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Enhancing the Socio-Spatial Configuration of Traditional inhabited Housing in the Old City of Hebron-Palestine.

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Enhancing the Socio-Spatial Configuration of Traditional inhabited Housing in the Old City of Hebron-Palestine.

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ABSTRACT

Traditional Palestinian cities are an original reflection of the local Palestinian architectural identity. The housing level's rehabilitation operations in these cities focus on the tangible and the intangible aspects, while the intangible aspect is considered developed and produced by the interaction of people with the building.

This research aims to enhance the socio-spatial configuration of the traditional inhabited housing, considering Hebron's old city as a case study.

The research relies mainly on the case study analysis using the descriptive method. The research collects data from the local people through questionnaires, observation, and documentation from various sources. The research takes some specific samples in the Old City of Hebron and analyses them by following the descriptive-analytical method. The resulting obtained information about the current spatial configuration is then linked with the theoretical framework to understand the factors that affect the socio-spatial distribution of spaces and the traditional buildings' rehabilitation determinants. Finally, the research concludes by making suggestions and providing recommendations to enhance inhabited housing.

Keywords: Enhancing, Socio-Spatial Configuration, Traditional Buildings, Inhabited Housing, Old City of Hebron.

تعزيز التكوين الاجتماعي المكاني للمساكن التقليدية المأهولة في البلدة القديمة في الخليل- فلسطين.

سارة التميمي

المستخلص

ان المدن الفلسطينية التقليدية هي انعكاس أصيلا للهوية المعمارية الفلسطينية المحلية. لقد ركزت عمليات إعادة تأهيل الإسكان في هذه المدن على الجوانب الملموسة وغير الملموسة، حيث يعتبر الجانب غير الملموس متطوراً وناتجاً من تفاعل الناس مع المبنى المعاد تأهيلها.

تهدف هذه الدراسة إلى تعزيز التكوين الاجتماعي المكاني للمساكن التقليدية المأهولة والمعاد تاهيلها، مع الأخذ في الاعتبار مدينة الخليل القديمة كحالة دراسية.

حيث تعتمد الدراسة بشكل أساسي على تحليل دراسة الحالة باستخدام المنهج الوصفي. تجمع الدراسة البيانات من السكان المحليين من خلال الاستبيانات و الملاحظة والتوثيق من مصادر مختلفة. تأخذ الدراسة بعض المباني كعينات محددة في الخليل ومن ثم تقوم بتحليلها باتباع الأسلوب الوصفي التحليلي، وإعطاء النتائج للحصول على معلومات حول التكوين المكاني الحالي. بحيث تيم ربطها بالإطار النظري لفهم العوامل التي تؤثر على التوزيع الاجتماعي المكاني للمساحات بالاضافة الى محددات إعادة تأهيل المباني القديمة. في النهاية ، تخلص الدراسة وتقترح وتقدم توصيات لتعزيز المساكن المأهولة.

الكلمات المفتاحية :تعزيز، التكوين الاجتماعي المكاني، المساكن التقليدية، المساكن المأهولة، المدينة القديمة في الخليل.

DECLARATION

I declare that the Master Thesis entitled "Enhancing the Socio-Spatial Configuration of Traditional inhabited Housing in the Old City of Hebron-Palestine." is my own original work, and hereby certify that unless stated, all work contained within this thesis is my own independent research and has not been submitted for the award of any other degree at any institution, except where due acknowledgement is made in the text.

Student Name. Sara....T.....Tamimi.....

Signature:...Sara....Tamimi Date:..07/06/2021

DEDICATION

For my parents,
Who devoted their lives to educating their children as best as they could.

Thank you…

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List of Abbreviations

AC\H	Air Changed per Hour
CFD	Computational Fluid Dynamics
HRC	Hebron Rehabilitation Committee
PMV	Predicted Mean Vote
PPD%	Percentage of People Dissatisfied
WWR%	Window to Wall Ratio

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Chapter 1

Introduction

1.1 Preface

The socio-spatial space is understood as the relationship between architecture and the nature of the socio-cultural life of people. Socio-cultural needs are among the crucial and notable factors that should be investigated to grasp architecture of housing (Abbaszadeh et al., 2009). Although, housing is more than meeting shelter needs; it is an essential measure of social and a cultural development (Chiu, 2004), where culture can influence the formation of architectural spaces by creating laws and behavioral principles that lead to functional organization and spatial sequencing (Ettehad et al., 2015).

In general, the continuity of an old city in its traditional form and content depends on its social and economic vitality and the ability of its residents to maintain and revive their homes and residential neighborhoods. However, the urban development, which is a manifestation of human development (Yazdani Mehr, 2019), had a negative impact on the housing environment in the old town, as it was not able to keep pace with the circumstances of the twentieth century, which makes it unfit for the contemporary housing (Serageldin et al., 2001).

The historical cities in the Arab and Islamic World have suffered from various problems. Perhaps, the most prominent is the change of its original function that began to shift from a place of housing to other functions. In addition, many of these houses were abandoned by its indigenous inhabitants with income, making them a shelter for the low-income classes and the poor. This change of the basic social composition of historical cities has increased their deterioration, devastation, and led to a loss of cultural heritage.

The Old City of Hebron is one example of this deterioration as the residential environment no longer meets the needs of its residents, who have to endure extreme hardship caused by the surrounding Israeli settlers. The encroachments on the old buildings have increased due to economical limitations and bad adaptation by the residents of those homes. In some cases, residents with very limited means will divide one house into multiple units in order to house more than one family, which led to overcrowding. Meanwhile, due to the problematic political situation in the region, many families with good income have migrated out of the

old town. This has pushed the percentage of abandoned houses to increase and become an infested area. As a result, the old town began to turn into a mere formative heritage stone and the spirit of social life was lost.

Institutions like the Hebron Rehabilitation Committee have contributed greatly to the rehabilitation of residential buildings and the re-housing of the citizens within the city. Noticeably, these appreciated efforts have positively changed the physical aspect of housing conditions. However due to the inhabitants' interaction with the buildings, new needs emerge. This should urge the researchers in this field, to find solutions with respect to the developing social aspects. From here came the importance of presenting the problem and trying to come up with recommendations depending on the case study and its analysis to deal with the old town homes and to adapt their characteristics to suit modern needs.

1.2 Research Problem

Currently, the traditional rehabilitated houses suffer from being unable to compromise between the physical rehabilitation and the human relationship. The primary goal in the rehabilitation of the old residential buildings is to restore the physical structure of the building to preserve its historical value without consideration of the human comfort side. Moreover, another strategy that was followed during the rehabilitation process was to accommodate the largest possible number of families quickly in order to face the Israeli occupation policies in the historic center of Hebron. Consequently, this rehabilitation strategy has unintentionally led to the neglect of human behavior and the resulting needs, in addition to the modern life requirements of the occupants.

Nowadays, there are about 1500 rehabilitated units, each intended to include one family. By 2040 about 85% of the traditional buildings in the old city of Hebron will be rehabilitated (HRC, 2015). In order to achieve this, it is necessary to improve the strategies of the restoration of these residential buildings and to make them more suitable for the residents. Thus, this research aims to present several improved models that may be points of reference in upcoming rehabilitation projects.

1.3 Research Questions

The main research question is: How to achieve socio-spatial space in rehabilitation efforts of houses in the Old City of Hebron.

The research sub-questions are:

1. What are the socio-spatial configuration main factors?
2. What are the socio-spatial problems facing the traditionally rehabilitated residential buildings in the old city of Hebron?

1.4 Research Objectives

The main objective of the research is to make suggestions and provide recommendations to enhance inhabited housing in Hebron. This objective can be achieved through these sub objectives:

1. Define the factors that affect the socio-spatial enhancement.
2. Evaluate the socio-spatial situation of the traditional buildings in the old city of Hebron through field study analysis.
3. Define the problems that face the socio-spatial in the rehabilitated buildings in Hebron.

1.5 The Significance of the Research

This research topic is critical due to the mutual relationship between the social factor and the preservation of rehabilitated residential buildings. So many studies have dealt with this concept, including

(Abu-Hantash, 2007) Towards Housing Renewal Policy In Palestinian City Centers "The Case Study of Nablus". In this study, the variables and problems experienced by the heritage buildings in Nablus city were discussed. The study concluded with some general rehabilitation policies for residential places after applying the field study analysis for a random sample of the old buildings in the city.

Another related study is (Awad, 2010) The Peasant House: Contemporary Meanings, Syntactic Qualities and Rehabilitation Challenges. Ramallah's Historic Core. This study discusses the rehabilitation of rural residential buildings in Birzeit, Palestine and deals with the meaning and purpose of the houses and discusses the changes that occurred on these buildings. The study followed the case study method using field study and syntax analysis of three peasant houses typologies. The study presents many suggestions to improve these homes and adapt them to new needs. Based on this study, suggested solutions have been executed on the case of study and details were attached to the study appendices.

1.6 Research Limitations

One obstacle that faced this research was data collection through questionnaire. The inhabitants of the old city face extreme difficulties and ongoing oppression caused by the Isreali occupation. As a result the residents are hesitant to cooperate with any inquiry and are always fearful of possible house-grabs; as the Israeli occupation authorities did employ tactics in order to Judaize the area, such as sending statistical teams in order to Judaize the area (pbc, 2020).

Another challenge that faced this research was classifying residential apartments in rehabilitated buildings from the point of view of spatial distribution. Therefore, it is not easy to understand the characteristics of spaces within their shapes see (Appendix B).

1.7 Research Organization

The research includes seven chapters. The first chapter presents the focus of the research approach.

Second chapter contains the definition of the socio-spatial distribution, determinants and illustrates the recommended enhancement methods according to the social aspect.

Third chapter includes analysis of the case study situation through documents and reports, this situation affected the construction of Hebron city and the factors that led to changing needs. In addition to the operations and methods of rehabilitation followed.

Fourth chapter discusses the research methodology, tools and methods used in the research.

Fifth chapter contains the field study analysis result of the current situation of the old city in Hebron.

Sixth chapter contains a discussion of some procedures of socio-spatial enhancement and implementations on many samples.

Finally, the seventh chapter contains a conclusion and recommendations of socio-spatial enhancement.

Chapter 2

Theoretical Perspective of the Research

This chapter is an overview of the literature of socio-spatial enhancement. It identifies the socio-spatial configuration. Later, the chapter focuses on the effect of the Islamic culture on the spatial configuration. Finally, the chapter defines the factors affecting the enhancement of spatial configurations in light of the socio-cultural aspect.

The built environment is an abstract concept employed in some literature in order to describe the products of human building activity through architecture (Lawrence and Low, 1990), (ERMAN, 2017). It is significant to understand architecture studies and social aspects combined in order to develop the built environment within the evolving human behavior (Qawasma, 2019) and to increase the amount of satisfaction, improve privacy, and achieve security (Rapoport, 1977).

2.1 Spatial Configuration Theory in Architecture

In 1984, ”the social logic of space” book for both Hillier and Hanson discussed a theory based on the relationships between the nature of social life and the nature of space design (Hillier, 1984).In general, a space is influenced by the changing of social and cultural activities of societies (Hillier and Hanson, 1989). Different resources define a space as a group of relations. Also, it interprets the relationships between two spaces and another third space (Hillier, 2007), (Fallah and Hojat, 2018), (Shahbazi et al., 2018).

2.2 Social Dimension and Spatial Configuration

The social dimension plays a vital role in forming the architecture, through a relationship between the house form and socio-cultural factors. The model depends on the relevance of architectural artifacts formulated by a culture, architectural values, social norms, and social values which affected each other by tangible-intangible direction (Erdoğan, 2018).

2.3 Factors Affecting the Spatial Configuration Enhancement

The house is considered as the most immediate human-related space where the first immediate experiences with space are formed (Lefebvre and Nicholson-Smith, 1991). It is

the only place where the first immediate experiences with space are formed, both in an isolation and a group.

The book “House Form and Culture” in 1969 speaks briefly about the house form and its influences on religious beliefs even in its spatial arrangement or its orientation. Moreover, it focuses on family structure and social organization as important factors in spatial space (Rapaport, 1969).

It is necessary to understand and categorize all factors and predict the appropriate relationship between the factors (Shahbazi et al., 2018). (Rapoport, 1969) has identified five affecting cultural aspects in the configuration of internal spaces of the house layouts, namely (Mzoori, 2014), see (Figure 2.1).

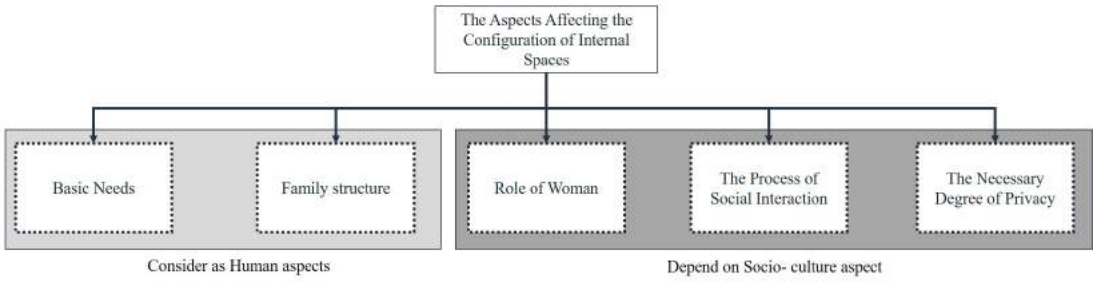


Figure 2.1: The Aspects Affecting the Configuration of Internal Spaces (Rapaport, 1969).

2.3.1 Basic Needs

One of the most appropriate frameworks for analyzing the human needs of housing is ”Maslow’s Theory of Inclusion” which discusses the human needs with minimum primary requirements. Thus, the increase in the level of needs depends on the availability of the previous needs (Li et al., 2019) (Taha, 2010). These needs are:

Physical needs: The physical requirements are the basic needs that all people share, such as eating, breathing, sleeping and protection from enemies. Concerning housing, these needs must be provided in the form of appropriate spaces. And are at the base of Maslow’s hierarchy.

Safety needs and Comfort: The need for safety and reassurance have to do with the extent to which people feel towards their lives and environment. The dwelling provides some necessary protection from the outside world and external threats. The satisfaction of the safety is gained through the dwelling as it provides shelter from any rough external

conditions and affords a healthy environment relatively free from noise, altering heat and other factors.

The belonging needs: It means that people generally like to be members of a group or a family, which helps them feel safer and more secure.

The esteem needs: This level of needs is divided into two categories; self-respect or self-esteem and other-esteem.

Self-realization: This is the target of a person who strives to achieve his maximal personal potential. These desires and capabilities differ significantly from person to another despite the fact that all human beings have the same basic needs.

These human needs are also classified into three categories: existence, relatedness and growth, see (Figure 2.2). Existence needs represent physiological and physical safety needs. Relatedness needs are interested in social relationships and external esteem. Growth needs include self-esteem and self-actualization (Estaji, 2014).

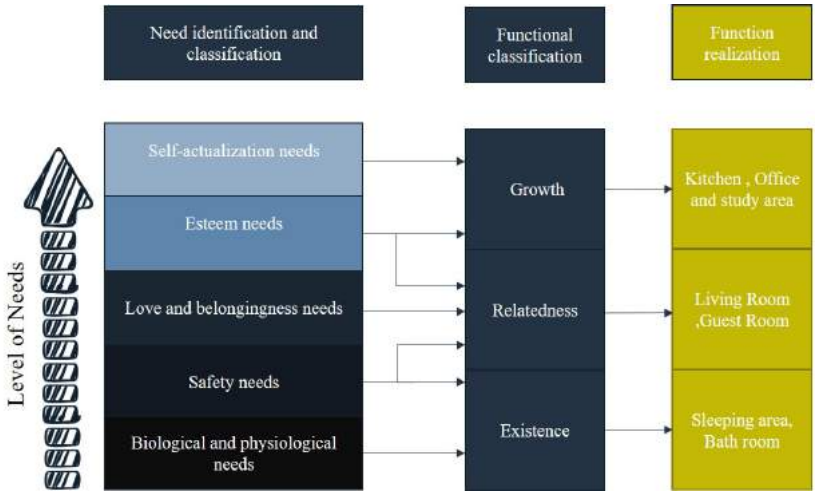


Figure 2.2: The Relation between the Need Identification and the Functional Classification (Estaji, 2014).

2.3.2 Family Typology and Structure

Knowing the future occupants is an essential element in the architectural design process. The suggested spatial organizing should take it into account family type;as for example the space that an extended family (multi-family residence) occupies differs in its characteristics from that of a nuclear family (single-family dwelling) (Fallah and Hojat, 2018).

2.3.3 Role of women

Women's role in the family and society decides several aspects regarding the urban form , such as: the residential unit, space openness, paths, and how these components are organized, forming the urban fabric (Rapoport, 1969).

2.3.4 Social Interaction Process

Social interaction and social relationships are significant factors in shaping different spaces in the physical environment. It depends on many factors such as personal space, social interaction between people, which identify the distances between the person from others (Aiello and Thompson, 1980), (Reynolds, 1998). Territory is another factor which generally forms the level of privacy (Huang et al., 2019), (Ridwana et al., 2018). Finally, Space elements identify as the interaction between the behavior and the environment as nonverbal communication (Huang et al., 2019).

2.3.5 Privacy Degree

The privacy concept cannot be clearly defined, as it varies from one community to another and from time to time. In other words, it reflects the ideas of a particular society at a given time (Kelvin, 1973).

Privacy has four main identified dimensions: first, isolation (individual privacy) means the presence of a person away from others' eyes. Second, intimacy (family privacy) is a desire to be separated from the outside world and remain with the individual's family. Third, anonymity is to remain unknown even in the presence of a crowd. Fourth, preservation is the case of placing a psychological barrier against any undesirable infiltration, such as the concept of permission at the home entry (Fischer, 1971).

2.4 Islamic Culture Influences on Spatial Configuration

The Islamic city architecture was firstly influenced by the Islamic Sharia from the Qur'an and Sunnah and secondly by the pattern of social life. Thus, the Islamic city has been built through ages depending on social norms, cultural values and religious roles such as privacy, property respect, the ownership right, pre-emption rights of neighbors and street rights (Al-Tawayha, 2011).

Ideological guides, social interaction and moral responsibility are three basic rules in the spatial space in the Islamic city. While the social interaction variable presents the formation

of human behavior and depends on psychological and cultural values and the surrounding community (Hameed, 1991), (Bassily, 2018).

In general, Islam considers the family as a primary nucleus of an intensifying community, and in this way, the Islamic architecture formed its residences so that the single dwelling is the basis of the city to form a compact fabric, see (Figure 2.3), (Bassily, 2018).

Social relations are valuable and important factor in people's lives and housing, as they are reflected in the urban and architectural levels in cities. Islamic architecture has taken into account this factor.

Figure 2.3: The Relationship Between Building Unit and Family (Researcher)

2.4.1 Urban Scale

Urban fabric and sovereign buildings construction came within the state's rules, laws and the prevailing architectural style. Simultaneously, residential neighborhoods in these cities are built within the needs of the inhabitants, so the space structure is appropriate for the overall social life and appropriate to the local architecture of each geographical region and climatic environment (Michell and Grube, 1978).

Following the social rules in urban housing makes the residents feel that they are part of the community, and it also pushes them to enhance their participation in developing their neighborhoods and their real feeling of safety (Mahdavi and Habib, 2016), (Onyx and Bullen, 2000). The urban pattern in Islamic cities has been described as a rhythmic pattern.

The streets are narrow and have access to dead ends, providing safety and privacy for individuals in their homes (Ismail, 2013), see (Figure 2.4).

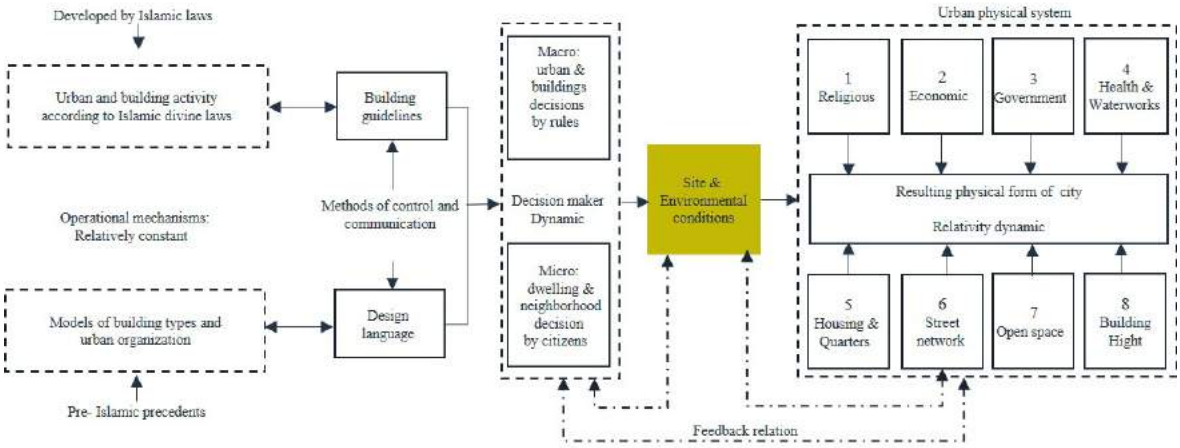


Figure 2.4: Hypothetical Model of Parameters that formed the traditional Arabic-Islamic City (Hakim, 1986)

2.4.2 Building Scale

Building scale relies on some factors such as privacy, hospitality and modesty. So, the spatial order can provide efficient communication, according to Islamic customs norms (Kauser, 2018), (Al-Mohannadi et al., 2019), (Othman et al., 2015), (Abdelkader and Park, 2018).

Hospitality: One of the Islam instructions is a particular interest in guests, making the Arab Islamic architecture create their own spaces. The Arab Islamic house contained Salamlek, which is the void for stranger males, in addition to the harem and Haramlek for female guests (Othman et al., 2014, p. 268). Nowadays, Salamlek is represented by the guest room. Moreover, Haramlek is represented by the living room in the contemporary Islamic house (Amro and Bahauddin, 2015).

Privacy: The home design in the ancient Islamic cities depended heavily on privacy levels, which vary for individuals within social norms during different historical periods (Alitajer and Nojoumi, 2016). It reinforced the separation between the interior, the exterior, the residents and the pedestrians in the street or surrounding neighbors. Therefore, the interior spaces need to be invisible to the eyes of a stranger passing by. Besides, girls and boys of the same family should be separated in rooms from one another after reaching adulthood (Saoud, 2002), (Othman et al., 2015, p. 266).

Likewise, freedom of movement in an open and safe space is available as a requirement in the Islamic housing unit, which opens to an inner roofless courtyard. Additionally, the house

outer sides are attached to be with the rest of the urban fabric units with few openings on the facades and with broken entrances. So, traditional Islamic building promoted privacy through this spatial element (Othman et al., 2014, p. 267). Visual privacy is fulfilled through the the following design patterns:

Majaz (Entrance): is the main entrance of the Islamic house and regularly opens toward a courtyard and the doorway, which is the main visible characteristic at the ground floor level. Majaz was designed to open into a blank wall to block views from outside into inside, see (Figure2.5).

Courtyard: is an essential component, which represents the core of all Islamic-Arab houses. The courtyard concept is commonly used in traditional architecture, both rural and urban and goes back to the Graeco-Roman traditions (1900 BC.). With the advent of Islam, muslims adopted the courtyard concept because it suited their religious and social needs, mainly privacy (El-Shorbagy, 2010).

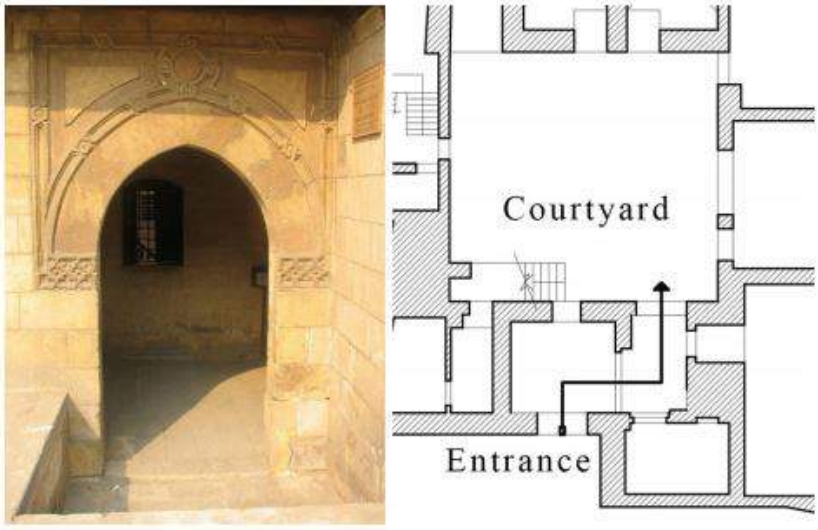


Figure 2.5: Courtyard and Magaz Organization in the Zeinab Khatoun House (Abdelkader and Park, 2018, p. 247)

Bedrooms: the height of windows is traditionally 2.5 m from the ground, taking into account that the bed's height ranges are between 0.8 and 1.25. Also, it stipulated that female bedrooms should be separated from male bedrooms (Hakim, 1986, p. 36).

Olfactory Privacy: generally, relied on providing privacy, including the sense of smell, and is represented by spaces related to amenities. It was stipulated that the kitchen should be kept away from the neighbors so that odors would not reach them, and the toilets should be kept away from the neighbors so that they would not harm them (Hakim, 1986, p. 31).

Acoustical privacy: this type of privacy affects the building materials selection, which should not allow voices penetrations to neighborhood dwellings and the streets, especially from women. This thickness of walls has affected the areas of the internal space (Hakim, 1986, p. 124).

2.5 Spatial Configuration Enhancement

Several studies concluded the fundamental factors to enhance house spatial configuration. Many of them focused on humans' physical needs, and others depended on the socio-cultural aspect. It is preferred to understand the spatial configuration in the past and then analyze the current situation to set future scenarios to achieve the transformation and enhancement of the spaces in an efficient way (Mohareb, 2009).

2.5.1 Space Enhancements to Fulfill The Basic Needs

The number of activities inside the house and the domestic services is proportionally related to the number of spaces (Yatmo and Atmodiwirjo, 2013). The spaces might be classified into many zones but without neglecting the circulation between these spaces. Each zone describes its functionality. e.g., the services zone location can be linked to the social zone, and then the design decides the private zone (Bedrooms) (Eloy, 2012), or it might be divided as a day zone, a night area and a common area and then linking these areas by the transition areas such as corridors (Raviz et al., 2015, p. 74).

The private or night zone should consist of the appropriate number of bedrooms according to the number of family members (Raviz et al., 2015, p. 69), so each bedroom can accommodate two persons and keep the cultural value of gender separation

It is essential to take the minimum required areas of each space in the enhancements procedure as shown in (Table 2.1). Also to evaluate if the minimum average area of the spaces in the inhabited apartment is acceptable (Ahmed, 2017).

Table 2.1: Minimum Require Areas of Each Space Type (Ahmed, 2017)

Room Type	**Min Required Area (M2)**
Master Bedroom	12
Normal Bedroom	10
Living room	14
Dinning room	10.5
Kitchen	5.3
W.C/Bathroom	2.9

2.5.2 Enhancement According to Socio-Cultural Aspect

As the literature showed, the Islamic culture considered privacy to be a top priority in housing, so each home must be divided into four privacy levels (public, semi-public, semi-private and private), see (Figure 2.6). Also, it identifies the amount of privacy according to space activity and linking these levels to the circulation zones and activities.

The cultural values influenced the spatial organization of Islamic dwellings to include: religion, family traditions, gender and moral responsibility (Zalloom, 2020). Also, the Islamic culture values hospitality and relations with guests (Othman et al., 2014, p. 269).

