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# **Sustainability Indicators of Urban Form : The Case of El-Kellej & Al-Wardiya Mahallat in Old Hilla**

**A thesis**

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**By**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ  
أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العلي العظيم

سورة البقره (ايه 32)

***TO MY FAMILY  
WITH ALL OF  
MY LOVE AND  
RESPECT***

*Rafal Hakim Hamiri*

2022

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# **Sustainability Indicators of Urban Form : The Case of El-Kellej & Al-Wardiya Mahallat in Old Hilla**

## **Abstract**

Sustainability indicators reflect the major trends in environment, social and economic systems, human well-being, and quality of life, concisely, measure what people are interest with. Indicators can play important roles in enabling and promoting and monitoring sustainability. Many studies have addressed the issue of urban sustainability indicators in various countries of the world, and set many of these indicators in an attempt to find a balance between economic and social development, and environmental factors in proportion to these countries, the presence of studies on the city of Hilla but need to develop. This thesis has addressed the issue of determining the mechanism and methodology for selection and evaluation of sustainability indicators urban form for( case study ), and because the decision-making centers in the city turn away, from the introduction of the concept of sustainability in decision-making processes ,sustainability become an important step ,thus, the research started from the problem of the need to develop sustainability indicators to measure the sustainable urban form to achieve the goal of finding indicators for measure sustainable urban form of the (traditional area Al- Kilge and Wardia) through the hypothesis of the existence of a methodology that is the basis for the transition to a more sustainable thought, since the inputs are a set of sustainable indicators for the urban form, and thus the theoretical part of the thesis has explained everything related to the conceptual side of the search . On the practical side, the methodology adopted in the case study are applied practically, following a participatory approach to arrive at a final set of indicators for achieving a sustainable urban form and ended with a set of recommendations related , a set of indicators for sustainability of urban form, based on research results.

## LIST OF CONTENTS

No.	Title	Page No
<b>Chapter One: Introduction</b>		
1.1	Introduction	1
1.2	Research problem	3
1.3	Research Questions	3
1.4	Research hypothesis	4
1.5	Aims	4
1.6	Objectives	4
1.7	Research Methodology	5
1.8	Thesis structure	7
<b>Chapter Two: Literature Review</b>		
2.1	Introduction	9
2.2	Sustainability	9
2.2.1	Environmental Sustainability	10
2.2.2	Social Sustainability	13
2.3	The Underlying Elements Of Social Sustainability	15
2.4	The Emerging Criteria For Social Sustainability	16
2.5.	The concept of indicators and the purpose of their use	17
2.6.	The Difference between the Traditional Urban Indicators and the Urban Sustainability Indicators	18
2.6.1	The most important options for using urban sustainability indicators	18
2.7.	Potential Approaches to the Organization and Design of Indicators	20

<b>2.8.</b>	Indicators Framework:	22
<b>2.8.1</b>	Some International Frameworks and Common Local Frameworks:	25
<b>2.9</b>	Sustainable Urban Form	26
<b>2.9.1</b>	Compactness	27
<b>2.9.2</b>	Sustainable Transport	27
<b>2.9.3</b>	Mixed Land Uses	28
<b>2.9.4</b>	The Housing Density	28
<b>2.9.5</b>	Accessibility	29
<b>2.9.6</b>	Urban Healthy System	29
<b>2.9.7</b>	Green Urbanism	30
<b>2.9.8</b>	Planning Passive	30
<b>2.10.</b>	Sustainable Development Strategies	30
<b>2.10.1.</b>	Neotraditional Development Strategy	31
<b>2.10.2.</b>	Strategies for Sustainable Cities	32
<b>2.11.</b>	Indicators of Foundations or Features of the Urban Environment To Achieve a Sustainable Urban Form:	34
<b>2.12.</b>	Global Studies on Urban Form and Sustainability	36
<b>2.13.</b>	Summary	41
<b>Chapter Three: Analytical study of El Kellej and Al Wardiya mahallat in Old Hilla</b>		
<b>3.1</b>	Introduction	43
<b>3.2</b>	Location of Babel Governorate	43
<b>3.3</b>	Traditional Area Location	45

3.4.	The Morphological Stages Experienced by the City of Hilla (The Traditional District)	46
3.4.1	The First Morphological Stage (Before 1921)	49
3.4.2	The second morphological stage (1921-1950)	50
3.4.3	The third morphological stage (1951-1970)	51
3.4.4	Contemporary Fourth Morphological Stage (1971-2020)	53
3.6	Case Study: El Kellej and Al Wardiya <i>mahallat</i> in Old Hilla.	54
3.6.1	El Kellej Mahalla location	54
3.6.1.A	The Social and Cultural Context of Mahalla -El Kellej	56
3.6.1.B	population	56
3.6.1.C	Characteristics of El Kellej <i>Mahalla</i>	57
3.6.2.	Al-Wardia Mahalla location	59
3.6.2.A	Social and Cultural Context of Al-Wardia Mahalla	60
3.6.2.B	population	61
3.6.2.C	Characteristics of Mahalla Al-Wardia	62
3.7	The Concept of Public/Private	63
3.8.	Social Privacy and Environmental factors of the Traditional Home	64
3.9.	Principles Of Sustainability in The Traditional House	67
3.10.	Indications of The Traditional House and Al <i>mahalla</i>	69
3.11.	The Current Urban form of the Traditional Area (El Kellej and Al-Wardia )	70
3.11.1.	Emerged New <i>Mahallat</i> From El Kellej and Al-Wardiya	72
3.12.	Summary	75
<b>Chapter Four: Applying The Research Methodology, Results And Discussions</b>		
4.1	Introduction:	76

4.2	The First Step: Identification Problems and needs	76
4.2.1	Review of Literature, Archive Documents, and Secondary Data	78
4.2.2	Focus Groups	82
5.2.3	Interview Method	88
4.2.3.A	Some of the problems that were noticed during the process of conducting interviews and focus groups	95
4.3	Final Problems	96
4.4	The Second Step: Finding sustainable indicators for the urban form	97
4.4.1	Objectives Formulation	97
4.4.1.A	Techniques for Objectives Formulation	98
4.4.2	Indicators Formulation:	100
4.4.3	Selection, Choosing and Ordering Indicators or Ranking of Indicators	103
4.3.4.A	Indicator Selection	103
4.3.4.B	Indicator Ranking	104
4.5:	Questionnaire Results and Discussions	106
4.6	Final Set of Sustainability and Urban Form Indicators for Heritage Area (El Kellej and Al-Wardiya), in the City of Hilla	111
4.7	Summary	115
<b>Chapter five: Conclusions and Recommendations</b>		
5.1	Introduction	117
5.2	Answering the Research Questions	117
5.3	Conclusions	118
5.4	Recommendations	120
5.5	Knowledge Provided by the Thesis	122

## LIST OF Figures

<b>Figure No.</b>	<b>Title</b>	<b>Page No</b>
<b>Figure (1-1)</b>	detailed Scheme of Research Methodology (the researcher 2022)	6
<b>Figure (1-2)</b>	General scheme shows the second step to reach the indicators of the sustainability of the urban form, based on the first step(the researcher 2022)	7
<b>Figure(2-1)</b>	two opposite masses, the one that faces a desired direction can shade the courtyard floor during summer afternoons (Almumar,2019,pp145)	11
<b>Figure (2.2)</b>	Privacy In Traditional Homes (Samir And Arayici,2020,Pp225)	14
<b>Figure (2.3)</b>	The safety of Traditional Environment (Samir and Arayici,2020,pp226)	15
<b>Figure (2-4)</b>	The foundations or features of the urban environment related to achieving a sustainable urban form (Hiyam, 2015 , p 46).	27
<b>Figure 3-1</b>	Babel province map (NGO Coordination Committee for Iraq, 2015 pp. 49-53).	44
<b>Figure 3-2</b>	The location of the old area according to the master plan of the city of Hilla for the year 2006-2030,( The researcher worked on Ministry of Municipalities and Public Works 2013)	45
<b>Figure 3-3</b>	The origin of the suit in these mahallat ( Hilla Traditional Center,2017)	46
<b>Figure (3-4)</b>	Morphological stages of the expansion of the city of Hilla (Al-Rubaie, 2002, p135)	47

<b>Figure (3-5)</b>	Morphological stages of the expansion of traditional area (The researcher worked on Al-Rubaie, 2002 )	48
<b>Figure (3-6)</b>	El Kellej <i>Mahalla</i> location according to the master plan of the city of Hilla for the year 2006-2030, (Ministry of Municipalities and Public Works 2013 and Nasir and Gado'o, 2016, p. 129).	55
<b>Figure (3-7)</b>	El Kellej <i>Mahalla</i> plan (Hilla Municipality Directorate, 2010, p 1)	57
<b>Figure( 3-8)</b>	El Kellej <i>Mahalla</i> plan (The researcher,2022)	58
<b>Figure (3-9)</b>	Al-Shanasheel and the old aziqqa in the Mahalla of El Kellej	59
<b>Figure(3-10)</b>	Al-Wardia location (The researcher,2022)	60
<b>Figure 3-11</b>	Al-Wardiya Mahalla in Hilla between the years 1947-1957 (Museum of Contemporary Al- Hilla)	61
<b>Figure 3-12</b>	Al-Wardia Mahalla Museum of Contemporary Al- Hilla)	62
<b>Figure 3-13</b>	Social space & privacy in traditional house	66
<b>Figure 3-14.</b>	The courtyard house, Dar Babil in Al-Hilla-Iraq. (Al-Thahab et al. .2014.p76)	66
<b>Figure 3-15</b>	basement, ground floor and first floor of the courtyard house building ( Fathulla ,2016,p 17)	67
<b>Figure (3-16)</b>	The traditional area (El Kellej and Al-Wardia ) at the present time(The researcher 2022)	72
<b>Figure (3-17)</b>	Some Of New Mahallat ( <b>The researcher 2022</b> )	74
<b>Figure (3-18)</b>	The Traditional Area (El Kellej and Al-Wardiya) (The researcher 2022).	74
<b>Figure 4-1</b>	A general scheme of the first step (issues identification) of Methodological process (The	77

	researcher ,2022)	
<b>Figure 4-2:</b>	Shows Some of the problems that were noticed during the process of conducting interviews and focus groups (Author,2022)	96
<b>Figure (4-3)</b>	General scheme of objective formulation ( <b>The researcher,2022</b> ).	98
<b>Figure ( 4.4)</b>	shows the percentage of answers by expert participants in the questionnaire	112
<b>Figure (4.5)</b>	the relationship between the average and the standard deviation of the indicators	114

## LIST OF TABLES

Table No.	Title	Page No
<b>Table( 2.1)</b>	Traditional and emerging social sustainability key themes (Abdul Kadir and Jamaludin ,2013,pp 181)	16
<b>Table (2.2)</b>	Criteria for social sustainability (Abdul Kadir and Jamaludin ,2013,pp 181)	17
<b>Table(2-3)</b>	Methodological frameworks for developing sustainability indicators showing their approach( Al-Alwani,2014 ,pp52-53).	20
<b>Table(2- 4)</b>	main framework types used for developing sustainability indicators ( <b>Maclaren, 1996 , Al-Alwani,2014, p 48</b> ).	22
<b>Table (2-5)</b>	sustainability frameworks for indicator development and identified the frameworks( Al-Alwani,2014,p 49)	24
<b>Table (2-6)</b>	Indicators of the urban environment that relate to achieving a sustainable urban form	34
<b>Table (2-7)</b>	Global Studies on urban form and sustainability	36
<b>Table( 3.1)</b>	The population of El Kellej <i>Mahalla</i> ( <b>Nasir and Gado'o, 2016, p. 130</b> )	56
<b>Table( 3.2)</b>	The population of Al-Wardia Mahalla (Nasir and Gado'o,2016, p 130)	61
<b>Table (3.3)</b>	<b>Some</b> of the indications of the traditional house and al <i>mahalla</i>	69
<b>Table (4.1)</b>	Problems of Traditional District (Al- Kellej and Al-Wardiya) in Hilla identified through document source analysis	79
<b>Table( 4.2)</b>	Problems of Traditional District (Al- Kellej and Al-	83

	Wardiya) in Hilla identified through focus group discussions	
<b>Table (4.3)</b>	Problems of Traditional District (Al- Kilge and Al- Wardiya) in Hilla gathered through interview	89
<b>Table( 4.4)</b>	shows set of final problems	96
<b>Table (4.5)</b>	formulation of objectives	99
<b>Table (5.6)</b>	formulation of indicators	101
<b>Table (4.7)</b>	shows the average, standard deviation and rank of each indicator	108

## Glossary of Arabic Terms

<i>mahalla</i> =	Traditional Neighborhood Unit in Iraq
<i>mahallat</i> =	Traditional Neighborhood Unit in Iraq
<i>al souwb al saghir</i> =	East Side of the City of Hilla-Iraq
<i>al souwb al kabir</i> =	West Side of the City of Hilla-Iraq
<i>zuqaq</i> =	Traditional Alley of al Mahalla
<i>aziqqa</i> =	Traditional Alleys of al Mahalla
<i>Suq el Amaar</i> =	Al-Ammar Market in the east side of the Old City of Hilla - Iraq
<i>Badgeer</i> =	Air catcher of the traditional courtyard house in Iraq
<i>Al Souq</i> =	The market
<i>Agd</i> =	The traditional alley of the mahalla in Old Hilla
<i>Shanashil</i> =	Wood lattice windows typology towards the outside sphere in Iraqi traditional houses

# **Chapter One**

## **INTRODUCTION**

## Chapter One

# INTRODUCTION

## 1.1 Introduction

There has been a considerable amount of research that defines and characterizes the form of the sustainable city, and which urban forms may most affect sustainability. It is a complex issue. The physical dimensions of urban form may include its size, shape, land uses, configuration and distribution of open space - a composite of a multitude of characteristics, including a city's transportation system and urban design features. However, its sustainability depends on more abstract issues environmental (including transport), social and economic. Research suggests that, not one, but a number of urban forms may be sustainable . Yet much of the debate about the sustainability of cities and urban forms has focused on increasing the density of development, ensuring a mix of uses, containing urban sprawl' and achieving social and economic diversity and vitality - often characterised as the concept of a 'compact city'( Dimensions of the Sustainable City2 , Jenks,2009,P 1).Urban form is a spatial composition of elements that repeat, and if based on certain sustainable concepts, can lead to the sustainability of cities. Various approaches are explored for achieving sustainable urban development through a city's form. Jabareen identifies four urban forms based on

seven design principles to attain the goals of sustainable urban development. The seven concepts or principles of sustainable cities are (a) Compactness (b) Sustainable Transport (c) Density (d) Mixed Land uses (e) Diversity (f) Passive Solar Design and (g) Greening. All of these aim at reducing travel

distances, saving energy, increase quality of life, efficient use of land, save infrastructure costs, etc. contributing to sustainable urban development. The four identified sustainable urban forms by Jabareen are Neo-traditional Development, Urban Containment, Compact City and Eco-City ;comprised of combination of the seven design principles or concepts. Each of these urban forms contribute differently in making cities sustainable, however conceptually compact city seems to be more convincing than other urban forms( Kotharkar et al 2014 ,p 2).Compact cities can promote sustainability by limiting the losses of surrounding natural and agricultural areas; reducing the amount of travel, car dependency and energy use for transport; reducing energy use; limiting the consumption of building materials for infrastructure; and maintaining the diversity and possibilities for choice among workplaces, service facilities and social contacts, Other studies stated, that compact developments can cause severe congestion in transport network, increase land and dwelling prices and create social exclusion (Breheny, 1997, pp.209-217) .

Indicators of urban sustainability have become an alternative approach in an urbanizing world that takes the city in all its sectors, as an integrated analytical unit, to know the extent of upgrading or deterioration in the quality of life in all its human, economic, social, urban, demographic, environmental and cultural implications. The need for indicators emerged, when the actual application of the term sustainability with all its pillars began to achieve a balance between them. Indicators were used to assess the urban form, which is known as urban form as “the spatial pattern of the large, inert, permanent physical objects in a city”, (Lynch ,1981,p.47). dimensions of urban form may include its size, shape, land uses, configuration and distribution of open space a composite of a multitude of characteristics, including a city’s transportation system and urban design features .One of the reasons why the urban form of cities is important

because it is seen as a major contributor to the high level of energy consumption, it also affects traveling behaviour, social integration, and consequently impacts the quality of air and soil in local open spaces, and the global climate (Cervero, 1997,pp199-219) .

In this thesis, a systematic method is used to find sustainable indicators to measure the sustainable urban form in the study area, the traditional area (El-Kellej and Al-Wardiya) in the alsawb alsaghir of the city of Hilla.

## **1.2 Research problem**

Many studies have dealt with the issue of sustainability indicators in various countries of the world and developed many of these indicators in an attempt to find a balance between the economic, social and environmental aspects and what is appropriate for those countries. There are such studies for the city of Hilla, but they need to be developed in order to apply them successfully at the local level, and this leads to the research problem of developing sustainability indicators to measure the sustainable urban form

## **1.3 Research Questions**

The question addressed in this thesis is how to develop a framework that provides suitable sustainable indicators that will lead to a more sustainable urban form in the traditional area. To answer this basic question, the study identifies important secondary research questions

- 1- What types of frameworks for evaluating indicators are there currently?
2. How could a framework for evaluating sustainable urban form be set up and organized?
- 3-How effective is the sustainability evaluation framework as a tool and a system for creating a sustainable region in real life?

## 1.4 Research hypothesis

The urban form can affect its sustainability several studies have tried to prove that sustainability of a city might depend on its shape, size, density and land use distribution. Urban form has positive or negative impact on accessibility to facilities, travel attributes (distance and time), energy used, social equity, efficient use of land, economic benefits, reduction in CO2 emissions, liveliness, etc .

The hypothesis is the existence of a methodology that is the basis for the transition to a more sustainable thought, since the inputs are a set of sustainable indicators for the urban form .

## 1.5 Aims

The main goal of this study is to, using the research questions as a guide and within the context of the research, finding indicators to measure the sustainable urban form of the traditional area (El-Kellej and Al-Wardiya) in the alsawb alsaghir of the city of Hilla. Within a methodological framework that would formulate, select and prioritize indicators, work can then be done to improve sustainability at the local level

## 1.6 Objectives

To reach the general goal of the research, several goals have been developed, as follows

1. To introduce the idea of sustainable cities.
2. To investigate the urban form characteristics of traditional area(El-Kellej ,Al-Wardiya) .
3. To comprehend the significance and role of sustainability indicators

4. To evaluate the many sustainability indicator frameworks already in use and comprehend their advantages and disadvantages.
5. To develop a practical method for evaluating the sustainability of urban forms.
- 6.To test the proposed methodological framework in a selected case study (traditional area)
7. To rank sustainability urban form indicators in order of priority in the selected case study
- 8.To propose future recommendations

## 1.7 Research Methodology

The proposed methodology for this thesis, which can be summarized at the beginning, it led to the adoption of a top-down/bottom-up approach. like this approach turns out to be the best way to develop indicators that (scientifically and publicly valid with stakeholders and local communities. The methodological framework includes two steps: the first step defining the problem is to identify the problems and sustainability problems facing traditional area (El-Kellej ,Al-Wardiya) in alsawb alsaghir in the city of Hilla and their root causes (social, economic, environmental and institutional)through several tools that can be used, which are documentary sources, and gather more information and interviews with citizensIn addition, strong community participation through focus group meetings to highlight problems and desires related to sustainability(such as Hiyam, 2015, Ameera and Haider, 2021 ,AL-Alwani,2014,AL- Anbary, et al.,2020, Rasha,2019, Shaker & Partners 2007 , Directorate of Urban Planning, Babylon ) Figure (1-1) .The second step includes, formulating the goal, formulating the indicator, and selecting the indicator. The first set of suggested indicators contained 40 indicators. This set of suggested indicators were reviewed and analyzed by means of a series of shared

insights from the literature and through consultations with experts from specific regions. This review phase was used to reformulate and select valid and useful indicators (comparable, measurable and sensitive). The second set of indicators (after the first revisions) contains 32 indicators. Indicators are arranged on the basis of priority to determine the final set of indicators , participants(40 expert in Hilla) will be asked to test the level of significance of each indicator included in the questionnaire Figure (1-2).

SPSS was used during this study. The traditional area (El-Kellej and Al-Wardiya) in alsawb alsaghir of the city of Hilla was selected as a case study to demonstrate the applicability of the methodological framework in a realistic case study.

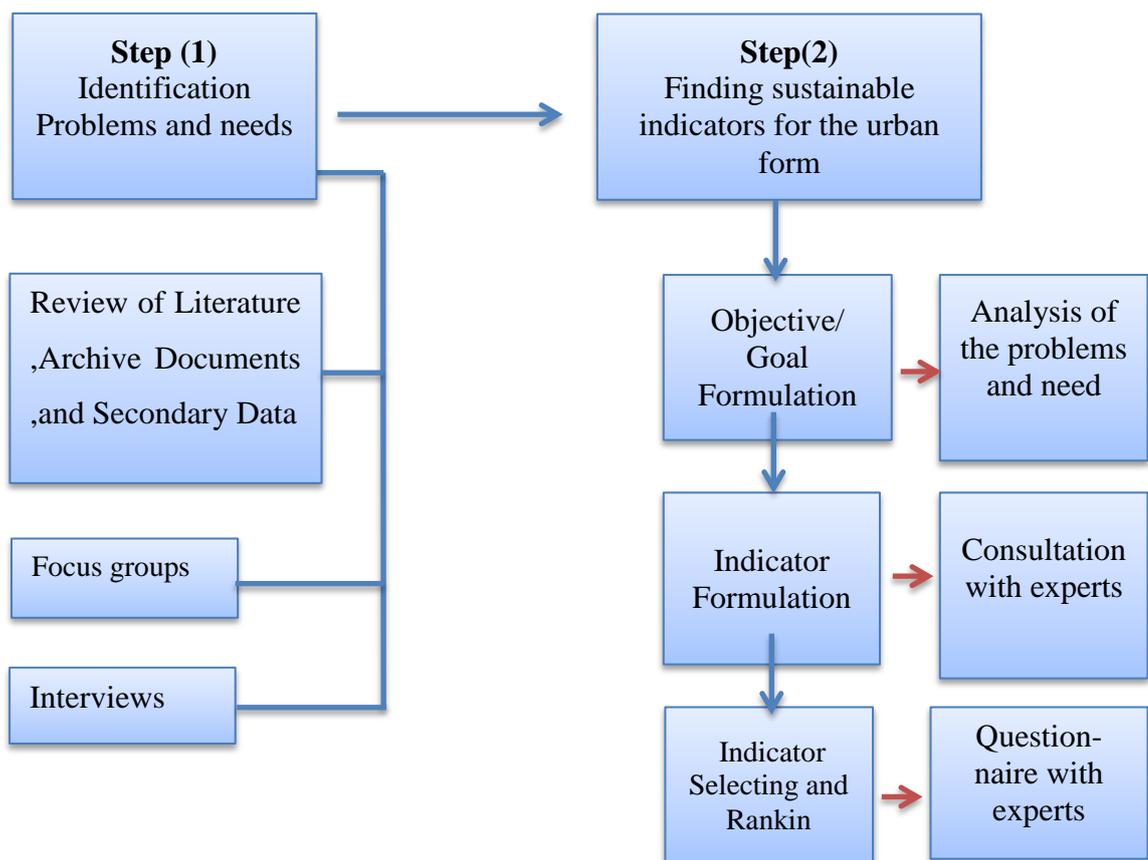
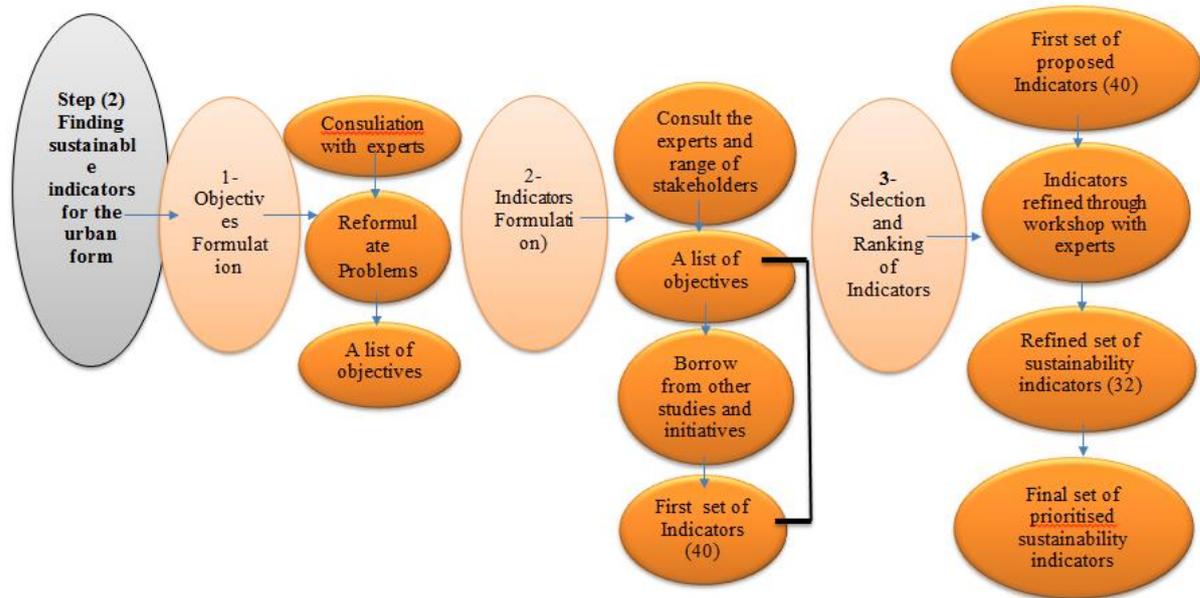


Figure (1-1) :detailed Scheme of Research Methodology (the researcher 2022)



**Figure (1-2)** General scheme shows the second step to reach the indicators of the sustainability of the urban form, based on the first step(the researcher 2022)

## 1.8 Thesis structure:-

This thesis is divided into six chapters:

**Chapter One:** An introduction that provides a general definition of the subject of the study. Explain the research problem, research questions, research hypothesis, aims, objectives and research methodology.

**Chapter Two:** This chapter deals with the previous literature on the concept of urban form and sustainability and sustainable urban form, **sustainable development** strategies, strategies for sustainable cities, the compact city strategy, the previous frameworks that are used to create sustainability indicators.

**Chapter Three:** This chapter presents a case study that will be applied the research methodology in traditional area (El-Kellej, Al-Wardiya) in Al-Sawb Al-Saghir in the city of Hilla, where it reviews a historical and geographical

overview of the area as well as morphological changes that occurred in the area .

**Chapter Four:** Applying the research methodology to traditional area (El-Kellej ,Al-Wardiya) in alsawb alsaghir and extracting and discussing the results.

**Chapter five:** This chapter deals with the conclusions and recommendations from the research that can be followed in the future.

## **Chapter Two**

# **LITERATURE REVIEW**

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## Chapter Two

### Literature Review

#### 2.1. Introduction :

In order to reach a better understanding of the indicators of sustainability of urban form, it is necessary to gain a comprehensive and integrated understanding of the concept of sustainability and sustainable cities in general, the concept of sustainable urban form in particular. This chapter explores sustainability, urban form, indicator concept, and the difference between traditional urban indicators and sustainable urban indicators, in addition to sustainable development strategies. It reviews a set of sustainability indicator frameworks, paving the way to develop and apply the Sustainability Indicators Framework .

#### 2.2 Sustainability :

Sustainability as a policy concept has its origin in the Brundtland Report of 1987. That document was concerned with the tension between the aspirations of mankind towards a better life on the one hand and the limitations imposed by nature on the other hand. In the course of time, the concept has been re-interpreted as encompassing three dimensions, namely social, economic and environmental (Kuhlman and Farrington ,2010,p1). Whereas the environmental dimension can be defined to be the sum of all bio-geological processes and the elements involved in them (referred to as ‘environmental capital’ by economists), the social dimension (‘human capital’) consists of the intra-personal qualities of human beings: their skills, dedication and experiences. Institutions (confusingly called ‘social capital’) are the result of interpersonal processes, such as communication and co-operation, resulting in information and systems of rules governing

the interaction of members of a society. The economic dimension (‘man-made capital’) includes not only the formal economy, but as well all kinds of informal activity that provide services to individuals and groups and thus increase the standard of living beyond the monetary income (Joachim H. ,2002,p104). where sustainability is concerned with the well-being of future generations and in particular with irreplaceable natural resources—as opposed to the gratification of present needs which we call well-being(Kuhlman and Farrington ,2010,p1)..

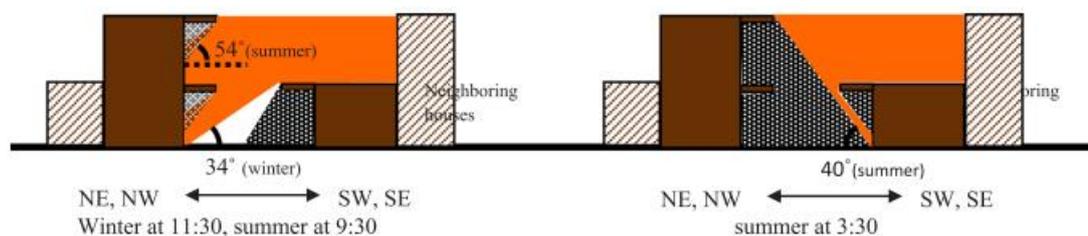
### **2.2.1.Environmental Sustainability**

Environmental sustainability is defined as responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality. The practice of environmental sustainability helps to ensure that the needs of today's population are met without jeopardizing the ability of future generations to meet their needs. When we look at the natural environment, we see that it has a rather remarkable ability to rejuvenate itself and sustain its viability. For example, when a tree falls, it decomposes, adding nutrients to the soil. These nutrients help sustain suitable conditions so future saplings can grow. (Gillaspy , 2021 ,p 1) .

Resources were overused Since sustainability is a multidimensional issue (local, regional, and international dimensions), it have to be developed at a level that people live, work and interact with each other and with nature such as local level . The various sustainability issues are interwoven, and the interaction of a building with its surroundings is also important. The environmental issues share, in common concerns which involve the reduction of the use of non-renewable materials and water, and

the reduction of emissions, wastes, and pollutants . Although social, economic, and cultural indicators are of significant importance to the concept of sustainable building, this concept is often based on environmental properties ,(Usta et al ,2017, p232) .

The traditional courtyard geometry has the capability to control building façades orientation to achieve thermal comfort and energy saving. Main façades, that have window openings, are oriented towards E, SE, S or SW. In these façades, sun is blocked easily in summer, while exposed and penetrated into during winter. Main façades orientations toward NE, N, NW, or Ware avoided. In order for the walls orientation be effective and meets the requirements of shading and solar exposure, it requires that courtyard to have a specific configuration and proportions between its horizontal and vertical dimensions of the surrounding walls which has to be consistent with the sun altitudes .The principles of the traditional courtyard order can be adopted in the design of contemporary buildings of larger scale to achieve environmental efficiency, building densities and human scale similar to the traditional ones. Fig. (2-1). Example of two opposite masses, the one that faces a desired direction can shade the courtyard floor during summer afternoons. (Almumar,2019,pp145)



Figure(2-1) two opposite masses, the one that faces a desired direction can shade the courtyard floor during summer afternoons (Almumar,2019,pp145)

The traditional dwelling agreed with the environment with all its positives and negatives. Protection was achieved by limiting the impact of the harsh natural environment conditions such as the hot climate, relative

humidity, and the intensity of solar radiation. As for adaptation, it was by exploiting the potentialities of natural energy sources such as the sun and wind. There are many basic principles on which the architecture of traditional housing was based, which can, with some modification and development, be indicative of the design of contemporary sustainable housing ( Abu Sirryeh,2021,p1)

Traditional Architecture in the Arab World provides a wealth of environmental treatments that can be applied today to address the crucial architectural situation and the problems of lack of materials and energies facing millions in the Third World. In Traditional Architecture in the Arab, the principles of thermal control were manifested through the proper use of; 1) the compact urban fabric, narrow streets, and shaded areas, 2) the central inner courtyard, 3) thick walls and insulating materials, 4) domes, vaults, and curved roofs. Moreover, natural ventilation is considered as one of the most important distinguishing characteristics of Traditional Architecture that relies on passive design strategies. These strategies are represented, but not limited to: 5)moving air between cold and hot courtyards through 6) directing the openings of the buildings towards favorable winds, 7) using the shanasheel to provide ventilation and natural lighting while maintaining privacy, 8 ) controlling wind movement and taking into account the direct and indirect influence of the sun via arcades, 9) attracting cold air via wind towers. Below is a review of these environmental treatments, (Shahda and Nosier ,2021,p 40) .Finally, there is no doubt that the Islamic dwelling is one of the most important models of success, as it succeeded in achieving a balance between beauty and function, as the elements of the Islamic architectural heritage were found to work and complement each other, with the synthesis between the different climatic, environmental and social conditions. As for contemporary architecture, it faces many challenges to

prove that it is able to absorb the requirements of sustainable development and environmental preservation, so it must re-explore the principles of traditional architecture and choose what are appropriate for the local environment and environmental influences, to develop and mix these principles with modern technologies, and use them in our contemporary architecture and our homes in Now and in the future, where modern technologies can make the use of traditional architecture principles easier and more efficient to achieve the principles of sustainable architecture. ( Abu Sirryeh,2021,p 6)

### **2.2.2. Social Sustainability**

Social sustainability is a major part of both sustainable development and sustainability including societal sustainability and overall promotion of more sustainable societies taking into account multiple social/society–environment relationships and interfaces. These contexts have a strong focus on both present and future generations, encompassing sustainable development of both people and the planet.( Husgafvel Roop,2021,p 1)

Social sustainability includes achieving a fair degree of social homogeneity, equitable income distribution, employment that allows the creation of decent livelihoods, and equitable access to resources and social services, a balance between respect of tradition and innovation, and selfreliance, endogeneity and self-confidence (Sachs, 1999, pp. 32–33)

#### **. Includ Social Sustainability**

##### **1-Belonging:**

Sense of belonging depends on many factors such as, length of residence in the place, social relations, and availability of place facilities.in general, the traditional environment provide to people strongest level of belonging to the place.

### 2-Place Memory:

The ability of residents, who live in the traditional districts to notice, understand, and remember their built environment better than in modern districts, as well as they have ability to link their physical architectural production to their cultural norms. The courtyard in houses in traditional areas was using for multi functions. Firstly, it is private interior meeting space for family members, secondly the courtyard provide a suitable climate especially in summer in Iraq, thirdly provides a safe place for children to play, as shown in fig(2.2). (Samir and Arayici,2020,pp227)



Figure (2.2): Privacy In Traditional Homes (Samir And Arayici,2020,Pp225)

3- Safety environment and Social Relationships in traditional areas(Samir and Arayici,2020,pp226)



Figure (2.3): The safety of Traditional Environment (Samir and Arayici,2020,pp226)

### **2.3. The Underlying Elements Of Social Sustainability**

With respect to the built environment. Young Foundation identifies social sustainability as "a process for creating sustainable, successful places that promote wellbeing, by understanding what people need from the places they live and work. Social sustainability combines design of the physical realm with design of the social world - infrastructure to support social and cultural life, social amenities, systems for citizen engagement and space for people and places to evolve" (Future Communities). To complement the definition, this paper would like to suggest that, in addition to the social development within a community, life cycle and growth of the individuals within their private living spaces are also significant as the underlying elements of social sustainability .Home is where an individual grows physically, develops essential values as a human being and builds a family. In a broader context, a single home is what creates a neighbourhood, and an individual is what composes a community Social sustainability, thus, can be implied as the collective process of life growth and interaction among

humans within their surrounding environment, which evolves from the private domain to the public living environment. (Abdul Kadir and Jamaludin ,2013,pp 180).

## 2.4 The Emerging Criteria For Social Sustainability

Many studies have been done as to develop a list of standards or criteria which may help researchers to measure social sustainability of a community. According to Colantonio (n.d. 2013 ,pp7), the traditional themes of social sustainability such as poverty mitigation and employment rate are being complemented and slowly substituted by the more subjective themes such as sense of place, social participation and happiness. The author compares the traditional and emerging key themes of social sustainability as in Table (2.1) (Abdul Kadir and Jamaludin ,2013,pp 180)

**Table( 2.1).** Traditional and emerging social sustainability key themes (Abdul Kadir and Jamaludin ,2013,pp 181)

TRADITIONAL	EMERGING
Basic needs, including housing and environmental health	Demographic change (aging, migration and mobility)
Education and skills	Social mixing and cohesion
Employment	Identity, sense of place and culture
Equity	Empowerment, participation and access
Human rights and gender	Health and Safety
Poverty	Social capital
Social justice	Well being, Happiness and Quality of Life

The emergence of the more subjective social sustainability themes as presented in Table 1 is also acknowledged by Sharifi and Murayama (2012) whose study reviews recent criteria for social sustainability. The evolving criteria, as listed in Table (2.2) Criteria for social sustainability, were accumulated from precedent social sustainability researches conducted within the last two decades. (Abdul Kadir and Jamaludin ,2013,pp 181)

**Table (2.2).** Criteria for social sustainability (Abdul Kadir and Jamaludin ,2013,pp 181)

AUTHOR(S)	CRITERIA CONSIDERED
Sachs, 1999	Equity; democracy; human rights; social homogeneity; equitable income distribution; employment; equitable access to resources and social services
UNSD, 2001	Equity; health; education; housing; security; population
Spangenberg, 2004	Income; communication and participation; education; social contacts; social security; distribution of income and assets
Choguill, 2008	Citizen participation; social interaction; feeling of belonging; interpersonal relations among the neighborhood residents; collective action; mutual support; access to facilities and amenities; safety
Bramley et al., 2009	Social equity; access to facilities and amenities; affordable housing; social interaction; safety/ security; satisfaction with home; stability (turnover); participation in collective group/ civic activities
Colantonio, 2009	Equity; inclusion; adaptability; security
Cuthill, 2010	Social Justice; social/community well-being; human scale development; engaged governance; social infrastructure; community and/or human scale development; community capacity building; human and social capital
Dave, 2011	Access to facilities and amenities; amount of living space; health of the inhabitants; community spirit and social interaction; safety; satisfaction with the neighborhood
Dempsey et al., 2011	Social interactions; participation; community stability; pride and sense of place; social equity; safety and security
Weingaertner & Moberg, 2011	Accessibility; social capital and networks; health and well-being; social cohesion and inclusion; safety and security; fair distribution (income, employment); local democracy, participation and empowerment; cultural heritage; education and training; equal opportunities; housing and community stability; connectivity and movement; social justice; sense of place; mixed use and tenure; attractive public realm

## 2.5. The concept of indicators and the purpose of their use:

The indicator expresses a quantitative or qualitative measure that is used to measure a specific phenomenon, or specific performance, during a certain period of time. Indicators reveal trends, the progress of that phenomenon (positively), or (negatively), to determine its strengths or weaknesses, (Salvaris at al , 2000 ) and thus indicators are used to measure and simplify information to follow:

- Assessment of conditions and trends for the phenomenon (Where are we?).
- Comparing cases or performance (assessing the way development is going).
- Assessing trends in relation to goals and objectives. Providing early warning about the negative trend of the phenomenon.

- Anticipating the future. ( Gallopin 1997,p15 ).

## **2.6. The Difference between the Traditional Urban Indicators and the Urban Sustainability Indicators:**

Appeared when cities - after the integration of the term sustainability in their development plans - began to focus on a set of urban indicators, in order to measure and quantify the progress made towards implementing sustainability, where urban sustainability indicators are considered that what distinguishes them as for the traditional urban indicators. The latter deals with development in the economic, social, and environmental fields independently of each field, while the sustainability indicators treat this development in an integrated and balanced manner for the three considerations at the same time, and those indicators may be quantitative, or qualitative (IHSD, 2003 ,p8) , and the International Institute for Sustainability has approved the following in terms of urban sustainability indicators: “Measurement helps decision-makers and the public to identify social goals, link them with detailed goals and objectives, and then evaluate progress .It provides an empirical and numerical (quantitative) basis for performance evaluation, in order to determine and calculate the impact of human activities on the environment and society, and to achieve a link between past and present activities to achieve future goals , (Hiyam, 2015 pp.32-35) .

### **2.6.1. The most important options for using urban sustainability indicators**

1-Enable the principles of sustainable development within the development plans (for the city, region or country).

2- (Monitoring) - or promoting sustainable development, where indicators

are chosen here for the purpose of describing and presenting cases or spatial phenomena that are subject to changes.

3- Decision making, which is used for the purpose of developing implementation methods, and comparing development alternatives, with their various effects, and it provides the decision maker with comprehensive and integrated information about the reality of the current situation of his city or region. For development plans, it also raises warning signs at an early stage in the implementation of any plan or strategy, forgetting, as it is possible to make a comparison between urban communities crosswise (through different places), or longitudinally through different stages of time.

4- Through it, it is possible to follow the periodic, realistic changes, towards progress or regression in achieving the goals of sustainable development plans for the urban settlement.

5 - Finally, indicators are used as benchmarks (Benchmarking), to test sustainable performance within a certain time series, and here indicators are called (measurement points), and in this case, cities can, through (reference points indicators), get a clear idea of their location Progress towards sustainability, compared to the rest of the municipalities, and the development of the performance of municipal councils. The indicators serve decision-makers at all levels, and enable them to use them as reference points to assess the extent of success in development plans, and to modify or change them with alternative plans if necessary, leading to more prosperous and sustainable societies. . This means that the purpose of using indicators is to assess the role of governments in achieving the goals and objectives of urban plans (Newman and Jennings 2008 , ,pp 67-68 ).

## 2.7. Potential Approaches to the Organization and Design of Indicators

The literature reveals a wide range of approaches to the organization and design of indicators that are top-down (expert), bottom-up (community) or a mixture of the two with each having their own advantages and disadvantages (Reed et al. 2005, pp 406-418) also focused on expert-driven and community-driven indicator processes by classifying frameworks according to the wide methodological paradigms which are expert-led and top-down contrary to community-based and bottom-up. Their argument is that these two approaches require integrating for a more understanding of system interferences (Sonntag, 2010 ,pp325–339). Government involvement can increase data credibility while the involvement of citizens in the process of choosing indicators ensures they are relevant to the community (Fraser et al., 2006, pp114-127).

(Reed et al. 2006 ,pp406-418) examined different approaches to develop methodological frameworks and sustainability indicators and characterized these as bottom–up or top–down approaches as shown in **Table(2.3)**

**Table(2-3):** Methodological frameworks for developing sustainability indicators showing their approach( Al-Alwani,2014 ,pp52-53).

Framework	Description	References
<b>BOTTOM–UP APPROACH</b>		
<b>Soft systems analysis:</b>	Based on systems thinking (Von Bertalanffy, 1968) and experiential learning (Kolb, 1984), indicators were created as a component of a participatory learning process to enhance sustainability with stakeholders.	Checkland, 1981
<b>Sustainable livelihoods analysis</b>	develops indicators of livelihood sustainability based on Robert Nozick's entitlement theory, a philosophy of distributive justice and private property, which may be used to track changes in human, social, environmental, physical, and	Carney,1998

	financial capitals (Nozick 1974:150)	
<b>Classification hierarchy framework</b>	Increases the resolution of the system element being examined to recognize indications, for example, when the element is soil, the property is productivity, and the descriptor is soil fertility, the indicator will be percent organic matter.	Bellows,1995
<b>The Natural Step</b>	Creates indicators to identify sustainability issues, visions, and solutions while defining four prerequisites for a sustainable society.	TNS, 2004
<b>TOP-DOWN APPROACH</b>		
<b>Panarchy theory and adaptive management</b>	Utilize three diverse groupings of indicators to identify the points on an adaptive cycle where complex systems are present. The panarchy concept also recommends that significant indicators can be divided into one of three groups: wealthy, connected, and diverse	Gunderson and Holling, 2002
<b>Pressure-state - response (PSR, DSR, and DPSIR):</b>	Environmental indicators are determined by human demands on the environment, environmental conditions, and societal reactions to these concerns. Late formats used driving forces to adjust the pressure. Although there may be positive or negative driving forces, pressures are invariably negative (DSR), and there are no unabated environmental impacts (DPSIR)	EEA, 1998
<b>Framework for evaluating sustainable land management</b>	a process for creating sustainability indicators that will maintain social, economic, and environmental prospects for current and future generations while conserving the land's quality.	Dumanski, Eswaran, and King (unpublished manuscript)
<b>Well-being assessment</b>	use four measures to evaluate the wellness of people and ecosystems: An ecological and human well-being index, a combined index evaluating both, and a fourth index examining the effects of improvements in human well-being on ecosystem health.	Prescott-Allen, 2001
<b>Thematic indicator development</b>	recognizes indicators for each of the institutional, social, economic, and environmental themes	UNCSD, 2001

## 2.8. Indicators Framework:

Utilizing rational frameworks for the creation and distribution of sustainability indicators. Even while many of the most common frameworks were developed in the 1990s . Only a limited number of them have been used in practice, and many more are still in the experimental stage. Frameworks facilitate indicators interpretation through several ways; providing a means to structure and analysis the indicators, help indicators to be organized into a particular construction and set of themes, help to avoid overlaps in indicator sets and identify key gaps .One of the most important advantages of indicator frameworks is that they can be used as a device to the categories of indicators into groups to confirm which issues have been covered and which have been ignored. Additional benefits of conceptual frameworks have been suggested, including the capacity to anchor indicator systems in theory, provide an organizational structure, identify meaningful indicators and data gaps, ensure indicator comparability, and aid in communicating with the public and decision-makers,( Al-Alwani,2014,pp 3-4)

**Table(2- 4):** main framework types used for developing sustainability indicators

(Maclaren, 1996 , Al-Alwani,2014, p 48).

Framework types	Description	Advantage, disadvantage or weaknesses
<b>Domain-Based Frameworks</b>	Consider the three main pillars of sustainability the environment, economy, and society before identifying indicators for each. One of the most well-known instances of a domain-based structure is Seattle's sustainability report.	This framework's main advantage is that it makes sure all aspects of sustainability are covered. This framework's flaw, however, is that it doesn't seem to link sustainability goals with indicators.
<b>Goal-Based Frameworks</b>	begins with the determination of a community's sustainability goals, after which indicators are produced for each goal or combination of goals. An	The benefit of this framework is that it limits the number of indicators that must be taken into account to just those pertaining to specific sustainability goals, which

	organization that employs a goal-based structure is the Local Government Management Board (LGMB), located in the United Kingdom (LGMB, 1993).	aid in determining whether indicators are moving in the direction of sustainability or away from it. The drawback is that it ignores some of the intricate relationships between a number of sustainability-related factors because it is so simplistic.
<b>Sectoral Frameworks</b>	Create sustainability indicators for each area within the government's control, such as housing, transportation, waste management, land use, and police services. These sectors can be connected to specific government departments, making it easier to assign blame for a specific issue or credit for successful outcomes that are shown by indicators.	This framework's inability to integrate disparate areas of intervention is a drawback because indicators are divided into discrete areas of government responsibility.
<b>Causal Frameworks</b>	These introduce the idea of cause-and-effect interactions in an effort to remedy the drawbacks of the earlier framework approaches.	This type of paradigm should be able to explain why indicators are changing and whether policy actions are having an effect, which is a benefit.
<b>Issue-Based Frameworks</b>	These frameworks prepared to list the sustainability issues in the community, such as waste management, air pollution, education, and employment	The key advantage of the issue-based frameworks is that they are more understandable and simple to construct. While the disadvantage is that there is limited match between indicators and sustainability goals and inadequate coverage of the main dimensions of sustainability
<b>Combination Frameworks</b>	This kind of framework combines two or more different frameworks. Many of the drawbacks of the various frameworks mentioned above can be eliminated by adopting a combination framework.	Since this framework combines two or more separate frameworks, it may establish some of the benefits of those frameworks while also solving some of their drawbacks.

(Nathan and Reddy2008) examined commonly used sustainability frameworks for indicator development and identified the frameworks as shown in **Table (2-5)**.

**Table (2-5):** sustainability frameworks for indicator development and identified the frameworks( Al-Alwani,2014,p 49)

Framework types	Description	Advantage, disadvantage
<b>Capital Accounting Framework</b>	This paradigm, which was created before the idea of sustainability, has its roots in economics. In environmental accounting, when changes to natural resources are calculated similarly to financial resources, the framework is employed. Additionally, social indicators have not yet been added to this framework for environmental and economic accounting (Lundin, 2002).	The benefit of this approach is that it connects mainstream accounting, enabling impartiality and comparison across environmental aspects. The difficulty in quantifying the quality of environmental resources is, however, a drawback.
<b>Issue – based, goal-oriented or thematic framework</b>	These frameworks, along with the pressure-state-response (PSR), are frequently found in the indicator literature. They are typically produced as a result of special interests at the local, national, and international levels (Australia, 1998) As the program was derived from Agenda 21 and organized into topics and sub-themes, UNCSO has adopted a thematic framework. Additionally, they are divided into four categories: social, economic, environmental, and institutional (UNCSO, 1996). The indicators have specific objectives and are built around a number of themes and problems.	The benefit of this framework is that it allows for the use of indicators in performance measurement and aids in the connection between indicators and policy priorities. The drawback is that, aside from what is already acknowledged within the policy procedure, many of the goal-oriented frameworks are overly precise and do not reflect the multidimensional nature of sustainability. They are therefore neither exhaustive nor consistent (Bossel, 1999).
<b>Systems Framework</b>	The authors of this framework are Newman et al (1996). It is created using an enlarged model of urban metabolism (EUMM). The EUMM model presents cities as systems with improved livability and reduced waste as the desired outcomes.	The notion of EUMM is strongly tied to the paradigm of sustainable development, which makes clear the sustainability objectives, future orientation, and links between various elements (Australia, 1998; Newton, 2001). Despite the fact that this system framework has advantages over other frameworks .
<b>Sectoral or domain framework</b>	Although it is not a framework in and of itself, it is widely used in conjunction with other frameworks. Indicators can be organized	

	<p>according to capital accounting, causal, thematic, or system frameworks, or they can be divided into several areas or sectors prior to being listed. Additionally, land, water, energy, etc., which are specific areas of interest or skill, may be included under as a domain under this approach. These activities are thought to generally align with local government departments..</p>	
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### **2.8.1. Some International Frameworks and Common Local Frameworks:**

At the international level, there are many frameworks, some of the best of them have been mentioned by Farsari, and Prastacos 2002, as follows: World Bank: measuring the wealth of nations, United Nations–CSD Indicators, Barometer of Sustainability, Ecological Footprint, OECD’s Pressure-State-Response framework.

While at local level, ( Besleme and Megan ,1997,pp 43-53) identified three basic conceptual frameworks adopted by community indicator projects taking place around the world. There are as follows:

1. A framework to measure local sustainability by focusing on a vision for the community's long-term future; and using additional sustainability indicators to deal with the connections among a variety of topics.
2. Quality-of-life indicators framework which differ from sustainability indicators frameworks in dealing with short-term goals and do not seek to address the need to demonstrate connections between indicator areas.
3. Performance evaluation framework which pays attention to performance evaluation; as well as seeking to determine efficiency in the delivery of a particular set of public services ( Al-Alwani,2014,p 7) .

## 2.9. Sustainable Urban Form

With more than half of the world's population living in urban areas and climate change one of the biggest challenges of our times it is time to turn our attention to cities in order to tackle this challenge. The layout or urban form of a city can influence the environmental impact of the urban settlement to a considerable extent. There are great differences between cities in terms of their urban form and their environmental footprints (Dempsey, et al .2010 ,p21) .

Various urban forms evolved through modern urban planning practices, but often the concern for their negative impacts is observed as missing. This disregard is apparent in the developed world in sprawl as a prime urban form. As significance of sustainability is internationally acclaimed, lately but consciously the sprawl is being incitingly condemned for its negative environmental, social and economic impacts. Several studies have tried to prove that sustainability of a city might depend on its shape, size, density and land use distribution. Urban form has positive or negative impact on

Accessibility to facilities, travel attributes (distance and time), energy used, social equity, efficient use of land, economic benefits, reduction in CO2 emissions, liveliness, etc. (Johnson, A. ,2007,pp 27-30 .But the debate on the most suitable urban form to achieve sustainability is still unresolved. To evolve urban sustainability, the relationships between urban form and the various elements of a city need to be understood, Kotharkar et al .2014,p 2) .

Through studies of urban sustainability frameworks, the foundations or features of the urban environment related to achieve a sustainable urban form have been reached (Figure (2-4)).



Figure (2-4) The foundations or features of the urban environment related to achieving a sustainable urban form (Hiyam, 2015 , p 46).

### **2.9.1. Compactness:**

Compactness built environment refers to the intensification of urban activities in the unit area which is of two approaches: 1 - Compactness with respect to the original built environment, and this trend is to resort to when it is intended to stop or limit urban expansion and sprawl, intensification and grouping of urban events and activities through (dictation policies of urban, rehabilitation, re-division and urban development). 2 - Compactness of settlements and new urban development, and this resort to as a sustainable direction, to achieve urban development, in a way that preserves the area of agricultural land and habitat ecological diversity, and reduce emissions carbonate, transport networks, easy access, activities and urban events are intensify activities, and diversity within the unit area itself, thus urban expansion vertically to that city. (wheeler, 2002 , pp 133-45).

### **2.9.2. Sustainable Transport**

Is one of the most important problems that stand in achieving urban sustainability, as defining urban sustainability as reducing both the mobility and disadvantages (pollutants) transport network urban ", and the world

(McLaren) enhanced urban sustainability, the extent of its ability to provide the shape, size appropriate, to practice sustainable lifestyles (exercise walking, and cycling.) defines sustainable transportation as: (Transportation service that reflects the total social and environmental costs of the individual, and which respects the absorptive capacity of the natural environment and urban, and a balance between the need for mobility and safety, with maintaining environmental quality), (Jordan & horan, 1992 , pp 12-16).

