



**Creation of Local Comprehensive Sustainability
Framework for Developing Cities: A Case Study in the
Iraqi Capital Baghdad**

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DEDICATION

This work is humbly dedicated to:

My country Iraq, especially the beloved capital city Baghdad

&

My parents

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ABSTRACT

Cities are responsible for a high percentage of CO₂ emissions and environmental pollution. This is due to rapid urbanization, population growth, lack of environmental strategies, and increasing transport and energy demand. Thus, there is an essential need to adopt urban sustainability frameworks to guide future development combatting current and future environmental challenges.

However, developing urban sustainability frameworks presents increasingly major challenges in developing countries, specifically in unstable regions, due to locality specific issues such as; lack of environmental strategy, increased transport and energy demand, population-inflation and housing deficit. Previous studies have developed sustainability frameworks based on the requirements of developed countries which are different from those of developing countries, in particular, those affected by harsh conditions such as wars.

This study will focus on the development of a comprehensive sustainability framework for Iraq. Iraq has faced several decades of war and international sanctions, impacting its overall public services and utilities, socio-economy, and infrastructure. Thus, there are many local issues that must be considered. Additionally, it is vital to ensure public engagement and involvement in decision-making in any developments.

This study has engaged with the Iraqi public, through an online survey, in order to investigate their role as a stakeholder and to; identify their priorities, gather their assessment of the current public services and utilities, and stimulate increased public awareness towards urban sustainable development goals.

Informed by this survey, an expert consultation was conducted using the Delphi technique to identify the constituent indicators of the framework. Statistical analysis was then used to identify the significant differences between public perceptions and expert views. This revealed that there were 13 areas that showed significant differences in views and six areas that showed no differences in views. Thus, this demonstrates how the current international guidelines, such as BREEAM, LEED, CASBEE, and etc are not fully applicable for developing countries.

In response to all these factors, this study has developed the Local Comprehensive Sustainability Framework (LCSF) to inform decision-makers and city developers on how to improve current and future city development in Baghdad, Iraq.

The key novelty of this framework is that most previous work has focused on the development of urban assessment frameworks, including only environmental, social, and economic indicators, while this study has also added additional indicators/strategies including future urban planning, future domestic criteria for low energy housing, and a set of urban sustainable development factors. This framework, in contrast to most existing work, is informed by the views of the public, a key difference from previous works that factor in only expert viewpoints.

The LCSF has been validated using semi-structured interviews with 15 intra-organisational leaders in order to ensure it is suitable and applicable. The results showed that 12 out of 15 leaders highly recommended the adoption of the framework. This validation reported that the LCSF is an appropriate way to assess and solve multiple urban issues and local problems, in particular in the Iraqi capital Baghdad. The final step of the validation process was to demonstrate the framework to the Mayorality of Baghdad. The Mayorality considered the framework valid and forwarded it to policy-makers suggesting its adoption as a plan of action for current and new urban development projects in the Iraqi cities, specifically the capital Baghdad.

The key contributions of this study are; (a) its methodological approach to investigating locality specific problems based on engagement with stakeholders, including public perceptions and an expert consultation, (b) the development of the LCSF, (c) engagement with intra-organisational leadership in order to validate the LCSF in politically-unstable countries and (d) use of a statistical method to show the significant differences between the public views and the experts' viewpoints in order to inform policy-makers before applying the LSCF.

LIST OF PUBLICATIONS

Journal Papers (published):

- (Mohsin et al. 2020) “Consensus-based urban sustainability framework for Iraqi cities: A case study in Baghdad”. Sustainable environment and management - Elsevier Journal, Heliyon, Contents lists available at ScienceDirect, journal homepage: www.cell.com/heliyon, <https://www.sciencedirect.com/science/article/pii/S2405844020321915>.

Journal Papers (Under review):

- “A Review of Frameworks for Sustainable Urban Development in Developing Countries” - Sustainable cities and society - Elsevier Journal.

Conference Papers (published):

- (MOHSIN et al. 2017) Public perceptions of urban sustainable challenges in developing countries. WESSEX Institute. Bristol, UK.
- (Mohsin et al. 2018). Energy Forecasting, Based on ANN Machine Learning for Domestic Properties in Dry Hot Arid Regions: A Case Study in Baghdad. ICCO 2018: 10th International Conference on Sustainable environment. Barcelona, Spain. International Journal of Engineering and Technology, Vol. 10, No. 6, December 2018

Conference paper (In Press):

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Chapter 1 Introduction

Chapter 1 begins with a general background of the study, outlining issues being faced by developing countries, such as; global population increases, rapid urbanisation and population growth. This chapter presents the research aims, objectives and the research questions and the hypothesis is posed. It presents the need for this study both in the context of Iraq and in terms of the need for a general methodology in the global context. Finally, this section concludes with a brief outline of the remaining chapters, providing an outline how the chapters of the thesis are organised.

1.1 Background

Currently, more than 50% of the global population live in cities (UN 2014; Prasad et al. 2016) (Ameen and Mourshed 2017a). Due to rapid urbanisation, this figure is projected to increase to nearly 70% by 2050 (Komeily and Srinivasan 2015). Globally cities are the engines of economic and social development (Mourshed et al. 2016) and are also responsible for the majority of energy consumption emitting more than 70% of global CO₂ emissions (Omer 2008; Ameen et al. 2015a; Aldossary et al. 2017; Kadhim et al. 2016). The most recent increases in demand for energy, transportation, social services, and economic activities are in developing countries, especially China, India, and the Middle-East countries (Lange et al. 2012; Ahvenniemi et al. 2017; Dumitru et al. 2020). This results in rapid urbanisation rates and population inflation. Currently, urbanisation rates in developing economies are higher than in developed countries (Kadhim et al. 2016). Consequently, the urban population in developing regions is forecast to increase from 46% in 2010 to 65% by 2050 (UN-Habitat 2014).

Based on this evidence, there is a broad consensus on the need to adopt practical solutions to address urban challenges, for both new urban developments and redevelopment of existing cities (Fawzi and Ameen 2017; Mohsin et al. 2018). This will mitigate local issues, including environmental, social, and economic aspects. It will also achieve an adequate balance between various aspects of sustainability issues. Urban sustainability frameworks have been presented as a critical method to achieve these practical solutions to meet current and future requirements, (Aldossary et al. 2014a; Alyami et al. 2013; Dumitru et al. 2020). This include frameworks such as 'Domestic Sustainable and Low Energy Design in Hot Climatic Regions', 'and The Development of Sustainable Assessment Method for Saudi Arabia Built Environment' (Sharifi and Murayama 2015; (Munier 2011).

The concept of sustainable development emerged from the United Nations Conference on Environment and Development (UNCED), 1992 (Gómez-Muñoz et al. 2010). The importance of adopting urban sustainable development to address urbanisation across diverse cities has

since been widely agreed (Najam and Cleveland 2003; Bosselmann 2016; Ahvenniemi et al. 2017).

The concept of sustainable development can be defined as the flexibility of urban areas to achieve a quality and standard of living in both the current and coming years without affecting the needs of future generations and reduce the undesirable effects of environmental pollution (Ali-toudert et al. 2020; Dumitru et al. 2020).

Urban design factors, specifically those relating to urban planning, are generally adopted from different global countries, but there is an urgent need to identify the key factors that are fit for tackling locality-specific issues (Al-Ansari et al. 2015; Republic of Iraq Ministry of Construction & Housing State Commission of Housing Studies Section 2010). These factors are linked in many aspects, such as population density, employment, social services and standard of living.

Currently, urban sustainable development and the need to improve the quality of life are emphasised to control rapid urbanisation, declining resource consumption, environmental pollution, preserve the ecosystem, and promote investment (Alyami 2015; Ameen and Mourshed 2017a; Goel et al. 2014; Alqahtany et al. 2014; Dumitru et al. 2020). Thus, urban sustainability has become popular in many countries, as reflected in the development of new urban areas, strict regulations of the new built environment assets while promoting sustainable methods to mitigate undesirable effects in current applications and future practices (Yigitcanlar and Lee 2014).

Urban sustainable development is one of the most important areas in urban design and development. However, an urban sustainability framework is required to help policy-makers, city developers and professionals to identify the significant aspects related to the standard of living and environmental issues at different project stages (Grant 2015). Urban sustainability frameworks can also be a catalyst to increase market demand for sustainable products (Briceno and Stagl 2006; Ahvenniemi et al. 2017; He et al. 2018; Castro-Lacouture et al. 2009; Ali-toudert et al. 2020).

The majority of sustainability frameworks have been developed around the local challenges and requirements of developed countries, which are often dramatically different from those of developing countries (Sharifi and Murayama 2015; Munier 2011; Verma and Raghubanshi 2018; Almutairi et al. 2019) and particularly countries affected by unstable conditions and a man-made catastrophe such as wars (Mohammed Ameen et al. 2014a). Iraq represents a unique example of a war-torn region that has suffered from harsh conditions originating from several decades of war and international sanctions, which have directly increased damage into the overall economy, infrastructure, public services and utilities (Mohsin et al. 2018). Even

though intensive efforts to rebuild, rehabilitate and develop new projects are currently underway, there is no evidence of a sustainable roadmap or policy plan (Mohammed Ameen et al. 2014a). Finally, there is currently no national urban guide or sustainable framework in either Iraq or the case study area of Baghdad.

An urban sustainability framework is an essential tool for the rapid urbanisation of developing economies (Anon n.d.; The United Nations 2014), which can help to mitigate the impact of climate change, energy and transport demands, environmental pollution and also enhance the standard of living. The environmental, economic and social aspects of sustainability issues are inter-dependent (Yigitcanlar and Lee 2014). Consequently, sustainability frameworks in the built environment have faced more challenges in developing countries than in developed countries (Ortiz et al. 2009; Susilawati and Al Surf 2011; Alyami 2015; Dumitru et al. 2020). This is because developing countries tend to rely on burning fossil fuel for power production and they lack environmental strategies, especially in the Middle-East countries such as Arab Gulf regions including Iraq (Sharifi and Murayama 2015).

Recently, most research and development practices have concluded that global urban sustainability frameworks are not necessarily applicable, specifically for developing economies, because of the wide differences in priorities for urban sustainable development (Grant 2015). Therefore, because different urban priorities are required, we need to take account of the local contexts before developing a new urban sustainability framework.

Prior investigations on urban sustainability frameworks (Sharifi and Murayana 2014), particularly in the Middle East (Alyami et al. 2015), have focused on data collection, analysis, and literature reviews, to understand relevant factors and indicators. They also relied on the views of experts and stakeholders, ignoring out the feedback of the public, who are ultimately the beneficiaries of urban development projects (Aldossary et al. 2015a). Despite this, this investigation approach is considered to be an enhancement of the out-of- global context techniques. However, the identified factors, indicators, and priorities cannot be adopted as a comprehensive collection of the views of all of the stakeholders including local citizens to identify their priorities, lifestyle, and cultural background.