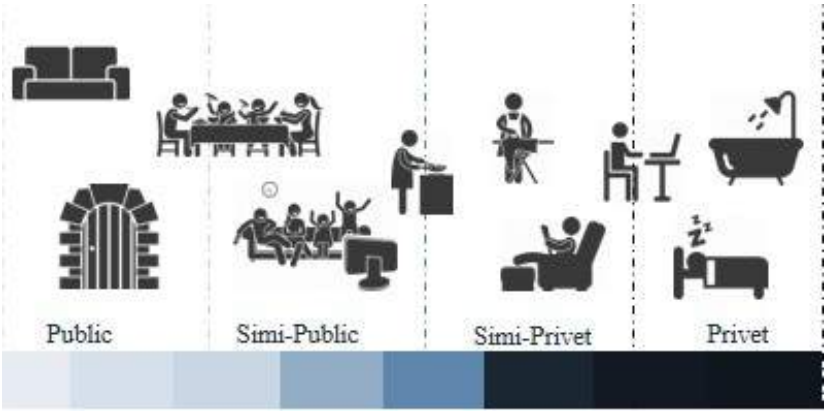


Figure 2.6: The Relation Between Privacy and Function Type (Shahbazi, 2020)

2.6 Socio-Spatial Enhancement Of Traditional Buildings

The spatial configuration enhancement process in traditional buildings is based on several laws emanating from international treaties and institutions in the last two centuries (Yazdani Mehr, 2019). These treaties were initially more stringent and stipulated that nothing would be changed in the old building, and it must be preserved.

This strategy creates different gaps, for example, between the aims of international conservation charters, and the values and meanings of different social groups (Awad, 2010). Another gap between the restoration theory is founded by classical architectural theories and the current architecture of space. And between international guidelines of the conservation of historic cities and contemporary development. Finally, a gap between theoretical and practical execution as there is no recipe for a successful intervention.

Some levels were agreed on to preserve these buildings (Feilden, 1979). One of these levels is rehabilitation, which is defined as reuse operations and considered as recent trends that have received specialists' attention because of their positive support of the preservation and

ensuring the success and continuity of the restoration process (Aplin, 2002). Moreover, It focuses on physical improvements necessary to provide an appropriate use for an empty or inappropriately utilized structure. Moreover, it keeps its use as close as possible to the original function to ensure a minimum intervention and minimum loss of cultural values (Feilden and Jokilehto, 1998). The rehabilitation process should consider the social aspect and people's needs (RehabiMed, 2005).

So, according to these definitions, it is noticed that the adaptation and the rehabilitation are closer to achieve the socio-spatial needs for the residents (Rodwell, 2003), (*Declaration of Amsterdam (1975)*, 2014).

2.6.1 Benefits of Architectural Heritage Rehabilitation

The architectural rehabilitation has four main benefits (Güner, 2015), are:

Social benefits: people and cities preserve their identities and social ties, and at the same time keep up with the current era.

Cultural benefits: preserve art, architecture and antiquities. These benefits may be vital when talking about a conflict on land. So each of the disputing parties seeks to prove their rights by referring to historical material evidence.

Economic and environmental benefits: reusing the existing building is economically better than demolishing, or rebuilding. In addition to the associated costs for removing rubble, establishing new health services and facilities, leading to more energy consumption and building materials.

2.6.2 The Antiquities Law of 2018

The Palestinian Antiquities Law of 2018 mentioned that tangible or movable cultural property is considered heritage when it has the cultural significance of as the historical, rare, aesthetic, artistic, social, scientific, religious, architectural, spiritual, symbolic, representative (IOL, 2018).

Table 2.2: The Classifications of Building Value (Abu-Hantash, 2007, p. 164)

	Classification of Residential Buildings by Value	**Type of Intervention Permitted**
1	Historical monuments that retain a high historical, artistic or aesthetic value (residential palaces)	• Architectural preservation: These are works related to the protection of the historic building through its maintenance and removal of damage affecting its structural and formal status without adding or changing any part of its acquired features. • Regular maintenance: these are the works related to repairs, renovations and replacement of some or all elements of modern finishes and extensions, which are necessary and indispensable.
2	Historical buildings of important architectural and artistic value (large houses and distinctive houses)	• Irregular maintenance: the necessary renovation and replacement of parts of the buildings to maintain the effectiveness of the building without any change in the building style, the type of construction elements or the general distribution shape of the building and that there is no use of another kind.
3	Historic buildings of architectural and artistic value medium(old town houses that do not carry distinctive elements but form in their composition an architectural fabric to be protected)	• Restoration work for employment: works aimed at preserving the building and continuing its employment through interventions that allow appropriate uses of the original form and respect the typical elements of the structure and construction of the building, including the renovation of structural elements and the introduction of technical elements and equipment and the removal of elements alien to the original building.

The traditional buildings are considered from the fixed heritage that must be preserved according to Article (13) (IOL, 2018), (Abu-Hantash, 2007, p. 164-166) summarized the methods of heritage protection according to the type of architectural heritage, its value and the determinants that it must be taken into account. The (Table 2.2) shows the The classifications of building value.

2.6.3 Limitations of Rehabilitation Processes

The Limitations of Rehabilitation Processes depending on building value as shown in (Table 2.2), (Table 2.3) shows the determinants and methods of intervention based on the previous classifications.The intervention includes the exterior walls , additions and internal distribution and the modern fittings.

Table 2.3: The Limitations of Rehabilitation (Abu-Hantash, 2007, p. 165-166)

Intervention place	**Limits and intervention method allowed**			
	Architectural preservation	**Regular maintenance**	**Irregular maintenance**	**Renovation Operations for Use**
Exterior Walls and Openings	•Maintaining the original material of the walls prevents partial or total closure of external openings. •Prevents changing the exterior by adding new elements such as drawers.	•Surface repair of parts of the walls and inner openings.	•Opening limited spaces in solid walls Partial change in openings.	•Partial interventions change the original format provided that the solution is homogeneous and integrated on all parts of the interface.
Additions	•No equipment is allowed to be built or entered unless necessary and must be matched with the building in terms of shape and functional relationships.	•Improving sanitary spaces allowing the introduction of equipment when necessary and in accordance with the original shape and material of the building. •Surface repair of parts of insertion and ramps.	•Creating new sanitary spaces inside the building provided that the building is illuminated and ventilated or provide scented and industrial lighting. •Reconstruction of limited parts of wall	Replacing or rebuilding damaged parts. •Use materials to suit the shape of the building without changing the pattern introducing new construction elements and techniques. •No blocks allowed to increase the size of the original building
Internal Distribution	•It is forbidden to change the internal partitions or introduce new ones to maintain the number of original floors and not to add an internal distributor.	•Allow surface repair of parts of the interior partitions and openings to build unstable decorative elements that can be removed without affecting the building.	•It is permitted to open and close doors and windows inside the building to build or demolish wall breakers inside the building.	•Changing internal partitions and introducing new partitions to separate the vacuum units provided that it does not change the overall distribution of the building.
Modern Fittings	•Extensions should be outside the building So that it fits the ocean. Allows the introduction of new technical equipment and extensions	•Repair and partial replacement or technical equipment if necessary.	•Improve or enter extensions •New equipment and the following construction blocks or works are necessary to maintain these equipment effectively.	•Building new technical equipment. •The added blocks must be inside the building as much as possible.

2.7 Conclusion

Through a review of literary studies, the research linked the relationship between spatial distribution and human, social and cultural factors. Moreover, how to enhance the social-spatial distribution inside the buildings based on these factors. Also, linking these enhancements with the limitations of the old building rehabilitation laws see (Figure 2.7) .

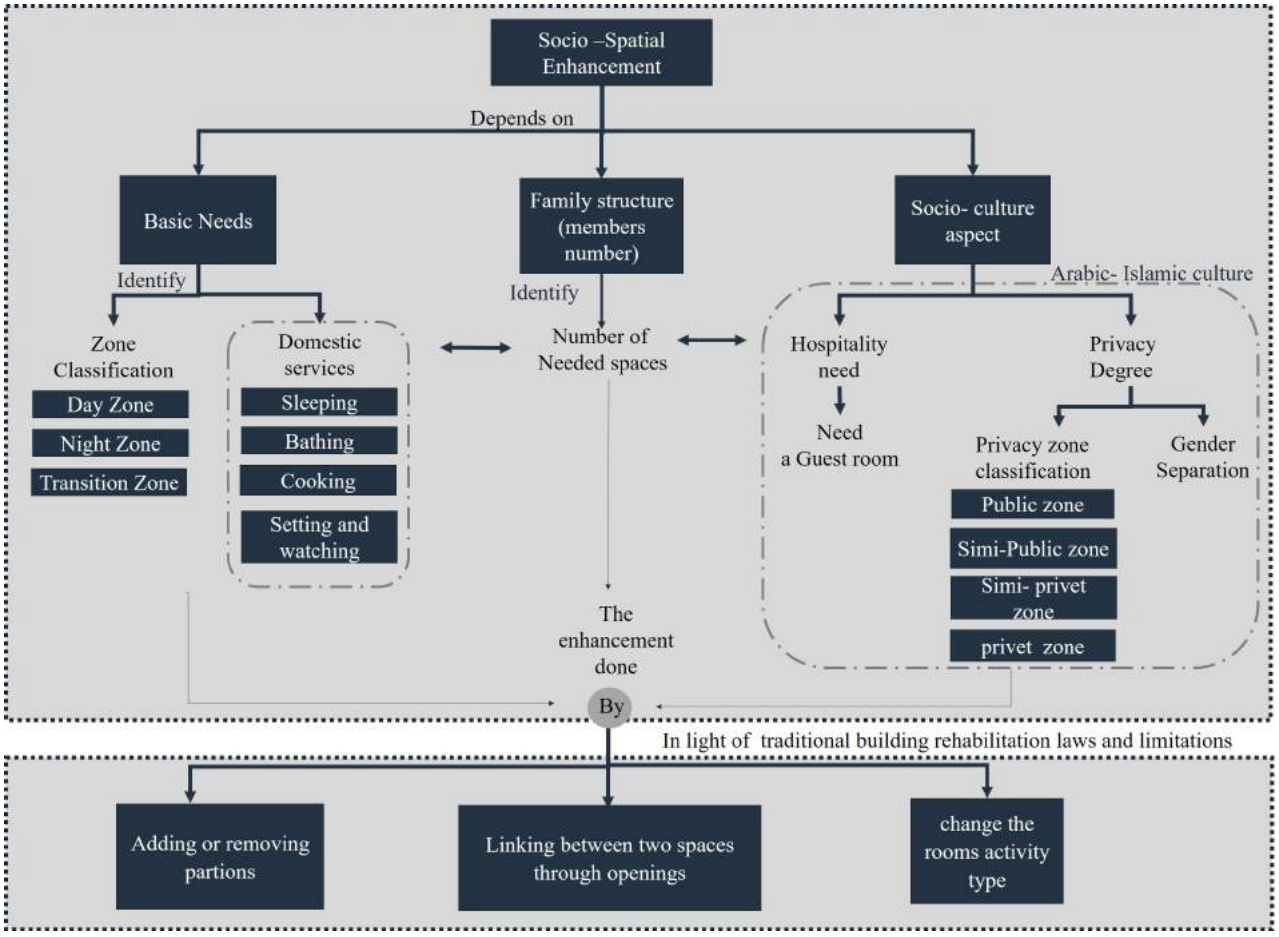


Figure 2.7: Socio-Spatial Enhancement in Literature Review (Researcher)

Next chapter talks about Hebron's old city as a case study, the factors that affected the architecture of Hebron and its spatial configuration, the new factors in the current time that affected the city which made the rehabilitation essential and how they oriented its methodology.

Chapter 3

The socio-spatial of the old residential buildings in the Old City of Hebron

This chapter talks about Hebron old city as a case study; the factors that affected the architecture of Hebron and its spatial configuration. Also the chapter discusses the new factors in the present time that affects the city and made the rehabilitation essential and how oriented its methodology.

3.1 Background

The urban structure was built at the heart of the old town and spread around the Ibrahimi Mosque, during the final stages of the Ottoman State (Abu-Siriya, 1995). The urban fabric of the residential neighborhoods in the old city consists of the composition of the public buildings, squares and courtyards' houses. These houses formed the major access roads leading to the main mosque through the streets and the twisted and winding alleys. The urban fabric has several neighborhoods inhabited by people who have a particular craft.

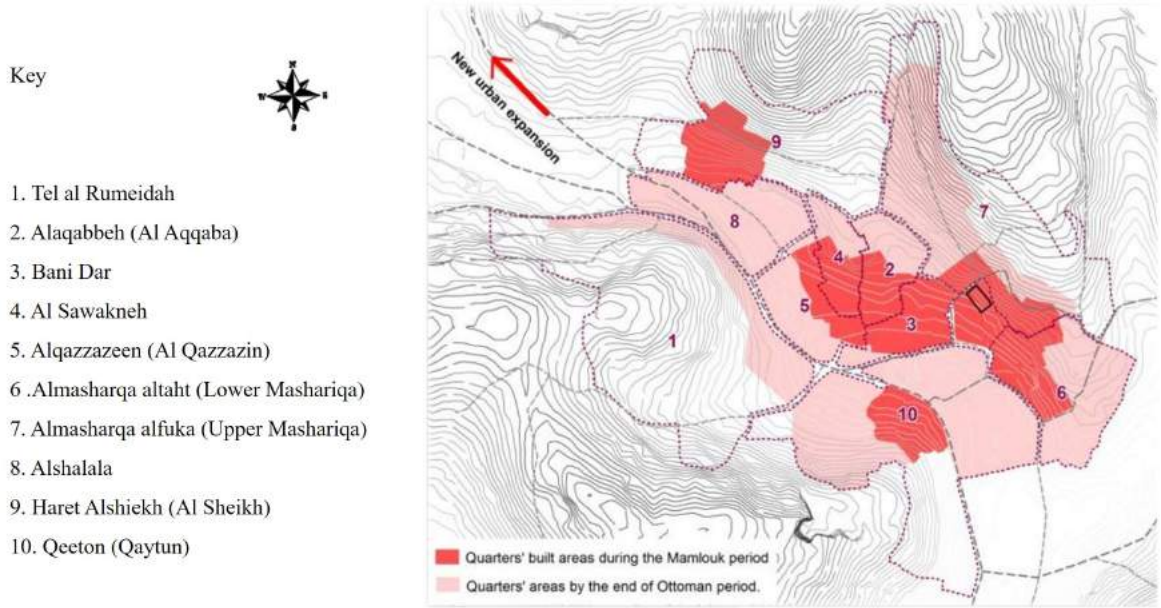


Figure 3.1: Old City Neighborhoods (HRC,2014)

These neighborhoods are called according to their original family names, see (Figure 3.1) (HRC, 2008), (Zahda and Fukukawa, 2008). Hebron buildings are one of the examples of

urban buildings in Palestinian cities, which usually contain either courtyards or liwan inside them (Ghadban, 2008).

3.2 Socio-Spatial Characteristics of the Old Residential Quarters.

The quarters in the Old City of Hebron are shaped of clustered courtyard houses connected by organizational structure of winding alleys joining the quarters with the main streets (Al Qasaba) (Dwiek and Shaheen, 2017).

Here are the factors that affect the internal spaces configuration:

1. Basic Needs: The families' basic needs depend on th life style of individuals, where males usually work all day and return at night. In most cases, the home of a single-core family is one or two rooms in which all activities are held and some spaces such as the kitchen and bathroom are shared (Dwiek and Shaheen, 2017) see (Figure 3.2).
2. Family Structure: Each extended family lived in its quarter or courtyard, housing several smaller families. The quarter has a main courtyard with more than one entry and several open and semi-open smaller courtyards at different levels, which creates a network that connects all the rooms. When the sons of a family grow up and get married, the building extended vertically by adding new rooms and private courtyards. This kind of building is termed the incremental house (Zahda and Fukukawa, 2008, p. 280) see (Figure 3.2).

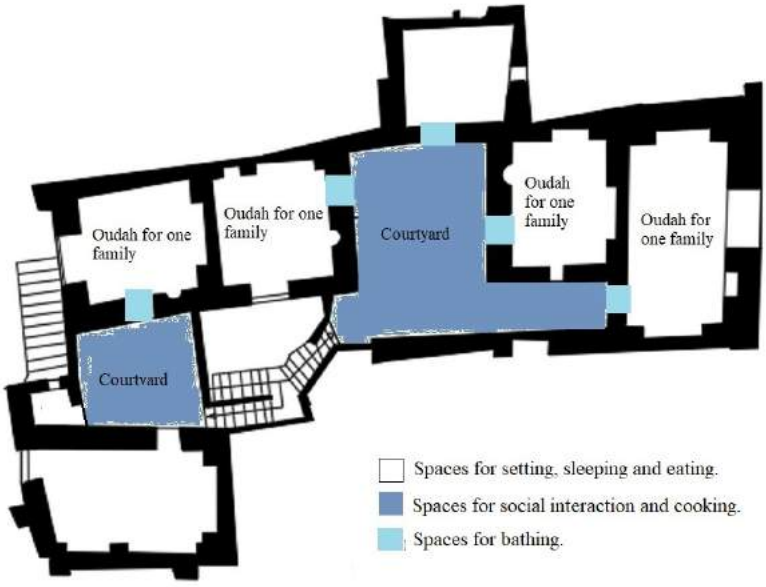


Figure 3.2: Basic needs and Family Structure (HRC edited by researcher)

3. Role of Women:the role of Palestinian women was one of the most significat factors in the structure of social life. Until the beginning of the twenty-first century, most women in Palestine were not granted any educational opportunities or did not meet the minimum requirements for education. Moreover, this applies to women, who lived, in the old city of Hebron (Al Qadi, 2000, p. 31).
4. The process of social Interaction: The social life in the Old City was characterized by vitality, whether between members of the single-core family or members of the extended family or between different families (Zahda and Fukukawa, 2008, p. 280). What made the spaces responsible for social activity, such as courtyard and guest rooms, are essential (Dwiek and Shaheen, 2017).
5. The degree of privacy: privacy was a crucial factor in living in the old city, where houses cluster in close proximity of one another. However, the level of privacy required in each case was relative to the family relationship between individuals (Al Qadi, 2000, p. 31).

3.2.1 Spatial Layouts of the Traditional House in Hebron

The dwellings within this urban fabric, which are dense and interconnected, had formed the heart of the old city. These dwellings took three patterns (HRC, 2008):

1. Independent residences units were built at the beginning of the nineteenth century on the outskirts of lanes, see (Figure 3.3).

Figure 3.3: Dweik Palace (Researcher)

2. Houses were built above commercial shops, with entrances leading them through an outside staircase located directly on the road.

Figure 3.4: Houses Built Above Commercial Shops (Researcher)

3. Residential units were built within the solidarity fabric of the neighborhood, ; for example al Juba Quarter.

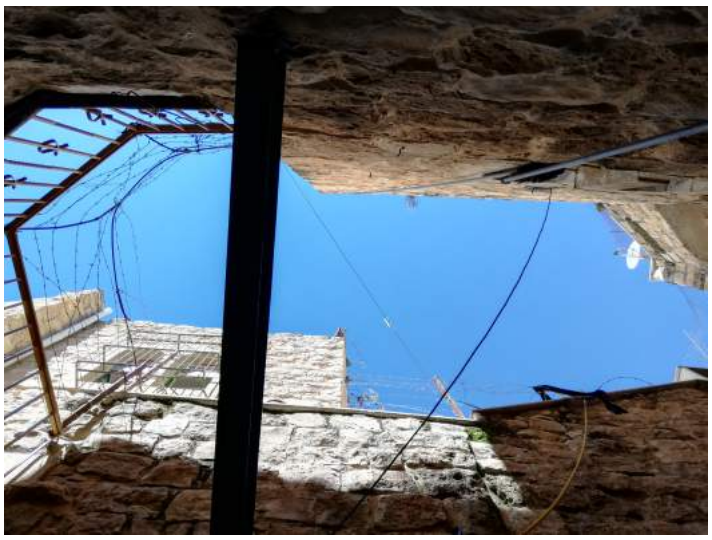


Figure 3.5: al Juba Quarter (Researcher)

3.2.2 Spatial components of the traditional house in Hebron

The traditional building contains many spatial components (Dwiek and Shaheen, 2017, p. 115-116) as:

1. The Entrance: The first space that can be seen from the semi-public space may have few small windows in their lower parts and bigger on upper floors. The house entrance was indirectly using the broken-access concept to prevent overlooking inside the house.

2. Courtyard: That is used for a family gathering, housework like cooking, and sometimes planted with small plants and bushes. However, there are houses in the old center of the city that have more than one courtyard. Each storey has a courtyard that is connected by stairs.

   According to the courtyard, there are two classes of houses. The first one has a central courtyard leading to a sub-courtyard. The other one has only one courtyard that directly leads to the rooms see (Figure 3.6).

Figure 3.6: Courtyard Directly Leads to the Rooms(Left),Main Courtyard Leading to Sub-Courtyard (Right) (HRC edited by the Researcher)

3. Al Oudah (Room): Most houses consisted of more than one storey since extended families lived together within the house. Each family has one room for the parents

and their children, which is called Oudah. This room has multiple functions: sleeping, sitting and dining and as a kitchen in some cases (Dwiek and Shaheen, 2017).

Commonly, each family had two private rooms and shared service rooms in the lower levels (Zahda and Fukukawa, 2008). Extended families used to gather in the same neighborhoods and formed coherent relationships.

4. Kitchen: Usually located on the floor at the entry-level in one corner of the yard and close to the water tank door. In some other cases, there is no kitchen at all; Ladies used to cook in the corners of the inner courtyard in summer. In winter times, Wijaq (fireplace) is used in one of the rooms (Al Qadi, 2000, p. 50). such fireplace had a chimney that was established to direct smoke away from the neighbors.
5. Bathroom (toilet): There were no bathrooms in houses as in modern times. While bathing at home was usually done at the threshold of Al Oudah (Dwiek and Shaheen, 2017).

3.3 Current Situation in The Old City

On both urban and architectural stages, the spatial configuration of the city is primarily affected by political and economic issues.

Both the Ibrahimi Massacre in 1994 (BADIL, 2016) and the Hebron Protocol (Un, 2016) had a significant impact on more than 50% of the residents of the Old City who are constantly exposed to settler violations (Harb and Lahluh, 2017). In addition, most of the residents live in poverty (Jabari, 2011).

Both political and economic factors led to a state of social instability inside the old city. So, its demographics shifted from its original residents with acceptable financial conditions to residents with low income or unemployed.

Social life in the old city has many problems which make the people feel unsafe inside their buildings. Therefore, The residents tend to cover their courtyards and build cement walls. Such practices have negatively affected the use of the buildings and led to their deterioration.

3.4 Contemporary Spatial Needs

The new social life in the city became more centered on the nuclear family, with fewer family members. So, the family that had one room inhabited by ten people now owns several rooms with dysfunctional specialties due to the change in the spatial needs and technological development.

The transformation of the families from an extended family, that lives at the same house sharing all services and rooms, to a nuclear family has created new needs. Nowadays, the dwellings became unambiguous and contained spaces that were not commonly used previously. For instance, families rely on the kitchen as a separate space rather than cooking in the courtyard. Also, wholly equipped bathrooms became a vital element of the house (Al Qadi, 2000). Moreover, the emergence of new social changes such as the pursuit of education, woman work outside the home, and acquisition of institutional careers lead to having a scheduled time to practice each of the activities. Thus, the traditional residential buildings in old cities become unfit for modern needs necessitating rehabilitating them.

3.5 The Rehabilitation of Old City of Hebron

On August 12, 1996, The Hebron Rehabilitation Committee was established by issuing a presidential decree. As soon as it was formed, the rehabilitation committee placed the following goals and strategies to revive the Old City by restoring its buildings, reusing the abandoned ones, rehabilitating its infrastructure, and preserving the cultural heritage, formative elements and urban fabric (HRC, 2011). The aims of rehabilitation project were (Awad, 2016):

1. Block the Israeli settlement inside the old city by surrounding the settlement outposts with rings of inhabited buildings to prevent their expansion horizontally and prevent these outposts' urban continuity by increasing the Arab population density between them.
2. Preserve cultural heritage by preserving the formative elements of the old building to preserve the entire urban fabric.
3. Revive the old city by strengthening the residents' association within it, reusing abandoned buildings, rehabilitating the infrastructure and linking the old town organically with the rest of the city.

3.5.1 Rehabilitation Process Challenges

The rehabilitation process faces several challenges (RehabiMed, 2005):

1. The problem of impeding the implementation of the Israeli army: as the old city is subject to Israeli control. Military orders have been issued to prevent the surrounding building's restoration. Furthermore, the Israeli forces arrest anyone who is working there.

2. The problem of fragmentation of ownership: the old city buildings formed dwellings for extended families with a succession of generations. These buildings became owned by hundreds of people, and a problem of property fragmentation arises.

   So, the rehabilitation committee resorted to renting the property from its owners to restore it and leasing it to a citizen who needs housing for a nominal rent for five years.

3.5.2 The Methodology Used in Houses Rehabilitation

In general, the restoration procedures in the city of Hebron are based on providing the basic contemporary needs of individuals. Sometimes, these methods may negatively harm the structure of the building as there are many problems that may face the historic building as a result of providing services such as kitchens and bathrooms that need infrastructure within this building see (Figure 3.7) .

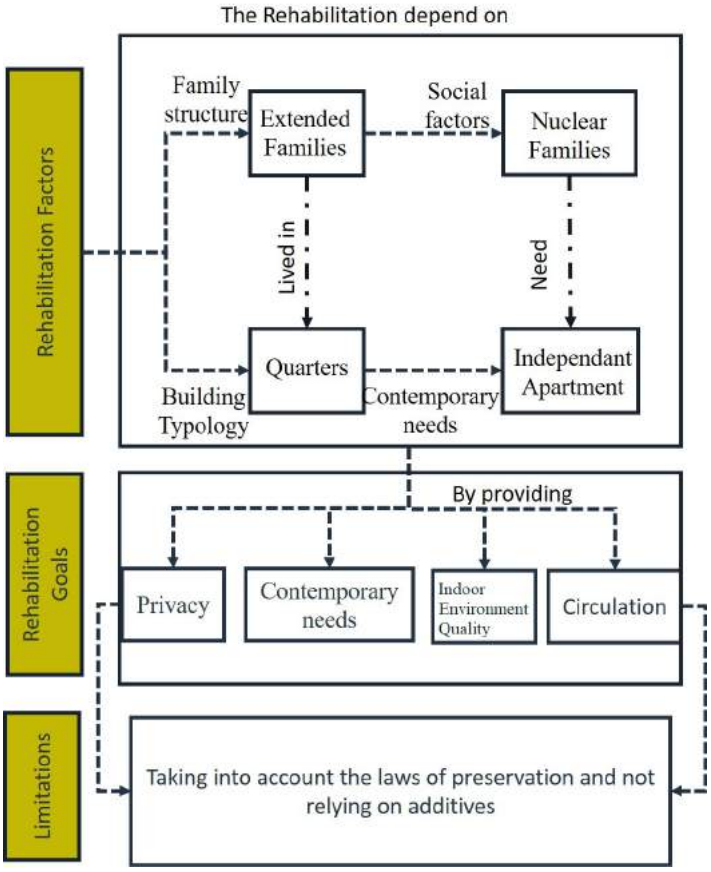


Figure 3.7: The Rehabilitation Methodology (HRC, 2015)

The solutions used in dividing the courtyards and independent houses into the apartments differ according to their patterns (Al-Qawasmi et al., 1998):

1. The independent houses containing small courtyards are converted into a single apartment after providing their services.
2. The large courtyard houses form suites around a courtyard or a narrow corridor, where each suite is transformed into a separate apartment.
3. The large courtyard houses with a random distribution of spaces around the open square or the narrow corridor are among the most typical cases that need critical architectural solutions. This happens to be divided into several apartments.
4. There are some cases where it is difficult to find solutions to divide them into apartments within rehabilitation interventions laws. Therefore, they are kept as a single apartment for a large family.

3.5.3 Providing Privacy

Providing privacy process is classified into providing external privacy, through separate the suites, and internal privacy, by distributing the internal spaces, and reopening and re-closing the windows and doors see (Figure 3.8).