### **2.9.3. Mixed Land Uses**

This feature plays an important and key role in urban sustainability, as it is considered a criterion to which the attributes (compactness, ease of access, and even housing density) are linked, because the mixed use of urban land, or the heterogeneous division it according to the type of activity gives the ability to integrate between urban activities, which gives a number of benefits, which lead to urban sustainability . In addition, the mixed use of the land, after one of the objectives of the Agenda (21) (Hiyam, 2015 , p 48) .

### **2.9.4. The Housing Density**

Is one of the most important concepts, or criteria, in determining the level of urban sustainability. As a concept that represents the ratio of the number of housing units to the area (neighborhood, sector or city) and the relationship between density and urban sustainability, it is related to the concept of thresholds, meaning, the housing density will be sustainable to the extent (threshold), in which the human density per unit area is sufficient to generate the interactions necessary for human life, without reaching the low level of quality of life standards, (realizing the concepts of social

communication, ease of access, intensification of events and activities, and reducing Energy use, emissions, and waste (Hiyam, 2015 ,p 47) .

### **2.9.5. Accessibility**

Easy access is a measure of the real extent of benefit in urban life, they measure the final benefit, integration of transport, with different land use systems, which indicate: (number of destinations work shopping - Education - Entertainment.), Which can be accessed during a given time , using a certain type of means of transportation or, without. Thus increasing the ease of access, means bringing goods, population, and employment opportunities, and gathered with each other, within the space of the city, in order to be spatial interaction, more effectively, and the indicator for easy access is (mobility speed), and the amount of traffic congestion, somewhere ,(Geurs, K.T&. Ritsema 2003 , pp 69 -87).

### **2.9.6. Urban Healthy System**

As a concept is against the low (the quality of urban life), which spread in the cities today, including the cities of Iraq as a whole - due to the effects of (Diseconomies of scale) of rapidly growing cities, and that is working to improve standards, and the level of the individual health of urban , by identifying negative influences, the elements of the urban system, resulting from the pressure on capacity, due for unplanned rapid growth. This concept moves away from the traditional analysis of the relationship of human health with the quality and quantity of health services in the urban system, and is heading towards the causes of low health for the urban individual compared to the individual for the rural one, and attributes to the group of effects on the urban system itself and the lifestyle practiced by the individual, and the extent of exposure to factors of

distress and pressure. psychological, noise, air, and polluted water, and those causes resulting from urban mismanagement of cities, the expansion of urban slums, the spread of slums, poverty areas, and the deterioration of the quality of life in cities today (Hiyam, 2015 ,p 49) .

### **2.9.7. Green Urbanism**

This type of planning, seeks to embrace nature, and then an integral part of the city itself, and seeks to introduce environmental considerations, in all types of urban development (Swanwick, 2003 ,pp 94-106) .

### **2.9.8. Planning Passive**

Orientation came to reduce energy consumption, because of the destruction of resources depleted, on the one hand, and the pollution of renewable resources, on the other hand, which includes asylum systems energies passive (cooling, heating, natural lighting) through specific measures, and thus affect the planning sites, physical configurations, sustainable city, because it interferes or impose certain criteria in the signature, and directing activities of spatial, in taking into account the prevailing wind, angle, and the degree of the fall of the solar rays, and even the different number of sunny hours daily, seasonal and among cities, different towns, this type of planning is important for cities today(Hiyam, 2015 ,pp 50-51 ) .

## **2.10. Sustainable Development Strategies :**

The characteristics of the sustainable urban form, and the dimensions of urban sustainability, led to the crystallization of the concepts that draw the sustainable urban form, through four strategies, given that the foundations and standards of urban sustainability are an effort and time to

be implemented. Very large resources, to reach the sustainable city, are not available in most countries of the world, which require a gradual application, within interrelated strategies for sustainable city development, starting with the Neotraditional development strategy, up to the strategies of sustainable cities (compact city, green city, healthy city) (Hiyam, ,2015,p54) .

### **2.10.1. Neotraditional Development Strategy :**

Traditional built environments inspired architects, and city planners, for this type of urban planning in a movement called (" neo traditional town planning" (Nasar, 2003, pp 58-68) and ("new urbanism"), which is oriented towards traditional planning concepts. (Dictation, Renewal and Urban Rehabilitation), to catch the urban sprawl and the structural deterioration of urban structures in city centers, as well as rebuild neighborhoods within existing cities. . New urbanization is a oriented approach towards incorporating housing into neighborhoods or neighborhood units, rather than spacious single dwellings in the suburbs, which will enhance social systems and urban safety, while increasing population density, there is also another type of development derived from (new traditional urban planning), which is called (transit-oriented development). (TOD), and this type of development or expansion, encourages residential and commercial gatherings around transportation stations, in order to reduce transportation costs, and facilitate transportation around cities (Bernick ,1997, pp 55-56) .

### **2.10.2.Strategies for Sustainable Cities :**

There are three strategies: the compact city strategy, the green city strategy, and the healthy city strategy. The following is a brief explanation of these strategies:

#### **1.The Compact City Strategy:**

It is defined as sustainable approach that works to control the urban growth and expansion of the city, by increasing the housing density and intensifying the economic, social and cultural activities .This city differs from the prevailing idea today of the urban model of cities, in which the urban structure is divided into areas and sectors .The functional ones are concentrated in the city center, and outside the shopping and entertainment sectors are located, then housing in the suburbs, and highways, (this idea is driven by market forces and economic developers). which failed to contain the development and sustainability of today's cities, and caused random spread that lacked planning, led to potentially disastrous results as the spread of slums and slums, while the idea of the system (compacting) means :above the workshops and families' homes, and the offices that sit above the shops, because this will give life to the street, and reduce the need for individuals to climb in the car to complete the requirements of their daily lives, but these multi-use buildings need complex technologies (Rogers 1997). Thus, a compact city can be defined as that city that is characterized by:

- a) It has a dense urban fabric and a diversified use of lands.
- b) Its urban areas are connected to public transportation systems.
- c) Provides easy access to work and public service areas (OECD,2012 , pp56-58) .

## **2. The Green City Strategy :**

The idea of green growth, or green cities and in general cities that harness all possible efforts to reduce the waste of energy, the use of water, or building materials, during the life cycle of the city or sector, or a single building, including the energy consumed in the processes of extracting, transporting and manufacturing materials, and using them in facilities and buildings, and those cities encourage the recycling and use of those building materials. Green cities are cities that ensure that buildings are planned and designed in a manner that respects the environment, taking into account, reducing the consumption of energy, materials, and resources, as well as reducing the impact of construction on the environment, and maximizing harmony, with nature. The design and planning basis, from which green urbanization is based on (triple zero), which is: (zero for carbon emissions), (zero for the use of fossil fuel energy such as oil) (and zero for urban waste). In 2010, the scientist Lehmann tried to establish the principles of planning and design for green cities, to be a comprehensive and integrated framework for green urbanization, based on a series of practical studies for elected cities. These principles are .1- Climate and Context:2- Renewable Energy for Zero CO<sub>2</sub> 3-Zero Waste City 4-water 5- Landscape, Gardens and Biodiversity 6- Sustainable transport 7- local and sustainable materials with Less embodied energy 8-Density and retrofitting of existing districts 9-Green buildings and districts, using passive design principles 10-Healthy Communities and Mixed-Use Programmes – Liveability , (Hiyam ,2015 , pp58-60) .

## **3. The Healthy City :**

The healthy city program, which aims to integrate the health agenda, achieve a sustainable urban form (urban sustainability), and then transform the existing cities into a safe and healthy environment through the

application of mechanisms and strategies for healthy cities. It works within the principle, that health, and the quality of life, can be improved by modifying the living conditions, in the spaces of housing, study, work, and other places, in the urban system, in which the urban individual lives, or in which he works. It establishes the principle that the health status of the exclusive individual it is affected by the physical, economic, and environmental elements of the urban system, and their negative effects, more than they are affected by the deficit or poor spatial signature of health services.. Thus, it is an urban environment maintainous program, with all its components in order to improve the quality of urban life, leading to the improvement of the health level of the urban individual. As for the reasons for the emergence of healthy cities strategies, they are (WHO, Healthy urban planning,2003):-

1-Rapid urban growth and expansion 2-Poor planning of the urban transport system 3-Poor planning for the spatial signature of industrial facilities 4- demographic and social changes 5-Poor and ineffective urban management , (Hiyam ,2015 , pp 60-63) .

### **2.11. Indicators of Foundations or Features of the Urban Environment To Achieve a Sustainable Urban Form:**

A summary has been made of indicators for each of these foundations or features related to achieving a sustainable urban form, as shown in the table (2-6).

Table (2-6) Indicators of the urban environment that relate to achieving a sustainable urban form

<b>Compactness</b>	<p>1-an area agricultural land and ecological diversity of habitats before and after urbanization.</p> <p>2 - urban quality of life indicators (promote social networking patterns, accessibility, patterns of life and whether moving towards sustainable and healthy patterns).</p> <p>3-The level or area of various activities within the unit area compared</p>
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	<p>to the same area of the city as a whole.</p> <p>4-Air pollution levels. (Alcarbone pollution) (Hagan 2000 )</p>
<b>Sustainable Transport</b>	<p>1- Sustainable transport must be supported by renewable energies and this can be counted the number of public transport vehicles running on alternative energies, which is an indicator of the presence of sustainable transport in the urban system</p> <p>2 - the level of carbon emissions.</p> <p>3-levels of noise</p> <p>4-The extent of diversity in the public transport network (bus network, metro, railways, river transport ...</p> <p>5 - The extent of diversity in urban events and activities within a unit area (Compactness) being an important factor in achieving ease of access and then access to sustainable transportation.</p>
<b>The Housing Density</b>	<p>1-Amount of communication and social interaction while maintaining social privacy and urban quality of life standards. .</p> <p>2 - the proportion of condensation, Compactness, compared to the overall urban area.</p> <p>3- Percentage of diversity in urban events and activities within the same unit area.</p> <p>4- As well as the proportion of housing density for the same unit area compared to the total housing density.</p>
<b>Mixed Land Uses</b>	<p>1-the proportion of the diversity of events, and urban activities, in the urban area.</p> <p>2.Population density.</p> <p>3. Easy access, or access time, to various events during a given unit of time.</p> <p>4 - The amount of social security.</p> <p>5- Amount or extent of social interaction.</p>
<b>Accessibility</b>	<p>1- The geographical density of the public transport network, which is defined by the lengths of the streets used by public transport for an area (1 km<sup>2</sup>) of the city area.</p> <p>2. Population density (demographic), the public transport network, which is defined by the lengths of the streets the public transport network per 10,000 inhabitants</p> <p>3 - The average density of the public transport network, and here the lengths of public transport streets are taken in terms of area and population together .</p>
<b>urban healthy system</b>	<p>1- The low levels of health awareness refer to: Reluctance in health awareness campaigns. 2- The increase in deaths from pneumonia indicates: the high levels of air pollution 3- The increasing rates of intestinal diseases refer to: the erosion or obsolescence of drinking water supply networks, and the obsolescence of sewage networks, which led to the contamination of drinking water with sewage germs.</p> <p>4 - The spread of respiratory diseases indicates a low level of air purity, due to the disappearance and decreasing of open green spaces, as well as the decrease in ecological diversity habitats on the outskirts of cities, due to the continued signing of urban facilities, and the rapid unplanned expansion. 5 - The high rate of traffic accident deaths indicates a failure in the planning and management of the transport system..</p>

<b>Green Urbanism</b>	<p>1 The proportion, or extent of, biodiversity of habitats, in the vicinity of a city, or metropolitan area (this should be studied over a period of time).</p> <p>2 ratio of carbon emissions, and air pollutants and other. 3 - the degree of reliance on renewable energy alternatives in different lifestyles, within the city (transport, heating, cooling, lighting).</p> <p>4 - the extent (number or percentage) recycling facilities for the presence of residues of all kinds, in the urban area.</p> <p>5 - the extent (number or percentage), the presence of factories environmentally friendly products, in the urban area.</p> <p>6- the extent of the spread of environmental awareness campaigns in the city.</p>
<b>Planning Passive</b>	<p>1- The amount of building density, or the amount of compactness of the urban area, the more control it is possible to reduce the consumption of cooling and heating of building spaces. 2- Building designs, starting with choosing their location, the shape of the blocks, the orientation of the building, and ending with the type of finishing materials, whether internal or external. This plays an important role in determining the extent of heat gain or heat loss. 3- Urban street network planning and designs, the trend towards organic street planning reduces the angles of solar radiation, and reduces dusty or cold winds. 4- Percentages of green spaces and water bodies within urban areas.</p>

## 2.12. Global Studies on Urban Form and Sustainability

Through research and published studies on urban form and social sustainability that helped build a knowledge base and reach more understanding on the issue of urban form sustainability. A brief description was made with notes on each study **Table (2-7)**.

**Table (2-7):** Global Studies on urban form and sustainability

<b>Study</b>	<b>Description</b>	<b>Notes</b>
<b>Urban Form and Sustainability: the Case Study of Rome Ltd Elsevier. (2014).</b>	Based on integrated land-use and transport modeling architecture, the research provides empirically based insights on the relation between urban form, sustainability and travel behavior. Different scenarios of urban development have been assessed for an empirical case study, with respect to transport network performance as well as social and environmental impacts. Preliminary results show that at the city	This paper investigates the relation between sustainability and urban form. To this aim a system of Land-Use and Transport Interactions (LUTI) models has been designed and applied

	<p>level different urban forms (i.e. compact, sprawl, TOD) have found to differ in their sustainability, and in particular the compact development appears to better off others form of spatial development. However, compact development imply an increase of urban congestion level and also an increase of dwelling prices which in some cases create social exclusion and segregation of peripheral areas.</p>	<p>to the metropolitan area of Rome, to understand the interdependence of key variables such as travel behavior, transport supply, property values, jobs and residential location.</p>
<p><b>Towards sustainability? Analyzing changing urban form patterns in the United States, Europe, and China . Ting Dong , et al (2019).</b></p>	<p>Urban form characterizes the spatial structure of fixed elements within a city, which affects daily life. Taking 27 large cities in the United States, Europe and China as examples, we developed a ternary graph to quantify urban forms based on the density distribution of the built-up area. The urban forms were divided into the following classes: central-compact, central-sprawl, decentralized-compact, and decentralized-sprawl. Spatially, the cities in the three regions have experienced rapid urban growth, while the urban forms vary greatly from region to region. Urban forms are dominated by decentralized-sprawl in the United States, and central-compact in Europe and China. Temporally, approximately 80% of sample cities kept the urban form class both in 1990–2000 and 2000–2014. It is noted that 40% of sample cities in China tended to grow in a more sprawling pattern in 2000–2014 than in 1990–2000.</p>	<p>Measuring the spatiotemporal characteristics of an urban form and its relationship with sustainable development is the basis of urban planning</p>
<p><b>The role of urban form in sustainability of community: The case of Amsterdam. ArundeL Rowan and Ronald Richard (2015)</b></p>	<p>Urban policy has increasingly emphasized the compact city and higher density urban forms in reaching sustainability goals. Using the city of Amsterdam, considered a case of high-quality compact city form, our study looks at how specific neighbourhood built form relates to key measures of sustainability of community. The study reveals that higher densities have no significant impact on local social capital, sense of community or resident satisfaction. Rather, other built-form</p>	<p>The study creates an impetus for more research into the link between urban form and key elements of ‘social’ sustainability such as social capital, sense of community and resident satisfaction.</p>

		measures such as scale, existence of local stores, degree of automobile dominance and construction period were of greater importance.	
<b>Okyo's Urban Growth, Urban Form and Sustainability</b>	<b>Urban Urban</b>	okyo, has experienced a rapid growth in the twentieth century with various issues associated with urban form and urban environment. Some issues were solved and others remain to be solved. If Tokyo is evaluated as one of the most efficient, productive and sustainable mega-regions in the world, it is the result of rapid urban growth and development in the twentieth century. After that, Tokyo has been facing new challenges as it left the phase of rapid growth and entered the phase of no- or low-growth, depopulating and aging society. From the viewpoint of urban form, Tokyo is a patchwork of various types of urban space with diverse urban issues. , not necessary to change the current spatial structure of Tokyo so drastically. It is more realistic to improve or conserve existing urban spaces incrementally to enhance quality of life in a sustainable manner.	okyo has been facing new challenges as it left the phase of rapid growth and entered the phase of no- or low-growth, depopulating and aging society .
<b>Okata Junichiro and Murayama Akito (2011)</b>	<b>Urban Urban</b>		

<p><b>Urban Form, Sustainability and Health: The Case of Greater Oslo</b> Næss Petter(2013).</p>	<p>Several studies have shown dense urban structures to be favourable in order to reduce greenhouse gas emissions from transport, limit energy consumption in buildings and protect farmland and natural areas in the surroundings of the city. There may, however, be some tensions between such a compact urban developmental strategy and considerations of public health in urban planning. by comparing statistics on life expectancy and the frequency of heart attacks among inhabitants of different urban districts in the Norwegian capital Oslo. The currently available results do, however, suggest that the densification strategies often recommended for reducing the ecological footprints of cities might be encumbered with some important drawbacks, seen from a public health perspective.</p>	<p>This paper reviews findings from international research on the relationships between urban form and health and illustrates some of these effects.</p>
<p><b>Mechanisms of Achieving the Social Sustainability in the Traditional Urban Structure,</b> Neama and Al- Ahabbi (2011).</p>	<p>We find shortcomings in the knowledge coverage of the importance of the social system for sustainability in Urban structure and mechanisms to achieve it in contemporary urban structure. Applied study methodology and method.Resolution and statistical analysis by spss program.And the application of indicators to a case study within (city center Kadhimiya)</p>	<p>The main objective of the research is to reveal the elements of social sustainability in the traditional urban structure, using indicators derived from the theoretical argument to analyze the traditional features of Al-Kadhimiya city as a case study.</p>
<p><b>Changes in the traditional urban form and the social sustainability of contemporary cities: A case study of Iranian cities .</b> Sharifi and Murayama (2013)</p>	<p>discusses how traditional urban patterns can inspire planners to create an integrated urban the most socially sustainable environments. the most significant characteristic of a traditional Iranian city that makes it distinguished from its modern counterpart is the integrated structure. In many respects the contemporary Iranian city failed. Our focus is on Iranian cities. The main elements of traditional Iranian cities, their characteristics and the way of their social contribution. Sustainability of societies such as the mosque, the bazaar, the Persian garden. Explanation</p>	<p>This paper stresses that planners should consider the city's evolution in the course of time and lessons learned from the past should be considered at the time of development or redevelopment. Traditional urban forms will complement modern planning and design techniques and will</p>

	<p>of current situations and how these elements work. They lost their jobs and their safety was disrupted . Taking intoaccount the underlying values traditional urban forms will complement modern planning and design techniques and will Facilitating the creation of more socially sustainable communities investigated how the urban form and its constituting and supplementary elements can.</p>	<p>in facilitating the creation of more socially sustainable communities.</p>
<p><b>Toward Sustainable Compact City: (Study in Convert Traditional Najaf City to Sustainable Compact City)</b>  <b>Al-Shouk1 and Al - Khfaji (2018)</b></p>	<p>Research problem: The lack of knowledge and the identification of clear indicators of the compact city through which it is possible to know the possibility of transforming cities Contemporary cities in general and traditional cities in particular. The research followed the descriptive and analytical method, as well as the statistical method measuring indicators. A combination of common indicators was found (Mix land use, density andintensification, movement and transport, accessibility, harmony, diversity). These indicators also include several sub-indicators, as these indicators can provide an appropriate basis for the possibility of a shift towards sustainability. The practical aspect was the conduct of field surveys of the study area (old city of Najaf) to identify the planning characteristics of it, and then the indicators derived from the theoretical framework were applied.</p>	<p>The research deals with an old concept in its inception, but it is modern in its applications and theses it deals with. The concept of compact city is one of the latest strategies for the sustainable development of cities. The research tackled the concept of compactness and the characteristics of the compact city, as well as the concept and characteristics of the Traditional Arabic city, A combination of common indicators, was found (Mix land use, density and intensification, movement and transport, accessibility, harmony, diversity).</p>

<p><b>Sustainability and planning: does urban form matter?</b>  <b>van Albertine Diepen and Voogd Henk (2001)</b></p>	<p>This paper deals with the difficult relation between urban form, travel behaviour and sustainable development. In more developed countries, the influence of governments on urban form can be considerable through planning. Modern planning theory focuses mainly on procedural aspects. . For making urban land-use planning more sustainable, it is essential to have insight into the relationships between users; and their surroundings. This is outlined by presenting some survey results on the additional role of the spatial context on household behaviour. The survey was conducted among households in the region of Amersfoort in the Netherlands. The results provide some empirical evidence that household behaviour is related to urban form, . Reasonably more energy-intensive and therefore less sustainable household practices were observed at the urban outskirts more than in the rural area.</p>	<p>It is argued in this paper that substantive aspects cannot be neglected if sustainable solutions are being pursued</p>
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### 2.13. Summary

This chapter reviewed the definitions of the urban form and its components, sustainability and the sustainable urban form and how to achieve the sustainable urban form, sustainable development strategies that include the unconventional strategy and the strategies of sustainable cities, in addition to the concept of indicators and the purpose of their use, the difference between traditional urban indicators and urban sustainability indicators, methodological frameworks for developing indicators Sustainability, the main types of frameworks used to develop sustainability indicators, some international frameworks and common local frameworks, and finally global studies on urban form and sustainability. This is by reviewing the current definitions of sustainability, urban form and sustainability indicators. The current work will adopt a comprehensive

view of the sustainable city and identify it as a city that must be economically viable, socially nonviolent and environmentally healthy. The next chapter will explain the research methodology adopted in this study, the rationale behind the approach to this study's methodology, data collection and analyses.

## **Chapter Three**

# **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

#### **3.1 Introduction**

This chapter provides a brief overview of the traditional area in Hilla, Iraq, as well as some key facts. Use of a case study requires a thorough understanding of the historical, social and cultural contexts of the region, as well as the morphological stages the region has gone through. This research is based on the existing literature about the study region.

#### **3.2 Location of Babel Governorate**

The city is located (110 km) south of the capital, Baghdad, near the site of Babylon. The archaeological site, as well as its proximity to the archaeological site of Borsippa, and the archaeological city of Kish. It is located approximately in the middle of what is known as Mesopotamia, especially on the western bank of Shatt Al -Hilla. It extended to the ruins of ancient Babylon from the north and to the warehouse area. In the south, the Al-Hilla irrigation channel in the west, and Shatt Al-Hilla in the east.

Iraq consists of (18) governorates with a total area of (435,052) km<sup>2</sup>. The amount of 5119 km<sup>2</sup>, is the third smallest governorate in area after each of the governorates of Baghdad and Karbala, with a percentage of (1.2%) the total area of Iraq (Ministry of Planning and Development

### Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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Cooperation, 2005). Babil Governorate is located to the south of the Baghdad, and it is geographically mediated by a group of governorates: Baghdad, Anbar, Wasit, Karbala, Najaf - - - - Qadisiyah).

Babil Governorate consists of (16) administrative units divided into (4) districts and (12) sub-districts, as the city of Al-Hilla is the administrative center of the county Babil Governorate is based on land transportation only, represented by railways and public roads, with the absence of river transportation and not to invest it despite the passage of the Euphrates River in it, which is 130 km long within the governorate (Duha and Amir, 2019, pp 212-216).

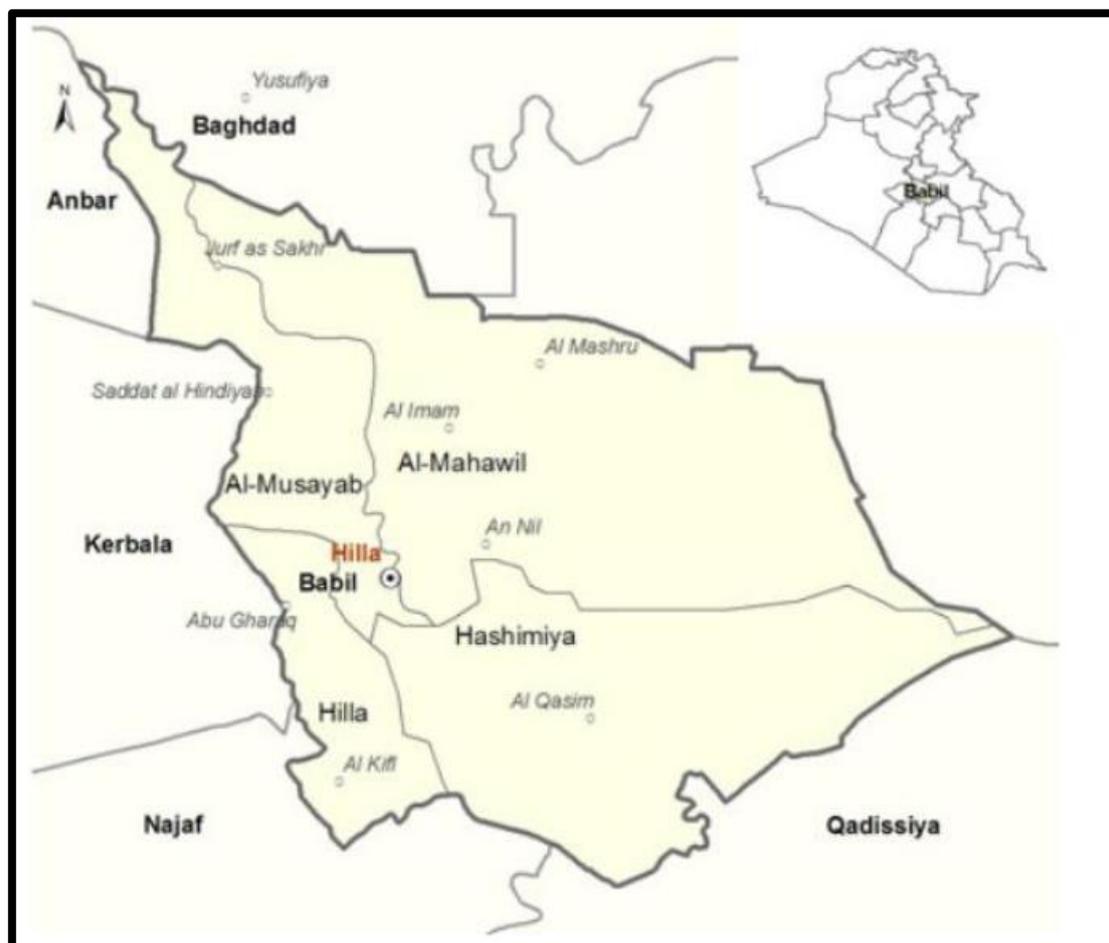


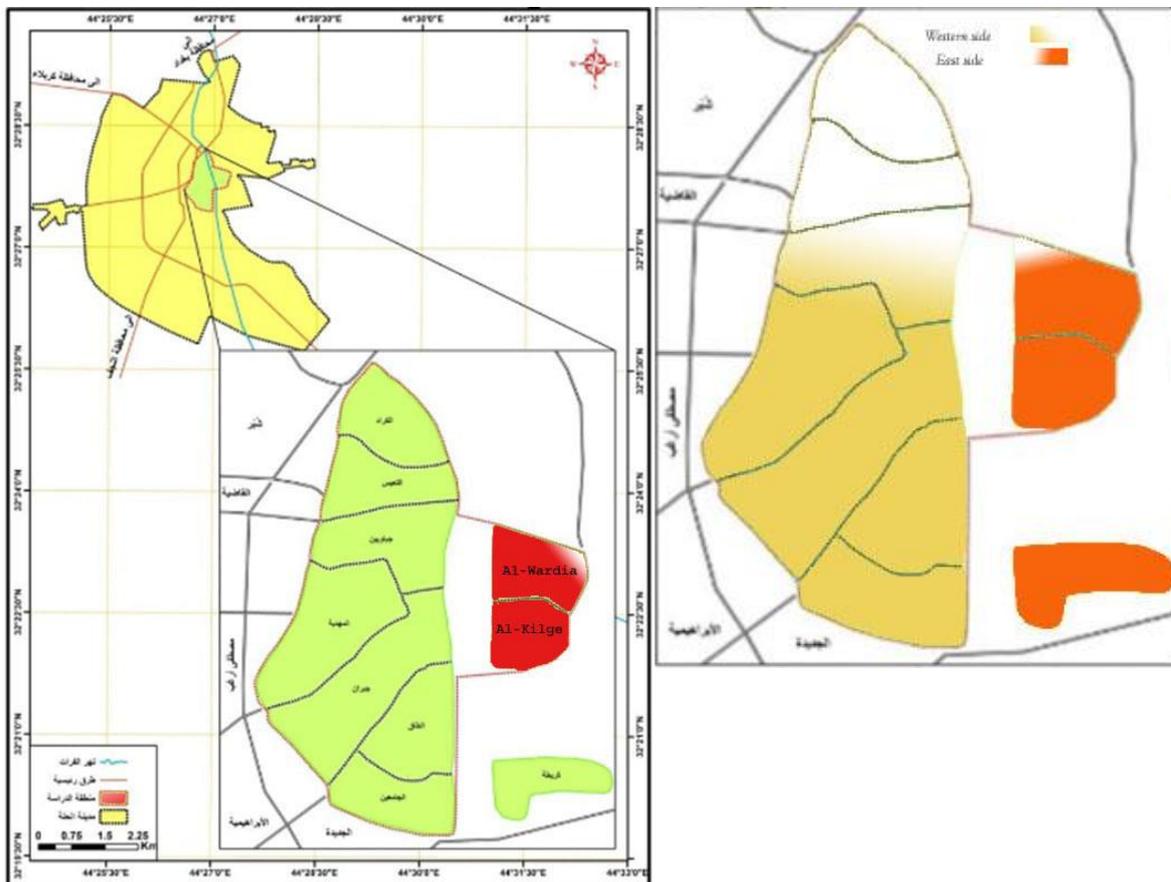
Figure 3-1 Babel province map (NGO Coordination Committee for Iraq, 2015 pp. 49-53).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

#### 3.3 Traditional Area Location

In the successive periods of time, the western side (el soub alkabir) of the city of Hilla contains seven residential *mahallat*: (Al-Jamieayn, the Kurds, Al-Taq, Al-Ta'is, Gibran, Al-Mahdia, Al-Jabawein), and the eastern side (el soub al saghir) two residential areas: El Kellej and Al-Wardiya are linked. The eastern and western sides by the old boat bridge, which was later replaced by a fixed bridge, (Kadhim,2014, p 1).



**Figure 3-2** : The location of the old area according to the master plan of the city of Hilla for the year 2006-2030,( The researcher worked on Ministry of Municipalities and Public Works 2013)

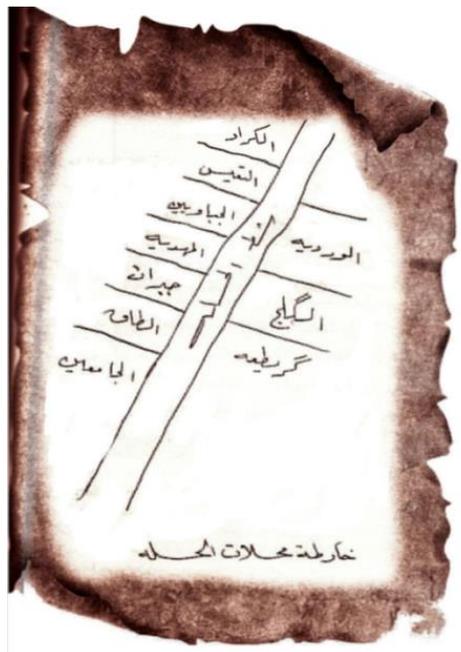
The city of Hilla was found on the land of Al-Jamiayn, which had existed before the founding of the city( Figure 4-5), and was called by

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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this name because it was a collection of various types of sciences and literature, so people moved to it from all sides and it was the first beginnings of establishing Hilla (Al-Sabah newspaper, 2021).



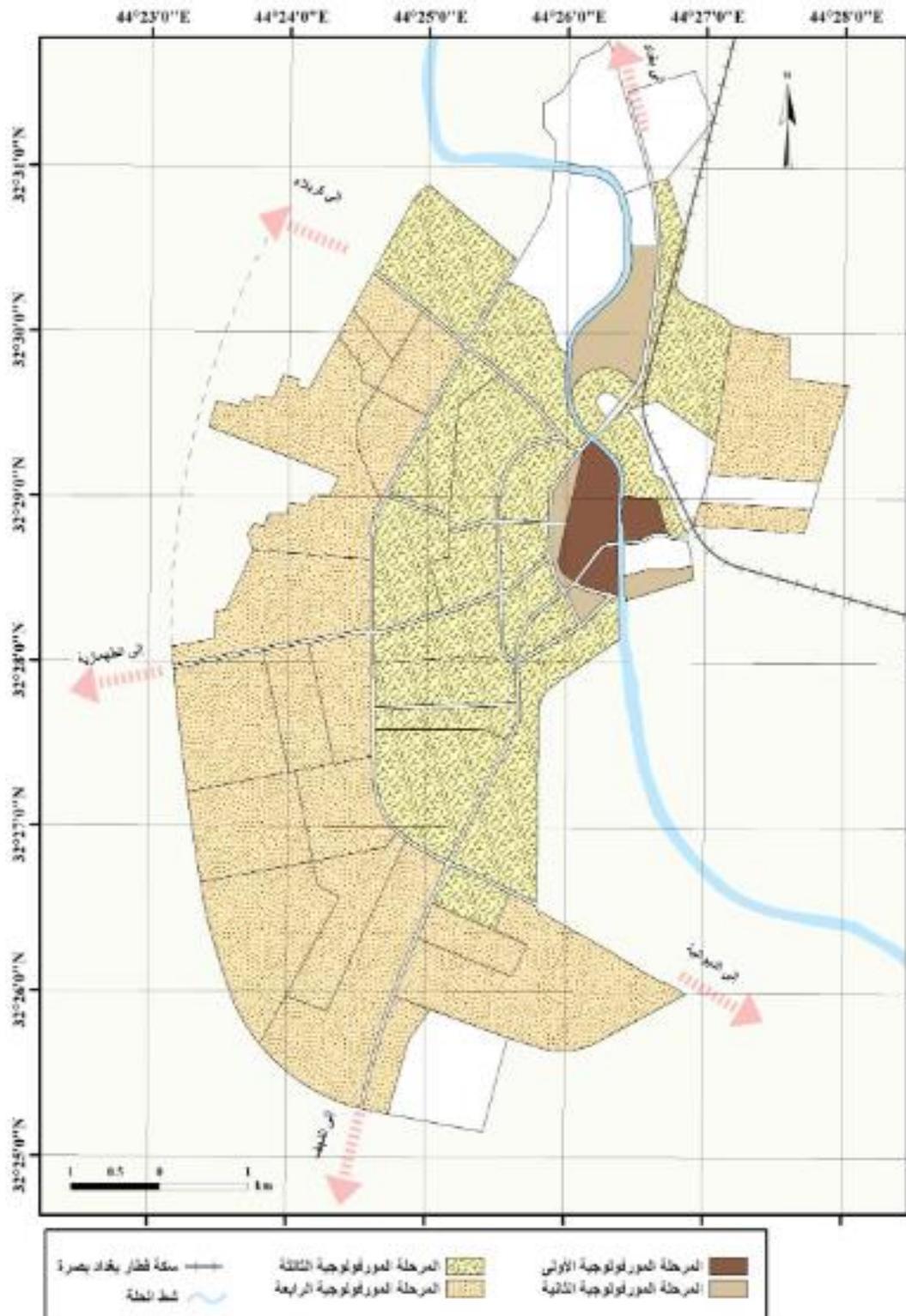
**Figure 3-3** The origin of the suit in these mahallat ( Hilla Traditional Center,2017)

#### **3.4. The Morphological Stages Experienced by the City of Hilla (The Traditional District)**

The city went through different morphological stages (Figure 4.5.), each with its own circumstances and history civilization, which was reflected on the inhabited city area (such as the area, the style of the streets and their systems, the building style, the building materials used, then its plan and the uses of the land therein) and each of the stages (Figure 3.4.) that characterizes the city shows the interaction of the (Function) and (Morphology) (Al-Rubaie, 2002, p 100) ,and certainly the traditional areas had a share of this change.

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla



**Figure (3-4)** Morphological stages of the expansion of the city of Hilla (Al-Rubaie, 2002, p135)

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

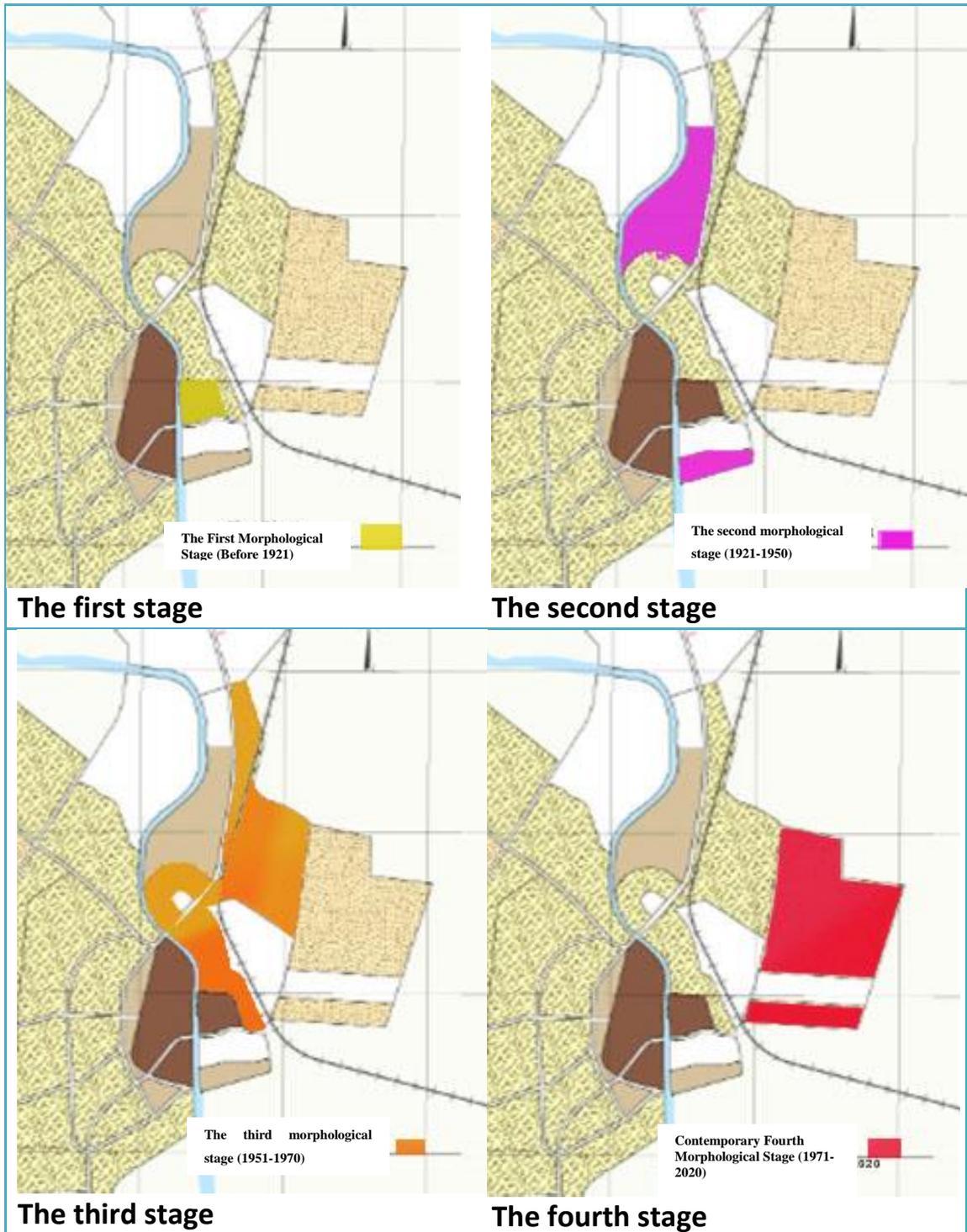


Figure (3-5) Morphological stages of the expansion of traditional area (The researcher worked on Al-Rubaie, 2002 )

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.4.1. The First Morphological Stage (Before 1921)

This stage of the city's life took a long time, and is considered one of the most important morphological stages in the life of the city, as it carries with it the cultural and architectural traditional of the city. It also reflects part of the city's history and represents the basis of the construction and urban style adopted in its later stages. This stage includes a group of *mahallat* that arose in successive periods of time, as the western side contains seven residential *mahallat*: (the Kurdish Al-Jamieayn Al-Taq, the unhappy Gibran Al-Mahdiyyah Al-Jabawiyin), and the eastern side are two residential areas (El Kellej and Al-Wardiya), and the eastern and western sides are linked by the old boat bridge. Which was then replaced by a fixed bridge (Kadhim, 2014, pp 34-36). The traditional areas were characterized by an irregular urban fabric, high population density, and organic streets, which are often narrow, crooked and sometimes impassable *aziqqa*, most of which do not allow any movement of vehicles within them. This is naturally due to the simplicity of the mode of transport that they had the ability to pass in the narrow paths at the time, Figure (3-5). As the *aziqqa* performs a social function for the residential mahalla, as it represents a social space for families and also provides a closed and safe area for children to play. The meanders and twists in the spaces and *aziqqa* created successful climatic treatments for the residential mahalla (Kadhim, 2014, p 38). The traditional areas were built on the higher parts of the land in order to be far from the dangers of flooding, in addition to the fact that the wall surrounding the city had an impact on the traditional areas taking the strip shape (Abdul Majid, 2015, p 117). At this stage, a group of residential *mahallat* arose

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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in successive periods, including the el soub al saghir that contains the two *mahallat* (El Kellej and Al-Wardiya). These *mahallat* were characterized by organic, narrow and winding streets.

#### **3.4 .2 The second morphological stage (1921-1950)**

At this stage, the city crossed its old wall as a result of the rapid urban growth, Figure (3-5). Most of the urban expansion witnessed by the city was on its western side, and a little of it occurred on the eastern side. The city of Hilla witnessed it, especially at the beginning of the thirties, as it opened new streets, and assumed the task of internal organization of the land uses, carrying out the operations of organizing and expanding the streets and opening new streets. After the establishment of the monarchy in Iraq in the year 1921, the tendency to work with contemporary planning laws was strengthened, which coincided with the emergence of previously unknown planning determinants, such as technical progress, the emergence of the impact of globalization, in addition to a significant increase in the urban population, which showed a need for new urban jobs. As the Iraqi planning institutions adopted and imposed written planning legislation and laws, and left the responsibility for implementing

These laws are the responsibility of the municipality, and their implementation led to the emergence of the city with a new appearance different from the traditional Islamic city prevailing in the previous phase (Nasrallah, 2002, p 35).

- 1- Baghdad City Expansion Law No. 53 of 1928
- 2- Roads and Buildings Regulations No. 44 of 1930

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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3-Municipal Administration Law No. - 84 of 1931  
4 Roads and Buildings System No. - 44 of 1935

The residential buildings in this phase were characterized by new architectural and urban characteristics different from the previous phase, as the housing units were arranged in regular blocks and in small areas on the new streets and in regular geometric shapes, as the municipality had a role in setting the planning and design process. The entry of mechanical means of transportation, including cars and wagons, as a new concept, was reflected in the new urban context, as the municipality of Hilla expanded some paths and aziqqa in (1934), as the process of opening and expanding the streets after that, which led to a change in the urban fabric of the old city. It attracted new urban activities that took their positions on the sides of those streets (Kadhim, 2014, p 40). It is clear from this stage that the expansion was very little outside the boundaries of the areas of the first stage of the city's life. Rather, the matter was mostly limited to organizing it and opening the streets in it by removing some houses and exposing some narrow aziqqa and paths (Al-Rubaie, 2021, p 57).

At this stage, most of the urban expansion was in the el soub al kabir rather than the el soub al saghir, the entry of cars had an impact on the expansion of the aziqqa and the widening of the streets, which led to a change in the urban fabric of the old city.

#### **3.4.3. The third morphological stage (1951-1970)**

The third stage is an important stage in the life of the city because it witnessed a wide urban expansion, Figure (3-5). During this stage two periods can be distinguished, the first of (1959-1951) in which urban

### Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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growth was slow, and the second after (1960), which is the period during the urban revolution (Hadi, 1982, p. 58). The population increase contributed to this, as high population growth rates were recorded in the early sixties, the economic situation of the population improved, migration from the countryside to the city to provide job opportunities, and the opening of internal streets and external roads and linking them regionally with the cities of the Middle Euphrates with paved roads. All of these factors contributed to the expansion of the city, as its shape moved away from the elongation that characterized it during the previous two phases, and began to take a circular radial shape. The city prevailed in the previous two phases, a unified pattern of residential *mahallat* with a traditional organic style, and a planning style appeared in this stage based on building *mahallat* residential grid system. This type included two types of housing, the first it is characterized by its wide area and large gardens, inhabited by rich families represented in the *mahallat* of (Al-Khusrawiyya Babil, Al-Qadi, Shubra, Al-Zahra, Al-Bakryli Association, Algeria, Al-Hussein Al-Karama), and the second type was represented by housing. The system established by the government for people with limited income and workers, which is small in its area and the area of its gardens, which is represented in the *mahallat* of (Al-Sadr Al-Iskan and others), as well as other *mahallat* such as: (Mustafa, Ragheb, Ibrahimia, Al-Shawi and Nader) (Al-Ghazali, 2007, pp. 74-75), During this stage, the city acquired a new type of streets (the grid system), which is completely different from the organic system in the traditional areas, as the new system is compatible with the technological development witnessed by the city. These streets have introduced changes

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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to the morphology of the city, as they have attracted a lot of urban, commercial and industrial uses, etc. . In addition, the main streets that exit from the city towards the neighboring provinces and regions were attracted for residential use, which changed the city's morphology from the previous stages. Thus, the form of growth became (zonal), and at the time when the city grew outward, a change occurred in the internal structure of the city, functionally and architecturally, which eventually gave the city a new morphology, began with the establishment of the first urban design for the city of Hilla in 1971), Al-Rubaie, 2002, p 117). The economic situation of the population improved, migration from the countryside to the city and *mahallat* were built. The residential network system differs from the organic system in the traditional areas. Changes occurred in the urban form of these areas, where a type of housing appeared with a large area and its large gardens, including the *mahallat* on the el soub al saghir.

#### **3.4.4. Contemporary Fourth Morphological Stage (1971-2020)**

These areas arose in the seventies of the last century in the first phase of the master plan of the city until (2020), Figure (3-5). During this stage, the city witnessed a great growth in the spatial area, which was reflected in the city's need for functional uses that keep pace with its civilized development. This growth had a clear impact on the functional structure of the city and on its final morphology as a result of the street systems and urban style of the city, which witnessed major changes during the many years that the city experienced during this stage (Al-Rabi, 2002, p. 127).

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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The emergence of new areas in the el soub al saghir, especially the expansion and growth towards agricultural areas.

#### **3.6 Case Study: El Kellej and Al Wardiya *mahallat* in Old Hilla.**

An overview of the information available in the study area will be provided. This study deals with El soub al saghir that consists of two *mahallat* (El Kellej and Al-Wardiya) as a case study. The study of morphology and how it evolved to find problems, solutions (Objectives) and indicators, and knowledge of the morphological development of the city of Al-Hilla (el soub al saghir).

##### **3.6.1. El Kellej Mahalla location**

El Kellej *Mahalla* is one of the el soub al saghir that is located on the eastern bank of Shat Al-Hilla, and overlooks on its western edge. The boundaries of this mahalla are from the old bridge to Al-Naziza region, and it separates the *mahallat* of Krayta'a and Al-Wardiya. The continuity of the name goes back to an Ottoman commander named (Kilij Pasha) who encamped with his army in this area, and the region was a station for ships carrying grain and firewood (Al-Sabah newspaper, 2021)

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-6)** El Kellej Mahalla location according to the master plan of the city of Hilla for the year 2006-2030, (Ministry of Municipalities and Public Works 2013 and Nasir and Gado'o, 2016, p. 129).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.6.1.A. The Social and Cultural Context of Mahalla -El Kellej

Arabs, Kurds, Turkmen, Jews and other sects. (Al-Sabah newspaper, 2021). The Mahalla of El Kellej was a port for small ships carrying grain and firewood, from various areas, where workers pulled these ships with ropes to anchor on the great beach of Shatt al-Hilla at that time. Residents of El Kellej are a coherent mixture of social relations, they were attracted by the city to live and settle there. All the people of the mahalla live in a state of poverty and their homes are at a level that is not greater than the other by anything, yet their children have obtained prestigious degrees in science, literature, art and sports.

Some of the mahalla families became famous in and outside the *mahalla*. The most famous of these families are the Khudair Al-Khaji family, the Raddam family, the Al-Hassoun family, and the Al-Mutairi family. (Hilla Traditional Center, 2016)

#### 3.6.1.B. population

The population of El Kellej *Mahalla* was 3076 for the year 2014, the number of housing units was 613, and the net population density was 558 person / hectare. (Nasir and Gado'o,2016, p130).

**Table 3.1** The population of El Kellej *Mahalla* (Nasir and Gado'o, 2016, p. 130)

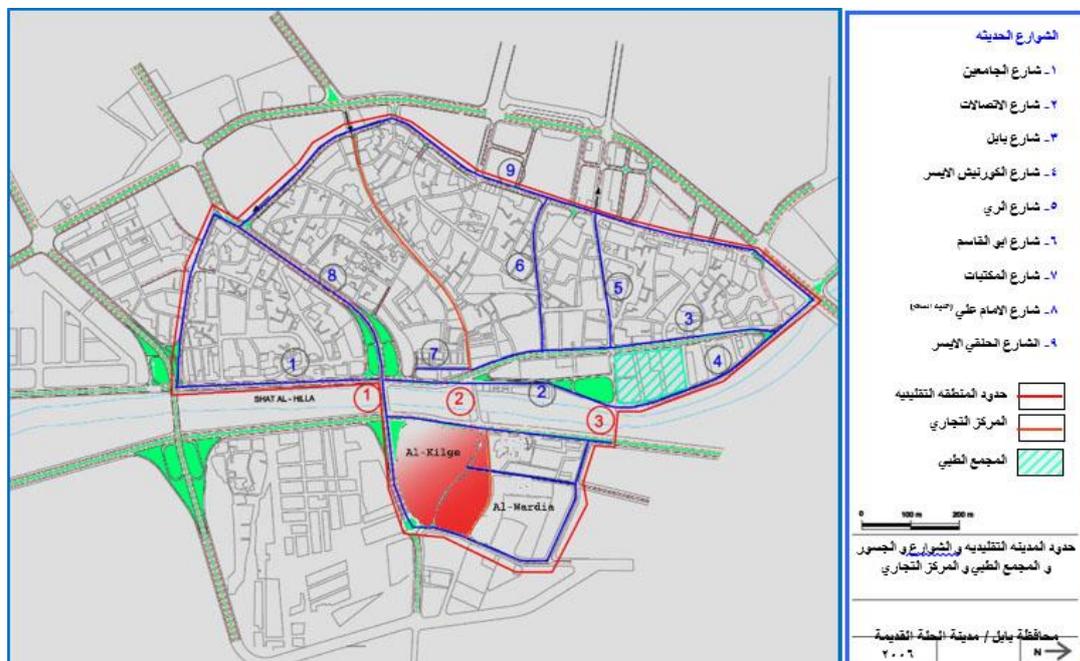
Al -Mahalla name	population	The number of housing units	Actual space dwelling/ha)	net population density (person/ha)
<b>El Kellej</b>	3076	613	51.5	558

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

#### 3.6.1.C. Characteristics of El Kellej Mahalla

Among the most famous aziqqa are Eakad al-Asfar, al-Bous, al-Akkam, al-Bawaba, al-Nahr, and al-Tama. (Al-Sabah newspaper, 2021) . The most famous houses of El Kellej Mahalla are: Beit Al-Amidi, Mal Allah, Al-Akkam, Barbin, Al-Hassoun, Amara, Sayed Jamil, Karim Al-Naddaf, Radif Al-Mukhtar, Al-Falluji, Usta Jaber, Babur, Al Tawfiq, the house of Zuhair and his brother Barir, and the house of Al-Mutairi, Al-Duri, and the house of Al-Mrah. The Mahalla of El Kellej was not free from the houses of God that the believers would visit during prayer times, and these mosques were: The Bait Mal Allah Mosque, the Sayyid Hakim Al-Amidi Mosque, which are inside the El Kellej Mahalla, and the Al-Shatt Mosque (Hilla Traditional Center , 2016).