In the absence of local plans and frameworks to combat these local challenges (Fawzi and Ameen 2017; Mohsin et al. 2018), a national framework is required to assess the locality-specific issues to design and develop urban projects in Iraq, particularly in the capital Baghdad, which is home to 25% of Iraq's population (Republic of Iraq Ministry of Construction& Housing State Commission of Housing Studies Section 2010; Mohsin et al. 2018).

Thus, this research aims to design a new comprehensive sustainability framework in the local context of Iraq. This is due to the fact that the well-known global sustainability frameworks are not appropriate for developing economies, especially for war-torn countries such as Iraq (Fawzi et al. 2016)].

This study represents a unique opportunity to design a framework that is appropriate to the case study area and which can address its specific challenges of urban development, involving different directions/dimensions to combat the most significant issues in the area being considered. These dimensions are; (a) a future vision for new urban development areas, (b) pathways towards low energy domestic projects, and (c) a set of urban sustainable development factors, including environmental, social, cultural, management, and economic indicators, in order to improve the quality of life in the case study region.

Consequently, this study will consider locality-specific issues, including environmental, social and economic aspects, in addition to promoting social awareness and public involvement. This will utilise a methodology that includes; (a) engagement with the public eliciting their perceptions in order to show their ambition and priorities, (b) consultation with experts, and, (c) validation of the work with intra- organisational leaders.

In conclusion, the key research problem tackled by this work is the lack of effective planning to mitigate the current and future problems. Therefore, this study will propose a new comprehensive sustainability framework.

1.2 Aims and objectives

The aim of this research is to develop a theoretical and practical sustainability framework based on the factors that affect urban development in developing countries. This is required because developing regions tend to demonstrate higher growth rates than developed countries (The United Nations 2014; Mohammed Ameen et al. 2014a). Most developing countries also have lower levels of economic growth and smaller capital markets than developed countries. Therefore, the least developed economies are the poorest of the developing countries (Galipeau et al. 2017; Ahvenniemi et al. 2017; Alyami 2015; Aldossary et al. 2015b; Almutairi et al. 2019; Ali-toudert et al. 2020).

The objectives of this research are to:

- Review the state-of-the-art on urban challenges and sustainability issues, including the global practices regarding urban frameworks currently used or under-development, to identify key factors and sustainability indicators (Kfsi).
- Engage with the public and assess their perceptions to investigate locality- specific issues and urban challenges in the case study area.

- Conduct an extensive consultative process with the experts to reach consensus regarding the different dimensions and factors and sustainability relevant to Iraq.
- Develop a comprehensive sustainability framework to assess urban sustainability challenges.
- Determine the differences in views between the public survey and the experts consultation.
- Validate the framework via semi-structured interviews that engage intra-organisational leadership in order to adopt the proposed framework at a national level.

1.3 The research hypothesis and questions

The key hypothesis of this research is:

That the application of a comprehensive sustainability framework incorporating future vision, future domestic requirements, and a set of urban sustainable development factors can lead to improved future urban development when applied at a city-scale.

This hypothesis is derived from the fact that international urban sustainability frameworks have not yet seen widespread deployment in developing countries, in particular unstable countries such as Iraq (Al-Ansari et al. 2015; Fawzi and Ameen 2017; Mohsin et al. 2018). Through the following research questions this hypothesis will be answered by developing a theoretical and practical sustainability framework, firstly examining how a sustainability framework can contribute towards sustainable city development and identifying the reasons for current lack of existing widespread deployment of sustainability frameworks. The research questions themselves will be answered through the execution of the research methodology (defined in Chapter 3).

The research questions that must be answered in order to answer this hypothesis are:

- **RQ1:** In what ways can a framework for a city level urban development pave the way towards sustainable city development and what are the requirements for such a framework to be deployed in unstable developing countries? RQ1 will be answered chapter 2.
- **RQ2:** What are the public's perceptions of sustainable urban development and locality-specific issues in Iraq? RQ2 will be answered in Chapter 4.
- **RQ3:** How do the views of the public differ from the generally accepted view of experts in the context of sustainable urban development in Iraq? RQ3 will be answered in Chapter 5 and Chapter 6.
- **RQ4:** How do the views of local experts' impact on the creation of a sustainable urban development framework for cities, including their vision for their development and desired future domestic features? RQ4 will be answered in Chapter 5 and Chapter 6.

- **RQ5:** Is the developed framework considering the public survey, experts' consultation, have the potential to improve future urban development and is it fit for purpose in its target context? RQ5 will be answered in Chapter 7.

More specifically:

RQ1 will enable the exploration of the sustainability factors to drive the creation of a new framework. This RQ also provides analysis of the research gap between this study and previous studies. This contributes to testing the hypothesis by identifying multiple urban sustainability dimensions and factors that must be considered by the study. This RQ will also identify the requirements for the deployment of such a framework in unstable developing countries.

RQ2 will identify the locality-specific issues that are important to the general public in Iraq. This contributes to testing the hypothesis by investigating the Iraqi local context.

RQ3 will compare the data collected from the general public with the data collected from experts. This is critical to testing the hypothesis as understanding the differences in views between the public and experts is vital to judging how the framework can eventually be deployed. Also, the findings of the statistical analysis methods will answer this research question to show the significant differences between both the public views and the experts' views before designing the proposed framework.

RQ4 will identify urban sustainable development factors in order to create a comprehensive sustainability framework. This question is highly related to the research hypothesis regarding as it contributes the key knowledge for the creation of a new framework.

RQ5 validates the proposed comprehensive framework contributing to the hypothesis by testing how experts and officials receive the proposed framework.

1.4 The research contribution

Key contributions of this study are twofold: first, it investigates the urban sustainability factors and local priorities in a war-torn developing region such as Iraq; and second, it develops a methodology for developing urban sustainability frameworks, including expert consultation and consensus, engagement with the public's viewpoints of urban development factors and their priorities, for an appropriate assessment/ comprehensive local framework.

This study presents, for the first time, a comprehensive sustainability framework for a country that has suffered several decades of wars and international sanctions. The results for the case study in Baghdad will help to improve urban development, as shown in Figure 1.1, and address multiple directions of practical solutions, including future planning vision, semi-standardised housing projects, and a set of urban sustainability indicators to enhance current and future conditions.

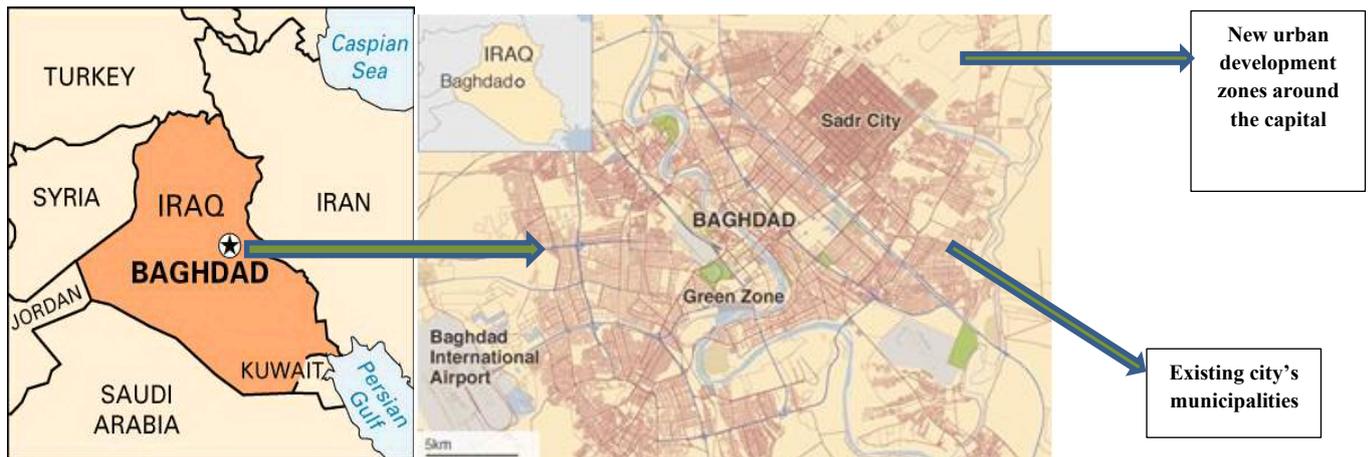


Figure 1.1 Case study region and new urban development. (CSO, 2016)

1.5 Methodological summary

This research will employ a variety of methodological techniques in order to answer the hypothesis described in Section 1.4. Firstly, as stated previously this research will adopt mixed philosophical approaches to achieve its main aims. More specifically the following techniques will be employed:

- A wide range of global and local problems will be discussed using a comparative case study.
- Public perceptions will be investigated via a public survey questionnaire, which will identify urban sustainable development challenges, locality-specific problems, and local priorities towards urban sustainability issues for future Iraqi cities. This is an important stage because it captures the public's attitudes towards urban development issues, policies, and applications.
- A new comprehensive framework will be designed based on the consultation with an expert panel utilised to seek consensus on the different dimensions relevant to the urban sustainability framework to establish it within the Iraqi context through the Delphi technique.
- The proposed comprehensive framework will be applied in a case study area (Baghdad, Iraq).
- Semi-structured interviews with various intra-organisational leaders will be utilised to validate the framework.

1.6 Local context: a case study in Iraq

This subsection will present the locality-specific issues in the area being considered. This will show how the design of the new framework will contribute and combat the existing and future challenges in this area.

Iraq is located in the Middle East. Most of the country can be classified as a hot, dry, arid region, while it is classed as semi-arid/ Mediterranean in the north and north-eastern areas. As shown in Figures 1.2 and 1.3. temperatures can vary significantly, for example, the summer months in Iraq are hot dry arid, and temperatures frequently exceed 50°C.