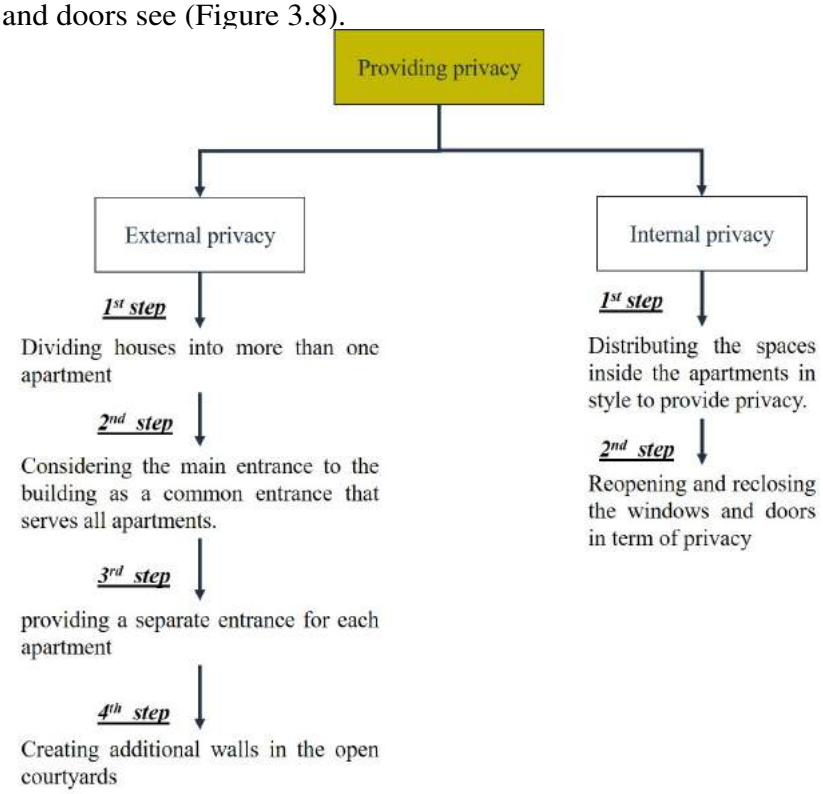


Figure 3.8: Providing Privacy Methodology (Summarized by Researcher)

3.5.4 Providing Essential Requirements for Traditional Buildings

Providing the essential services to meet the new necessities of the housing, which were not available in the old dwelling or were provided in a manner not commensurate with current requirements. These buildings in terms of the possibility of adequate solutions to provide the necessary needs are classified as:

1. First model: buildings where some services are available, such as toilets or kitchens. These spaces are reused and equipped with the necessary equipment.
2. Second model: buildings where some services are not available, where it was necessary to provide these types of spaces.

Providing convenient environmental conditions by providing daylight and natural ventilation in the dwellings, which is carried out through two directions:

First: By preserving the original elements that provide light and natural ventilation through:

1. The opened courtyard is an essential element to provide daylight and natural ventilation, whereas no spaces are added inside.
2. Small upper openings in walls or ceilings to enhance natural ventilation.

Second: Adding the necessary treatments to provide light and normal ventilation by:

1. Creating additional openings or expanding the original openings in harmony with the existing architectural composition.
2. Providing lighting and ventilation for all established services such as baths and kitchens.

Figure 3.9: Adding Environment Elements (Researcher)

3.5.5 Enhancing Accessibility in the Old Buildings

Enhancing accessibility to the old buildings means providing simple ways to move through the spaces within one apartment. One of the most important treatments was treating the stairs as shown in (Figure 3.11), removing the terraces and expanding the narrow doors, see (Figure 3.10).

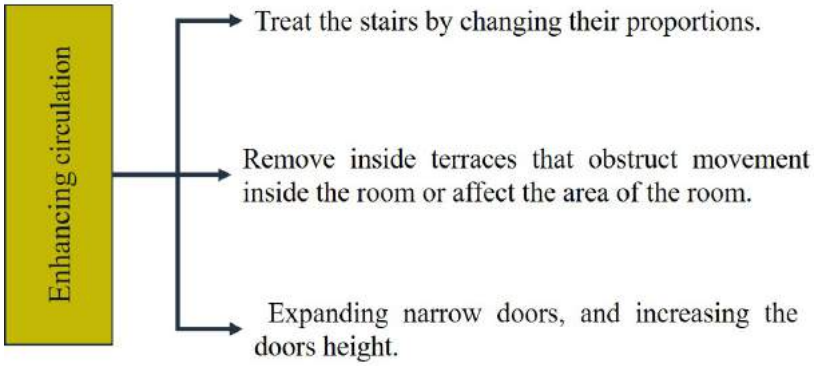


Figure 3.10: The Circulation Enhancement (Summarized by Researcher)

Figure 3.11: The Rehabilitated Stairs (Researcher)

3.6 Conclusion

Through this chapter, the matters that affected the changing needs of the families in the city of Hebron were reviewed and the restoration policies that the Hebron Rehabilitation Committee worked on to rehabilitate these buildings.

This methodology is mainly concerned with the physical aspect of the buildings. It contributes significantly to housing large numbers of families quickly, making this methodology affect the residents' comfort inside their homes. In the next chapter, the research methodology will be presented.

Chapter 4

Research Methodology

The purpose of this chapter is to discuss methodological and empirical frameworks used in this research. In addition, it explains the fieldwork processes used in data collection that supported the research.

The research relies mainly case-study analysis, using descriptive method. The research gathers data related to the case study in the form of questionnaires of the local population, documents from various organizations, and photographing. The descriptive-analytical method is used to analyze the results in order to obtain information about the current spatial configuration, linking it with the theoretical framework in order to understand the factors affecting the socio-spatial distribution of spaces and the determinants of the rehabilitation of old buildings.

4.1 Theoretical Approach

The theoretical approach is based on theories and ideas related to the field of study that have been introduced and identified to indicate the needs of people in rehabilitated buildings.

The keywords related to this research, based on literature review in (chapter 2), are: spatial configuration, human behavior and needs, conservation and rehabilitation laws.

Human needs can be investigated in rehabilitated buildings based on theories of human behavior. This will determine the reasons of the residents' behavior in their living environment and the mutual influence between the human race and buildings.

4.2 Case Study Approach

A case study is a research approach that is used to generate in-depth, multi-faceted understanding of a complex issue in a real-life scenario. It is an established research design that is used extensively in a wide variety of disciplines, particularly in social sciences (Crowe et al., 2011).

4.2.1 Case Study Selection

The Old City of Hebron has been chosen as the case study of this research; where restoration operations are primarily aimed at reviving the residential sector and maintaining its primary function.

4.2.2 Data Collection

The research adopts several data collection methods, including observation and questionnaires and documents. The observations are done first through the examining of the tangible elements of rehabilitated houses. Questionnaires to collect some data about the lifestyle of the traditional rehabilitated houses occupants.These methods are discussed in the following sections.

4.2.3 Documents

Documents are an explicit source of data collection in doing case studies. This research has relied on previous studies, drawings, qualitative and quantitative data that had been conducted by Hebron Rehabilitation Committee, who were helpful in this research.

4.2.4 The drawings analysis

The drawings are analyzed through Gamma Analysis as shown in (Appendix B) in order to understand the spatial configuration of different samples of houses.

The drawings analysis depends on the space syntax approach, which intends to investigate the relation of the inhabitants to their houses in the by the decoding of the spatial configuration of the house spaces and to link these orders with the social order and pattern of use.

At the late ’70s, Steadman established a method of architecture and urbanization investigation called space syntax theory (Ferguson, 1996). The theory depends on the inspection of the relation of each space unit among spaces in a group, so an applicable methodology to establish a comparative assessment and evaluate housing transformation (Al-Mohannadi et al., 2019), (Memarian and Sadoughi, 2011). Some indicators are used to show the relation between spaces, such as Integration and depth.

Integration (RA): ”the integration level is the depth average passed to reach from a node to all other system nodes” (Al-Mohannadi et al., 2019).

Depth: "is not the main parameter in space syntax. However, it is primary for determining integration at a given point. Moreover, it is illustrated as one of the steps one must take to pass from a point to another" (Al-Mohannadi et al., 2019).

Both depth and integration can be calculated through Gamma analysis and carried out to define the spatial configuration for the selected rehabilitated houses. A Gamma diagram is required for each house floor to evaluate the current situation and the suggested enhancement scenarios by the relative asymmetry (RA), which is calculated using (Equation 4.1) (Hillier, 1984), see (Figure 4.1).

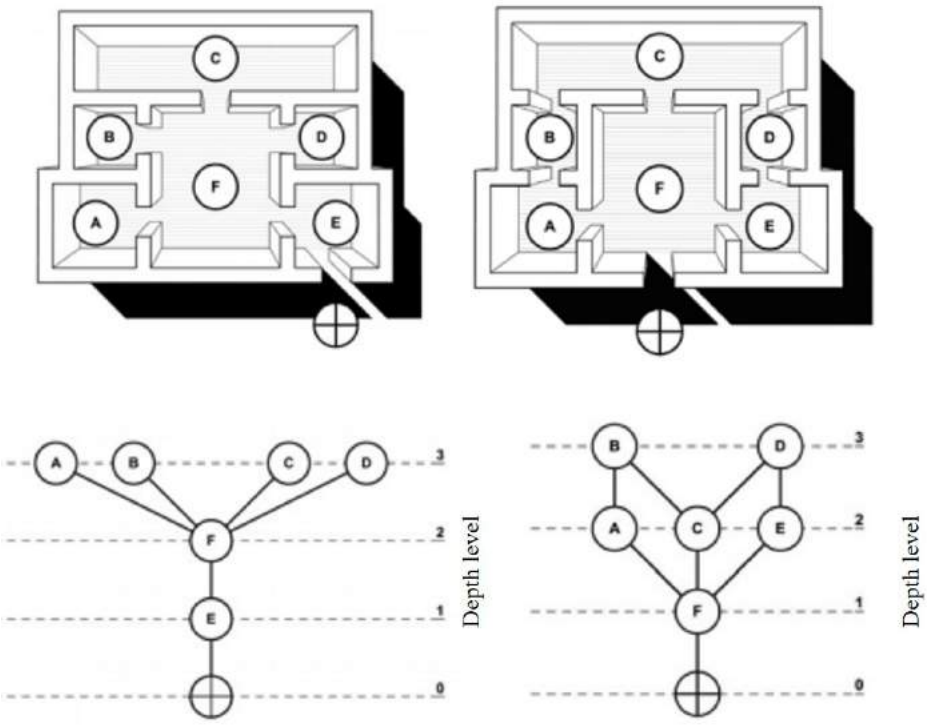


Figure 4.1: Building Analysis Using Gamma Analysis Method (Ostwald, 2011)

$$RA = 2(MD - 1)/K - 2 \tag{4.1}$$

MD is the mean depth and calculated as in Equation 4.2, where K is the number of spaces.

$$MD = TotalDepth/K - 1 \tag{4.2}$$

And the Total depth equation is:

$$TotalDepth = (0xN0) + (1xN1)... \tag{4.3}$$

Where 0 ,1 ,2 .. depth level ,N0 ,N1 .. are the number of spaces in each level.

The value of RA is an indicator of the integration. An increase in RA of space means a decrease of the integration of the space relative to other spaces in the house. In contrast, a decrease in RA of space means an increase in the integration of the space relative to other spaces (Hillier, 1984).

4.2.5 Observations

The study intends to observe people's behavior in the rehabilitated houses in the old city of Hebron, which helped in understanding the tangible elements within these buildings. Observations were documented through handwriting, architectural drawings and photographs. The observations made by the study are as follow:

1. Observing both the arrangement of spaces within the restored homes and link this arrangement to the level of satisfaction of families and the level of improvement they demand.
2. Observing the nature of spaces in terms of function, areas and people's interaction.

4.2.6 Questionnaire

The questionnaire attempts to examine the traditional houses in the old city of Hebron that were built in the Mameluke State and the Ottoman State and are occupied for housing. The estimated total number of historical buildings in Hebron is about 1500 according to the maps and records available from the HRC.

In order to evaluate the social lifestyle of the residents, the questionnaire relied on closed-ended and open-ended questions; as shown in (Appendix A). The goals of the questionnaire are as follows:

1. Linking general information about the inhabitants, such as: their age, gender, and numbers of family members, with the specifications of the apartments.
2. Determining the assessment of the residents of their rehabilitated homes in terms of their effectiveness in meeting their lifestyle and current needs.

3. Identifying the significant changes that residents have already made to the look of their homes.

The sample size is estimated to be 65 households, with a 10% margin of error and a 90% confidence level and it is calculated using sample calculator. The sample is randomly distributed.

Both questionnaire and observations help in understanding the current situation of the traditional rehabilitated houses through the user experience.

4.3 Conclusion

In this chapter, the methodology was presented and it can be summarized as in (Figure 4.2). The next chapter will present the data collection analysis in order to evaluate the current situation of residents' needs and find the problems that face the socio-spatial space in rehabilitated apartments.

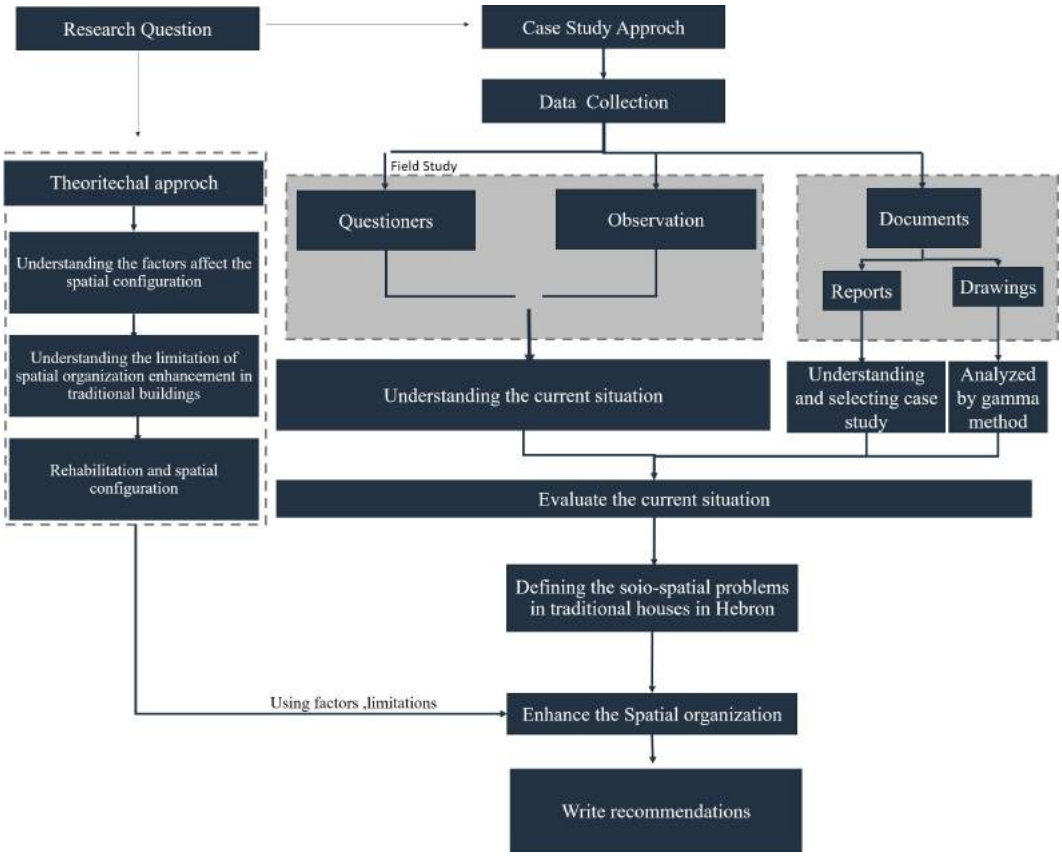


Figure 4.2: The research Methodology (Researcher)

Chapter 5

Research Results

This chapter analyzes the current situation of the socio-spatial configuration in the Rehabilitated Residential Buildings in the old city of Hebron through inhabitants' input and physical situation of the houses in order to identify the main socio-spatial problems in order to enhance them.

5.1 Demographic Analysis of the Old Houses

The research is based on questionnaire work, field visits and observations drawn from the residential buildings. Building plans analysis was carried on in order to understand the factors affecting the rehabilitation process of the residential buildings, and it was as follows:

1. Inhabitance situation: focusing on the community socially and economically is important as the society is considered as the main pillar in the building conservation projects. Recognizing the problems that the inhabitants suffer from, and the residents' needs play a major role in the project's failure and success. Moreover, assessing the economic situation helps in determining the mechanism of rehabilitation.
2. Characteristics and physical situation of the residential houses: studying the characteristics of the heritage houses and understanding the problems that each of them suffers from helps in the decision making process and searching for solutions to achieve the best results from studying the opportunities for its development and adaptation.
3. The environmental condition of the residential building: Evaluating the building's environmental conditions by understanding the residents' thermal comfort in it, the level of natural light provided by the building as both affect energy consumption; such as air conditioning and cooling methods.

5.2 Inhabitant Situation

The general situation of the Inhabitant deals with the origins of the families who live in these buildings and the number of families who live in these buildings, in addition to detailed information about the individuals who live in the apartments covered by the questionnaire.

5.2.1 Inhabitants' Origins

Over the decades, many of the original inhabitants of the old city have moved out to the suburbs due to several social factors such as: family formal and new needs. As the original inhabitants shifted out, they were replaced by new residents with different culture, traditions, and priorities. This change of the social composition had some negative impact on life in the old city. The analysis of the questionnaire shows that over 60% of the residents of the random sample have rented or acquired the building from the Hebron Rehabilitation Committee for free. Meanwhile, less than 40% of the residents are descendants or relatives of the original residents.

5.2.2 Families Numbers at The Building

The number of families that inhabit same building varies from one family to two families. Sometimes, it has three and more, but with a smaller percentage see (Figure 5.1).

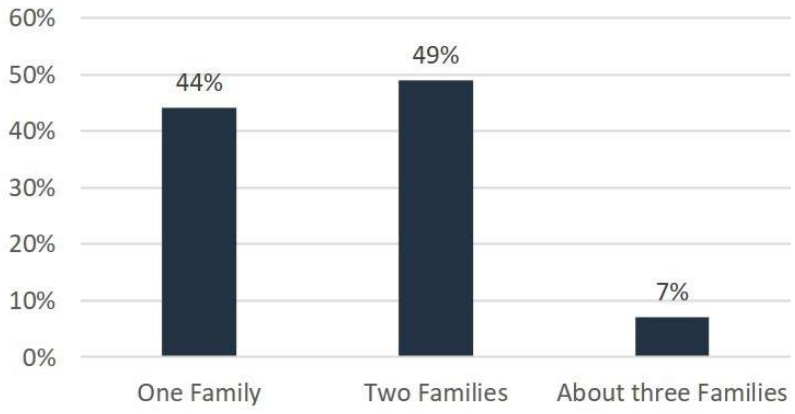


Figure 5.1: The Number of Families in The Building (Researcher)

By observation, grandfathers and grandmothers in the house were not considered as just one person. Rather, they are a whole family because of the relationship that binds them to their married sons, daughters and their descendants. So, they they have many visitors with long-period visits. Therefore, it is noticeable that they have a minimum number of rooms inside the house, even if they live with their married sons.

5.2.3 Family Members in the Apartment

The questionnaire collected information about family members in the same apartment, and this information was as follows:

5.2.3.1 Family Members Number

The number of family members in the random sample varied, and their distribution is shown in the (Figure 5.2).

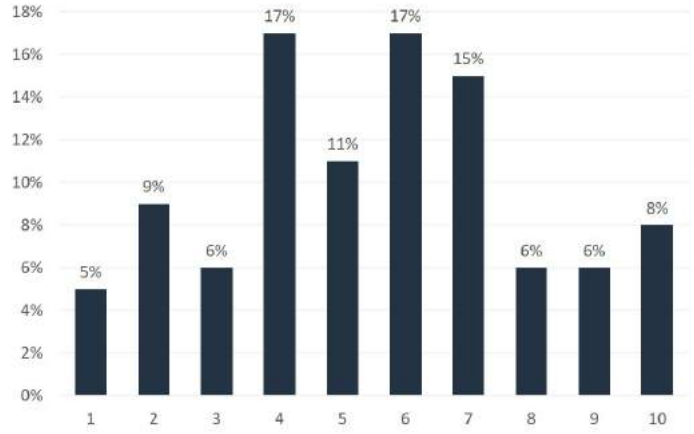


Figure 5.2: The Number of Family Members Distribution (Researcher)

This disparity indicates that the rehabilitation process must consider all these groups to achieve stability within the family.

5.2.3.2 Gender Distribution Among the Family

The gender distribution among these families, males and females, was also taken into consideration. This information is important because of the community nature, as most families in Hebron contribute to provide housing to their marrying sons, which leads to the additions of new rooms. On the other hand, families with daughters decline in number as those girls get married, see (Table 5.1).

Table 5.1: Sample Distribution According to the Gender (Researcher)

Number	**1**	**2**	**3**	**4**	**5**	**6**
Male	13%	26%	29%	16%	15%	2%
Female	28%	22%	25%	11%	11%	3%

5.2.3.3 Age Distribution of The Family members

Based on the age distribution in the random sample, families are considered young families, and most of their children are less than 21 years old, see (Table 5.2).

Table 5.2: Sample Distribution according to their ages (Researcher)

Ages of Spouses		
Age group	**Husbands**	**Wives**
20-29	11%	19%
30-39	21%	23%
40-49	25%	24%
50-59	25%	15%
60-69	9%	16%
70-	9%	3%
Ages of Others Family Members		
Age group	**Sons**	**Daughters**
0-6	25%	17%
7-15	34%	35%
16-18	15%	19%
19-21	12%	12%
22-30	14%	12%
30-	0%	5%

Almost 94% of the random sample did not have relatives living with them at the same house. The research considers the family members include a grandfather, grandmother, parents or children otherwise they are considered as relatives. The families that have relatives within the house share family members the spaces and do not have their own private rooms.

Examples of the relatives, who live among a family, include unmarried or divorced sisters, who live at their brothers houses, and orphans grandchildren.

5.3 Economic Situation

Close to 63% of the random sample shows that the paterfamilias has a job. Additionally, below 40% of the families have one to three other working members in addition to the paterfamilias. Based on Observation, the economic situation of the family is reflected on the house conditions; good finances meant good house condition. Also, the families that included a working female, either a mother or daughters, were able to determine their exact needs more precisely than others.

5.4 Education Situation

The research found that around 55% of the families have members who are studying, which raises the demand for places to study inside the house.

5.5 Apartments Specification

The characteristics of the apartments are the main reflection of the spatial distribution in the restored buildings. By understanding these characteristics it is possible to identify the common problems that these apartments suffer from and make recommendations.

5.5.1 Entrances

About 46% of the apartments' entrances are sharing, while 54% are independent. So, if a person wants to enter a family house, crossing another family house is needed, see (Figure 5.3).

Figure 5.3: Shared Entrance (Researcher)

Usually, as noticed, the shared entrance belongs to two nuclear families from the same extended family e.g (brothers, cousins, father and son). These families mentioned that they suffer from privacy shortage .

5.5.2 Spaces Areas and Usages

The areas of the rooms vary in the buildings random sample, ranging from 9 square meters up to 24 square meters, and sometimes reaching 36 square meters. The main reason behind this variation is that each room were built independently and later attached to the main house.

The families use the larger rooms either as a guest room or as a multi-function room. The smaller rooms are used as private bedrooms and the smallest ones as kitchens or bathrooms.

(Table 5.3) shows the availability of different activities as one type of room per each family and shows the average areas.

Table 5.3: The Used Rooms in The Buildings (Researcher)

Room Activity	Percentage % (One of Room Type/Family)	Average area (M^2)
Bedroom	100%	17.09 M^2
Guest room	52.30%	16.9 M^2
dinning room	4.60%	14.3 M^2
living room	30.70%	16.7 M^2
kitchen	70%	8.1 M^2
bath	70%	2.28 M^2
store	6.15%	8.5 M^2

According to (Table 2.1) in (Section 2.5.1), the minimum average area of the spaces in (Table 5.3) is acceptable.

It is noticeable that a large number of houses use a room for a number of activities. Mainly, the living room is the room which is used as the multi activities room by 100% of the questioned people.

1. Multi Activity Room:Most families use its living room or multi activity room to Watch TV and to eat together. Even more, some families use the multi activity rooms as a bedroom and a living room. In other cases, it might be a guest room and the dinning room at the same time, see (Figure 5.4) .

Figure 5.4: The Multi Activity Room (Researcher)

Beside the living room functionality it was used additionally for another functionality. Either as a bedroom by 71% or as a guest room by 58.5% or as a dining room by about 41%. However, a few families 1.9% use it as a kitchen, see (Figure 5.5).

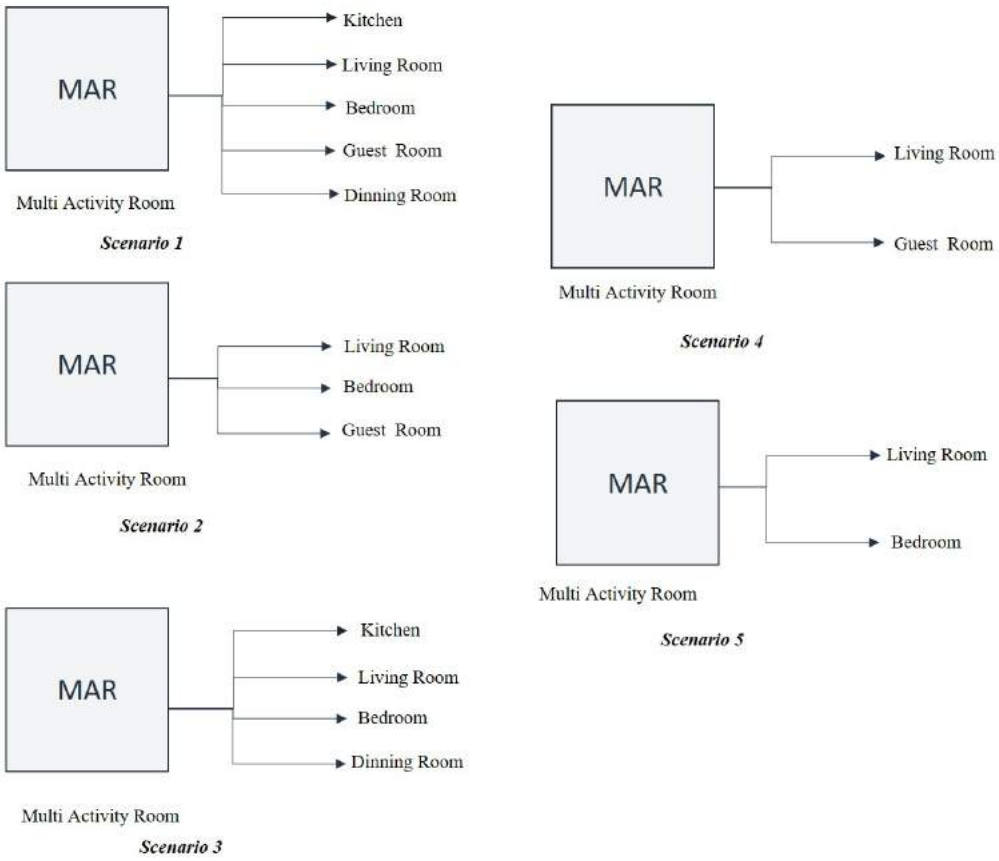


Figure 5.5: Multi Activity Room Using Scenarios (Researcher)

2. Guest Room: Most families mentioned that they have family visits. Especially, the families that have married sons and daughters spend social and religious events with each other. Therefore, they own a guest room even though they do not have enough bedrooms, see (Figure 5.6).

Figure 5.6: The Guest Rooms in traditional buildings (Researcher)

3. Bedrooms: Based on the questionnaire, it should be noted that most of the restored residential buildings in the Old City lack the needed number of rooms, especially the bedrooms. Additionally, by reviewing the spaces in the buildings, the average area is about 17 square meters in the bedroom's random sample as shown in (Table 5.3), and the average number of rooms is about 1.6. Meanwhile, the average number of beds is 5.54 Therefore, the crowding degree of the individuals in the room is high. The research concludes that there are, on average, two people in 52.5% of the sample who do not have their own bedroom. And worth mentioning, many families stated their desire to create new spaces inside the house as their children slept at their parents' bedroom.