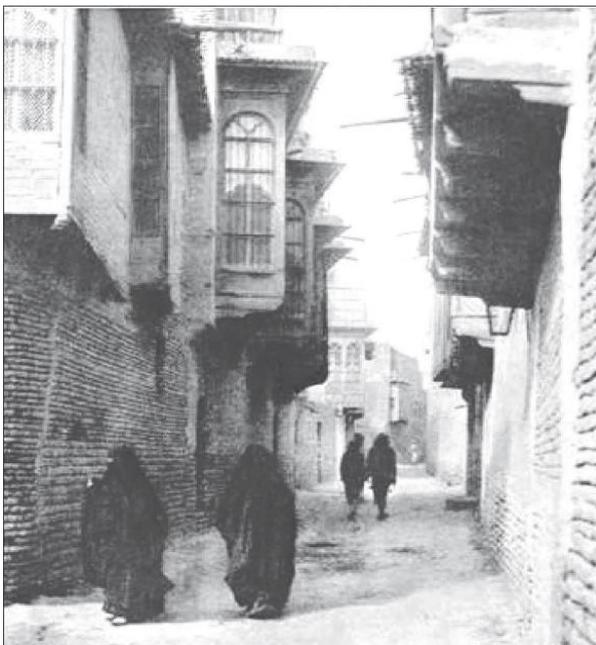
**Figure (3-7)** El Kellej Mahalla plan (Hilla Municipality Directorate, 2010, p 1)

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla



Figure( 3-8) El Kellej Mahalla plan (The researcher,2022)



## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-9)** Al-Shanasheel and the old aziqqa in the Mahalla of El Kellej

#### 3.6.2. Al-Wardiya Mahalla location

The Mahalla of Al-Wardiya is a Mahalla on the el soub alsaghir of the city of Hilla. Al-Wardiya separates from the Mahalla of El Kellej the small market as well as Suq al Ammar. Al-Wardiya extends from Market Al-Amar, which includes different professions, until you reach a branch on your left called “agd Al-Arian”, and from it, take a left from an aziqqa that connects you to the houses of the family of Al-Sayed Mahdi Al-Alaq until reach the river road, take it towards the bridge. come across an aziqqa on left at the beginning of the mosque of Al-Wardiya. Hajj Salman Al-Barak, then reach the bridge, this is the border of the old region (Iraq grandeur, 2017, p 1)

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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Figure (3-10) Al-Wardiya location (The researcher,2022)

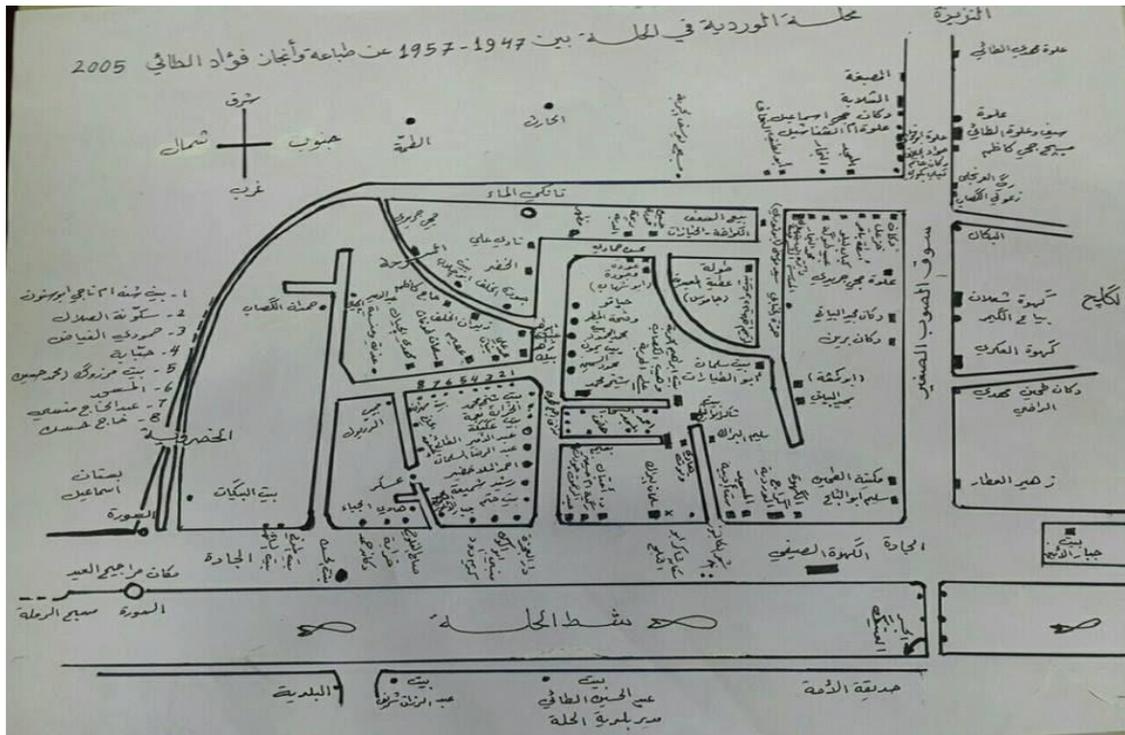
#### 3.6.2.A. Social and Cultural Context of Al-Wardiya Mahalla

This mahalla was established in a late period from the founding of the city, and its residents are of Arab origins who are engaged in self-employment and agriculture in orchards (Al-Sabah newspaper, 2021). Its people are peaceful, with relations of love and mutual respect prevailing among them. Among the prominent figures of the Mahalla of Al-Wardiya are the late Sheikh, the scholar Muhammad Samaka, the scholar Sheikh Ali Sammak, and Sheikh Salman Al-Barrak, who are among the men of the Twenty Revolution, as well as Messrs. As for the most famous families that inhabited the Al-Wardiya, they are (the Samaka family, the Bunyan family, the Al-Barrak family, the Jabbar Ali Al-Hasani family,

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

Al-Jilawi family, ...) and other generous families. Among the most prominent mayors who represented the moral and social authority in the mahalla, Jabbar Hassani, Abdul Amir Al-Taie, (Iraq grandeur,2017, p 1).



**Figure 3-11** Al-Wardiya Mahalla in Hilla between the years 1947-1957 (Museum of Contemporary Al- Hilla)

#### 3.6.2.B. population

The population of Al-Wardiya Mahalla was 3340 for the year 2014, the number of housing units was 487, and the net population density was 762 person / hectare (Nasir and Gado'o,2016, p 130).

**Table 3.2** The population of Al-Wardiya Mahalla (Nasir and Gado'o,2016, p 130)

Al -Mahalla name	population	The number of housing units	Actual space dwelling/ha)	net population density (person/ha)
Al-Wardiya	3340	487	38.4	762

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

#### 3.6.2.C. Characteristics of Mahalla Al-Wardiya

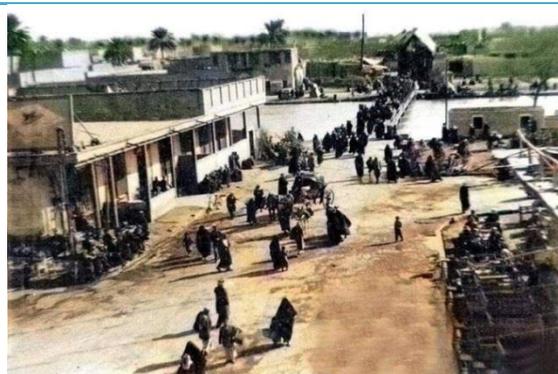
*Mahalla* has several *aziqqa* and was called by different names by its residents, the most important of which are (Eakad al-Sheikh - Eakad Hassan - Eakad Hajul - Eakad al-Alaq and al-Jilawiyin - Eakad Bunyan - Eakad Beit Shakhat and others). Among its remaining mosques are (the mosque of the Allama Muhammad Samaka or the mosque of Al-Wardiya, the mosque and Husseiniya Al-Arian). The most prominent cafes in it are (Abbas Al-Tama Cafe, Al-Haj Nayef Cafe, Kolat Cafe, Mahdi and Hamoud Al-Jamal Cafe, Alwan Pasha Cafe, and then it became the Reda Abaka Cafe (Iraq grandeur,2017, p1).



Shanasheel Mahalla al-Wardiya in the sixties



Al-Wardiya inside and Al-Wardiya outside



For The City Of Hilla, The Old Bridge And The Suwk Aleamaar Appear 1948



Old Bridge

**Figure 3-12** Al-Wardiya Mahalla Museum of Contemporary Al- Hilla)

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.7 The Concept of Public/Private

Public and private domains have an essential role in the articulation of spaces. These concepts introduce necessary steps towards a complete understanding of the main idea of these domains. The social, cultural or physical division of urban spaces into public and private realms expresses the relation between the two different spheres in society which reflects respectively the different types of relations that combine the individual with society and, in other words, between the self and the others within the same context. Public spaces have basically been related to spaces where social interactions can take place in larger groups without censorship. They show the embodiment of the notion of promotion into the unrestricted visibility or accessibility of social interactions such as being in a street coffee house or in a shopping centre. However, the socio-cultural notion of the public/private segregation refers to the meaning of the private realm and its different spaces. The female domain provides a high degree of desired privacy, secrecy, concealments and isolation from the attention of the public. This mechanism articulates the integral meaning of privacy including visual, aural and accessibility determinants. The intimate, closed and separated private domain and the opposite open and shared public one constitutes a social and contextual environment of people's daily life in an interrelated relationship. This idea can be clearly shown when, for example, the public domain of the alleyway 'agd' in local communities similar of *mahalla* transforms into private to accommodate diverse social and cultural occasion (Al-Thahab *et al.* 2014. p75)

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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#### **3.8. Social Privacy and Environmental factors of the Traditional Home**

The social and cultural factors, rules and principles of Iraqi society are represented as the main need and structure of achieving privacy. The perspective of different spaces of the house has been wrapped by various cultural, social and behavioural rules. Social habits, cultural values and lifestyle of the family members dictate the form of the social spaces of the traditional house in Iraq (Khattab, O.2013, pp. 1-18). The home represents the fundamental spatial system of a specific culture, social identity and family affiliation and recognition (Jiboye, A.D. & Ogunshakin L. 2010, PP 117-128). It is a reliable organization that can be more responsive to the changing needs of the family which thus can develop flexible solutions to the increasingly limited spaces to encompass the different social and cultural needs. Despite the rigidity of the house plan, there is an opportunity for informality with functions according to the degree of privacy acquired from each space (Boudiaf. 2010, pp. 167-184). Physical treatments with regard to privacy, gender segregation and direct visual contacts between male and female or visitors and women have, therefore, been performed in a manner that shows a deep understanding of social, cultural and religious values. This can be clearly shown in the physical, spatial and functional properties. The real concept of privacy in traditional domestic units in Iraq could be practised in the cantilevered elements (shanashil), which represent physical components within the structural compound of the house that help assert the privacy of its users .They are particularly important for women to ensure the notion of gender segregation and achieve a visual contact to the public

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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outside or visitors inside the introverted compound without being observe except from those who belong to the same family .At the same time, the components of ‘shanashil’ allow an interpersonal relationship between women of nearby houses to contact freely each other .Each house shows the private domain in various levels and degrees with regard to the nature of privacy, social groups and mechanisms used .Whilst the private refers in some degree to the concept of the public, the form of this relation and the different transitional spaces has the tendency to vary more and change over the course of time (Rapoport,A. 2007, pp. 57-72). The house has a range of public and private realms reflecting the different activities over the course of time. It contains many physical boundaries which perform the thresholds between the public domain associated with the out-side alleyway (agd); and the semi - public realm of the house illustrated by the entrance This thought can be shown in most traditional houses The space of the entrance has been articulated in a way that prevents any kind of direct visual intrusion from the outside towards

The main social core of the house. Semi-private and, often, private realms represent particularly the socio-cultural core of the house, while the semi-public realm which, is in direct association with the semi-public realm of the entrance, views the world of men, guests and uninvited visitors as well as many public affairs, such as wedding ceremonies. Public and private relations inside the house are largely arranged in relation to the lines of familiar stranger, guests and, most certainly, male-female relations (Madanipour. 2003).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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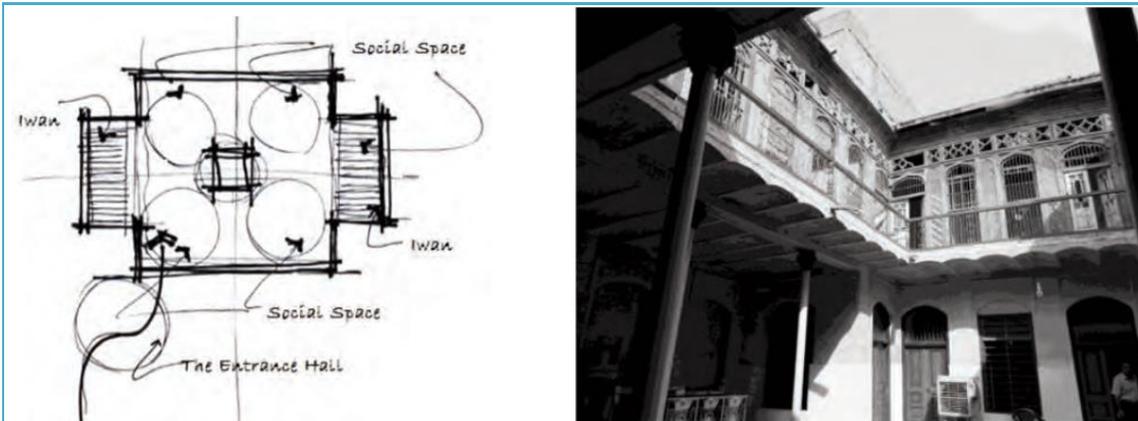


Figure 3-13 Social space & privacy in traditional house

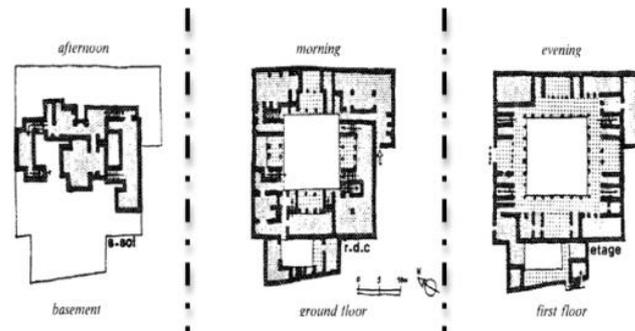
Figure 3-14. The courtyard house, Dar Babil in Al-Hilla-Iraq. (Al-Thahab et al .2014,p76)

Environmental factors have influenced the form of the courtyard house which relates to the size of the courtyard, height of the building, architectural details as well as to vegetation and fountain design. Due to hot dry climate, courtyards were kept small and over shadowed by high walls to modify the high temperature environmentally, it can be clearly seen that these buildings and design have responsibility to the climate as shown in the (figure 3-15). In the morning, the ground floor is suitable for use. In the morning as usual the sun is not too hot and the angle of the sun does not go to the courtyard and covers all of the area. Otherwise in the afternoon, the angle of the sun will be nearly too perpendicular and the basement will be better to use. In the evening, the family can use first floor). The dimension and ratio of the yard designs efficiency and calculated with the sun angle (Fathulla ,2016, p 18).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure 3-15** basement, ground floor and first floor of the courtyard house building ( Fathulla ,2016,p 17)

The traditional cohesive fabric is the best example of applying the concept of sustainability at the city level as a whole. City planning and movement path treatments in terms of width, shape, length, orientation and directional change represent the basic stage of adapting to the environment. The compact fabric leads to softening the harsh climate effects and mitigating their effects, especially high temperatures, solar radiation, dusty and hot winds, and thus mitigating the total heat load affecting the facades of buildings, especially the residential units, where the residential units constitute the largest quantity in the total structural production. In the Arab city, which is thus one of the strong influences on environmental data. Some cities were distinguished by semi-solid and shaded walls that were, the courtyards with the middle of the dwellings, acting as a thermoregulator for the residential mahalla and for the city as a whole (Fathulla, 2016, p. 17).

### **3.9. Principles Of Sustainability in The Traditional House**

The compatibility of the traditional House with the environment, with all its advantages and its drawbacks have been achieved according to

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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two strategies: protection and adaptation. Protection has been achieved by limiting the impact of harsh natural environment conditions such as hot climate, low relative humidity in some areas and high in others, and the intensity of solar radiation. As for the adaptation, it was by exploiting the potentialities inherent in these harsh conditions and dealing with them in order to achieve thermal comfort for the residents and to exploit natural energy sources such as the sun and wind. There are several basic principles on which it is based. The architecture of the traditional dwelling includes the concept of sustainability, which can, with some modification, modification and development, be indicative indicators for the design of the contemporary sustainable dwelling.

1. Planning and dealing with the site

Traditional architecture treated the site as part of the urban fabric of the city as a whole.

2. The design idea of the traditional dwelling use of the courtyard

3. Environmental design and energy conservation

4. The traditional house is a good example of environmental design in terms of the design principle building materials and environmental treatments that relied mainly on the exploitation of natural energy resources in order to provide a comfortable internal environment.

5. Natural ventilation in traditional systems

pedicure

6. Building materials and thermal performance of the building shell

7. The basement (al Zubaidi and Rashad ,2010, pp. 83-90).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.10. Indications of The Traditional House and Al *mahalla*

There are many basic principles on which the structure traditional house was based, as well as a wealth of environmental remedies that can be applied today to address the critical situation in Table (2.6), which, with some modification and development, can be indicative indicators of contemporary sustainable housing design.

**Table 3.3** Some of the indications of the traditional house and al *mahalla*

Social Sustainability	<ul style="list-style-type: none"> <li>- Orientation towards the interior, and this feeling begins by moving between spaces from the public to the semi-public to the private.</li> <li>- The formal unity through the relationship between the different parts of the city, which is of great importance for the formation of the traditional urban fabric, where the parts are in a mutual functional relationship that affects all parts.</li> <li>- The interaction and harmony of the behavior of the population and its reflection on the formation of the traditional urban fabric.</li> <li>- The traditional environment is characterized by being a living organism that is influenced and affected, and this cohesion was reflected in its urban fabric and structure through its planning.</li> <li>- The balance of the traditional environment between the privacy of the family and the interactions of the community. In addition to the existence of the sanctity of the dwelling within the grouping of its housing units.</li> <li>-alsuwkin the traditional Islamic cities is an essential part of life and is considered its economic artery, as most of the mixture of uses is concentrated in the</li> </ul>
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## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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	center area, and these uses are linked to the alleys and the streets that are gradient and distributed in an organic way, thus providing easy access and clear permeability
Environmental Sustainability	<ul style="list-style-type: none"> <li>-Building with mud or bricks</li> <li>-Thermal comfort (courtyard( <ul style="list-style-type: none"> <li>- natural ventilation (pedicure)</li> <li>- Use of the basement to access thermal comfort</li> <li>- natural lighting (The expulsion of direct sunlight, the most important of which is the chanasheel, which are architectural treatments that allow the entry of soothing winds, and do not allow the entry of sunlight)</li> </ul> </li> <li>narrow streets, and shaded areas,</li> </ul>

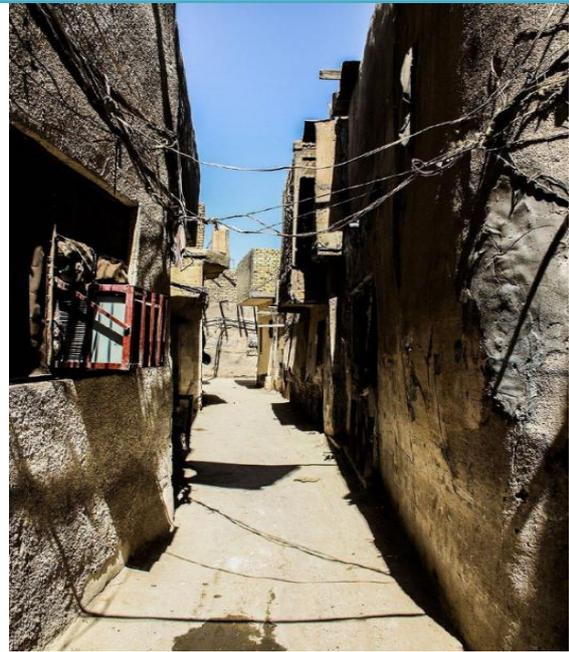
#### 3.11. The Current Urban form of the Traditional Area (El Kellej and Al-Wardiya )

This area suffers from many problems due to neglect, lack of maintenance and the disappearance of this important area, which has a civilized history, and new *mahallat* have emerged, expanded and grown, sometimes affected by it and sometimes not.

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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El Kellej *Mahalla*

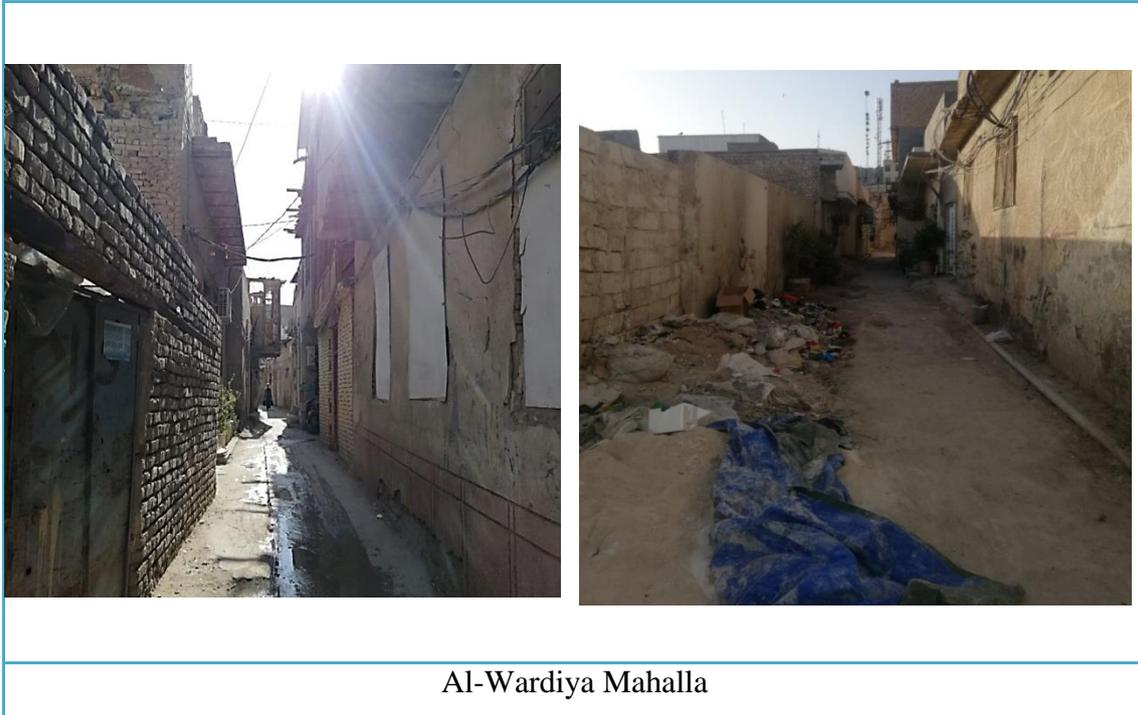


small market (Suq al amaar)

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-16)** The traditional area (El Kellej and Al-Wardiya ) at the present time(The researcher 2022)

#### 3.11.1. Emerged New *Mahallat* From El Kellej and Al-Wardiya

(Figure 3.18) represents some of the new *mahallat* that grew and expanded from the traditional part (El Kellej and Wardiya). Some of these *mahallat* were expanded and appeared at the expense of agricultural areas, including the areas adjacent to a pink area outside, where orchards have eroded and the lack of control over these erosion of these agricultural lands and these *mahallat* suffer many problems, as shown in pictures, both in terms of services, roads not paved with design standards, demolishing traditional areas and building commercial complexes, changing the landmarks of the area, including the clock in the Babel mahalla.

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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River front



Babel



Al-Bakrly



Al-Bakrly



aljazayir



Behind the Kilaj region

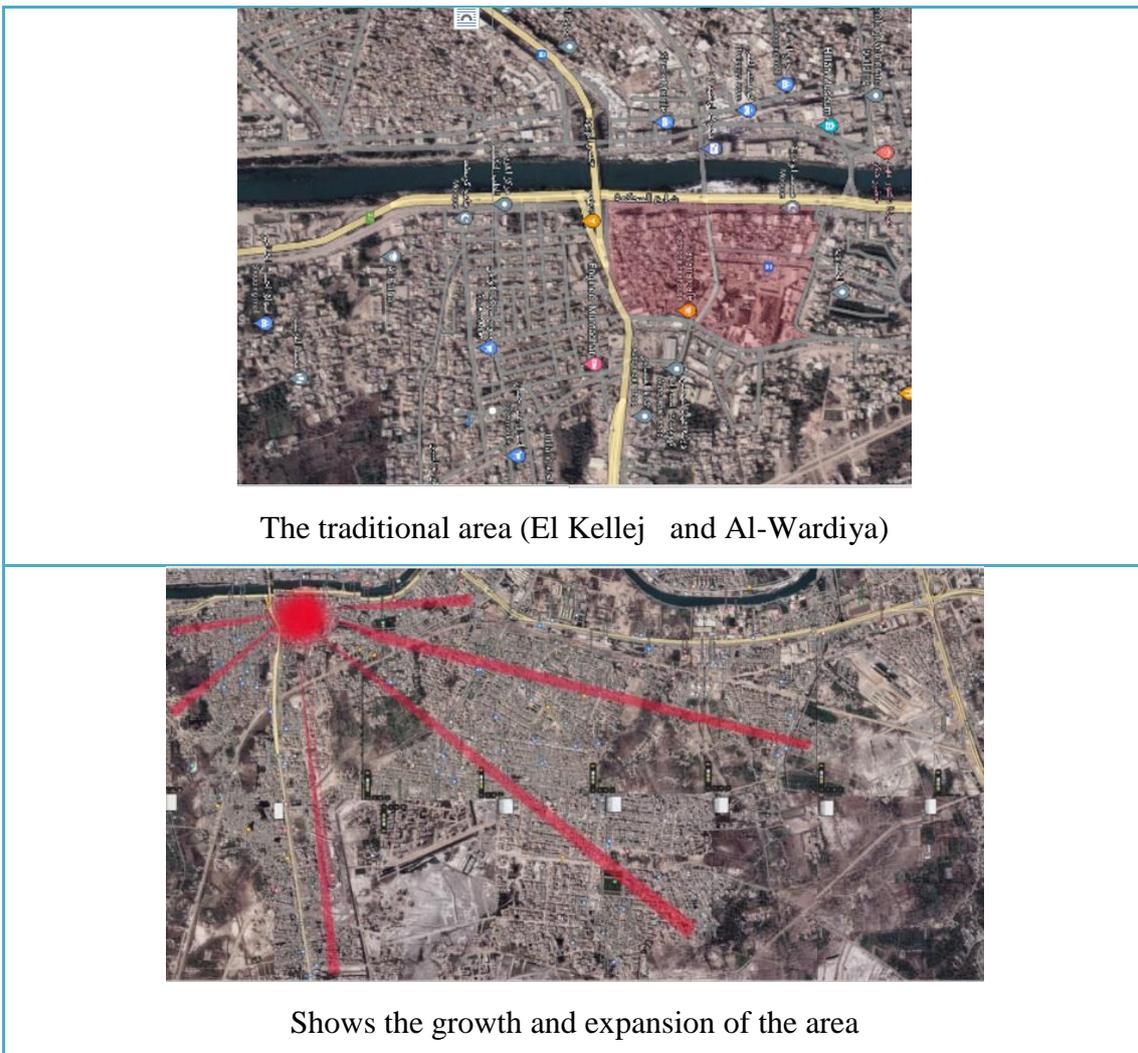
# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-17):** Some Of New Mahallat (The researcher 2022)



**Figure (3-18):** The Traditional Area (El Kellej and Al-Wardiya) (The researcher 2022).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.12. Summary:

In this chapter, the case study is the traditional area (El Kellej and Al-Wardiya) in the el soub al saghir in the city of Hilla. The study area contains many problems, including neglect and lack of care for this area, which has a cultural and historical traditional. As this area expanded and grew and new *mahallat* appeared that may be affected by the traditional area or not also suffer from many problems, whether in terms of service, not implementing streets with good design standards, or slums and encroachments on orchards or empty lands, because they have a role in changing the urban form of these areas .On the other hand, the lack of a planning policy for these new *mahallat* Including areas in a pink direction outside areas with agricultural lands, where these lands are divided among their owners under the framework of inheritance without any control over the process of dividing these lands.

**Chapter Four**  
**Applying Research Methodology,**  
**Results and Discussions**

## **Chapter Four**

### **Applying Research Methodology, Results and Discussions**

#### **4.1 Introduction:**

As discussed in the section dealing with the research aim and objectives in Chapter one, there is a need to develop the framework the use of a selected case study, in developing sustainability indicators. framework as described in details. involves identifying the major issues, needs and problems within the case study area using documentary sources, focus group discussions and interviews. Step 2 consists the sustainable indicators by reformulating the problems and needs that appeared in the objectives (solution statements), and the next two stages consist of formulating the indicators in addition to select and arrange the indicators in the last stage.

The purpose of this chapter is as stated below:

1. To identify any major application related to problems concerning the implementation of the sustainability framework
2. To identify key themes and those which require to be given priority

Underlying these purposes.

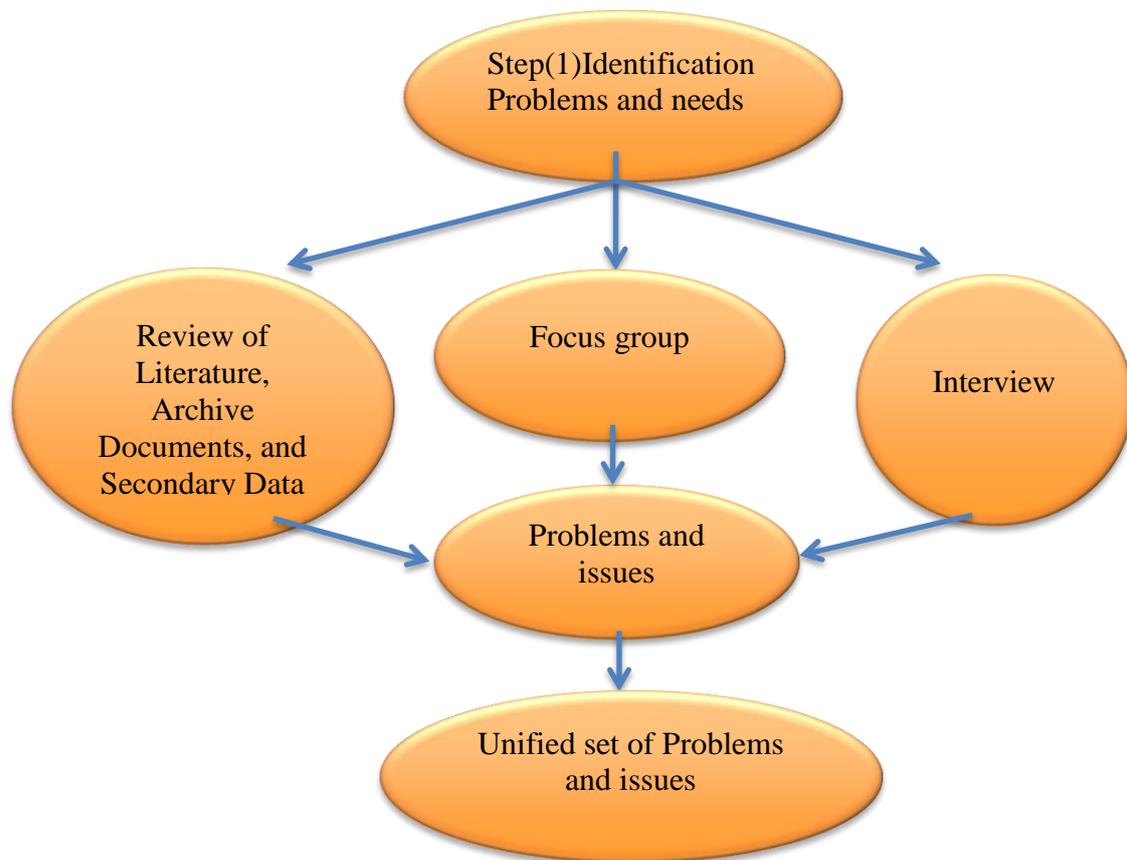
#### **4.2 The First Step: Identification Problems and needs**

The first step of the methodological process is to explore the main issues, needs and problems in a case study, which is assembled from several tools. (Figure 4.1) shows the process by which this task was processed

## Chapter Four

### Applying the research methodology, results and discussions

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**Figure 4-1** A general scheme of the first step (issues identification) of Methodological process (The researcher ,2022)

(Patton, 2002) recommended a series of procedures to allow the appropriate construction of case study data for analysis: collect the raw case study data; construct a case record and write a final case study narrative which can be presented thematically, chronologically, or both. To collect raw case study data, a variety of research techniques can be adopted including: interviews; observation; questionnaires; focus groups; documentary sources; visual methods; and ranking exercises (Laws *et al.*, 2003, p. 121).

Qualitative study deals with the universe of meanings, beliefs, motivations, aspirations, values, perceptions and human feelings obtained

## Chapter Four

### Applying the research methodology, results and discussions

with research participants in their subjectivity and living contexts. Qualitative research is generally used as a broad umbrella term for a range of research methodologies, with differing epistemological assumptions. (Petty et al, 2012, pp. 267-74).

The research design is the plan or strategy researchers use to answer the research question, which is underpinned by philosophy, methodology and methods, (Chun et al, 2019, p3). One aspect is very clear the process will generate a large amount of data. In addition to the variety of methods available, there are also different methods of collecting and recording the data. For example, if the qualitative data is collected through a focus group or one-to-one discussion, there will be handwritten notes or video recorded tapes. If there are recording, they should be transcribed and before the process of data analysis can begin. In this study, the data are presented to allow understanding of the main problems or issues within (El- Klleje and Al-Wardiya traditional district). Findings from documentary sources, focus group discussions, and interviews were faithfully reproduced.

#### **4.2.1 Review of Literature, Archive Documents, and Secondary Data**

Archived qualitative data is rich and unique, but often untapped, source of research material. It provides information that can be re-analyzed, reformulated, and compared with contemporary data. Also, archived research materials can prove to be an important part of our cultural heritage and become resources for historical as well as contemporary research, (Corti and Thompson ,2012, pp 7-8) Documentary sources relating to the entire study can also be found in the previous chapters where a critical analysis of the literature for developing a sustainable

## Chapter Four

### Applying the research methodology, results and discussions

framework (Chapters 2 and 3) and a description of some important facts about the case study (Chapter 4). Government records, unpublished reports, non-governmental reports, academic reports, local historical records, maps, socio-economic studies, and other sources are relevant sources to the case study. Documentary Sources all recorded sources of information irrespective of their contents and forms come under documentary sources. These may be published or unpublished, in print or in electronic form. These may be books, periodicals, magazines, and others Documentary sources can further be categorized based on their contents and form (or media), (Dhiman, and Yashoda, 2005). Data from documentary sources were useful in the initial stages of this study in allowing the case study to be understood and the problems and issues important to sustainability drawn out.

### **Results of Review of Literature, Archive Documents, and Secondary Data**

A methodical process was used to examine the information obtained from documentary sources. The data was sorted and organized. The final results from this work are shown in **Table 4.1**.

**Table 4.1:** Problems of Traditional District (Al- Kellej and Al-Wardiya) in Hilla identified through document source analysis

<b>problems</b>	
The deterioration of sewage services	The scarcity of agricultural machinery and equipment and the aging of equipment work
Lack of interest in graduates and providing suitable job opportunities for them	Lack of interest in the historical city of Babylon

## Chapter Four

### Applying the research methodology, results and discussions

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Not caring about the heritage city	The lack of a green belt surrounding the city
Not activating the archaeological and religious facilities	The fertility of the land has deteriorated, and farmers are ignoring agriculture
Inefficiency of the internal road system	The deterioration of the city's slums
The deterioration of the industrial and manufacturing sector in the city	The spread of illiteracy among the slum dwellers
Not activating the tourism sector	Lack of funding for the unemployed to set up their own businesses
Weak central planning	Inefficiency of electricity services
Horizontal construction of urban development	Reliance on the central government as the only source of funding
Traffic congestion increase	Weakness of local industries
Lack and poor quality of paved road works	Unemployment and lack of job opportunities.
Lack of bridges and streets in the city	The spread of the phenomenon of abuses on agricultural land.
Dangerous import policy	Increasing random gatherings.
lack of stores	Lack of adequate housing for poor families
Shortage of power and fuel supply	Slums in el Soub alsaghir .
The lack of manufacturing industries in addition to the underdevelopment of agriculture	Lack of workers and equipment required to collect waste.
Low incomes for individuals and societies	A shortage of doctors, medical professionals and nursing staff.
Inefficiency of the sewage network	A shortage of ambulances.
Inefficiency of the telephone network	Inefficiency of the equipment and devices used and not keeping pace with global technological

## Chapter Four

### Applying the research methodology, results and discussions

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	development.
Inefficiency of waste collection services	The presence of foreign products competing with the local product
Inefficiency of the drinking water network	The spread of illiteracy among the slums.
Lack of emergency services	The high rate of poverty
A shortage of health care services	social heterogeneity
Shortage of medical personnel	Lack of equipment and devices needed to maintain gardens and parks.
Shortage of medical supplies and medicines	The deterioration of the fertility of the land and the neglect of farmers for the cultivation cycle.
A few health centers	Lack of training and qualification courses.
The spread of cancerous diseases	The lack of service and maintenance of green spaces
visual pollution	Lack of environmental awareness among the public and institutional sectors
Lack of standardized codes for building facade finishing materials	Weak coordination and joint action mechanisms with local government departments and civil society organizations
The spread of crime and drugs	Absence of the role of civil society organizations in educating citizens
Inefficient street furnishing and lighting improvement	_ Failure to activate legislation related to the urban environment
Lack of support for the requirements of agriculture	The lack of green spaces and the lack of resources needed to establish them
Al-Hilla River water pollution due to waste	A large discrepancy in the per capita percentage of park area between city

## Chapter Four

### Applying the research methodology, results and discussions

---

	mahalas
There are no entertainment centers	Noise Pollution
Inefficiency of solid waste collection services	Weak laws and penalties for motorcyclists
Increased soil salinity	Air pollution from vehicle emissions
The deterioration of the cultural aspect	Increased desertification and water scarcity
Failure to keep pace with technological development in the education sector	Few schools

#### **4.2.2 Focus Groups**

The use of focus groups is to measure the opinions of the people of the area in the traditional part (El Kellej and Al Wardiya) in the el Soub al saghir of the city of Hilla regarding their priorities and opinions about a sustainable future for their city. The opportunity is taken to hold some focus groups. Participants will participate free of charge or withdraw from the focus group, so that there is no coercion. In these meetings the residents who agreed to participate discussed their views and desires regarding achieving a more sustainable city and were asked what was wrong with your area. The researcher made recordings of their views and writing In accordance with the ethical research protocol, it was made clear that the participants had the right to opt out during the group focus or at any time after the focus period ends. The researcher noticed some imbalances such as fewer women Therapies that address the expected imbalances were implemented by increasing the number in the interview component of the research from six to twelve people, recommended as ideal sizes for effective group discussions (Robson, 2002)The focus group in this case study included six to ten participants. By the researcher avoided the problem of having groups that were too small or too large,

## Chapter Four

### Applying the research methodology, results and discussions

which could lead to Superficial discussion of experiences and ideas or difficulty controlling the direction of the discussion. Focus group meetings continued until 'saturation' was reached, when no new important topics were acquired. After completing each focus group, the results were evaluated and added to the information obtained from previous meetings. This helped determine if the saturation point was reached, at which point it is taken into account. No additional focus groups were necessary. A total of 6 focus group meetings were held across the heritage area (El Kellej and Al Wardiya). The organization of these focus groups began in February 2022. Fifty participants participated in all focus group meetings (Men and women, residents of *mahallat*, decision-makers in government departments, including the General Directorate of Municipalities in Babel, and planners). Information from focus group discussions was transcribed to record the discussion details and rank of all relevant issues raised.

### **Results of Focus Groups**

The issues raised during the discussions were taken into consideration in order to extract all relevant information. If the information mentioned more than once, the repetition ignored. The texts were grouped into their relevant dimensions (social, environmental, economic and institutional), and sorted. The results of this process are shown in Table 5.2.

**Table 4.2:** Problems of Traditional District (Al- Kellej and Al-Wardiya) in Hilla identified through focus group discussions

<b>Problems</b>	
The excesses of the owners of restaurants and cafes on the sidewalk	The owners of the area were annoyed by the parking lot in front of the houses and the lack of a specific garage

## Chapter Four

### Applying the research methodology, results and discussions

---

Most of the streets inside the mahalas are unpaved	Encroachments on sidewalk
Lack of water	The municipality's leniency with the excesses
lack of hygiene	Cut down trees planted by the owners of the area
Weakness in the electrical power system	Waste disposal on rivers.
Increasing the ampere price of private generators	Lots of drugs
Lack of quality control over medicines	A lack of sewage services and a lack of paved streets
The weakness of the legislation that prevents the violation of public rights	Administrative and financial corruption
Few job opportunities	Lack of vegetation
Lack of cultural activities in schools	Bypassing the city's green belt and exploiting it to residential areas
Low cultural awareness	High level of crime
Lack of job opportunities for women	Low level of student absorption due to the Corona pandemic
Lack of support for teachers	The increase in the number of deaths under the age of seventy
Lack of attention to orphans and the elderly	Increasing the number of low-income families
Decrease in the number of citizens who love their city	Ineffective use of modern technology
The lack of housing complexes for the families of martyrs and widows	High rental costs
Inadequate schools	Lack of interest in young people and support for marriage
Lack of interest in monitoring the quality of treated drinking water	Increasing the number of institutes to teach private lessons to students

## Chapter Four

### Applying the research methodology, results and discussions

---

Lack of interaction between the university and the city	Lack of sanitary landfills
Lack of water projects	The growth of parasitic plants in water systems
Deterioration of the fertility of the land due to the lack of agricultural use	demographic changes
The income of the residents of most mahalas is moderate to limited	Weak agricultural guidelines
Development and construction of private schools and the collapse of public schools	Weakness of local government
Hiring people with no specialization in important decision-making positions	There are no service streets
Lack of awareness among citizens about the cleanliness of their city	Contracting with novice contractors who do not have the financial liquidity to complete projects
Lack of traffic instructions	Not activating the role of religious shrines to provide them with material income
Traffic fines increase	Unplanned population expansion
Poor planning and lack of responsibility	Violations on the sidewalks of the streets
The successive bad policies of the city	Not paying attention to the old (heritage) houses.
Most of the residents of the archaeological areas abandoned their homes	Demolition of archaeological areas such as (Al Jabal Garden) and Shanasheel
Postal service neglect	It is difficult for municipal cars to enter the old mahalas because of the narrow streets
Traffic jams	Unemployment increase

## Chapter Four

### Applying the research methodology, results and discussions

---

Lack of parking	Increase the number of cars for each house, at least 3 cars
Poor municipal services	Weakness of the master plan of Babylon Governorate
The lack of hope among the residents of the mahalas to restore life to him	Administrative and financial corruption in the city
Transgressions on the Babel mahala park and turning it into a landfill	Relationships between the people of the old area are good
The unwillingness of citizens to roam within the parks due to its transformation into a landfill	Bypass the civil generator on the park
Weak government support for agriculture	The new residents of the mahala are isolated and have a weak relationship with others
Weakness of the laws of the ownership of agricultural lands	Inefficiency of agricultural pesticides
Shortage and obsolescence of agricultural machinery and equipment	Low productivity per acre
Lack of periodic maintenance and opening of channels and water pumping stations	Scarcity of water during the summer
Air pollution is the gases produced by cars	Air pollution with dust resulting from a lack of vegetation cover
Not paying attention to air pollution	There are no airports and few hotels in the city
Neglecting the tourism sector	Lack of specialized and efficient cadres
Absence of environmental monitoring of air pollution	The lack of specifications of raw materials and their deterioration
Increased consumption of electrical energy.	Few of shopping centers and shops of international standards

## Chapter Four

### Applying the research methodology, results and discussions

---

Neglect and lack of interest in transportation links between the city and other cities	Increasing the number of traffic accidents
Non-reuse and treatment of sewage water	Absence of large commercial companies
There is no recycling of the accumulated waste	Lack of support and encouragement for national products
Inefficiency of public transportation	Neglecting industries
Lack of support and encouragement for foreign investment	Neglecting local industries such as dates and insufficient marketing for it
Water networks projects fade away	Shortage of electric power
Not using renewable energy sources	The lack of modern warehouses in the governorate and the lack of rehabilitation for those in them
Lack of awareness in energy conservation	The disappearance of city landmarks
Lack of water courses	environmental pollution
Lack of future expansion plans	An increase in incurable and chronic diseases
The problem of troughs and turning them into a landfill	The lack of laws to protect the neighbor from his neighbor in the process of rising houses
Weakness of the provincial council	farming migration
inheritance facilitates the process of deviating orchards and building houses	Change the use of construction for commercial purposes
Lack of health services and hospitals	There is difficulty in the work of investment companies due to the imposition of profit rates from companies
The deterioration of the educational reality	Too much waste inside mahalas

## Chapter Four

### Applying the research methodology, results and discussions

---

Increasing the number of cars, in addition to motorcycles	Excessive financial corruption
Adopting centralization instead of decentralization in the management of institutions	Few of civil society organizations
The spread of administrative and financial corruption in the city	Inefficiency of emergency services
Internet service is very weak and insufficient	Weak coordination between institutions

### 5.2.3 Interview Method

The semi-structured interviews used in the case study were designed to achieve detailed answers from the interviewees and to explain/explore the answers/issues in depth. Try to address the expected imbalances in the previous focus groups, particularly with regard to female participation. Explanation and increased accuracy of uncertain responses in previous focus groups. The interview survey was piloted prior to the appropriate study, which made it possible to identify a number of points of confusion and problems which led to modifications to the final version of the interview schedule, ensuring that the survey was clear and easy to answer. Interviews were conducted with many residents of the El Kellej and Al Wardiya *mahallat* in Old Hilla. Most of the residents of the old mahala were interviewed. They had a great role in contributing to identify the most important problems of the *mahallat* in addition to their opinions and desires to achieve a sustainable region. The number of people interviewed in El Kellej and Al Wardiya *mahallat* in Old Hilla was 60 participants (including men, a few women, decision makers and planners)

## Chapter Four

### Applying the research methodology, results and discussions

---

#### Results of Interviews

Table shows Heritage area (El-Kellej and Al-Wardiya) problems and needs which are obtained from interviews using the same social, environmental, economic and institutional categorization. Table 4.3

**Table 4.3:** Problems of Traditional District (El-Kellej and Al-Wardiya) in Hilla gathered through interview

problems	
Lack of paved street	Lack of water and rain
The increase in the unemployment rate	Encroachment on agricultural areas and their transformation into residential areas
Not benefiting from certificate holders in government departments	There are no health centers in the mahala
disappearance of government services	Weak teaching methods
Lack of a preventive policy for agricultural production	_Discrimination against women
Increasing the number of married women before completing their studies	Weak teachers' abilities
Women's lack of awareness of their rights	There are no specialized hospitals
Negative behavior towards women working abroad	The collapse of the level of education in the country
The rise in the prices of building materials	Lack of hygiene in the streets
There is no emergency plan in the special services under the Corona regulation	Local delegations and lack of internal control
Lack of services	Families with limited income do not provide educational supplies (such as

## Chapter Four

### Applying the research methodology, results and discussions

---

	electronic devices) in light of the Corona pandemic
The height and largeness of the central carrots and their impact on the streets	Strong social relations between the old people of the mahala
The lack of housing complexes and the large number of slums	Few housing complexes
The lack of development in the level of modern technology in the education sector	Few social relations between the people of the mahala (between the son of the countryside and the son of the city)
The presence of medical complexes within the residential mahala	No sewerage
The expansion of mahalas was only the demolition of houses with an area of 400 square meters and their construction as 2 or 3 units (expansion in the number of housing units)	Exodus from the countryside to the city
The difference in ideas and mentalities between the son of the countryside and the son of the city	The lack of schools to accommodate the population density, Some of the school exits on public streets endanger students,
Population momentum and the lack of lands expropriated by the municipality, and if any, they are without habitable services	
The weakness of the water network carrying drinking water, thus the area suffers from water scarcity,	no sidewalks,
narrow streets,	Increasing the number of houses in agricultural areas
few designed car parking	The increased use of el Soub alsaghir , in addition to large private generators, leads to air pollution
Not specifying land uses, as they are	Increasing the horizontal expansion instead

## Chapter Four

### Applying the research methodology, results and discussions

---

overlapping	of the vertical for universities
Lack of investment in building residential buildings	The increasing population density
Increasing the housing crisis	A shortage of medical and health personnel in health institutions
Lack of trained manpower	Increasing the use of heavy products in the operation of power plants and many other industrial fields
Few housing complexes	Lack of care and lack of irrigation for green spaces
Lack of interest in the environment and clean energy sources	Increased high temperatures in summer in addition to dust storms
air pollution	Using ancient irrigation techniques
Ignoring the agricultural cycle by farmers	The lack of implementation of the communication network program
Less use of el Soub alsaghir in agriculture	The merging of religion and politics
There are no special places to practice religious rites and rituals	Neglecting the e-Government Service
Lack of coordination between departments	Weakness in the communication service
A limited role for civil society organizations	There are no waste recycling plants
Weakness in internet service	Infrastructure collapse
Frequent power outages	Not caring about graduates
Lack of interest in environmentally friendly technology and clean energy	Shortage of medicines and medical supplies
There is no bus stop on most of the roads	A large increase of strangers to live in the area as a result of selling agricultural land to convert it to residential or commercial
Lots of unemployment	The cultivation has decreased in the area

## Chapter Four

### Applying the research methodology, results and discussions

---

	due to the lack of sufficient water to continue the cultivation
Inadequate training and rehabilitation for the poor	The high prices of real estate in the center of Hilla
Unavailability of a regular public transport network,	The increase in the exchange rate of the dollar significantly affected the stagnation of local markets
Cutting down palm trees and trees and transforming agricultural areas into residential areas.	Rising rents
lack of kindergarten,	The social relations between the residents of the mahala are weak
Bad services	The increase in imported products negatively affected the demand for local products
Waste accumulation	Demolition of residential homes on the street and construction of shops
Limited per capita income	Slums in the fronts of houses
The collapse of education	There are no main streets in the city except for two main streets
Lack of interest in the aspect of agriculture	The lack of food products granted by the Ministry of Trade to every Iraqi individual
The stagnation of local markets at the end of each month	Most of the families have moved towards the areas of 80th and 60th Streets on the outskirts of the city
Visual pollution for electricity cables and poles	Lack of hotels
Lack of urban planning	Failure of many individuals within institutional structures to adopt modern technologies
Municipalities are inactive	Lack of foreign investment in the tourism

## Chapter Four

### Applying the research methodology, results and discussions

---

	sector
Lack of recreational areas, and if they exist, they are not maintained by the municipality	The dominance of political parties over city departments
Increase in administrative and financial corruption	Limited use of modern technology
Limited support for activities	There are no updated laws
Difference in physician, population, and nurse index	Lack of trained tourist cadres
A shortage of participants in local elections	Increased consumption of gasoline and oil
Lack of trust between citizens and the local council	Limited industrial projects
A limited role for email service within organizations	Lack of pedestrian bridges at intersections
Lack of experience in tourism management	Water scarcity and its impact on the operation of hydroelectric power plants
Shortage of electric power	Low investment in transportation
Bad road paving	Lack of interest in archaeological sites
Dependence on centralization in government funding	The old part of the city is deserted at night Growth from the center, outskirts of the city, towards 80th Street, towards Al-Bakrly
Lack of funding in the process of maintaining archaeological sites	The weak role of the state in appropriating agricultural land
Archaeological sites exposed to theft and demolition	Lack of a clear vision to accommodate the growth of the city of Hilla
Employing unspecialized people in important positions to make decisions	Social disparities and their impact on the population

## Chapter Four

### Applying the research methodology, results and discussions

---

Weakness in laws and local the researcherities' control over abuses	Remnants of the political situation on the situation of the city
Weak social relations among the residents of the mahala	Lack of cultural centers
The high prices of real estate compared to the lack of services	The deterioration of the health and living situation
Existence of empty spaces and bypassing them and making them a landfill and places for private generators and others	The lag of the city and the accumulation of these lags of local governments
The construction rate is lower than the population growth rate	There are no service streets to the main streets
Existence of archaeological areas and not properly exploiting them	Old designs not updated
Weak social relations between mahala members	Old designs out of date in the city
Traffic congestion in vehicles	Change the use of old areas from residential to commercial
Poverty increase	Lack of public taste in construction at the level of the public and private sectors
Increased environmental pollution	Variation in pharmacy pricing
Street crowding	The impact of the Corona pandemic on the progress of the country
Lack of families to follow up on their children	Misuse of social media
Not using modern and advanced technologies in construction	Theft of public money
Lack of strict laws and follow-up	The increase of drugs and their impact on security and safety
Increasing the prices of medical services that burden the citizen	Randomness in the construction of buildings as well as in the restoration of old

## Chapter Four

### Applying the research methodology, results and discussions

	buildings
Lack of investment and entrepreneurial projects	Low prices of agricultural land versus government land
The difficulty of owning agricultural land	Failure to set important priorities in the city
Narrow residential streets due to the phenomenon of cars in front of the houses	Lack of green areas
Increasing migration from the countryside to the city	Administrative corruption in the province and its inefficiency
Poor maintenance and maintenance of damaged parts	

#### **4.2.3.A. Some of the problems that were noticed during the process of conducting interviews and focus groups**

Many of the problems that mahalas suffer from during the process of interviewing people, as the level of services was poor, including the spread of waste and abuses, and changing the use of housing to a commercial function.

	
<b>The use of housing changed to commercial, shown here in the picture, the Al-Wardiya Mosque</b>	<b>waste spread</b>

## Chapter Four

### Applying the research methodology, results and discussions

	
<b>Explains the poor quality of the streets</b>	
	
<b>Encroachments on agricultural land</b>	<b>neglect the parks</b>

**Figure 4-2:** Shows Some of the problems that were noticed during the process of conducting interviews and focus groups (The researcher,2022)

### 4.3 Final Problems:

Through the above tools, secondary sources, focus groups, interviews, through which problems and sustainability issues were identified (Table 4.4.). The study area suffers from was reached, while avoiding recurring problems as much as possible and in preparation for the next second step.

