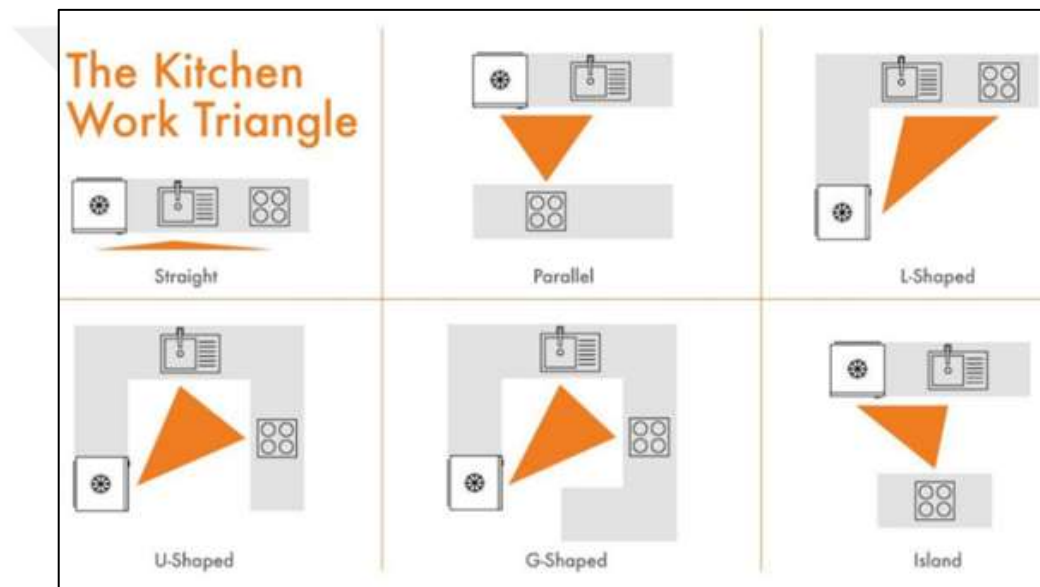


Figure 5.12: Kitchen Triangles Shapes [60].



Figure 5.13: Kitchen Before.



Figure 5.14: Kitchen After.



Figure 5.15: Kitchen Before from Other Position.



Figure 5.16: Kitchen After from Other Position.

5.3.5 Bedroom

The bedroom is one of the main spaces in the house, and its importance is no less than other spaces. The focus of this study is on several basic axes that led to the space not being designed and not being used properly. First: The furniture used is not suitable for the room's space in terms of size, color, and storage capacity, which leads to a chaotic accumulation of items, Color has a major impact on the general atmosphere, whether the color of the walls,

the floor, or the furniture used. Dark color creates a feeling of tightness and a feeling of small space. Lighting: Using dark curtains and not taking advantage of the window negatively affects the natural lighting of the place, in addition to using artificial lighting in an ill-considered way, which affects the aesthetic appearance of the room. Storage: No useful storage solutions were used which affected the overall arrangement of the bedroom.

Table 5.9: Bedroom Makeover Interventions.

Intervention	Description	Purpose
Light Color Palette	Used light colors like white, light grey, etc. on walls and furniture	Expand the visual field, enhance light reflection, and create a more spacious feel
Maximizing Wall Usage	Utilized walls horizontally and vertically	Optimize storage space
Storage Solutions		
	Cabinets	Installed cabinets for additional storage
	Hanging Shelves	Incorporated hanging shelves for versatile storage
	Worktable	it is used for study and contains cupboards for storage
	Attached Library	Added an attached library for additional storage and functionality
Mirrors	Strategically placed mirrors	Mirrors are essential for adding beauty, depth, and functionality to any space. They can make a room look larger and more elegant by spreading daylight. Mirrors also take up little space, allowing different sizes to be used to suit individual decor tastes
Furniture Selection	Opt for furniture with a slim profile and legs	Create a feeling of openness
Multifunctional Furniture	Consider furniture like ottomans with storage or beds with built-in drawers	Maximize storage and functionality
Decluttering	Minimize clutter by employing storage solutions and keeping surfaces clear	Enhance the feeling of spaciousness
Light-Colored Flooring	Use light-colored flooring	Contribute to the illusion of a larger space
Area Rugs (Light Colors)	Use area rugs in a similar color palette to define specific areas	Maintain visual openness while defining spaces
Light & Airy Window Treatments	Choose light curtains or blinds to allow natural light	Enhance brightness and spaciousness



Figure 5.17: Bedroom Before.