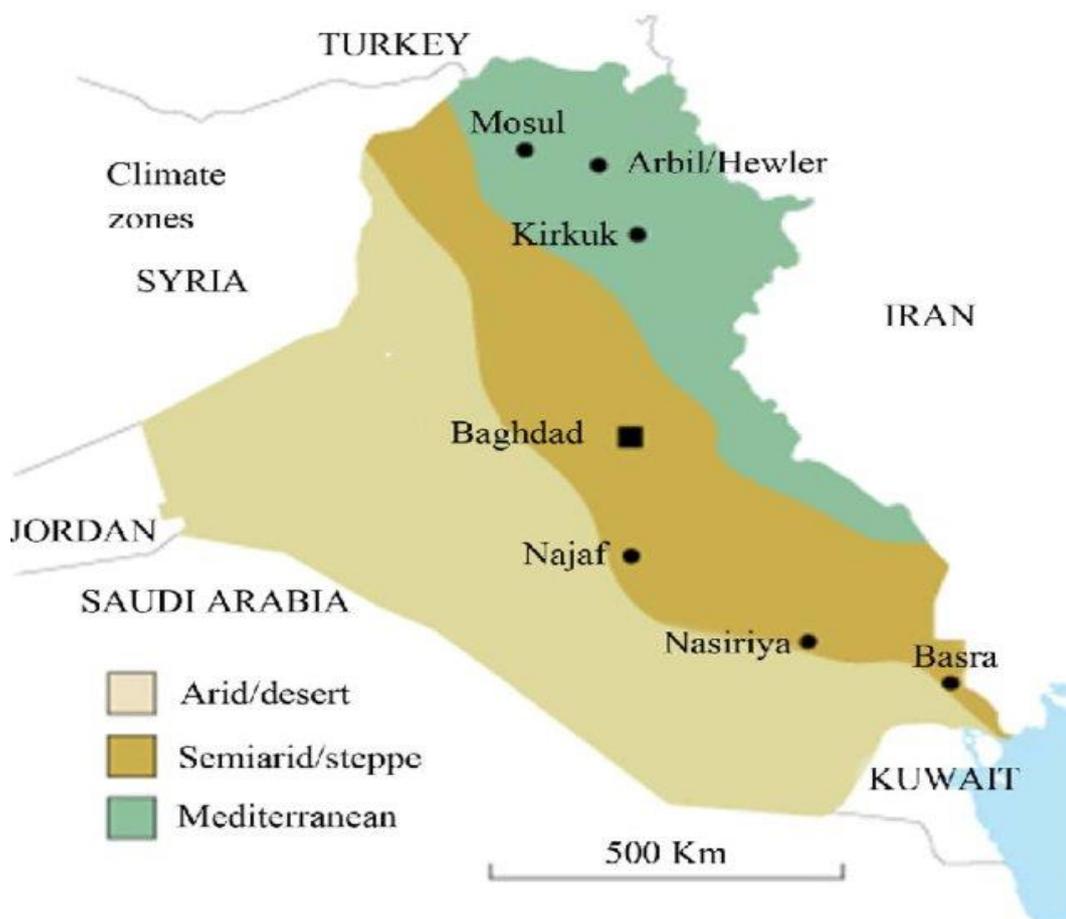


Figure 1.2 Iraqi Climate (source: CSO, 2017)

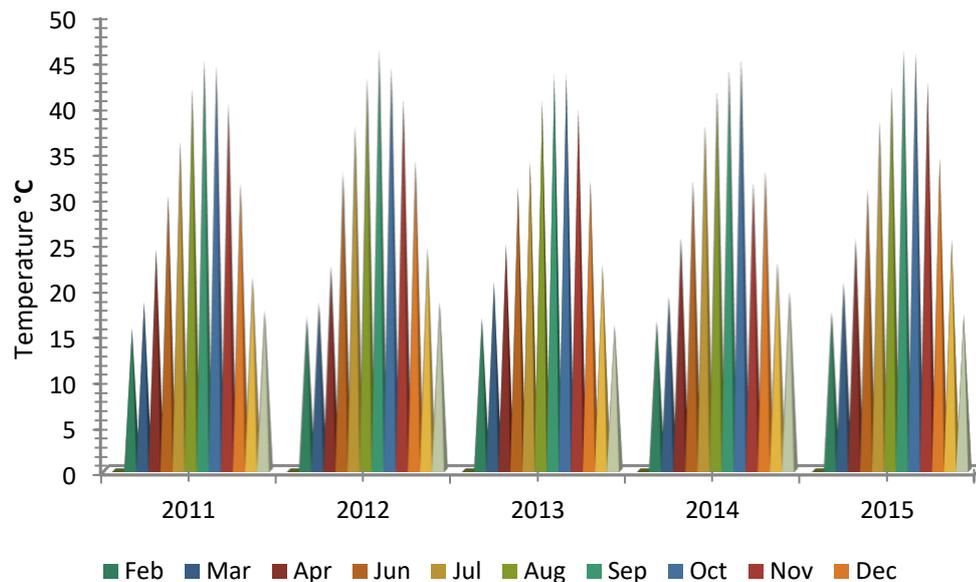


Figure 1.3 Mean air temperature (source: Iraqi Metrological Organization and Seismology)

Meanwhile, the temperature in the winter reaches 5°C and is even below 0°C during a few days in December and January (P. Doyle and K.Jaafar 2010; Al-Ansari 2013). Also, in the summer, dusty desert winds occur and it rarely rains (Varoujan K et al. 2013). In the winter, rainfall amounts to less than 40 mm between November and April (Zakaria et al. 2013).

The population of Iraq is predicted to double in size from 38.5 million in 2017 to about 70 million by 2030 (CSO 2013). Baghdad is the capital of Iraq and it houses a quarter of the total population. The population of Baghdad is predicted to reach 14 million by 2030, which will add to the city’s problems including insufficient public services and infrastructure, exacerbating undesirable environmental impacts (Al-Salihi et al. 2010; Hasson and Hussain Al-Askari 2013; Mohsin et al. 2018).

Energy consumption is one of the most important challenges in hot dry arid regions and it needs to be addressed by sustainability frameworks, focusing on the transition from the concept of energy consumption to energy-producing homes, exploiting the use of solar energy. Specifically, in Baghdad other problems include increasing pressure on transportation, housing, water and energy consumption. Consequently, sustainable urban development in this city faces many significant challenges due to rapid urbanization, population growth, lack of environmental strategies, poor future urban planning, and increasing transport and energy demand (Ameen and Mourshed 2017a; Mohsin et al. 2018).

Iraq has been selected in this study as a representative politically unstable country due to the severe post-war damage to its infrastructure and the ongoing terrorist attacks in its cities, specifically the capital Baghdad (Al-Salihi et al. 2010; Hasson and Hussain Al-Askari 2013). Despite several efforts to rebuild Iraq's cities, more intensive efforts are needed to enhance the quality of life and mitigate the current problems, such as high energy consumption and demand, traffic congestion, environmental pollution, and lack of effective planning (Hasson and Hussain Al-Askari 2013; Mohsin et al. 2018). Of these problems, the shortage of electricity is one of the most common issues in developing countries (The United Nations 2014; Al-Khatteeb and Istepanian 2015). In particular, Iraqi citizens suffer considerable shortages in electricity, which affects their quality of life and their economy (Al-Khatteeb and Istepanian 2015; Mohsin et al. 2018).

Since 2003, Baghdad has experienced population inflation, which includes increased demands for energy and transportation. For example, before 2003, the number of vehicles in Baghdad was proportional to the basic design of the city. The number of vehicles in the capital has since increased more than ten times, while the basic design of the city and its roads have not developed sufficiently to mitigate this increase (Al-hafiz et al. 2017; Implementation et al. 2014). Specifically, the percentage increase of the number of vehicles in Iraq is about 300% (The United Nations 2014). This is an increase of about five hundred vehicles daily (Republic 2017). This large increase in the number of vehicles is a result of the improved economy after the regime change in 2003 and also due to the end of the international sanctions, as well as the lack of public transport and the huge rise in population.

In light of these locality-specific issues in Iraq, especially in the capital, it is an essential to identify radical and sustainable solutions to mitigate the current crises. Consequently, this study will design a comprehensive sustainable framework that covers the basic aspects, including planning, transport, housing, and issues of economy and environment (as shown in Figures 1.4 and 1.5).

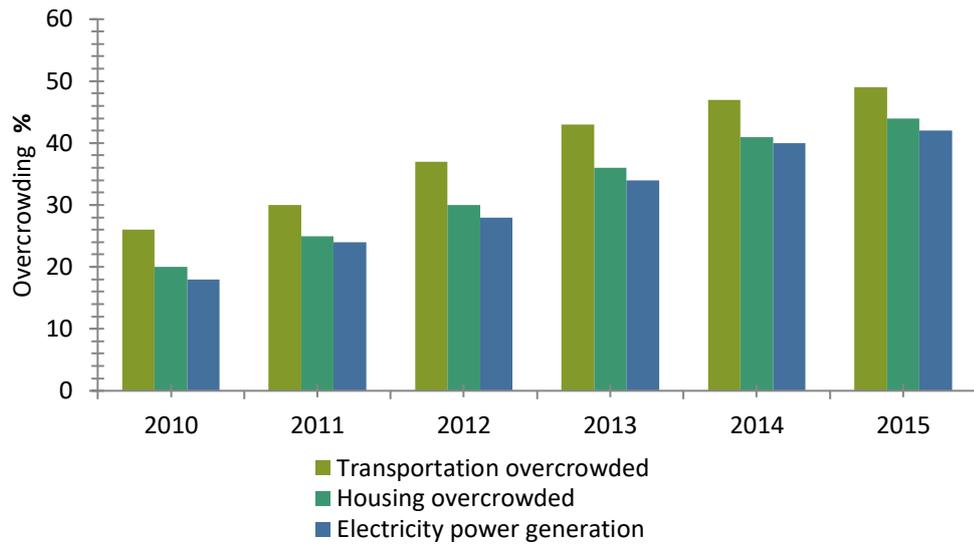


Figure 1.4 Overcrowding in Baghdad (source: CSO 2016)

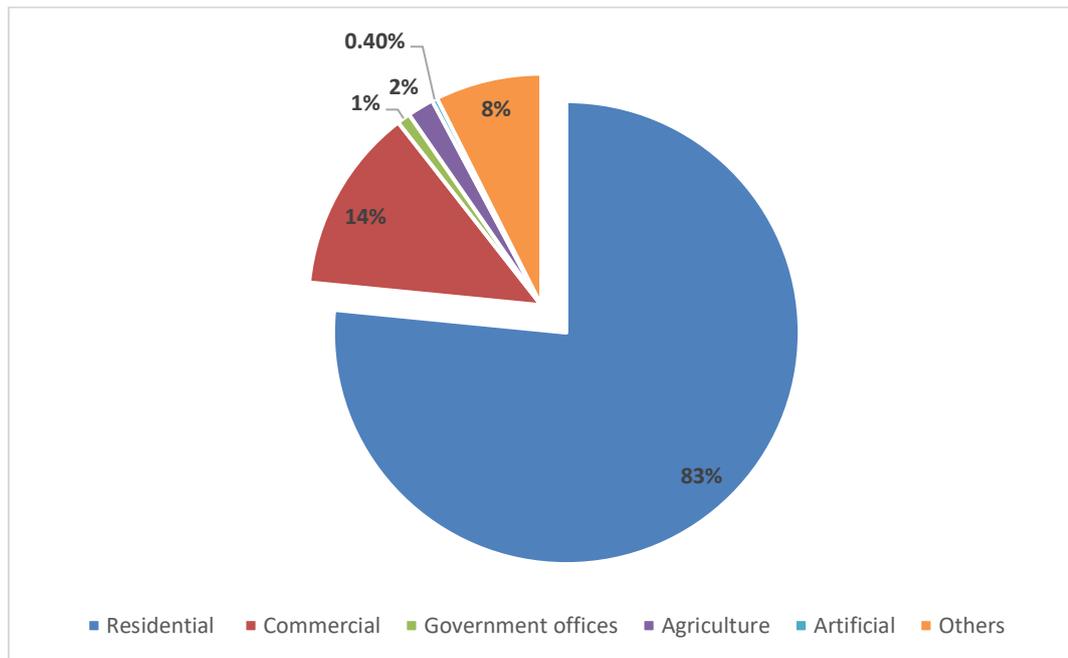


Figure 1.5 Consumers electricity demand, 2015–2016 (source: CSO 2017)

1.6.1 Population of Iraq, growth and transition

Iraq's population increased from 4.8 million in 1947 to nearly 6.3 million in 1957, with an annual growth rate of 2.68%. It then jumped to 12 million in 1977. The annual growth rate was 3.2% for 1957–1977. The population reached 16.3 million in 1987, with an annual growth rate of 3.1% for 1977–1987. It then climbed to 22 million in 1997, with an annual growth rate of 3%. It rose to 31.6 million in 2009, with an annual

growth rate of 3.0% for 1997–2009 (the last listing and numbering report, 2009, CSO). Figures 1.6 and 1.7 show the population size and the annual growth rate as shown in Figure 1.7.