4. Kitchens: The research shows that less than 14% of the families share a kitchen with another family that lives beside them. On the other side, more than 86% do not.

5. Bathrooms and W.C: The research demonstrates that only 10% of the families have a shared bathroom with another family that lives beside them. However, 90% don't.

6. Children Spaces: The research explains that the answers to the question regarding the place where children play: watch TV, play PC games. Some answered that their children play outside the house but only inside the courtyard as shown in (Figure 5.7) and they do not allow their children to play outside with their neighbors, which is based on the assumption that the surrounding neighborhood is unhealthy from morality point-of-view. Another group of parents allow their children to play outside

the house, however only with children of the ”good” neighbors. Also the research shows that others prefer to go to public parks with their children. A group of parents also indicated that their children are in the study stage, and therefore one of their activities is studying.

Figure 5.7: A Swing Inside the Yard Dedicated for Children Playing (Researcher)

5.5.3 Spaces Acceptability

The movement inside the house is one of the issues facing the Old City. Especially in the houses that contain courtyards.

1. Walking through the courtyard to enter the house: About three quarters of the families have courtyard within their apartments. The courtyard is considered a rooms distributor without the presence of a transition area. This conclusion is based on the calculations of the depth and the integration values of the houses plans, see (Appendix B).

   Based on the nature and the position of the courtyard several problems may appear; like privacy and comfort of usage. Moreover, the open ceiling nature of the courtyard represents a problem through the seasons, especially during the winter time, when it rains.

   The following (Figure 5.8) shows the nature of moving to the bathroom across the courtyard. In some cases, families who live in close proximity to the Israeli settlers,

chose to cover their courtyard in order to feel safe.

Less than one third of those who have a courtyard have covered it. either by the themselves or by the Hebron Rehabilitation Committee.

Figure 5.8: The Accessibility of bathroom using the courtyard (Researcher)

2. Walking the stairs: There are some problems related to the number of stair-steps inside the apartments that affect people with special needs see (Figure 5.9).

Figure 5.9: Accessibility and Movement Obstacles (Researcher)

5.5.4 Rooms Distribution

It was clear that many apartments suffer from an inadequate distribution of spaces, which affects these rooms' effectiveness and affects the level of privacy required, as shown in (Figure 5.10).

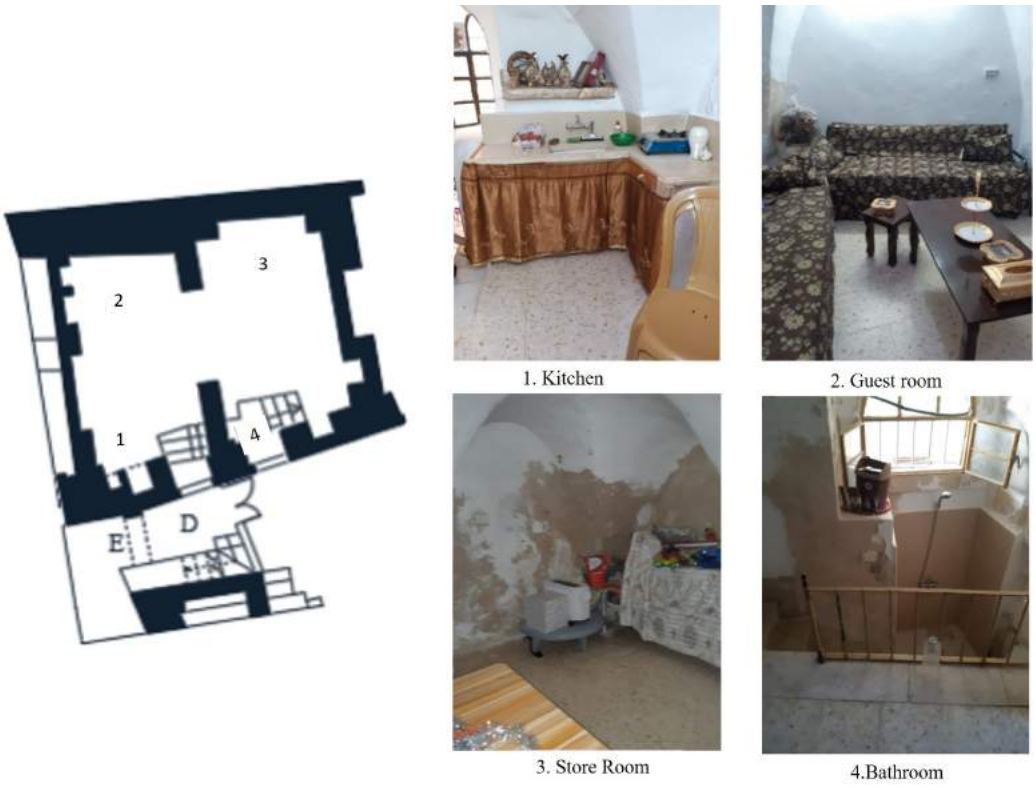


Figure 5.10: Example of Spaces Distribution (Researcher)

It was noticed that services are useless, such as the more than one kitchen that can be converted into a more needed space, see (Figure 5.11).

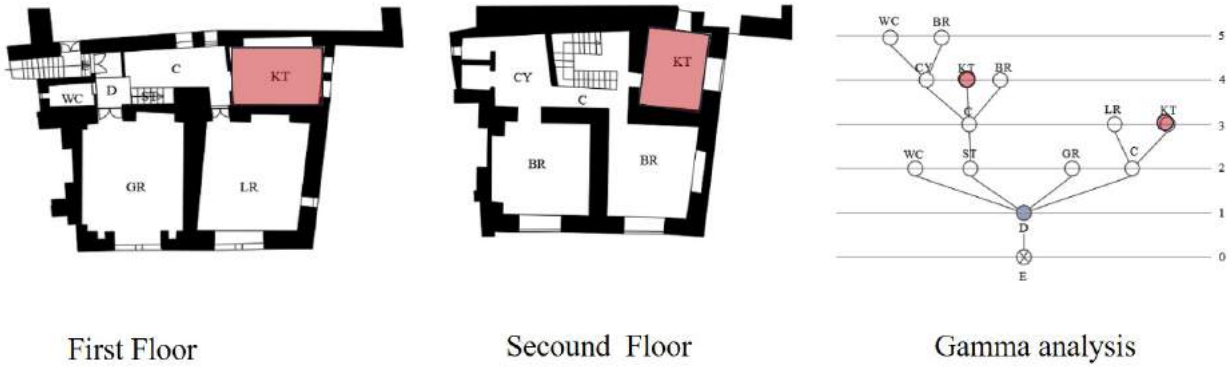


Figure 5.11: Services Repetition (Researcher)

5.5.5 Satisfaction Level With the Spatial formation

The satisfaction index is based on several factors, including the adequacy of spaces, the variety of spaces inside the house, a sense of privacy, and satisfaction with the environmental and social level.

The level of families' satisfaction with their homes has varied, as about 37% of the families are never satisfied with the house, 30% rate it acceptable, 20% consider it well, and only about 13% view it very well and are completely satisfied with it as shown in (Figure 5.12).

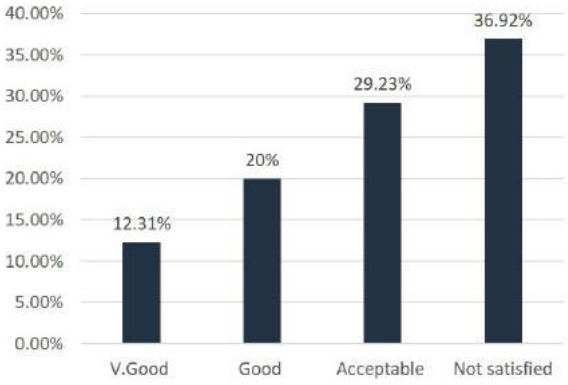


Figure 5.12: Satisfaction Level With Spatial Formation (Researcher)

The inhabitants have partially changed in their houses to fulfill their own needs, whether by increasing the number of rooms, covering the courtyards; to protect against the sun rays or the rain, or or increasing the level of the privacy as shown in (Figure 5.13).

Figure 5.13: The additions by residents (Researcher)

5.6 Environmental Situation Assessment in the Random Sample buildings

There are some rooms that have unsatisfactory environmental conditions, such as no windows, and thus the lack of natural lighting and ventilation. About 93% of the random sample buildings suffer from damp damage visible on the walls and ceiling, see (Figure 5.14).

Figure 5.14: The Damp Problem (Left), The Lack of The Daylight (Right), (Researcher)

In some cases where families have established new windows between rooms to allow in some natural sunlight. According to the questionnaire, the availability of natural sunlight inside the old buildings can be described as shown (Figure 5.15) . As a result, 34% of the residents have to rely on artificial lighting during daytime. Meanwhile 22% use artificial lighting although they do not have to.

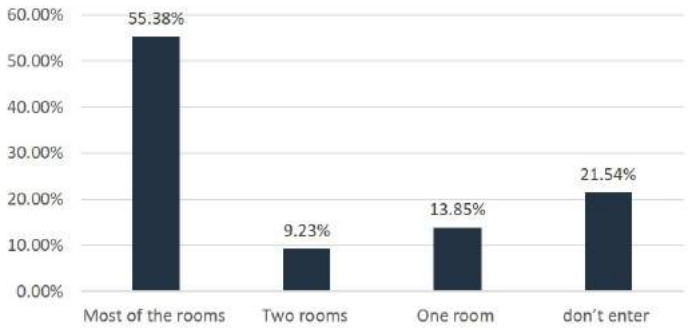


Figure 5.15: Daylight Inside The Building (Researcher)

1. Thermal comfort in Winter: About 26% of families heat their homes all day long and 21% need heating during day time, in contrast 3% rely on it at night time only, while the rest of them use it for less than ten hours. The (Figure 5.16) shows thermal comfort in winter.

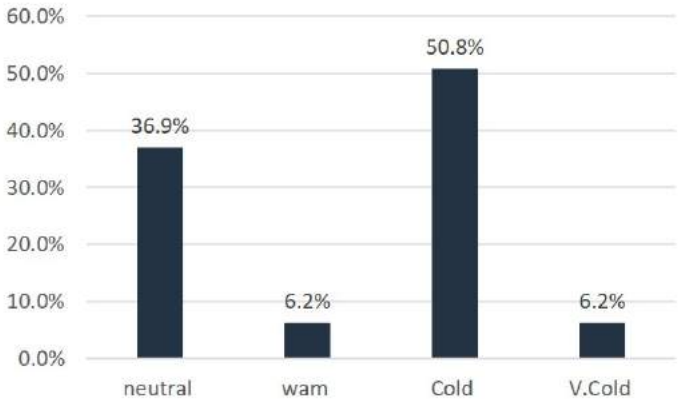


Figure 5.16: Thermal Comfort in Winter (Researcher)

About 86.2% of families depend on electric heater for heating, and up to 12% use gas, 3.1% have air conditioning, and less than 10% use other heating methods, such as firewood.

2. Thermal comfort in Summer: About 92.8% of families depend on the electric fan, and less than 10% use air conditioners.

   About 45.3% of families cool their homes all day long and 17.2% need cooling during day time, in contrast 12.5% rely on it during night hours only, while the rest use it for less than ten hours. The (Figure 5.17) shows thermal comfort in the summer.

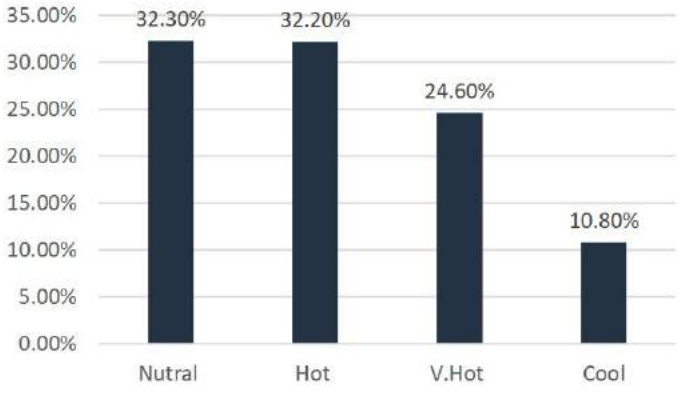


Figure 5.17: Thermal Comfort in Summer (Researcher)

5.7 Conclusion

This chapter shows that 37% of the residents within the random sample are not satisfied with their homes because of socio-spatial problems. Which can be summarized as follows.

1. Lack of privacy: The lack of privacy in the traditional residential building has three levels.
   (a) External privacy (privacy between apartments): It is caused when families live and share in the courtyard and entrance, leading to a loss of privacy. To solve this problem, it is necessary to redistribute housing units and separate entrances.
   (b) Internal privacy (privacy inside the house): As a result of poor space function distribution, most of the building's spatial configuration does not consider the privacy levels inside the apartment.
   (c) The lack of privacy due to the inadequacy of the number of rooms relative to the number of people. This has forced families to use rooms for multiple activities that include sleeping, sitting and others. Thus, the privacy level in these spaces is somewhat limited. In addition, children sleep at their parents' room.
2. Availability of service rooms: There are a few buildings where essential services such as the kitchen and bathrooms are shared, and whose residents expressed desire to be separated, there is a repetition in useless services.
3. The distribution of spaces: this appears in the distribution of day and night spaces and their relation, so the individuals cannot move smoothly inside the building.

The next chapter discusses the findings in this chapter to develop recommendations for enhancing the socio-spatial space in the traditional rehabilitated buildings.

Chapter 6

Research Discussion

This chapter discusses the results of the (chapter 5), including in light of the essential points summarized by (chapter 2), Literature Studies, to set recommendations later.

In addition, this chapter applies some suggestions to a group of samples to demonstrate how the improvement process of the socio-spatial space in traditional homes can be accomplished.

6.1 The Enhancement of Rehabilitated Houses

The improvement process of an old building was based on the literature studies; as shown in (Figure 2.7) by providing the necessary services, achieving both internal and external privacy, and securing access to spaces.

6.1.1 Domestic Services

According to (chapter 5), domestic services are defined based on their relative importance to the residents and are classified into: indispensable, very important, of medium impotence, and low importance services.

Consequently, the minimum number of spaces that should be available for a family of two people that do not share any room is five spaces. It is very important in choosing the rooms' activities that their dimensions are commensurate with the furniture used, so that the movement area is possible see (Table 6.1).

Table 6.1: The Required Domestic Services (Researcher)

The importance level	**Irreplaceable**			**High Importance**	**Average Importance**	**Little Importance**	**Can Be Dispensable**
The room	Bedroom	Bath /W.C	Kitchen	Living Room	Guest Room	Store	Dinning Room
Shareable between families	Can't	Can't	Can't	Can't	Can	Can	Can't

in the case where a building is shared by two related families, it is possible for both families to share the guest room where a stranger male guests are received. Meanwhile women guests can be received in each family private living room.

6.1.2 Privacy

As discussed earlier, privacy is essential for the residents of the old city, this section presents suggestions to enhance privacy situation of apartments and houses.

1. Privacy Between Apartments (The Shared Entrances)

   In buildings with a shared entrance, the type of relationship between families must be well defined; for example, the relationship between in-law family and their son's family as shown in (Figure 6.2). In that case, it is possible to let the father's apartment closer to the entrance. The son's apartment is the farthest to provide greater privacy for the son's family.

   As for the case of two brothers' families, shown in (Figure 6.5), it is necessary to separate the entrance using a partition, and if it is not possible to separate the entrance, it is preferable for the building to be inhabited by one family only.

2. Privacy Inside The House

   (a) Lack of partitions: increasing privacy inside the buildings can be achieved by adding some partitions, meanwhile taking into account the degree of permissible interference in the building and the limitations that accompany the aesthetic degree of the building according to (Table 2.3) and (Table 2.2).

   (b) Bedrooms availability: the increase in the number of family members and different genders among children are considered as factors to determine the number of the bedrooms, taking into consideration the bedroom area as shown in (Table 2.1).

   In order to provide the appropriate number of bedrooms, one must take into account the determinants of ownership, meaning that it might not be possible to add or subtract any space inside the yard due to ownership by others. In other words, if a family owns its home, it is possible to add new spaces in the building.

Table 6.2: The Suggested Numbers of Bedrooms (Researcher)

No. of person /family	1-2	3-4	5-6
Minimum required rooms in the children in each room are from the same gender	1	2	3
Minimum required rooms in the children in each bedroom aren't from the same gender \ bedrooms have enough areas	1	3	4
Minimum required rooms in the children in each bedroom aren't from the same gender \ bedrooms don't have enough areas	1	4	5

6.1.3 Accessibility

In the process of identifying spaces and their relationship with each other, the degree of privacy of those spaces must be determined based on space classification as for day or night functions. In addition to transition spaces. (Figure 6.1) summarizes the suggestions for the improvement process.

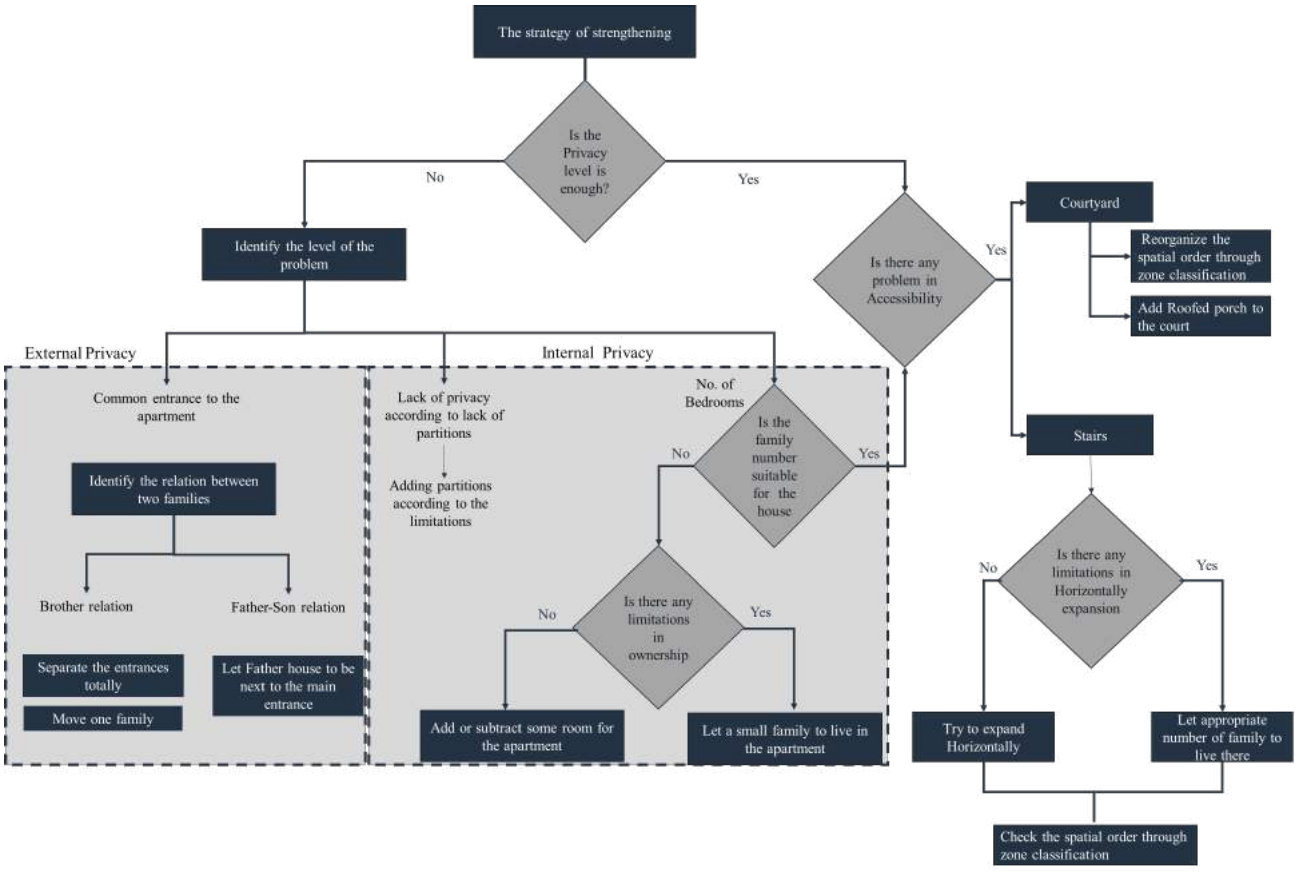


Figure 6.1: The Enhancement Recommendations (Researcher)

6.1.4 Thermal Comfort Evaluation

Because of the importance of thermal comfort, the research evaluated the thermal comfort that affects on the spatial configuration for some samples as seen in Appendix C.

6.2 Implementations of the Enhancement Suggestions

The research has applied some recommendations to a group of samples using a specific research methodology based on analyzing these samples using gamma analysis before and after the enhancement processes.

6.3 The Implementation Samples

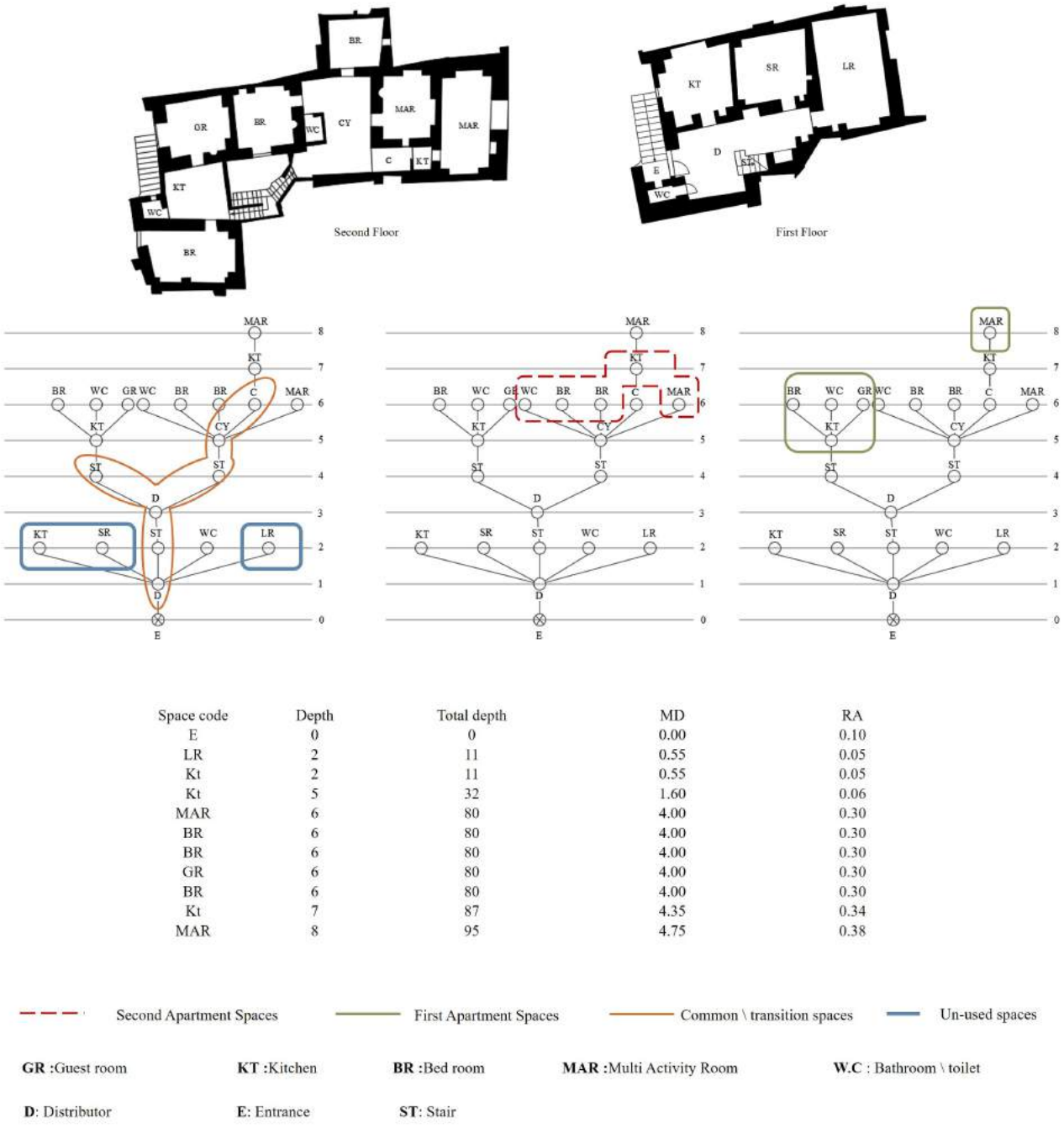
The research selects three types of buildings:

1. Residential building was built over shops, which has windows toward the street and toward the courtyard, such as Al-Aqqaba building.
2. Independent residential building that has windows toward the street only as Dwiek house.
3. Residential building that was built in a contiguous urban fabric as Al-juba building.

6.3.1 Dweik Dwelling

Dweik dwelling sample is located at Al-Aqqaba building see (Appendix B). It consists of rooms around a central courtyard. Two families currently live there; a father and his married son, as shown in (Figure 6.2).

The house needs to be divided in order to achieve two independent entrances. Also, the services need to be non-shared in order to mitigate social conflicts. Additionally, The house suffers from poor distribution of rooms, lack of privacy, and inadequate accessibility priorities.



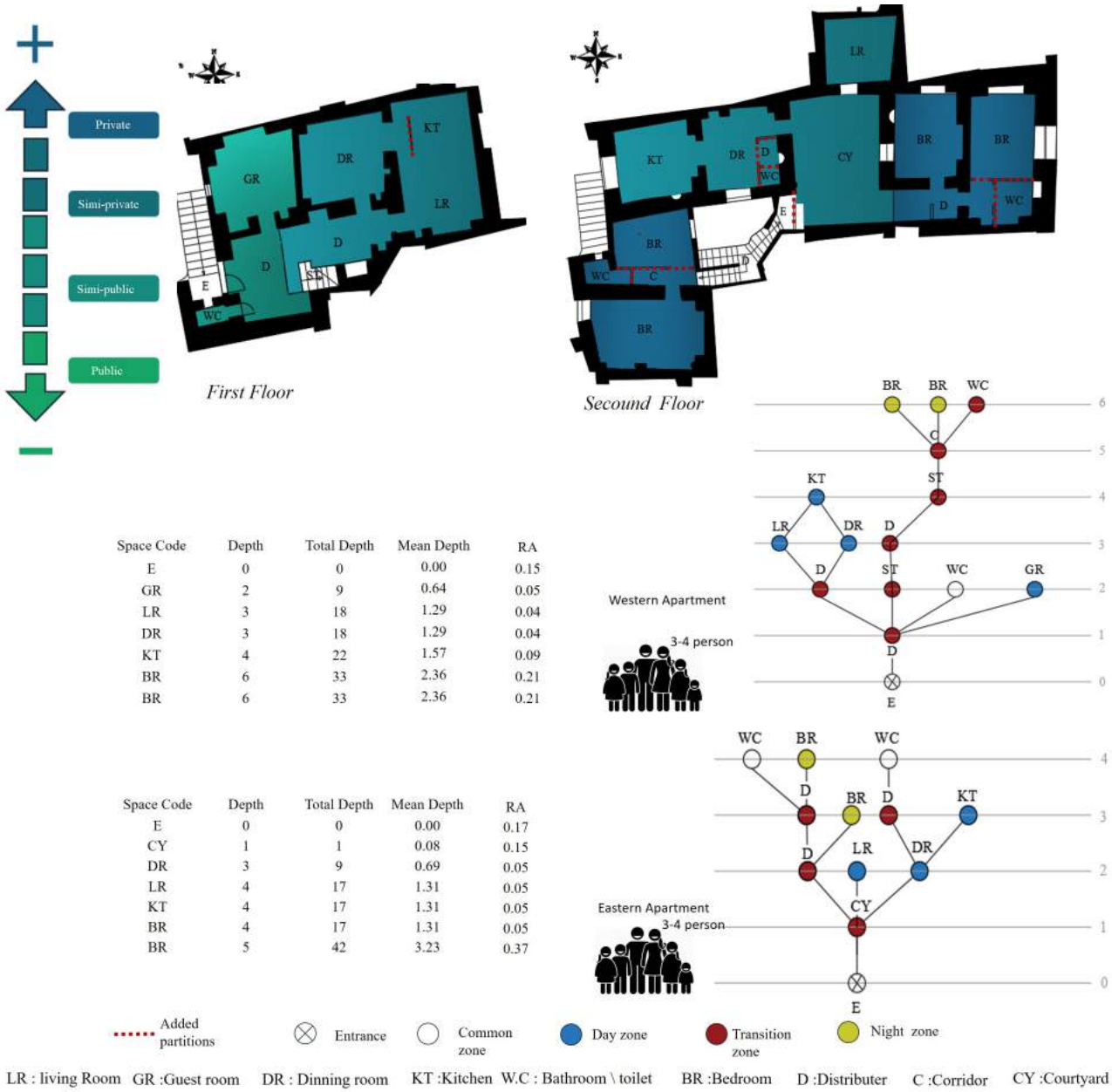
Space code	Depth	Total depth	MD	RA
E	0	0	0.00	0.10
LR	2	11	0.55	0.05
Kt	2	11	0.55	0.05
Kt	5	32	1.60	0.06
MAR	6	80	4.00	0.30
BR	6	80	4.00	0.30
BR	6	80	4.00	0.30
GR	6	80	4.00	0.30
BR	6	80	4.00	0.30
Kt	7	87	4.35	0.34
MAR	8	95	4.75	0.38

Figure 6.2: The Gamma Analysis for The Dweik House (Researcher)

6.3.1.1 Suggested Enhancement Scenarios

First suggested solution: the house should be separated into two apartments with different services. Therefore, an eastern apartment will be formed on part of the second floor. meanwhile, a western apartment will be formed on both the first and the remaining part of

the second floor. In the first proposal, the building will contain two apartments,each with capacity for a family of four.