Figure 5.18: Bedroom After.

5.3.6 Store

It is disorganized and messy in the sense that there are unused cabinets and shelves at the store. It can be reused if only it is properly organized.



Figure 5.19: Store Before.



Figure 5.20: Store After [61].

Thus, the paper reports that tiny houses are becoming very popular, especially based on increased demands for housing in Iraq. This paper is about a house in the New Baghdad area that was converted into a smaller residential space to maximize the area. The study gives a detailed look at how geometric points such as under-stair storage and multifunctional furniture were used to maximize the area in the house. The research also focuses on the use of colors, furniture arrangement, and lighting in creating the effect of larger space in a small

house. Overall, this case study presents the key insights of engineering solutions towards the design and optimization of tiny houses.



6. CONCLUSION AND FUTURE WORK

6.1 CONCLUSION

This study is conducted to explain the principles of tiny houses and how their application in small dwellings may increase living comfort for the residents of Baghdad, who are suffering badly under the pressure of tight spaces. The research will be focused on adopting those principles in a way that enhances functionality, comfort, and sustainability in such homes to upgrade the lifestyles of occupants.

By carrying out such a study, the immediate beneficiaries would be people who are forced to reside in cluttered apartments of Baghdad, suffering from disorganisation and lost privacy, along with emotional anguish due to their living situation. The findings can also enlighten architects, city planners, and lawmakers concerning various design tactics that contribute to effective design and greener practices that can be carried out in the building of urban housing.

Tiny house design is crucial in the maximization of living conditions in small houses. Tiny house design can create the most out of the small space if the layout, storage solutions, and furniture for multifunction's are carefully planned. Other strategies, such as the use of natural lighting, inclusion of outdoor living areas, and maximization of vertical space, can help improve the functionality and comfort of a tiny house.

The concept of tiny house design in architecture, on the other hand, is viewed as a technique aimed at maximizing space and functionality in a compact dwelling. It strives for creative use of space, multifunctional furniture, and design strategies that enhance the notion of space and comfort. Designing a tiny house is a challenge to traditional architectural concepts of form; it challenges an architect to think creatively about utilizing every square foot. Tiny house design should include innovative ways of storing things and using vertical space to create a more efficient use of space without sacrificing aesthetics. This shift towards smaller living. In this regard, sustainable materials and energy-efficient systems should be integrated into the tiny house design. The other way these houses achieve sustainability is through natural light and ventilation, making the interior of the house much healthier for those occupants. Tiny house design reveals a growing urge to live more simply, efficiently, and environmentally.

This study comes at a time when there is a gap in the studies of applying tiny house design principles to already existing small dwellings in culturally specific contexts like Baghdad. Therefore, the research is aimed at looking into the challenges confronted by residents living in small Baghdad dwellings and how tiny house design principles might be adapted to improve their quality of life.

The hypotheses that were formulated by this research regarding tiny house design and its importance as an architectural element are as follows:

- a. Tiny house design principles can be adapted to improve small dwellings in Baghdad to be more functional and more livable.
- b. Using light, color, and furniture strategically, one can create an illusion of spaciousness in small spaces.

In the research methodology, the researcher based his study on previous papers on tiny house design and interior design for small spaces. A survey was done in which questionnaires were given out to residents of small dwellings in Baghdad. This was done to collect data on the challenges and individual preferences of those who dwell in small spaces, together with their opinions regarding tiny house designs.

The study found that there are some factors that determine the relation between the design of tiny houses and make them more environmentally efficient. These factors include:

- a. Sustainability: Design in a tiny house can lead to sustainable practices through efficient use of materials and resources.
- b. Aesthetics: Principles in design for a tiny house can be used to create a comfortable and pleasant dwelling.
- c. Space optimization: Principles in design for a tiny house help architects optimize the use of space in small dwellings.
- d. Functionality: The design of a tiny house features multifunctional furniture and flexible spaces to meet residents' requirements.

As for improving the efficiency of the small house, the opinions, and answers of the responses in Baghdad, showed that tiny house design principles can be effectively applied in Baghdad, considering some factors:

- a. Natural light: Maximizing natural light was seen as crucial for improving the feeling of spaciousness.