**Table 4.4:** shows set of final problems

Final Problems	
the mix of uses and urban functions in the neighbourhood is poor	there is no clear identity for each neighbourhood
There is no street patterns	No effective participation of residents in developing their neighbourhoods
Change Building regulations	Underdevelopment and weakness of local industries
Lack of planning criteria	the developed urban designs are not sensitive to the hot climate

## Chapter Four

### Applying the research methodology, results and discussions

No updated urban policy of mahala planning	There is no hierarchy between public, semi-private and private in modern mahalas
the person not easy access different services	Increase the number of cars
density high	Lack of affordable housing options
There are no green spaces	Weakness in social security
Weak and poor transportation system	An increase in the encroachments of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets
There are no street design and connectivity	Lack of interest in the heritage mahalas in the small sob
The Change of Lifestyle and Travelling Culture	there is no land mark
There are no waste recycling plants	Increasing slums
lack of key facilities such as schools and health centers	Environmental pollution
lack of infrastructure of civil services such as sewage system and telephones	Increasing the proportion of drugs
Unavailability of potable water	Use of some public places as a landfill
Shortage of power and fuel supplies	Increasing the level of crime in the slums

#### 4.4 The Second Step: Finding sustainable indicators for the urban form

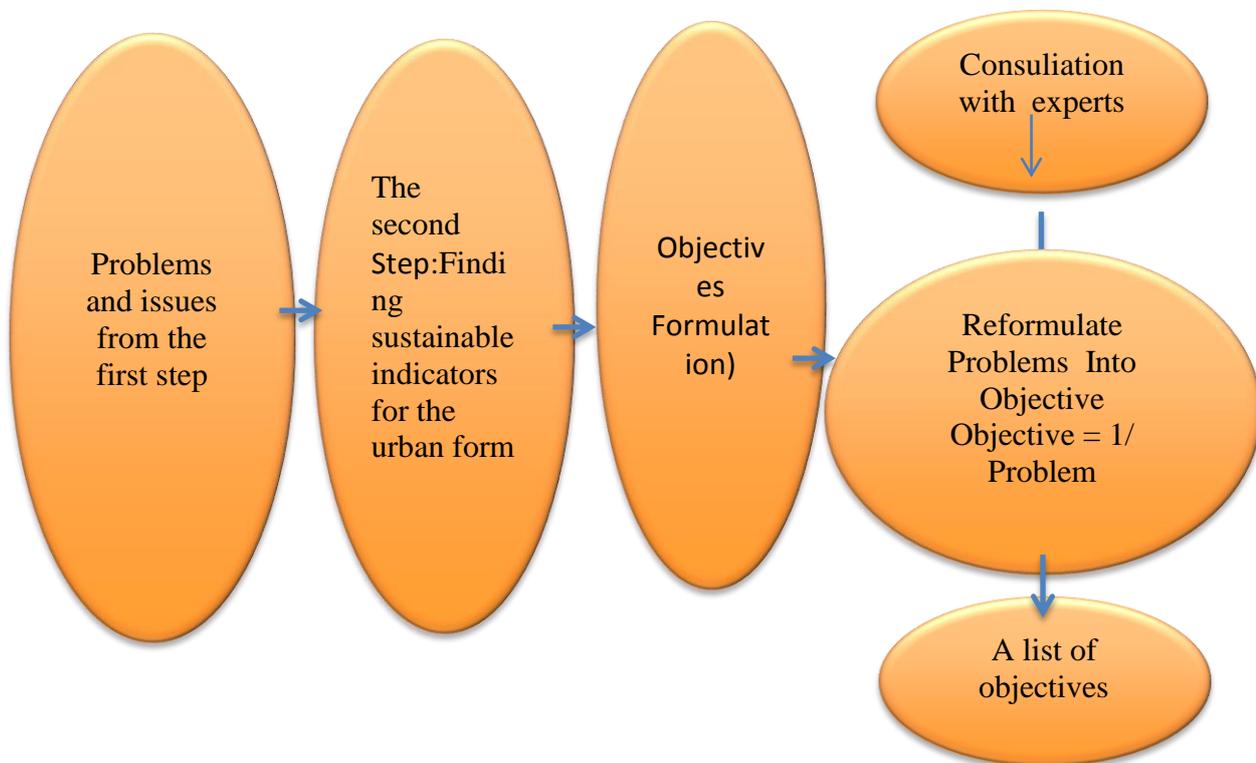
This step of finding sustainable indicators for the urban form includes several steps that depend on the result of the first step through which problems and sustainability issues were identified through secondary sources, focus groups and interviews. These steps are:

##### 4.4.1 Objectives Formulation

With the assistance of specialists and experts, the problems and needs identified during the first step of identifying the problems are reformulated in the solution goals or objectives (see **Figure 4.3**).

## Chapter Four

### Applying the research methodology, results and discussions



**Figure (4-3)** General scheme of objective formulation (The researcher,2022).

#### 4.4.1.A: Techniques for Objectives Formulation

The objective definition of these goals is one of the crucial elements in the process of figuring out what people want their city to turn into. Finding the best answer to these issues becomes challenging when the aim is framed in a poor and unwise manner (Bureau of Local Government Development and DILG, 2008). In the current study, the generation of objectives has been derived through a thorough analysis of the problems and issues using the following two formulas (Bureau of Local Government:

##### 1. **Problem =Objective + Impediments to Achieve the Objective**

Therefore Objective =Problem – Impediments (Figure 5-3)  
methodological framework

## Chapter Four

### Applying the research methodology, results and discussions

#### 2. Objective =1 / Problem

The second strategy, which is employed in this thesis, is found on the maxim that the objective is the exact opposite of the issue. For instance, when widespread corruption is a problem, the objective will be to avoid corruption instead of addressing the original issue ,( Al-Alwani,2014, pp 142-143).

#### Results

Results of the objectives, which were determined through the analysis of the issue and problems, are shown in (Table 4.5.). The formulas mentioned above were used to create these objectives.

**Table 4.5** formulation of objectives

Problems	Objectives
the mix of uses and urban functions in the neighbourhoods is poor	the mix of uses and urban functions in the neighbourhoods
There is no street patterns	Improve street patterns
Change Building regulations	Define building regulations
Lack of planning criteria	finding of planning criteria
No updated urban policy of neighbourhoods planning	updated urban policy of neighbourhoods planning
the person not easy access different services	the person easy access different services
Density High	Decreased density
There are no green spaces	Increase green spaces
Weak and poor transportation system	Improving transportation system
There are no street design and connectivity	Improve street design and connectivity
The Change of Lifestyle and Travelling Culture	Improving public transportation services
There are no waste recycling plants	Providing waste recycling plants
lack of key facilities such as schools and health centers	Increase of key facilities schools and health centers
lack of infrastructure of civil services such as sewage system and telephones	Increasing the efficiency of infrastructure of civil services such as sewage system and telephones
Unavailability of potable water	Providing safe drinking water

## Chapter Four

### Applying the research methodology, results and discussions

---

Environmental pollution	Reduce environmental pollution
Increasing the proportion of drugs	Reducing the proportion of drugs
Use of some public places as a landfill	Preventing the acquisition in public places
Shortage of power and fuel supplies	Increase in power and fuel supply
there is no land mark	there is land mark
Increasing slums	Reducing slums
there is no clear identity for each neighbourhoods	there is clear identity for each neighbourhoods
No effective participation of residents in developing their neighbourhoods	effective participation of residents in developing their neighbourhoods
Underdevelopment and weakness of local industries	Development and improvement of local industries
the developed urban designs are not sensitive to the hot climate	Developing urban designs sensitive to hot climates
There is no hierarchy between public, semi-private and private in modern mahalas	There is hierarchy between public, semi-private and private in modern mahalas
Increase the number of cars	Reduce the number of cars
Lack of affordable housing options	Provides affordable housing options
Weakness in social security	Strengthening social security
An increase in the encroachments of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	Reducing the encroachment of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets
Lack of interest in the heritage mahalas in the small sob	Attention to the heritage mahalas in the small sob
Increasing the level of crime in the slums	Reducing the level of crime in slums

#### 4.4.2 Indicators Formulation:

This method was used to create a preliminary set of roughly 40 suggested indicators for the goals deriving from the previous stage. The following stage was to choose a second, more precise set of indicators after this

## Chapter Four

### Applying the research methodology, results and discussions

initial set of 40 untested indicators had been produced in order to get the proper and constrained number of the 32 indications as stated in **Table 4.6**. To optimize their impact on the decision-making process and to improve their applicability and qualifying qualities, indicators should be carefully picked so that only relevant and valid indicators are employed. To create the final set of indications, it was ultimately necessary to rank the second set of indicators. Essentially, the method utilized to create the list of prospective indicators for this thesis followed the fundamental methodology established by UNESCO in 2003. This comprises:

- Examine every goal that was created in the previous stage.
- Think about potential indicators for each aim in an open-minded manner.

#### Deep thought

- Consultation with professionals and a variety of stakeholders.
- Reliance on research findings and other initiatives: It's important to consider how to gauge goal progress throughout implementation at the formulation stage and to select the most suitable indicator. For instance, developing an indicator to monitor progress toward a goal of "reduced randomness" involves idea generation, expert consultation, (Al-Alwani, 2014, p146).

### **Results**

The 32 indicators that were formulated from the objectives from the previous step after the development of the first group of 40 indicators, are shown in Table 4.6.

## Chapter Four

### Applying the research methodology, results and discussions

**Table 5.6** formulation of indicators

Objectives	Indicators
the mix of uses and urban functions in the neighbourhoods	The percentage of diversity in terms of land use in the neighbourhoods
There are street patterns	Number and types of street patterns
Install building regulations	Number and types of building regulation
Existence of planning criteria	The percentage of taking and applying of planning criteria
updated urban policy of neighbourhoods planning	The percentage of updated urban policy of neighbourhoods planning
the person easy access different services	The time taken to access to different services
Decreased density	Number of persons in one hectare
There are green spaces	The percentage of green spaces
Improving transportation system	The percentage of efficient transportation system
There are street design and connectivity	The percentage of streets have good condition and design
Improving public transportation services	The percentage of people using public transportation and walking
Providing waste recycling plants	The number of waste recycling plants
Increase of key facilities schools and health centers	The number of schools and health centers relative to the number of their residents
Increasing the efficiency of infrastructure of civil services such as sewage system and telephones	Percentage of streets that have sewers and the Internet
Providing safe drinking water	The number of mahalas suffering from a lack of potable water
Reduce environmental pollution	environmental pollution rate
Reducing the proportion of drugs	drug ratio
Preventing the acquisition in public places	Percentage of public places that have turned into a landfill
Increase in power and fuel supply	Energy and fuel prices and availability
there is land mark	The number of land mark in the mahalas
Reducing slums	The number of random housing units
there is clear identity for each neighbourhoods	Percentage of buildings that carry the urban heritage of the city
effective participation of residents in developing their neighbourhoods	The number of activities that the people of the locality participate in
_Development and improvement of local industries	The rate of support provided to local industries
Developing urban designs sensitive	The building materials used and the nature of

## Chapter Four

### Applying the research methodology, results and discussions

---

to hot climates	the design
There is hierarchy between public, semi-private and private in modern mahalas	The difference in the intensity of the movement of cars and vehicles
Reduce the number of cars	Number of cars
Provides affordable housing options	The number people don't have housing units
Strengthening social security	The amount of support for social security
Reducing the encroachment of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks
Attention to the heritage mahalas in the el Soub alsaghir	The percentage of money allocated by the local government to take care of the heritage mahalas
Reducing the level of crime in slums	The number of crimes committed annually

#### **4.4.3 Selection, Choosing and Ordering Indicators or Ranking of Indicators**

In a traditional district (El-Kellej and Al-Wardia), this part explains how to choose a more streamlined list of urban form sustainability indicators and how to rank such indicators.

##### **4.3.4.A: Indicator Selection**

Choosing the right number of indicators for this step is crucial because if there are too few, an idea or concept may not be clarified or presented, while too many indicators may cause distraction and a lack of focus on the main objective. Consequently, a set of selection criteria must be applied in order to select the proper number of indicators from a possibly lengthy list (Nathan and Reddy, 2010). In addition, numerous the researchers including Hens, De Wit (2003), UN (2001), and Hodge, Hardi suggest that the number of pointers be "restricted" (1997). A crucial step in the process of choosing indicators in a transparent manner is

## Chapter Four

### Applying the research methodology, results and discussions

determining the standards by which possible indicators will be assessed (Keirstead,2007). The published lists of criteria on which indicators should be evaluated, however, are frequently comparable (Al-Alwani, 2014, p 157), allowing the the researcher to consider and note these parallels, as shown in (Table 4.6.).

#### **4.3.4.B: Indicator Ranking**

The World Trade Organization (WTO, 2004) suggested giving the indicators a priority order in order to create a list of indicators that is more useful. At the end of April 2022, a questionnaire for ranking sustainability indicators was distributed to a group of forty specialists (academics and practitioners) in Hilla city's el Soub al saghir. Each participant was required to rank each indicator on the questionnaire according to its level of relevance, as described in Chapter 3. The Likert scale was used in the questionnaire, which assigns a number and a brief description to each category of responses. On a scale of 1 to 4, where 1 was classified as not important; 2 was considered less important, and 3 was important,4 the very important, experts who took part in the survey were asked to rank each of the 32 indicators. The categories that the participants felt best captured their opinions on the rated indication were chosen. To determine a final set of indicators, the indications were ranked according to priority in this stage. To determine the respondents' general preferences, the average score for each indicator was determined. A questionnaire should generally not be used in the field study without significant piloting. Consequently, a pilot survey was conducted with 10 participants to ensure the validity and reliability of the results as well as to identify and address any potential issues with the questionnaire. The pilot poll provided insightful data on the degree of comprehension of the

## Chapter Four

### Applying the research methodology, results and discussions

questionnaire survey was conducted using the following methodology (Al-Alwani,2014, p159):

1. Identify the investigation's goal.
2. With the support of consultations with the supervisory discussion group, jointly develop the questionnaire tool.
3. Run a pilot test and make changes to the instrument to ensure accuracy also dependability
4. Select probable respondents in the city of Hilla
- 5-Complete the poll (carried out at the end of April, 2022)
6. Compute the average, standard deviation, using spss.
7. Describe the findings and discuss them

(Table 4.7.) presents the results of the survey that was conducted in addition to the analysis of the data using the SPSS program, which included the mean, standard deviation, and the rank of each indicator.

## Chapter Four

### Applying the research methodology, results and discussions

#### **4.5 Questionnaire Results and Discussions**

SPSS was used to calculate the average score, which is the mean(average) and standard deviation is a measure of variance or prevalence, calculating the percentage of answers, in addition to determine the trend of the sample for each indicator between very important, important, less important and unimportant for each 32 Indicators based on responses to the questionnaire .Many the researchers have shown that Likert scales can definitely be analysed efficiently as interval scales and analyses them as such with descriptive statistics like means, standard deviations, etc., such as Baggaley and Hull, 1983; Maurer and Pierce, 1998; Vickers, 1999;Allen and Seaman, 1997. Moreover, Brown (2011) supports treating Likert scales as interval data, because Likert scales contain multiple items and can be taken to be interval scales so descriptive statistics can be applied. According to Carifio and Perla (2007) the myth of only non-parametric statistical tests should be used with Likert scales are wrong. In this manner, Norman (2010) suspended the controversy on this subject as he proved that parametric statistics (Parametric statistics use the mean and standard deviation) can be used with Likert data, with unequal variances, with non-normal distributions and with small sample sizes, with outa significant risk of reaching an incorrect conclusion. Thus, the average score for each indicator was used to rank the priority ascribed to each indicator. Moreover, Green et al (1990) and Miller (2001a) use the standard deviation to measure the degree of convergence. The lower the standard deviation is, the less dispersion or variation in the data, subsequently the consistency or the degree of convergence is higher. On the other hand, the higher the standard deviation is, the more dispersion or variation in the data or in other words a wider range of opinions has been encountered

## Chapter Four

### Applying the research methodology, results and discussions

and subsequently the consistency or the degree of convergence is lower (Al-Alwani, 2014). (Table 4.7.) shows the results that were reached using the SPSS program and extracting the average, standard deviation, and rank of each indicator.

## Chapter Four

### Applying the research methodology, results and discussions

**Table 4.7** shows the average, standard deviation and rank of each indicator.

Indicator	not important	less important	important	very important	Average	SD	T-test	Percent %	sample direction	Rank
The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks	1	4	11	24	3.450	0.782	27.873	86.25	Very important	1
The number of mahalas suffering from a lack of potable water	0	5	13	22	3.425	0.712	30.420	85.625	very important	2
Number of cars	0	3	17	20	3.425	0.635	34.059	85.625	very important	2
environmental pollution rate	1	5	11	23	3.400	0.810	26.541	85	very important	3
Percentage of public places that have turned into a landfill	2	4	10	24	3.400	0.871	24.683	85	Very important	3
The number of schools and health centers relative to the number of their residents	1	7	9	23	3.350	0.863	24.528	83.75	very important	4
Number of persons in one hectare	1	2	20	17	3.325	0.693	30.308	83.125	very important	5
The number of waste recycling	0	6	15	19	3.325	0.729	28.813	83.125	Very	5

## Chapter Four

### Applying the research methodology, results and discussions

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plants									importa nt	
Percentage of buildings that carry the urban heritage of the city	4	3	10	23	3.300	0.992	21.033	82.5	very importa nt	6
Percentage of streets that have sewers and the Internet	2	6	10	22	3.300	0.911	22.898	82.5	very importa nt	6
The number of random housing units	1	9	8	22	3.275	0.905	22.875	81.875	Very importa nt	7
Number and types of building regulation	2	6	14	18	3.200	0.882	22.923	80	importa nt	8
The percentage of updated urban policy of neighbourhoods planning	2	7	15	16	3.125	0.882	22.395	78.125	importa nt	9
Number and types of street patterns	5	4	14	17	3.075	1.022	19.020	76.875	importa nt	10
The percentage of diversity in terms of land use in the neighbourhoods	4	6	14	16	3.050	0.985	19.568	76.25	importa nt	11
The percentage of taking and applying of planning criteria	2	7	19	12	3.025	0.831	23.004	75.625	importa nt	12
drug ratio	3	10	11	16	3.000	0.987	19.222	75	importa nt	13
The building materials used and the nature of the design	2	10	15	13	2.975	0.891	21.113	74.375	importa nt	14
The percentage of green spaces	6	4	15	15	2.975	1.049	17.924	74.375	importa nt	14
The number of crimes committed	7	5	11	17	2.950	1.131	16.494	73.75	importa	15

## Chapter Four

### Applying the research methodology, results and discussions

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annually									nt	
The difference in the intensity of the movement of cars and vehicles	3	9	15	13	2.950	0.932	20.012	73.75	importa nt	15
Energy and fuel prices and availability	1	11	18	10	2.925	0.797	23.210	73.125	importa nt	16
The percentage of money allocated by the local government to take care of the heritage mahalas	6	5	15	14	2.925	1.047	17.664	73.125	importa nt	16
The time taken to access to different services	5	8	13	14	2.900	1.032	17.759	72.5	importa nt	17
The amount of support for social security	2	11	17	10	2.875	0.852	21.317	71.875	importa nt	18
The rate of support provided to local industries	3	13	11	13	2.850	0.975	18.481	71.25	importa nt	19
The number people don't have housing units	2	10	20	8	2.850	0.802	22.468	71.25	importa nt	19
The percentage of people using public transportation and walking	4	12	12	12	2.800	0.992	17.847	70	importa nt	20
The percentage of efficient transportation system	4	11	15	10	2.775	0.946	18.533	69.375	importa nt	21
The percentage of streets have good condition and design	6	10	16	8	2.650	0.975	17.184	66.25	importa nt	22
The number of land mark in the mahalas	4	14	17	5	2.575	0.843	19.298	64.375	importa nt	23
The number of activities that the people of the locality participate in	5	20	13	2	2.300	0.757	19.194	57.5	less importa nt	24

## **Chapter Four: Applying The Research Methodology, Results And Discussions**

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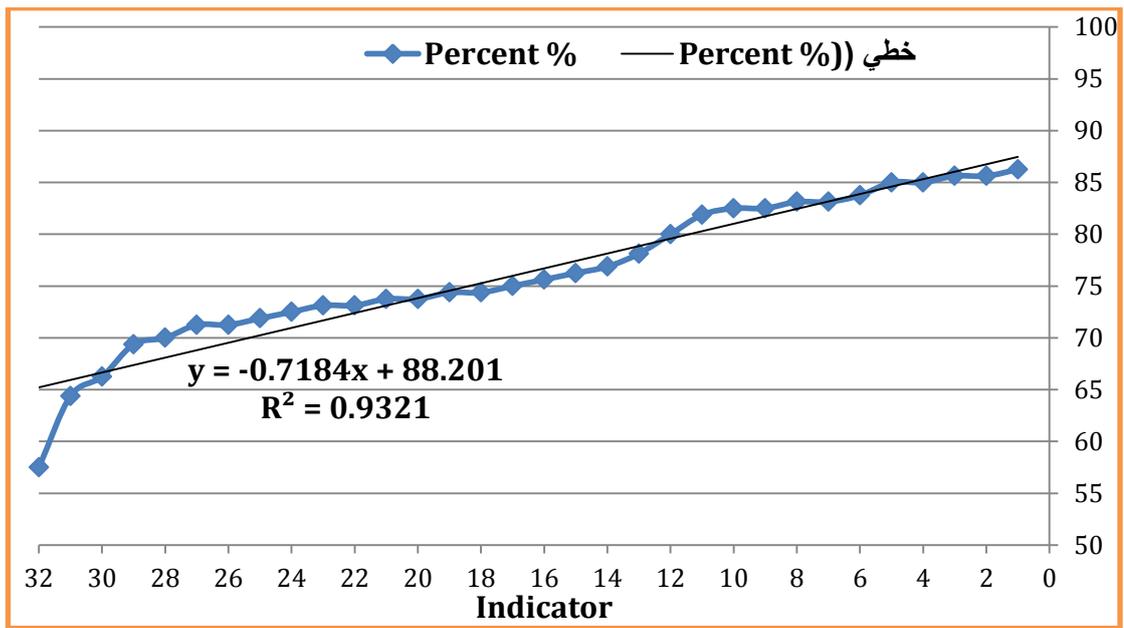
### **4.6 Final Set of Sustainability and Urban Form Indicators for Heritage Area (El Kellej and Al-Wardiya), in the City of Hilla**

After the analysis, review and selection processes that were applied to the first set of potential indicators and led to the results of a revised list of 32 useful and valid sustainability indicators.

The results presented in (Table 4.7) demonstrate a high level of consistency in the higher-ranked indicators and issues across expert participants, the standard deviation of the data set of the questionnaire ranges from 0.6 \_1.1

The results showed that the most important indicator in heritage area (El Kellej and Al-Wardiya), which was given the highest priority by experts, where the frequency of answers was high 24 and is located in a very important place is the indicator (the percentage of abuse of the commercial sector over the residential sector and the percentage of abuse on street sidewalks), which has the highest average. of 3.450 and a standard deviation 0.782, with an answer rate (percent)of 86.25%. The indicators that are given the highest priority by the 10 participating experts, which are located in a very important place, according to the opinion of the participating experts, these indicators are of great importance to achieve sustainability in the heritage area (El Kellej and Al-Wardiya), where the standard deviation of the data set from the questionnaire for these 11 indicators ranges from 0.635\_0 .992 and the average of these indicators is from 3.275\_3.450 .with a high percent ranging from 85.625% - 81.875%. The percentage was calculated based on the average of the answers provided by the participants in the questionnaire in the (Figure 4.4).

## Chapter Four: Applying The Research Methodology, Results And Discussions



**Figure ( 4.4)** shows the percentage of answers by expert participants in the questionnaire .

After the highest indicator (The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks), which received the highest priority, the indicator appears (The number of mahalas suffering from a lack of potable water) with an average of 3.425 and a standard deviation of 0.712 and it is located in a very important place with a percent of 85.625.

The population density index had the lowest standard deviation of 0.693 and an average of 3.325, and this indicator is located in a very important place.

The participants gave the lowest priority to (The number of activities that the people of the locality participate in), as it is located in a place of less importance. It got 20 answers, with average of 2.300 and a standard deviation of 0.757, with percent of 57.5%. This judgment had a degree of consistency among the expert participants. In addition, some problems were marked as significant (Number and types of building regulation) and (The percentage of updated urban policy of neighborhood's planning) as

## Chapter Four: Applying The Research Methodology, Results And Discussions

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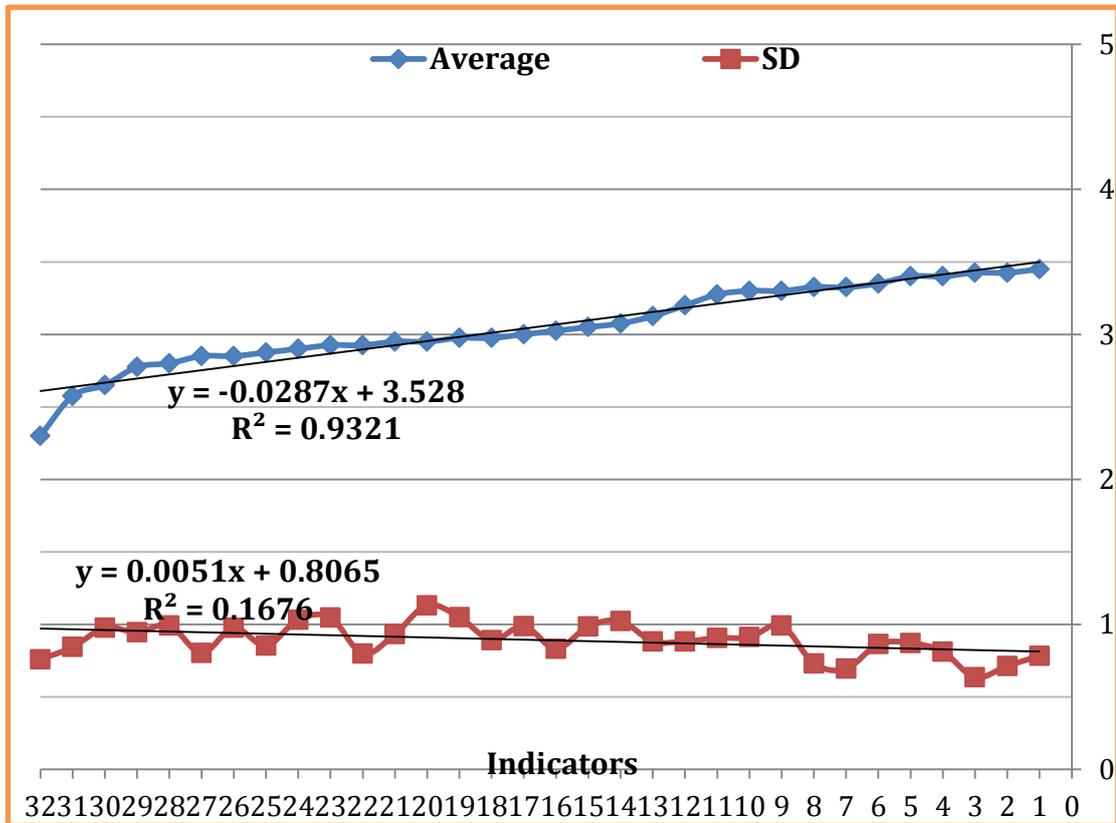
well as (Number and types of street patterns) .On the other hand, high degrees were given to those indicators related to (lack of potable water, number of cars, environmental pollution, public places that have turned into a landfill, of schools and health centers relative to the number of their residents, number of persons in one hectare ,the number of waste recycling plants, percentage of buildings that carry the urban heritage of the city, percentage of streets that have sewers and the internet ,the number of random housing units). Many of the big problems were explained in the first step of the methodological framework which involved identifying the issues. Some social issues are given different importance on a large scale (such as (Unavailability of potable water, high density), and environmental issues such as (the rate of environmental pollution, the number of cars, Percentage of public places that have turned into a landfill, The number of waste recycling plants, and the percentage of green spaces, the building materials used and the nature of the design, the percentage of green spaces ,number and types of building regulation).

The results may seem surprising at the first moment, but they are considered realistic, especially in a situation such as Iraq, where many conflicts have led to big and very important problems. The results showed most of the problems between a very important and important place, except for one indicator in a less important place, which is the indicator (The number of activities that the people of the locality participate in).

As shown in Figure (4.5), the relationship between the average and the standard deviation, where the relationship is inverse between them, whenever the arithmetic mean increases, we find that the standard deviation is few. We find that  $R^2$  is the coefficient of determination of the average.

## Chapter Four: Applying The Research Methodology, Results And Discussions

As it approaches one, the data are close to each other .



**Figure (4.5)** the relationship between the average and the standard deviation of the indicators

From the outcome of the above table, we note that (violations or abuses of the commercial sector on the residential sector, this use contributed to the change or demolition of old buildings and change in the shape of the area, water shortage, number of cars, environmental pollution, public places that turned into a landfill, places for generators, etc., and a lack of schools Health centers, high population density, lack of waste recycling stations, sewage networks, streets that are not designed according to correct standards, and the lack of identity that bears the heritage in many mahalas, in addition to random housing and the erosion of orchards) these problems were extracted from the 11 indicators of which occupied important sites. Very much in the questionnaire that was conducted with the experts. Therefore, these 11 indicators are no less important than the

## **Chapter Four: Applying The Research Methodology, Results And Discussions**

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remaining 20 indicators, which occupied an important position to measure the sustainable urban form of these mahalas, as the indicator (the number and types of building systems. This indicator is followed in turn by (the percentage of the urban policy updated for mahala planning)

If you take these 32 indicators into account, the urban form will be more compact and sustainable, that sustainable urban form and planning are only parts of the equation and that more is needed to truly achieve urban sustainability. It should also be noted that even in the presence of ideal forms and the efforts of the planners, the behavior, traditions, culture and beliefs of the inhabitants will have a very large impact on the levels of sustainability of the urban area in use. In short, the urban form appears to be an important factor in urban sustainability and residents need to cooperate for the success of inclusive sustainability.

### **4.7 Summary**

This class has shown the result of applying the first and second, the steps of the methodological framework in El Kellej and Al Wardiya *mahallat* in Old Hilla. The first step, identifying issues, aims to explore the main issues, needs and Problems inside the traditional area (El Kellej and Al Wardiya) in the el Soub al saghir. This methodological framework has been successful. The relevant social, environmental, economic and institutional problems were collected in the study area through the use of source documentation analysis, focus groups and interviews. With multiple data sources, triangulation is one of the important protocols used to ensure accuracy and alternative interpretations. Moreover, the need to confirm the validity of the data increases the necessity of triangulation. The results were from documentary sources, focus group and interviews, honestly copied and analyzed. This set of results was used in the second step

## **Chapter Four: Applying The Research Methodology, Results And Discussions**

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(Finding sustainable indicators for the urban form), which consists of reformulating the problems and needs that were developed during the first step in the solution or goals statements. In the current study, the objectives were formulated using formulas developed by the Local Government Development Office and DILG (2008) Generally, one objective was formulated for each problem. the development of the indicators as well as the selection of the indicators and their ranking. Each indicator was developed in consultation with experts from various fields and through a careful review of the literature in the environmental, social, economic and institutional fields. This step produced the first set of proposed indicators which contained 40 indicators covering the four dimensions of sustainability (social, environmental, economic and institutional). This revision stage was used to reformulate and select useful indicators. This resulted in the production of a refined list of 32 useful and valid sustainability indicators. A group of forty experts from the city of Hilla, Iraq contributed to the process of ranking indicators on the basis of priority (final set of indicators). The results of applying the methodology used for in the traditional area (El Kellej and Al Wardiya) in the el Soub al saghir, and then discussed.

## **Chapter five**

# **Conclusions and Recommendations**

## Chapter five

### Conclusions and Recommendations

#### 5.1 Introduction

The previous chapter explained the results of the methodological framework that was reached El Kellej and Al Wardiya *mahallat* in Old Hilla. It discussed the final set of indicators of sustainable urban form. This chapter indicates research's conclusions with a set of recommendations.

#### 5.2 Answering the Research Questions

The research addresses its primary question of "*How to develop a framework that provides suitable sustainable indicators that will lead to a more sustainable urban form in the traditional area*". In order to address this primary question, succeed in developing valid framework and provide sustainable indicators for measuring sustainable urban form, secondary research questions and consequent findings are reviewed in this section.

The first asked secondary question was: "*What types of frameworks that are suitable for evaluating indicators can be indicated?*"

This question has been answered through an assessment of some existing indicators and frameworks developed for local, national and international level which are provided in Chapter two of the literature review. Through reviewing of existing types of sustainability indicators' frameworks, a good level of understanding of the organization and construction of frameworks has been provided. However, the combination framework is shown to be more appropriate in this instance than other types as it may provide an

overview of the advantages of individual frameworks while at the same time overcoming some of their weaknesses.

Another secondary question asked was: "*How could a framework for evaluating sustainable urban form be set up and organized?*"

To answer this question, a review of existing types of sustainability indicators' frameworks had been carried out in Chapter two to assist the construction that could help developing a methodological framework. Advantages and disadvantages of these frameworks, which had been diagnosed in Chapter two, aided the choice and combination of frameworks. Methodological framework was developed by a combination of a goal-based framework (bottom-up) and a CSD, Theme Indicator Framework 2001, (top-down) which had been used as a tool or mechanism for promoting sustainability urban form assessment.

Third secondary asked question was: "*How effective is the sustainability evaluation framework as a tool and a system for creating a sustainable district in the real life?*"

This question has been answered through the application of two steps of the methodological framework of the case study (El Kellej and Al Wardiya *mahallat* in Old Hilla) from which insights have been gained and conclusions may be drawn about the practicality of the approach.

### **5.3 Conclusions**

- The indicator provides quantitative or qualitative information that helps determine priorities for sustainable urban development and is the basis for setting sustainable policies for any district or a city.

- Urban sustainability indicators are the most effective tools that contribute to the transformation of sustainable thinking towards its actual application. It provides quantitative and qualitative tools and directs attention towards the studied phenomenon in an integrated manner. It integrates environmental, economic, social and institutional considerations, diagnoses deficiencies and provides an early and important warning in determining future development's priorities and therefore directing them towards the future.
- The participatory approach to the preparation of a set of sustainability can't be made clear or by his single side in this process must be made in a partnership.
- The participatory approach in preparing a set of sustainability indicators comes through different case studies, as there are no unified indicators can be applied to all cases or all cities. It is a participatory approach by which local community and local government can integrate local specificity into the final set of indicators.
- The process of selecting and organizing indicators must be drawn within a specific framework. Many international experiences have proven that following framework for devising and evaluating sustainability indicators is an important issue in the process of proceeding within scientific, logical and rational standards, frameworks and methods. The result is a set of indicators consistent with the studied phenomenon that setting priorities and providing early warning from the ideal case.
- The methodology is a tool that helps us follow the progress of the process. This methodology has produced (32 indicators) through which people and experts have been used to reach the results. This type of methodology can be applied to other cities for approaching

more sustainable urban forms. Results indicate the importance of this issue, as the indicator (the percentage of violations of the commercial sector over the residential sector and the percentage of violations on street sidewalks) occupied the highest rank among other indicators. In addition, it addresses the most important indicators that have a role in changing the urban form of El Kellej and Al Wardiya *mahallat* in Old Hilla. The number of green spaces, the population density and the number of slums are among these indicators.

## 5.4 Recommendations

It became clear through a set of final reached indicators that *the percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks* are clearly identified. This indicator is related to the shape and pattern of urban distribution, where the spread of horizontal expansions prevails widely. The trend towards compaction is related to the (Neotraditional Development Strategy), which has been issued as the trend towards intensification of what is already exists in urban construction through benefiting the filling of voids in urban districts. The policy of urban dictation, the rehabilitation of old areas and the reuse of bricks in order to control the rampant horizontal spread have been indicated.

- This type of work is directed towards the community and aimed to improve the quality of urban life and community health through healthy cities' program. The latter is directed towards reviving traditional city centers in which the levels of municipal services are low.

- The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks, as an effective indicator, is related to the shape and pattern of urban form, where horizontal spread prevails widely.
- Indicators issued with environmental dimensions indicates that the followed strategy should be concerned with the provision of environmental services, such as turning into a landfill and the number of waste recycling stations.
- Latter indicators require a clear fact related to the provision of municipal services that impact the health of city people. This appropriate strategy moves towards determining the provision of a health system.
- It is clear that most of the indicators are related to the efficiency of providing environmental municipal services. It has been indicated that the city has no clear development plan with specific objectives, as there is no plan that introducing the concept of sustainability. It is clear that these indicators must refer to a well-known fact when measured, as the level of quality of urban life in the city is generally declining and there is an inevitable gap between the standards.
- Drawing inspiration from ideas and indicators and using them as planning criteria for modern region and cities are the effective tools towards sustainable urban form.
- It is necessary to enhance the sense of belonging, privacy, and social cohesion among people, which comes through an effective spatial and functional considerations to create visual signs and dynamic effects to maintain a distinct urban identity.
- There is a significant informative deficiency regarding the basic information needed to complete development's plans in general and sustainable plans in particular for the city of Hilla, as the city does

not have an up-to-date database, if it is available. Therefore, the research relied on the information and data provided by studies conducted for the city Hilla, and “The reality of the situation,” which is the study of Dar Al-Handasah, Shaer and Associates for the year 2007.

- Disseminate environmental awareness campaigns for city’s residents, and how to maintain the city and its cleanliness and to reduce the waste of natural resources, such as water and soil.
- It is necessary to go towards spreading green spaces and preserving the natural environment and agricultural land. Thus, it is recommended to go towards a green city strategy and to rely on natural energies for heating, cooling, lighting, wind movement issues and solar radiation angles, as observed in the spatial and functional considerations of the traditional residential house.

### **5.5 Knowledge Provided by the Thesis**

- This thesis seeks to be pioneering by adding knowledge and understanding the development of a sustainable framework to provide indicators to measure the sustainable urban form.
- This research has carried out a new empirical study in the city of Hilla - Iraq, which supports and promotes the adoption of mechanisms to achieve sustainable urban form.
- This should be prioritized for future development and elaborated the details of the application of proposed sustainable evaluating framework.
- The author believes that this study has made a major contribution to the body of knowledge on sustainability by developing a framework that combines Bottom–Up and Top–Down approaches and provides a flexible, participatory and systematic one that will facilitate the

formulation, selection and priorities of key indicators which can guide the assessment and action towards improving sustainability.

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# Appendices

## Appendix A: The full sets of objectives formulated in the two step

<b>Problems</b>	<b>Objectives</b>	<b>Indicators</b>
Lack of sanitary landfills	Increasing sanitary landfills.	The number of sanitary landfills
A shortage of health structures and services	Increasing structures and improving health services	Number of hospitals, health centers and counseling centers
Unavailability of potable water	Providing safe drinking water	The number of neighborhoods suffering from a lack of potable water
Inefficiency of the sewage network	Increasing the efficiency of the sewage network	The percentage of increasing the efficiency of the sewage network
Environmental pollution	Reduce environmental pollution	environmental pollution rate
Increase the number of cars	Reduce the number of cars	car numbers
Underdevelopment and weakness of local industries	Development and improvement of local industries	The rate of support provided to local industries
An increase in population density	Decreased population density	Population density
Increasing the proportion of drugs	Reducing the proportion of drugs	drug ratio
Lack of suitable (tourist) hotels	Increasing the number of hotels	The number of hotels in relation to the number of visitors
There are no waste recycling plants	Providing waste recycling plants	The number of waste recycling plants
A shortage of housing complexes	An increase in residential complexes	The number of residential complexes
Exodus from the countryside to the city	Reducing migration from the countryside to the city	The rate of displacement from the countryside to the city
An increase in the encroachments of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	Reducing the encroachment of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks
Decreased per capita income	Increasing per capita income	Percentage increase in per capita income
Weak educational structures	Increasing interest in educational structures	Number of primary, middle, and middle schools in proportion to population
There is no implementation of roads implemented with the new standards and a shortage in the number of	Implementation of roads implemented with new standards and an increase in the number of bridges and pedestrian bridges	Percentage of roads implemented with new standards, number of bridges and pedestrian bridges

bridges and pedestrian bridges		
Weakness in the communication network and the Internet	Improve the communication network and the Internet	Telecom service rates and internet speed
Shortage of power and fuel supplies	Increase in power and fuel supply	Energy and fuel prices and availability
Turning cesspools into waste dumps	Elimination of troughs that turn into landfills	The number of troughs converted into waste dumps
Increasing deaths in traffic accidents	Reducing deaths in traffic accidents	The number of deaths in traffic accidents
Increasing the import of foreign goods	Reducing the import of foreign goods	Percentage of importing foreign goods
Poor use of the land	Land use improvement	Land Use Efficiency Ratio
There is no hierarchy (city - sector - district - locality) in small greenhouse	Re-designing the city and creating a hierarchy (local, district, sector, city)	The existence of a hierarchy (local, district, sector, city)
Increasing random expansion on agricultural land	Reducing the random expansion of agricultural land	Number of slums
Lack of interest in the old neighborhoods of the city of Hilla (Kilge, Al-Wardiya)	Attention to the the old neighborhoods of the city of Hilla (KilgeAl-Wardiya)	The percentage of money allocated by the local government to take care of the old neighborhoods
Neglecting the Shatt al-Hilla, which has a role in the morphology of al-Hilla	Taking care of the river front of the Shatt al-Hilla	The percentage of redevelopment in the river front area
Not paying attention to religious shrines	Taking care of religious shrines	The number of religious shrines that have been redeveloped
Bypassing empty lands inside residential neighborhoods to place generators or turn them into waste dumps	Preventing the acquisition of green areas inside the small sob	The number of green spaces inside the small sob that has been crossed
Increasing the level of crime in the slums	Reducing the level of crime in slums	The number of crimes committed annually
Lack of green spaces in small greenhouses	Application of green spaces in small greenhouses	Percentage of green areas in small greenhouses
Poor public transportation	Improving public transportation services	Percentage of the city's population that uses public transportation
deterioration of the ecosystem and global warming	Improving of the ecosystem	Per capita consumption per hectare
there is no street furniture and street spaces and paths for	there is street furniture and street spaces and paths for pedestrians that protect	Proportion of well-designed streets within standards

pedestrians that protect their safety	their safety	
lack of infrastructure of civil services such as sewage system and telephones	Increasing the efficiency of infrastructure of civil services such as sewage system and telephones	Percentage of streets that have sewers and the Internet
the mix of uses and urban functions in the neighbourhoods is poor	the mix of uses and urban functions in the neighbourhoods	The percentage of diversity in terms of land use in the neighbourhoods
The Change of Lifestyle and Travelling Culture	Improving public transportation services	The percentage of people using public transportation and walking
A shortage of health structures and services	Increasing structures and improving health services	Number of hospitals, health centers and counseling centers
Increasing slums	Reducing slums	Number of slums
Lack of interest in the heritage neighborhoods in the small sob	Attention to the heritage neighborhoods in the small sob	The percentage of money allocated by the local government to take care of the heritage neighborhoods

## Appendix B: Questionnaire survey

استمارة تقييم مؤشرات الاستدامة في المنطقة التراثية (الكلج والوردية) في الصوب الصغير  
لمدينة الحلة

الاسم:.....

تاريخ اليوم: .....

العنوان (المدينة- الحي- المنطقة): .....

رقم الهاتف:.....

تاريخ الميلاد:.....

مكان العمل:.....

الجنس:.....

يرجى اختيار مجال الخبرة :  أكاديمي  ممارس

اختيار مستوى التعليم:  بكالوريوس  ماجستير  دكتوراه  اخرى

منذ متى تعيش في مدينة الحلة:  أكثر من ٥ سنوات  أكثر من ١٠ سنوات

أكثر من ٢٠ سنة  أكثر من ٣٠ سنة

يُرجى تحديد أحد المستويات الأربعة المهمة لمؤشرات الاستدامة لمدينة الحل

ملاحظة: غير مهم = ١ ، أقل أهمية = ٢ ، مهم = ٣ ، مهم جدًا = ٤

المؤشرات	غير مهم	أقل أهمية	مهم	مهم جدًا
نسبة الشوارع التي بها مجاري وانترنت				
عدد الوحدات السكنية العشوائية				
مواد البناء المستخدمة وطبيعة التصميم				
عدد المدارس والمراكز الصحية بالنسبة لعدد سكانها				
مقدار الدعم للامن الاجتماعي				
معدل التلوث البيئي				
عدد الأشخاص الذين ليس لديهم وحدات سكنية				
نسبة التنوع في استخدامات الأراضي في الأحياء				
نسبة الأبنية التي تحمل التراث العمراني للمدينة				
نسبة تجاوزات القطاع التجاري على القطاع السكني ونسبة التجاوزات على أرصفة الشوارع				
عدد الأحياء التي تعاني من نقص المياه الصالحة للشرب				
الوقت المستغرق للوصول إلى الخدمات المختلفة				
نسبة الشوارع بحالة وتصميم جيد				
عدد وأنواع أنماط الشوارع				
عدد الأنشطة التي يشارك فيها أهل المحلة				
نسبة أخذ وتطبيق معايير التخطيط				
عدد محطات إعادة التدوير				
عدد السيارات				
الاختلاف في شدة حركة السيارات والمركبات				
عدد الجرائم المرتكبة سنوي				
نسبة المساحات الخضراء				
أسعار الطاقة والوقود وتوفرها				
نسبة الأموال التي تخصصها الحكومة المحلية				

				للعناية بالأحياء التراثية
				عدد وأنواع أنظمة البناء
				نسبة الأماكن العامة التي تحولت إلى مكب نفايات
				معدل الدعم المقدم للصناعات المحلية
				عدد الأشخاص في هكتار واحد
				عدد land mark في الأحياء
				نسبة كفاءة نظام النقل
				النسبة المئوية للسياسة الحضرية المحدثة لتخطيط الأحياء
				نسبة الأشخاص الذين يستخدمون المواصلات العامة والمشى
				نسبة المخدرات

## Appendix C: Responses of questionnaire

**indicator1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	3	7.5	7.5	17.5
	3.00	10	25.0	25.0	42.5
	4.00	23	57.5	57.5	100.0
	Total	40	100.0	100.0	

**indicator2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	7	17.5	17.5	20.0
	3.00	9	22.5	22.5	42.5
	4.00	23	57.5	57.5	100.0
	Total	40	100.0	100.0	

**indicator3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	5	12.5	12.5	12.5
	3.00	13	32.5	32.5	45.0
	4.00	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

**indicator4**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	6	15.0	15.0	20.0
	3.00	10	25.0	25.0	45.0
	4.00	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

### indcator5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	5	12.5	12.5	15.0
	3.00	11	27.5	27.5	42.5
	4.00	23	57.5	57.5	100.0
	Total	40	100.0	100.0	

### indcator6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	11	27.5	27.5	37.5
	3.00	15	37.5	37.5	75.0
	4.00	10	25.0	25.0	100.0
	Total	40	100.0	100.0	

### indcator7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	2	5.0	5.0	7.5
	3.00	20	50.0	50.0	57.5
	4.00	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

### indcator8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	3	7.5	7.5	7.5
	2.00	10	25.0	25.0	32.5
	3.00	11	27.5	27.5	60.0
	4.00	16	40.0	40.0	100.0
	Total	40	100.0	100.0	

### indcator9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	5	12.5	12.5	12.5
	2.00	20	50.0	50.0	62.5
	3.00	13	32.5	32.5	95.0
	4.00	2	5.0	5.0	100.0
	Total	40	100.0	100.0	

### indcator10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	7	17.5	17.5	17.5
	2.00	5	12.5	12.5	30.0
	3.00	11	27.5	27.5	57.5
	4.00	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

### indcator11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	3	7.5	7.5	7.5
	3.00	17	42.5	42.5	50.0
	4.00	20	50.0	50.0	100.0
	Total	40	100.0	100.0	

### indcator12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	7	17.5	17.5	22.5
	3.00	19	47.5	47.5	70.0
	4.00	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

**indicator13**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	10	25.0	25.0	30.0
	3.00	15	37.5	37.5	67.5
	4.00	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

**indicator14**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	6	15.0	15.0	15.0
	2.00	10	25.0	25.0	40.0
	3.00	16	40.0	40.0	80.0
	4.00	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

**indicator15**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	6	15.0	15.0	20.0
	3.00	14	35.0	35.0	55.0
	4.00	18	45.0	45.0	100.0
	Total	40	100.0	100.0	

**indicator16**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	5	12.5	12.5	12.5
	2.00	4	10.0	10.0	22.5
	3.00	14	35.0	35.0	57.5
	4.00	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

### indicator17

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	11	27.5	27.5	30.0
	3.00	18	45.0	45.0	75.0
	4.00	10	25.0	25.0	100.0
	Total	40	100.0	100.0	

### indicator18

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	6	15.0	15.0	15.0
	3.00	15	37.5	37.5	52.5
	4.00	19	47.5	47.5	100.0
	Total	40	100.0	100.0	

### indicator19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	5	12.5	12.5	12.5
	2.00	8	20.0	20.0	32.5
	3.00	13	32.5	32.5	65.0
	4.00	14	35.0	35.0	100.0
	Total	40	100.0	100.0	

### indicator20

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	4	10.0	10.0	12.5
	3.00	11	27.5	27.5	40.0
	4.00	24	60.0	60.0	100.0
	Total	40	100.0	100.0	

### indicator21

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	3	7.5	7.5	7.5
	2.00	13	32.5	32.5	40.0
	3.00	11	27.5	27.5	67.5
	4.00	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

### indicator22

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	6	15.0	15.0	25.0
	3.00	14	35.0	35.0	60.0
	4.00	16	40.0	40.0	100.0
	Total	40	100.0	100.0	

### indicator23

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	14	35.0	35.0	45.0
	3.00	17	42.5	42.5	87.5
	4.00	5	12.5	12.5	100.0
	Total	40	100.0	100.0	

### indicator24

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	3	7.5	7.5	7.5
	2.00	9	22.5	22.5	30.0
	3.00	15	37.5	37.5	67.5
	4.00	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

### indicator25

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	9	22.5	22.5	25.0
	3.00	8	20.0	20.0	45.0
	4.00	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

### indicator26

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	6	15.0	15.0	15.0
	2.00	5	12.5	12.5	27.5
	3.00	15	37.5	37.5	65.0
	4.00	14	35.0	35.0	100.0
	Total	40	100.0	100.0	

### indicator27

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	7	17.5	17.5	22.5
	3.00	15	37.5	37.5	60.0
	4.00	16	40.0	40.0	100.0
	Total	40	100.0	100.0	

### indicator28

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	4	10.0	10.0	15.0
	3.00	10	25.0	25.0	40.0
	4.00	24	60.0	60.0	100.0
	Total	40	100.0	100.0	

**indicator29**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	11	27.5	27.5	32.5
	3.00	17	42.5	42.5	75.0
	4.00	10	25.0	25.0	100.0
	Total	40	100.0	100.0	

**indicator30**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	6	15.0	15.0	15.0
	2.00	4	10.0	10.0	25.0
	3.00	15	37.5	37.5	62.5
	4.00	15	37.5	37.5	100.0
	Total	40	100.0	100.0	

**indicator31**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	12	30.0	30.0	40.0
	3.00	12	30.0	30.0	70.0
	4.00	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

**indicator32**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	10	25.0	25.0	30.0
	3.00	20	50.0	50.0	80.0
	4.00	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

## مؤشرات استدامة الشكل الحضري: الحالة الدراسية محلات الكلج والوردية في الحلة القديمة

### المستخلص

تعكس مؤشرات الاستدامة الاتجاهات الرئيسية في البيئة والأنظمة الاجتماعية والاقتصادية ورفاهية الإنسان ونوعية الحياة. يمكن أن تلعب المؤشرات أدوارًا مهمة في تمكين وتعزيز ورصد الاستدامة. تناولت العديد من الدراسات موضوع مؤشرات الاستدامة الحضرية في مختلف دول العالم، ووضعت العديد من هذه المؤشرات في محاولة لإيجاد توازن بين التنمية الاقتصادية والاجتماعية، والعوامل البيئية، ووجود دراسات حول مدينة الحلة لكنها بحاجة إلى تطوير. تناولت هذه الرسالة موضوع تحديد آلية ومنهجية اختيار وتقييم مؤشرات الاستدامة الشكل الحضري لـ (دراسة حالة)، ولأن مراكز اتخاذ القرار في المدينة تنأى بنفسها عن ادخال مفهوم الاستدامة في القرار. - أصبحت عمليات تحقيق الاستدامة خطوة مهمة، وبالتالي، بدأ البحث من تطوير مؤشرات الاستدامة لتحقيق الشكل الحضري المستدام والوصول الى الهدف المتمثل في إيجاد مؤشرات لقياس الشكل الحضري المستدام لـ (المنطقة التقليدية - الكلج والوردية) من خلال فرضية وجود منهجية هي الأساس للانتقال إلى فكر أكثر استدامة، حيث أن المدخلات هي مجموعة من المؤشرات المستدامة للشكل الحضري، وبالتالي فإن الجزء النظري من الأطروحة يتعلق بالجانب المفاهيمي للبحث. من الناحية العملية، يتم تطبيق المنهجية المعتمدة في دراسة الحالة عمليًا، باتباع نهج تشاركي للوصول إلى مجموعة نهائية من المؤشرات لتحقيق شكل حضري مستدام وتنتهي بمجموعة من التوصيات ذات الصلة، ومجموعة من المؤشرات للاستدامة الشكل الحضري، بناءً على نتائج البحث.