Space Code	Depth	Total Depth	Mean Depth	RA
E	0	0	0.00	0.15
GR	2	9	0.64	0.05
LR	3	18	1.29	0.04
DR	3	18	1.29	0.04
KT	4	22	1.57	0.09
BR	6	33	2.36	0.21
BR	6	33	2.36	0.21

Space Code	Depth	Total Depth	Mean Depth	RA
E	0	0	0.00	0.17
CY	1	1	0.08	0.15
DR	3	9	0.69	0.05
LR	4	17	1.31	0.05
KT	4	17	1.31	0.05
BR	4	17	1.31	0.05
BR	5	42	3.23	0.37

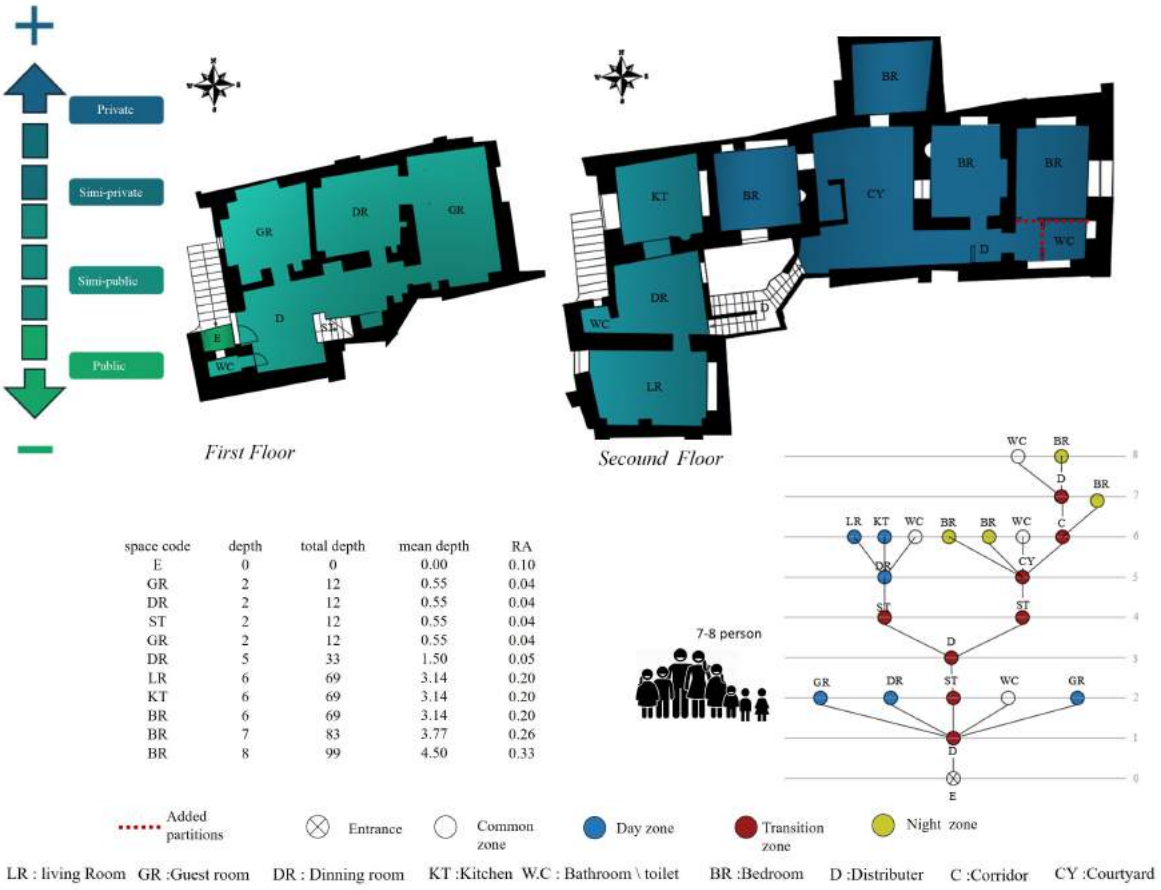
Figure 6.3: The First Scenario for Two Families (Researcher)

So, the two apartments were separated by a partition, preferably of wood or a living wall, which it guarantees not to distort the beauty of the building. Furthermore, the apartments are formed such that the apartment of the father is nearest to main entrance, which gives greater privacy to son's family. This is especially important as the father receives many visits from

his others children and their families, which would constitute a breach of the privacy of the son's family.

A shared guest room for men is created by the entrance to ensure greater privacy for both families. The spaces are distributed to ensure easier access and higher privacy. For the spaces to be sufficient , the spaces were redistributed by placing new, and removing some existing partitions as shown in (Figure 6.3).

Second suggested solution: In another possible scenario, the dwelling can be formed as residence for a single large family of seven or eight members. In this solution, the research transform the first floor rooms for living and guest spaces only and the second floor rooms for the family members. Moreover, rooms wrap up around the courtyard, turning the courtyard to a private space, see (Figure 6.4). This solution is only applicable if one of the current families move out.



space code	depth	total depth	mean depth	RA
E	0	0	0.00	0.10
GR	2	12	0.55	0.04
DR	2	12	0.55	0.04
ST	2	12	0.55	0.04
GR	2	12	0.55	0.04
DR	5	33	1.50	0.05
LR	6	69	3.14	0.20
KT	6	69	3.14	0.20
BR	6	69	3.14	0.20
BR	7	83	3.77	0.26
BR	8	99	4.50	0.33

Figure 6.4: The Second Scenario With One Family (Researcher)

6.3.2 Al-Hirbawi Dwelling

Al-Hirbawi dwelling occupied by two families; of two brothers. One family has four members and the other has eight members. They share one entrance, some common spaces, and the distributor. Each dwelling has a guest room, a bedroom for the parents, a kitchen, a bathroom and a multi-activity room that is used a living room and sleeping space, see (Figure 6.5).

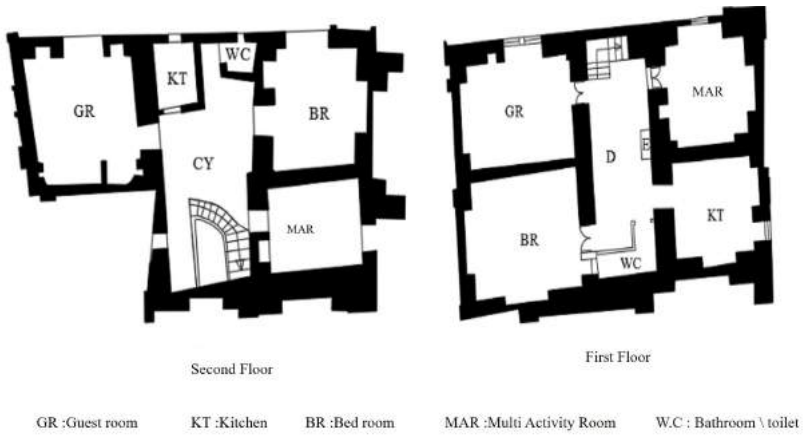
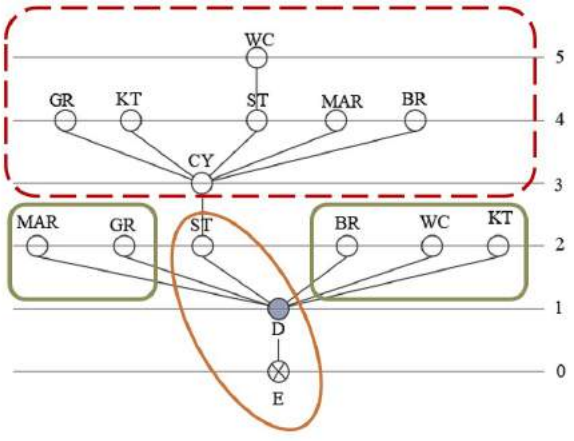


Figure 6.5: Al Herbawi Dwelling at Al-Aqqaba Dwelling

As shown in (Figure 6.6), the layout suffers from a lack of privacy between two families of two brothers. One of the two families lives on the first floor and the other is on the second floor. When people living on the second floor need to go outside, they have to pass through the dwelling the family living on the first floor. This lack of separation and privacy between the two dwellings is a problem for both families.

Space Code	Depth	Total Depth	MD	RA
E	0	0	0.00	0.15
GR	2	13	0.93	0.01
KT	2	13	0.93	0.01
MPR	2	13	0.93	0.01
BR	2	13	0.93	0.01
KT	4	36	2.57	0.24
BR	4	36	2.57	0.24
MPR	4	36	2.57	0.24
GR	4	36	2.57	0.24

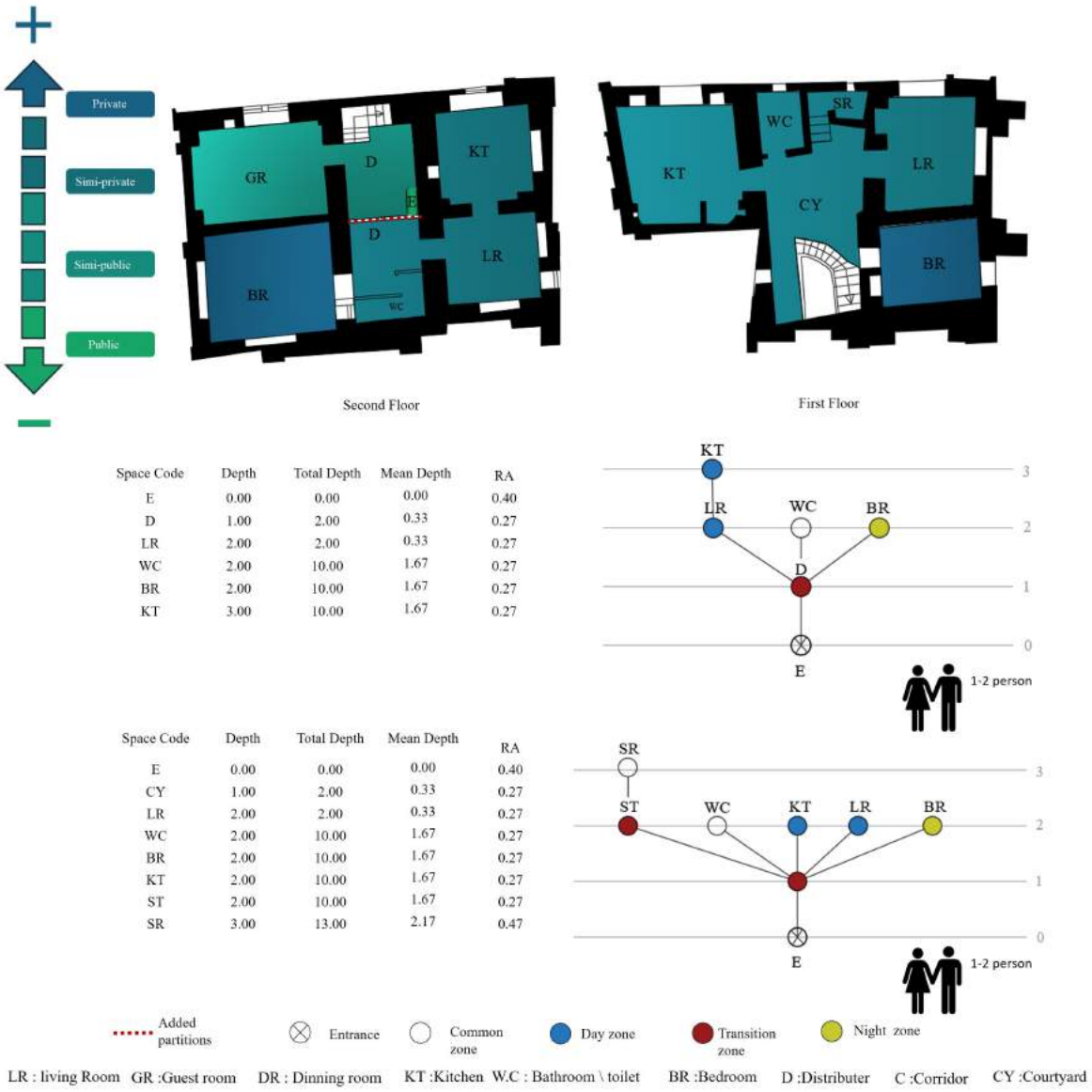


Second Apartment Spaces — First Apartment Spaces — Transition Spaces

Figure 6.6: The Gamma Analysis of Al Herbawi Dwelling (Researcher)

6.3.2.1 Suggested Enhancement Scenarios

Two proposals were worked out: one provides two seperate apartments, and the other present a one family solution. In the case of two apartments, the entrance is separated by introducing a partition in the first apartment. allocate new spaces within each apartment to eliminate any shared areas; which increases privacy between the two. In this scenario, each apartment can accommodate only two people, with essential needs being met, see (Figure 6.8).



Space Code	Depth	Total Depth	Mean Depth	RA
E	0.00	0.00	0.00	0.40
D	1.00	2.00	0.33	0.27
LR	2.00	2.00	0.33	0.27
WC	2.00	10.00	1.67	0.27
BR	2.00	10.00	1.67	0.27
KT	3.00	10.00	1.67	0.27

Space Code	Depth	Total Depth	Mean Depth	RA
E	0.00	0.00	0.00	0.40
CY	1.00	2.00	0.33	0.27
LR	2.00	2.00	0.33	0.27
WC	2.00	10.00	1.67	0.27
BR	2.00	10.00	1.67	0.27
KT	2.00	10.00	1.67	0.27
ST	2.00	10.00	1.67	0.27
SR	3.00	13.00	2.17	0.47

Figure 6.7: First Scenario With a Shared Guest Room, Al-Hirbawi Dwelling (Researcher)

First suggestion: Each apartment will have a separate living room, kitchen, and bedroom.

The two apartments will have a shared guest room. This is the vacancy where male guests are received, and is situated close to the main entrance in order ensure the privacy of the family living on the first floor as shown in (Figure 6.7).

Second suggestion: on the first floor of the building, two entrances are constructed: one for family members and the other for receiving guests. However, an opening is created between the kitchen and the guest room to facilitate access to the guest rooms without going outside the house as shown in (Figure 6.8).

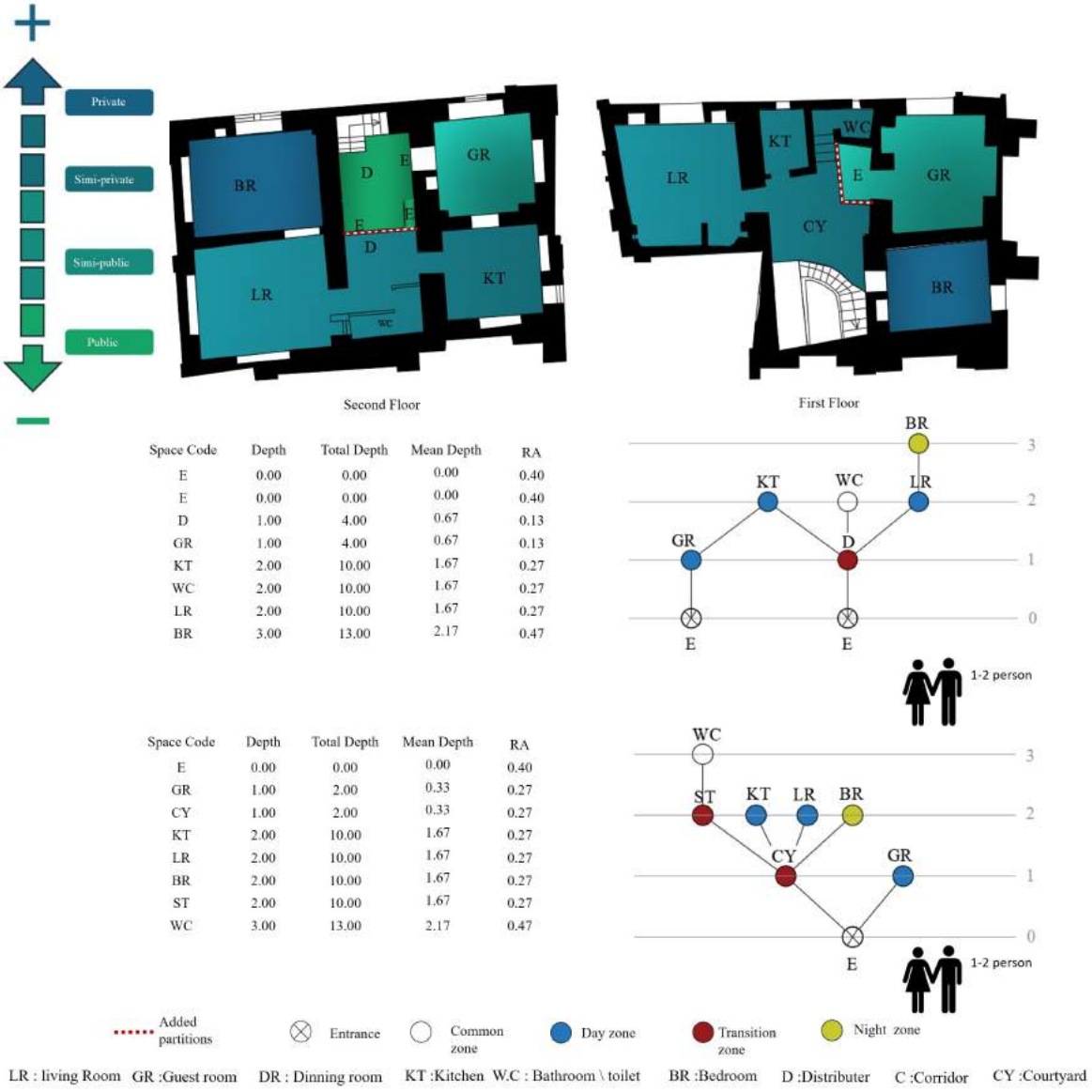


Figure 6.8: Second Scenario for Enhancement, Al-Hirbawi Dwelling (Researcher)

It is noticed that first proposal in (Figure 6.7) contributed to providing more spaces which is better than the second proposal shown in (Figure 6.8).

Third suggestion: another proposal is presented to include only one family. The house is divided internally to provide privacy. The proposal suggest to change the arrangement of the spaces so that the guest room becomes closer to the entrance.In addition, changes include adding a bathroom and dinning room by the guest room. Then, the living room and kitchen are added to the apartment. All daytime zones are placed close to each other to facilitate the residents' movement inside the house. Also, the bedrooms are placed on the upper floor.

This scenario contains three bedrooms. The house can accommodate a family with six members. The maximum mean depth reached in this scenario is about 2.38 according to the increasing in the number of spaces as shown in (Figure 6.9) .

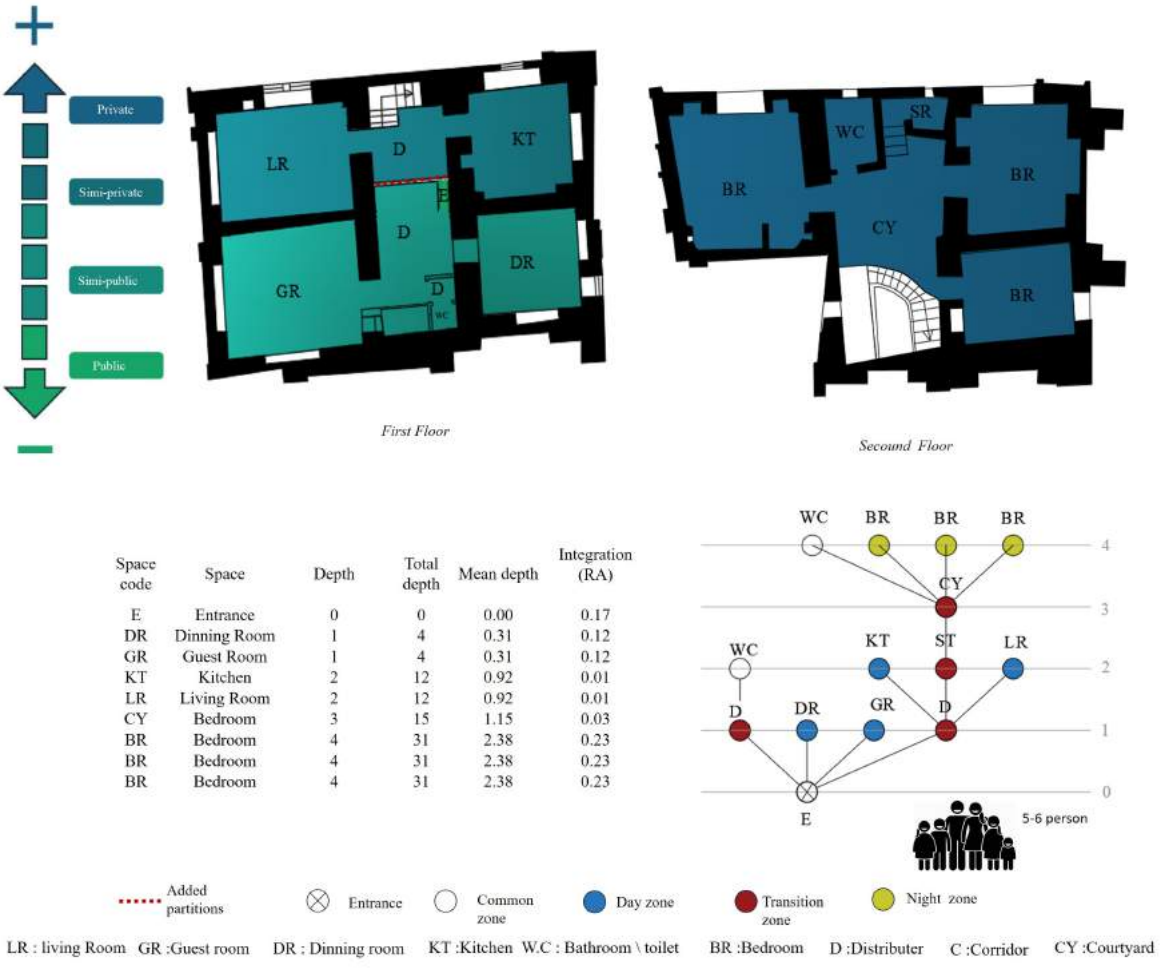


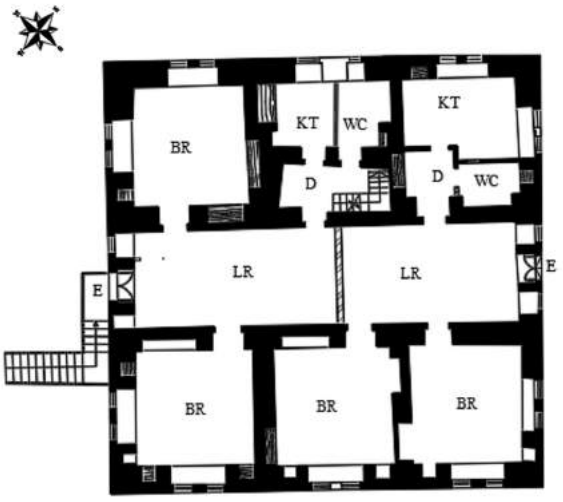
Figure 6.9: Third Scenario Including Three Bedrooms, Al-Hirbawi Dwelling (Researcher)

6.3.3 Dweik Palace

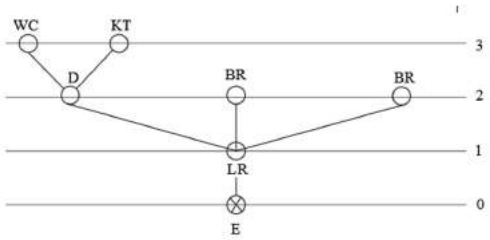
The quadruple building of Dweik consists of three floors, where the ground floor consists of two entrances and water well. The first floor consists of a reception hall and a central hall. Six rooms are distributed around the central hall. The first floor is accessed through two entrances, the main is on the western façade and the back is on the eastern façade. The second floor is constructed with an open central courtyard and six distributed spaces. The vertical connection between the two floors is through a western staircase, and an eastern one connecting the second floor directly to the street.

The building has transformed by HRC from a single house with one family to a dwelling containing three apartments. Two apartments are on the first floor, and the third is located on the second floor."

Through the Gamma analysis, it can be found that the central hall provides equal level of privacy to all spaces In other words, improved privacy is needed see (Figure 6.10).