- b. Storage Furniture: Participants found that using the appropriate size of storage furniture enhances the appearance of the space, resolves clutter, and enhances functionality by effectively arranging furniture within the space.
- c. Colors: Light and harmonious colors play a major role in creating a visual impression to enlarge small spaces, as they help make small spaces appear more spacious.
- d. Privacy: Design should find ways to address privacy concerns in small dwellings.
- e. Cost-effectiveness: The respondents indicated the use of cheap and locally available materials.
- f. Storage solutions: The respondents indicated the need for efficient and well-integrated storage solutions.
- g. Flexibility: The occupants wanted flexible space to accommodate various activities.

Relationship between design features and space use in tiny houses according to the perception of the respondents:

- a. Furniture arrangement: The mean for this item was 2.957, which shows that residents are very much inclined to agree on the importance and impact of the method of arranging furniture within a small space on enhancing the feeling of functionality and organization.
- b. The problem of clutter: Participants strongly agreed on the necessity of using multi-functional and storage furniture to solve the problem of clutter in a small house, with an average value of 2.939. This shows the importance of choosing the appropriate type of furniture for the space.
- c. Sustainability Considerations: The residents' responses over agreement to the availability of sustainable materials stood at a mean of 3.078, while considering the environmental impact stood at a mean of 2.887. This gives them a desire for dwellings that minimize their ecological footprint and recognizes that in the long term, sustainable materials may be cost-effective and durable.
- d. Combination of living spaces: From the results of the survey, there is strong agreement, mean = 2.948, for the combination of a living room, bathroom, and kitchen space. This would seem to reflect a desire to make the most of often limited square footage by creating multi-functional areas that open a sense of spaciousness and perhaps encourage social interaction.

In Iraq, the housing crisis has worsened as a result of rapid population growth over the past two decades, as the high demand for housing and internal migration led to the division of the housing unit into two or sometimes three sections. These small designs have become popular recently, in addition to the trend towards using Recycled materials in construction. Depending on the nature of the space, therefore, a case study of a house in the New Baghdad neighborhood of Baghdad Governorate in Iraq illustrates the use of geometric points in the design of the house to maximize the space and achieve the concept of small houses. Some results were obtained that can be applied to small homes, such as:

- a. Stairs in compact houses are an excellent strategy to optimize the utilization of restricted space, offering a secure and effective means of reaching the loft or sleeping area while minimizing floor space. They also provide additional storage space beneath them, enhancing the opulence of the interior design.
- b. Color plays a crucial role in design, especially in small house, where the atmosphere can be visually enhanced. Employing light and neutral hues on walls, ceilings, and floors can create an illusion of increased brightness and spaciousness. Bright and vibrant colors strategically delineate distinct zones within the area, avoiding overcrowding.
- c. Furniture is an essential component of apartments, occupying a significant portion of the floor space. Arranging furniture strategically can create visual illusions that make a space appear larger than its actual size. Multifunctional furniture, such as space-saving furniture, transformable furnishings, and multipurpose furniture, are excellent for making the most of limited spaces.
- d. Lighting has a significant impact on interior design, with natural light increasing perceived spaciousness, improves the quality of space, and a combination of natural and adjustable artificial lighting being preferred. Artificial light improves clarity and perception of detail, and layered lighting with ambient and accent lighting can create a more ordered feel. Designers should consider the combined effects of natural and artificial lighting on various aspects of a space, including spaciousness, privacy, clarity, and orderliness. Also Focusing on user experience and how lighting can enhance the overall functionality and mood of the space has a big impact.

The case study discusses the design of a small house in the New Baghdad neighborhood, with a focus on space optimization. Some treatments were made to maximize natural light, improve exterior views, and create the illusion of more space. The treatments begin with the

entrance, where the entrance was defined using light colors with the use of color gradation to break the feeling of continuity, adding a mirror to give a sense of space, and adding plants to improve the general atmosphere. Next, the living room was redesigned by enlarging and framing the window, using the right curtains in color and size, using corner sofas, and placing the TV on the opposite side. This is about rearranging the furniture to suit the size of the space and the flow of movement within it, focusing on using hidden storage in furniture or side libraries, and relying on the color scheme (60-30-10 rule) to create a cohesive and visually attractive space. Artificial lighting is also designed to suit the dimensions of the space and the functions it requires.

The kitchen has been redesigned. An iron-framed glass window and a removable roof with windows were used to ensure the entry of a large amount of sunlight and natural air, and plants were placed to improve the psychological comfort of users and to be a source of oxygen, which improves the quality of the space. For storage, upper cabinets were used. Wall-mounted cabinets, which provide useful storage space, and cabinet drawers, which are the most used, and the use of a marble kitchen table specially designed for the space and filled from the bottom with drawers on all sides instead of the traditional table. Regarding lighting, artificial lighting was placed above important activities (food preparation, eating, and storage of supplies).