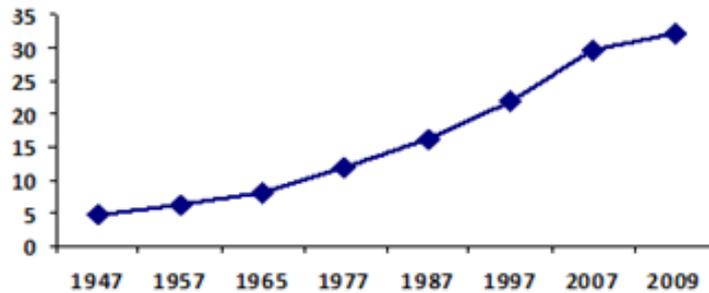


Figure 1.6 Iraq's population size (in million) (source: Listing and Numbering report, CSO 2009)

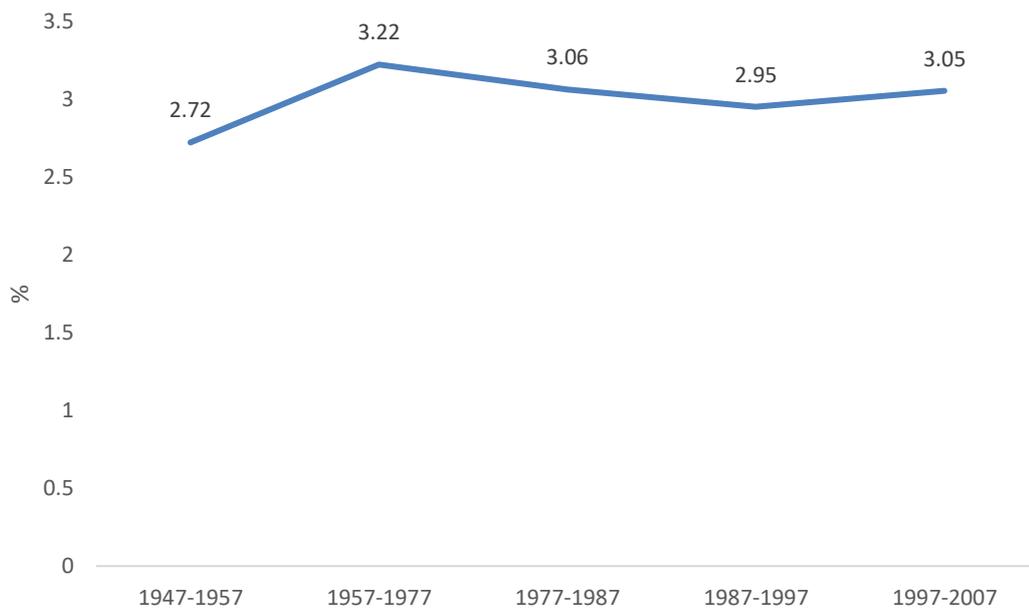


Figure 1.7 Iraq's annual population growth rate (source: Iraq National Population Commission 2011)

Unlike many other developing countries, Iraq's population has grown rapidly during the last three decades, due to population policies targeting population growth. In 2007, the population of Iraq was estimated at 10-fold the country's population in 1927 (Ameen and Mourshed 2017a; The United Nations 2014). If fertility and mortality rates continue at their current pace, then Iraq's present population will double every 23 years, which will have many negative repercussions on the quality of life unless the

traditional perspective of the relationship between population growth and development changes. Iraq is suffering from an imbalance in the geographic distribution of the population and from the predominance of a single population block (i.e., the capital and its surroundings), as well as the emergence of the phenomena of concentration in large cities, urban swelling, and growth of haphazard housing around the metropolis (Maguen et al. 2012; The United Nations 2014). These facts indicate that it is necessary for population policies to focus on understanding the rapid urbanisation and civilization process, and its potential impacts. This should be channelled through development plans and programmes.

Many developing countries have placed emphasis on low-energy housing. However, this concept has many connotations and it would be appropriate to first clarify the meaning of this popular terminology. Basically, low-energy housing means the provision of housing at low cost for all sections of society.

In October 2010, the Iraqi Ministry of Construction and Housing (MOCH) published the National Housing Policy, supported by United Nations human settlements programme (UN-HABITAT). The head of the UN mission mentioned that Iraq's estimated housing shortage has reached approximately 2 million housing units, while the Government of Iraq has concluded that centralized systems of housing delivery can no longer address the country's increasing housing deficit (Republic of Iraq Ministry of Construction & Housing State Commission of Housing Studies Section 2010). Through this new policy, the MOCH outlines how the Government of Iraq will establish an enabling environment to support the engagement of other actors in radically scaling up housing provision; in particular the private sector (Republic of Iraq Ministry of Construction & Housing State Commission of Housing Studies Section 2010).

1.7 Thesis summary

This thesis has eight chapters. A summary of the content follows:

Chapter One highlights the background of urban sustainability frameworks and introduces the locality-specific issues of the Iraqi context, followed by the aims and objectives of the research, the research hypotheses and questions. The contributions of the research are identified, and the problem statement of the thesis is discussed.

Chapter Two reviews the previous literature of urban sustainability frameworks. It then gives a critical comparison and review of global urban sustainability practices, including energy consumption, to identify the appropriate urban sustainability factors that will be used to support the development of the new comprehensive

sustainability framework in this study.

Chapter Three reviews the main methodological approaches that underpin this research. Specific tools and justification are provided to support the research methodology. The findings of a critical review of the previous studies, the online questionnaire, the consensus-build method approach (the Delphi rounds) and semi-structured interviews will be used to develop and make the new comprehensive sustainability framework applicable/useful in the case study region.

Chapter Four investigates public perceptions of the urban sustainability challenges in Baghdad, Iraq. It launches data collection methods and the findings of the nationwide questionnaire to identify the locality-specific issues.

Chapter Five describes the methods that have been used to identify the urban sustainability factors (indicators and sub-indicators) that were deemed to be most applicable for use in the new comprehensive sustainability framework. It also justifies the selection of the Delphi tool as a consensus-building approach. This chapter also identifies the various urban sustainability factors that were generated and divided through the Delphi consultation survey into three main dimensions. This includes a description of how the expert panel was selected to reach the final consensus of the new urban sustainability factors.

Chapter Six discusses the development of the new comprehensive sustainability framework. It also gives more specific details about the Delphi results, which will be used to establish the new framework. A discussion of the significance of the various urban sustainability factors, together with the public's perceptions and expert's consultation is also given. This chapter also discusses the major dimensions of the proposed sustainability framework and the appropriate methods of statistical analysis to identify the significance and the differences of the factors in the public survey and the expert consultation.

Chapter Seven verifies the newly designed framework based on the semi-structured interviews in the case study region. It will then discuss the theoretical and practical suggestions of the new framework from the selected expert panel using face to face interviews to find how to make the proposed framework applicable and reliable in the case study region.

Chapter Eight concludes this thesis. It gives the implementation of the new framework, according to the results obtained during the study period. This chapter will make general recommendations to improve and develop the case study region. It will then close by making several suggestions for future work.

Chapter 2 Sustainability and Sustainable Urban Development in Developing Countries

Global attention towards sustainable urban development of cities has increased recently due to a growing awareness of issues around rapid urbanisation. Cities are responsible for a substantial amount of the world's CO₂ environmental pollution. In developing countries, existing global sustainability guidelines for cities are often not appropriate due to climate differences between developed and developing countries. There are also issues specific to countries suffering from political instability e.g. the degradation of public services and utilities, severe damage to the infrastructure and economic deterioration.

*Improved urban sustainability may be achieved by utilising sustainable development frameworks but existing frameworks are not sufficient to meet current challenges nor future requirements in developing countries because they have focused on planning and engineering aspects without the involvement of stakeholders. However, the inclusion of stakeholder perceptions does create significant challenges re feedback from the public. This chapter reviews and analyses existing sustainable urban development frameworks, identifies the reasons for the lack of widespread adoption of sustainability frameworks in unstable countries. It identifies several different strategies have not been addressed in the previous research to address/solve locality specific issues. These strategies include; (a) consideration of the views of the general public, (b) future urban planning requirements, (c) future domestic property requirements of occupants in new urban development zones, and (d) achieving a reduction in domestic energy consumption. Finally, this chapter proposes that new frameworks must consider stakeholders views. Stakeholder participation is a new challenge but addressing this will combat gaps found between decision-maker's opinions and public opinion. This chapter will answer **RQ1:In what ways can a framework for a city level urban development pave the way towards sustainable city development and what are the requirements for such a framework to be deployed in unstable developing countries?** This is solved by identifying the research gap and the novelty of research. Specifically, this chapter examine why global frameworks are not fully applicable for developing countries including the case study area in Iraq. The coming sections will discuss current and past global research in terms of urban sustainable development frameworks.*

2.1 Introduction

In the past two decades, it has been recognised that buildings are a major factor regarding rising pollution and increasing environmental problems (Ahmad, Hippolyte, et al. 2016). The built environment is therefore one of the main areas where work can be undertaken to reduce undesirable impacts on the environment caused by conventional power generation, traffic congestion, greenhouse emissions, rapid urbanisation and population growth (Gómez-Muñoz et al. 2010, Fawzi et al. 2016). Cities, the main engines of economic prosperity, are considered the main source of more than 70% of greenhouse gas emissions, due to the excessive use of energy consumption, transportation problems and weaknesses in management (Fawzi et al. 2016). In developing countries like Iraq, the demand for energy from fossil fuels is a particular problem which is exacerbated by a lack of investment in renewable resources.