First Floor



Gamma analysis

space code	depth	total depth	MD	RA
E	0	0	0.00	0.40
LR	1	1	0.17	0.33
BR	2	6	1.00	0.00
BR	2	6	1.00	0.00
D	2	6	1.00	0.00
KT	3	12	2.00	0.40
WC	3	12	2.00	0.40

GR :Guest room **KT** :Kitchen **BR** :Bed room **LR** :Multi Activity Room **W.C** : Bathroom \ toilet

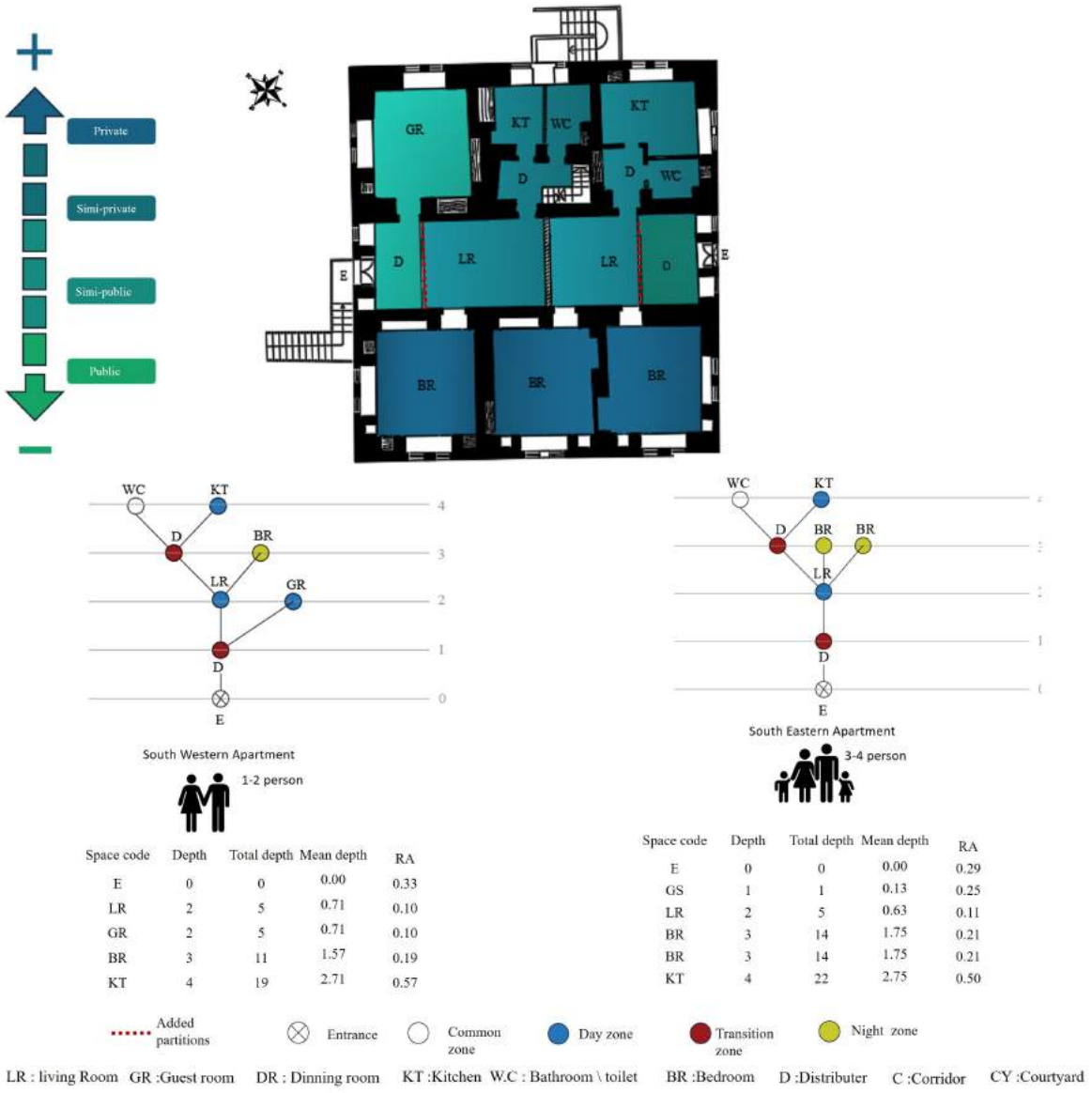
D: Distributor **E**: Entrance **ST**: Stair **SR**: Store Room

Figure 6.10: Gamma Analysis for Dwiek Palace (Researcher)

6.3.3.1 Suggested Enhancement Scenarios

Two different socio-spatial enhancement scenarios are suggested for Dweik Palace sample. The first one configure the building to accommodate two families, with two separate entrances. Also, The enhancement suggests adding new partitions in order to enhance the

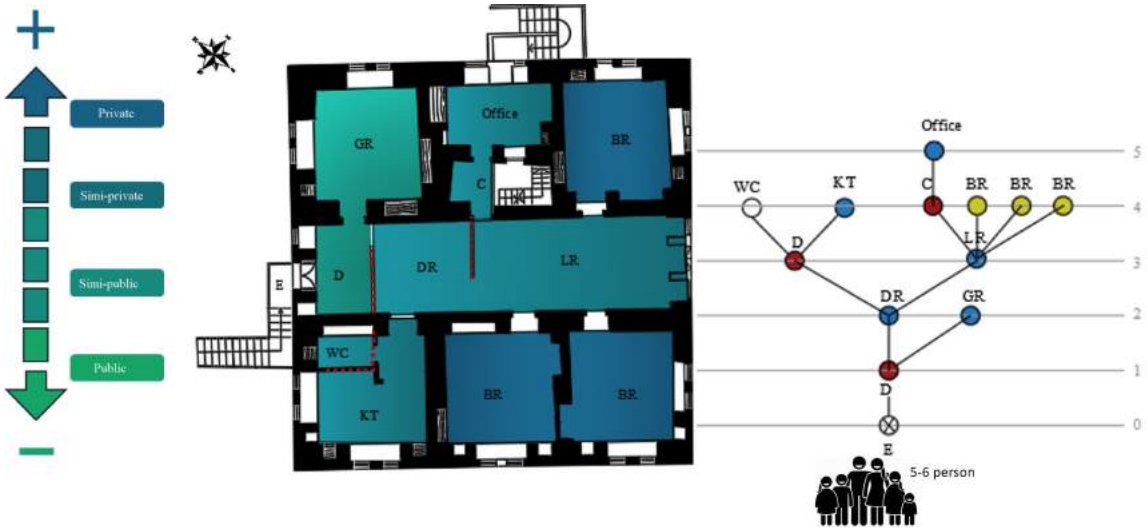
privacy level of both apartments see (Figure 6.11). And the second enhancement scenario is to use the dwelling for only one family of six people as show in (Figure 6.12).



Space code	Depth	Total depth	Mean depth	RA
E	0	0	0.00	0.33
LR	2	5	0.71	0.10
GR	2	5	0.71	0.10
BR	3	11	1.57	0.19
KT	4	19	2.71	0.57

Space code	Depth	Total depth	Mean depth	RA
E	0	0	0.00	0.29
GS	1	1	0.13	0.25
LR	2	5	0.63	0.11
BR	3	14	1.75	0.21
BR	3	14	1.75	0.21
KT	4	22	2.75	0.50

Figure 6.11: First Enhancement Scenario for Dweik Palace (Researcher)



Space code	Depth	Total depth	Mean depth	RA
E	0	0	0.00	0.18
DR	2	5	0.42	0.11
GR	2	5	0.42	0.11
LR	3	11	0.92	0.02
KT	4	35	2.92	0.35
BR	4	35	2.92	0.35
BR	4	35	2.92	0.35
BR	4	35	2.92	0.35
Office	5			

Figure 6.12: Second Enhancement Scenario for Dweik Palace (Researcher)

6.3.4 Al-Juba Quarter

The Fourth sample is a building considered as an Islamic architectural building in Hebron city at Al-Qazzazin alley. It contains three residential storeys, see (Figure 3.5).

It has no view at the main street except for the main gate. The main gate is a broken entrance, which leads through a simple distributor that leads us to a courtyard. It is length extended by more than 20 meters. The ground floor includes small rooms and storage room along the yards, some of them were used to house animals and crops. Entering one of the residential houses is done through the individual separated doors in the courtyard.

The courtyard is considered the central element in this type of building design see (Appendix B). On one hand, it is the central axis of movement between the different spaces in the

yard. On the other hand, it is an environmental element necessary to provide air and natural lighting where most of the openings are directed toward it.

Figure 6.13: An apartment in Al-juba Quarter (Researcher)

The first floor consists of a guest room, a kitchen, and a multi-use room used as a place to sit. In addition, it has the parents' bedroom and bathroom. Whereas, the second floor of the building consists of one room, which is accessed via an external staircase and is not used due to the lack of security.

Relatively, it was clear that the spaces' arrangement provide some level of privacy. However, there were some non-specialized rooms, such as the multi-purpose room, as shown in (Figure 6.13).

6.3.4.1 Suggested Enhancement Scenarios

The enhancement relies on creating the spaces to extend horizontally. So, some rooms are used in the enhancement scenario from neighboring buildings and dispense with rooms that are not used so they will be given to adjacent apartments.

First scenario: does not depend on significant change. It is intended for a family of two people only. The multi-use room is converted into a living room. Thus, the depth values were close to the existing situation, see (Figure 6.14).

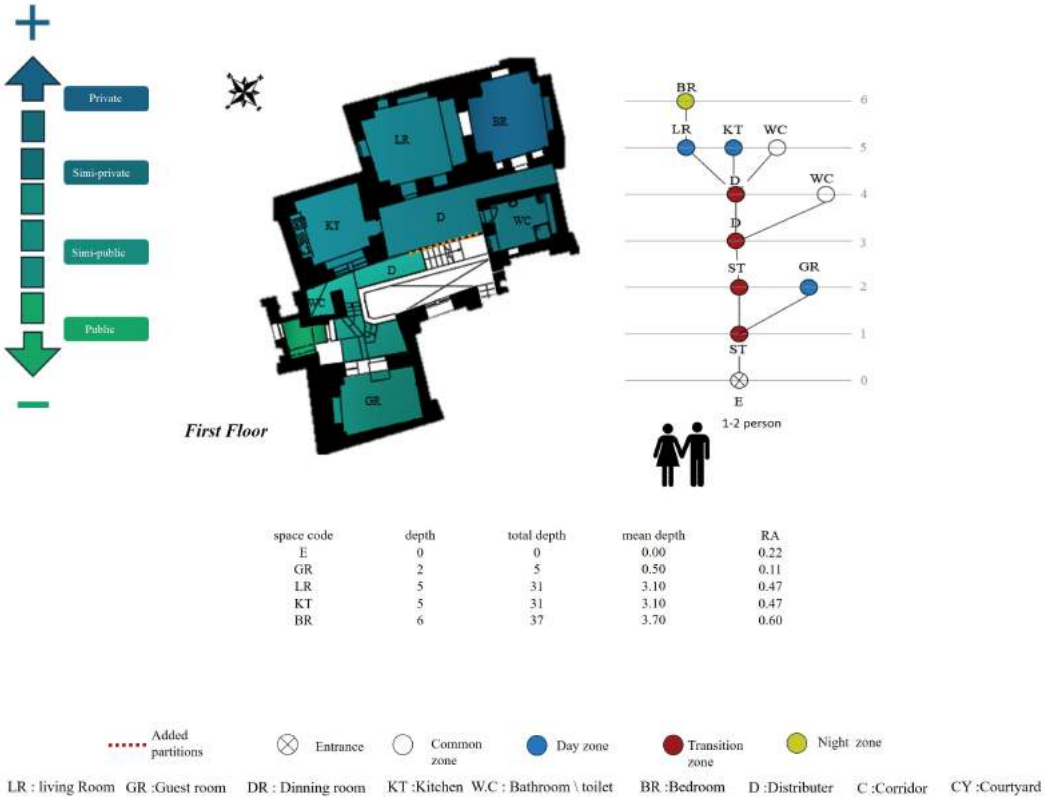
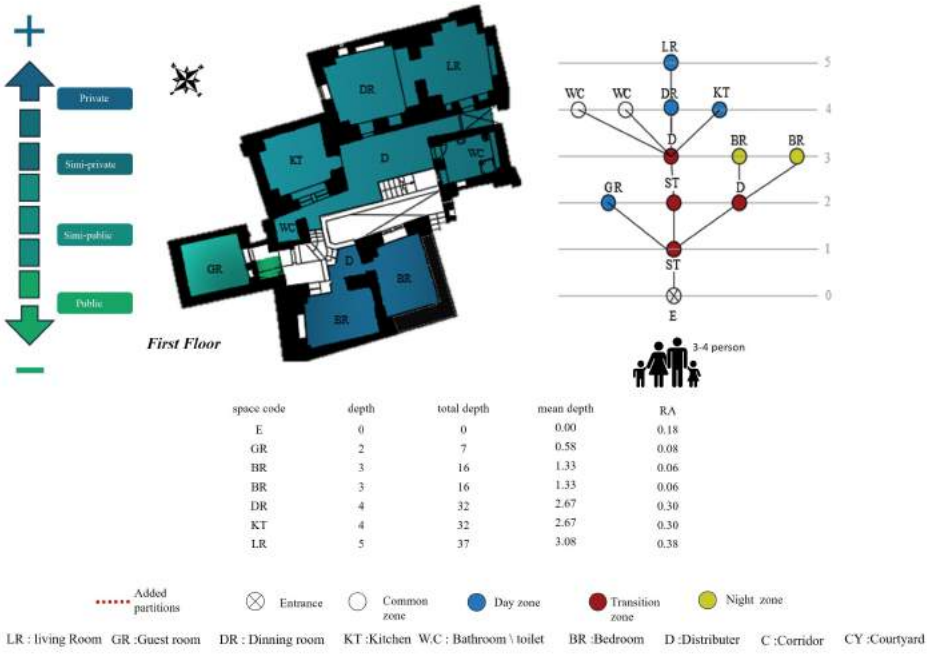


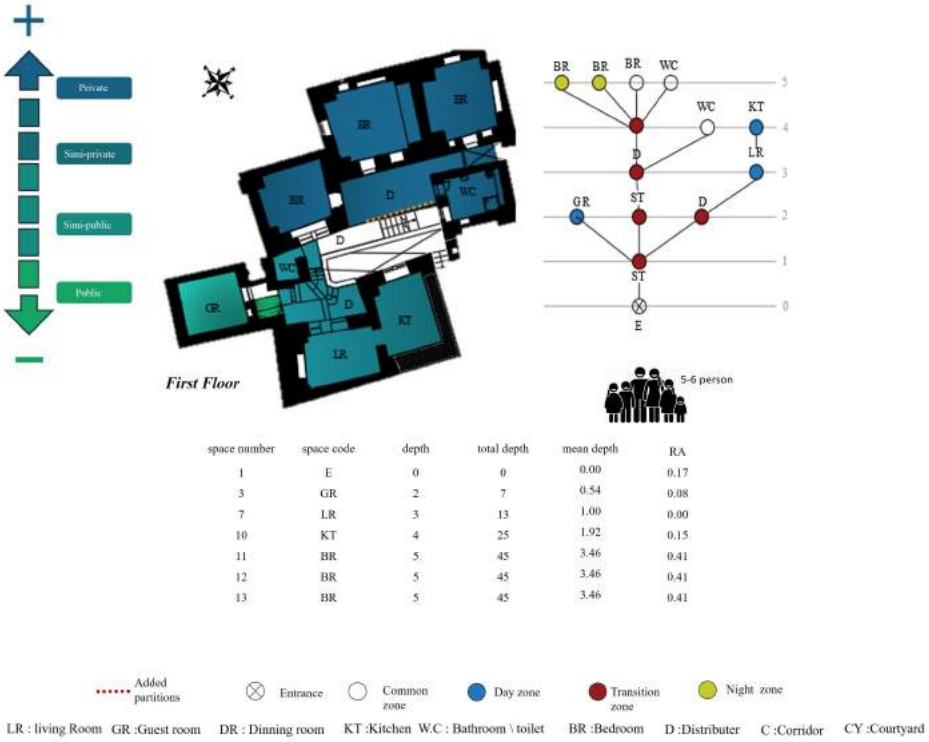
Figure 6.14: First Scenario of Enhancement for Al-Juba Quarter (Researcher)

The second scenario attempts to provide two bedrooms for four people, rearranges the rooms again and take some rooms from the adjacent neighbors. The spaces are arranged in a way which combines functions and facilitates movement as shown in (Figure 6.15). Although, this solution is not recommended due to the depth value, as shown in (Figure 6.15). The bedrooms depth value is less than the day zone depth values.



space code	depth	total depth	mean depth	RA
E	0	0	0.00	0.18
GR	2	7	0.58	0.08
BR	3	16	1.33	0.06
BR	3	16	1.33	0.06
DR	4	32	2.67	0.30
KT	4	32	2.67	0.30
LR	5	37	3.08	0.38

Figure 6.15: Second Scenario of Enhancement for Al-Juba Quarter (Researcher)



space number	space code	depth	total depth	mean depth	RA
1	E	0	0	0.00	0.17
3	GR	2	7	0.54	0.08
7	LR	3	13	1.00	0.00
10	KT	4	25	1.92	0.15
11	BR	5	45	3.46	0.41
12	BR	5	45	3.46	0.41
13	BR	5	45	3.46	0.41

Figure 6.16: Third Scenario of Enhancement for Al-Juba Quarter (Researcher)

Third solution can serve about six family members, the solution contains the highest depth values for the bedrooms, see (Figure 6.16).

6.4 Conclusion

In this chapter, socio-spatial problems which were previewed in the chapter 5 are discussed, and suggest some enhancement recommendations based on literature studies.

Also, the research implements several socio-spatial enhancement scenarios for different samples. The research shows that the traditional buildings are subject to improvement in terms of socio-spatial configuration, improving the privacy degree, the domestic service availability, the number of bedrooms and accessibility.

the research concludes that the buildings can serve the families with the least number of individuals, whether they are emerging families or families consisting of the elderly. Thus, most buildings could be improved to serve these two groups, Those building may better serve emerging families; due to the number of staircases in these buildings.

The next chapter will conclude the findings of the research and make a numbers of recommendations.

Chapter 7

Conclusion and Recommendations

This research addressed the problem of the socio-spatial space in rehabilitated, currently inhabited buildings in the Old City of Hebron. Moreover, it aimed to make suggestions and provide recommendations to enhance inhabited housing in Hebron.

The research relied on observation, documents and questionnaires for a random sample. The results from the questionnaire showed that 37% of the residents are not satisfied in their dwellings due to internal function problems such as; the lack of privacy, lack of domestic services, shortage in the number of bedrooms relative to the number of family members and accessibility inside the house, see (Figure 7.1).

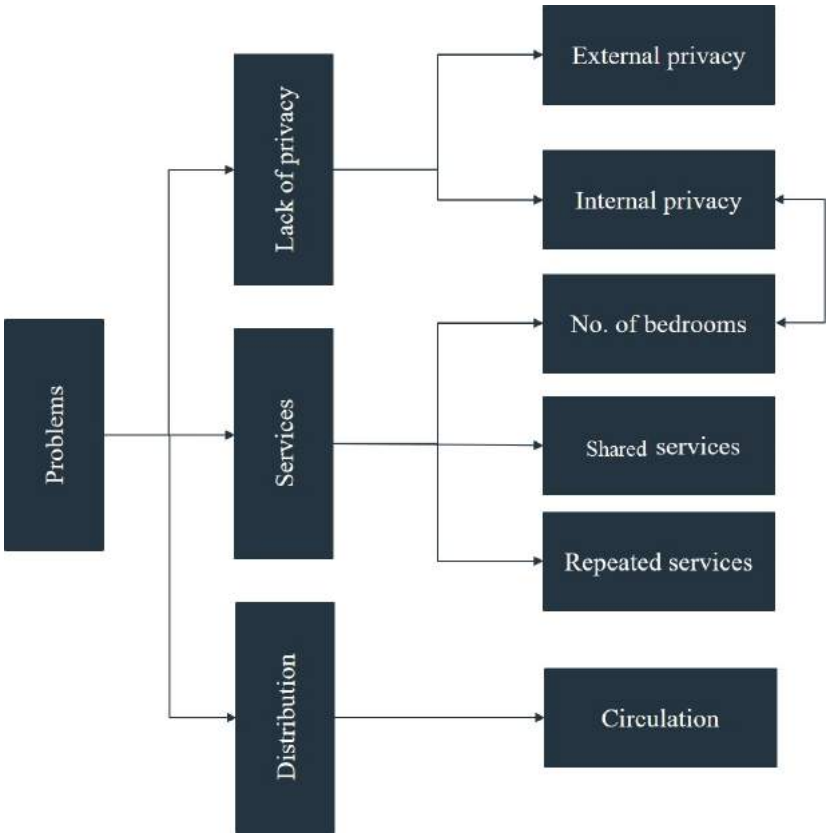


Figure 7.1: The Research Main Findings (Researcher)

Consequently, this research relied on literature and related studies in the socio-spatial field to analyze input data, develop solutions, and implement them on some selected samples.

The main research question was how to achieve socio-spatial space in rehabilitation efforts of houses in the Old City of Hebron. So, the research proposed providing the necessary services, achieving internal and external privacy and securing access to spaces; the suggestions taking the rehabilitation limitations in to consideration. Also, the research implemented several socio-spatial enhancement scenarios for different samples using gamma analysis before and after the enhancement processes. The implementations showed that the traditional buildings could subject to improvement in terms of socio-spatial configuration.

The researcher believes that improving the socio-spatial configuration of the traditional inhabited houses in old cities is essential for the residents and keeps these cities alive. So, improvement research should continuously perform. However, the improvement process for these houses contains many limitations, mainly that the spatial distribution of the traditional houses can not be classified. So, there is no specific improvement guideline and the improvements depend on the spatial distribution of each house.

7.1 Recommendations for the Rehabilitation Commissions

1. Increasing level of privacy in the rehabilitated buildings sparate entrances, add partions and providing an adequate number of rooms for residents.
2. When the number of rooms is not suitable for number of family members, it is necessary to have a mechanism that helps residents extend or divide the big rooms into two rooms.
3. Periodically inspect the physical condition of the building to insure their safety for use by the residents.
4. If the apartment has extra rooms that residents don't use for any reason, the study recommends forfeiting these rooms to the neighboring apartments, when possible.
5. Covering courtyard, when possible, as they are considered a primary distributor distributor and so not burden the residents in the winter and summer seasons.
6. Housing emerging families with small numbers of members in the rehabilitated building; these buildings contain staircases, and the number of bedrooms is limited.

7.2 Recommendations for Future Work

The research encourages conducting more research on the old cities, especially the socio-spatial aspect, due to its importance for the residents and in order to keep old cities alive. Also, assessing and improving buildings in old cities can build on the research methodology and results presented in this research.

This research propose the following future work topics in order to further asses and improve old cities environmental situation:

1. Enhancing natural ventilation and air circulation inside the traditional buildings.
2. Enhancing natural lighting inside the traditional buildings.
3. Enhancing thermal comfort inside the tradition buildings by improving building materials in order to reduce damp and heat transfer.
4. Reducing energy consumption inside old buildings by through strategies that reduce energy dissipation.

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Appendices

Appendix A

The study Questionnaire Form

Appendix A. The study Questionnaire Form

Date: Questionnaire Form

Form Number: _____

Assessment of the relationship between citizens new needs And the Rehabilitated buildings in the Old City of Hebron.

جامعة بوليتكنك فلسطين

The questionnaire is part of a study I'm currently conducting for a master's degree in Sustainable Architecture at Palestine Polytechnic University. The research aims to assess the impact of the new social and cultural life on the traditional buildings in the Old City of Hebron. I would appreciate it if you would like to answer the questionnaire's questions in all the seriousness and professionalism.

The success of this work depends on your cooperation and sincerity in the answer. All the information is provided will only be used for scientific research purposes.

With sincere gratitude and appreciation for your response and contribution to the completion of this scientific research.

The first part is about the building in general and its current state.

First: General information about the building

1. The Location .....
2. The building number .....
3. The address .....
4. The name or names of the owners .....
5. The number of storeys .....

Second: Description of the housing in the building in terms of

6. Number of residential floors .....
7. Number of families living in the building: .....
8. Number of rooms in the building: .....
9. Number of unused rooms .....

Third: Description of the building in terms of additions

1. what type of additions are there? □Vertical □ Horizontal □Vertical and horizontal □ There's no.

Appendix A. The study Questionnaire Form

2. Construction material used in the addition □ Others. □ Asbestos □Cement □ Brick □ Stone

3. Other notes regarding the building:

.....
.....

The second part of the questionnaire is about the single-apartment apartments within the same building:

First: General information about families living in the Old City:

1. The building number .....
2. The residents' name .....
3. Number of family members vacant for housing unit: .....

Males ( ) Females ( )

Their distribution is as follows:

	Father	Mother	Children	Girls	Other relatives.
Age group	.....	.....	.....	.....	.....
Number	.....	.....	.....	.....	.....

4. If some family members are in the educational stage, then the distribution is as follows:

Sex	Elementary school stage	Secondary school stage	University degree
Male	( )	( )	( )
Female	( )	( )	( )

5. Paterfamilias's work .....
.

6. Are there other members working in the same family? □ Yes □ No

Second: Information about the specifications of the apartments for each family:

1. Entrances of the apartment. □ Shared □ Independent

2. The activities within the apartment:

Appendix A. The study Questionnaire Form

Room	The number	Room Area	Notes
□ Bedrooms	( )	.....	.....
□ Guest room	( )	.....	.....
□ dining room	( )	.....	.....
□ Living room	( )	.....	.....
□ Storage room	( )	.....	.....
□ Kitchen	( )	.....	.....
□ Bathroom unit / Toilets	( )	.....	.....

3. Is there an open courtyard within the apartment? □ Yes □ No
4. If yes, is the yard covered? □ Yes □ No
5. Satisfaction level toward the area distribution □ Excellent □ Very Good □ Good □ Accepted □ Bad
6. What level of change are you seeking?

……
……
……
……

Third: technological needs.

1. here's a power line. □ Yes □ No
2. There's a TV. □ Yes □ No
3. Internet access is available □ Yes □ No

Fourth: Evaluating the nature of social life.

1. What are the joint family activities carried out by family members?

.....
.....
.....

2. What activities do children do most of the time?

.....
.....
.....

3. What are the social challenges you face within the residential area and the surroundings?

Appendix A. The study Questionnaire Form

.....
.....
.....

Fifth: The environmental situation of residential apartments.

* This section is concerned with evaluating the environmental situation of residential apartments in order to link them with the nature of the internal division of the house and understand the effect of each of them on the other.

4. Sunlight enters □ Most of the rooms □ Two Rooms □ One room □ Other

5. Do you use artificial lights during the day? □ Yes □ No □Sometimes

6. Your winter thermal satisfaction is considered as

□ Very cold □ Cold □ intermediate □ Hot □ Very hot

The heating method in winter .....

Number of hours per day.....

7. Your summer thermal satisfaction is considered as

□ Very cold □ Cold □ intermediate □ Hot □ Very hot

The cooling method in summer .....

The Number of hours per day.....