The bedroom was also redesigned using a light color palette to enhance light reflection and expand the visual field while maximizing the use of the wall, wardrobes, hanging shelves and attached library. Using Mirrors are important to add depth, beauty and function to a space. It can make a room appear larger by diffusing daylight. Use a selection of furniture, such as a wardrobe, multi-functional furniture, and light-colored curtains that allow natural light to pass through. This study provides insight into how to design and improve small homes, especially considering the increasing demand for housing in Iraq.

In conclusion, this study provided readers with an understanding of the plight of residents of small dwellings in Baghdad and suggested ways to optimize space to improve living conditions. This research uses survey research and data analysis to collect information about participants' experiences and perceptions. The study found that participants faced difficulties in small dwellings, such as lack of space, chaos, disorganization, and lack of privacy, and the resulting negative effects on the Psychological health of the residents, such as feelings

of distress, depression, and increased levels of depression. From stress. In addition to low levels of creativity and productivity. This study looked at existing interiors and found interest in mobile tiny homes and flexible use of space. It also discussed interior design interventions in terms of the use of stairs, color schemes, furniture arrangement, lighting, and light interventions in maximizing space. In addition, a case study was designed that gives specific design solutions for a small house in Baghdad. This study adds to the fields of urban planning, cultural studies, and interior design, especially towards developing housing and urban development policies and sustainable practices.

6.2 RECOMMENDATIONS

- a. Carry out a comprehensive survey to understand the challenges faced by individuals living in compact homes.
- b. Conduct interviews or focus groups to gain deeper insights into their experiences.
- c. Investigate cultural and sociological factors influencing the creation and usage of compact homes.
- d. Analyze the economic implications of compact homes, including cost-effectiveness, financial viability, and financing alternatives.
- e. Examine the ecological impacts of compact homes and explore sustainable design solutions.
- f. Prioritize the execution and assessment of design modifications in compact homes.
- g. Collaborate with architects, designers, and politicians to create and evaluate innovative design solutions.
- h. Enhance the well-being and living conditions of Baghdad citizens by addressing their challenges and developing culturally sensitive and sustainable design solutions.

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Dr. Ghada Moussa rizouki and Dr. Amna Basem: the phenomenon of the division and transformation of the single dwelling in Baghdad after 2003. (September 2017)

APPENDIX A

QUESTIONNAIRE

**OPTIMIZING SPACE EFFICIENCY IN SMALL DWELLINGS: A STUDY OF
INTERIOR DESIGN STRATEGIES AND SOLUTIONS - CASE STUDY IN
BAGHDAD, IRAQ**

Dear Participants,

You are welcome to take part in this study by responding to the following questionnaire. The survey's main objective is to determine the particular difficulties experienced by Baghdad inhabitants who live in small dwellings. It also tends to evaluate of the suitability of current interior design techniques used throughout the world to maximize space efficiency in small dwellings and the analysis of their application in the Baghdad.

In order to achieve these objectives, the questionnaire is divided into two main sections. The first section concerns with collecting some demographic data about the respondents. The second section concerns with collecting the respondents' opinions about the difficulties in living in small dwellings, materials to be used in small dwelling construction, the psychological impact of living in small dwellings, and the designs that people would like to have in their dwellings.

The following survey should take approximately 5 to 10 minutes to be completed. I appreciate you taking the time to help me with this study. You are under no obligation to respond to any of the questions, but doing so will help me finish my research and improve my understanding of this research focus. The information gathered will be kept private and used only for academic research.

Once again, I greatly appreciate your cooperation.

Name*

Section 1: Please give the following general information about yourself before participating in this questionnaire:

Age				
22:30	31:40	41:50	Above 50	
Gender				
Male		Female		
Position				
Manager	Head Department	Senior Engineer	Junior Engineer	Other
Experience in Architectural Engineering				
Recently Employed	1:5 years	6:10 years	Above 10 years	Have no experience
Education Level				
High School Diploma	Bachelor's Degree	Graduate Degree (Masters, Ph.D.)	Other	
Have you experienced with living in small dwellings?				
Yes		No		
Have you ever participated in the design of small dwellings?				
Yes		No		

Section 2: Please tick ✓ appropriately to indicate the extent to which you agree or disagree with the following statements.