Urban development has special importance within the broader context of sustainability. In terms of global urbanization and population growth, the world's urban population was reported to 3.17 billion out of a total of 6.45 billion in 2005 (UN-HABITAT, 2007). Current international reports forecast that the urban population will continue rising, reaching approximately 5 billion by 2030, out of a total of 8.1 billion (UNHABITAT, 2007). In Baghdad, Iraq, a city which houses a quarter of the total population of the country, the population will double by 2030 to reach 12 million. Across Iraq, city populations will also rise from 35 million to approximately 70 million by 2030 (CSO, ministry of planning reports).

In developing countries, where urban sustainable development has faced a major challenges, there is an essential need to combat climate change, traffic congestions, population growth, and high energy consumption, because these countries, such as

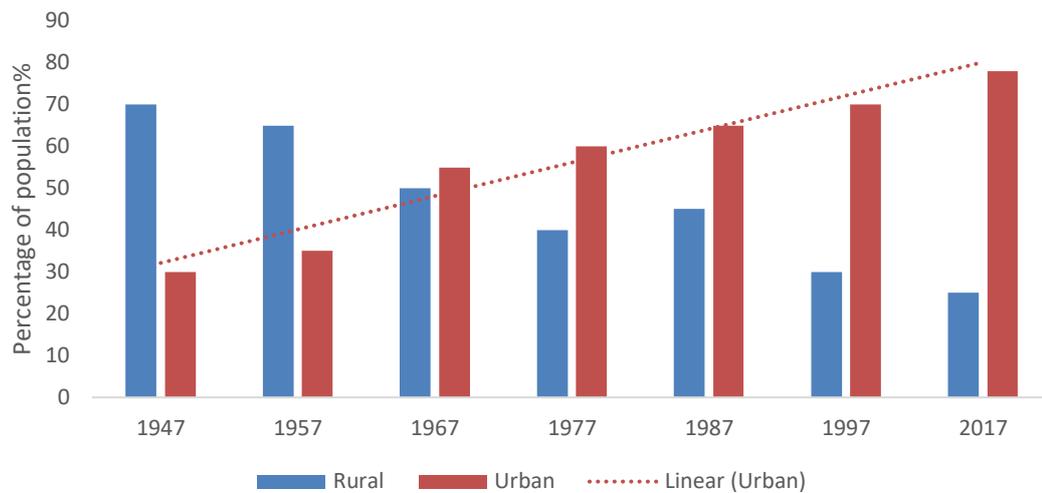


Figure 2.1 Population distribution (Urban, Rural), Iraq. - Source: [Central Statistical organization; Statistical Annual Abstract and World Bank 2014]

Arab gulf countries and Iraq, rely on burning fossil fuels for as much as 90% of their power generation, this dramatically increase CO₂ emissions and environmental pollution (Nader 2009a; Reiche 2010; Janajreh et al. 2013; Alqahtani et al. 2017).

Energy consumption plays a significant role in developing regions, in particular hot dry and arid countries, due to the excessive use of natural resources and environmental pollution, because of their use of conventional power production. The main reason for increasing energy demands lie in the growth of the economy and population (i.e. in countries such as China, India and the Middle East regions (IEA 2013) this has resulted in rapid urbanization. For example, in Iraq, there has been a rapid shift from the population living mainly in rural areas to urban regions as shown in Figure 2.1. In 1947, 70% of the population lived in rural areas; by contrast, today more than 70% of the population live in urban areas (The United Nations 2014). Such urbanization and increase in population density are identified as the key factors shaping future cities (Suzuki et al. 2010). This, therefore, constitutes a significant challenge to find acceptable solutions for new and existing city developments tackling the impacts of climate change, and achieving a balance between various dimensions of sustainability (Siemens 2012; Sharifi and Murayama 2015).

Over 90% of energy is produced by burning fossil fuels in Arab Gulf countries. This is because these countries are rich in oil and fossils fuels. Hence, there is a limited uptake of renewable resources like solar radiation, despite favourable climatic conditions (Al-Saleh, 2009, Alyami et al. 2015). However, a shift in global practices to reduce energy consumption through an increased reliance and investment in

renewable resources, could contribute to energy savings and reduce CO₂ emissions. A number of developed countries already emphasize the use of energy saving systems but these renewable technologies are largely absent in the Middle-East (Aldossary et al. 2014a; Ameen et al. 2015b; Alyami et al. 2015). Therefore, energy consumption is one of the most important challenges that needs to be addressed by sustainable frameworks, focusing on the transition from the concept of energy-consumption to energy-producing homes, exploiting the use of solar energy (Ahmad, Hippolyte, et al. 2016; Aldossary et al. 2015b).

A number of authors (Mohammed Ameen et al. 2014a; Alyami et al. 2015; Aldossary et al. 2014a) have focused on sustainable assessment tools, defining global sustainability indicators which include various socio-economic factors specific to developing regions, with the goal of minimising resource consumption (water, energy and materials) while addressing environmental factors. However, an understanding of locality-specific problems is essential to achieve urban sustainability development (Alyami et al. 2015). This includes the identification of local challenges, specifically in high-density cities in developing regions that increase pressure on transportation and housing, and water and energy consumption (Yigitcanlar and Lee 2014). As such, sustainable urban development faces major challenges in developing countries, including Iraq, addressing current and future requirements (Fawzi and Ameen 2017; Mohsin et al. 2018).

Scientific evidence suggests that sustainability assessment tools such as the Building Research Establishment Environmental Assessment Method (BREEAM) and LEED, are not appropriate for developing countries including Saudi Arabia and Iraq (Mohammed Ameen et al. 2014a) especially regarding the development of the built environment (Alyami et al. 2015; Ameen et al. 2015b). To this end, (Ameen et al. 2015b) reviewed six international urban sustainability assessment tools; BREEAM Communities, CASBEE-UD, LEED-ND, Pearl Community Rating System (PCRS), SBToolPT-UP and GSAS/QSAS. These tools were reviewed to compare rating indicators in developing and developed countries to identify appropriate environment, economic and ecology indicators for developing countries such as Iraq.

Previous urban sustainability studies have also highlighted the need to link the goals of sustainable development with the demands of decision-makers and organizers, including community factors (Fawzi et al. 2016). Urban sustainability challenges in developing countries include addressing stakeholders' perceptions, opinions and their ambitions in order to identify the public perspective, acceptable solutions for users and policies based on the local context, these normally different in comparison

with global tools (Ameen et al., 2016). Finally, work by Aldossary, Rezgui & Kwan (2014a, 2014b), revealed a gap between public and expert perceptions regarding sustainable development. They found a wide difference between public perceptions and expert / government views on topics such as housing patterns.

The rapid transformations of global cities reflect economic prosperities, environmental strategies, together with technological, and social aspects (Nader 2009a; Yigitcanlar and Lee 2014). Yet all are, in turn, greatly driven by economic aspects involving new urban spatial development to develop new cities based on urban sustainable development goals in order to improve the quality of life, as well as to meet current and future requirements (Li et al. 2010; Kankal et al. 2011; Fawzi et al. 2016).

The strategies of planning cities and sustainable urban development are effected by improvements in our knowledge of the causes, and impacts of the process of urbanization and its driving forces (Kadhim et al. 2015). Hence, the sustainable planning of cities is facing a major challenge in developing cities due to population growth and rapid urbanisation, yet new innovative techniques and sustainable urban design offer the potential to significantly impact the analysis, planning, and understanding of sustainability issues and future urban development planning (Almutairi et al. 2019; Saffar and Advisor 2019). Based on a theoretical and practical knowledge of how to improve current and future developments, combining land use with urban sustainable development factors, such as environmental, social, and economic aspects to investigate how the planning of new urban developments change the processes of urban development to be more sustainable (McDonnell and Pickett, 1990; Medley et al., 1995; Luck and Wu, 2002; Zhang et al., 2004; (Ahvenniemi et al. 2017; He et al. 2018; Dumitru et al. 2020) . By understanding the integration of ecological, social, and economic considerations of various disciplines, urban design can prove to be a significant tool for understanding the urban challenges and environmental consequences of urbanization (McDonnell and Pickett, 1990; Medley et al., 1995; Foresman et al., 1997).

However, the development of new urban areas also plays a vital role in improving the processes of urbanisation and investment in metropolitan areas/zones (Kadhim et al. 2015). Here the rapid urbanisation process is not only determined by the growth rate of the main cities, but also shaped by the transition from rural areas, specifically in developing economies or political-unstable regions (Ameen and Mourshed 2017a). For this reason most of developing cities suffering from traffic congestions, lack of environmental plans and management, and population-inflation (Ruhé et al. 2013; Fawzi et al. 2016). In response to this, satellite towns or new cities around capitals

have faced major challenges in recent years (Li et al. 2010; Chang and Sheppard 2013) developing new sustainable urban zones. In addition, to drive the economy of developing cities, it is, therefore, an essential need to explore the potential need of urbanisation issues (Li et al. 2010; Alyami et al. 2015; Ali-toudert et al. 2020).

For example, China has experienced development and rapid urbanisation over the last two decades, in line with economic development, the landscape has transformed significantly (Yeung, 1998; Zhou and Ma, 2000; Liu et al., 2002; (Chang and Sheppard 2013; He et al. 2018). Therefore, new urban development cities/towns and landscapes for industrial development cities/ poles have been impacted directly to increase the economic aspect for developing regions within a short and long-term period of time. In addition, it could be needed to improve the environment, socio-economic aspect, and reduce multiple problems including traffic congestion such as Beijing city (Gu, 1999; Liu et al., 2000; Xie and Fan, 2003; He et al., 2002; Wu et al., 2006), and Shanghai (Zhang et al., 2004; Zhu et al., 2006; Guo et al. 2011; Chang and Sheppard 2013; He et al. 2018; Ali-toudert et al. 2020). The new development towns/poles such as the common city of Shenzhen (Shi et al., 2000; Sui and Zeng, 2001; Dumitru et al. 2020), has a huge scales of cities located in the central and western China, such as Shijiazhuang and Chengdu, to mitigate the current and future pressure on the mother city or capital.

Rapid urbanization is, thus, the most important challenge to emerge in recent years, due to the rapid transition of populations from rural to urban regions, this occurring in developing countries, more so than developed regions (Debnath et al. 2015a). This is specifically the case in Baghdad, adding to problems including insufficient public services and infrastructure, exacerbating undesirable environmental impacts (Roberts 2008a; Bryant 2006). According to previous studies such as Mohammed Ameen et al. (2014a), Alyami et al. (2013), Lange et al. (2012), (Ahvenniemi et al. 2017; He et al. 2018; Alyami et al. 2015; Dumitru et al. 2020), the advantage lies in identifying the most important indicators of urban sustainability development.

The aim of this chapter is to review the existing literature, identifying the state of the art and judging the applicability of current sustainable frameworks for new sustainable urban development in developing countries.

In the next section, this chapter will review the requirements for urban sustainability frameworks according to their ability to recognise locality-specific issues. The third section will present the global practices of energy consumption and the need for sustainable development, in hot dry arid regions. The fourth section will review

several global urban sustainability frameworks including the factors of urban sustainable development which have previously surveyed from several researchers. The fifth section will analyse international practices in terms of urban sustainability frameworks and recognise the research gap between the past studies and the current researches in order to solve multiple locality-specific problems in the case study area by adopting a new comprehensive sustainability framework. The final section will discuss the recommendation for future urban development and sustainability in developing countries and hot dry regions.