جمهورية العراق  
وزارة التعليم العالي والبحث العلمي  
جامعة بابل / كلية الهندسة  
قسم هندسة العمارة

## مؤشرات استدامة الشكل الحضري : الحالة الدراسية محلات الكلج والوردية في الحلة القديمة

رسالة

مقدمة إلى قسم هندسة العمارة في كلية الهندسة في جامعة بابل كجزء من  
متطلبات نيل درجة الماجستير في علوم هندسة العمارة

من قبل

رفل حاكم محييد حميري

(بكالوريوس في علوم هندسة العمارة / جامعة بابل - ٢٠١٩ )

اشراف

الاستاذ المساعد الدكتور : مصطفى العلواني

Republic of Iraq  
Ministry of Higher Education and Scientific Research  
University of Babylon College of Engineering  
Architecture Engineering Department



# **Sustainability Indicators of Urban Form : The Case of El-Kellej & Al-Wardiya Mahallat in Old Hilla**

**A thesis**

*Submitted To The Department of Architecture Engineering, College  
Of Engineering of Babylon University In A Partial  
Fulfillment of The Requirements For The Degree of Master  
of Science In Architecture Engineering*

**By**

***Rafal Hakim Mhaimed Humairi***

**B.Sc. Architecture Engineering, 2019  
University of Babylon**

*Supervised by*

***Asst. Prof. Dr. Mustafa Al-Alwani***

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ  
أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العلي العظيم

سورة البقره (ايه 32)

***TO MY FAMILY  
WITH ALL OF  
MY LOVE AND  
RESPECT***

*Rafal Hakim Hamiri*

2022

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Finally, special thanks to my dear *father , mother , brothers , my husband (Mustafa) and my daughter (Linda)* for their love and support which have been a source of strength and motivation.

# **Sustainability Indicators of Urban Form : The Case of El-Kellej & Al-Wardiya Mahallat in Old Hilla**

## **Abstract**

Sustainability indicators reflect the major trends in environment, social and economic systems, human well-being, and quality of life, concisely, measure what people are interest with. Indicators can play important roles in enabling and promoting and monitoring sustainability. Many studies have addressed the issue of urban sustainability indicators in various countries of the world, and set many of these indicators in an attempt to find a balance between economic and social development, and environmental factors in proportion to these countries, the presence of studies on the city of Hilla but need to develop. This thesis has addressed the issue of determining the mechanism and methodology for selection and evaluation of sustainability indicators urban form for( case study ), and because the decision-making centers in the city turn away, from the introduction of the concept of sustainability in decision-making processes ,sustainability become an important step ,thus, the research started from the problem of the need to develop sustainability indicators to measure the sustainable urban form to achieve the goal of finding indicators for measure sustainable urban form of the (traditional area Al- Kilge and Wardia) through the hypothesis of the existence of a methodology that is the basis for the transition to a more sustainable thought, since the inputs are a set of sustainable indicators for the urban form, and thus the theoretical part of the thesis has explained everything related to the conceptual side of the search . On the practical side, the methodology adopted in the case study are applied practically, following a participatory approach to arrive at a final set of indicators for achieving a sustainable urban form and ended with a set of recommendations related , a set of indicators for sustainability of urban form, based on research results.

## LIST OF CONTENTS

No.	Title	Page No
<b>Chapter One: Introduction</b>		
<b>1.1</b>	Introduction	1
<b>1.2</b>	Research problem	3
<b>1.3</b>	Research Questions	3
<b>1.4</b>	Research hypothesis	4
<b>1.5</b>	Aims	4
<b>1.6</b>	Objectives	4
<b>1.7</b>	Research Methodology	5
<b>1.8</b>	Thesis structure	7
<b>Chapter Two: Literature Review</b>		
<b>2.1</b>	Introduction	9
<b>2.2</b>	Sustainability	9
<b>2.2.1</b>	Environmental Sustainability	10
<b>2.2.2</b>	Social Sustainability	13
<b>2.3</b>	The Underlying Elements Of Social Sustainability	15
<b>2.4</b>	The Emerging Criteria For Social Sustainability	16
<b>2.5.</b>	The concept of indicators and the purpose of their use	17
<b>2.6.</b>	The Difference between the Traditional Urban Indicators and the Urban Sustainability Indicators	18
<b>2.6.1</b>	The most important options for using urban sustainability indicators	18
<b>2.7.</b>	Potential Approaches to the Organization and Design of Indicators	20

<b>2.8.</b>	Indicators Framework:	22
<b>2.8.1</b>	Some International Frameworks and Common Local Frameworks:	25
<b>2.9</b>	Sustainable Urban Form	26
<b>2.9.1</b>	Compactness	27
<b>2.9.2</b>	Sustainable Transport	27
<b>2.9.3</b>	Mixed Land Uses	28
<b>2.9.4</b>	The Housing Density	28
<b>2.9.5</b>	Accessibility	29
<b>2.9.6</b>	Urban Healthy System	29
<b>2.9.7</b>	Green Urbanism	30
<b>2.9.8</b>	Planning Passive	30
<b>2.10.</b>	Sustainable Development Strategies	30
<b>2.10.1.</b>	Neotraditional Development Strategy	31
<b>2.10.2.</b>	Strategies for Sustainable Cities	32
<b>2.11.</b>	Indicators of Foundations or Features of the Urban Environment To Achieve a Sustainable Urban Form:	34
<b>2.12.</b>	Global Studies on Urban Form and Sustainability	36
<b>2.13.</b>	Summary	41
<b>Chapter Three: Analytical study of El Kellej and Al Wardiya mahallat in Old Hilla</b>		
<b>3.1</b>	Introduction	43
<b>3.2</b>	Location of Babel Governorate	43
<b>3.3</b>	Traditional Area Location	45

3.4.	The Morphological Stages Experienced by the City of Hilla (The Traditional District)	46
3.4.1	The First Morphological Stage (Before 1921)	49
3.4.2	The second morphological stage (1921-1950)	50
3.4.3	The third morphological stage (1951-1970)	51
3.4.4	Contemporary Fourth Morphological Stage (1971-2020)	53
3.6	Case Study: El Kellej and Al Wardiya <i>mahallat</i> in Old Hilla.	54
3.6.1	El Kellej Mahalla location	54
3.6.1.A	The Social and Cultural Context of Mahalla -El Kellej	56
3.6.1.B	population	56
3.6.1.C	Characteristics of El Kellej <i>Mahalla</i>	57
3.6.2.	Al-Wardia Mahalla location	59
3.6.2.A	Social and Cultural Context of Al-Wardia Mahalla	60
3.6.2.B	population	61
3.6.2.C	Characteristics of Mahalla Al-Wardia	62
3.7	The Concept of Public/Private	63
3.8.	Social Privacy and Environmental factors of the Traditional Home	64
3.9.	Principles Of Sustainability in The Traditional House	67
3.10.	Indications of The Traditional House and Al <i>mahalla</i>	69
3.11.	The Current Urban form of the Traditional Area (El Kellej and Al-Wardia )	70
3.11.1.	Emerged New <i>Mahallat</i> From El Kellej and Al-Wardiya	72
3.12.	Summary	75
<b>Chapter Four: Applying The Research Methodology, Results And Discussions</b>		
4.1	Introduction:	76

4.2	The First Step: Identification Problems and needs	76
4.2.1	Review of Literature, Archive Documents, and Secondary Data	78
4.2.2	Focus Groups	82
5.2.3	Interview Method	88
4.2.3.A	Some of the problems that were noticed during the process of conducting interviews and focus groups	95
4.3	Final Problems	96
4.4	The Second Step: Finding sustainable indicators for the urban form	97
4.4.1	Objectives Formulation	97
4.4.1.A	Techniques for Objectives Formulation	98
4.4.2	Indicators Formulation:	100
4.4.3	Selection, Choosing and Ordering Indicators or Ranking of Indicators	103
4.3.4.A	Indicator Selection	103
4.3.4.B	Indicator Ranking	104
4.5:	Questionnaire Results and Discussions	106
4.6	Final Set of Sustainability and Urban Form Indicators for Heritage Area (El Kellej and Al-Wardiya), in the City of Hilla	111
4.7	Summary	115
<b>Chapter five: Conclusions and Recommendations</b>		
5.1	Introduction	117
5.2	Answering the Research Questions	117
5.3	Conclusions	118
5.4	Recommendations	120
5.5	Knowledge Provided by the Thesis	122

## LIST OF Figures

<b>Figure No.</b>	<b>Title</b>	<b>Page No</b>
<b>Figure (1-1)</b>	detailed Scheme of Research Methodology (the researcher 2022)	6
<b>Figure (1-2)</b>	General scheme shows the second step to reach the indicators of the sustainability of the urban form, based on the first step(the researcher 2022)	7
<b>Figure(2-1)</b>	two opposite masses, the one that faces a desired direction can shade the courtyard floor during summer afternoons (Almumar,2019,pp145)	11
<b>Figure (2.2)</b>	Privacy In Traditional Homes (Samir And Arayici,2020,Pp225)	14
<b>Figure (2.3)</b>	The safety of Traditional Environment (Samir and Arayici,2020,pp226)	15
<b>Figure (2-4)</b>	The foundations or features of the urban environment related to achieving a sustainable urban form (Hiyam, 2015 , p 46).	27
<b>Figure 3-1</b>	Babel province map (NGO Coordination Committee for Iraq, 2015 pp. 49-53).	44
<b>Figure 3-2</b>	The location of the old area according to the master plan of the city of Hilla for the year 2006-2030,( The researcher worked on Ministry of Municipalities and Public Works 2013)	45
<b>Figure 3-3</b>	The origin of the suit in these mahallat ( Hilla Traditional Center,2017)	46
<b>Figure (3-4)</b>	Morphological stages of the expansion of the city of Hilla (Al-Rubaie, 2002, p135)	47

<b>Figure (3-5)</b>	Morphological stages of the expansion of traditional area (The researcher worked on Al-Rubaie, 2002 )	48
<b>Figure (3-6)</b>	El Kellej <i>Mahalla</i> location according to the master plan of the city of Hilla for the year 2006-2030, (Ministry of Municipalities and Public Works 2013 and Nasir and Gado'o, 2016, p. 129).	55
<b>Figure (3-7)</b>	El Kellej <i>Mahalla</i> plan (Hilla Municipality Directorate, 2010, p 1)	57
<b>Figure( 3-8)</b>	El Kellej <i>Mahalla</i> plan (The researcher,2022)	58
<b>Figure (3-9)</b>	Al-Shanasheel and the old aziqqa in the Mahalla of El Kellej	59
<b>Figure(3-10)</b>	Al-Wardia location (The researcher,2022)	60
<b>Figure 3-11</b>	Al-Wardiya Mahalla in Hilla between the years 1947-1957 (Museum of Contemporary Al- Hilla)	61
<b>Figure 3-12</b>	Al-Wardia Mahalla Museum of Contemporary Al- Hilla)	62
<b>Figure 3-13</b>	Social space & privacy in traditional house	66
<b>Figure 3-14.</b>	The courtyard house, Dar Babil in Al-Hilla-Iraq. (Al-Thahab et al. .2014.p76)	66
<b>Figure 3-15</b>	basement, ground floor and first floor of the courtyard house building ( Fathulla ,2016,p 17)	67
<b>Figure (3-16)</b>	The traditional area (El Kellej and Al-Wardia ) at the present time(The researcher 2022)	72
<b>Figure (3-17)</b>	Some Of New Mahallat ( <b>The researcher 2022</b> )	74
<b>Figure (3-18)</b>	The Traditional Area (El Kellej and Al-Wardiya) (The researcher 2022).	74
<b>Figure 4-1</b>	A general scheme of the first step (issues identification) of Methodological process (The	77

	researcher ,2022)	
<b>Figure 4-2:</b>	Shows Some of the problems that were noticed during the process of conducting interviews and focus groups (Author,2022)	96
<b>Figure (4-3)</b>	General scheme of objective formulation ( <b>The researcher,2022</b> ).	98
<b>Figure ( 4.4)</b>	shows the percentage of answers by expert participants in the questionnaire	112
<b>Figure (4.5)</b>	the relationship between the average and the standard deviation of the indicators	114

## LIST OF TABLES

Table No.	Title	Page No
Table( 2.1)	Traditional and emerging social sustainability key themes (Abdul Kadir and Jamaludin ,2013,pp 181)	16
Table (2.2)	Criteria for social sustainability (Abdul Kadir and Jamaludin ,2013,pp 181)	17
Table(2-3)	Methodological frameworks for developing sustainability indicators showing their approach( Al-Alwani,2014 ,pp52-53).	20
Table(2- 4)	main framework types used for developing sustainability indicators ( <b>Maclaren, 1996 , Al-Alwani,2014, p 48).</b>	22
Table (2-5)	sustainability frameworks for indicator development and identified the frameworks( Al-Alwani,2014,p 49)	24
Table (2-6)	Indicators of the urban environment that relate to achieving a sustainable urban form	34
Table (2-7)	Global Studies on urban form and sustainability	36
Table( 3.1)	The population of El Kellej <i>Mahalla</i> ( <b>Nasir and Gado'o, 2016, p. 130</b> )	56
Table( 3.2)	The population of Al-Wardia Mahalla (Nasir and Gado'o,2016, p 130)	61
Table (3.3)	<b>Some</b> of the indications of the traditional house and al <i>mahalla</i>	69
Table (4.1)	Problems of Traditional District (Al- Kellej and Al-Wardiya) in Hilla identified through document source analysis	79
Table( 4.2)	Problems of Traditional District (Al- Kellej and Al-	83

	Wardiya) in Hilla identified through focus group discussions	
<b>Table (4.3)</b>	Problems of Traditional District (Al- Kilge and Al- Wardiya) in Hilla gathered through interview	89
<b>Table( 4.4)</b>	shows set of final problems	96
<b>Table (4.5)</b>	formulation of objectives	99
<b>Table (5.6)</b>	formulation of indicators	101
<b>Table (4.7)</b>	shows the average, standard deviation and rank of each indicator	108

## Glossary of Arabic Terms

<i>mahalla</i> =	Traditional Neighborhood Unit in Iraq
<i>mahallat</i> =	Traditional Neighborhood Unit in Iraq
<i>al souwb al saghir</i> =	East Side of the City of Hilla-Iraq
<i>al souwb al kabir</i> =	West Side of the City of Hilla-Iraq
<i>zuqaq</i> =	Traditional Alley of al Mahalla
<i>aziqqa</i> =	Traditional Alleys of al Mahalla
<i>Suq el Amaar</i> =	Al-Ammar Market in the east side of the Old City of Hilla - Iraq
<i>Badgeer</i> =	Air catcher of the traditional courtyard house in Iraq
<i>Al Souq</i> =	The market
<i>Agd</i> =	The traditional alley of the mahalla in Old Hilla
<i>Shanashil</i> =	Wood lattice windows typology towards the outside sphere in Iraqi traditional houses

# **Chapter One**

## **INTRODUCTION**

## Chapter One

# INTRODUCTION

## 1.1 Introduction

There has been a considerable amount of research that defines and characterizes the form of the sustainable city, and which urban forms may most affect sustainability. It is a complex issue. The physical dimensions of urban form may include its size, shape, land uses, configuration and distribution of open space - a composite of a multitude of characteristics, including a city's transportation system and urban design features. However, its sustainability depends on more abstract issues environmental (including transport), social and economic. Research suggests that, not one, but a number of urban forms may be sustainable . Yet much of the debate about the sustainability of cities and urban forms has focused on increasing the density of development, ensuring a mix of uses, containing urban sprawl' and achieving social and economic diversity and vitality - often characterised as the concept of a 'compact city'( Dimensions of the Sustainable City2 , Jenks,2009,P 1).Urban form is a spatial composition of elements that repeat, and if based on certain sustainable concepts, can lead to the sustainability of cities. Various approaches are explored for achieving sustainable urban development through a city's form. Jabareen identifies four urban forms based on

seven design principles to attain the goals of sustainable urban development. The seven concepts or principles of sustainable cities are (a) Compactness (b) Sustainable Transport (c) Density (d) Mixed Land uses (e) Diversity (f) Passive Solar Design and (g) Greening. All of these aim at reducing travel

distances, saving energy, increase quality of life, efficient use of land, save infrastructure costs, etc. contributing to sustainable urban development. The four identified sustainable urban forms by Jabareen are Neo-traditional Development, Urban Containment, Compact City and Eco-City ;comprised of combination of the seven design principles or concepts. Each of these urban forms contribute differently in making cities sustainable, however conceptually compact city seems to be more convincing than other urban forms( Kotharkar et al 2014 ,p 2).Compact cities can promote sustainability by limiting the losses of surrounding natural and agricultural areas; reducing the amount of travel, car dependency and energy use for transport; reducing energy use; limiting the consumption of building materials for infrastructure; and maintaining the diversity and possibilities for choice among workplaces, service facilities and social contacts, Other studies stated, that compact developments can cause severe congestion in transport network, increase land and dwelling prices and create social exclusion (Breheny, 1997, pp.209-217) .

Indicators of urban sustainability have become an alternative approach in an urbanizing world that takes the city in all its sectors, as an integrated analytical unit, to know the extent of upgrading or deterioration in the quality of life in all its human, economic, social, urban, demographic, environmental and cultural implications. The need for indicators emerged, when the actual application of the term sustainability with all its pillars began to achieve a balance between them. Indicators were used to assess the urban form, which is known as urban form as “the spatial pattern of the large, inert, permanent physical objects in a city”, (Lynch ,1981,p.47). dimensions of urban form may include its size, shape, land uses, configuration and distribution of open space a composite of a multitude of characteristics, including a city’s transportation system and urban design features .One of the reasons why the urban form of cities is important

because it is seen as a major contributor to the high level of energy consumption, it also affects traveling behaviour, social integration, and consequently impacts the quality of air and soil in local open spaces, and the global climate (Cervero, 1997,pp199-219) .

In this thesis, a systematic method is used to find sustainable indicators to measure the sustainable urban form in the study area, the traditional area (El-Kellej and Al-Wardiya) in the alsawb alsaghir of the city of Hilla.

## **1.2 Research problem**

Many studies have dealt with the issue of sustainability indicators in various countries of the world and developed many of these indicators in an attempt to find a balance between the economic, social and environmental aspects and what is appropriate for those countries. There are such studies for the city of Hilla, but they need to be developed in order to apply them successfully at the local level, and this leads to the research problem of developing sustainability indicators to measure the sustainable urban form

## **1.3 Research Questions**

The question addressed in this thesis is how to develop a framework that provides suitable sustainable indicators that will lead to a more sustainable urban form in the traditional area. To answer this basic question, the study identifies important secondary research questions

- 1- What types of frameworks for evaluating indicators are there currently?
2. How could a framework for evaluating sustainable urban form be set up and organized?
- 3-How effective is the sustainability evaluation framework as a tool and a system for creating a sustainable region in real life?

## 1.4 Research hypothesis

The urban form can affect its sustainability several studies have tried to prove that sustainability of a city might depend on its shape, size, density and land use distribution. Urban form has positive or negative impact on accessibility to facilities, travel attributes (distance and time), energy used, social equity, efficient use of land, economic benefits, reduction in CO2 emissions, liveliness, etc .

The hypothesis is the existence of a methodology that is the basis for the transition to a more sustainable thought, since the inputs are a set of sustainable indicators for the urban form .

## 1.5 Aims

The main goal of this study is to, using the research questions as a guide and within the context of the research, finding indicators to measure the sustainable urban form of the traditional area (El-Kellej and Al-Wardiya) in the alsawb alsaghir of the city of Hilla. Within a methodological framework that would formulate, select and prioritize indicators, work can then be done to improve sustainability at the local level

## 1.6 Objectives

To reach the general goal of the research, several goals have been developed, as follows

1. To introduce the idea of sustainable cities.
2. To investigate the urban form characteristics of traditional area(El-Kellej ,Al-Wardiya) .
3. To comprehend the significance and role of sustainability indicators

4. To evaluate the many sustainability indicator frameworks already in use and comprehend their advantages and disadvantages.
5. To develop a practical method for evaluating the sustainability of urban forms.
- 6.To test the proposed methodological framework in a selected case study (traditional area)
7. To rank sustainability urban form indicators in order of priority in the selected case study
- 8.To propose future recommendations

## 1.7 Research Methodology

The proposed methodology for this thesis, which can be summarized at the beginning, it led to the adoption of a top-down/bottom-up approach. like this approach turns out to be the best way to develop indicators that (scientifically and publicly valid with stakeholders and local communities. The methodological framework includes two steps: the first step defining the problem is to identify the problems and sustainability problems facing traditional area (El-Kellej ,Al-Wardiya) in alsawb alsaghir in the city of Hilla and their root causes (social, economic, environmental and institutional)through several tools that can be used, which are documentary sources, and gather more information and interviews with citizens. In addition, strong community participation through focus group meetings to highlight problems and desires related to sustainability (such as Hiyam, 2015, Ameera and Haider, 2021 ,AL-Alwani,2014,AL- Anbary, et al.,2020, Rasha,2019, Shaker & Partners 2007 , Directorate of Urban Planning, Babylon ) Figure (1-1) .The second step includes, formulating the goal, formulating the indicator, and selecting the indicator. The first set of suggested indicators contained 40 indicators. This set of suggested indicators were reviewed and analyzed by means of a series of shared

insights from the literature and through consultations with experts from specific regions. This review phase was used to reformulate and select valid and useful indicators (comparable, measurable and sensitive). The second set of indicators (after the first revisions) contains 32 indicators. Indicators are arranged on the basis of priority to determine the final set of indicators , participants(40 expert in Hilla) will be asked to test the level of significance of each indicator included in the questionnaire Figure (1-2).

SPSS was used during this study. The traditional area (El-Kellej and Al-Wardiya) in alsawb alsaghir of the city of Hilla was selected as a case study to demonstrate the applicability of the methodological framework in a realistic case study.

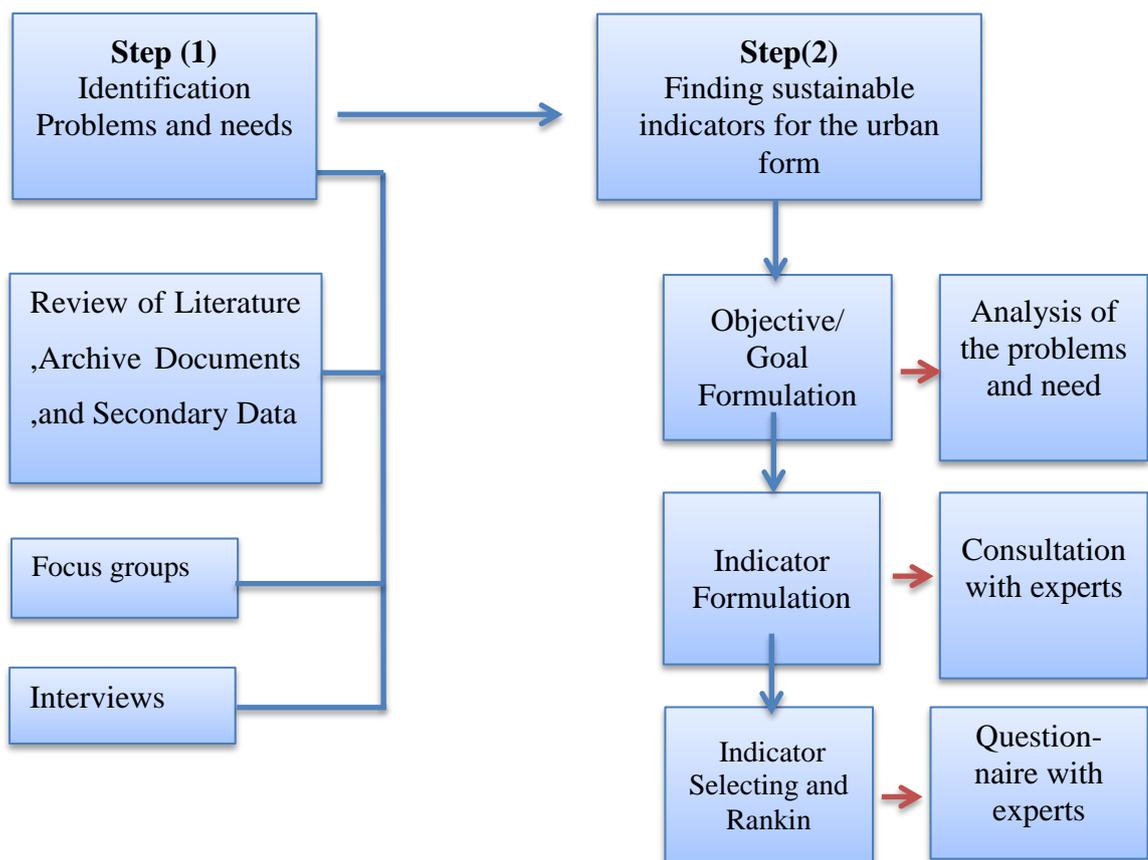
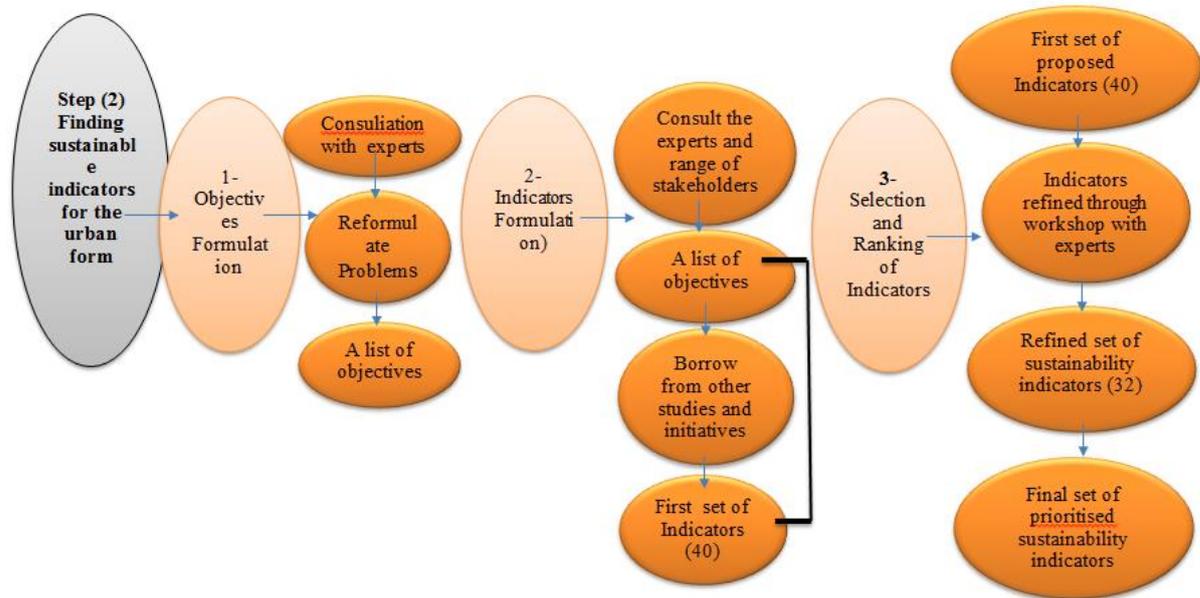


Figure (1-1) :detailed Scheme of Research Methodology (the researcher 2022)



**Figure (1-2)** General scheme shows the second step to reach the indicators of the sustainability of the urban form, based on the first step(the researcher 2022)

## 1.8 Thesis structure:-

This thesis is divided into six chapters:

**Chapter One:** An introduction that provides a general definition of the subject of the study. Explain the research problem, research questions, research hypothesis, aims, objectives and research methodology.

**Chapter Two:** This chapter deals with the previous literature on the concept of urban form and sustainability and sustainable urban form, **sustainable development** strategies, strategies for sustainable cities, the compact city strategy, the previous frameworks that are used to create sustainability indicators.

**Chapter Three:** This chapter presents a case study that will be applied the research methodology in traditional area (El-Kellej, Al-Wardiya) in alsawb alsaghir in the city of Hilla, where it reviews a historical and geographical

overview of the area as well as morphological changes that occurred in the area .

**Chapter Four:** Applying the research methodology to traditional area (El-Kellej ,Al-Wardiya) in alsawb alsaghir and extracting and discussing the results.

**Chapter five:** This chapter deals with the conclusions and recommendations from the research that can be followed in the future.

## **Chapter Two**

# **LITERATURE REVIEW**

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## Chapter Two

### Literature Review

#### 2.1. Introduction :

In order to reach a better understanding of the indicators of sustainability of urban form, it is necessary to gain a comprehensive and integrated understanding of the concept of sustainability and sustainable cities in general, the concept of sustainable urban form in particular. This chapter explores sustainability, urban form, indicator concept, and the difference between traditional urban indicators and sustainable urban indicators, in addition to sustainable development strategies. It reviews a set of sustainability indicator frameworks, paving the way to develop and apply the Sustainability Indicators Framework .

#### 2.2 Sustainability :

Sustainability as a policy concept has its origin in the Brundtland Report of 1987. That document was concerned with the tension between the aspirations of mankind towards a better life on the one hand and the limitations imposed by nature on the other hand. In the course of time, the concept has been re-interpreted as encompassing three dimensions, namely social, economic and environmental (Kuhlman and Farrington ,2010,p1). Whereas the environmental dimension can be defined to be the sum of all bio-geological processes and the elements involved in them (referred to as ‘environmental capital’ by economists), the social dimension (‘human capital’) consists of the intra-personal qualities of human beings: their skills, dedication and experiences. Institutions (confusingly called ‘social capital’) are the result of interpersonal processes, such as communication and co-operation, resulting in information and systems of rules governing

the interaction of members of a society. The economic dimension (‘man-made capital’) includes not only the formal economy, but as well all kinds of informal activity that provide services to individuals and groups and thus increase the standard of living beyond the monetary income (Joachim H. ,2002,p104). where sustainability is concerned with the well-being of future generations and in particular with irreplaceable natural resources—as opposed to the gratification of present needs which we call well-being(Kuhlman and Farrington ,2010,p1)..

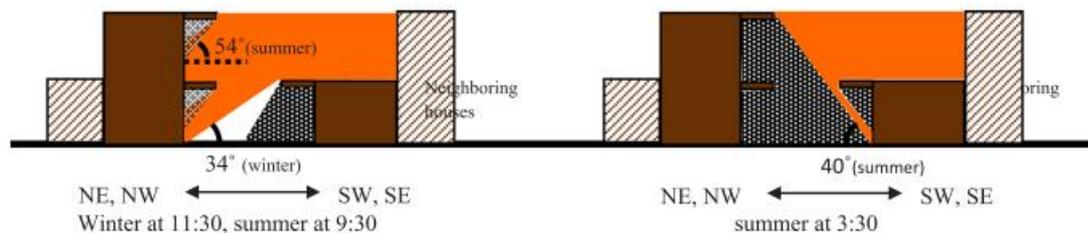
### **2.2.1.Environmental Sustainability**

Environmental sustainability is defined as responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality. The practice of environmental sustainability helps to ensure that the needs of today's population are met without jeopardizing the ability of future generations to meet their needs. When we look at the natural environment, we see that it has a rather remarkable ability to rejuvenate itself and sustain its viability. For example, when a tree falls, it decomposes, adding nutrients to the soil. These nutrients help sustain suitable conditions so future saplings can grow. (Gillaspy , 2021 ,p 1) .

Resources were overused Since sustainability is a multidimensional issue (local, regional, and international dimensions), it have to be developed at a level that people live, work and interact with each other and with nature such as local level . The various sustainability issues are interwoven, and the interaction of a building with its surroundings is also important. The environmental issues share, in common concerns which involve the reduction of the use of non-renewable materials and water, and

the reduction of emissions, wastes, and pollutants . Although social, economic, and cultural indicators are of significant importance to the concept of sustainable building, this concept is often based on environmental properties ,(Usta et al ,2017, p232) .

The traditional courtyard geometry has the capability to control building façades orientation to achieve thermal comfort and energy saving. Main façades, that have window openings, are oriented towards E, SE, S or SW. In these façades, sun is blocked easily in summer, while exposed and penetrated into during winter. Main façades orientations toward NE, N, NW, or Ware avoided. In order for the walls orientation be effective and meets the requirements of shading and solar exposure, it requires that courtyard to have a specific configuration and proportions between its horizontal and vertical dimensions of the surrounding walls which has to be consistent with the sun altitudes .The principles of the traditional courtyard order can be adopted in the design of contemporary buildings of larger scale to achieve environmental efficiency, building densities and human scale similar to the traditional ones. Fig. (2-1). Example of two opposite masses, the one that faces a desired direction can shade the courtyard floor during summer afternoons. (Almumar,2019,pp145)



Figure(2-1) two opposite masses, the one that faces a desired direction can shade the courtyard floor during summer afternoons (Almumar,2019,pp145)

The traditional dwelling agreed with the environment with all its positives and negatives. Protection was achieved by limiting the impact of the harsh natural environment conditions such as the hot climate, relative

humidity, and the intensity of solar radiation. As for adaptation, it was by exploiting the potentialities of natural energy sources such as the sun and wind. There are many basic principles on which the architecture of traditional housing was based, which can, with some modification and development, be indicative of the design of contemporary sustainable housing ( Abu Sirryeh,2021,p1)

Traditional Architecture in the Arab World provides a wealth of environmental treatments that can be applied today to address the crucial architectural situation and the problems of lack of materials and energies facing millions in the Third World. In Traditional Architecture in the Arab, the principles of thermal control were manifested through the proper use of; 1) the compact urban fabric, narrow streets, and shaded areas, 2) the central inner courtyard, 3) thick walls and insulating materials, 4) domes, vaults, and curved roofs. Moreover, natural ventilation is considered as one of the most important distinguishing characteristics of Traditional Architecture that relies on passive design strategies. These strategies are represented, but not limited to: 5)moving air between cold and hot courtyards through 6) directing the openings of the buildings towards favorable winds, 7) using the shanasheel to provide ventilation and natural lighting while maintaining privacy, 8 ) controlling wind movement and taking into account the direct and indirect influence of the sun via arcades, 9) attracting cold air via wind towers. Below is a review of these environmental treatments, (Shahda and Nosier ,2021,p 40) .Finally, there is no doubt that the Islamic dwelling is one of the most important models of success, as it succeeded in achieving a balance between beauty and function, as the elements of the Islamic architectural heritage were found to work and complement each other, with the synthesis between the different climatic, environmental and social conditions. As for contemporary architecture, it faces many challenges to

prove that it is able to absorb the requirements of sustainable development and environmental preservation, so it must re-explore the principles of traditional architecture and choose what are appropriate for the local environment and environmental influences, to develop and mix these principles with modern technologies, and use them in our contemporary architecture and our homes in Now and in the future, where modern technologies can make the use of traditional architecture principles easier and more efficient to achieve the principles of sustainable architecture. ( Abu Sirryeh,2021,p 6)

### **2.2.2. Social Sustainability**

Social sustainability is a major part of both sustainable development and sustainability including societal sustainability and overall promotion of more sustainable societies taking into account multiple social/society–environment relationships and interfaces. These contexts have a strong focus on both present and future generations, encompassing sustainable development of both people and the planet.( Husgafvel Roop,2021,p 1)

Social sustainability includes achieving a fair degree of social homogeneity, equitable income distribution, employment that allows the creation of decent livelihoods, and equitable access to resources and social services, a balance between respect of tradition and innovation, and selfreliance, endogeneity and self-confidence (Sachs, 1999, pp. 32–33)

#### **. Includ Social Sustainability**

##### **1-Belonging:**

Sense of belonging depends on many factors such as, length of residence in the place, social relations, and availability of place facilities.in general, the traditional environment provide to people strongest level of belonging to the place.

### 2-Place Memory:

The ability of residents, who live in the traditional districts to notice, understand, and remember their built environment better than in modern districts, as well as they have ability to link their physical architectural production to their cultural norms. The courtyard in houses in traditional areas was using for multi functions. Firstly, it is private interior meeting space for family members, secondly the courtyard provide a suitable climate especially in summer in Iraq, thirdly provides a safe place for children to play, as shown in fig(2.2). (Samir and Arayici,2020,pp227)



Figure (2.2): Privacy In Traditional Homes (Samir And Arayici,2020,Pp225)

3- Safety environment and Social Relationships in traditional areas(Samir and Arayici,2020,pp226)



Figure (2.3): The safety of Traditional Environment (Samir and Arayici,2020,pp226)

### **2.3. The Underlying Elements Of Social Sustainability**

With respect to the built environment. Young Foundation identifies social sustainability as "a process for creating sustainable, successful places that promote wellbeing, by understanding what people need from the places they live and work. Social sustainability combines design of the physical realm with design of the social world - infrastructure to support social and cultural life, social amenities, systems for citizen engagement and space for people and places to evolve" (Future Communities). To complement the definition, this paper would like to suggest that, in addition to the social development within a community, life cycle and growth of the individuals within their private living spaces are also significant as the underlying elements of social sustainability .Home is where an individual grows physically, develops essential values as a human being and builds a family. In a broader context, a single home is what creates a neighbourhood, and an individual is what composes a community Social sustainability, thus, can be implied as the collective process of life growth and interaction among

humans within their surrounding environment, which evolves from the private domain to the public living environment. (Abdul Kadir and Jamaludin ,2013,pp 180).

## 2.4 The Emerging Criteria For Social Sustainability

Many studies have been done as to develop a list of standards or criteria which may help researchers to measure social sustainability of a community. According to Colantonio (n.d. 2013 ,pp7), the traditional themes of social sustainability such as poverty mitigation and employment rate are being complemented and slowly substituted by the more subjective themes such as sense of place, social participation and happiness. The author compares the traditional and emerging key themes of social sustainability as in Table (2.1) (Abdul Kadir and Jamaludin ,2013,pp 180)

**Table( 2.1).** Traditional and emerging social sustainability key themes (Abdul Kadir and Jamaludin ,2013,pp 181)

TRADITIONAL	EMERGING
Basic needs, including housing and environmental health	Demographic change (aging, migration and mobility)
Education and skills	Social mixing and cohesion
Employment	Identity, sense of place and culture
Equity	Empowerment, participation and access
Human rights and gender	Health and Safety
Poverty	Social capital
Social justice	Well being, Happiness and Quality of Life

The emergence of the more subjective social sustainability themes as presented in Table 1 is also acknowledged by Sharifi and Murayama (2012) whose study reviews recent criteria for social sustainability. The evolving criteria, as listed in Table (2.2) Criteria for social sustainability, were accumulated from precedent social sustainability researches conducted within the last two decades. (Abdul Kadir and Jamaludin ,2013,pp 181)

**Table (2.2).** Criteria for social sustainability (Abdul Kadir and Jamaludin ,2013,pp 181)

AUTHOR(S)	CRITERIA CONSIDERED
Sachs, 1999	Equity; democracy; human rights; social homogeneity; equitable income distribution; employment; equitable access to resources and social services
UNSD, 2001	Equity; health; education; housing; security; population
Spangenberg, 2004	Income; communication and participation; education; social contacts; social security; distribution of income and assets
Choguill, 2008	Citizen participation; social interaction; feeling of belonging; interpersonal relations among the neighborhood residents; collective action; mutual support; access to facilities and amenities; safety
Bramley et al., 2009	Social equity; access to facilities and amenities; affordable housing; social interaction; safety/ security; satisfaction with home; stability (turnover); participation in collective group/ civic activities
Colantonio, 2009	Equity; inclusion; adaptability; security
Cuthill, 2010	Social Justice; social/community well-being; human scale development; engaged governance; social infrastructure; community and/or human scale development; community capacity building; human and social capital
Dave, 2011	Access to facilities and amenities; amount of living space; health of the inhabitants; community spirit and social interaction; safety; satisfaction with the neighborhood
Dempsey et al., 2011	Social interactions; participation; community stability; pride and sense of place; social equity; safety and security
Weingaertner & Moberg, 2011	Accessibility; social capital and networks; health and well-being; social cohesion and inclusion; safety and security; fair distribution (income, employment); local democracy, participation and empowerment; cultural heritage; education and training; equal opportunities; housing and community stability; connectivity and movement; social justice; sense of place; mixed use and tenure; attractive public realm

## 2.5. The concept of indicators and the purpose of their use:

The indicator expresses a quantitative or qualitative measure that is used to measure a specific phenomenon, or specific performance, during a certain period of time. Indicators reveal trends, the progress of that phenomenon (positively), or (negatively), to determine its strengths or weaknesses, (Salvaris at al , 2000 ) and thus indicators are used to measure and simplify information to follow:

- Assessment of conditions and trends for the phenomenon (Where are we?).
- Comparing cases or performance (assessing the way development is going).
- Assessing trends in relation to goals and objectives. Providing early warning about the negative trend of the phenomenon.

- Anticipating the future. ( Gallopin 1997,p15 ).

## **2.6. The Difference between the Traditional Urban Indicators and the Urban Sustainability Indicators:**

Appeared when cities - after the integration of the term sustainability in their development plans - began to focus on a set of urban indicators, in order to measure and quantify the progress made towards implementing sustainability, where urban sustainability indicators are considered that what distinguishes them as for the traditional urban indicators. The latter deals with development in the economic, social, and environmental fields independently of each field, while the sustainability indicators treat this development in an integrated and balanced manner for the three considerations at the same time, and those indicators may be quantitative, or qualitative (IHSD, 2003 ,p8) , and the International Institute for Sustainability has approved the following in terms of urban sustainability indicators: “Measurement helps decision-makers and the public to identify social goals, link them with detailed goals and objectives, and then evaluate progress .It provides an empirical and numerical (quantitative) basis for performance evaluation, in order to determine and calculate the impact of human activities on the environment and society, and to achieve a link between past and present activities to achieve future goals , (Hiyam, 2015 pp.32-35) .

### **2.6.1. The most important options for using urban sustainability indicators**

1-Enable the principles of sustainable development within the development plans (for the city, region or country).

2- (Monitoring) - or promoting sustainable development, where indicators

are chosen here for the purpose of describing and presenting cases or spatial phenomena that are subject to changes.

3- Decision making, which is used for the purpose of developing implementation methods, and comparing development alternatives, with their various effects, and it provides the decision maker with comprehensive and integrated information about the reality of the current situation of his city or region. For development plans, it also raises warning signs at an early stage in the implementation of any plan or strategy, forgetting, as it is possible to make a comparison between urban communities crosswise (through different places), or longitudinally through different stages of time.

4- Through it, it is possible to follow the periodic, realistic changes, towards progress or regression in achieving the goals of sustainable development plans for the urban settlement.

5 - Finally, indicators are used as benchmarks (Benchmarking), to test sustainable performance within a certain time series, and here indicators are called (measurement points), and in this case, cities can, through (reference points indicators), get a clear idea of their location Progress towards sustainability, compared to the rest of the municipalities, and the development of the performance of municipal councils. The indicators serve decision-makers at all levels, and enable them to use them as reference points to assess the extent of success in development plans, and to modify or change them with alternative plans if necessary, leading to more prosperous and sustainable societies. . This means that the purpose of using indicators is to assess the role of governments in achieving the goals and objectives of urban plans (Newman and Jennings 2008 , ,pp 67-68 ).

## 2.7. Potential Approaches to the Organization and Design of Indicators

The literature reveals a wide range of approaches to the organization and design of indicators that are top-down (expert), bottom-up (community) or a mixture of the two with each having their own advantages and disadvantages (Reed et al. 2005, pp 406-418) also focused on expert-driven and community-driven indicator processes by classifying frameworks according to the wide methodological paradigms which are expert-led and top-down contrary to community-based and bottom-up. Their argument is that these two approaches require integrating for a more understanding of system interferences (Sonntag, 2010 ,pp325–339). Government involvement can increase data credibility while the involvement of citizens in the process of choosing indicators ensures they are relevant to the community (Fraser et al., 2006, pp114-127).

(Reed et al. 2006 ,pp406-418) examined different approaches to develop methodological frameworks and sustainability indicators and characterized these as bottom–up or top–down approaches as shown in **Table(2.3)**

**Table(2-3):** Methodological frameworks for developing sustainability indicators showing their approach( Al-Alwani,2014 ,pp52-53).

Framework	Description	References
<b>BOTTOM–UP APPROACH</b>		
<b>Soft systems analysis:</b>	Based on systems thinking (Von Bertalanffy, 1968) and experiential learning (Kolb, 1984), indicators were created as a component of a participatory learning process to enhance sustainability with stakeholders.	Checkland, 1981
<b>Sustainable livelihoods analysis</b>	develops indicators of livelihood sustainability based on Robert Nozick's entitlement theory, a philosophy of distributive justice and private property, which may be used to track changes in human, social, environmental, physical, and	Carney,1998

	financial capitals (Nozick 1974:150)	
<b>Classification hierarchy framework</b>	Increases the resolution of the system element being examined to recognize indications, for example, when the element is soil, the property is productivity, and the descriptor is soil fertility, the indicator will be percent organic matter.	Bellows,1995
<b>The Natural Step</b>	Creates indicators to identify sustainability issues, visions, and solutions while defining four prerequisites for a sustainable society.	TNS, 2004
<b>TOP-DOWN APPROACH</b>		
<b>Panarchy theory and adaptive management</b>	Utilize three diverse groupings of indicators to identify the points on an adaptive cycle where complex systems are present. The panarchy concept also recommends that significant indicators can be divided into one of three groups: wealthy, connected, and diverse	Gunderson and Holling, 2002
<b>Pressure-state - response (PSR, DSR, and DPSIR):</b>	Environmental indicators are determined by human demands on the environment, environmental conditions, and societal reactions to these concerns. Late formats used driving forces to adjust the pressure. Although there may be positive or negative driving forces, pressures are invariably negative (DSR), and there are no unabated environmental impacts (DPSIR)	EEA, 1998
<b>Framework for evaluating sustainable land management</b>	a process for creating sustainability indicators that will maintain social, economic, and environmental prospects for current and future generations while conserving the land's quality.	Dumanski, Eswaran, and King (unpublished manuscript)
<b>Well-being assessment</b>	use four measures to evaluate the wellness of people and ecosystems: An ecological and human well-being index, a combined index evaluating both, and a fourth index examining the effects of improvements in human well-being on ecosystem health.	Prescott-Allen, 2001
<b>Thematic indicator development</b>	recognizes indicators for each of the institutional, social, economic, and environmental themes	UNCSD, 2001

## 2.8. Indicators Framework:

Utilizing rational frameworks for the creation and distribution of sustainability indicators. Even while many of the most common frameworks were developed in the 1990s . Only a limited number of them have been used in practice, and many more are still in the experimental stage. Frameworks facilitate indicators interpretation through several ways; providing a means to structure and analysis the indicators, help indicators to be organized into a particular construction and set of themes, help to avoid overlaps in indicator sets and identify key gaps .One of the most important advantages of indicator frameworks is that they can be used as a device to the categories of indicators into groups to confirm which issues have been covered and which have been ignored. Additional benefits of conceptual frameworks have been suggested, including the capacity to anchor indicator systems in theory, provide an organizational structure, identify meaningful indicators and data gaps, ensure indicator comparability, and aid in communicating with the public and decision-makers,( Al-Alwani,2014,pp 3-4)

**Table(2- 4):** main framework types used for developing sustainability indicators

(Maclaren, 1996 , Al-Alwani,2014, p 48).

<b>Framework types</b>	<b>Description</b>	<b>Advantage, disadvantage or weaknesses</b>
<b>Domain-Based Frameworks</b>	Consider the three main pillars of sustainability the environment, economy, and society before identifying indicators for each. One of the most well-known instances of a domain-based structure is Seattle's sustainability report.	This framework's main advantage is that it makes sure all aspects of sustainability are covered. This framework's flaw, however, is that it doesn't seem to link sustainability goals with indicators.
<b>Goal-Based Frameworks</b>	begins with the determination of a community's sustainability goals, after which indicators are produced for each goal or combination of goals. An	The benefit of this framework is that it limits the number of indicators that must be taken into account to just those pertaining to specific sustainability goals, which

	organization that employs a goal-based structure is the Local Government Management Board (LGMB), located in the United Kingdom (LGMB, 1993).	aid in determining whether indicators are moving in the direction of sustainability or away from it. The drawback is that it ignores some of the intricate relationships between a number of sustainability-related factors because it is so simplistic.
<b>Sectoral Frameworks</b>	Create sustainability indicators for each area within the government's control, such as housing, transportation, waste management, land use, and police services. These sectors can be connected to specific government departments, making it easier to assign blame for a specific issue or credit for successful outcomes that are shown by indicators.	This framework's inability to integrate disparate areas of intervention is a drawback because indicators are divided into discrete areas of government responsibility.
<b>Causal Frameworks</b>	These introduce the idea of cause-and-effect interactions in an effort to remedy the drawbacks of the earlier framework approaches.	This type of paradigm should be able to explain why indicators are changing and whether policy actions are having an effect, which is a benefit.
<b>Issue-Based Frameworks</b>	These frameworks prepared to list the sustainability issues in the community, such as waste management, air pollution, education, and employment	The key advantage of the issue-based frameworks is that they are more understandable and simple to construct. While the disadvantage is that there is limited match between indicators and sustainability goals and inadequate coverage of the main dimensions of sustainability
<b>Combination Frameworks</b>	This kind of framework combines two or more different frameworks. Many of the drawbacks of the various frameworks mentioned above can be eliminated by adopting a combination framework.	Since this framework combines two or more separate frameworks, it may establish some of the benefits of those frameworks while also solving some of their drawbacks.

(Nathan and Reddy2008) examined commonly used sustainability frameworks for indicator development and identified the frameworks as shown in **Table (2-5)**.

**Table (2-5):** sustainability frameworks for indicator development and identified the frameworks( Al-Alwani,2014,p 49)

Framework types	Description	Advantage, disadvantage
<b>Capital Accounting Framework</b>	This paradigm, which was created before the idea of sustainability, has its roots in economics. In environmental accounting, when changes to natural resources are calculated similarly to financial resources, the framework is employed. Additionally, social indicators have not yet been added to this framework for environmental and economic accounting (Lundin, 2002).	The benefit of this approach is that it connects mainstream accounting, enabling impartiality and comparison across environmental aspects. The difficulty in quantifying the quality of environmental resources is, however, a drawback.
<b>Issue – based, goal-oriented or thematic framework</b>	These frameworks, along with the pressure-state-response (PSR), are frequently found in the indicator literature. They are typically produced as a result of special interests at the local, national, and international levels (Australia, 1998) As the program was derived from Agenda 21 and organized into topics and sub-themes, UNCSO has adopted a thematic framework. Additionally, they are divided into four categories: social, economic, environmental, and institutional (UNCSO, 1996). The indicators have specific objectives and are built around a number of themes and problems.	The benefit of this framework is that it allows for the use of indicators in performance measurement and aids in the connection between indicators and policy priorities. The drawback is that, aside from what is already acknowledged within the policy procedure, many of the goal-oriented frameworks are overly precise and do not reflect the multidimensional nature of sustainability. They are therefore neither exhaustive nor consistent (Bossel, 1999).
<b>Systems Framework</b>	The authors of this framework are Newman et al (1996). It is created using an enlarged model of urban metabolism (EUMM). The EUMM model presents cities as systems with improved livability and reduced waste as the desired outcomes.	The notion of EUMM is strongly tied to the paradigm of sustainable development, which makes clear the sustainability objectives, future orientation, and links between various elements (Australia, 1998; Newton, 2001). Despite the fact that this system framework has advantages over other frameworks .
<b>Sectoral or domain framework</b>	Although it is not a framework in and of itself, it is widely used in conjunction with other frameworks. Indicators can be organized	

	<p>according to capital accounting, causal, thematic, or system frameworks, or they can be divided into several areas or sectors prior to being listed. Additionally, land, water, energy, etc., which are specific areas of interest or skill, may be included under as a domain under this approach. These activities are thought to generally align with local government departments..</p>	
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### **2.8.1. Some International Frameworks and Common Local Frameworks:**

At the international level, there are many frameworks, some of the best of them have been mentioned by Farsari, and Prastacos 2002, as follows: World Bank: measuring the wealth of nations, United Nations–CSD Indicators, Barometer of Sustainability, Ecological Footprint, OECD’s Pressure-State-Response framework.

While at local level, ( Besleme and Megan ,1997,pp 43-53) identified three basic conceptual frameworks adopted by community indicator projects taking place around the world. There are as follows:

1. A framework to measure local sustainability by focusing on a vision for the community's long-term future; and using additional sustainability indicators to deal with the connections among a variety of topics.
2. Quality-of-life indicators framework which differ from sustainability indicators frameworks in dealing with short-term goals and do not seek to address the need to demonstrate connections between indicator areas.
3. Performance evaluation framework which pays attention to performance evaluation; as well as seeking to determine efficiency in the delivery of a particular set of public services ( Al-Alwani,2014,p 7) .

## 2.9. Sustainable Urban Form

With more than half of the world's population living in urban areas and climate change one of the biggest challenges of our times it is time to turn our attention to cities in order to tackle this challenge. The layout or urban form of a city can influence the environmental impact of the urban settlement to a considerable extent. There are great differences between cities in terms of their urban form and their environmental footprints (Dempsey, et al .2010 ,p21) .

Various urban forms evolved through modern urban planning practices, but often the concern for their negative impacts is observed as missing. This disregard is apparent in the developed world in sprawl as a prime urban form. As significance of sustainability is internationally acclaimed, lately but consciously the sprawl is being incitingly condemned for its negative environmental, social and economic impacts. Several studies have tried to prove that sustainability of a city might depend on its shape, size, density and land use distribution. Urban form has positive or negative impact on

Accessibility to facilities, travel attributes (distance and time), energy used, social equity, efficient use of land, economic benefits, reduction in CO2 emissions, liveliness, etc. (Johnson, A. ,2007,pp 27-30 .But the debate on the most suitable urban form to achieve sustainability is still unresolved. To evolve urban sustainability, the relationships between urban form and the various elements of a city need to be understood, Kotharkar et al .2014,p 2) .

Through studies of urban sustainability frameworks, the foundations or features of the urban environment related to achieve a sustainable urban form have been reached (Figure (2-4)).



Figure (2-4) The foundations or features of the urban environment related to achieving a sustainable urban form (Hiyam, 2015 , p 46).