Questions		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The role of furniture, light source, and color in small dwelling						
1	The problem of clutter in a small house is effectively solved by using storage furniture.					
2	Choosing furniture that is appropriate for the size of the space makes the space appear more spacious and harmonious.					
3	The way furniture is arranged within a space affects the flow of movement and enhances the feeling of functionality.					
4	The color of the furniture used affects the size of the space.					
5	Using natural lighting such as large windows, a transparent ceiling, or glass doors can make a small space appear larger and brighter.					
6	The use of different sources of artificial lighting creates an exciting and attractive effect in small spaces					
7	Paying attention to coordinating lighting colors with the overall décor of the space can enhance harmony and overall aesthetics in small spaces					
8	Colors play a big role in creating a visual impression to enlarge or reduce small spaces					

9	Light colors help make small spaces appear more spacious.					
10	The use of color and its gradations in small spaces helps create an attractive effect of depth and dimension					
Materials to achieve sustainability in small dwellings in Baghdad						
11	Small dwellings are built up with fewer resources and energies.					
12	Small dwellings with sustainable materials are more affordable and come with lower household costs.					
13	Sustainable materials are available in Baghdad.					
14	In Baghdad, people concern with the environmental impact of the materials used in the construction of their dwellings.					
15	The long-term advantages of sustainable materials (in terms of energy efficiency and durability), will compensate for the high initial cost. (Low Return on Investment).					
The psychological impact of living in small dwellings						
16	People feel more sociable while living in small dwellings.					
17	Small dwelling's inhabitants have some feelings of restriction and annoyance.					
18	People feel unsecure while living in small dwellings.					

19	Small dwelling's inhabitants experience some difficulties in regards to privacy and individual space.					
20	Development clear protocols among neighbors in small dwellings, is common in Baghdad.					
Evaluation of the current interior designs as to be implemented in Baghdad						
As an inhabitant or a designer of a small dwelling in Baghdad, how could you rate the implementation of such designs:						
21	The idea of having mobile tiny houses					
22	Achieving flexibility-based on switching the use of their own homes' rooms					
23	The reuse of the existing spaces for new activities					
24	Performance of the open plan system found in the home's spaces					
25	Existence of a multi-use space in the dwelling					
26	The ability of adaptation processes of the dwelling without impacting the construction structure, basic materials, and services' location					
27	Expansion within the internal spaces' boundaries of the dwelling					
28	Expansion based on merging the exterior space[s] into the dwelling					
29	Increasing the height of spaces and rooms					
30	Natural lighting (Large windows)					

31	Multi-use furniture and spaces					
32	Interior design: A living room + Kitchen + Bathroom					
33	Interior design: the kitchen and living room are in the same room					
34	Interior design: the bathroom and living room are in the same room					
35	Interior design: the bathroom, the living room, and the kitchen are in the same room					
36	The use of dynamic furniture such like murphy bed, expanding table, staircase, and micro kitchen					

Thanks for your participation.

APPENDIX B

INTERNAL CONSISTENCY RELIABILITY

The researcher assessed the internal consistency reliability of the questionnaire by calculating the Pearson's Correlation Coefficient to examine the correlation of each item in the questionnaire with the total score of the dimension to which it belongs. The following tables demonstrate the internal consistency reliability of the research instrument.

- a. Internal consistency reliability of the first dimension: The role of furniture, light source, and color in small dwelling.



Table B.1: Internal Consistency Reliability of the First Dimension.

Dimensions	Pearson Correlation	Sig. (2-tailed)	N
The problem of clutter in a small house is effectively solved by using storage furniture	.460**	.000	115
Choosing furniture that is appropriate for the size of the space makes the space appear more spacious and harmonious.	.308**	.001	115
The way furniture is arranged within a space affects the flow of movement and enhances the feeling of functionality.	.408**	.000	115
The color of the furniture used affects the size of the space.	.410**	.000	115
The Using natural lighting such as large windows, a transparent ceiling, or glass doors can make a small space appear larger and brighter legal status of many tiny houses makes them a risky investment.	.552**	.000	115
The use of different sources of artificial lighting creates an exciting and attractive effect in small spaces	.423**	.000	115
Paying attention to coordinating lighting colors with the overall décor of the space can enhance harmony and overall aesthetics in small spaces	.510**	.000	115
Colors play a big role in creating a visual impression to enlarge or reduce small spaces	.367**	.000	115
Light colors help make small spaces appear more spacious	.392**	.000	115
The use of color and its gradations in small spaces helps create an attractive effect of depth and dimension	.492**	.000	115

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table (4.2) shows that the correlation coefficients between each item of the first dimension, The role of furniture, light source, and color in small dwelling., and the total score are positive and statistically significant at a level of significance of 0.5 or less.