2.2 Sustainability and the Requirement for Urban Sustainability Frameworks

Sustainability is viewed as the balance between using resources and managing current and future issues by ensuring the minimum use of such resources (Cilliers et al. 2014). In developing countries achieving urban sustainability faces major challenges due to rapid urbanization, population-inflation, lack of environmental strategy, high energy and transport demands and weaknesses in the design of public services and utilities. In response to this, sustainability frameworks constitute a strategical plan to manage current and future problems (Haughton 1997) this includes planning for how to address environmental issues, reduce excessive use of resources such as energy and water and considering socio-economic aspects (Xing et al. 2009; Almutairi et al. 2019).

According to UNCSO (2012), rapid urbanization leads to increases in air pollution due to the effects of transport, waste and population growth. These factors are recognised as the main reasons for increases in CO₂ levels. In Iraq, population has had a location shift from mainly rural to mainly urban with 30% of the population are now reported as living in rural areas in compared to 70% in the past (The United Nations 2014; Youth 2014). This trend is also seen in other countries due to the growth of national migration from rural regions to cities (The United Nations 2014), creating cities which have become crowded and polluted (Niemelä 2014). These urban regions are responsible for increases in greenhouse gas emissions, having fewer green spaces and natural resources than rural areas. The built environment in which people live, therefore has a substantial negative impact globally, regarding pollution, environmental problems, global warming and climate change (Haughton et al. 1996, Fawzi et al. 2016). Secondly, increasing energy consumption in many countries has been attributed to climate change; this phenomenon has been identified in Middle East countries. Exacerbating this situation, these countries generate power by

burning fossil oil, leading to further increases in levels of CO₂ emissions (Reiche 2010, Alqahtani et al. 2017).

This high-energy consumption, rapid population growth and the need to combat climate change is becoming a key determinant of the economic development pathways. Economic growth remains a priority for national governments but dealing with population growth has raised significant challenges for developing economies (Ameen and Mourshed 2017c). Additionally, local traditional urban build standards, despite some updating, still need further development to truly implement future sustainable development.

One of the criticisms levelled at global sustainability assessment methods is that they are not suitable for every urban area/neighbourhood, at a sector city or district level (Carmen and Bruno 2014). Reasons for this are that these tools do not adequately address specifics around climate differences, socio-cultural factors and locality-specific problems.

One way to aid in achieving sustainability is the use of frameworks. Sustainability frameworks are balanced, comprehensive plans which address the development of quality standard of life by investigating current and future requirements of the region being considered (Xing et al. 2009; Almutairi et al. 2019). The adoption of urban sustainable development goals and organising them into a framework suitable for locality-specific issues is key (Almutairi et al. 2019; Matthews et al. 2020). This involves balancing the short and long-term improvement in environmental, socioeconomic and resource utilisation problems to ensure balance.

In most frameworks, the urban sustainability indicators that make up the framework, can be classified into two major groups; common and local, reflecting global and local priorities for urban sustainability (Power 2008; Matthews et al. 2020). Most international indicators are assumed to be applicable to all countries and communities. There are some indicators which can be adopted worldwide, i.e. energy, climate change and reductions in pollution/greenhouse gas emissions which have global importance and as such, are utilised as common indicators worldwide (Alyami et al. 2015; Aldossary et al. 2015b; Dumitru et al. 2020). There is also the need to assess the local context to investigate communities' priorities, their standard of living and awareness of sustainable solutions (Mohammed Ameen et al. 2014a; Aldossary et al. 2015b). This is specifically the case in Iraq, where harsh conditions have endured for more than four decades (Mohsin et al. 2017). Intensive efforts are underway to-rebuild the country while addressing environmental, economic and

cultural aspects. This has rendered common international tools, (such as BREEAM Co., LEED-ND, Pearl Community and GSAS/QSAS) inappropriate for use because of political instability (Castro-Lacouture et al. 2009, Alyami et al. 2015). These tools also lack evidence of community priorities gathered through the collection of public perceptions (Pauleit et al. 2005; Bryant 2006, Seyfang 2010; Alyami et al. 2013) .

However, identifying these indicators, especially comparable indicators is a complex matter because the requirements of cities are measured using different goals (Mohsin et al. 2017; Ameen and Mourshed 2017a). Local priorities can be highlighted quite easily, reflecting real needs in specific contexts. For example, the water indicator which includes conservation, availability and quality, is rated as one of the most important indicators in Iraq, according to Fawzi et al. (2016), due to a shortage of water and climate change, experienced as a decline in rainfall creating drought. In Arab Gulf countries, both Pearl Community and GSAS/QSAS have addressed issues around water, comparing this to other indicators. Natural hazards, for example, can be rated as significant factors in some coastal regions (Castro-Lacouture et al. 2009; Alyami et al. 2015).

Several studies have discussed the use of global urban sustainability indicators in developed countries such as Europe, Japan, the USA and the UK (Cohen 2006). These indicators/factors have been designed by different organizations including the Japan Green Building Council, the European Commission, US Green Building Council and BRE/UK. However, they are often not fully applicable for developing regions (Castro-Lacouture et al. 2009, Alyami et al. 2015). This is because of considerable differences between developed and developing regions including; rapid urbanization, population growth, high energy and transport demands because of climate, cultural background and locality-specific problems (Alyami et al. 2015; Ameen et al. 2015b). Critically, most developed countries have passed the stage of development which requires the reconstruction and/or establishment of basic services, thus the level of well-being of the individual is better than in developing countries (Lange et al. 2012; Ameen and Mourshed 2017a). As such, developed countries no longer require detailed investigations of locality-specific issues in comparison to developing regions (Ortiz et al. 2009). The reverse is true of developing countries where locality-specific issues and community priorities play a vital role in the development of any new framework (MOHSIN et al. 2017).

In recent years, sustainability frameworks have faced major challenges in their application in developing countries, specifically in hot climatic regions such as Arab Gulf countries and Iraq (Fawzi and Ameen 2017). According to Mohammed Ameen

et al. (2014a), these countries depend on burning fossil oil for power production, this causing an increase in levels of CO₂ emissions and environmental pollution. Therefore, it is essential to establish comprehensive, urban sustainability frameworks to enable developing countries to reduce the undesirable effects caused by use of conventional strategies (Aldossary et al. 2015b; Almutairi et al. 2019). For example, sustainable frameworks will recommend the use of renewable resources, such as solar energy in hot climatic regions instead of fossil fuels, thus investing in natural resources for future generations. Frameworks will allow planners, developers, policy makers and architects to design future cities guided by their sustainability. New sustainable frameworks will include urban sustainability goals considering environmental, social, cultural, and economic and innovation factors, rated according to public perceptions and expert views, in order to identify a policy plan for the area based on local priorities, standards of living, social awareness towards sustainability issues and cultural background (Mohammed Ameen et al. 2014a; Alyami 2015; Almutairi et al. 2019).

2.3 Global Energy Consumption and Sustainable Development

Based on the concept of sustainability described previous, sustainable development is defined a new approach to meeting human needs, promoting the use of economic aspects to preserve our environment and resources, by integrating various aspects e.g. the construction sector, industry and health services (Mebratu 1998; Assefa and Frostell 2007) (Debnath et al. 2015a; Yuce et al. 2016). This approach includes challenges concerning the utilization of natural resources such as energy, food, transportation, social activities, shelter and effective waste management, while conserving and protecting the quality of the environment and the supply of said natural resources (Chauhan and Saini 2014; Alyami 2015; Munier 2011; Aldossary et al. 2015b).

Recent studies have focused on practical solutions; i.e. renewable sources, sustainable societies and minimising energy consumption, to combat excessive carbon emissions and environmental pollution (Aldossary et al. 2015b; Ahmad et al. 2017; Ali-toudert et al. 2020). Urban sustainable development can thus be conceptualized as improving quality of life by creating a healthier environment while satisfying socio-economic demands (Munier 2011; Dumitru et al. 2020). This is of significance for the domestic building sector as it occupies the largest proportion of national energy consumption; 25% for Japan, 28% for China, 42% for Brazil, 47% for Switzerland and 39% for the UK. In Saudi Arabia, domestic energy consumption exceeds 50% (Alyami et al. 2015) while in Iraq, domestic energy consumption has

been recorded at a staggering 83% (Hasson and Hussain Al-Askari 2013; Al-Salihi et al. 2010; Mohsin et al. 2018) as shows in Table 2.1. These levels are a result of weather conditions, cultural background, standards of living, building design, domestic local features and population growth (Markandya and Wilkinson 2007).

Developed countries are leading the way through investing in clean energy sources such as photovoltaic (PV) as a source of clean energy for future cities (Schaffers et al. 2011; Delisle and Kummert 2014; Ahmad et al. 2017; Dumitru et al. 2020).

Table 2.1 Energy consumption in domestic sector- worldwide source

Country	
UK	39-40%
Brazil	45-47%
Iraq	80-83%
Switzerland	45-47%
China	28-30%
Saudi-Arabia	50-55%
Australia	30-35%

As the building sector in the EU is seeking to increase the utilization of renewable energies, several studies already reporting on the use of these (Lund 2007). Previous studies have also focused on decreasing energy consumption by maximizing the use of renewable energy resources through the use of small-scale power plants in the domestic sector (Janajreh et al. 2013; Delisle and Kummert 2014; Aldossary et al. 2015b; Jayan et al. 2016). That said, environment protection and quality of life improvements may need more time to become embedded in practice through an increase in social awareness and education (Roberts 2008c; Matthews et al. 2020).

Sustainability and utilization of renewable energies are critical challenges for Middle-East countries, due to the limited direction from policy-makers; these countries have difficulties investing in natural resources (Kenworthy 2006). This is because the countries with the largest oil reserves, Saudi Arabia, Iraq, Iran and Kuwait, all favour the use fossil oil to generate energy (Markandya and Wilkinson 2007). Breaking this down by country, Iraq's oil reserves rank fifth in the world making it a relatively rich country but with rapid urban development, economic development, a population boom and large demands on electricity (The United Nations, 2014). Global practices such as renewable energy should be considered as an option to oil and gas sources,

recognizing, for example, the sun as a source of natural energy (Al-Salihi et al. 2010; Aldossary et al. 2014a; Aldossary et al. 2015b; Ali-toudert et al. 2020).

Due to poor infrastructure and mounting demands on energy, shortages of electricity is common in developing countries, for example the people of Iraq suffer considerable shortages in electricity supply, this affecting the economy. The cost to the economy from Life Cycle Cost (LCC) is estimated to be about US\$40 billion per year at present (Hague 2010). Therefore, it is essential to identify alternative methods to address the waste of resources and provide practical sustainability solutions for future generations. For example Prasad et al. (2014) report that the economy of oil, transport, health cost, and energy consumption related carbon emissions are causing an increase in societal problems. Mitigation of climate change, energy usage, traffic congestion and transport demands can however be achieved through a range of international policies that reduce greenhouse-gas emissions on a global scale (Woodcock et al. 2007).