### 2.9.1. Compactness:

Compactness built environment refers to the intensification of urban activities in the unit area which is of two approaches: 1 - Compactness with respect to the original built environment, and this trend is to resort to when it is intended to stop or limit urban expansion and sprawl, intensification and grouping of urban events and activities through (dictation policies of urban, rehabilitation, re-division and urban development). 2 - Compactness of settlements and new urban development, and this resort to as a sustainable direction, to achieve urban development, in a way that preserves the area of agricultural land and habitat ecological diversity, and reduce emissions carbonate, transport networks, easy access, activities and urban events are intensify activities, and diversity within the unit area itself, thus urban expansion vertically to that city. (wheeler, 2002 , pp 133-45).

### 2.9.2. Sustainable Transport

Is one of the most important problems that stand in achieving urban sustainability, as defining urban sustainability as reducing both the mobility and disadvantages (pollutants) transport network urban ", and the world

(McLaren) enhanced urban sustainability, the extent of its ability to provide the shape, size appropriate, to practice sustainable lifestyles (exercise walking, and cycling.) defines sustainable transportation as: (Transportation service that reflects the total social and environmental costs of the individual, and which respects the absorptive capacity of the natural environment and urban, and a balance between the need for mobility and safety, with maintaining environmental quality), (Jordan & horan, 1992 , pp 12-16).

### **2.9.3. Mixed Land Uses**

This feature plays an important and key role in urban sustainability, as it is considered a criterion to which the attributes (compactness, ease of access, and even housing density) are linked, because the mixed use of urban land, or the heterogeneous division it according to the type of activity gives the ability to integrate between urban activities, which gives a number of benefits, which lead to urban sustainability . In addition, the mixed use of the land, after one of the objectives of the Agenda (21) (Hiyam, 2015 , p 48) .

### **2.9.4. The Housing Density**

Is one of the most important concepts, or criteria, in determining the level of urban sustainability. As a concept that represents the ratio of the number of housing units to the area (neighborhood, sector or city) and the relationship between density and urban sustainability, it is related to the concept of thresholds, meaning, the housing density will be sustainable to the extent (threshold), in which the human density per unit area is sufficient to generate the interactions necessary for human life, without reaching the low level of quality of life standards, (realizing the concepts of social

communication, ease of access, intensification of events and activities, and reducing Energy use, emissions, and waste (Hiyam, 2015 ,p 47) .

### **2.9.5. Accessibility**

Easy access is a measure of the real extent of benefit in urban life, they measure the final benefit, integration of transport, with different land use systems, which indicate: (number of destinations work shopping - Education - Entertainment.), Which can be accessed during a given time , using a certain type of means of transportation or, without. Thus increasing the ease of access, means bringing goods, population, and employment opportunities, and gathered with each other, within the space of the city, in order to be spatial interaction, more effectively, and the indicator for easy access is (mobility speed), and the amount of traffic congestion, somewhere ,(Geurs, K.T&. Ritsema 2003 , pp 69 -87).

### **2.9.6. Urban Healthy System**

As a concept is against the low (the quality of urban life), which spread in the cities today, including the cities of Iraq as a whole - due to the effects of (Diseconomies of scale) of rapidly growing cities, and that is working to improve standards, and the level of the individual health of urban , by identifying negative influences, the elements of the urban system, resulting from the pressure on capacity, due for unplanned rapid growth. This concept moves away from the traditional analysis of the relationship of human health with the quality and quantity of health services in the urban system, and is heading towards the causes of low health for the urban individual compared to the individual for the rural one, and attributes to the group of effects on the urban system itself and the lifestyle practiced by the individual, and the extent of exposure to factors of

distress and pressure. psychological, noise, air, and polluted water, and those causes resulting from urban mismanagement of cities, the expansion of urban slums, the spread of slums, poverty areas, and the deterioration of the quality of life in cities today (Hiyam, 2015 ,p 49) .

### **2.9.7. Green Urbanism**

This type of planning, seeks to embrace nature, and then an integral part of the city itself, and seeks to introduce environmental considerations, in all types of urban development (Swanwick, 2003 ,pp 94-106) .

### **2.9.8. Planning Passive**

Orientation came to reduce energy consumption, because of the destruction of resources depleted, on the one hand, and the pollution of renewable resources, on the other hand, which includes asylum systems energies passive (cooling, heating, natural lighting) through specific measures, and thus affect the planning sites, physical configurations, sustainable city, because it interferes or impose certain criteria in the signature, and directing activities of spatial, in taking into account the prevailing wind, angle, and the degree of the fall of the solar rays, and even the different number of sunny hours daily, seasonal and among cities, different towns, this type of planning is important for cities today(Hiyam, 2015 ,pp 50-51 ) .

## **2.10. Sustainable Development Strategies :**

The characteristics of the sustainable urban form, and the dimensions of urban sustainability, led to the crystallization of the concepts that draw the sustainable urban form, through four strategies, given that the foundations and standards of urban sustainability are an effort and time to

be implemented. Very large resources, to reach the sustainable city, are not available in most countries of the world, which require a gradual application, within interrelated strategies for sustainable city development, starting with the Neotraditional development strategy, up to the strategies of sustainable cities (compact city, green city, healthy city) (Hiyam, ,2015,p54) .

### **2.10.1. Neotraditional Development Strategy :**

Traditional built environments inspired architects, and city planners, for this type of urban planning in a movement called (" neo traditional town planning" (Nasar, 2003, pp 58-68) and ("new urbanism"), which is oriented towards traditional planning concepts. (Dictation, Renewal and Urban Rehabilitation), to catch the urban sprawl and the structural deterioration of urban structures in city centers, as well as rebuild neighborhoods within existing cities. . New urbanization is a oriented approach towards incorporating housing into neighborhoods or neighborhood units, rather than spacious single dwellings in the suburbs, which will enhance social systems and urban safety, while increasing population density, there is also another type of development derived from (new traditional urban planning), which is called (transit-oriented development). (TOD), and this type of development or expansion, encourages residential and commercial gatherings around transportation stations, in order to reduce transportation costs, and facilitate transportation around cities (Bernick ,1997, pp 55-56) .

### **2.10.2.Strategies for Sustainable Cities :**

There are three strategies: the compact city strategy, the green city strategy, and the healthy city strategy. The following is a brief explanation of these strategies:

#### **1.The Compact City Strategy:**

It is defined as sustainable approach that works to control the urban growth and expansion of the city, by increasing the housing density and intensifying the economic, social and cultural activities .This city differs from the prevailing idea today of the urban model of cities, in which the urban structure is divided into areas and sectors .The functional ones are concentrated in the city center, and outside the shopping and entertainment sectors are located, then housing in the suburbs, and highways, (this idea is driven by market forces and economic developers). which failed to contain the development and sustainability of today's cities, and caused random spread that lacked planning, led to potentially disastrous results as the spread of slums and slums, while the idea of the system (compacting) means :above the workshops and families' homes, and the offices that sit above the shops, because this will give life to the street, and reduce the need for individuals to climb in the car to complete the requirements of their daily lives, but these multi-use buildings need complex technologies (Rogers 1997). Thus, a compact city can be defined as that city that is characterized by:

- a) It has a dense urban fabric and a diversified use of lands.
- b) Its urban areas are connected to public transportation systems.
- c) Provides easy access to work and public service areas (OECD,2012 , pp56-58) .

## **2. The Green City Strategy :**

The idea of green growth, or green cities and in general cities that harness all possible efforts to reduce the waste of energy, the use of water, or building materials, during the life cycle of the city or sector, or a single building, including the energy consumed in the processes of extracting, transporting and manufacturing materials, and using them in facilities and buildings, and those cities encourage the recycling and use of those building materials. Green cities are cities that ensure that buildings are planned and designed in a manner that respects the environment, taking into account, reducing the consumption of energy, materials, and resources, as well as reducing the impact of construction on the environment, and maximizing harmony, with nature. The design and planning basis, from which green urbanization is based on (triple zero), which is: (zero for carbon emissions), (zero for the use of fossil fuel energy such as oil) (and zero for urban waste). In 2010, the scientist Lehmann tried to establish the principles of planning and design for green cities, to be a comprehensive and integrated framework for green urbanization, based on a series of practical studies for elected cities. These principles are .1- Climate and Context:2- Renewable Energy for Zero CO<sub>2</sub> 3-Zero Waste City 4-water 5- Landscape, Gardens and Biodiversity 6- Sustainable transport 7- local and sustainable materials with Less embodied energy 8-Density and retrofitting of existing districts 9-Green buildings and districts, using passive design principles 10-Healthy Communities and Mixed-Use Programmes – Liveability , (Hiyam ,2015 , pp58-60) .

## **3. The Healthy City :**

The healthy city program, which aims to integrate the health agenda, achieve a sustainable urban form (urban sustainability), and then transform the existing cities into a safe and healthy environment through the

application of mechanisms and strategies for healthy cities. It works within the principle, that health, and the quality of life, can be improved by modifying the living conditions, in the spaces of housing, study, work, and other places, in the urban system, in which the urban individual lives, or in which he works. It establishes the principle that the health status of the exclusive individual it is affected by the physical, economic, and environmental elements of the urban system, and their negative effects, more than they are affected by the deficit or poor spatial signature of health services.. Thus, it is an urban environment maintainous program, with all its components in order to improve the quality of urban life, leading to the improvement of the health level of the urban individual. As for the reasons for the emergence of healthy cities strategies, they are (WHO, Healthy urban planning,2003):-

1-Rapid urban growth and expansion 2-Poor planning of the urban transport system 3-Poor planning for the spatial signature of industrial facilities 4- demographic and social changes 5-Poor and ineffective urban management , (Hiyam ,2015 , pp 60-63) .

### **2.11. Indicators of Foundations or Features of the Urban Environment To Achieve a Sustainable Urban Form:**

A summary has been made of indicators for each of these foundations or features related to achieving a sustainable urban form, as shown in the table (2-6).

Table (2-6) Indicators of the urban environment that relate to achieving a sustainable urban form

<b>Compactness</b>	<p>1-an area agricultural land and ecological diversity of habitats before and after urbanization.</p> <p>2 - urban quality of life indicators (promote social networking patterns, accessibility, patterns of life and whether moving towards sustainable and healthy patterns).</p> <p>3-The level or area of various activities within the unit area compared</p>
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	to the same area of the city as a whole. 4-Air pollution levels. (Alcarbone pollution) (Hagan 2000 )
<b>Sustainable Transport</b>	1- Sustainable transport must be supported by renewable energies and this can be counted the number of public transport vehicles running on alternative energies, which is an indicator of the presence of sustainable transport in the urban system 2 - the level of carbon emissions. 3-levels of noise 4-The extent of diversity in the public transport network (bus network, metro, railways, river transport ... 5 - The extent of diversity in urban events and activities within a unit area (Compactness) being an important factor in achieving ease of access and then access to sustainable transportation.
<b>The Housing Density</b>	1-Amount of communication and social interaction while maintaining social privacy and urban quality of life standards. . 2 - the proportion of condensation, Compactness, compared to the overall urban area. 3- Percentage of diversity in urban events and activities within the same unit area. 4- As well as the proportion of housing density for the same unit area compared to the total housing density.
<b>Mixed Land Uses</b>	1-the proportion of the diversity of events, and urban activities, in the urban area. 2.Population density. 3. Easy access, or access time, to various events during a given unit of time. 4 - The amount of social security. 5- Amount or extent of social interaction.
<b>Accessibility</b>	1- The geographical density of the public transport network, which is defined by the lengths of the streets used by public transport for an area (1 km <sup>2</sup> ) of the city area. 2. Population density (demographic), the public transport network, which is defined by the lengths of the streets the public transport network per 10,000 inhabitants 3 - The average density of the public transport network, and here the lengths of public transport streets are taken in terms of area and population together .
<b>urban healthy system</b>	1- The low levels of health awareness refer to: Reluctance in health awareness campaigns. 2- The increase in deaths from pneumonia indicates: the high levels of air pollution 3- The increasing rates of intestinal diseases refer to: the erosion or obsolescence of drinking water supply networks, and the obsolescence of sewage networks, which led to the contamination of drinking water with sewage germs. 4 - The spread of respiratory diseases indicates a low level of air purity, due to the disappearance and decreasing of open green spaces, as well as the decrease in ecological diversity habitats on the outskirts of cities, due to the continued signing of urban facilities, and the rapid unplanned expansion. 5 - The high rate of traffic accident deaths indicates a failure in the planning and management of the transport system..

<b>Green Urbanism</b>	<p>1 The proportion, or extent of, biodiversity of habitats, in the vicinity of a city, or metropolitan area (this should be studied over a period of time).</p> <p>2 ratio of carbon emissions, and air pollutants and other. 3 - the degree of reliance on renewable energy alternatives in different lifestyles, within the city (transport, heating, cooling, lighting).</p> <p>4 - the extent (number or percentage) recycling facilities for the presence of residues of all kinds, in the urban area.</p> <p>5 - the extent (number or percentage), the presence of factories environmentally friendly products, in the urban area.</p> <p>6- the extent of the spread of environmental awareness campaigns in the city.</p>
<b>Planning Passive</b>	<p>1- The amount of building density, or the amount of compactness of the urban area, the more control it is possible to reduce the consumption of cooling and heating of building spaces. 2- Building designs, starting with choosing their location, the shape of the blocks, the orientation of the building, and ending with the type of finishing materials, whether internal or external. This plays an important role in determining the extent of heat gain or heat loss. 3- Urban street network planning and designs, the trend towards organic street planning reduces the angles of solar radiation, and reduces dusty or cold winds. 4- Percentages of green spaces and water bodies within urban areas.</p>

## 2.12. Global Studies on Urban Form and Sustainability

Through research and published studies on urban form and social sustainability that helped build a knowledge base and reach more understanding on the issue of urban form sustainability. A brief description was made with notes on each study **Table (2-7)**.

**Table (2-7):** Global Studies on urban form and sustainability

<b>Study</b>	<b>Description</b>	<b>Notes</b>
<b>Urban Form and Sustainability: the Case Study of Rome Ltd Elsevier. (2014).</b>	Based on integrated land-use and transport modeling architecture, the research provides empirically based insights on the relation between urban form, sustainability and travel behavior. Different scenarios of urban development have been assessed for an empirical case study, with respect to transport network performance as well as social and environmental impacts. Preliminary results show that at the city	This paper investigates the relation between sustainability and urban form. To this aim a system of Land-Use and Transport Interactions (LUTI) models has been designed and applied

	level different urban forms (i.e. compact, sprawl, TOD) have found to differ in their sustainability, and in particular the compact development appears to better off others form of spatial development. However, compact development imply an increase of urban congestion level and also an increase of dwelling prices which in some cases create social exclusion and segregation of peripheral areas.	to the metropolitan area of Rome, to understand the interdependence of key variables such as travel behavior, transport supply, property values, jobs and residential location.
<b>Towards sustainability? Analyzing changing urban form patterns in the United States, Europe, and China . Ting Dong , et al (2019).</b>	Urban form characterizes the spatial structure of fixed elements within a city, which affects daily life. Taking 27 large cities in the United States, Europe and China as examples, we developed a ternary graph to quantify urban forms based on the density distribution of the built-up area. The urban forms were divided into the following classes: central-compact, central-sprawl, decentralized-compact, and decentralized-sprawl. Spatially, the cities in the three regions have experienced rapid urban growth, while the urban forms vary greatly from region to region. Urban forms are dominated by decentralized-sprawl in the United States, and central-compact in Europe and China. Temporally, approximately 80% of sample cities kept the urban form class both in 1990–2000 and 2000–2014. It is noted that 40% of sample cities in China tended to grow in a more sprawling pattern in 2000–2014 than in 1990–2000.	Measuring the spatiotemporal characteristics of an urban form and its relationship with sustainable development is the basis of urban planning
<b>The role of urban form in sustainability of community: The case of Amsterdam.  ArundeL Rowan and Ronald Richard (2015)</b>	Urban policy has increasingly emphasized the compact city and higher density urban forms in reaching sustainability goals. Using the city of Amsterdam, considered a case of high-quality compact city form, our study looks at how specific neighbourhood built form relates to key measures of sustainability of community. The study reveals that higher densities have no significant impact on local social capital, sense of community or resident satisfaction. Rather, other built-form	The study creates an impetus for more research into the link between urban form and key elements of ‘social’ sustainability such as social capital, sense of community and resident satisfaction.

		measures such as scale, existence of local stores, degree of automobile dominance and construction period were of greater importance.	
<b>Okyo's Urban Growth, Urban Form and Sustainability</b>	<b>Urban Urban</b>	okyo, has experienced a rapid growth in the twentieth century with various issues associated with urban form and urban environment. Some issues were solved and others remain to be solved. If Tokyo is evaluated as one of the most efficient, productive and sustainable mega-regions in the world, it is the result of rapid urban growth and development in the twentieth century. After that, Tokyo has been facing new challenges as it left the phase of rapid growth and entered the phase of no- or low-growth, depopulating and aging society. From the viewpoint of urban form, Tokyo is a patchwork of various types of urban space with diverse urban issues. , not necessary to change the current spatial structure of Tokyo so drastically. It is more realistic to improve or conserve existing urban spaces incrementally to enhance quality of life in a sustainable manner.	okyo has been facing new challenges as it left the phase of rapid growth and entered the phase of no- or low-growth, depopulating and aging society .
<b>Okata Junichiro and Murayama Akito (2011)</b>	<b>Urban Urban</b>		

<p><b>Urban Form, Sustainability and Health: The Case of Greater Oslo</b> Næss Petter(2013).</p>	<p>Several studies have shown dense urban structures to be favourable in order to reduce greenhouse gas emissions from transport, limit energy consumption in buildings and protect farmland and natural areas in the surroundings of the city. There may, however, be some tensions between such a compact urban developmental strategy and considerations of public health in urban planning. by comparing statistics on life expectancy and the frequency of heart attacks among inhabitants of different urban districts in the Norwegian capital Oslo. The currently available results do, however, suggest that the densification strategies often recommended for reducing the ecological footprints of cities might be encumbered with some important drawbacks, seen from a public health perspective.</p>	<p>This paper reviews findings from international research on the relationships between urban form and health and illustrates some of these effects.</p>
<p><b>Mechanisms of Achieving the Social Sustainability in the Traditional Urban Structure,</b> Neama and Al- Ahabbi (2011).</p>	<p>We find shortcomings in the knowledge coverage of the importance of the social system for sustainability in Urban structure and mechanisms to achieve it in contemporary urban structure. Applied study methodology and method.Resolution and statistical analysis by spss program.And the application of indicators to a case study within (city center Kadhimiya)</p>	<p>The main objective of the research is to reveal the elements of social sustainability in the traditional urban structure, using indicators derived from the theoretical argument to analyze the traditional features of Al-Kadhimiya city as a case study.</p>
<p><b>Changes in the traditional urban form and the social sustainability of contemporary cities: A case study of Iranian cities .</b> Sharifi and Murayama (2013)</p>	<p>discusses how traditional urban patterns can inspire planners to create an integrated urban the most socially sustainable environments. the most significant characteristic of a traditional Iranian city that makes it distinguished from its modern counterpart is the integrated structure. In many respects the contemporary Iranian city failed. Our focus is on Iranian cities. The main elements of traditional Iranian cities, their characteristics and the way of their social contribution. Sustainability of societies such as the mosque, the bazaar, the Persian garden. Explanation</p>	<p>This paper stresses that planners should consider the city's evolution in the course of time and lessons learned from the past should be considered at the time of development or redevelopment. Traditional urban forms will complement modern planning and design techniques and will</p>

	<p>of current situations and how these elements work. They lost their jobs and their safety was disrupted . Taking intoaccount the underlying values traditional urban forms will complement modern planning and design techniques and will Facilitating the creation of more socially sustainable communities investigated how the urban form and its constituting and supplementary elements can.</p>	<p>in facilitating the creation of more socially sustainable communities.</p>
<p><b>Toward Sustainable Compact City: (Study in Convert Traditional Najaf City to Sustainable Compact City)</b>  <b>Al-Shouk1 and Al - Khfaji (2018)</b></p>	<p>Research problem: The lack of knowledge and the identification of clear indicators of the compact city through which it is possible to know the possibility of transforming cities Contemporary cities in general and traditional cities in particular. The research followed the descriptive and analytical method, as well as the statistical method measuring indicators. A combination of common indicators was found (Mix land use, density andintensification, movement and transport, accessibility, harmony, diversity). These indicators also include several sub-indicators, as these indicators can provide an appropriate basis for the possibility of a shift towards sustainability. The practical aspect was the conduct of field surveys of the study area (old city of Najaf) to identify the planning characteristics of it, and then the indicators derived from the theoretical framework were applied.</p>	<p>The research deals with an old concept in its inception, but it is modern in its applications and theses it deals with. The concept of compact city is one of the latest strategies for the sustainable development of cities. The research tackled the concept of compactness and the characteristics of the compact city, as well as the concept and characteristics of the Traditional Arabic city, A combination of common indicators, was found (Mix land use, density and intensification, movement and transport, accessibility, harmony, diversity).</p>

<p><b>Sustainability and planning: does urban form matter?</b>  <b>van Albertine Diepen and Voogd Henk (2001)</b></p>	<p>This paper deals with the difficult relation between urban form, travel behaviour and sustainable development. In more developed countries, the influence of governments on urban form can be considerable through planning. Modern planning theory focuses mainly on procedural aspects. . For making urban land-use planning more sustainable, it is essential to have insight into the relationships between users; and their surroundings. This is outlined by presenting some survey results on the additional role of the spatial context on household behaviour. The survey was conducted among households in the region of Amersfoort in the Netherlands. The results provide some empirical evidence that household behaviour is related to urban form, . Reasonably more energy-intensive and therefore less sustainable household practices were observed at the urban outskirts more than in the rural area.</p>	<p>It is argued in this paper that substantive aspects cannot be neglected if sustainable solutions are being pursued</p>
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### 2.13. Summary

This chapter reviewed the definitions of the urban form and its components, sustainability and the sustainable urban form and how to achieve the sustainable urban form, sustainable development strategies that include the unconventional strategy and the strategies of sustainable cities, in addition to the concept of indicators and the purpose of their use, the difference between traditional urban indicators and urban sustainability indicators, methodological frameworks for developing indicators Sustainability, the main types of frameworks used to develop sustainability indicators, some international frameworks and common local frameworks, and finally global studies on urban form and sustainability. This is by reviewing the current definitions of sustainability, urban form and sustainability indicators. The current work will adopt a comprehensive

view of the sustainable city and identify it as a city that must be economically viable, socially nonviolent and environmentally healthy. The next chapter will explain the research methodology adopted in this study, the rationale behind the approach to this study's methodology, data collection and analyses.

## **Chapter Three**

# **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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#### **3.1 Introduction**

This chapter provides a brief overview of the traditional area in Hilla, Iraq, as well as some key facts. Use of a case study requires a thorough understanding of the historical, social and cultural contexts of the region, as well as the morphological stages the region has gone through. This research is based on the existing literature about the study region.

#### **3.2 Location of Babel Governorate**

The city is located (110 km) south of the capital, Baghdad, near the site of Babylon. The archaeological site, as well as its proximity to the archaeological site of Borsippa, and the archaeological city of Kish. It is located approximately in the middle of what is known as Mesopotamia, especially on the western bank of Shatt Al -Hilla. It extended to the ruins of ancient Babylon from the north and to the warehouse area. In the south, the Al-Hilla irrigation channel in the west, and Shatt Al-Hilla in the east.

Iraq consists of (18) governorates with a total area of (435,052) km<sup>2</sup>. The amount of 5119 km<sup>2</sup>, is the third smallest governorate in area after each of the governorates of Baghdad and Karbala, with a percentage of (1.2%) the total area of Iraq (Ministry of Planning and Development

### Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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Cooperation, 2005). Babil Governorate is located to the south of the Baghdad, and it is geographically mediated by a group of governorates: Baghdad, Anbar, Wasit, Karbala, Najaf - - - - Qadisiyah).

Babil Governorate consists of (16) administrative units divided into (4) districts and (12) sub-districts, as the city of Al-Hilla is the administrative center of the county Babil Governorate is based on land transportation only, represented by railways and public roads, with the absence of river transportation and not to invest it despite the passage of the Euphrates River in it, which is 130 km long within the governorate (Duha and Amir, 2019, pp 212-216).

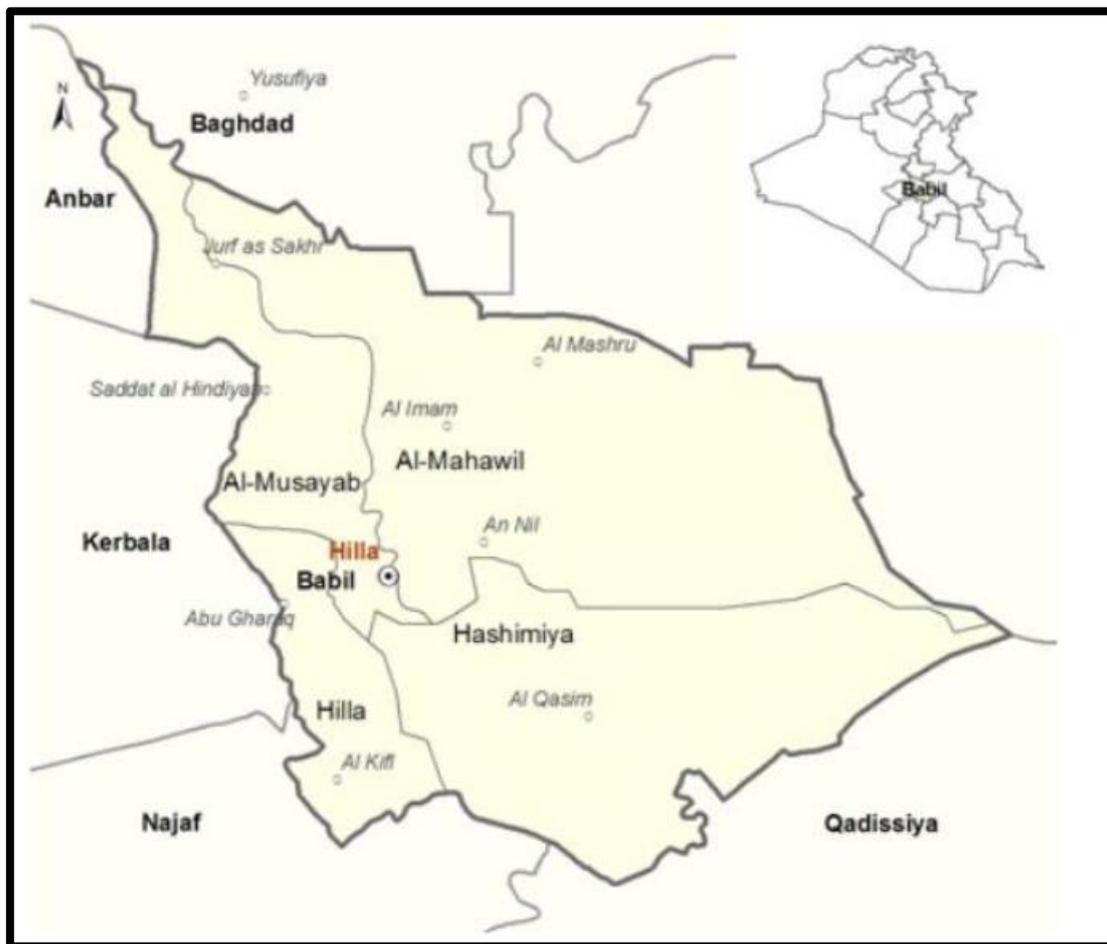


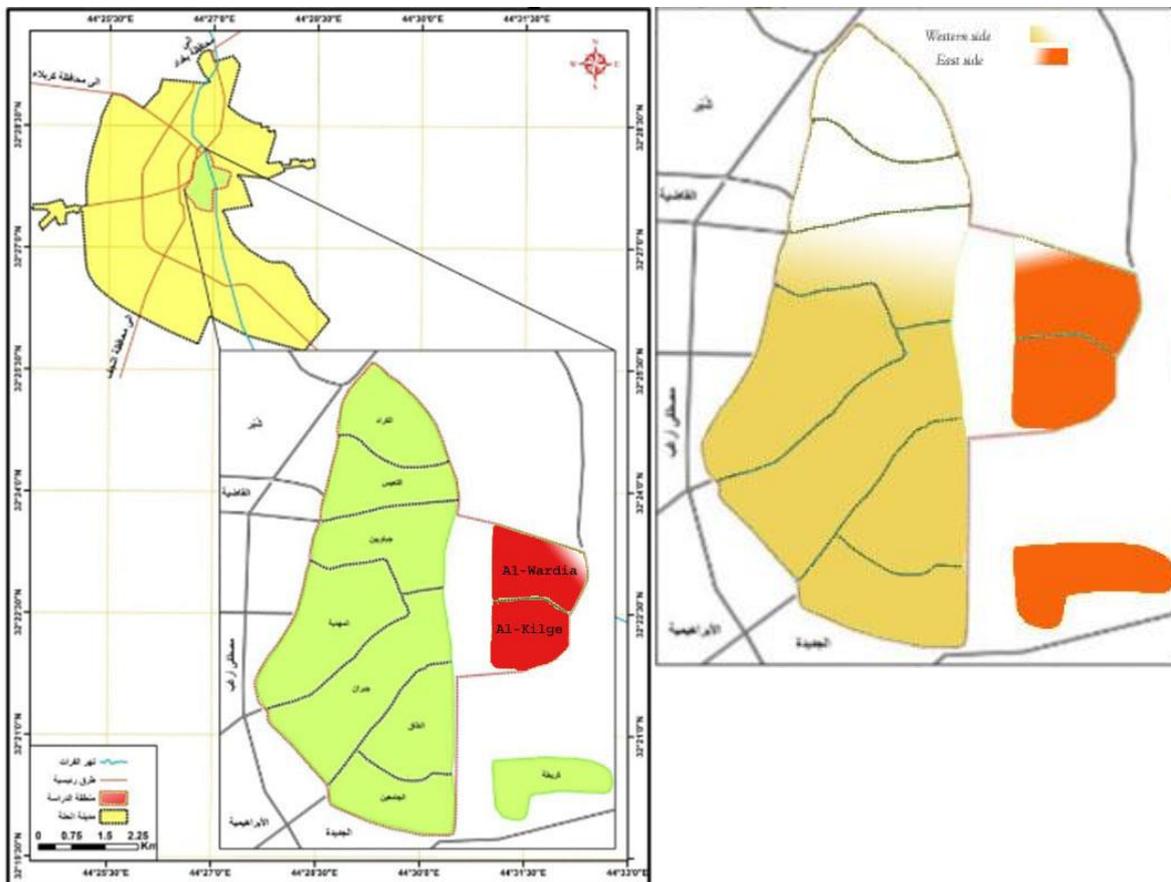
Figure 3-1 Babel province map (NGO Coordination Committee for Iraq, 2015 pp. 49-53).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

#### 3.3 Traditional Area Location

In the successive periods of time, the western side (el soub alkabir) of the city of Hilla contains seven residential *mahallat*: (Al-Jamieayn, the Kurds, Al-Taq, Al-Ta'is, Gibran, Al-Mahdia, Al-Jabawein), and the eastern side (el soub al saghir) two residential areas: El Kellej and Al-Wardiya are linked. The eastern and western sides by the old boat bridge, which was later replaced by a fixed bridge, (Kadhim,2014, p 1).



**Figure 3-2** : The location of the old area according to the master plan of the city of Hilla for the year 2006-2030,( The researcher worked on Ministry of Municipalities and Public Works 2013)

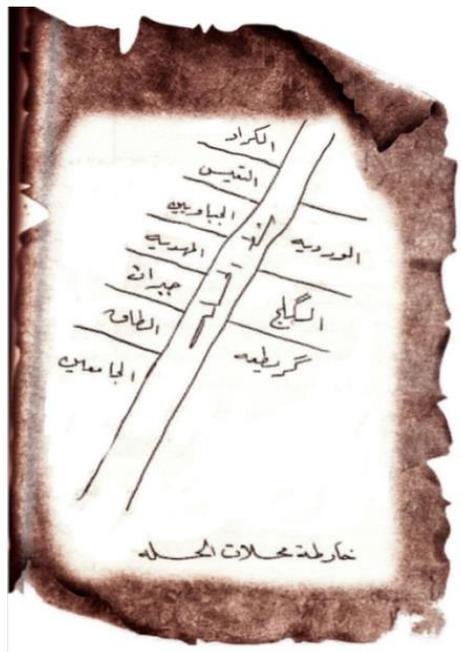
The city of Hilla was found on the land of Al-Jamiayn, which had existed before the founding of the city( Figure 4-5), and was called by

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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this name because it was a collection of various types of sciences and literature, so people moved to it from all sides and it was the first beginnings of establishing Hilla (Al-Sabah newspaper, 2021).



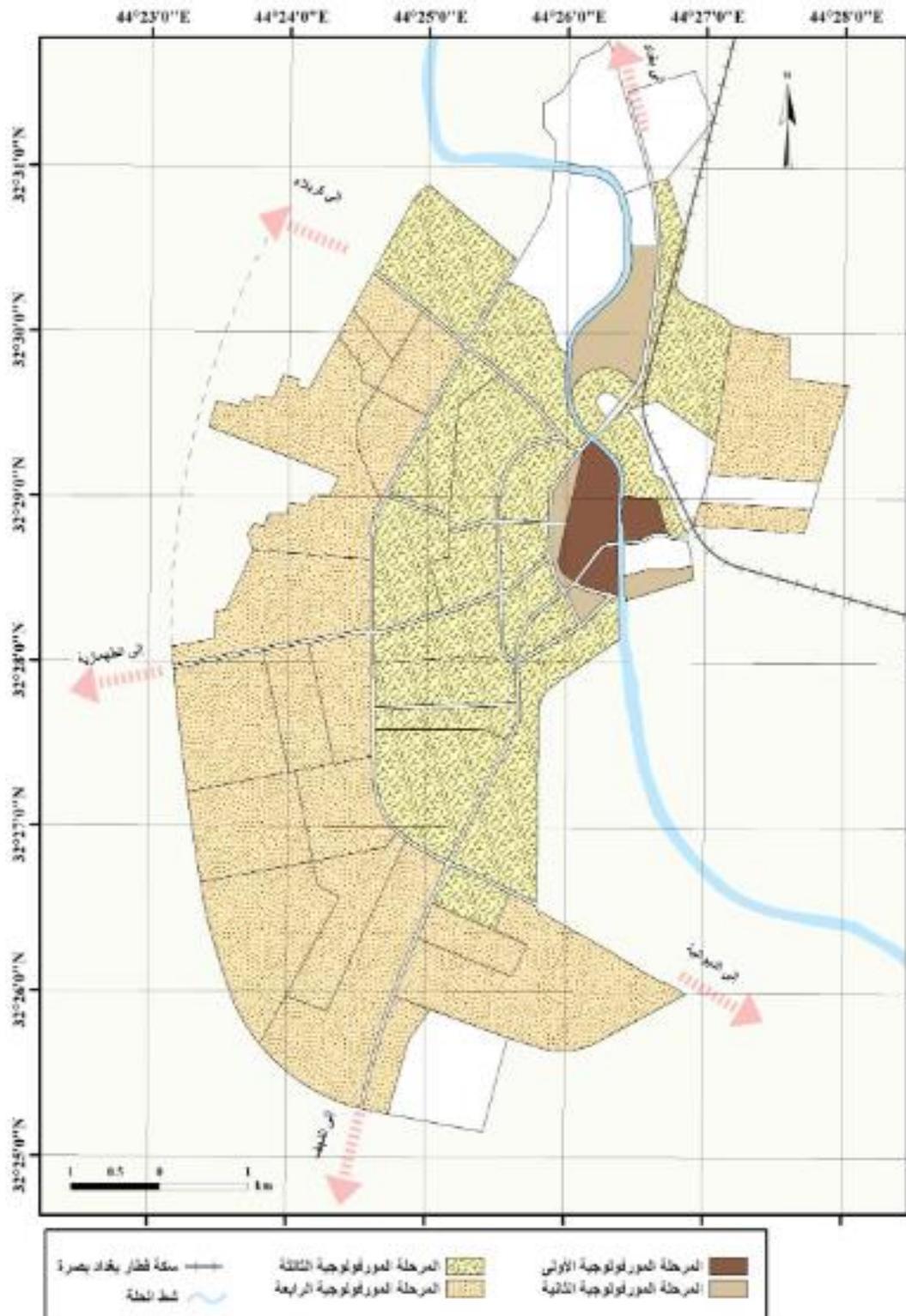
**Figure 3-3** The origin of the suit in these mahallat ( Hilla Traditional Center,2017)

#### **3.4. The Morphological Stages Experienced by the City of Hilla (The Traditional District)**

The city went through different morphological stages (Figure 4.5.), each with its own circumstances and history civilization, which was reflected on the inhabited city area (such as the area, the style of the streets and their systems, the building style, the building materials used, then its plan and the uses of the land therein) and each of the stages (Figure 3.4.) that characterizes the city shows the interaction of the (Function) and (Morphology) (Al-Rubaie, 2002, p 100) ,and certainly the traditional areas had a share of this change.

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla



**Figure (3-4)** Morphological stages of the expansion of the city of Hilla (Al-Rubaie, 2002, p135)

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

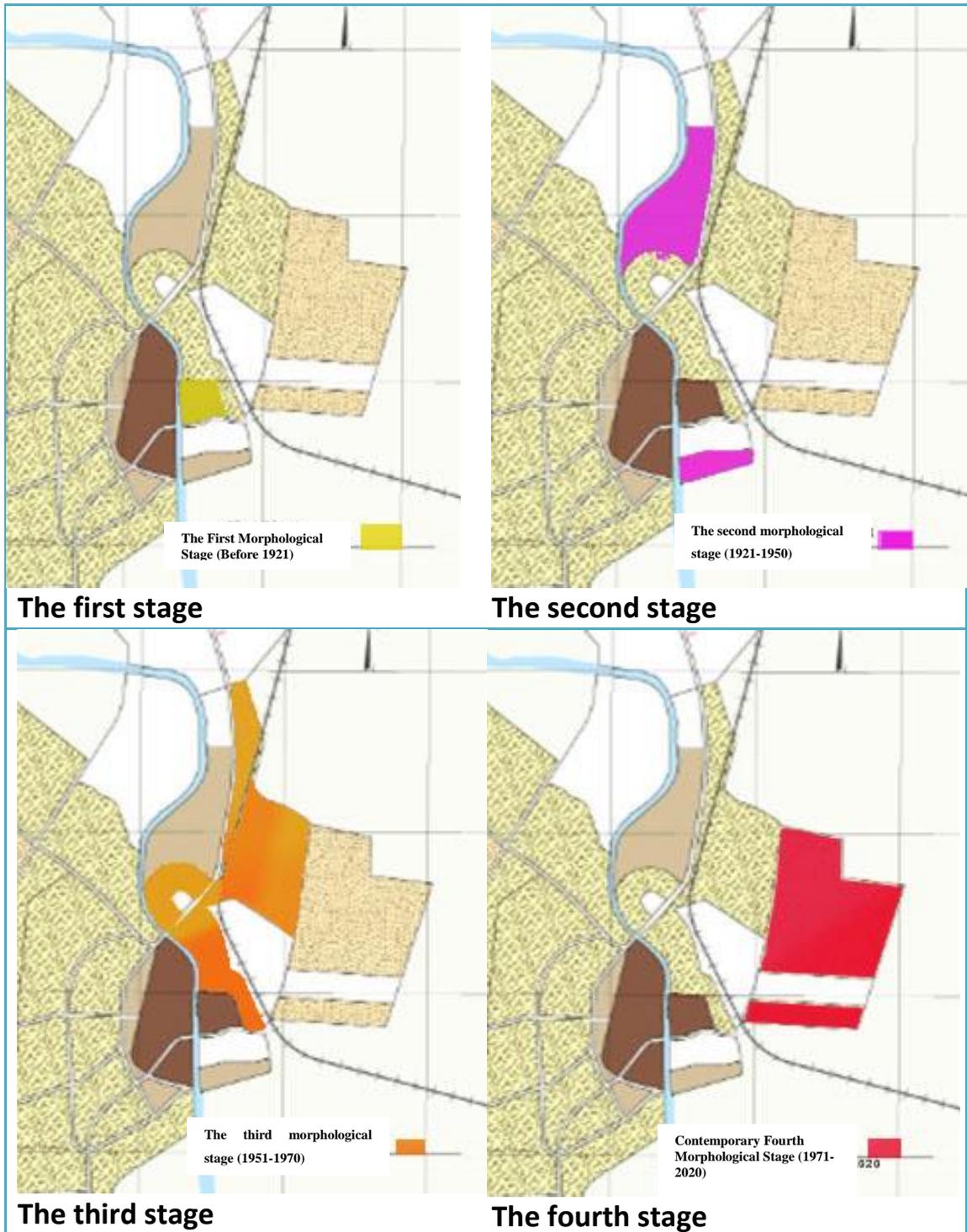


Figure (3-5) Morphological stages of the expansion of traditional area (The researcher worked on Al-Rubaie, 2002 )

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.4.1. The First Morphological Stage (Before 1921)

This stage of the city's life took a long time, and is considered one of the most important morphological stages in the life of the city, as it carries with it the cultural and architectural traditional of the city. It also reflects part of the city's history and represents the basis of the construction and urban style adopted in its later stages. This stage includes a group of *mahallat* that arose in successive periods of time, as the western side contains seven residential *mahallat*: (the Kurdish Al-Jamieayn Al-Taq, the unhappy Gibran Al-Mahdiyyah Al-Jabawiyin), and the eastern side are two residential areas (El Kellej and Al-Wardiya), and the eastern and western sides are linked by the old boat bridge. Which was then replaced by a fixed bridge (Kadhim, 2014, pp 34-36). The traditional areas were characterized by an irregular urban fabric, high population density, and organic streets, which are often narrow, crooked and sometimes impassable *aziqqa*, most of which do not allow any movement of vehicles within them. This is naturally due to the simplicity of the mode of transport that they had the ability to pass in the narrow paths at the time, Figure (3-5). As the *aziqqa* performs a social function for the residential mahalla, as it represents a social space for families and also provides a closed and safe area for children to play. The meanders and twists in the spaces and *aziqqa* created successful climatic treatments for the residential mahalla (Kadhim, 2014, p 38). The traditional areas were built on the higher parts of the land in order to be far from the dangers of flooding, in addition to the fact that the wall surrounding the city had an impact on the traditional areas taking the strip shape (Abdul Majid, 2015, p 117). At this stage, a group of residential *mahallat* arose

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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in successive periods, including the el soub al saghir that contains the two *mahallat* (El Kellej and Al-Wardiya). These *mahallat* were characterized by organic, narrow and winding streets.

#### **3.4 .2 The second morphological stage (1921-1950)**

At this stage, the city crossed its old wall as a result of the rapid urban growth, Figure (3-5). Most of the urban expansion witnessed by the city was on its western side, and a little of it occurred on the eastern side. The city of Hilla witnessed it, especially at the beginning of the thirties, as it opened new streets, and assumed the task of internal organization of the land uses, carrying out the operations of organizing and expanding the streets and opening new streets. After the establishment of the monarchy in Iraq in the year 1921, the tendency to work with contemporary planning laws was strengthened, which coincided with the emergence of previously unknown planning determinants, such as technical progress, the emergence of the impact of globalization, in addition to a significant increase in the urban population, which showed a need for new urban jobs. As the Iraqi planning institutions adopted and imposed written planning legislation and laws, and left the responsibility for implementing

These laws are the responsibility of the municipality, and their implementation led to the emergence of the city with a new appearance different from the traditional Islamic city prevailing in the previous phase (Nasrallah, 2002, p 35).

- 1- Baghdad City Expansion Law No. 53 of 1928
- 2- Roads and Buildings Regulations No. 44 of 1930

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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3-Municipal Administration Law No. - 84 of 1931 4 Roads and Buildings System No. - 44 of 1935

The residential buildings in this phase were characterized by new architectural and urban characteristics different from the previous phase, as the housing units were arranged in regular blocks and in small areas on the new streets and in regular geometric shapes, as the municipality had a role in setting the planning and design process. The entry of mechanical means of transportation, including cars and wagons, as a new concept, was reflected in the new urban context, as the municipality of Hilla expanded some paths and aziqqa in (1934), as the process of opening and expanding the streets after that, which led to a change in the urban fabric of the old city. It attracted new urban activities that took their positions on the sides of those streets (Kadhim, 2014, p 40). It is clear from this stage that the expansion was very little outside the boundaries of the areas of the first stage of the city's life. Rather, the matter was mostly limited to organizing it and opening the streets in it by removing some houses and exposing some narrow aziqqa and paths (Al-Rubaie, 2021, p 57).

At this stage, most of the urban expansion was in the el soub al kabir rather than the el soub al saghir, the entry of cars had an impact on the expansion of the aziqqa and the widening of the streets, which led to a change in the urban fabric of the old city.

#### **3.4.3. The third morphological stage (1951-1970)**

The third stage is an important stage in the life of the city because it witnessed a wide urban expansion, Figure (3-5). During this stage two periods can be distinguished, the first of (1959-1951) in which urban

### Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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growth was slow, and the second after (1960), which is the period during the urban revolution (Hadi, 1982, p. 58). The population increase contributed to this, as high population growth rates were recorded in the early sixties, the economic situation of the population improved, migration from the countryside to the city to provide job opportunities, and the opening of internal streets and external roads and linking them regionally with the cities of the Middle Euphrates with paved roads. All of these factors contributed to the expansion of the city, as its shape moved away from the elongation that characterized it during the previous two phases, and began to take a circular radial shape. The city prevailed in the previous two phases, a unified pattern of residential *mahallat* with a traditional organic style, and a planning style appeared in this stage based on building *mahallat* residential grid system. This type included two types of housing, the first it is characterized by its wide area and large gardens, inhabited by rich families represented in the *mahallat* of (Al-Khusrawiyya Babil, Al-Qadi, Shubra, Al-Zahra, Al-Bakryli Association, Algeria, Al-Hussein Al-Karama), and the second type was represented by housing. The system established by the government for people with limited income and workers, which is small in its area and the area of its gardens, which is represented in the *mahallat* of (Al-Sadr Al-Iskan and others), as well as other *mahallat* such as: (Mustafa, Ragheb, Ibrahimia, Al-Shawi and Nader) (Al-Ghazali, 2007, pp. 74-75), During this stage, the city acquired a new type of streets (the grid system), which is completely different from the organic system in the traditional areas, as the new system is compatible with the technological development witnessed by the city. These streets have introduced changes

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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to the morphology of the city, as they have attracted a lot of urban, commercial and industrial uses, etc. . In addition, the main streets that exit from the city towards the neighboring provinces and regions were attracted for residential use, which changed the city's morphology from the previous stages. Thus, the form of growth became (zonal), and at the time when the city grew outward, a change occurred in the internal structure of the city, functionally and architecturally, which eventually gave the city a new morphology, began with the establishment of the first urban design for the city of Hilla in 1971), Al-Rubaie, 2002, p 117). The economic situation of the population improved, migration from the countryside to the city and *mahallat* were built. The residential network system differs from the organic system in the traditional areas. Changes occurred in the urban form of these areas, where a type of housing appeared with a large area and its large gardens, including the *mahallat* on the el soub al saghir.

#### **3.4.4. Contemporary Fourth Morphological Stage (1971-2020)**

These areas arose in the seventies of the last century in the first phase of the master plan of the city until (2020), Figure (3-5). During this stage, the city witnessed a great growth in the spatial area, which was reflected in the city's need for functional uses that keep pace with its civilized development. This growth had a clear impact on the functional structure of the city and on its final morphology as a result of the street systems and urban style of the city, which witnessed major changes during the many years that the city experienced during this stage (Al-Rabi, 2002, p. 127).

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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The emergence of new areas in the el soub al saghir, especially the expansion and growth towards agricultural areas.

#### **3.6 Case Study: El Kellej and Al Wardiya *mahallat* in Old Hilla.**

An overview of the information available in the study area will be provided. This study deals with El soub al saghir that consists of two *mahallat* (El Kellej and Al-Wardiya) as a case study. The study of morphology and how it evolved to find problems, solutions (Objectives) and indicators, and knowledge of the morphological development of the city of Al-Hilla (el soub al saghir).

##### **3.6.1. El Kellej Mahalla location**

El Kellej *Mahalla* is one of the el soub al saghir that is located on the eastern bank of Shat Al-Hilla, and overlooks on its western edge. The boundaries of this mahalla are from the old bridge to Al-Naziza region, and it separates the *mahallat* of Krayta'a and Al-Wardiya. The continuity of the name goes back to an Ottoman commander named (Kilij Pasha) who encamped with his army in this area, and the region was a station for ships carrying grain and firewood (Al-Sabah newspaper, 2021)

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-6)** El Kellej Mahalla location according to the master plan of the city of Hilla for the year 2006-2030, (Ministry of Municipalities and Public Works 2013 and Nasir and Gado'o, 2016, p. 129).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.6.1.A. The Social and Cultural Context of Mahalla -El Kellej

Arabs, Kurds, Turkmen, Jews and other sects. (Al-Sabah newspaper, 2021). The Mahalla of El Kellej was a port for small ships carrying grain and firewood, from various areas, where workers pulled these ships with ropes to anchor on the great beach of Shatt al-Hilla at that time. Residents of El Kellej are a coherent mixture of social relations, they were attracted by the city to live and settle there. All the people of the mahalla live in a state of poverty and their homes are at a level that is not greater than the other by anything, yet their children have obtained prestigious degrees in science, literature, art and sports.

Some of the mahalla families became famous in and outside the *mahalla*. The most famous of these families are the Khudair Al-Khaji family, the Raddam family, the Al-Hassoun family, and the Al-Mutairi family. (Hilla Traditional Center, 2016)

#### 3.6.1.B. population

The population of El Kellej *Mahalla* was 3076 for the year 2014, the number of housing units was 613, and the net population density was 558 person / hectare. (Nasir and Gado'o,2016, p130).

**Table 3.1** The population of El Kellej *Mahalla* (Nasir and Gado'o, 2016, p. 130)

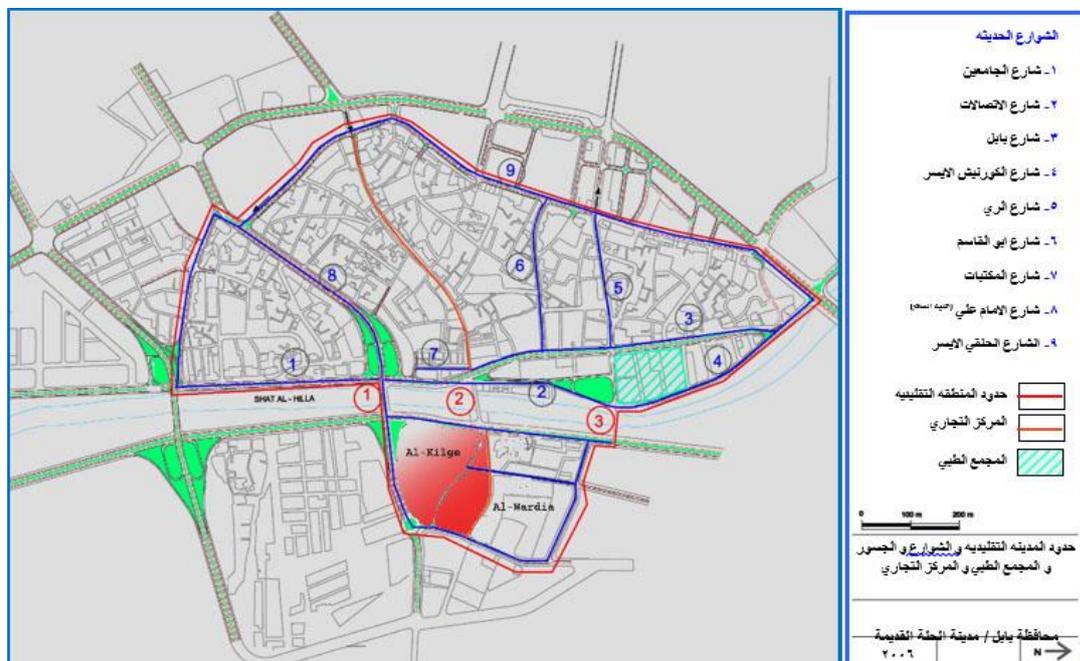
Al -Mahalla name	population	The number of housing units	Actual space dwelling/ha)	net population density (person/ha)
<b>El Kellej</b>	3076	613	51.5	558

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

#### 3.6.1.C. Characteristics of El Kellej Mahalla

Among the most famous aziqqa are Eakad al-Asfar, al-Bous, al-Akkam, al-Bawaba, al-Nahr, and al-Tama. (Al-Sabah newspaper, 2021) . The most famous houses of El Kellej Mahalla are: Beit Al-Amidi, Mal Allah, Al-Akkam, Barbin, Al-Hassoun, Amara, Sayed Jamil, Karim Al-Naddaf, Radif Al-Mukhtar, Al-Falluji, Usta Jaber, Babur, Al Tawfiq, the house of Zuhair and his brother Barir, and the house of Al-Mutairi, Al-Duri, and the house of Al-Mrah. The Mahalla of El Kellej was not free from the houses of God that the believers would visit during prayer times, and these mosques were: The Bait Mal Allah Mosque, the Sayyid Hakim Al-Amidi Mosque, which are inside the El Kellej Mahalla, and the Al-Shatt Mosque (Hilla Traditional Center , 2016).