The correlation coefficients ranged from 0.308 as a minimum to 0.552 as a maximum, indicating the presence of internal consistency reliability in the items of this dimension and their suitability for measuring what they were designed to measure.

- b. Internal consistency reliability of the second dimension: Materials to achieve sustainability in small dwellings in Baghdad.

Table B.2: Internal Consistency Reliability of the Second Dimension.

Dimensions	Pearson Correlation	Sig. (2-tailed)	N
Small dwellings are built up with fewer resources and energies	.384**	.000	115
The long-term advantages of sustainable materials (in terms of energy efficiency and durability), will compensate for the high initial cost. (Low Return on Investment).	.460**	.000	115
Sustainable materials are available in Baghdad.	.607**	.000	115
In Baghdad, people concern with the environmental impact of the materials used in the construction of their dwellings.	.522**	.000	115
Small dwellings with sustainable materials are more affordable and come with lower household costs.	.610**	.000	115

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table (4.3) shows that the correlation coefficients between each item of the second

dimension: Materials to achieve sustainability in small dwellings in Baghdad, and the total score are positive and statistically significant at a level of significance of 0.5 or less.

The correlation coefficients ranged from 0.384 as a minimum to 0.610 as a maximum, indicating the presence of internal consistency reliability in the items of this dimension and their suitability for measuring what they were designed to measure.

c. Internal consistency reliability of the third dimension: The psychological impact of living in small dwellings.

Table B.3: Internal Consistency Reliability of the Third Dimension.

Dimensions	Pearson Correlation	Sig. (2-tailed)	N
People feel more sociable while living in small dwellings.	.546**	.000	115
Small dwelling's inhabitants have some feelings of restriction and annoyance	.686**	.000	115
People feel insecure while living in small dwellings.	.467**	.000	115
Small dwelling's inhabitants experience some difficulties in regards to privacy and individual space	.654**	.000	115
development clear protocols among neighbors in small dwellings, is common in Baghdad. protocols includes (Noise levels-shared spaces-Waste disposal)	.545**	.000	115

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table (4.4) shows that the correlation coefficients between each item of the third dimension: The psychological impact of living in small dwellings, and the total score are positive and statistically significant at a level of significance of 0.5 or less.

The correlation coefficients ranged from 0.467 as a minimum to 0.686 as a maximum, indicating the presence of internal consistency reliability in the items of this dimension and

their suitability for measuring what they were designed to measure.

- d. Internal consistency reliability of the fourth dimension: Evaluation of the current interior designs as to be implemented in Baghdad.

Table B.4: Internal Consistency Reliability of the Fourth Dimension.

Dimensions	Pearson Correlation	Sig. (2-tailed)	N
Interior design: the kitchen and living room are in the same room	.454**	.000	115
Interior design: the bathroom and living room are in the same room	.519**	.001	115
Interior design: the bathroom, the living room, and the kitchen are in the same room	.546**	.000	115
The use of dynamic furniture such like murphy bed, expanding table, staircase, and micro kitchen	.389**	.000	115
Interior design: A living room + Kitchen + Bathroom	.572**	.000	115
Multi-use furniture and spaces	.432**	.000	115
Natural lighting (Large windows)	.544**	.000	115
Increasing the height of spaces and rooms	.565**	.000	115
Expansion based on merging the exterior space[s] into the dwelling	.511**	.000	115
Expansion within the internal spaces boundaries of the dwelling	.491**	.000	115
The ability of adaptation processes of the dwelling without impacting the construction structure, basic materials, and services location	.485**	.000	115

Table B.4: Internal Consistency Reliability of the Fourth Dimension ‘Table Continued’.

Existence of a multi-use space in the dwelling	.447**	.000	115
Performance of the open plan system found in the homes spaces	.243**	.009	115
The reuse of the existing spaces for new activities	.148	.116	115
Achieving flexibility-based on switching the use of their own homes rooms	.258**	.005	115
The idea of having mobile tiny houses	.232	.013	115

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table (4-5) shows that the correlation coefficients between each item of the fourth dimension: Evaluation of the current interior designs as to be implemented in Baghdad, and the total score are positive and statistically significant at a level of significance of 0.5 or less.

The correlation coefficients ranged from 0.148 as a minimum to 0.572 as a maximum, indicating the presence of internal consistency reliability in the items of this dimension and their suitability for measuring what they were designed to measure.