A rapidly growing global population also impacts the urban environment. Various kinds of air pollution, noise, material waste, and high energy demand expand necessitating sustainable development (Kántor and Unger 2010). For example, the UK domestic sector is expected to adopt the Government's carbon emission reduction program, which expects a reduction in emissions of 20% (Bell and Lowe 2000; Hamilton-MacLaren et al. 2013; Opoku and Ahmed 2014; Darko et al. 2017). Energy Efficiency Standards of Performance (EESOP) have been imposed to achieve gas and electricity reductions, the majority of which have to come from low-income households (Shiu and Lam 2004; Aldossary et al. 2015b; Ahmad et al. 2017).

Many global practices have focused on achieving a reduction in CO₂ emissions of 60%, like Japan, by 2050. Minimising CO₂ emissions is proving difficult for Japan (Yamaguchi et al. 2007), the main challenge determining energy savings from the building sector by reducing environmental issues such as air pollution (Oikonomou et al. 2009).

In recent years, significant efforts have been made to optimise energy efficiency and reduce energy consumption in buildings. This is related to the energy demand to achieve desirable environmental conditions, at the same time reducing energy consumption and CO₂ emissions (Maleki 2011). For this reason, researchers have been looking at techniques to improve indoor climatic conditions and reduce energy consumption (Babaizadeh et al. 2015). These techniques include the use of exterior shading systems which decrease the amount of roof surface exposed to direct

sunlight. These shades can keep the interiors of buildings cooler and reduce cooling loads and operational costs (Shashua-Bar et al. 2009; Maleki 2011). Construction practices on optimizing site layout and urban sustainable design can lead to the optimize land use effectively in particular for new urban development areas, also improve the indoor buildings temperatures for hot dry regions according to use the practical techniques feed into the new urban projects frameworks (Ahvenniemi et al. 2017; Ali-toudert et al. 2020).

Table 2.2 lists previous works which have focussed on different subjects related to sustainable development. This table shows the multiple themes of previous research in this area, illustrating how it is focusing on a cross section of various aspects including; urban sustainable development factors, energy consumption and zero energy, optimization of energy, renewable energy, implementation of sustainability frameworks, and urban sustainable assessment tools. Urban sustainable assessment tools and sustainability frameworks are the most important areas of study in order to ensure sustainable development addresses locality-specific issues (Alyami et al. 2015; Liu et al. 2010). This is because most of the sustainability frameworks do not address locality-specific problems (Alyami et al. 2015; Aldossary et al. 2015a; Ameen and Mourshed 2017a). In addition, this table shows the main aims and tools that have used in past studies. This demonstrates the the research gap between this study and the past studies, represented by three main dimesions including future urban planning to develop new urban zones, domestic requirements towards low energy housing, and a set of urban sustaianble developemnt factors to improve the quality of life. Many studies have reviewed global assessment tools, Life Cycle Assessment tools LCA, analysing energy and optimisation and urban sustainable developments goals. These goals include; minimising energy consumption, CO₂ emissions, the use of resources, and predicting energy needs (Thiers and Peuportier 2012). Several themed topics can be found targeting the same area but in different subjects. For example, there are several papers under the title of optimisation of energy consumption, zero energy, renewable energy, urban sustainable development and framework assessment tools. All these different areas have common objectives related to sustainability with objectives of reducing the consumption of resources and energy and improve the quality of the environment.

Table 2.2 Multi-illustration themes of the previous studies

	(Olatomiwa et al. 2016; Ahmad, Mourshed, et al. 2016; Suganthi and Samuel 2012; Debnath et al. 2015a; Ā et al. 2008; Yuce et al. 2016; Mohsin et al. 2018)	(Peng et al. 2013; Mohammed Ameen et al. 2014a; Alyami 2015; Fawzi and Ameen 2017; Almutairi et al. 2019)	(Morelli 2011; Ameen and Mourshed 2017a; Peng et al. 2013; Liu et al. 2010; Gerbinet et al. 2014; Mourshed et al. 2009)	(Cohen 2006; Holden 2012; Olatomiwa et al. 2016; Pauleit et al. 2005; Rodrigues et al. 2015; Ahvenniemi et al. 2017; Alyami 2015; Munier 2011; Dumitru et al. 2020; Ali-toudert et al. 2020)	(Roberts 2008a; Ruhé et al. 2013) (Hamilton-MacLaren et al. 2013; Aldossary et al. 2015b; Alyami 2015; Mohsin et al. 2018)
Aims and tools	Predicting energy and optimisation resources	Urban sustainability framework and assessment tools	Environmental impacts: LCA Life Cycle Assessment	Urban sustainable development: Minimising energy consumption	Reducing CO2 emissions and, optimizing use of resources
Theme 1 Optimization energy	✓		✓	✓	✓
Theme 2 Urban sustainable development	✓	✓	✓	✓	
Theme 3 Energy consumption & zero energy		✓	✓	✓	
Theme 4 Renewable source	✓	✓	✓	✓	✓
Theme 5 Framework assessments tools	✓		✓	✓	✓

To conclude, efforts are underway worldwide but particularly in developing countries, such as China and India, Arab gulf regions, including Saudi Arabia and Iraq, to reduce energy consumption. These countries, more so in the Arab Gulf, endure a long summer season with high temperatures up to 50 degrees Celsius, and as such are classified as having energy consumption levels (Aldossary et al. 2015a; Nader 2009a; Alyami et al. 2013). In response, intensive efforts are being made to gather theoretical and practical knowledge about how to reduce the undesirable effects of relying on conventional power generation and traditional methods to combat climate change and high energy consumption.

2.4 Urban Sustainability Frameworks

Sustainability assessment frameworks are an integrated concept which combine numerous urban sustainability indicators, covering environmental, social and economic dimensions (Bounoua et al. 2020) . These indicators are combined as part of a framework to improve applications by cities to help meet future challenges, specifically in developing regions such as housing deficits, rapid urbanization and high energy and transport demands (Bounoua et al. 2020; Almutairi et al. 2019).

Working at two levels, sustainability frameworks comprise a set of urban sustainability factors which are designed to mitigate locality-specific issues (Alyami et al. 2013). Addressing these issues can involve the adoption of multiple strategies which in turn feed into the process of the further development of urban sustainable development guidelines (Huang et al. 1998; Wu 2014).

Urban sustainability frameworks are characterised by the development of mutual relationships between local and global challenges such as rapid urbanization, high energy consumption and environmental problems. A number of studies have listed urban sustainability assessment tools and compared them (Rossi et al. 2012; Ameen et al. 2015b; Ahvenniemi et al. 2017; Munier 2011; Almutairi et al. 2019; Dumitru et al. 2020), highlighting the content, structure and output of urban sustainability development tools. Key findings suggest that no framework or tool can cover the wide range of urban design aspects required to meet both the development of new city applications, such as city districts and domestic sectors, or further improve existing ones (Weber et al. 2007; Mohsin et al. 2018). Many researchers have tested several practices (Alyami et al. 2015; Fawzi et al. 2016; Aldossary et al. 2015b) and suggested new assessment tools which include comparative items such as environmental, social and economic aspects of urban sustainability development to understand the goals of addressing a specific region and its locality-specific issues. In contrast, authors such as (Willis 2006; Alyami et al. 2015) suggest that urban

sustainability assessment tools are not fit for all regions because of diverse locality-specific factors including community features, weather conditions, social awareness levels and standards of living.

Consequently, it has been realised that global frameworks/assessment tools need to be re-assessed/designed, their urban sustainability goals appropriate for the countries they are applied to (Alyami et al. 2013; Mohammed Ameen et al. 2014a) . To achieve this, leading experts in various fields such as environmental and sustainable development have been consulted in previous works, in addition to professionals and local experts from government organisations, academia and Non-Government Organisations (NGO). Their findings conclude that global environmental assessment methods are not suitable for application in Saudi Arabia, Jordan, and Iraq (Alyami et al. 2015; Willis 2006; Ameen and Mourshed 2017c).

These urban sustainability frameworks are key to urban development. They encompass a wide range of indicators that identify successful strategic plans and policies designed to meet urban sustainability targets (Munier 2011; Alyami 2015; Ameen and Mourshed 2017a). Indicators can be defined as “A quantitative or qualitative variables/factors that explain a reliable means to determine achievement, reflecting changes relationship to assess the behavioural development actor or phenomena (Devuyst et al. 2001; Munier 2011; Ahvenniemi et al. 2017). These urban sustainability indicators improve interactions between international and local contexts and enhance human well-being and social satisfaction.

Global sustainability frameworks/assessment tools involve several urban sustainability indicators which cover a variety of dimensions e.g. environment, water, energy infrastructure and transportation socio-economic factors, and natural hazards. One global sustainable development assessment tool for buildings is the Comprehensive Assessment System for Built Environment (CASBEE), created and developed in 2001. A similar tool is a Leadership in Energy and Environmental Design for Neighbourhood Development (LEED-ND in 2009), and, the BRE Environmental Assessment Methods for Communities (BREEAM Communities in 2011), UK. However, there is no specific list of all indicators that suit all countries and communities due to the wide-ranging differences between regions, local communities' culture, climatic regions, social factors, local priorities and availability of resources (Alyami et al. 2015; Willis 2006; Fawzi et al. 2016).

Table 2.3 lists the global and local assessment tools for different countries which have established urban sustainable development assessment tools. It also illustrates all

indicators used in selected urban sustainability assessment tools, such as BREEAM Community, LEED-ND, CASBE-UD and GSAS/QSAS. Several indicators representative of energy, climate change and greenhouse gas emissions, have global significance and are used as major indicators in all assessment tools. These essential indicators can be adopted across countries for use in local guidelines, but they must be appropriate for these specific countries based on community priorities, culture and economic situation. This thesis has identified urban sustainability indicators relevant to each country's needs. Selection was based on a review of previous studies and the re-assessment of indicators in order to establish their suitability for Baghdad. Each of the tools in the table is described in more detail below.

Table 2.3 shows a number of urban sustainable assessment tools for various developing and developed countries, most of these were designed and developed to be suited for developed countries (such as BREEAM, LEED, CASBEE). However, those developed countries are totally different from those developing countries due to locality-specific issues (Rezaallah and Bolognesi 2012; Castro-Lacouture et al. 2009; Alyami et al. 2013). Most of the global assessment tools have not fully designed to suit developing countries, specifically politically-unstable regions such as Iraq, due to a wide gap between locality-specific issues such as weather conditions, community's priorities, the standard of living, social awareness, and etc (Ameen and Mourshed 2017a).