**Figure (3-7)** El Kellej Mahalla plan (Hilla Municipality Directorate, 2010, p 1)

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla



Figure( 3-8) El Kellej Mahalla plan (The researcher,2022)



## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-9)** Al-Shanasheel and the old aziqqa in the Mahalla of El Kellej

#### **3.6.2. Al-Wardiya Mahalla location**

The Mahalla of Al-Wardiya is a Mahalla on the el soub alsaghir of the city of Hilla. Al-Wardiya separates from the Mahalla of El Kellej the small market as well as Suq al Ammar. Al-Wardiya extends from Market Al-Amar, which includes different professions, until you reach a branch on your left called “agd Al-Arian”, and from it, take a left from an aziqqa that connects you to the houses of the family of Al-Sayed Mahdi Al-Alaq until reach the river road, take it towards the bridge. come across an aziqqa on left at the beginning of the mosque of Al-Wardiya. Hajj Salman Al-Barak, then reach the bridge, this is the border of the old region (Iraq grandeur, 2017, p 1)

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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Figure (3-10) Al-Wardiya location (The researcher,2022)

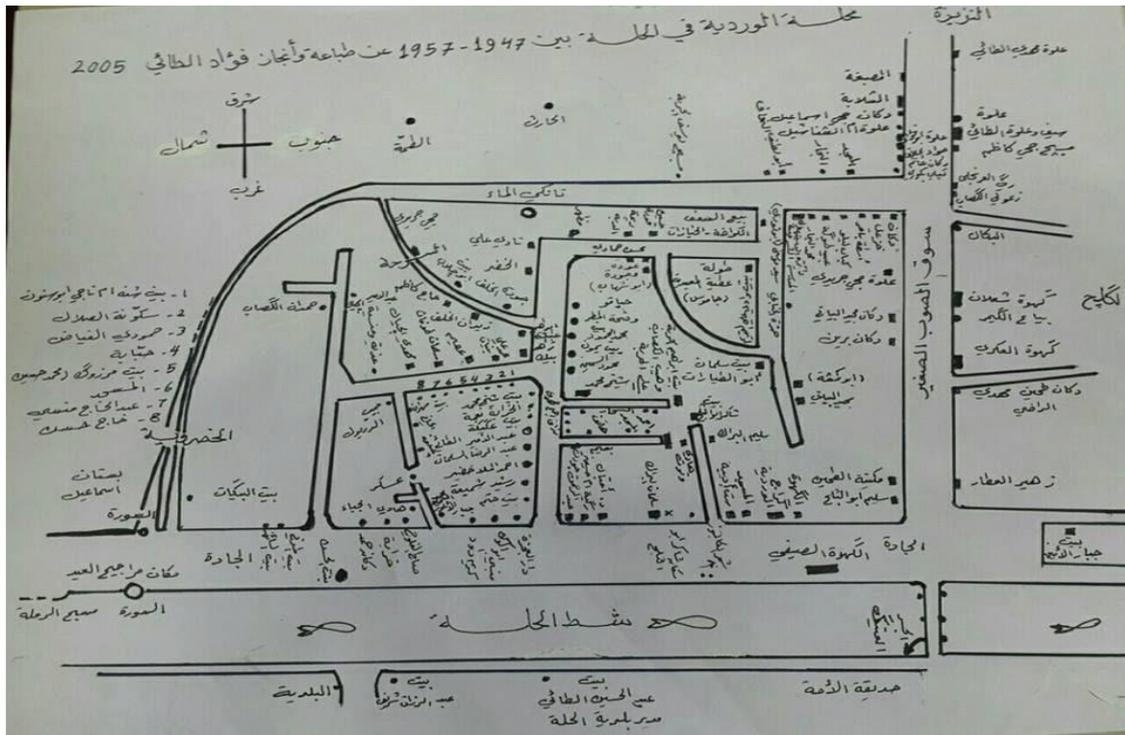
#### 3.6.2.A. Social and Cultural Context of Al-Wardiya Mahalla

This mahalla was established in a late period from the founding of the city, and its residents are of Arab origins who are engaged in self-employment and agriculture in orchards (Al-Sabah newspaper, 2021). Its people are peaceful, with relations of love and mutual respect prevailing among them. Among the prominent figures of the Mahalla of Al-Wardiya are the late Sheikh, the scholar Muhammad Samaka, the scholar Sheikh Ali Sammak, and Sheikh Salman Al-Barrak, who are among the men of the Twenty Revolution, as well as Messrs. As for the most famous families that inhabited the Al-Wardiya, they are (the Samaka family, the Bunyan family, the Al-Barrak family, the Jabbar Ali Al-Hasani family,

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

Al-Jilawi family, ...) and other generous families. Among the most prominent mayors who represented the moral and social authority in the mahalla, Jabbar Hassani, Abdul Amir Al-Taie, (Iraq grandeur,2017, p 1).



**Figure 3-11** Al-Wardiya Mahalla in Hilla between the years 1947-1957 (Museum of Contemporary Al- Hilla)

#### 3.6.2.B. population

The population of Al-Wardiya Mahalla was 3340 for the year 2014, the number of housing units was 487, and the net population density was 762 person / hectare (Nasir and Gado'o,2016, p 130).

**Table 3.2** The population of Al-Wardiya Mahalla (Nasir and Gado'o,2016, p 130)

Al -Mahalla name	population	The number of housing units	Actual space dwelling/ha)	net population density (person/ha)
Al-Wardiya	3340	487	38.4	762

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

#### 3.6.2.C. Characteristics of Mahalla Al-Wardiya

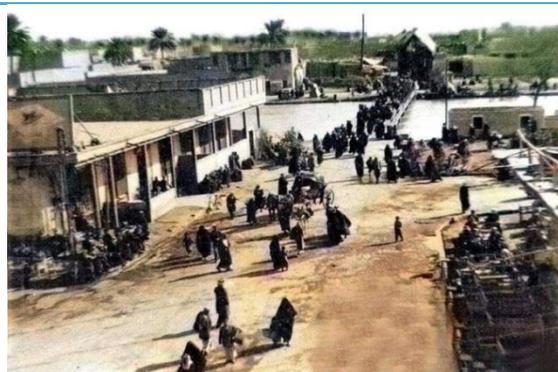
*Mahalla* has several aزيقqa and was called by different names by its residents, the most important of which are (Eakad al-Sheikh - Eakad Hassan - Eakad Hajul - Eakad al-Alaq and al-Jilawiyin - Eakad Bunyan - Eakad Beit Shakhat and others). Among its remaining mosques are (the mosque of the Allama Muhammad Samaka or the mosque of Al-Wardiya, the mosque and Husseiniya Al-Arian). The most prominent cafes in it are (Abbas Al-Tama Cafe, Al-Haj Nayef Cafe, Kolat Cafe, Mahdi and Hamoud Al-Jamal Cafe, Alwan Pasha Cafe, and then it became the Reda Abaka Cafe (Iraq grandeur,2017, p1).



Shanasheel Mahalla al-Wardiya in the sixties



Al-Wardiya inside and Al-Wardiya outside



For The City Of Hilla, The Old Bridge And The Suwk Aleamaar Appear 1948



Old Bridge

**Figure 3-12** Al-Wardiya Mahalla Museum of Contemporary Al- Hilla)

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.7 The Concept of Public/Private

Public and private domains have an essential role in the articulation of spaces. These concepts introduce necessary steps towards a complete understanding of the main idea of these domains. The social, cultural or physical division of urban spaces into public and private realms expresses the relation between the two different spheres in society which reflects respectively the different types of relations that combine the individual with society and, in other words, between the self and the others within the same context. Public spaces have basically been related to spaces where social interactions can take place in larger groups without censorship. They show the embodiment of the notion of promotion into the unrestricted visibility or accessibility of social interactions such as being in a street coffee house or in a shopping centre. However, the socio-cultural notion of the public/private segregation refers to the meaning of the private realm and its different spaces. The female domain provides a high degree of desired privacy, secrecy, concealments and isolation from the attention of the public. This mechanism articulates the integral meaning of privacy including visual, aural and accessibility determinants. The intimate, closed and separated private domain and the opposite open and shared public one constitutes a social and contextual environment of people's daily life in an interrelated relationship. This idea can be clearly shown when, for example, the public domain of the alleyway 'agd' in local communities similar of *mahalla* transforms into private to accommodate diverse social and cultural occasion (Al-Thahab *et al.* 2014. p75)

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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#### **3.8. Social Privacy and Environmental factors of the Traditional Home**

The social and cultural factors, rules and principles of Iraqi society are represented as the main need and structure of achieving privacy. The perspective of different spaces of the house has been wrapped by various cultural, social and behavioural rules. Social habits, cultural values and lifestyle of the family members dictate the form of the social spaces of the traditional house in Iraq (Khattab, O.2013, pp. 1-18). The home represents the fundamental spatial system of a specific culture, social identity and family affiliation and recognition (Jiboye, A.D. & Ogunshakin L. 2010, PP 117-128). It is a reliable organization that can be more responsive to the changing needs of the family which thus can develop flexible solutions to the increasingly limited spaces to encompass the different social and cultural needs. Despite the rigidity of the house plan, there is an opportunity for informality with functions according to the degree of privacy acquired from each space (Boudiaf. 2010, pp. 167-184). Physical treatments with regard to privacy, gender segregation and direct visual contacts between male and female or visitors and women have, therefore, been performed in a manner that shows a deep understanding of social, cultural and religious values. This can be clearly shown in the physical, spatial and functional properties. The real concept of privacy in traditional domestic units in Iraq could be practised in the cantilevered elements (shanashil), which represent physical components within the structural compound of the house that help assert the privacy of its users .They are particularly important for women to ensure the notion of gender segregation and achieve a visual contact to the public

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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outside or visitors inside the introverted compound without being observe except from those who belong to the same family .At the same time, the components of ‘shanashil’ allow an interpersonal relationship between women of nearby houses to contact freely each other .Each house shows the private domain in various levels and degrees with regard to the nature of privacy, social groups and mechanisms used .Whilst the private refers in some degree to the concept of the public, the form of this relation and the different transitional spaces has the tendency to vary more and change over the course of time (Rapoport,A. 2007, pp. 57-72). The house has a range of public and private realms reflecting the different activities over the course of time. It contains many physical boundaries which perform the thresholds between the public domain associated with the out-side alleyway (agd); and the semi - public realm of the house illustrated by the entrance This thought can be shown in most traditional houses The space of the entrance has been articulated in a way that prevents any kind of direct visual intrusion from the outside towards

The main social core of the house. Semi-private and, often, private realms represent particularly the socio-cultural core of the house, while the semi-public realm which, is in direct association with the semi-public realm of the entrance, views the world of men, guests and uninvited visitors as well as many public affairs, such as wedding ceremonies. Public and private relations inside the house are largely arranged in relation to the lines of familiar stranger, guests and, most certainly, male-female relations (Madanipour. 2003).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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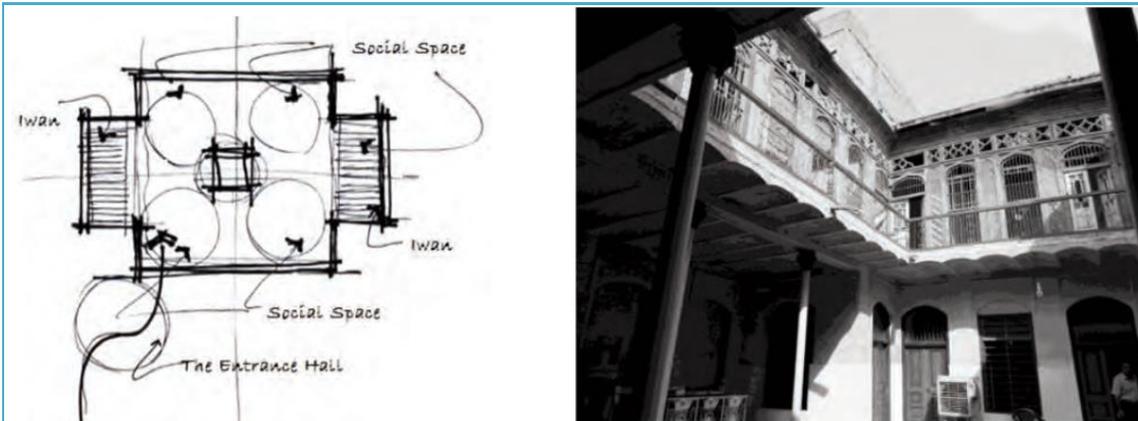


Figure 3-13 Social space & privacy in traditional house

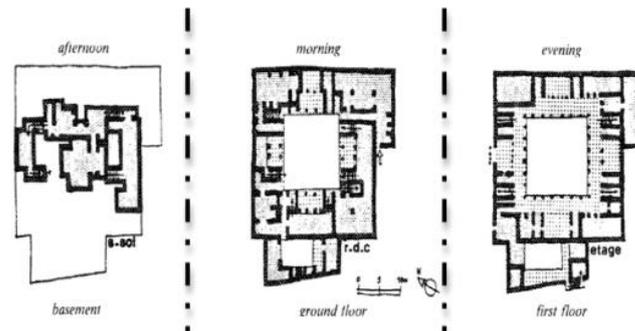
Figure 3-14. The courtyard house, Dar Babil in Al-Hilla-Iraq. (Al-Thahab et al .2014,p76)

Environmental factors have influenced the form of the courtyard house which relates to the size of the courtyard, height of the building, architectural details as well as to vegetation and fountain design. Due to hot dry climate, courtyards were kept small and over shadowed by high walls to modify the high temperature environmentally, it can be clearly seen that these buildings and design have responsibility to the climate as shown in the (figure 3-15). In the morning, the ground floor is suitable for use. In the morning as usual the sun is not too hot and the angle of the sun does not go to the courtyard and covers all of the area. Otherwise in the afternoon, the angle of the sun will be nearly too perpendicular and the basement will be better to use. In the evening, the family can use first floor). The dimension and ratio of the yard designs efficiency and calculated with the sun angle (Fathulla ,2016, p 18).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure 3-15** basement, ground floor and first floor of the courtyard house building ( Fathulla ,2016,p 17)

The traditional cohesive fabric is the best example of applying the concept of sustainability at the city level as a whole. City planning and movement path treatments in terms of width, shape, length, orientation and directional change represent the basic stage of adapting to the environment. The compact fabric leads to softening the harsh climate effects and mitigating their effects, especially high temperatures, solar radiation, dusty and hot winds, and thus mitigating the total heat load affecting the facades of buildings, especially the residential units, where the residential units constitute the largest quantity in the total structural production. In the Arab city, which is thus one of the strong influences on environmental data. Some cities were distinguished by semi-solid and shaded walls that were, the courtyards with the middle of the dwellings, acting as a thermoregulator for the residential mahalla and for the city as a whole (Fathulla, 2016, p. 17).

### **3.9. Principles Of Sustainability in The Traditional House**

The compatibility of the traditional House with the environment, with all its advantages and its drawbacks have been achieved according to

## **Chapter Three**

### **Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla**

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two strategies: protection and adaptation. Protection has been achieved by limiting the impact of harsh natural environment conditions such as hot climate, low relative humidity in some areas and high in others, and the intensity of solar radiation. As for the adaptation, it was by exploiting the potentialities inherent in these harsh conditions and dealing with them in order to achieve thermal comfort for the residents and to exploit natural energy sources such as the sun and wind. There are several basic principles on which it is based. The architecture of the traditional dwelling includes the concept of sustainability, which can, with some modification, modification and development, be indicative indicators for the design of the contemporary sustainable dwelling.

1. Planning and dealing with the site

Traditional architecture treated the site as part of the urban fabric of the city as a whole.

2. The design idea of the traditional dwelling use of the courtyard

3. Environmental design and energy conservation

4. The traditional house is a good example of environmental design in terms of the design principle building materials and environmental treatments that relied mainly on the exploitation of natural energy resources in order to provide a comfortable internal environment.

5. Natural ventilation in traditional systems

pedicure

6. Building materials and thermal performance of the building shell

7. The basement (al Zubaidi and Rashad ,2010, pp. 83-90).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.10. Indications of The Traditional House and Al *mahalla*

There are many basic principles on which the structure traditional house was based, as well as a wealth of environmental remedies that can be applied today to address the critical situation in Table (2.6), which, with some modification and development, can be indicative indicators of contemporary sustainable housing design.

**Table 3.3** Some of the indications of the traditional house and al *mahalla*

Social Sustainability	<ul style="list-style-type: none"> <li>- Orientation towards the interior, and this feeling begins by moving between spaces from the public to the semi-public to the private.</li> <li>- The formal unity through the relationship between the different parts of the city, which is of great importance for the formation of the traditional urban fabric, where the parts are in a mutual functional relationship that affects all parts.</li> <li>- The interaction and harmony of the behavior of the population and its reflection on the formation of the traditional urban fabric.</li> <li>- The traditional environment is characterized by being a living organism that is influenced and affected, and this cohesion was reflected in its urban fabric and structure through its planning.</li> <li>- The balance of the traditional environment between the privacy of the family and the interactions of the community. In addition to the existence of the sanctity of the dwelling within the grouping of its housing units.</li> <li>-alsuwkin the traditional Islamic cities is an essential part of life and is considered its economic artery, as most of the mixture of uses is concentrated in the</li> </ul>
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## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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	center area, and these uses are linked to the alleys and the streets that are gradient and distributed in an organic way, thus providing easy access and clear permeability
Environmental Sustainability	<ul style="list-style-type: none"> <li>-Building with mud or bricks</li> <li>-Thermal comfort (courtyard(</li> <li>- natural ventilation (pedicure)</li> <li>- Use of the basement to access thermal comfort</li> <li>- natural lighting (The expulsion of direct sunlight, the most important of which is the chanasheel, which are architectural treatments that allow the entry of soothing winds, and do not allow the entry of sunlight)</li> <li>narrow streets, and shaded areas,</li> </ul>

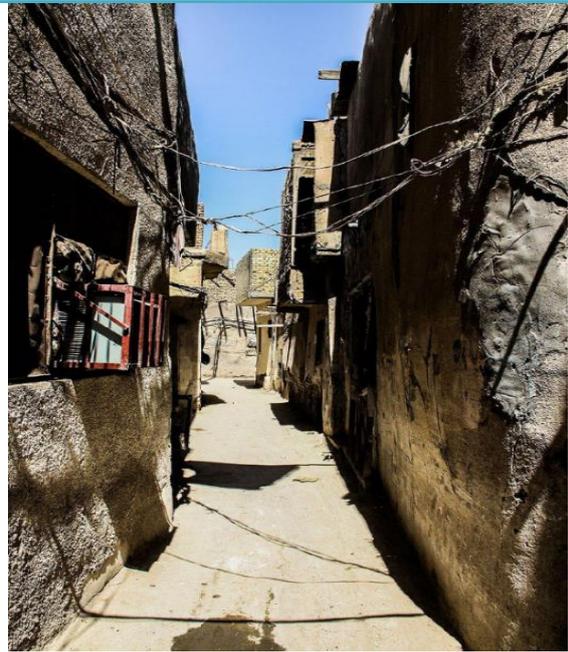
#### 3.11. The Current Urban form of the Traditional Area (El Kellej and Al-Wardiya )

This area suffers from many problems due to neglect, lack of maintenance and the disappearance of this important area, which has a civilized history, and new *mahallat* have emerged, expanded and grown, sometimes affected by it and sometimes not.

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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El Kellej *Mahalla*

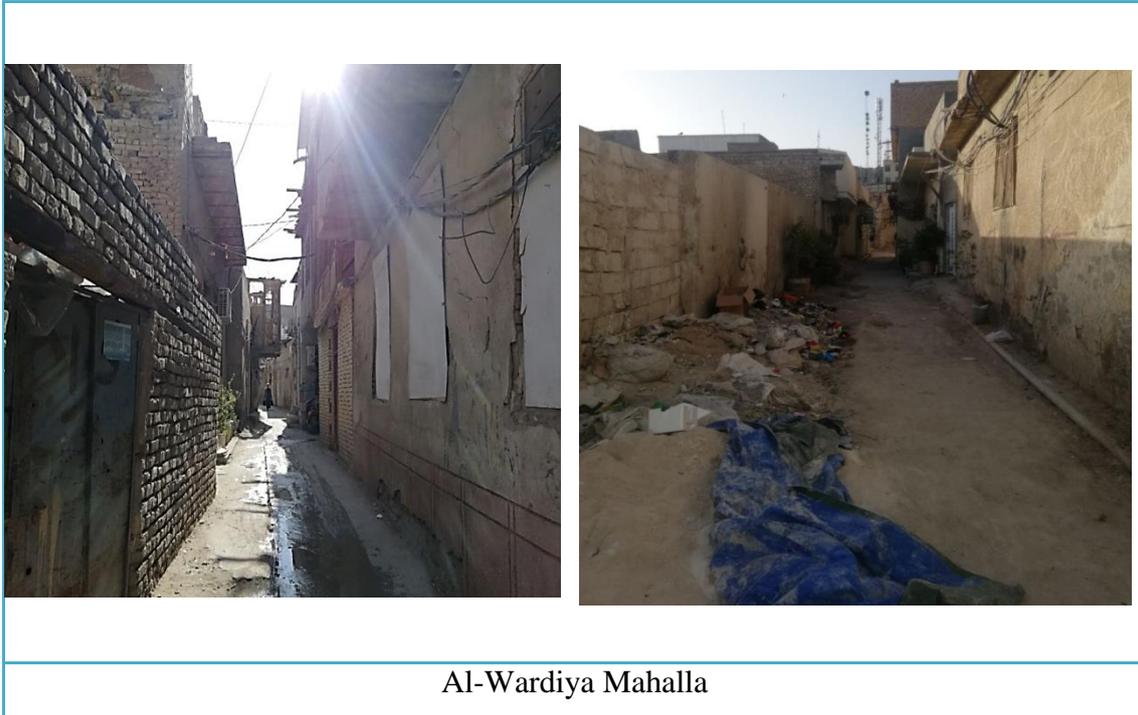


small market (Suq al amaar)

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-16)** The traditional area (El Kellej and Al-Wardiya ) at the present time(The researcher 2022)

#### 3.11.1. Emerged New *Mahallat* From El Kellej and Al-Wardiya

(Figure 3.18) represents some of the new *mahallat* that grew and expanded from the traditional part (El Kellej and Wardiya). Some of these *mahallat* were expanded and appeared at the expense of agricultural areas, including the areas adjacent to a pink area outside, where orchards have eroded and the lack of control over these erosion of these agricultural lands and these *mahallat* suffer many problems, as shown in pictures, both in terms of services, roads not paved with design standards, demolishing traditional areas and building commercial complexes, changing the landmarks of the area, including the clock in the Babel mahalla.

# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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River front



Babel



Al-Bakrly



Al-Bakrly



aljazayir



Behind the Kilaj region

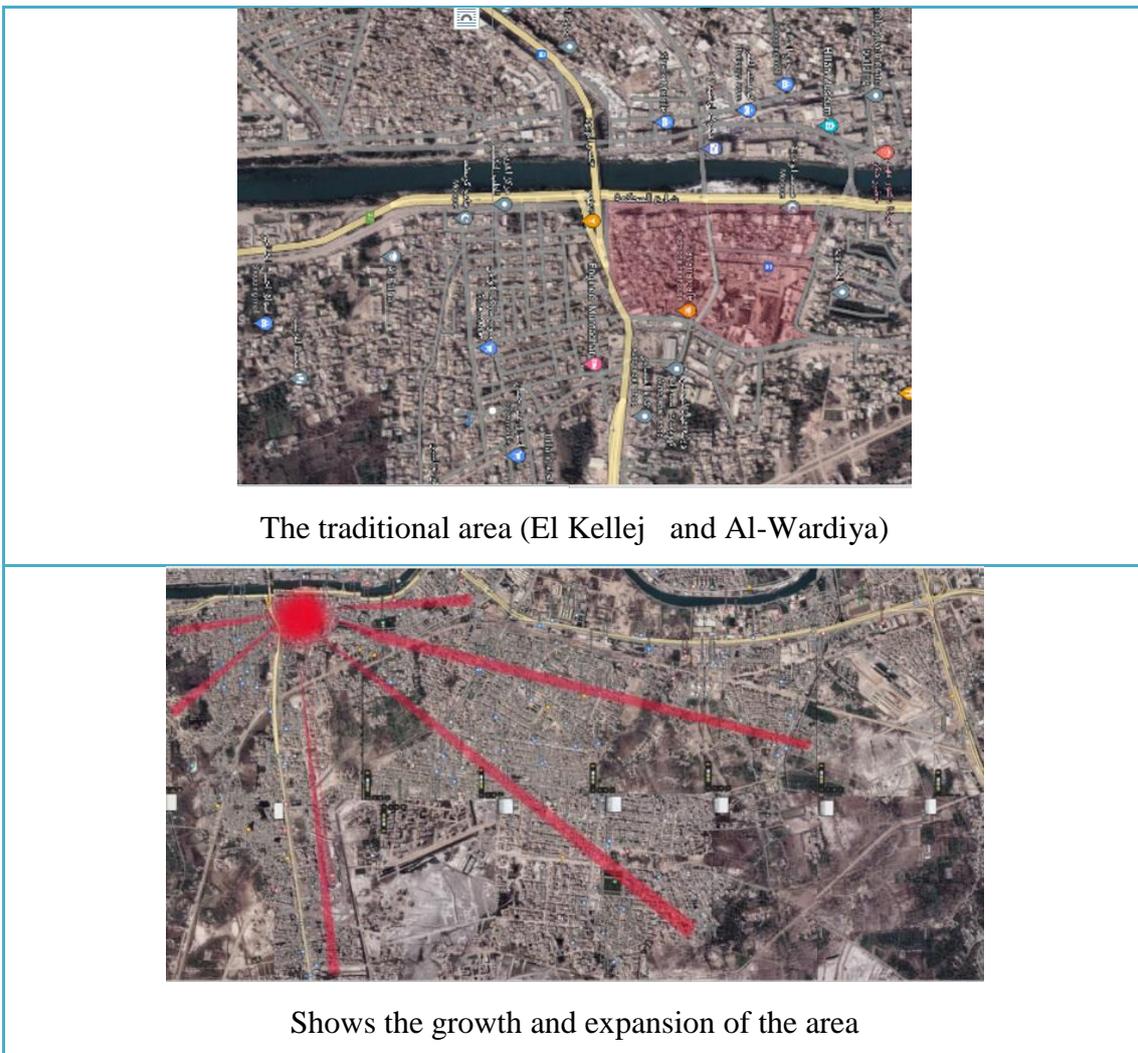
# Chapter Three

## Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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**Figure (3-17):** Some Of New Mahallat (The researcher 2022)



**Figure (3-18):** The Traditional Area (El Kellej and Al-Wardiya) (The researcher 2022).

## Chapter Three

### Analytical study of El Kellej and Al Wardiya Mahallat in Old Hilla

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#### 3.12. Summary:

In this chapter, the case study is the traditional area (El Kellej and Al-Wardiya) in the el soub al saghir in the city of Hilla. The study area contains many problems, including neglect and lack of care for this area, which has a cultural and historical traditional. As this area expanded and grew and new *mahallat* appeared that may be affected by the traditional area or not also suffer from many problems, whether in terms of service, not implementing streets with good design standards, or slums and encroachments on orchards or empty lands, because they have a role in changing the urban form of these areas .On the other hand, the lack of a planning policy for these new *mahallat* Including areas in a pink direction outside areas with agricultural lands, where these lands are divided among their owners under the framework of inheritance without any control over the process of dividing these lands.

**Chapter Four**  
**Applying Research Methodology,**  
**Results and Discussions**

## **Chapter Four**

### **Applying Research Methodology, Results and Discussions**

#### **4.1 Introduction:**

As discussed in the section dealing with the research aim and objectives in Chapter one, there is a need to develop the framework the use of a selected case study, in developing sustainability indicators. framework as described in details. involves identifying the major issues, needs and problems within the case study area using documentary sources, focus group discussions and interviews. Step 2 consists the sustainable indicators by reformulating the problems and needs that appeared in the objectives (solution statements), and the next two stages consist of formulating the indicators in addition to select and arrange the indicators in the last stage.

The purpose of this chapter is as stated below:

1. To identify any major application related to problems concerning the implementation of the sustainability framework
2. To identify key themes and those which require to be given priority

Underlying these purposes.

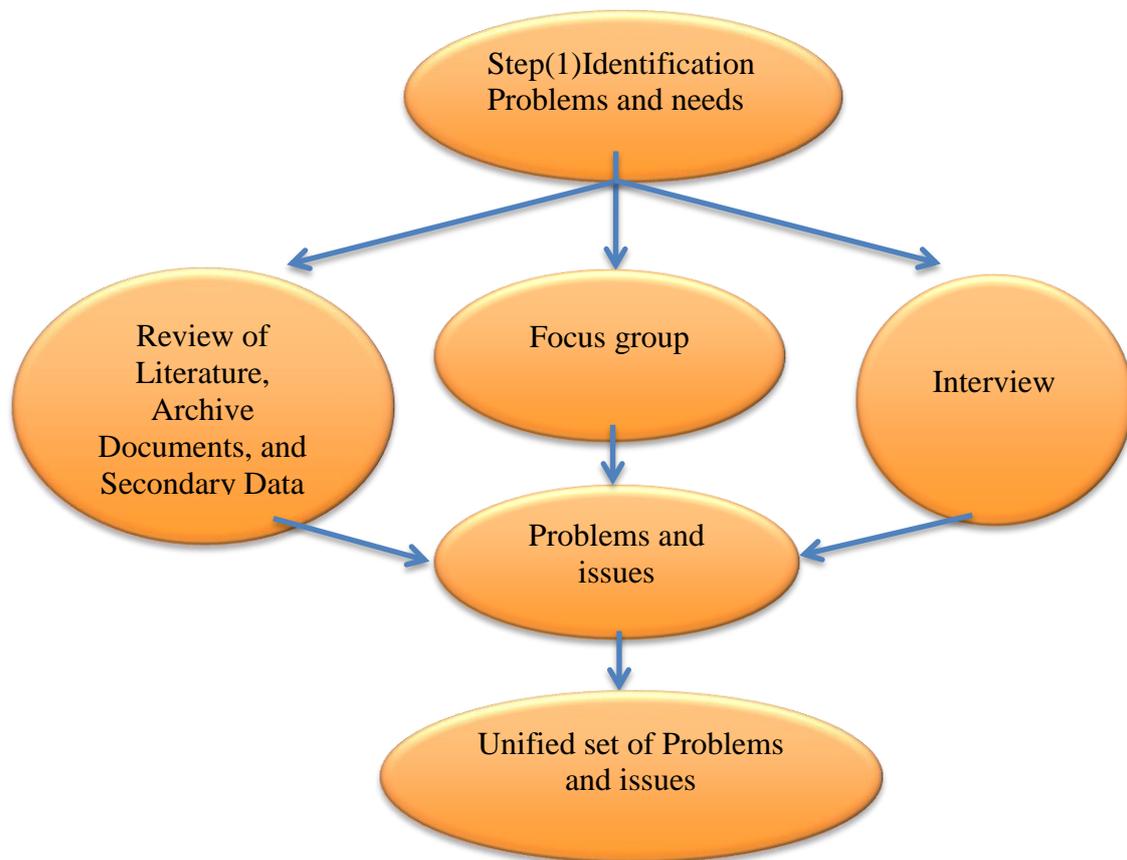
#### **4.2 The First Step: Identification Problems and needs**

The first step of the methodological process is to explore the main issues, needs and problems in a case study, which is assembled from several tools. (Figure 4.1) shows the process by which this task was processed

## Chapter Four

### Applying the research methodology, results and discussions

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**Figure 4-1** A general scheme of the first step (issues identification) of Methodological process (The researcher ,2022)

(Patton, 2002) recommended a series of procedures to allow the appropriate construction of case study data for analysis: collect the raw case study data; construct a case record and write a final case study narrative which can be presented thematically, chronologically, or both. To collect raw case study data, a variety of research techniques can be adopted including: interviews; observation; questionnaires; focus groups; documentary sources; visual methods; and ranking exercises (Laws *et al.*, 2003, p. 121).

Qualitative study deals with the universe of meanings, beliefs, motivations, aspirations, values, perceptions and human feelings obtained

## Chapter Four

### Applying the research methodology, results and discussions

with research participants in their subjectivity and living contexts. Qualitative research is generally used as a broad umbrella term for a range of research methodologies, with differing epistemological assumptions. (Petty et al, 2012, pp. 267-74).

The research design is the plan or strategy researchers use to answer the research question, which is underpinned by philosophy, methodology and methods, (Chun et al, 2019, p3). One aspect is very clear the process will generate a large amount of data. In addition to the variety of methods available, there are also different methods of collecting and recording the data. For example, if the qualitative data is collected through a focus group or one-to-one discussion, there will be handwritten notes or video recorded tapes. If there are recording, they should be transcribed and before the process of data analysis can begin. In this study, the data are presented to allow understanding of the main problems or issues within (El- Klleje and Al-Wardiya traditional district). Findings from documentary sources, focus group discussions, and interviews were faithfully reproduced.

#### **4.2.1 Review of Literature, Archive Documents, and Secondary Data**

Archived qualitative data is rich and unique, but often untapped, source of research material. It provides information that can be re-analyzed, reformulated, and compared with contemporary data. Also, archived research materials can prove to be an important part of our cultural heritage and become resources for historical as well as contemporary research, (Corti and Thompson ,2012, pp 7-8) Documentary sources relating to the entire study can also be found in the previous chapters where a critical analysis of the literature for developing a sustainable

## Chapter Four

### Applying the research methodology, results and discussions

framework (Chapters 2 and 3) and a description of some important facts about the case study (Chapter 4). Government records, unpublished reports, non-governmental reports, academic reports, local historical records, maps, socio-economic studies, and other sources are relevant sources to the case study. Documentary Sources all recorded sources of information irrespective of their contents and forms come under documentary sources. These may be published or unpublished, in print or in electronic form. These may be books, periodicals, magazines, and others Documentary sources can further be categorized based on their contents and form (or media), (Dhiman, and Yashoda, 2005). Data from documentary sources were useful in the initial stages of this study in allowing the case study to be understood and the problems and issues important to sustainability drawn out.

### **Results of Review of Literature, Archive Documents, and Secondary Data**

A methodical process was used to examine the information obtained from documentary sources. The data was sorted and organized. The final results from this work are shown in **Table 4.1**.

**Table 4.1:** Problems of Traditional District (Al- Kellej and Al-Wardiya) in Hilla identified through document source analysis

<b>problems</b>	
The deterioration of sewage services	The scarcity of agricultural machinery and equipment and the aging of equipment work
Lack of interest in graduates and providing suitable job opportunities for them	Lack of interest in the historical city of Babylon

## Chapter Four

### Applying the research methodology, results and discussions

---

Not caring about the heritage city	The lack of a green belt surrounding the city
Not activating the archaeological and religious facilities	The fertility of the land has deteriorated, and farmers are ignoring agriculture
Inefficiency of the internal road system	The deterioration of the city's slums
The deterioration of the industrial and manufacturing sector in the city	The spread of illiteracy among the slum dwellers
Not activating the tourism sector	Lack of funding for the unemployed to set up their own businesses
Weak central planning	Inefficiency of electricity services
Horizontal construction of urban development	Reliance on the central government as the only source of funding
Traffic congestion increase	Weakness of local industries
Lack and poor quality of paved road works	Unemployment and lack of job opportunities.
Lack of bridges and streets in the city	The spread of the phenomenon of abuses on agricultural land.
Dangerous import policy	Increasing random gatherings.
lack of stores	Lack of adequate housing for poor families
Shortage of power and fuel supply	Slums in el Soub alsaghir .
The lack of manufacturing industries in addition to the underdevelopment of agriculture	Lack of workers and equipment required to collect waste.
Low incomes for individuals and societies	A shortage of doctors, medical professionals and nursing staff.
Inefficiency of the sewage network	A shortage of ambulances.
Inefficiency of the telephone network	Inefficiency of the equipment and devices used and not keeping pace with global technological

## Chapter Four

### Applying the research methodology, results and discussions

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	development.
Inefficiency of waste collection services	The presence of foreign products competing with the local product
Inefficiency of the drinking water network	The spread of illiteracy among the slums.
Lack of emergency services	The high rate of poverty
A shortage of health care services	social heterogeneity
Shortage of medical personnel	Lack of equipment and devices needed to maintain gardens and parks.
Shortage of medical supplies and medicines	The deterioration of the fertility of the land and the neglect of farmers for the cultivation cycle.
A few health centers	Lack of training and qualification courses.
The spread of cancerous diseases	The lack of service and maintenance of green spaces
visual pollution	Lack of environmental awareness among the public and institutional sectors
Lack of standardized codes for building facade finishing materials	Weak coordination and joint action mechanisms with local government departments and civil society organizations
The spread of crime and drugs	Absence of the role of civil society organizations in educating citizens
Inefficient street furnishing and lighting improvement	_ Failure to activate legislation related to the urban environment
Lack of support for the requirements of agriculture	The lack of green spaces and the lack of resources needed to establish them
Al-Hilla River water pollution due to waste	A large discrepancy in the per capita percentage of park area between city

## Chapter Four

### Applying the research methodology, results and discussions

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	mahalas
There are no entertainment centers	Noise Pollution
Inefficiency of solid waste collection services	Weak laws and penalties for motorcyclists
Increased soil salinity	Air pollution from vehicle emissions
The deterioration of the cultural aspect	Increased desertification and water scarcity
Failure to keep pace with technological development in the education sector	Few schools

#### **4.2.2 Focus Groups**

The use of focus groups is to measure the opinions of the people of the area in the traditional part (El Kellej and Al Wardiya) in the el Soub al saghir of the city of Hilla regarding their priorities and opinions about a sustainable future for their city. The opportunity is taken to hold some focus groups. Participants will participate free of charge or withdraw from the focus group, so that there is no coercion. In these meetings the residents who agreed to participate discussed their views and desires regarding achieving a more sustainable city and were asked what was wrong with your area. The researcher made recordings of their views and writing In accordance with the ethical research protocol, it was made clear that the participants had the right to opt out during the group focus or at any time after the focus period ends. The researcher noticed some imbalances such as fewer women Therapies that address the expected imbalances were implemented by increasing the number in the interview component of the research from six to twelve people, recommended as ideal sizes for effective group discussions (Robson, 2002)The focus group in this case study included six to ten participants. By the researcher avoided the problem of having groups that were too small or too large,

## Chapter Four

### Applying the research methodology, results and discussions

which could lead to Superficial discussion of experiences and ideas or difficulty controlling the direction of the discussion. Focus group meetings continued until 'saturation' was reached, when no new important topics were acquired. After completing each focus group, the results were evaluated and added to the information obtained from previous meetings. This helped determine if the saturation point was reached, at which point it is taken into account. No additional focus groups were necessary. A total of 6 focus group meetings were held across the heritage area (El Kellej and Al Wardiya). The organization of these focus groups began in February 2022. Fifty participants participated in all focus group meetings (Men and women, residents of *mahallat*, decision-makers in government departments, including the General Directorate of Municipalities in Babel, and planners). Information from focus group discussions was transcribed to record the discussion details and rank of all relevant issues raised.

### **Results of Focus Groups**

The issues raised during the discussions were taken into consideration in order to extract all relevant information. If the information mentioned more than once, the repetition ignored. The texts were grouped into their relevant dimensions (social, environmental, economic and institutional), and sorted. The results of this process are shown in Table 5.2.

**Table 4.2:** Problems of Traditional District (Al- Kellej and Al-Wardiya) in Hilla identified through focus group discussions

<b>Problems</b>	
The excesses of the owners of restaurants and cafes on the sidewalk	The owners of the area were annoyed by the parking lot in front of the houses and the lack of a specific garage

## Chapter Four

### Applying the research methodology, results and discussions

---

Most of the streets inside the mahalas are unpaved	Encroachments on sidewalk
Lack of water	The municipality's leniency with the excesses
lack of hygiene	Cut down trees planted by the owners of the area
Weakness in the electrical power system	Waste disposal on rivers.
Increasing the ampere price of private generators	Lots of drugs
Lack of quality control over medicines	A lack of sewage services and a lack of paved streets
The weakness of the legislation that prevents the violation of public rights	Administrative and financial corruption
Few job opportunities	Lack of vegetation
Lack of cultural activities in schools	Bypassing the city's green belt and exploiting it to residential areas
Low cultural awareness	High level of crime
Lack of job opportunities for women	Low level of student absorption due to the Corona pandemic
Lack of support for teachers	The increase in the number of deaths under the age of seventy
Lack of attention to orphans and the elderly	Increasing the number of low-income families
Decrease in the number of citizens who love their city	Ineffective use of modern technology
The lack of housing complexes for the families of martyrs and widows	High rental costs
Inadequate schools	Lack of interest in young people and support for marriage
Lack of interest in monitoring the quality of treated drinking water	Increasing the number of institutes to teach private lessons to students

## Chapter Four

### Applying the research methodology, results and discussions

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Lack of interaction between the university and the city	Lack of sanitary landfills
Lack of water projects	The growth of parasitic plants in water systems
Deterioration of the fertility of the land due to the lack of agricultural use	demographic changes
The income of the residents of most mahalas is moderate to limited	Weak agricultural guidelines
Development and construction of private schools and the collapse of public schools	Weakness of local government
Hiring people with no specialization in important decision-making positions	There are no service streets
Lack of awareness among citizens about the cleanliness of their city	Contracting with novice contractors who do not have the financial liquidity to complete projects
Lack of traffic instructions	Not activating the role of religious shrines to provide them with material income
Traffic fines increase	Unplanned population expansion
Poor planning and lack of responsibility	Violations on the sidewalks of the streets
The successive bad policies of the city	Not paying attention to the old (heritage) houses.
Most of the residents of the archaeological areas abandoned their homes	Demolition of archaeological areas such as (Al Jabal Garden) and Shanasheel
Postal service neglect	It is difficult for municipal cars to enter the old mahalas because of the narrow streets
Traffic jams	Unemployment increase

## Chapter Four

### Applying the research methodology, results and discussions

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Lack of parking	Increase the number of cars for each house, at least 3 cars
Poor municipal services	Weakness of the master plan of Babylon Governorate
The lack of hope among the residents of the mahalas to restore life to him	Administrative and financial corruption in the city
Transgressions on the Babel mahala park and turning it into a landfill	Relationships between the people of the old area are good
The unwillingness of citizens to roam within the parks due to its transformation into a landfill	Bypass the civil generator on the park
Weak government support for agriculture	The new residents of the mahala are isolated and have a weak relationship with others
Weakness of the laws of the ownership of agricultural lands	Inefficiency of agricultural pesticides
Shortage and obsolescence of agricultural machinery and equipment	Low productivity per acre
Lack of periodic maintenance and opening of channels and water pumping stations	Scarcity of water during the summer
Air pollution is the gases produced by cars	Air pollution with dust resulting from a lack of vegetation cover
Not paying attention to air pollution	There are no airports and few hotels in the city
Neglecting the tourism sector	Lack of specialized and efficient cadres
Absence of environmental monitoring of air pollution	The lack of specifications of raw materials and their deterioration
Increased consumption of electrical energy.	Few of shopping centers and shops of international standards

## Chapter Four

### Applying the research methodology, results and discussions

---

Neglect and lack of interest in transportation links between the city and other cities	Increasing the number of traffic accidents
Non-reuse and treatment of sewage water	Absence of large commercial companies
There is no recycling of the accumulated waste	Lack of support and encouragement for national products
Inefficiency of public transportation	Neglecting industries
Lack of support and encouragement for foreign investment	Neglecting local industries such as dates and insufficient marketing for it
Water networks projects fade away	Shortage of electric power
Not using renewable energy sources	The lack of modern warehouses in the governorate and the lack of rehabilitation for those in them
Lack of awareness in energy conservation	The disappearance of city landmarks
Lack of water courses	environmental pollution
Lack of future expansion plans	An increase in incurable and chronic diseases
The problem of troughs and turning them into a landfill	The lack of laws to protect the neighbor from his neighbor in the process of rising houses
Weakness of the provincial council	farming migration
inheritance facilitates the process of deviating orchards and building houses	Change the use of construction for commercial purposes
Lack of health services and hospitals	There is difficulty in the work of investment companies due to the imposition of profit rates from companies
The deterioration of the educational reality	Too much waste inside mahalas

## Chapter Four

### Applying the research methodology, results and discussions

---

Increasing the number of cars, in addition to motorcycles	Excessive financial corruption
Adopting centralization instead of decentralization in the management of institutions	Few of civil society organizations
The spread of administrative and financial corruption in the city	Inefficiency of emergency services
Internet service is very weak and insufficient	Weak coordination between institutions

### 5.2.3 Interview Method

The semi-structured interviews used in the case study were designed to achieve detailed answers from the interviewees and to explain/explore the answers/issues in depth. Try to address the expected imbalances in the previous focus groups, particularly with regard to female participation. Explanation and increased accuracy of uncertain responses in previous focus groups. The interview survey was piloted prior to the appropriate study, which made it possible to identify a number of points of confusion and problems which led to modifications to the final version of the interview schedule, ensuring that the survey was clear and easy to answer. Interviews were conducted with many residents of the El Kellej and Al Wardiya *mahallat* in Old Hilla. Most of the residents of the old mahala were interviewed. They had a great role in contributing to identify the most important problems of the *mahallat* in addition to their opinions and desires to achieve a sustainable region. The number of people interviewed in El Kellej and Al Wardiya *mahallat* in Old Hilla was 60 participants (including men, a few women, decision makers and planners)

## Chapter Four

### Applying the research methodology, results and discussions

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#### Results of Interviews

Table shows Heritage area (El-Kellej and Al-Wardiya) problems and needs which are obtained from interviews using the same social, environmental, economic and institutional categorization. Table 4.3

**Table 4.3:** Problems of Traditional District (El-Kellej and Al-Wardiya) in Hilla gathered through interview

problems	
Lack of paved street	Lack of water and rain
The increase in the unemployment rate	Encroachment on agricultural areas and their transformation into residential areas
Not benefiting from certificate holders in government departments	There are no health centers in the mahala
disappearance of government services	Weak teaching methods
Lack of a preventive policy for agricultural production	_Discrimination against women
Increasing the number of married women before completing their studies	Weak teachers' abilities
Women's lack of awareness of their rights	There are no specialized hospitals
Negative behavior towards women working abroad	The collapse of the level of education in the country
The rise in the prices of building materials	Lack of hygiene in the streets
There is no emergency plan in the special services under the Corona regulation	Local delegations and lack of internal control
Lack of services	Families with limited income do not provide educational supplies (such as

## Chapter Four

### Applying the research methodology, results and discussions

	electronic devices) in light of the Corona pandemic
The height and largeness of the central carrots and their impact on the streets	Strong social relations between the old people of the mahala
The lack of housing complexes and the large number of slums	Few housing complexes
The lack of development in the level of modern technology in the education sector	Few social relations between the people of the mahala (between the son of the countryside and the son of the city)
The presence of medical complexes within the residential mahala	No sewerage
The expansion of mahalas was only the demolition of houses with an area of 400 square meters and their construction as 2 or 3 units (expansion in the number of housing units)	Exodus from the countryside to the city
The difference in ideas and mentalities between the son of the countryside and the son of the city	The lack of schools to accommodate the population density, Some of the school exits on public streets endanger students,
Population momentum and the lack of lands expropriated by the municipality, and if any, they are without habitable services	
The weakness of the water network carrying drinking water, thus the area suffers from water scarcity,	no sidewalks,
narrow streets,	Increasing the number of houses in agricultural areas
few designed car parking	The increased use of el Soub alsaghir , in addition to large private generators, leads to air pollution
Not specifying land uses, as they are	Increasing the horizontal expansion instead

## Chapter Four

### Applying the research methodology, results and discussions

---

overlapping	of the vertical for universities
Lack of investment in building residential buildings	The increasing population density
Increasing the housing crisis	A shortage of medical and health personnel in health institutions
Lack of trained manpower	Increasing the use of heavy products in the operation of power plants and many other industrial fields
Few housing complexes	Lack of care and lack of irrigation for green spaces
Lack of interest in the environment and clean energy sources	Increased high temperatures in summer in addition to dust storms
air pollution	Using ancient irrigation techniques
Ignoring the agricultural cycle by farmers	The lack of implementation of the communication network program
Less use of el Soub alsaghir in agriculture	The merging of religion and politics
There are no special places to practice religious rites and rituals	Neglecting the e-Government Service
Lack of coordination between departments	Weakness in the communication service
A limited role for civil society organizations	There are no waste recycling plants
Weakness in internet service	Infrastructure collapse
Frequent power outages	Not caring about graduates
Lack of interest in environmentally friendly technology and clean energy	Shortage of medicines and medical supplies
There is no bus stop on most of the roads	A large increase of strangers to live in the area as a result of selling agricultural land to convert it to residential or commercial
Lots of unemployment	The cultivation has decreased in the area

## Chapter Four

### Applying the research methodology, results and discussions

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	due to the lack of sufficient water to continue the cultivation
Inadequate training and rehabilitation for the poor	The high prices of real estate in the center of Hilla
Unavailability of a regular public transport network,	The increase in the exchange rate of the dollar significantly affected the stagnation of local markets
Cutting down palm trees and trees and transforming agricultural areas into residential areas.	Rising rents
lack of kindergarten,	The social relations between the residents of the mahala are weak
Bad services	The increase in imported products negatively affected the demand for local products
Waste accumulation	Demolition of residential homes on the street and construction of shops
Limited per capita income	Slums in the fronts of houses
The collapse of education	There are no main streets in the city except for two main streets
Lack of interest in the aspect of agriculture	The lack of food products granted by the Ministry of Trade to every Iraqi individual
The stagnation of local markets at the end of each month	Most of the families have moved towards the areas of 80th and 60th Streets on the outskirts of the city
Visual pollution for electricity cables and poles	Lack of hotels
Lack of urban planning	Failure of many individuals within institutional structures to adopt modern technologies
Municipalities are inactive	Lack of foreign investment in the tourism

## Chapter Four

### Applying the research methodology, results and discussions

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	sector
Lack of recreational areas, and if they exist, they are not maintained by the municipality	The dominance of political parties over city departments
Increase in administrative and financial corruption	Limited use of modern technology
Limited support for activities	There are no updated laws
Difference in physician, population, and nurse index	Lack of trained tourist cadres
A shortage of participants in local elections	Increased consumption of gasoline and oil
Lack of trust between citizens and the local council	Limited industrial projects
A limited role for email service within organizations	Lack of pedestrian bridges at intersections
Lack of experience in tourism management	Water scarcity and its impact on the operation of hydroelectric power plants
Shortage of electric power	Low investment in transportation
Bad road paving	Lack of interest in archaeological sites
Dependence on centralization in government funding	The old part of the city is deserted at night Growth from the center, outskirts of the city, towards 80th Street, towards Al-Bakrly
Lack of funding in the process of maintaining archaeological sites	The weak role of the state in appropriating agricultural land
Archaeological sites exposed to theft and demolition	Lack of a clear vision to accommodate the growth of the city of Hilla
Employing unspecialized people in important positions to make decisions	Social disparities and their impact on the population

## Chapter Four

### Applying the research methodology, results and discussions

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Weakness in laws and local the researcherities' control over abuses	Remnants of the political situation on the situation of the city
Weak social relations among the residents of the mahala	Lack of cultural centers
The high prices of real estate compared to the lack of services	The deterioration of the health and living situation
Existence of empty spaces and bypassing them and making them a landfill and places for private generators and others	The lag of the city and the accumulation of these lags of local governments
The construction rate is lower than the population growth rate	There are no service streets to the main streets
Existence of archaeological areas and not properly exploiting them	Old designs not updated
Weak social relations between mahala members	Old designs out of date in the city
Traffic congestion in vehicles	Change the use of old areas from residential to commercial
Poverty increase	Lack of public taste in construction at the level of the public and private sectors
Increased environmental pollution	Variation in pharmacy pricing
Street crowding	The impact of the Corona pandemic on the progress of the country
Lack of families to follow up on their children	Misuse of social media
Not using modern and advanced technologies in construction	Theft of public money
Lack of strict laws and follow-up	The increase of drugs and their impact on security and safety
Increasing the prices of medical services that burden the citizen	Randomness in the construction of buildings as well as in the restoration of old

## Chapter Four

### Applying the research methodology, results and discussions

	buildings
Lack of investment and entrepreneurial projects	Low prices of agricultural land versus government land
The difficulty of owning agricultural land	Failure to set important priorities in the city
Narrow residential streets due to the phenomenon of cars in front of the houses	Lack of green areas
Increasing migration from the countryside to the city	Administrative corruption in the province and its inefficiency
Poor maintenance and maintenance of damaged parts	

#### **4.2.3.A. Some of the problems that were noticed during the process of conducting interviews and focus groups**

Many of the problems that mahalas suffer from during the process of interviewing people, as the level of services was poor, including the spread of waste and abuses, and changing the use of housing to a commercial function.

	
<b>The use of housing changed to commercial, shown here in the picture, the Al-Wardiya Mosque</b>	<b>waste spread</b>

## Chapter Four

### Applying the research methodology, results and discussions

	
<b>Explains the poor quality of the streets</b>	
	
<b>Encroachments on agricultural land</b>	<b>neglect the parks</b>

**Figure 4-2:** Shows Some of the problems that were noticed during the process of conducting interviews and focus groups (The researcher,2022)

### 4.3 Final Problems:

Through the above tools, secondary sources, focus groups, interviews, through which problems and sustainability issues were identified (Table 4.4.). The study area suffers from was reached, while avoiding recurring problems as much as possible and in preparation for the next second step.