THE DESCRIPTIVE ANALYSIS

Determine the direction of the sample = Highest Degree – Lowest Degree \ Highest Degree.

$$5-1 \div 5 = 0.8$$

Each time we add a value of 0.8 to determine the direction of the sample as follows:

Table B.5: Descriptive Analysis for Dimension.

Direction	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Category	1 – 1.80	1.81 – 2.60	2.61 – 3.40	3.41 – 4.20	4.21 - 5

The researcher conducted descriptive statistics (mean, standard deviation, and ranking) for the questionnaire items to describe the attitudes of the selected sample at the study site towards the study variables as follows:

Table B.6: Descriptive Analysis for First Dimension.

Dimensions	Mean	Std. Deviation	T	Sig. (2-tailed)	Rank
The problem of clutter in a small house is effectively solved by using storage furniture.	2.939	1.5632	9.170	.000	2
Choosing furniture that is appropriate for the size of the space makes the space appear more spacious and harmonious.	2.739	1.7626	6.443	.000	4
The way furniture is arranged within a space affects the flow of movement and enhances the feeling of functionality.	2.957	1.8132	4.497	.000	1
The color of the furniture used affects the size of the space.	2.896	1.6134	5.657	.000	3

Table B.6: Descriptive Analysis for First Dimension (Table Continuos)

Using natural lighting such as large windows, a transparent ceiling, or glass doors can make a small space appear larger and brighter	2.426	1.5047	5.953	.000	7
The use of different sources of artificial lighting creates an exciting and attractive effect in small spaces	2.652	1.6439	3.037	.003	6
Paying attention to coordinating lighting colors with the overall décor of the space can enhance harmony and overall aesthetics in small spaces	2.165	1.4745	4.254	.000	9
Colors play a big role in creating a visual impression to enlarge or reduce small spaces.	2.687	1.5296	1.202	.232	5
Light colors help make small spaces appear more spacious.	2.043	1.4891	4.816	.000	10
The use of color and its gradations in small spaces helps create an attractive effect of depth and dimension	2.409	1.6801	.313	.755	8

From the table above, it is clear that paragraph number (3) titled "The way furniture is arranged within a space affects the flow of movement and enhances the feeling of functionality " Came in first place with an average of 2.957, which is the highest score.

Paragraph number (1) titled "The problem of clutter in a small house is effectively solved using storage furniture." came in second place with an average of 2.939. Paragraph number (8) titled " Colors play a big role in creating a visual impression to enlarge or reduce small spaces." came in last place with an average of 2.043.

- a. This axis aimed to test the presence of a statistically significant impact of the dimension of the role of furniture, light source, and color in small dwelling. in Baghdad on defining and identifying the problems, setting objectives and formulating a research strategy. The sample's significance level was less than 0.05 for all statements used to verify this objective, except for statements number (10). This indicates that the sample elements unanimously agree on the statistically significant impact of the role of furniture, light source, and color in small dwelling. in Baghdad on defining and identifying the problems, setting objectives and formulating a research strategy.

Table B.7: Descriptive Analysis for Second Dimension.

Dimensions	Mean	Std. Deviation	T	Sig. (2-tailed)	Rank
Small dwellings are built up with fewer resources and energies	2.391	1.7152	2.446	.016	5
The long-term advantages of sustainable materials (in terms of energy efficiency and durability), will compensate for the high initial cost. (Low Return on Investment).	2.713	1.7560	4.354	.000	4
Sustainable materials are available in Baghdad.	3.078	1.7925	6.451	.000	1

Table B.7: Descriptive Analysis for Second Dimension (Table Continuos)

In Baghdad, people concern with the environmental impact of the materials used in the construction of their dwellings.	2.887	1.6898	5.629	.000	2
Small dwellings with sustainable materials are more affordable and come with lower household costs.	2.783	1.7106	4.906	.000	3

From the table above, it is clear that paragraph number (3) titled " Sustainable materials are available in Baghdad." came in first place with an average of 3.078, which is the highest score. Paragraph number (4) titled " In Baghdad, people concern with the environmental impact of the materials used in the construction of their dwellings." came in second place with an average of 2.887. Paragraph number (1) titled " Small dwellings are built up with fewer resources and energies " came in last place with an average of 2.391.