8. The resident notes about the apartment.

……
……
……
……

The researcher: Sara Tamimi

Appendix B

The Space-Syntax Analysis of Samples

A Al-Aqqaba Building

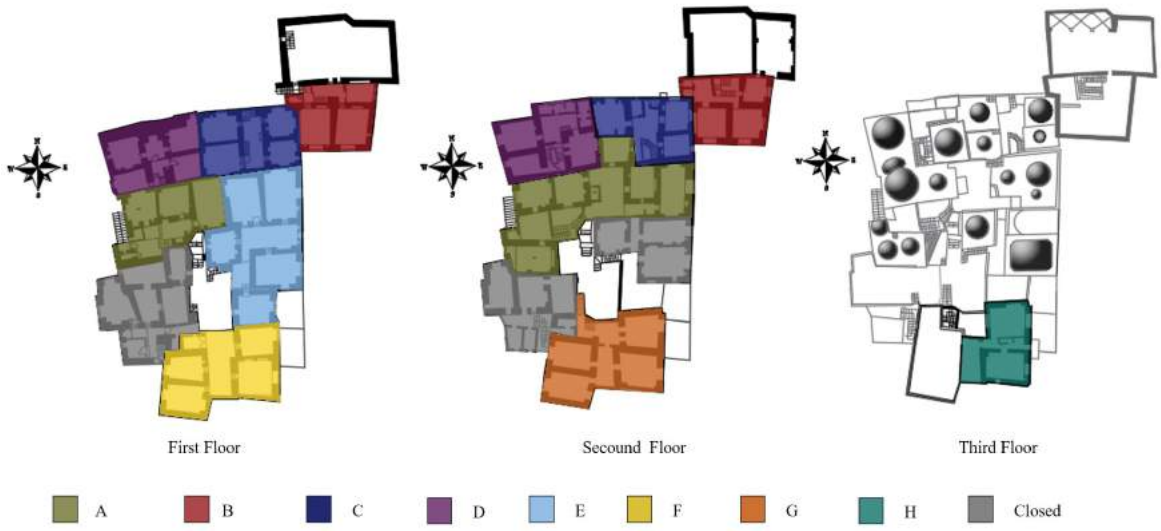


Figure B.1: The Apartments in al Aqqaba (HRC edited by the Researcher)

Appendix B. The Space-Syntax Analysis of Samples

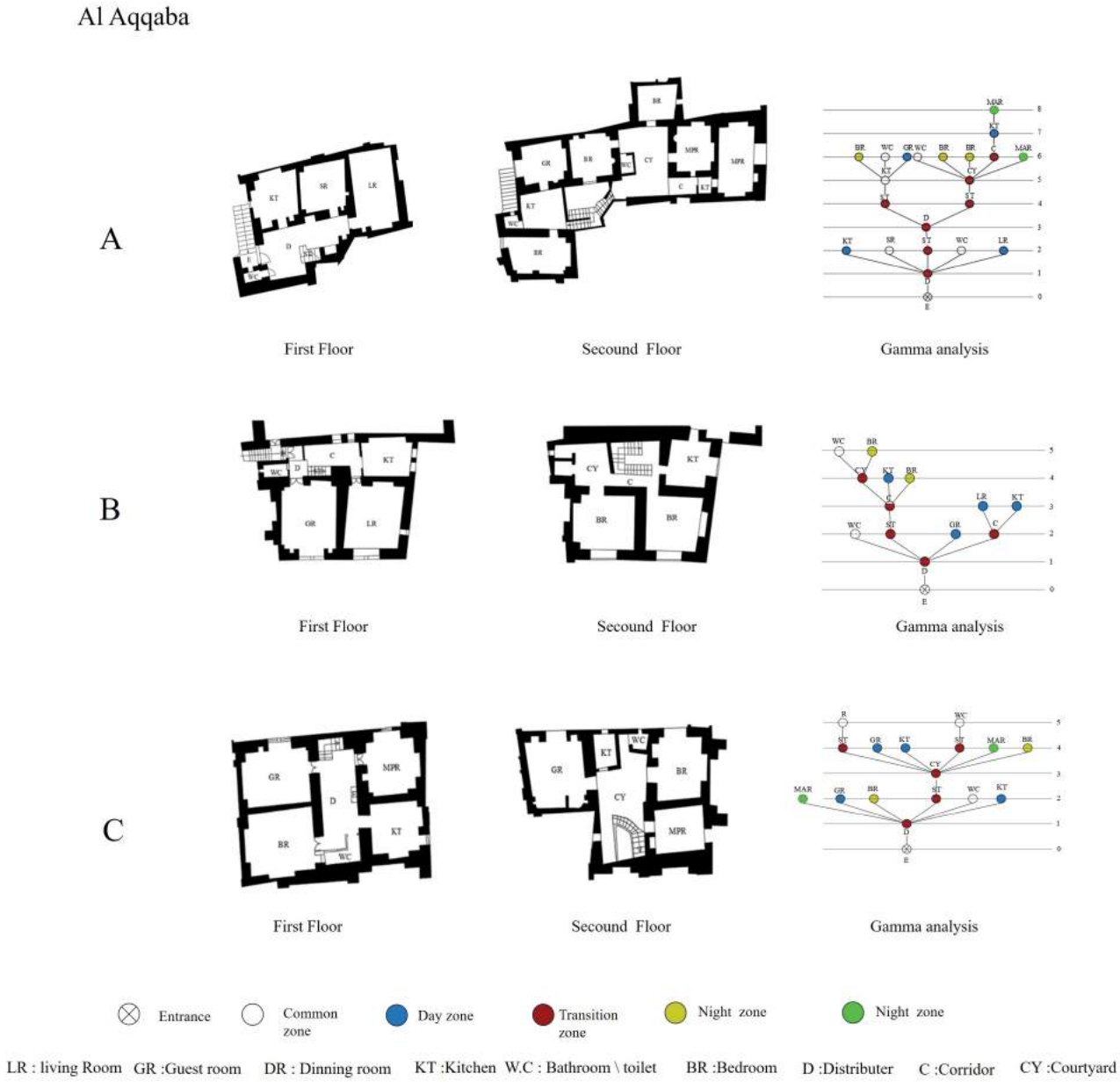


Figure B.2: The analysis of Dwellings in Al-Aqqaba building (HRC edited by the Researcher)

Appendix B. The Space-Syntax Analysis of Samples

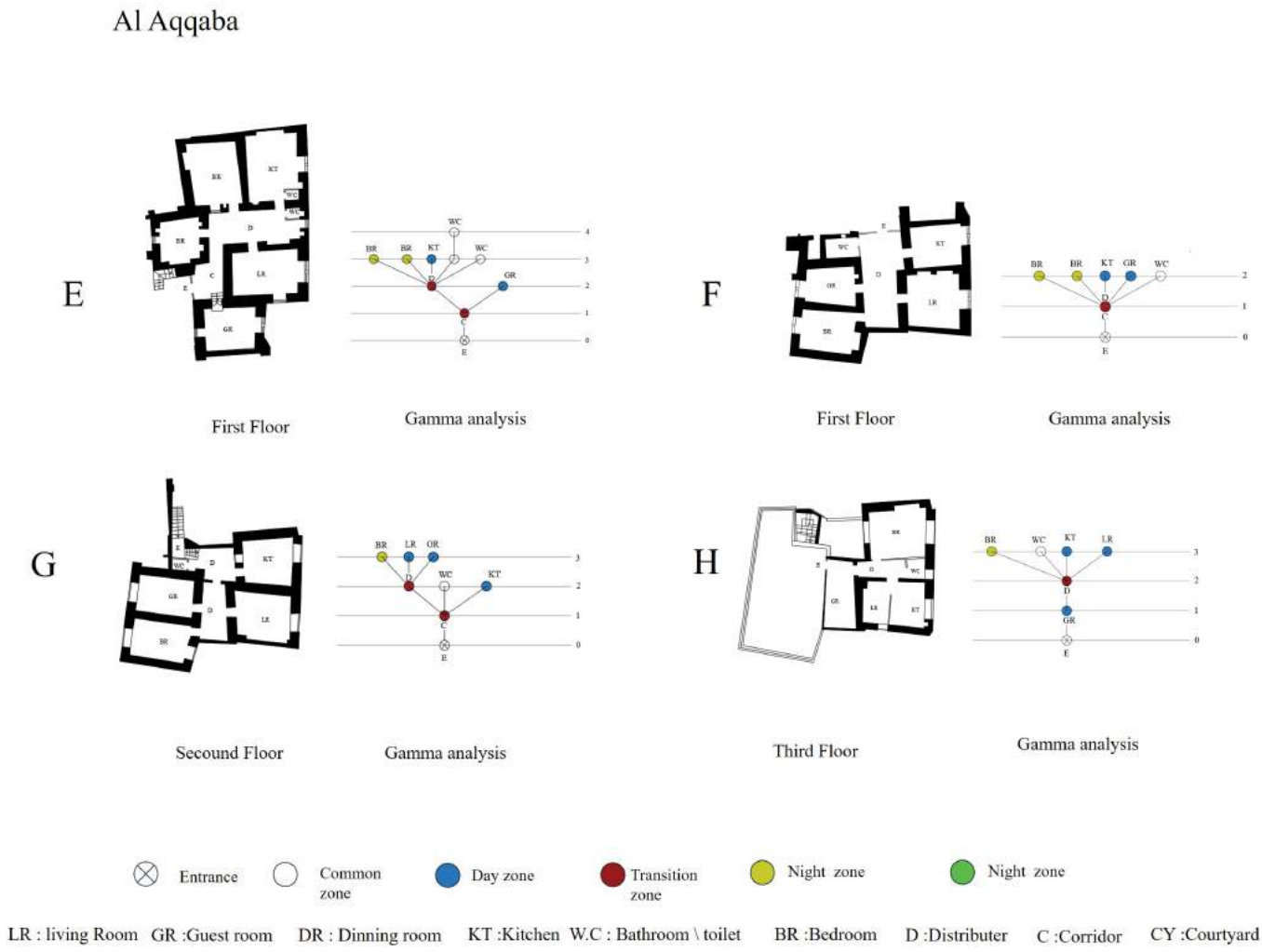


Figure B.3: The analysis of Dwellings in Al-Aqqaba building (Hosh Naser Al Deen)
(HRC edited by the Researcher)

Appendix B. The Space-Syntax Analysis of Samples

B Al-Juba Quarter

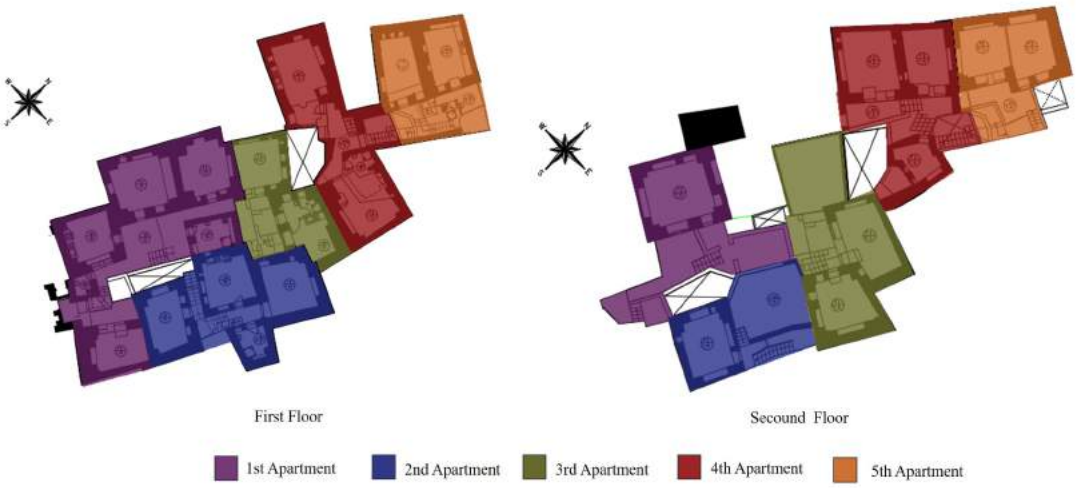


Figure B.4: The Apartments in Al-Juba Quarter (HRC edited by the Researcher)

Appendix B. The Space-Syntax Analysis of Samples

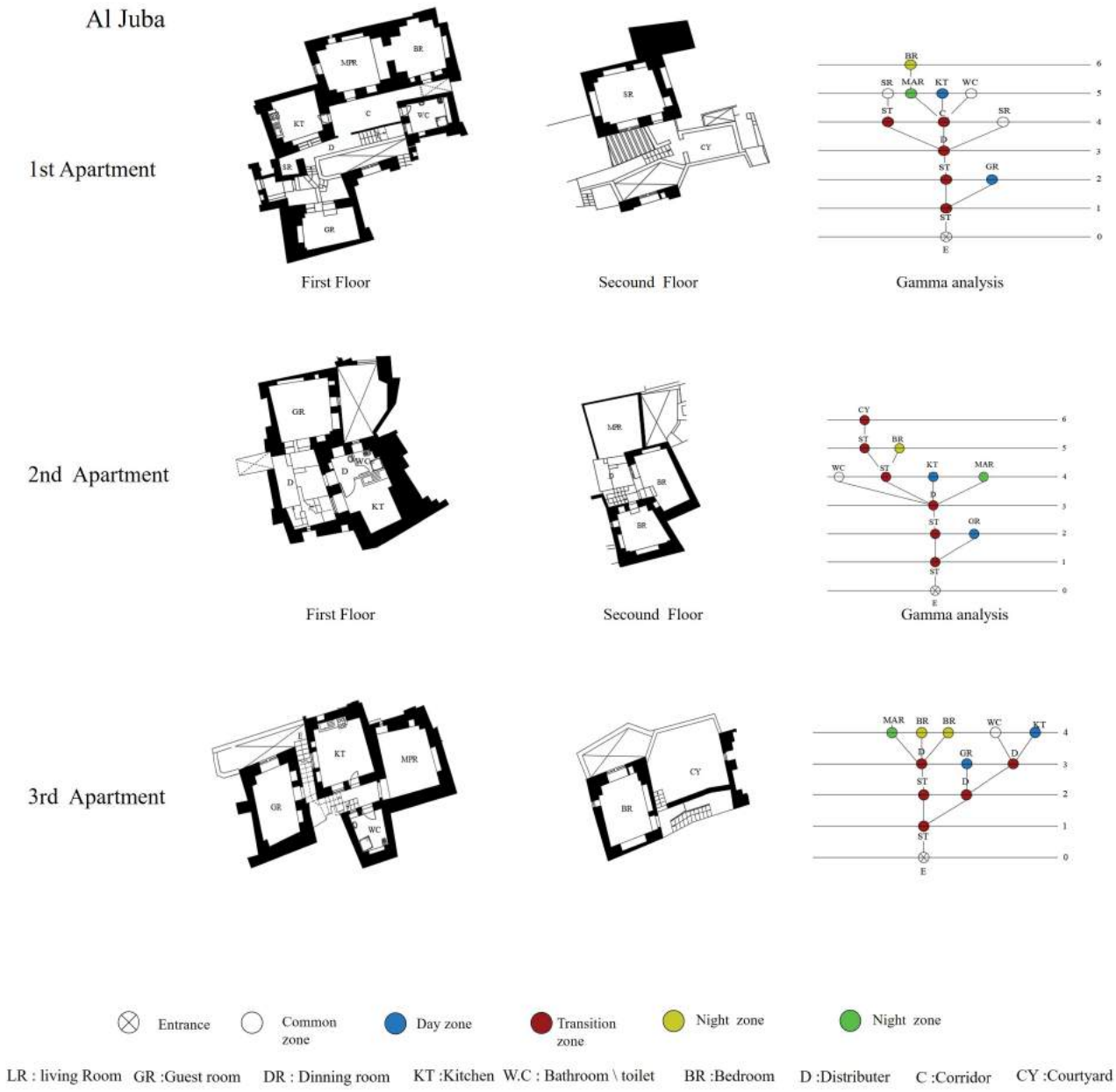


Figure B.5: The analysis of 1st , 2nd , 3rd Dwellings in Al-Juba building (HRC edited by the Researcher)

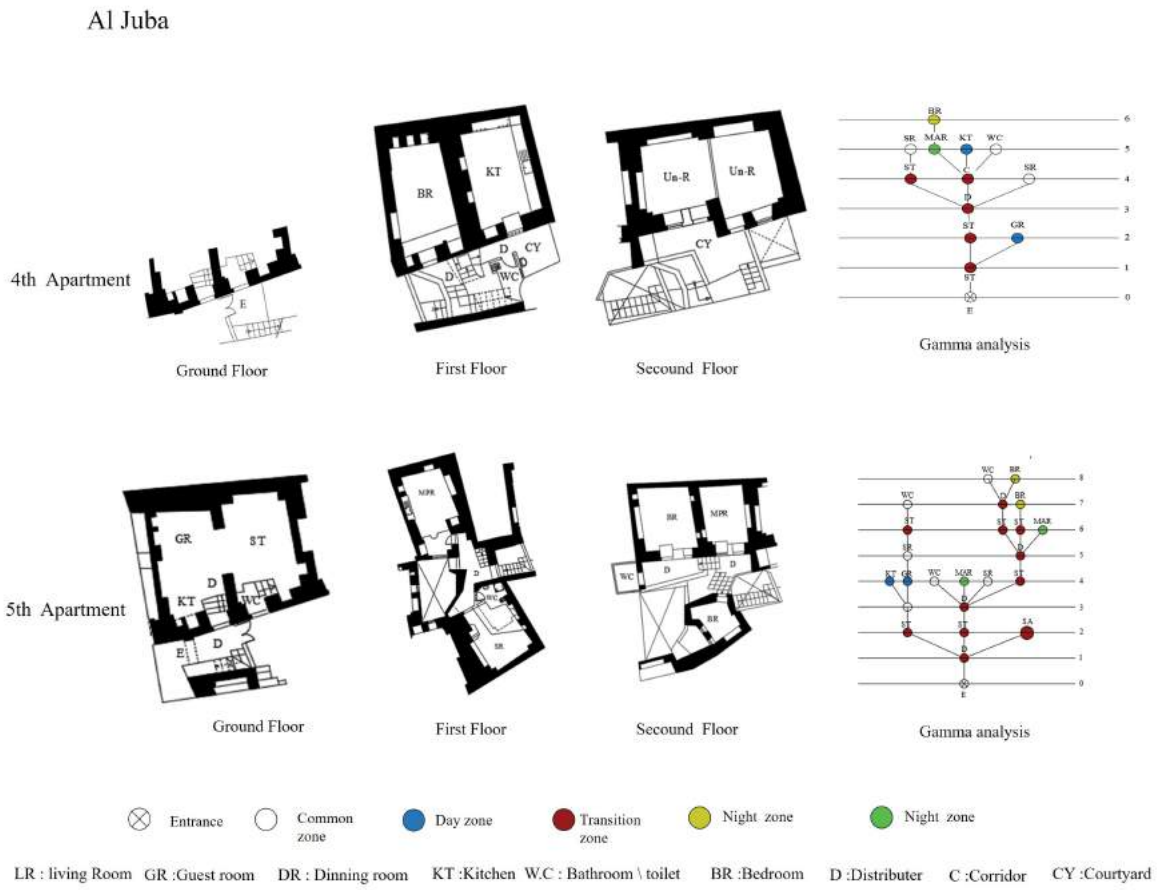


Figure B.6: The analysis of 4th and 5th Dwellings in Al-Juba building (HRC edited by the Researcher)

C Dweik Palace

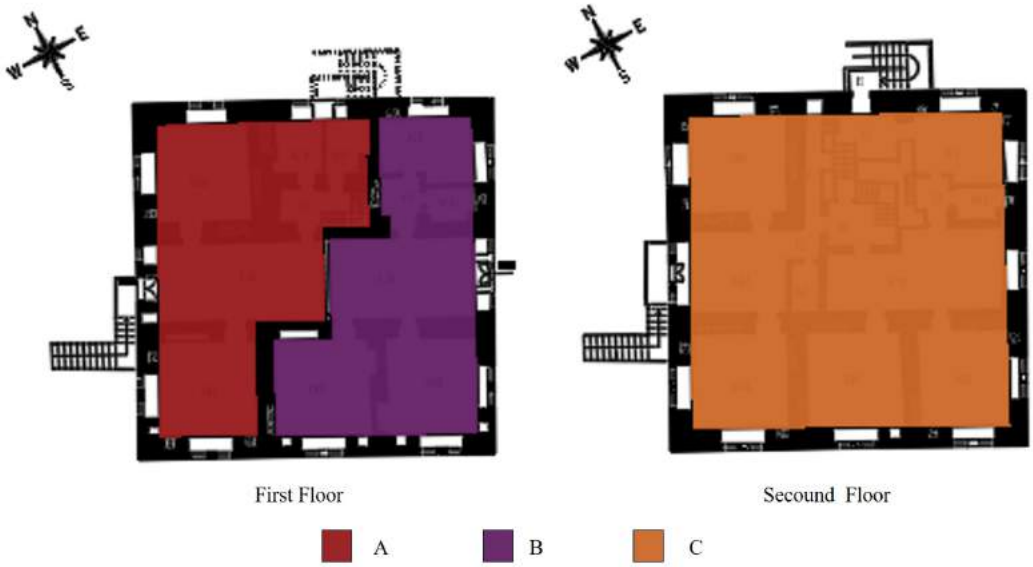


Figure B.7: Dweik Palace (HRC edited by the Researcher)

Appendix B. The Space-Syntax Analysis of Samples

Al Dwiek

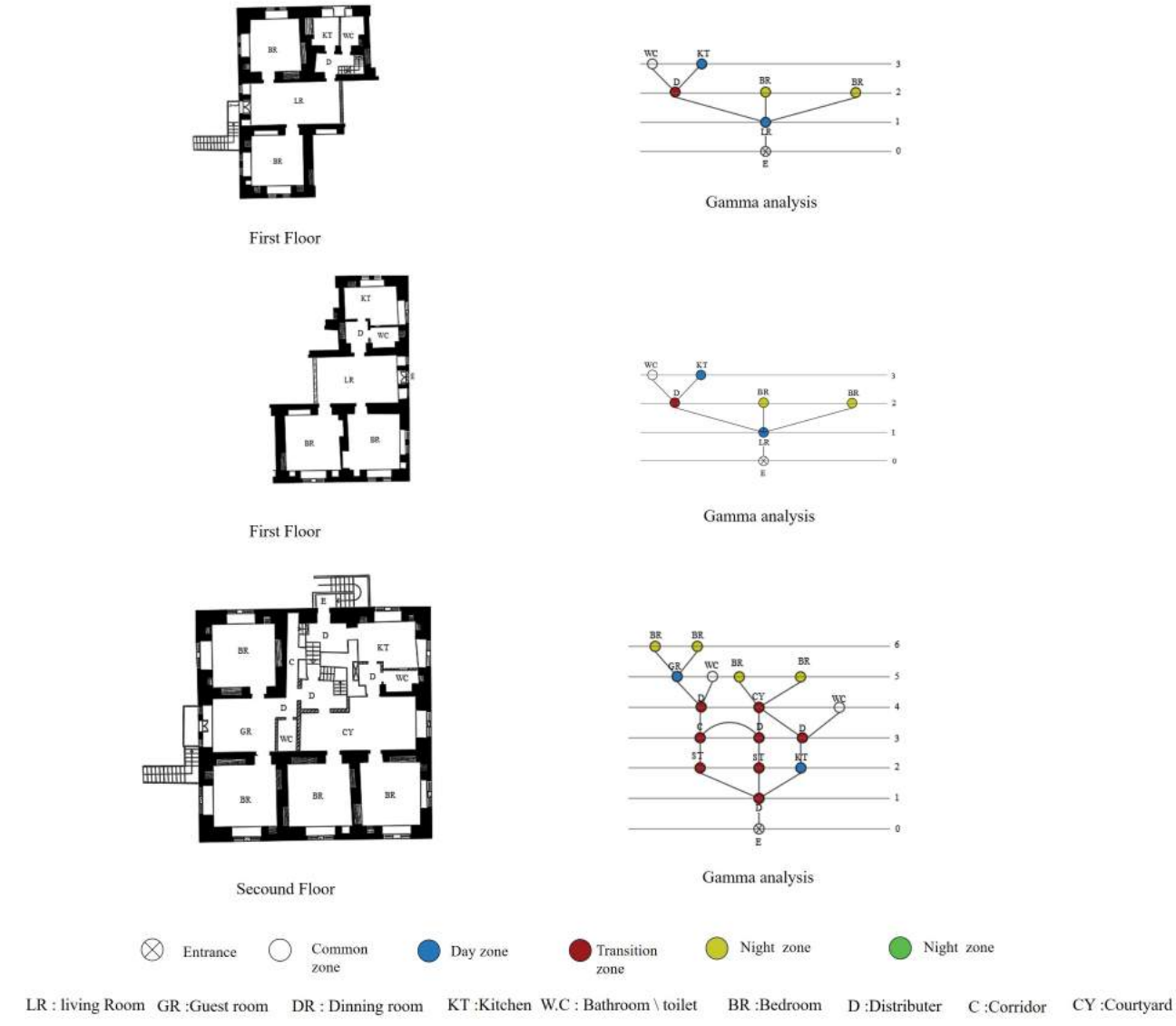


Figure B.8: The analysis of 1st , 2nd , 3rd Dwellings in Al Dweik building (HRC edited by the Researcher)

Appendix C

The Effect of Socio-spatial Enhancements on Thermal Comfort

The spatial configuration has a significant influence on thermal comfort; as it determines natural ventilation among spaces (60). The window to wall ratio (WWR%) and the position of inner walls significantly impact the amount of cross ventilation inside the dwelling (51), (21).

A Thermal Comfort Evaluation

The thermal comfort evaluation processcombines the use of Depthmap and Design-Builder software. The Depthmap is used to visually evaluate the natural air flow, Using CFD simulation was not possible due to the modeling nature of the project. The simulation process resulting from the Design-Builder provides the values of PPD%, PMV and the values of the amount of natural ventilation, by extracting them in the CSV formula to compare the results with each other as shown in (Figure C.1).

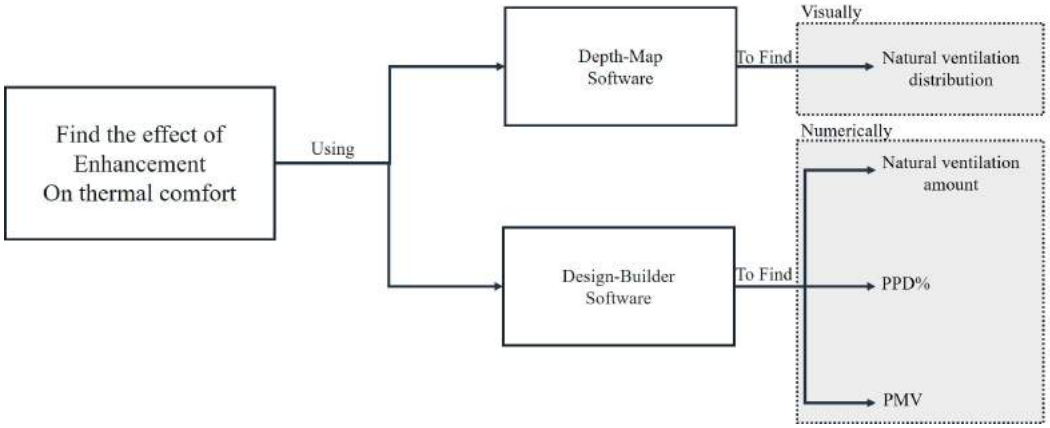


Figure C.1: The Procedure for Evaluating The Enhancement Effect on The Thermal Comfort (Researcher)

A.1 Depthmap Simulation

The space syntax simulation using Depth-map software is used to predict the effect of building spatial configuration on thermal comfort by simulating the air movement in the space, which is measured by connectivity value. A high connectivity value indicate better

natural ventilation, affecting thermal comfort (22). The connectivity value is defined as the number of points in space directly connected to the other spaces (7). Thus, the simulation was performed on the current situation and the proposed solution in order to measure enhancement level. The simulation application set the prevailing winds to northwest wind as is the case of the study area.

A.2 Design-Builder Modeling Parameters

The study depends on several parameters to model and predict the effect of spatial configuration on thermal comfort. Design-Builder modeling parameters such as the spatial configuration of the buildings before and after the enhancement, the schedule of using the spaces in the building and the microclimate of the case study was considered.

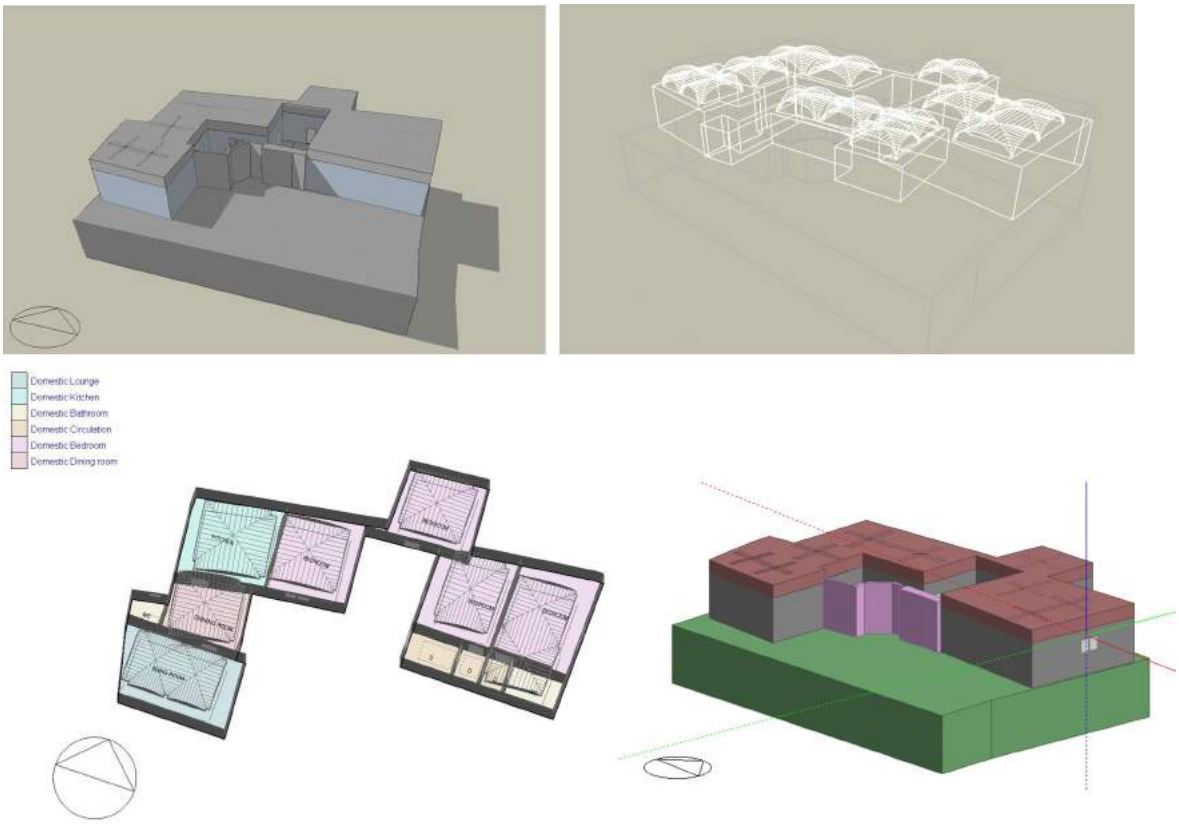


Figure C.2: The Modeling of One of the Buildings (Researcher)

B Thermal Comfort Evaluation

The evaluation of thermal comfort of the samples that were suggested to be socio-spatial enhanced.