**Table 4.4:** shows set of final problems

Final Problems	
the mix of uses and urban functions in the neighbourhood is poor	there is no clear identity for each neighbourhood
There is no street patterns	No effective participation of residents in developing their neighbourhoods
Change Building regulations	Underdevelopment and weakness of local industries
Lack of planning criteria	the developed urban designs are not sensitive to the hot climate

## Chapter Four

### Applying the research methodology, results and discussions

No updated urban policy of mahala planning	There is no hierarchy between public, semi-private and private in modern mahalas
the person not easy access different services	Increase the number of cars
density high	Lack of affordable housing options
There are no green spaces	Weakness in social security
Weak and poor transportation system	An increase in the encroachments of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets
There are no street design and connectivity	Lack of interest in the heritage mahalas in the small sob
The Change of Lifestyle and Travelling Culture	there is no land mark
There are no waste recycling plants	Increasing slums
lack of key facilities such as schools and health centers	Environmental pollution
lack of infrastructure of civil services such as sewage system and telephones	Increasing the proportion of drugs
Unavailability of potable water	Use of some public places as a landfill
Shortage of power and fuel supplies	Increasing the level of crime in the slums

#### 4.4 The Second Step: Finding sustainable indicators for the urban form

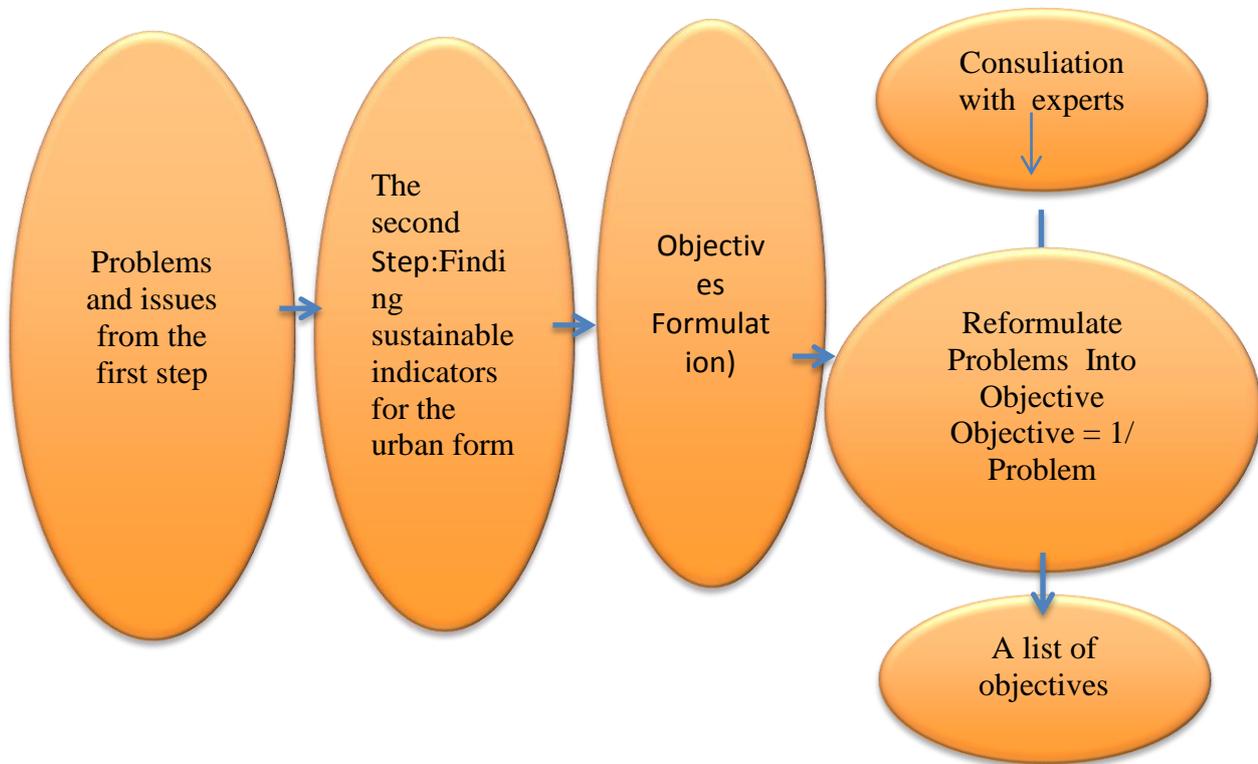
This step of finding sustainable indicators for the urban form includes several steps that depend on the result of the first step through which problems and sustainability issues were identified through secondary sources, focus groups and interviews. These steps are:

##### 4.4.1 Objectives Formulation

With the assistance of specialists and experts, the problems and needs identified during the first step of identifying the problems are reformulated in the solution goals or objectives (see **Figure 4.3**).

## Chapter Four

### Applying the research methodology, results and discussions



**Figure (4-3)** General scheme of objective formulation (The researcher,2022).

#### 4.4.1.A: Techniques for Objectives Formulation

The objective definition of these goals is one of the crucial elements in the process of figuring out what people want their city to turn into. Finding the best answer to these issues becomes challenging when the aim is framed in a poor and unwise manner (Bureau of Local Government Development and DILG, 2008). In the current study, the generation of objectives has been derived through a thorough analysis of the problems and issues using the following two formulas (Bureau of Local Government:

##### 1. **Problem =Objective + Impediments to Achieve the Objective**

Therefore  $\text{Objective} = \text{Problem} - \text{Impediments}$  (Figure 5-3) methodological framework

## Chapter Four

### Applying the research methodology, results and discussions

#### 2. Objective =1 / Problem

The second strategy, which is employed in this thesis, is found on the maxim that the objective is the exact opposite of the issue. For instance, when widespread corruption is a problem, the objective will be to avoid corruption instead of addressing the original issue ,( Al-Alwani,2014, pp 142-143).

#### Results

Results of the objectives, which were determined through the analysis of the issue and problems, are shown in (Table 4.5.). The formulas mentioned above were used to create these objectives.

**Table 4.5** formulation of objectives

Problems	Objectives
the mix of uses and urban functions in the neighbourhoods is poor	the mix of uses and urban functions in the neighbourhoods
There is no street patterns	Improve street patterns
Change Building regulations	Define building regulations
Lack of planning criteria	finding of planning criteria
No updated urban policy of neighbourhoods planning	updated urban policy of neighbourhoods planning
the person not easy access different services	the person easy access different services
Density High	Decreased density
There are no green spaces	Increase green spaces
Weak and poor transportation system	Improving transportation system
There are no street design and connectivity	Improve street design and connectivity
The Change of Lifestyle and Travelling Culture	Improving public transportation services
There are no waste recycling plants	Providing waste recycling plants
lack of key facilities such as schools and health centers	Increase of key facilities schools and health centers
lack of infrastructure of civil services such as sewage system and telephones	Increasing the efficiency of infrastructure of civil services such as sewage system and telephones
Unavailability of potable water	Providing safe drinking water

## Chapter Four

### Applying the research methodology, results and discussions

---

Environmental pollution	Reduce environmental pollution
Increasing the proportion of drugs	Reducing the proportion of drugs
Use of some public places as a landfill	Preventing the acquisition in public places
Shortage of power and fuel supplies	Increase in power and fuel supply
there is no land mark	there is land mark
Increasing slums	Reducing slums
there is no clear identity for each neighbourhoods	there is clear identity for each neighbourhoods
No effective participation of residents in developing their neighbourhoods	effective participation of residents in developing their neighbourhoods
Underdevelopment and weakness of local industries	Development and improvement of local industries
the developed urban designs are not sensitive to the hot climate	Developing urban designs sensitive to hot climates
There is no hierarchy between public, semi-private and private in modern mahalas	There is hierarchy between public, semi-private and private in modern mahalas
Increase the number of cars	Reduce the number of cars
Lack of affordable housing options	Provides affordable housing options
Weakness in social security	Strengthening social security
An increase in the encroachments of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	Reducing the encroachment of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets
Lack of interest in the heritage mahalas in the small sob	Attention to the heritage mahalas in the small sob
Increasing the level of crime in the slums	Reducing the level of crime in slums

#### **4.4.2 Indicators Formulation:**

This method was used to create a preliminary set of roughly 40 suggested indicators for the goals deriving from the previous stage. The following stage was to choose a second, more precise set of indicators after this

## Chapter Four

### Applying the research methodology, results and discussions

initial set of 40 untested indicators had been produced in order to get the proper and constrained number of the 32 indications as stated in **Table 4.6**. To optimize their impact on the decision-making process and to improve their applicability and qualifying qualities, indicators should be carefully picked so that only relevant and valid indicators are employed. To create the final set of indications, it was ultimately necessary to rank the second set of indicators. Essentially, the method utilized to create the list of prospective indicators for this thesis followed the fundamental methodology established by UNESCO in 2003. This comprises:

- Examine every goal that was created in the previous stage.
- Think about potential indicators for each aim in an open-minded manner.

#### Deep thought

- Consultation with professionals and a variety of stakeholders.
- Reliance on research findings and other initiatives: It's important to consider how to gauge goal progress throughout implementation at the formulation stage and to select the most suitable indicator. For instance, developing an indicator to monitor progress toward a goal of "reduced randomness" involves idea generation, expert consultation, (Al-Alwani, 2014, p146).

### **Results**

The 32 indicators that were formulated from the objectives from the previous step after the development of the first group of 40 indicators, are shown in Table 4.6.

## Chapter Four

### Applying the research methodology, results and discussions

**Table 5.6** formulation of indicators

Objectives	Indicators
the mix of uses and urban functions in the neighbourhoods	The percentage of diversity in terms of land use in the neighbourhoods
There are street patterns	Number and types of street patterns
Install building regulations	Number and types of building regulation
Existence of planning criteria	The percentage of taking and applying of planning criteria
updated urban policy of neighbourhoods planning	The percentage of updated urban policy of neighbourhoods planning
the person easy access different services	The time taken to access to different services
Decreased density	Number of persons in one hectare
There are green spaces	The percentage of green spaces
Improving transportation system	The percentage of efficient transportation system
There are street design and connectivity	The percentage of streets have good condition and design
Improving public transportation services	The percentage of people using public transportation and walking
Providing waste recycling plants	The number of waste recycling plants
Increase of key facilities schools and health centers	The number of schools and health centers relative to the number of their residents
Increasing the efficiency of infrastructure of civil services such as sewage system and telephones	Percentage of streets that have sewers and the Internet
Providing safe drinking water	The number of mahalas suffering from a lack of potable water
Reduce environmental pollution	environmental pollution rate
Reducing the proportion of drugs	drug ratio
Preventing the acquisition in public places	Percentage of public places that have turned into a landfill
Increase in power and fuel supply	Energy and fuel prices and availability
there is land mark	The number of land mark in the mahalas
Reducing slums	The number of random housing units
there is clear identity for each neighbourhoods	Percentage of buildings that carry the urban heritage of the city
effective participation of residents in developing their neighbourhoods	The number of activities that the people of the locality participate in
_Development and improvement of local industries	The rate of support provided to local industries
Developing urban designs sensitive	The building materials used and the nature of

## Chapter Four

### Applying the research methodology, results and discussions

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to hot climates	the design
There is hierarchy between public, semi-private and private in modern mahalas	The difference in the intensity of the movement of cars and vehicles
Reduce the number of cars	Number of cars
Provides affordable housing options	The number people don't have housing units
Strengthening social security	The amount of support for social security
Reducing the encroachment of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks
Attention to the heritage mahalas in the el Soub alsaghir	The percentage of money allocated by the local government to take care of the heritage mahalas
Reducing the level of crime in slums	The number of crimes committed annually

#### **4.4.3 Selection, Choosing and Ordering Indicators or Ranking of Indicators**

In a traditional district (El-Kellej and Al-Wardia), this part explains how to choose a more streamlined list of urban form sustainability indicators and how to rank such indicators.

##### **4.3.4.A: Indicator Selection**

Choosing the right number of indicators for this step is crucial because if there are too few, an idea or concept may not be clarified or presented, while too many indicators may cause distraction and a lack of focus on the main objective. Consequently, a set of selection criteria must be applied in order to select the proper number of indicators from a possibly lengthy list (Nathan and Reddy, 2010). In addition, numerous the researchers including Hens, De Wit (2003), UN (2001), and Hodge, Hardi suggest that the number of pointers be "restricted" (1997). A crucial step in the process of choosing indicators in a transparent manner is

## Chapter Four

### Applying the research methodology, results and discussions

determining the standards by which possible indicators will be assessed (Keirstead,2007). The published lists of criteria on which indicators should be evaluated, however, are frequently comparable (Al-Alwani, 2014, p 157), allowing the the researcher to consider and note these parallels, as shown in (Table 4.6.).

#### **4.3.4.B: Indicator Ranking**

The World Trade Organization (WTO, 2004) suggested giving the indicators a priority order in order to create a list of indicators that is more useful. At the end of April 2022, a questionnaire for ranking sustainability indicators was distributed to a group of forty specialists (academics and practitioners) in Hilla city's el Soub al saghir. Each participant was required to rank each indicator on the questionnaire according to its level of relevance, as described in Chapter 3. The Likert scale was used in the questionnaire, which assigns a number and a brief description to each category of responses. On a scale of 1 to 4, where 1 was classified as not important; 2 was considered less important, and 3 was important,4 the very important, experts who took part in the survey were asked to rank each of the 32 indicators. The categories that the participants felt best captured their opinions on the rated indication were chosen. To determine a final set of indicators, the indications were ranked according to priority in this stage. To determine the respondents' general preferences, the average score for each indicator was determined. A questionnaire should generally not be used in the field study without significant piloting. Consequently, a pilot survey was conducted with 10 participants to ensure the validity and reliability of the results as well as to identify and address any potential issues with the questionnaire. The pilot poll provided insightful data on the degree of comprehension of the

## Chapter Four

### Applying the research methodology, results and discussions

questionnaire survey was conducted using the following methodology (Al-Alwani,2014, p159):

1. Identify the investigation's goal.
2. With the support of consultations with the supervisory discussion group, jointly develop the questionnaire tool.
3. Run a pilot test and make changes to the instrument to ensure accuracy also dependability
4. Select probable respondents in the city of Hilla
- 5-Complete the poll (carried out at the end of April, 2022)
6. Compute the average, standard deviation, using spss.
7. Describe the findings and discuss them

(Table 4.7.) presents the results of the survey that was conducted in addition to the analysis of the data using the SPSS program, which included the mean, standard deviation, and the rank of each indicator.

## Chapter Four

### Applying the research methodology, results and discussions

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#### 4.5 Questionnaire Results and Discussions

SPSS was used to calculate the average score, which is the mean(average) and standard deviation is a measure of variance or prevalence, calculating the percentage of answers, in addition to determine the trend of the sample for each indicator between very important, important, less important and unimportant for each 32 Indicators based on responses to the questionnaire .Many the researchers have shown that Likert scales can definitely be analysed efficiently as interval scales and analyses them as such with descriptive statistics like means, standard deviations, etc., such as Baggaley and Hull, 1983; Maurer and Pierce, 1998; Vickers, 1999;Allen and Seaman, 1997. Moreover, Brown (2011) supports treating Likert scales as interval data, because Likert scales contain multiple items and can be taken to be interval scales so descriptive statistics can be applied. According to Carifio and Perla (2007) the myth of only non-parametric statistical tests should be used with Likert scales are wrong. In this manner, Norman (2010) suspended the controversy on this subject as he proved that parametric statistics (Parametric statistics use the mean and standard deviation) can be used with Likert data, with unequal variances, with non-normal distributions and with small sample sizes, with outa significant risk of reaching an incorrect conclusion. Thus, the average score for each indicator was used to rank the priority ascribed to each indicator. Moreover, Green et al (1990) and Miller (2001a) use the standard deviation to measure the degree of convergence. The lower the standard deviation is, the less dispersion or variation in the data, subsequently the consistency or the degree of convergence is higher. On the other hand, the higher the standard deviation is, the more dispersion or variation in the data or in other words a wider range of opinions has been encountered

## Chapter Four

### Applying the research methodology, results and discussions

and subsequently the consistency or the degree of convergence is lower (Al-Alwani, 2014). (Table 4.7.) shows the results that were reached using the SPSS program and extracting the average, standard deviation, and rank of each indicator.

## Chapter Four

### Applying the research methodology, results and discussions

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**Table 4.7** shows the average, standard deviation and rank of each indicator.

Indicator	not important	less important	important	very important	Average	SD	T-test	Percent %	sample direction	Rank
The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks	1	4	11	24	3.450	0.782	27.873	86.25	Very important	1
The number of mahalas suffering from a lack of potable water	0	5	13	22	3.425	0.712	30.420	85.625	very important	2
Number of cars	0	3	17	20	3.425	0.635	34.059	85.625	very important	2
environmental pollution rate	1	5	11	23	3.400	0.810	26.541	85	very important	3
Percentage of public places that have turned into a landfill	2	4	10	24	3.400	0.871	24.683	85	Very important	3
The number of schools and health centers relative to the number of their residents	1	7	9	23	3.350	0.863	24.528	83.75	very important	4
Number of persons in one hectare	1	2	20	17	3.325	0.693	30.308	83.125	very important	5
The number of waste recycling	0	6	15	19	3.325	0.729	28.813	83.125	Very	5

## Chapter Four

### Applying the research methodology, results and discussions

plants									importa nt	
Percentage of buildings that carry the urban heritage of the city	4	3	10	23	3.300	0.992	21.033	82.5	very importa nt	6
Percentage of streets that have sewers and the Internet	2	6	10	22	3.300	0.911	22.898	82.5	very importa nt	6
The number of random housing units	1	9	8	22	3.275	0.905	22.875	81.875	Very importa nt	7
Number and types of building regulation	2	6	14	18	3.200	0.882	22.923	80	importa nt	8
The percentage of updated urban policy of neighbourhoods planning	2	7	15	16	3.125	0.882	22.395	78.125	importa nt	9
Number and types of street patterns	5	4	14	17	3.075	1.022	19.020	76.875	importa nt	10
The percentage of diversity in terms of land use in the neighbourhoods	4	6	14	16	3.050	0.985	19.568	76.25	importa nt	11
The percentage of taking and applying of planning criteria	2	7	19	12	3.025	0.831	23.004	75.625	importa nt	12
drug ratio	3	10	11	16	3.000	0.987	19.222	75	importa nt	13
The building materials used and the nature of the design	2	10	15	13	2.975	0.891	21.113	74.375	importa nt	14
The percentage of green spaces	6	4	15	15	2.975	1.049	17.924	74.375	importa nt	14
The number of crimes committed	7	5	11	17	2.950	1.131	16.494	73.75	importa	15

## Chapter Four

### Applying the research methodology, results and discussions

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annually									nt	
The difference in the intensity of the movement of cars and vehicles	3	9	15	13	2.950	0.932	20.012	73.75	importa nt	15
Energy and fuel prices and availability	1	11	18	10	2.925	0.797	23.210	73.125	importa nt	16
The percentage of money allocated by the local government to take care of the heritage mahalas	6	5	15	14	2.925	1.047	17.664	73.125	importa nt	16
The time taken to access to different services	5	8	13	14	2.900	1.032	17.759	72.5	importa nt	17
The amount of support for social security	2	11	17	10	2.875	0.852	21.317	71.875	importa nt	18
The rate of support provided to local industries	3	13	11	13	2.850	0.975	18.481	71.25	importa nt	19
The number people don't have housing units	2	10	20	8	2.850	0.802	22.468	71.25	importa nt	19
The percentage of people using public transportation and walking	4	12	12	12	2.800	0.992	17.847	70	importa nt	20
The percentage of efficient transportation system	4	11	15	10	2.775	0.946	18.533	69.375	importa nt	21
The percentage of streets have good condition and design	6	10	16	8	2.650	0.975	17.184	66.25	importa nt	22
The number of land mark in the mahalas	4	14	17	5	2.575	0.843	19.298	64.375	importa nt	23
The number of activities that the people of the locality participate in	5	20	13	2	2.300	0.757	19.194	57.5	less importa nt	24

## **Chapter Four: Applying The Research Methodology, Results And Discussions**

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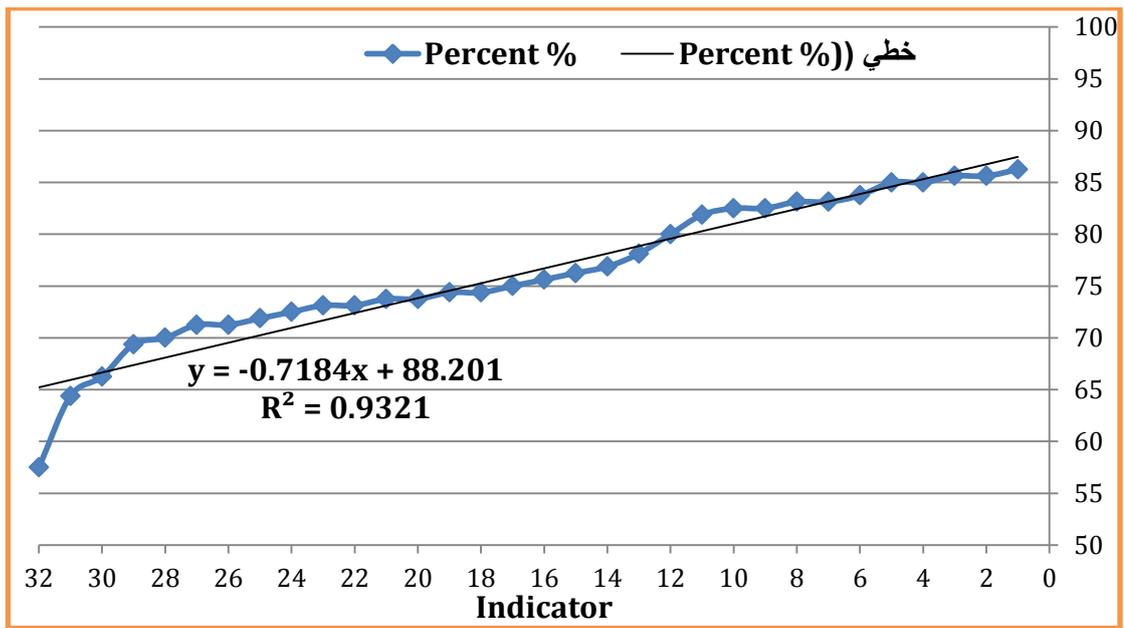
### **4.6 Final Set of Sustainability and Urban Form Indicators for Heritage Area (El Kellej and Al-Wardiya), in the City of Hilla**

After the analysis, review and selection processes that were applied to the first set of potential indicators and led to the results of a revised list of 32 useful and valid sustainability indicators.

The results presented in (Table 4.7) demonstrate a high level of consistency in the higher-ranked indicators and issues across expert participants, the standard deviation of the data set of the questionnaire ranges from 0.6 \_1.1

The results showed that the most important indicator in heritage area (El Kellej and Al-Wardiya), which was given the highest priority by experts, where the frequency of answers was high 24 and is located in a very important place is the indicator (the percentage of abuse of the commercial sector over the residential sector and the percentage of abuse on street sidewalks), which has the highest average. of 3.450 and a standard deviation 0.782, with an answer rate (percent)of 86.25%. The indicators that are given the highest priority by the 10 participating experts, which are located in a very important place, according to the opinion of the participating experts, these indicators are of great importance to achieve sustainability in the heritage area (El Kellej and Al-Wardiya), where the standard deviation of the data set from the questionnaire for these 11 indicators ranges from 0.635\_0 .992 and the average of these indicators is from 3.275\_3.450 .with a high percent ranging from 85.625% - 81.875%. The percentage was calculated based on the average of the answers provided by the participants in the questionnaire in the (Figure 4.4).

## Chapter Four: Applying The Research Methodology, Results And Discussions



**Figure ( 4.4)** shows the percentage of answers by expert participants in the questionnaire .

After the highest indicator (The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks), which received the highest priority, the indicator appears (The number of mahalas suffering from a lack of potable water) with an average of 3.425 and a standard deviation of 0.712 and it is located in a very important place with a percent of 85.625.

The population density index had the lowest standard deviation of 0.693 and an average of 3.325, and this indicator is located in a very important place.

The participants gave the lowest priority to (The number of activities that the people of the locality participate in), as it is located in a place of less importance. It got 20 answers, with average of 2.300 and a standard deviation of 0.757, with percent of 57.5%. This judgment had a degree of consistency among the expert participants. In addition, some problems were marked as significant (Number and types of building regulation) and (The percentage of updated urban policy of neighborhood's planning) as

## Chapter Four: Applying The Research Methodology, Results And Discussions

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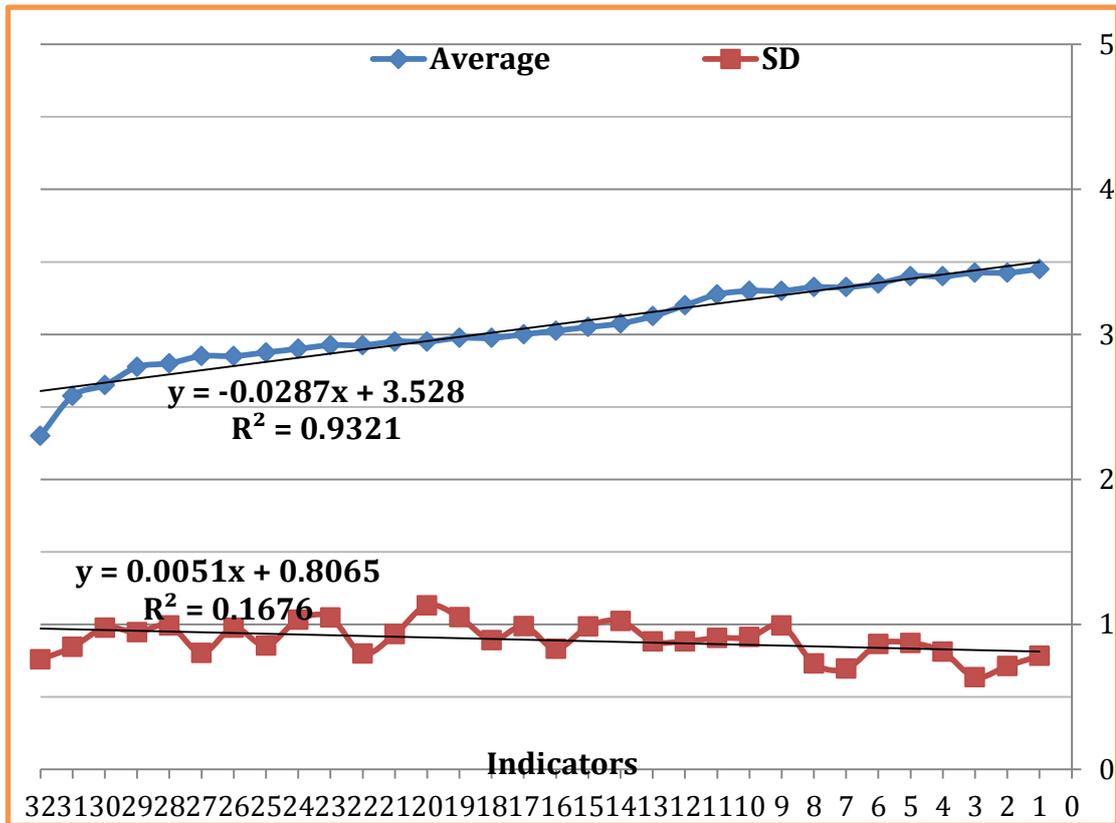
well as (Number and types of street patterns) .On the other hand, high degrees were given to those indicators related to (lack of potable water, number of cars, environmental pollution, public places that have turned into a landfill, of schools and health centers relative to the number of their residents, number of persons in one hectare ,the number of waste recycling plants, percentage of buildings that carry the urban heritage of the city, percentage of streets that have sewers and the internet ,the number of random housing units). Many of the big problems were explained in the first step of the methodological framework which involved identifying the issues. Some social issues are given different importance on a large scale (such as (Unavailability of potable water, high density), and environmental issues such as (the rate of environmental pollution, the number of cars, Percentage of public places that have turned into a landfill, The number of waste recycling plants, and the percentage of green spaces, the building materials used and the nature of the design, the percentage of green spaces ,number and types of building regulation).

The results may seem surprising at the first moment, but they are considered realistic, especially in a situation such as Iraq, where many conflicts have led to big and very important problems. The results showed most of the problems between a very important and important place, except for one indicator in a less important place, which is the indicator (The number of activities that the people of the locality participate in).

As shown in Figure (4.5), the relationship between the average and the standard deviation, where the relationship is inverse between them, whenever the arithmetic mean increases, we find that the standard deviation is few. We find that  $R^2$  is the coefficient of determination of the average.

## Chapter Four: Applying The Research Methodology, Results And Discussions

As it approaches one, the data are close to each other .



**Figure (4.5)** the relationship between the average and the standard deviation of the indicators

From the outcome of the above table, we note that (violations or abuses of the commercial sector on the residential sector, this use contributed to the change or demolition of old buildings and change in the shape of the area, water shortage, number of cars, environmental pollution, public places that turned into a landfill, places for generators, etc., and a lack of schools Health centers, high population density, lack of waste recycling stations, sewage networks, streets that are not designed according to correct standards, and the lack of identity that bears the heritage in many mahalas, in addition to random housing and the erosion of orchards) these problems were extracted from the 11 indicators of which occupied important sites. Very much in the questionnaire that was conducted with the experts. Therefore, these 11 indicators are no less important than the

## **Chapter Four: Applying The Research Methodology, Results And Discussions**

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remaining 20 indicators, which occupied an important position to measure the sustainable urban form of these mahalas, as the indicator (the number and types of building systems. This indicator is followed in turn by (the percentage of the urban policy updated for mahala planning)

If you take these 32 indicators into account, the urban form will be more compact and sustainable, that sustainable urban form and planning are only parts of the equation and that more is needed to truly achieve urban sustainability. It should also be noted that even in the presence of ideal forms and the efforts of the planners, the behavior, traditions, culture and beliefs of the inhabitants will have a very large impact on the levels of sustainability of the urban area in use. In short, the urban form appears to be an important factor in urban sustainability and residents need to cooperate for the success of inclusive sustainability.

### **4.7 Summary**

This class has shown the result of applying the first and second, the steps of the methodological framework in El Kellej and Al Wardiya *mahallat* in Old Hilla. The first step, identifying issues, aims to explore the main issues, needs and Problems inside the traditional area (El Kellej and Al Wardiya) in the el Soub al saghir. This methodological framework has been successful. The relevant social, environmental, economic and institutional problems were collected in the study area through the use of source documentation analysis, focus groups and interviews. With multiple data sources, triangulation is one of the important protocols used to ensure accuracy and alternative interpretations. Moreover, the need to confirm the validity of the data increases the necessity of triangulation. The results were from documentary sources, focus group and interviews, honestly copied and analyzed. This set of results was used in the second step

## **Chapter Four: Applying The Research Methodology, Results And Discussions**

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(Finding sustainable indicators for the urban form), which consists of reformulating the problems and needs that were developed during the first step in the solution or goals statements. In the current study, the objectives were formulated using formulas developed by the Local Government Development Office and DILG (2008) Generally, one objective was formulated for each problem. the development of the indicators as well as the selection of the indicators and their ranking. Each indicator was developed in consultation with experts from various fields and through a careful review of the literature in the environmental, social, economic and institutional fields. This step produced the first set of proposed indicators which contained 40 indicators covering the four dimensions of sustainability (social, environmental, economic and institutional). This revision stage was used to reformulate and select useful indicators. This resulted in the production of a refined list of 32 useful and valid sustainability indicators. A group of forty experts from the city of Hilla, Iraq contributed to the process of ranking indicators on the basis of priority (final set of indicators). The results of applying the methodology used for in the traditional area (El Kellej and Al Wardiya) in the el Soub al saghir, and then discussed.

## **Chapter five**

# **Conclusions and Recommendations**

## Chapter five

### Conclusions and Recommendations

#### 5.1 Introduction

The previous chapter explained the results of the methodological framework that was reached El Kellej and Al Wardiya *mahallat* in Old Hilla. It discussed the final set of indicators of sustainable urban form. This chapter indicates research's conclusions with a set of recommendations.

#### 5.2 Answering the Research Questions

The research addresses its primary question of "*How to develop a framework that provides suitable sustainable indicators that will lead to a more sustainable urban form in the traditional area*". In order to address this primary question, succeed in developing valid framework and provide sustainable indicators for measuring sustainable urban form, secondary research questions and consequent findings are reviewed in this section.

The first asked secondary question was: "*What types of frameworks that are suitable for evaluating indicators can be indicated?*"

This question has been answered through an assessment of some existing indicators and frameworks developed for local, national and international level which are provided in Chapter two of the literature review. Through reviewing of existing types of sustainability indicators' frameworks, a good level of understanding of the organization and construction of frameworks has been provided. However, the combination framework is shown to be more appropriate in this instance than other types as it may provide an

overview of the advantages of individual frameworks while at the same time overcoming some of their weaknesses.

Another secondary question asked was: "*How could a framework for evaluating sustainable urban form be set up and organized?*"

To answer this question, a review of existing types of sustainability indicators' frameworks had been carried out in Chapter two to assist the construction that could help developing a methodological framework. Advantages and disadvantages of these frameworks, which had been diagnosed in Chapter two, aided the choice and combination of frameworks. Methodological framework was developed by a combination of a goal-based framework (bottom-up) and a CSD, Theme Indicator Framework 2001, (top-down) which had been used as a tool or mechanism for promoting sustainability urban form assessment.

Third secondary asked question was: "*How effective is the sustainability evaluation framework as a tool and a system for creating a sustainable district in the real life?*"

This question has been answered through the application of two steps of the methodological framework of the case study (El Kellej and Al Wardiya *mahallat* in Old Hilla) from which insights have been gained and conclusions may be drawn about the practicality of the approach.

### **5.3 Conclusions**

- The indicator provides quantitative or qualitative information that helps determine priorities for sustainable urban development and is the basis for setting sustainable policies for any district or a city.

- Urban sustainability indicators are the most effective tools that contribute to the transformation of sustainable thinking towards its actual application. It provides quantitative and qualitative tools and directs attention towards the studied phenomenon in an integrated manner. It integrates environmental, economic, social and institutional considerations, diagnoses deficiencies and provides an early and important warning in determining future development's priorities and therefore directing them towards the future.
- The participatory approach to the preparation of a set of sustainability can't be made clear or by his single side in this process must be made in a partnership.
- The participatory approach in preparing a set of sustainability indicators comes through different case studies, as there are no unified indicators can be applied to all cases or all cities. It is a participatory approach by which local community and local government can integrate local specificity into the final set of indicators.
- The process of selecting and organizing indicators must be drawn within a specific framework. Many international experiences have proven that following framework for devising and evaluating sustainability indicators is an important issue in the process of proceeding within scientific, logical and rational standards, frameworks and methods. The result is a set of indicators consistent with the studied phenomenon that setting priorities and providing early warning from the ideal case.
- The methodology is a tool that helps us follow the progress of the process. This methodology has produced (32 indicators) through which people and experts have been used to reach the results. This type of methodology can be applied to other cities for approaching

more sustainable urban forms. Results indicate the importance of this issue, as the indicator (the percentage of violations of the commercial sector over the residential sector and the percentage of violations on street sidewalks) occupied the highest rank among other indicators. In addition, it addresses the most important indicators that have a role in changing the urban form of El Kellej and Al Wardiya *mahallat* in Old Hilla. The number of green spaces, the population density and the number of slums are among these indicators.

## 5.4 Recommendations

It became clear through a set of final reached indicators that *the percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks* are clearly identified. This indicator is related to the shape and pattern of urban distribution, where the spread of horizontal expansions prevails widely. The trend towards compaction is related to the (Neotraditional Development Strategy), which has been issued as the trend towards intensification of what is already exists in urban construction through benefiting the filling of voids in urban districts. The policy of urban dictation, the rehabilitation of old areas and the reuse of bricks in order to control the rampant horizontal spread have been indicated.

- This type of work is directed towards the community and aimed to improve the quality of urban life and community health through healthy cities' program. The latter is directed towards reviving traditional city centers in which the levels of municipal services are low.

- The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks, as an effective indicator, is related to the shape and pattern of urban form, where horizontal spread prevails widely.
- Indicators issued with environmental dimensions indicates that the followed strategy should be concerned with the provision of environmental services, such as turning into a landfill and the number of waste recycling stations.
- Latter indicators require a clear fact related to the provision of municipal services that impact the health of city people. This appropriate strategy moves towards determining the provision of a health system.
- It is clear that most of the indicators are related to the efficiency of providing environmental municipal services. It has been indicated that the city has no clear development plan with specific objectives, as there is no plan that introducing the concept of sustainability. It is clear that these indicators must refer to a well-known fact when measured, as the level of quality of urban life in the city is generally declining and there is an inevitable gap between the standards.
- Drawing inspiration from ideas and indicators and using them as planning criteria for modern region and cities are the effective tools towards sustainable urban form.
- It is necessary to enhance the sense of belonging, privacy, and social cohesion among people, which comes through an effective spatial and functional considerations to create visual signs and dynamic effects to maintain a distinct urban identity.
- There is a significant informative deficiency regarding the basic information needed to complete development's plans in general and sustainable plans in particular for the city of Hilla, as the city does

not have an up-to-date database, if it is available. Therefore, the research relied on the information and data provided by studies conducted for the city Hilla, and “The reality of the situation,” which is the study of Dar Al-Handasah, Shaer and Associates for the year 2007.

- Disseminate environmental awareness campaigns for city’s residents, and how to maintain the city and its cleanliness and to reduce the waste of natural resources, such as water and soil.
- It is necessary to go towards spreading green spaces and preserving the natural environment and agricultural land. Thus, it is recommended to go towards a green city strategy and to rely on natural energies for heating, cooling, lighting, wind movement issues and solar radiation angles, as observed in the spatial and functional considerations of the traditional residential house.

### **5.5 Knowledge Provided by the Thesis**

- This thesis seeks to be pioneering by adding knowledge and understanding the development of a sustainable framework to provide indicators to measure the sustainable urban form.
- This research has carried out a new empirical study in the city of Hilla - Iraq, which supports and promotes the adoption of mechanisms to achieve sustainable urban form.
- This should be prioritized for future development and elaborated the details of the application of proposed sustainable evaluating framework.
- The author believes that this study has made a major contribution to the body of knowledge on sustainability by developing a framework that combines Bottom–Up and Top–Down approaches and provides a flexible, participatory and systematic one that will facilitate the

formulation, selection and priorities of key indicators which can guide the assessment and action towards improving sustainability.

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# Appendices

## Appendix A: The full sets of objectives formulated in the two step

<b>Problems</b>	<b>Objectives</b>	<b>Indicators</b>
Lack of sanitary landfills	Increasing sanitary landfills.	The number of sanitary landfills
A shortage of health structures and services	Increasing structures and improving health services	Number of hospitals, health centers and counseling centers
Unavailability of potable water	Providing safe drinking water	The number of neighborhoods suffering from a lack of potable water
Inefficiency of the sewage network	Increasing the efficiency of the sewage network	The percentage of increasing the efficiency of the sewage network
Environmental pollution	Reduce environmental pollution	environmental pollution rate
Increase the number of cars	Reduce the number of cars	car numbers
Underdevelopment and weakness of local industries	Development and improvement of local industries	The rate of support provided to local industries
An increase in population density	Decreased population density	Population density
Increasing the proportion of drugs	Reducing the proportion of drugs	drug ratio
Lack of suitable (tourist) hotels	Increasing the number of hotels	The number of hotels in relation to the number of visitors
There are no waste recycling plants	Providing waste recycling plants	The number of waste recycling plants
A shortage of housing complexes	An increase in residential complexes	The number of residential complexes
Exodus from the countryside to the city	Reducing migration from the countryside to the city	The rate of displacement from the countryside to the city
An increase in the encroachments of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	Reducing the encroachment of the commercial sector on the residential sector and the encroachment on the sidewalks of the streets	The percentage of violations by the commercial sector over the residential sector and the percentage of violations on street sidewalks
Decreased per capita income	Increasing per capita income	Percentage increase in per capita income
Weak educational structures	Increasing interest in educational structures	Number of primary, middle, and middle schools in proportion to population
There is no implementation of roads implemented with the new standards and a shortage in the number of	Implementation of roads implemented with new standards and an increase in the number of bridges and pedestrian bridges	Percentage of roads implemented with new standards, number of bridges and pedestrian bridges

bridges and pedestrian bridges		
Weakness in the communication network and the Internet	Improve the communication network and the Internet	Telecom service rates and internet speed
Shortage of power and fuel supplies	Increase in power and fuel supply	Energy and fuel prices and availability
Turning cesspools into waste dumps	Elimination of troughs that turn into landfills	The number of troughs converted into waste dumps
Increasing deaths in traffic accidents	Reducing deaths in traffic accidents	The number of deaths in traffic accidents
Increasing the import of foreign goods	Reducing the import of foreign goods	Percentage of importing foreign goods
Poor use of the land	Land use improvement	Land Use Efficiency Ratio
There is no hierarchy (city - sector - district - locality) in small greenhouse	Re-designing the city and creating a hierarchy (local, district, sector, city)	The existence of a hierarchy (local, district, sector, city)
Increasing random expansion on agricultural land	Reducing the random expansion of agricultural land	Number of slums
Lack of interest in the old neighborhoods of the city of Hilla (Kilge, Al-Wardiya)	Attention to the the old neighborhoods of the city of Hilla (KilgeAl-Wardiya)	The percentage of money allocated by the local government to take care of the old neighborhoods
Neglecting the Shatt al-Hilla, which has a role in the morphology of al-Hilla	Taking care of the river front of the Shatt al-Hilla	The percentage of redevelopment in the river front area
Not paying attention to religious shrines	Taking care of religious shrines	The number of religious shrines that have been redeveloped
Bypassing empty lands inside residential neighborhoods to place generators or turn them into waste dumps	Preventing the acquisition of green areas inside the small sob	The number of green spaces inside the small sob that has been crossed
Increasing the level of crime in the slums	Reducing the level of crime in slums	The number of crimes committed annually
Lack of green spaces in small greenhouses	Application of green spaces in small greenhouses	Percentage of green areas in small greenhouses
Poor public transportation	Improving public transportation services	Percentage of the city's population that uses public transportation
deterioration of the ecosystem and global warming	Improving of the ecosystem	Per capita consumption per hectare
there is no street furniture and street spaces and paths for	there is street furniture and street spaces and paths for pedestrians that protect	Proportion of well-designed streets within standards

pedestrians that protect their safety	their safety	
lack of infrastructure of civil services such as sewage system and telephones	Increasing the efficiency of infrastructure of civil services such as sewage system and telephones	Percentage of streets that have sewers and the Internet
the mix of uses and urban functions in the neighbourhoods is poor	the mix of uses and urban functions in the neighbourhoods	The percentage of diversity in terms of land use in the neighbourhoods
The Change of Lifestyle and Travelling Culture	Improving public transportation services	The percentage of people using public transportation and walking
A shortage of health structures and services	Increasing structures and improving health services	Number of hospitals, health centers and counseling centers
Increasing slums	Reducing slums	Number of slums
Lack of interest in the heritage neighborhoods in the small sob	Attention to the heritage neighborhoods in the small sob	The percentage of money allocated by the local government to take care of the heritage neighborhoods

## Appendix B: Questionnaire survey

استمارة تقييم مؤشرات الاستدامة في المنطقة التراثية (الكلج والوردية) في الصوب الصغير  
لمدينة الحلة

الاسم:.....

تاريخ اليوم: .....

العنوان (المدينة- الحي- المنطقة): .....

رقم الهاتف:.....

تاريخ الميلاد:.....

مكان العمل:.....

الجنس:.....

يرجى اختيار مجال الخبرة :  أكاديمي  ممارس

اختيار مستوى التعليم:  بكالوريوس  ماجستير  دكتوراه  اخرى

منذ متى تعيش في مدينة الحلة:  أكثر من ٥ سنوات  أكثر من ١٠ سنوات

أكثر من ٢٠ سنة  أكثر من ٣٠ سنة

يُرجى تحديد أحد المستويات الأربعة المهمة لمؤشرات الاستدامة لمدينة الحل

ملاحظة: غير مهم = ١ ، أقل أهمية = ٢ ، مهم = ٣ ، مهم جدًا = ٤

المؤشرات	غير مهم	أقل أهمية	مهم	مهم جدًا
نسبة الشوارع التي بها مجاري وانترنت				
عدد الوحدات السكنية العشوائية				
مواد البناء المستخدمة وطبيعة التصميم				
عدد المدارس والمراكز الصحية بالنسبة لعدد سكانها				
مقدار الدعم للامن الاجتماعي				
معدل التلوث البيئي				
عدد الأشخاص الذين ليس لديهم وحدات سكنية				
نسبة التنوع في استخدامات الأراضي في الأحياء				
نسبة الأبنية التي تحمل التراث العمراني للمدينة				
نسبة تجاوزات القطاع التجاري على القطاع السكني ونسبة التجاوزات على أرصفة الشوارع				
عدد الأحياء التي تعاني من نقص المياه الصالحة للشرب				
الوقت المستغرق للوصول إلى الخدمات المختلفة				
نسبة الشوارع بحالة وتصميم جيد				
عدد وأنواع أنماط الشوارع				
عدد الأنشطة التي يشارك فيها أهل المحلة				
نسبة أخذ وتطبيق معايير التخطيط				
عدد محطات إعادة التدوير				
عدد السيارات				
الاختلاف في شدة حركة السيارات والمركبات				
عدد الجرائم المرتكبة سنوي				
نسبة المساحات الخضراء				
أسعار الطاقة والوقود وتوفرها				
نسبة الأموال التي تخصصها الحكومة المحلية				

				للعناية بالأحياء التراثية
				عدد وأنواع أنظمة البناء
				نسبة الأماكن العامة التي تحولت إلى مكب نفايات
				معدل الدعم المقدم للصناعات المحلية
				عدد الأشخاص في هكتار واحد
				عدد land mark في الأحياء
				نسبة كفاءة نظام النقل
				النسبة المئوية للسياسة الحضرية المحدثة لتخطيط الأحياء
				نسبة الأشخاص الذين يستخدمون المواصلات العامة والمشى
				نسبة المخدرات

## Appendix C: Responses of questionnaire

**indicator1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	3	7.5	7.5	17.5
	3.00	10	25.0	25.0	42.5
	4.00	23	57.5	57.5	100.0
	Total	40	100.0	100.0	

**indicator2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	7	17.5	17.5	20.0
	3.00	9	22.5	22.5	42.5
	4.00	23	57.5	57.5	100.0
	Total	40	100.0	100.0	

**indicator3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	5	12.5	12.5	12.5
	3.00	13	32.5	32.5	45.0
	4.00	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

**indicator4**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	6	15.0	15.0	20.0
	3.00	10	25.0	25.0	45.0
	4.00	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

### indcator5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	5	12.5	12.5	15.0
	3.00	11	27.5	27.5	42.5
	4.00	23	57.5	57.5	100.0
	Total	40	100.0	100.0	

### indcator6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	11	27.5	27.5	37.5
	3.00	15	37.5	37.5	75.0
	4.00	10	25.0	25.0	100.0
	Total	40	100.0	100.0	

### indcator7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	2	5.0	5.0	7.5
	3.00	20	50.0	50.0	57.5
	4.00	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

### indcator8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	3	7.5	7.5	7.5
	2.00	10	25.0	25.0	32.5
	3.00	11	27.5	27.5	60.0
	4.00	16	40.0	40.0	100.0
	Total	40	100.0	100.0	

### indcator9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	5	12.5	12.5	12.5
	2.00	20	50.0	50.0	62.5
	3.00	13	32.5	32.5	95.0
	4.00	2	5.0	5.0	100.0
	Total	40	100.0	100.0	

### indcator10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	7	17.5	17.5	17.5
	2.00	5	12.5	12.5	30.0
	3.00	11	27.5	27.5	57.5
	4.00	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

### indcator11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	3	7.5	7.5	7.5
	3.00	17	42.5	42.5	50.0
	4.00	20	50.0	50.0	100.0
	Total	40	100.0	100.0	

### indcator12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	7	17.5	17.5	22.5
	3.00	19	47.5	47.5	70.0
	4.00	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

**indicator13**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	10	25.0	25.0	30.0
	3.00	15	37.5	37.5	67.5
	4.00	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

**indicator14**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	6	15.0	15.0	15.0
	2.00	10	25.0	25.0	40.0
	3.00	16	40.0	40.0	80.0
	4.00	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

**indicator15**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	6	15.0	15.0	20.0
	3.00	14	35.0	35.0	55.0
	4.00	18	45.0	45.0	100.0
	Total	40	100.0	100.0	

**indicator16**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	5	12.5	12.5	12.5
	2.00	4	10.0	10.0	22.5
	3.00	14	35.0	35.0	57.5
	4.00	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

### indicator17

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	11	27.5	27.5	30.0
	3.00	18	45.0	45.0	75.0
	4.00	10	25.0	25.0	100.0
	Total	40	100.0	100.0	

### indicator18

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	6	15.0	15.0	15.0
	3.00	15	37.5	37.5	52.5
	4.00	19	47.5	47.5	100.0
	Total	40	100.0	100.0	

### indicator19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	5	12.5	12.5	12.5
	2.00	8	20.0	20.0	32.5
	3.00	13	32.5	32.5	65.0
	4.00	14	35.0	35.0	100.0
	Total	40	100.0	100.0	

### indicator20

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	4	10.0	10.0	12.5
	3.00	11	27.5	27.5	40.0
	4.00	24	60.0	60.0	100.0
	Total	40	100.0	100.0	

### indicator21

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	3	7.5	7.5	7.5
	2.00	13	32.5	32.5	40.0
	3.00	11	27.5	27.5	67.5
	4.00	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

### indicator22

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	6	15.0	15.0	25.0
	3.00	14	35.0	35.0	60.0
	4.00	16	40.0	40.0	100.0
	Total	40	100.0	100.0	

### indicator23

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	14	35.0	35.0	45.0
	3.00	17	42.5	42.5	87.5
	4.00	5	12.5	12.5	100.0
	Total	40	100.0	100.0	

### indicator24

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	3	7.5	7.5	7.5
	2.00	9	22.5	22.5	30.0
	3.00	15	37.5	37.5	67.5
	4.00	13	32.5	32.5	100.0
	Total	40	100.0	100.0	

**indicator25**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	2.5	2.5	2.5
	2.00	9	22.5	22.5	25.0
	3.00	8	20.0	20.0	45.0
	4.00	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

**indicator26**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	6	15.0	15.0	15.0
	2.00	5	12.5	12.5	27.5
	3.00	15	37.5	37.5	65.0
	4.00	14	35.0	35.0	100.0
	Total	40	100.0	100.0	

**indicator27**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	7	17.5	17.5	22.5
	3.00	15	37.5	37.5	60.0
	4.00	16	40.0	40.0	100.0
	Total	40	100.0	100.0	

**indicator28**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	4	10.0	10.0	15.0
	3.00	10	25.0	25.0	40.0
	4.00	24	60.0	60.0	100.0
	Total	40	100.0	100.0	

**indicator29**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	11	27.5	27.5	32.5
	3.00	17	42.5	42.5	75.0
	4.00	10	25.0	25.0	100.0
	Total	40	100.0	100.0	

**indicator30**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	6	15.0	15.0	15.0
	2.00	4	10.0	10.0	25.0
	3.00	15	37.5	37.5	62.5
	4.00	15	37.5	37.5	100.0
	Total	40	100.0	100.0	

**indicator31**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	4	10.0	10.0	10.0
	2.00	12	30.0	30.0	40.0
	3.00	12	30.0	30.0	70.0
	4.00	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

**indicator32**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	5.0	5.0	5.0
	2.00	10	25.0	25.0	30.0
	3.00	20	50.0	50.0	80.0
	4.00	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

## مؤشرات استدامة الشكل الحضري: الحالة الدراسية محلات الكلج والوردية في الحلة القديمة

### المستخلص

تعكس مؤشرات الاستدامة الاتجاهات الرئيسية في البيئة والأنظمة الاجتماعية والاقتصادية ورفاهية الإنسان ونوعية الحياة. يمكن أن تلعب المؤشرات أدواراً مهمة في تمكين وتعزيز ورصد الاستدامة. تناولت العديد من الدراسات موضوع مؤشرات الاستدامة الحضرية في مختلف دول العالم، ووضعت العديد من هذه المؤشرات في محاولة لإيجاد توازن بين التنمية الاقتصادية والاجتماعية، والعوامل البيئية، ووجود دراسات حول مدينة الحلة لكنها بحاجة إلى تطوير. تناولت هذه الرسالة موضوع تحديد آلية ومنهجية اختيار وتقييم مؤشرات الاستدامة الشكل الحضري لـ (دراسة حالة)، ولأن مراكز اتخاذ القرار في المدينة تنأى بنفسها عن ادخال مفهوم الاستدامة في القرار. - أصبحت عمليات تحقيق الاستدامة خطوة مهمة، وبالتالي، بدأ البحث من تطوير مؤشرات الاستدامة لتحقيق الشكل الحضري المستدام والوصول الى الهدف المتمثل في إيجاد مؤشرات لقياس الشكل الحضري المستدام لـ (المنطقة التقليدية - الكلج والوردية) من خلال فرضية وجود منهجية هي الأساس للانتقال إلى فكر أكثر استدامة، حيث أن المدخلات هي مجموعة من المؤشرات المستدامة للشكل الحضري، وبالتالي فإن الجزء النظري من الأطروحة يتعلق بالجانب المفاهيمي للبحث. من الناحية العملية، يتم تطبيق المنهجية المعتمدة في دراسة الحالة عملياً، باتباع نهج تشاركي للوصول إلى مجموعة نهائية من المؤشرات لتحقيق شكل حضري مستدام وتنتهي بمجموعة من التوصيات ذات الصلة، ومجموعة من المؤشرات للاستدامة الشكل الحضري، بناءً على نتائج البحث.



جمهورية العراق  
وزارة التعليم العالي والبحث العلمي  
جامعة بابل / كلية الهندسة  
قسم هندسة العمارة

## مؤشرات استدامة الشكل الحضري : الحالة الدراسية محلات الكلج والوردية في الحلة القديمة

رسالة

مقدمة إلى قسم هندسة العمارة في كلية الهندسة في جامعة بابل كجزء من  
متطلبات نيل درجة الماجستير في علوم هندسة العمارة

من قبل

رفل حاكم محييد حميري

(بكالوريوس في علوم هندسة العمارة / جامعة بابل - ٢٠١٩ )

اشراف

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