This axis aimed to test the presence of a statistically significant impact of the Materials to achieve sustainability in small dwellings in Baghdad on defining and identifying the problems, setting objectives and formulating a research strategy. The sample's significance level was less than 0.05 for all statements used to verify this objective, this indicates that the sample elements unanimously agree on the statistically significant impact of Materials to achieve sustainability in small dwellings in Baghdad on defining and identifying the problems, setting objectives and formulating a research strategy.

Table B.8: Descriptive Analysis for Third Dimension.

Dimensions	Mean	Std. Deviation	T	Sig. (2-tailed)	Rank
Small dwelling's inhabitants experience some difficulties in regards to privacy and individual space	2.243	1.2950	2.016	.046	4
Development clear protocols among neighbors in small dwellings, is common in Baghdad. protocols includes (Noise levels-shared spaces-Waste disposal)	2.774	1.5731	5.276	.000	1
People feel more sociable while living in small dwellings.	2.557	1.4216	4.198	.000	3
Small dwelling's inhabitants have some feelings of restriction and annoyance	2.130	1.3670	1.023	.308	5

from the table above, it is clear that paragraph number (2) titled " Development clear protocols among neighbors in small dwellings, is common in Baghdad. protocols include (Noise levels-shared Spaces-Waste disposal)" came in first place with an average of 2.774, which is the highest score. Paragraph number (5) titled " People feel unsecure while living in small dwellings." came in second place with an average of 2.739. Paragraph number (4) titled " Small dwelling's inhabitants have some feelings of restriction and annoyance " came in last place with an average of 2.130.

This axis aimed to test the presence of a statistically significant impact of The psychological impact of living in small dwellings on defining and identifying the problems, setting objectives and formulating a research strategy. The sample's significance level was less than 0.05 for all statements used to verify this objective except for statements number (1) and (4), this indicates that the sample elements unanimously agree on the statistically significant impact of The psychological impact of living in small dwellings on defining and identifying the problems, setting objectives and formulating a research strategy.

Table B.9: Descriptive Analysis for Fourth Dimension.

Dimensions	Mean	Std. Deviation	T	Sig. (2-tailed)	Rank
The idea of having mobile tiny houses	2.930	1.5934	6.262	.000	2
Achieving flexibility-based on switching the use of their own homes rooms	2.896	1.7640	5.445	.000	3
The reuse of the existing spaces for new activities	2.435	1.5846	2.942	.004	11
Performance of the open plan system found in the homes spaces	2.417	1.6648	2.689	.008	12
Existence of a multi-use space in the dwelling	2.130	1.5016	.932	.354	16
The ability of adaptation processes of the dwelling without impacting the construction structure, basic materials, and services location	2.757	1.7551	4.622	.000	4
Expansion within the internal spaces boundaries of the dwelling	2.409	1.6905	2.593	.011	13

Table B.9: Descriptive Analysis for Fourth Dimension (Table Continuos)

Expansion based on merging the exterior space[s] into the dwelling	2.443	1.6340	2.910	.004	10
Increasing the height of spaces and rooms	2.548	1.7078	3.440	.001	8
Natural lighting (Large windows)	2.478	1.5122	3.392	.001	9
Multi-use furniture and spaces	2.278	1.5134	1.972	.051	14
Interior design: A living room + Kitchen + Bathroom	2.235	1.6186	1.556	.123	15
Interior design: the kitchen and living room are in the same room	2.600	1.5938	4.037	.000	7
Interior design: the bathroom and living room are in the same room	2.730	1.4162	5.531	.000	5
Interior design: the bathroom, the living room, and the kitchen are in the same room	2.948	1.3882	7.322	.000	1
The use of dynamic furniture such like murphy bed, expanding table, staircase, and micro kitchen	2.678	1.7042	4.268	.000	6

From the table above, it is clear that paragraph number (15) “titled Interior design: the bathroom, the living room, and the kitchen are in the same room”. came in first place with an average of 2.948, which is the highest score. Paragraph number (1) titled " The idea of having mobile tiny houses." came in second place with an average of 2.930. Paragraph number (12) titled " Interior design: A living room + Kitchen + Bathroom " came in last place with an average of 2.235.

This axis aimed to test the presence of a statistically significant impact of Evaluation of the current interior designs as to be implemented in Baghdad on defining and identifying the problems, setting objectives and formulating a research strategy. The sample's significance level was less than 0.05 for all statements used to verify this objective except for statements number (5) , this indicates that the sample elements unanimously agree on the statistically significant impact of Evaluation of the current interior designs as to be implemented in Baghdad on defining and identifying the problems, setting objectives and formulating a research strategy.