B.1 Dweik Dwelling

The current total WWR% of Dweik dwelling is about 1.92%. The southern and the northern sides of the dwelling are blocked. Some windows open towards the inner courtyard only, or east and west towards the street, see (Figure 6.2) and (Table C.1).

Table C.1: Window to Wall Ratio for Dweik Dwelling at Al-Aqqaba Building (Researcher)

	Total	North (315 to 45 deg)	East (45 to 135 deg)	South (135 to 225 deg)	West (225 to 315 deg)
Gross Wall Area [m2]	482.69	130.04	116.28	128.10	108.27
Window Opening Area [m2]	9.25	0.63	1.46	1.05	6.12
Gross Window-Wall Ratio [%]	1.92	0.48	1.25	0.82	5.65

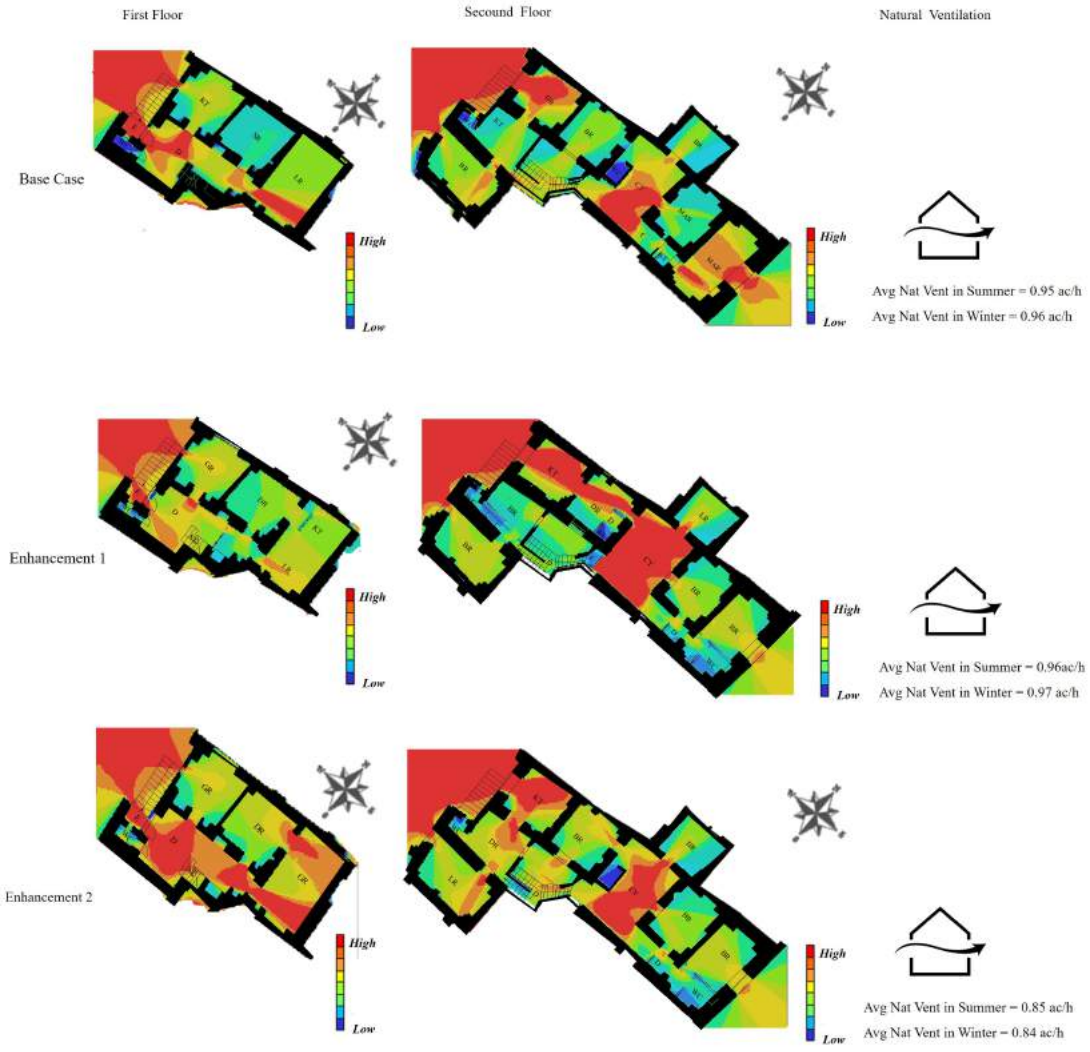


Figure C.3: Air Movement Inside Dweik Dwelling in Both: The Base Case and Enhancement Proposals (Researcher)

The first proposal, increase the natural ventilation on the second floor in the living room and dining room due to addition of wall opening. This ventilation was connected to the central courtyard. So, the average of natural ventilation in the first enhancement scenario was highest in winter and summer as shown in see (Figure C.3).

In the second proposal, the ventilation on the second floor was similar to the base case on the western side, with decreased ventilation on the eastern side. However, on the first floor, The ventilation increased more than before due to two spaces' opening, see (Figure C.3).

The maximum PPD% of the base case is 73% in April, as shown in (Table C.2). According to the PMV value in Figure C.4, April is considered the coldest month for the occupants.

Table C.2: The PPD% of The Base Case in Dweik Dwelling

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PPD%	48.5	49.9	44.6	73.1	46.5	37.7	24.5	22.6	31.2	16.0	35.7	43.7

The maximum difference of PPD% after the enhancement as shown in (Figure C.4) was around 27%, and all values were based on increasing the overall PPD% value.

Figure C.4: The Thermal Comfort in Dewik Dwelling; PMV Values (Left), PPD% (Right) (Researcher)

B.2 Al Hirbawi Dwelling Case Study

In the base case, the percentage of natural ventilation in the summer was 4.02 ac/h and in the winter, it was about 2.02 ac/h. In the first and second proposals, the natural ventilation decreased about 1.3 ac/h in summer and remained the same in winter. In the last proposal, there was no significant difference in the amount of ventilation in both semesters.

It is noticeable that when an opening in the wall was proposed, the path of air movement inside the building changed. In addition, adding the wall in the central distributor on the first floor introduced another path for air flow, see (Figure C.5)

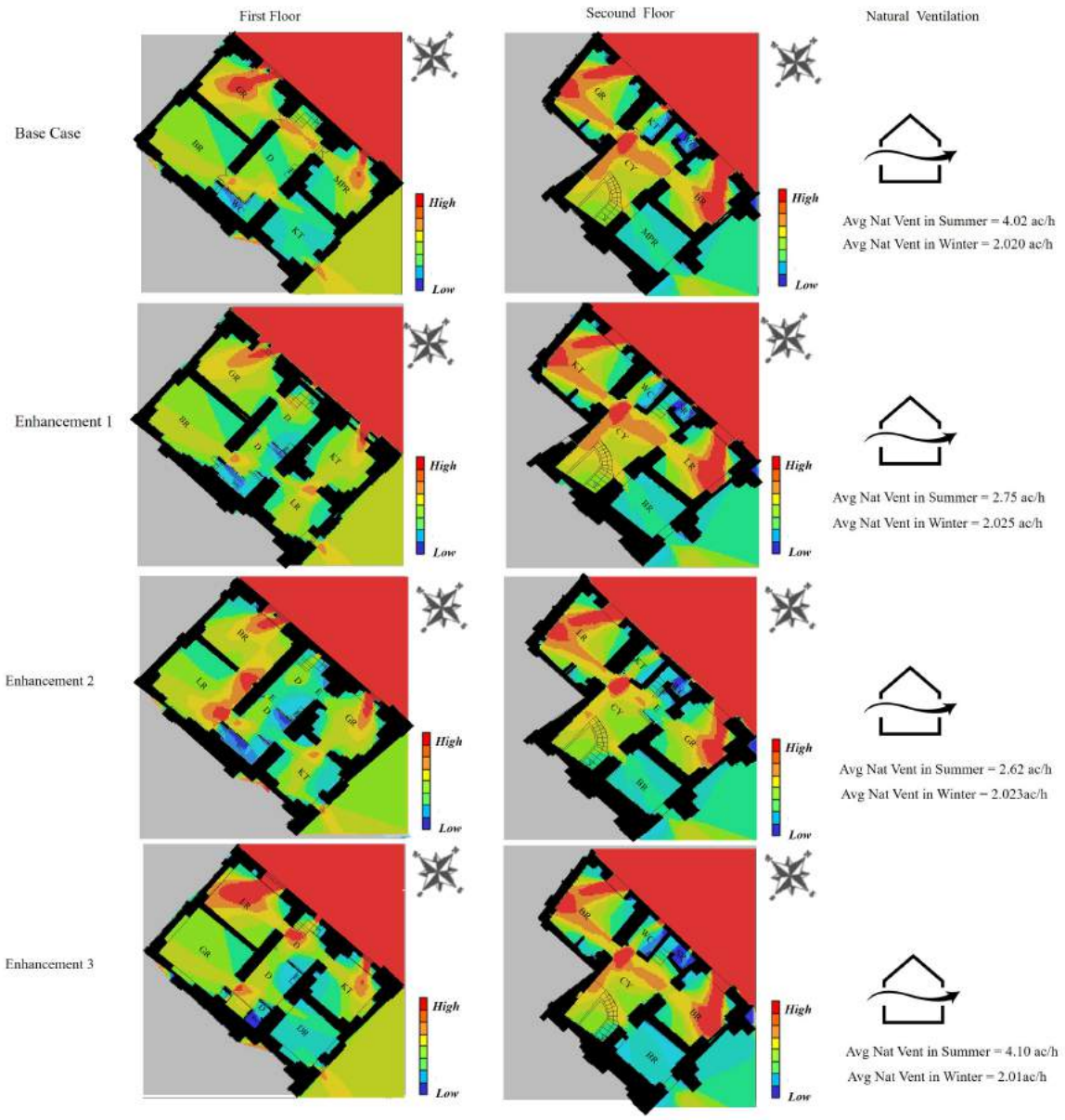


Figure C.5: Air Distribution and Natural Ventilation Amount in Al-Hirbawi Dwelling (Researcher)

The Total WWR% in Al-Hirbawi base case is about 1.91% distributed on both the eastern and northern sides. Both the western and southern sides do not contain any openings due to their connection with the other apartments, see (Figure C.3).

Table C.3: The WWR% in Al-Hirbawi Dwelling (Researcher)

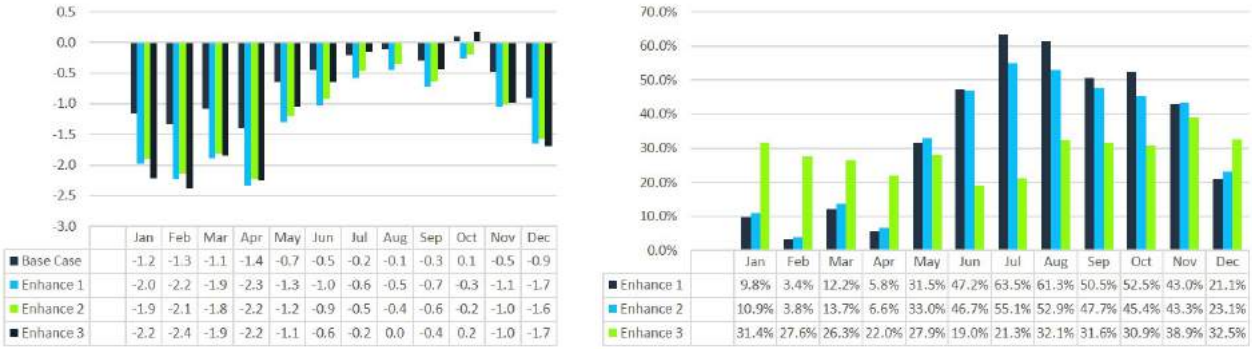
	Total	North (315 to 45 deg)	East (45 to 135 deg)	South (135 to 225 deg)	West (225 to 315 deg)
Gross Wall Area [m2]	268.98	89.33	78.85	68.74	32.07
Window Opening Area [m2]	5.14	4.09	1.05	0.00	0.00
Gross Window-Wall Ratio [%]	1.91	4.58	1.33	0.00	0.00

The maximum PPD% was 50% in February, which is the coldest month for the occupants, as shown in (Table C.4). According to the PMV value in (Figure C.6), February is considered the coldest month for the occupants.

Table C.4: The PPD% of The Base Case in Al-Herbawi Dwelling (Researcher)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PPD%	42.50	50.90	39.50	46.70	20.10	11.80	5.10	4.90	8.80	3.90	13.70	31.20

Al-Herbawi dwelling is located on the northern side of Al-Aqqaba residential building. Furthermore, according to the PMV value, the building is cool in both winter and summer. In the base case, the PMV was about -1.1 in the winter and -0.2 in the summer, meaning that the weather is considered between slightly cool in winter and neutral in summer. On the other hand the enhancement scenarios the building ranged between cool and slightly cool, see (Figure C.6).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Base Case	-1.2	-1.3	-1.1	-1.4	-0.7	-0.5	-0.2	-0.1	-0.3	0.1	-0.5	-0.9
Enhance 1	-2.0	-2.2	-1.9	-2.3	-1.3	-1.0	-0.6	-0.5	-0.7	-0.3	-1.1	-1.7
Enhance 2	-1.9	-2.1	-1.8	-2.2	-1.2	-0.9	-0.5	-0.4	-0.6	-0.2	-1.0	-1.6
Enhance 3	-2.2	-2.4	-1.9	-2.2	-1.1	-0.6	-0.2	0.0	-0.4	0.2	-1.0	-1.7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Enhance 1	9.8%	3.4%	12.2%	5.8%	31.5%	47.2%	63.5%	61.3%	50.5%	52.5%	43.0%	21.1%
Enhance 2	10.9%	3.8%	13.7%	6.6%	33.0%	46.7%	55.1%	52.9%	47.7%	45.4%	43.3%	23.1%
Enhance 3	31.4%	27.6%	26.3%	22.0%	27.9%	19.0%	21.3%	32.1%	31.6%	30.9%	38.9%	32.5%

Figure C.6: The Thermal Comfort in Al-Herbawi Dwelling; PMV Values (Left), PPD% (Right)(Researcher)

When the internal arrangement was changed and some partitions were added to the ground floor, the degree of coldness increased in winter, which affected the building's thermal comfort as shown in (Figure C.6).

B.3 Al-Juba Quarter

Al-Juba dwelling contains windows with a total WWR% equals to 1.76% distributed into inner courtyards, see (Figure C.5).

Table C.5: Al-Juba Quarter WWR% (Researcher)

	Total	North (315 to 45 deg)	East (45 to 135 deg)	South (135 to 225 deg)	West (225 to 315 deg)
Gross Wall Area [m2]	438.67	88.39	129.41	91.68	129.18
Window Opening Area [m2]	7.74	0.00	3.21	1.31	3.21
Gross Window-Wall Ratio [%]	1.76	0.00	2.48	1.43	2.49

The proportion of airflow was increased by increasing the number of added rooms in the building also by increasing the number of openings that the residents can use, see (Figure C.7).

In this type of dwellings, the natural ventilation value is identical during summer and winter in all cases due to the lack of cross ventilation and all openings take ventilation from the central courtyard only, as shown in (Figure C.8).

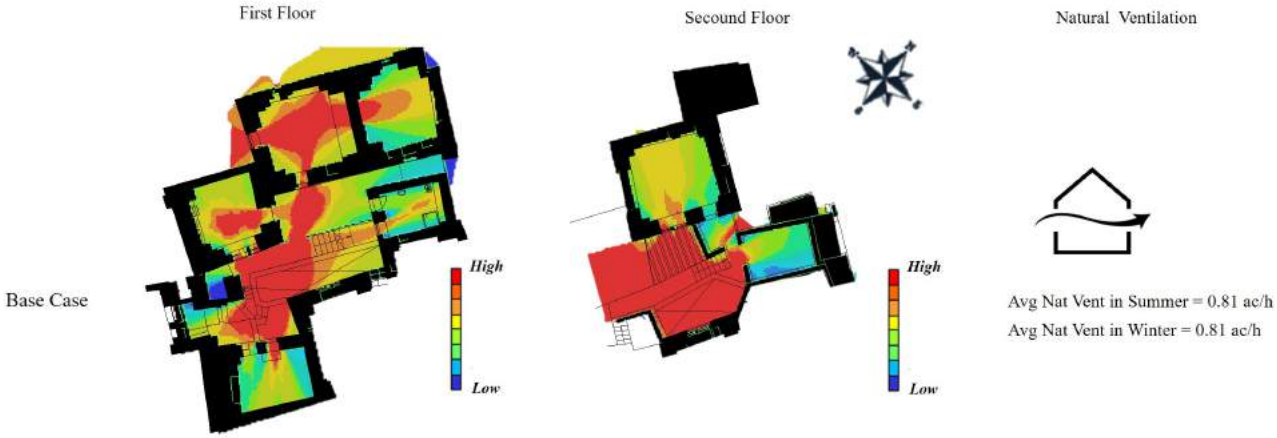


Figure C.7: Air Distribution and Natural Ventilation Amount for Al-Juba Quarter Case Study (Researcher)

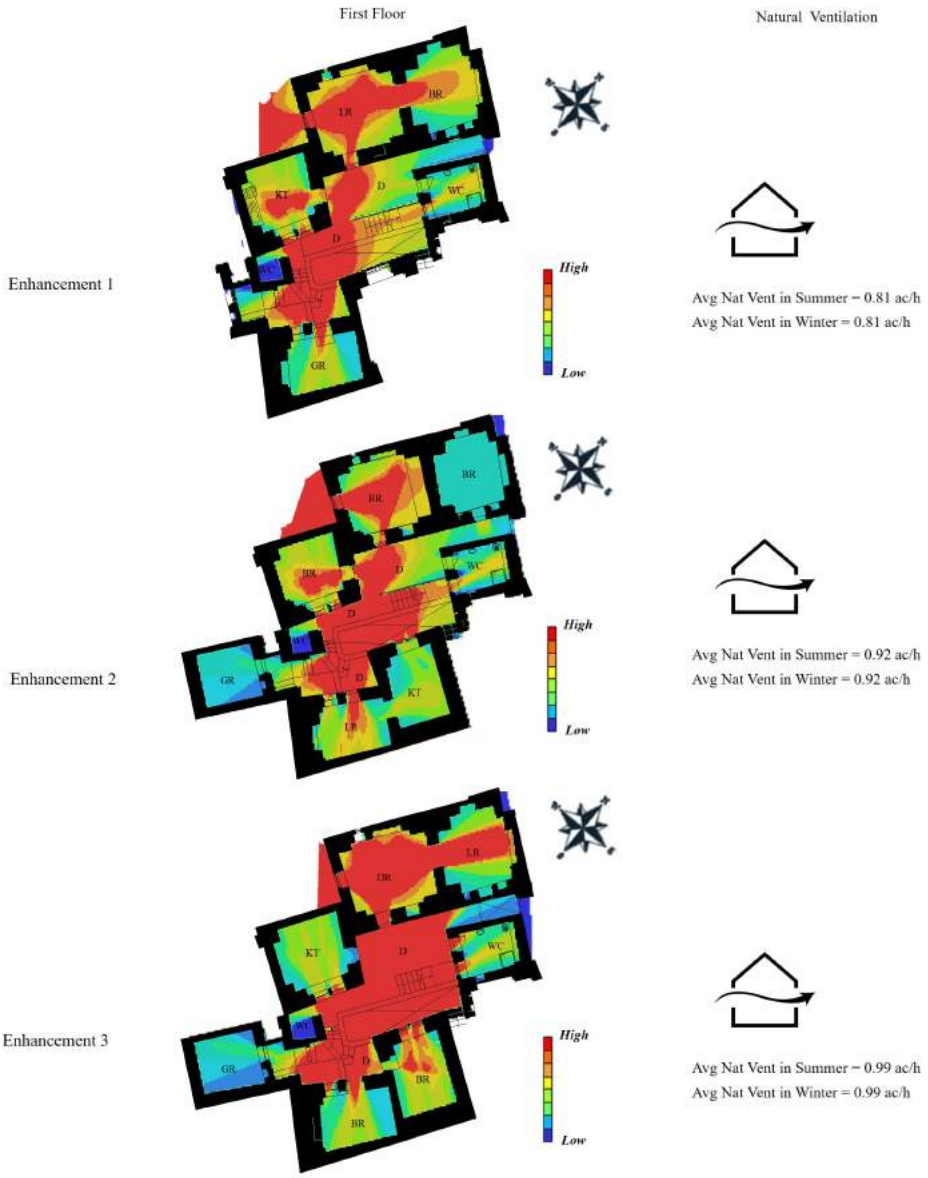


Figure C.8: Air Movement Inside Different Scenarios of Dwelling enhancement for Al-Juba Quarter Case Study (Researcher)

The highest PPD% values were in Feb with 39.9%. In general, the PPD% values are in the acceptable range, which is lower than 40%. Also, the PMV values are between neutral and cool for the base case; see (Table C.6).

Table C.6: The PPD% of The Base Case of Al-Juba Dwelling (Researcher)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PPD%	37.9	39.9	29	44.4	21.6	9.3	6.6	8.7	11.3	8.11	19.0	30.6

The (Figure C.9) shows the PMV and the PPD% in Al-juba dwelling due to different enhancement scenarios.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Base case	-1.17	-1.23	-0.94	-1.37	-0.55	-0.18	0.14	0.23	-0.12	0.25	-0.61	-0.96
Enhancment 1	-1.38	-1.44	-1.12	-1.57	-0.70	-0.31	0.03	0.13	-0.22	0.18	-0.76	-1.15
Enhancmnet 2	-0.98	-1.03	-0.75	-1.42	-0.43	-0.02	0.33	0.42	0.06	0.45	-0.43	-0.78
Enhancment 3	-0.86	-0.91	-0.64	-1.48	-0.47	-0.04	0.31	0.40	0.04	0.44	-0.37	-0.66

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Enhancment 1	8.5%	7.8%	11.0%	5.0%	10.2%	14.1%	3.6%	0.8%	8.5%	-2.3%	13.1%	11.6%
Enhancment 2	-11.8%	-10.9%	-18.2%	4.7%	-6.2%	-3.1%	14.0%	14.4%	-3.7%	16.8%	-20.6%	-19.1%
Enhancment 3	-19.7%	-19.0%	-27.3%	6.4%	-4.7%	-3.8%	12.2%	13.2%	-4.2%	14.8%	-29.1%	-29.4%

Figure C.9: The PMV (Left) and The PPD% (Right) in Al-juba Dwelling due to different enhancement Scenarios (Researcher)

The maximum difference for the PPD% between the base and the enhancement scenarios is about -29% while decreasing the PPD% means that the occupants feel more comfortable.

In Dweik palace, the Total WWR% value is about 7.83% and all the windows are directed to the outer view. Also, it provides a high amount of cross ventilation, see (Table C.7).

Table C.7: Dweik Palace WWR% value (Researcher)

	Total	North (315 to 45 deg)	East (45 to 135 deg)	South (135 to 225 deg)	West (225 to 315 deg)
Gross Wall Area [m2]	234.65	59.15	58.42	58.63	58.45
Window Opening Area [m2]	18.37	4.17	5.01	5.01	4.17
Gross Window-Wall Ratio [%]	7.83	7.06	8.58	8.55	7.14

The new spatial configuration gratefully affects the air movement inside the houses. The two different scenarios generate different effects. However, in all scenarios, the natural ventilation amount was the same: about 0.95 ac/h in summer and 0.96 ac/h in winter see Figure C.10.

The PPD% value in the base case does not exceed 14% in most of the months. However, in April, the PPD% was 58% so, April is considered the coldest month in the year with a PMV value equal to -1.6, see (Table C.8).

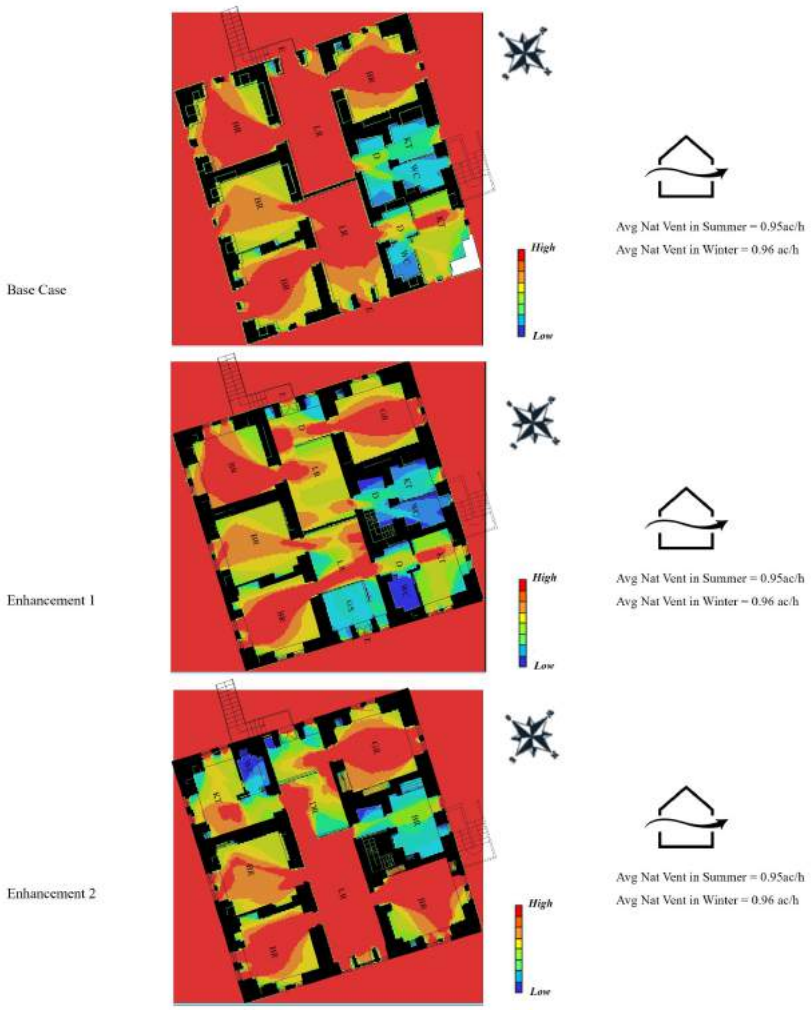


Figure C.10: Air Movement in Dweik Palace (Researcher)

Table C.8: The PPD% of The Base Case of Dweik Palace (Researcher)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PPD%	11.3	12.2	8.8	58.1	14.8	8.7	7.35	9.17	8.8	13.6	7.21	8.26

The PMV has the same values in different scenarios. However, the PPD% is changed because of the changing of the activities inside the spaces, which affects the metabolic rate of the inhabitants.

Figure C.11: The PMV (Left) and the PPD% (Right) for Dweik Palace (Researcher)

B.4 Summery

In terms of thermal comfort, the results showed that the airflow increased due to the increasing number of rooms added to the building and the number of openings that can be controlled, which affects thermal comfort.

The PPD% and PMV change mainly when the room activities change, which means that when the building contains more bedrooms and few numbers other activity rooms such as the kitchen and living room, the PPD% becomes high PMV becomes low in the whole building.