One of the global assessment tools considered in Table 2.3 is BREEAM, which was developed in 1990 in the UK by the Building Research Establishment (BRE).

Table 2.3 Review of indicators in global/local assessment tools of urban sustainability indicators in developed and developing have surveyed through different authors.

Type of urban sustainability tools	Organization	Region	Context	Indicators	Previous studies surveyed
-LEED-ND	US Green Building Council	USA	Local	Environmental indicators	(A'zami et al. 2005; Ameen et al. 2015a; Fawzi et al. 2016; Aldossary et al. 2015b; Aldossary et al. 2014a; Alyami et al. 2015; Willis 2006) (Haroglu 2015; Rezaallah and Bolognesi 2012) (BREEAM Design 2018) (Bounoua et al. 2020; Ameen et al. 2015a; Alyami et al. 2013)
- BREEAM	BRE/UK	UK	Local	Ecology Energy Water	
-Community	(JaGBC) and (JSBC) ††	UK	Local	Transportation Economy Natural hazards	
- CASBE-UD	IBM	Japan	Local	Community involvement	
- Smart cities challenge	Gulf Organization for Research	USA	Global	Sustainable buildings Resources	
- GSAS/QSA	Green Building Council of Australia (GBCA)	Qatar	Local	Environmental indicators Ecology Energy Water Transportation Economy Natural hazards Resources	
- Green Star Sustainable Communities		Australia	Local	Ecology Energy Water Transportation Economy Natural hazards	

Nowadays, BREEAM has a variety of sustainability assessment tools covering different locations, e.g. BREEAM Canada, BREEAM Hong Kong and BREEAM International (BRE 2011). According to the technical guidelines for BRE (2013b), this

version was issued for local projects and has been adopted in the UK as a guide for building sustainable communities (Ameen et al. 2015a). It is not just a local assessment tool but also constitutes global and international project guidelines in terms of sustainability (Haroglu 2015) (BREEAM Design 2018). LEED-ND and CASBE-UD have also launched global and local indicators that can be adopted anywhere with different rating systems which allow for local specific issues such as energy consumption, environmental indicators and transportation factors (Rezaallah and Bolognesi 2012). These global/ local assessment tools have been assessed by different researchers, as shown in Table 2.3, to establish their appropriateness for application in countries such as Iraq, Saudi Arabia, and Jordan.

In addition, there are sustainable assessment tools and sustainable development methods already available, i.e; life-cycle assessment (LCA), indicators of sustainable-cities, sustainability-projects, urban sustainable frameworks, rating-system and certification guidelines (Paranagamage et al. 2010; Joss 2012; Gil and Duarte 2013).

In recent years, several well-known global and international assessment tools have been improved, some expanded making the transition from building assessment to urban development (Sharifi and Murayama 2013, 2014). Another global tool, the Comprehensive Assessment System for Built Environment (CASBEE) was developed in 2001, later expanded to include urban development in 2007. Similar developments can also be seen in the Leadership in Energy and Environmental Design for Neighbourhood Development (LEED—ND) in 2009).

In developing countries, tools such as UAE, the Estiadma Pearl Community Rating System (Pearl Community 2010), BRE Environmental Assessment Methods for Communities (BREEAM Communities in 2011) and the Sustainable Building Tool in Portugal for Urban Projects (SBToolPT – UP in 2014), are available. The Global/Qatar Sustainability Assessment System (GSAS/ QSAS) emerged in 2010 as a set of assessment tools for buildings and urban development, as shown in Table 2.3. These assessment tools include multi-dimensional indicators, like other global frameworks but with different rating systems. These rating systems reflect locality-specific issues for individual countries (Castro-Lacouture et al. 2009; Haroglu 2015). For example, water quality and availability was rated as the most significant indicator in UAE using the Estiadma Pearl Community Rating System (Pearl Community 2010), due to very little rainfall coupled with hot, dry and arid climatic conditions. Likewise, Iraq has suffered from the same issue caused by the low rainfall because of climate change caused by desertification and the exposure of rivers and water bodies such as marshes, to drought (Lange et al. 2012). Ecological indicators, including green cover,

were rated the highest according to BREEM and LEED systems (Rezaallah and Bolognesi 2012; Haroglu 2015) (BREEAM Communities in 2011). Rating systems and assessment tools must be able to evaluate individual climatic regions amongst other things making it important to engage local stakeholders and member of the public to collect accurate data and thus create a successful framework.

Globally, the establishment of new urban sustainability frameworks is based on identifying designs, planning, selecting the site, topography, services and utilities (Xing et al. 2009; Habibi et al. 2014). Most key urban planning decisions are made by policy-makers such as politicians, engineers and designers without public consultation on urban construction projects, particularly in developing economies (Hamilton-MacLaren et al. 2013; Susilawati and Al Surf 2011). The dimensions of urban sustainability are characterized by a huge number of indicators with Xing et al. (2007) suggesting over 600. Zhou et al. (2012) have created a framework comprising 141 urban indicators for sustainability assessment applicable to Chinese cities. The need for a comprehensive and integrated framework for urban sustainability has been investigated by researchers by considering the influence of cities. However, there is no specific list of indicators exists that suits all countries, areas and communities (Ugwu and Haupt 2007).

Several indicators such as, energy, climate change and greenhouse gas emissions have international priorities and are common indicators in all evaluation methods. These common aspects are essential for monitoring the evaluate process of sustainable urbanization in order that it does not remain as a fixed abstract concept (Shen et al. 2011; CIDA 2012), while providing designers and policy-makers of urban development from multiple dimensions of urban factors.

Urban sustainability assessment tools and frameworks have the potential to assist in achieving a balance between the needs of humans and environmental requirements thus developing the quality of life and the economic competitiveness of the urban area (Liu et al. 2010; Almutairi et al. 2019). Moreover, there is the need to promote the active participation of those living in urban areas, to achieve effective decision-making processes (Practices n.d.; Beunder and Groot 2015). Specifically, this is applicable to the case study region and its locality-specific problems to demonstrate that urban sustainable development is one of the most important solutions to mitigate current and future challenges (Haughton et al. 1996; Janajreh et al. 2013; Fawzi et al. 2016).

To conclude, this section has examined a wide range of global sustainability tools, which tend to have the same range of main indicators such as the environment,

ecology, water, energy, transportation and infrastructure. In order to improve the quality life in the area being considered, new sustainable frameworks can be established to provide policy-makers, developers, architects and engineers with local guidelines which embrace the concept of urban sustainability development. The problems that have been identified through the current review is that existing tools cannot simply be adopted in any location, because of locality-specific factors (Aldossary et al. 2014a; Ameen et al. 2015b; Alyami 2015). These include levels of social awareness, local community priorities, cultural background and standard of living. For this reason, many authors from Arab Gulf countries have re-assessed global indicators according to their specific community needs and the perceptions of local experts, to create/design suitable frameworks for their regions. This previous work shows there is a mismatch between previous studies and this study which focuses on proposing strategies and the elicitation of a set of urban sustainability indicators, focussing on planning strategies and domestic features. The selection of a set of appropriate indicators can improve quality of life and minimise the use of valuable resources.

Table 2.4 lists several previous studies that have critically reviewed assessment methods of urban sustainability goals in developing countries.

Table 2.4 Review papers listed according to the specific regions/countries in developing countries. (Caprotti 2014; Li and Wen 2014; Aldossary et al. 2015b; Willis 2006; Ameen et al. 2015b; Alyami et al. 2015)

Papers reviewed (authors)	Country	Title/Subject	Tools/ Methods
(Aldossary et al. 2014a)	Saudi Arabia	City form and sustainable indicators framework	Use of a multiple case study in Riyadh city via a simulation model using IES-VE software
(Alyami et al. 2015)	Saudi Arabia	The development of sustainable assessment method for Saudi Arabia	Saudi environmental assessment method (SEAM), (AHP), Panel of experts
Willis (2006)	Jordan	The urban sustainable methods: case study Jordan	Weighting system (AHP), Panel of experts
(Aldossary et al. 2015b)	Saudi Arabia	Consensus based, low-carbon, domestic sustainable design in Saudi Arabia	An in-depth investigation of public views and a consultation with 40 experts across Saudi Arabia

(Ameen and Mourshed 2017a)	Iraq	Urban environmental challenges in developing countries: A stakeholders perceptions	Investigation of public views across Iraqi cities
(Ameen et al. 2015b)	Iraq	A critical review of urban assessment tools	Reviewed six widely used sustainability global assessment tools to identify the research gap
(Alyami et al. 2015)	Saudi Arabia	The development of assessment methods for Saudi Arabia	Weighting system method (SEAM) categories. AHP process
Shohouhian and Soflaee (2005)	Iran	Environmental sustainable Iranian traditional architecture in hot-humid regions	Use of library documents and Internet sites as well as analysing building plans

These reviews of existing sustainability frameworks, have shown that there is the need to develop a framework for sustainable urban development specifically for developing countries, specifically in the case study area that incorporates the viewpoint of the public in the decision-making process (Aldossary et al. 2015b; A'zami et al. 2005b; Alyami et al. 2015; Habibi et al. 2014; Fawzi and Ameen 2017; Bounoua et al. 2020).

Previous studies have presented a comparative analysis of tools, practice and the purpose of global sustainability assessment of urban developments to provide a better understanding of the vision and goals of each practice (Alyami et al. 2013; Almutairi et al. 2019; Bounoua et al. 2020). They also highlight the special circumstances different countries consider before selecting their list of indicators and categorizing them according to the environment and economic, social and cultural parameters.

Developing a new framework can help to improve the decision-making process by identifying the optimal urban indicators to tackle current challenges and future requirements including setting the most important priorities for new urban developments (A'zami et al. 2005a; Almutairi et al. 2019). In this context, global strategies target three major areas: energy savings, improvements in energy production and alternative energy sources which encourage the use of renewable energy. Large-scale, renewable energy plans must therefore adopt strategies to integrate alternative sources systems influenced by energy consumption and consumer awareness (Lund 2007).

While there currently are many international assessment tools and frameworks, these are not suitable for specific developing regions, such as those in hot dry countries i.e. our Iraqi case study (Alyami et al. 2013; Ameen et al. 2015b; Castro-Lacouture et al. 2009; Bounoua et al. 2020). In addition to climate challenges, there are many reasons why global frameworks and assessment tools are not suited for developing countries. There are wide differences between local priorities from place to place, as well as social factors, the standard of living of the community and political issues (Fawzi et al. 2016). Iraq has been classified as politically unstable for more than four decades, this causing a wide gap between global and local circumstances (Mohsin et al. 2018).

Well-known global methods such as BREEAM and LEED were not originally designed to suit all regions, including developing countries, such as the Saudi built environment (Alyami and Rezgui 2012). This is because their environmental assessment indicators and criteria were primarily improved to suit a specific region and own its environment, such as the US for LEED, UK for BREEAM, and CASBEE for Japan (Castro-Lacouture et al. 2009; Alyami et al. 2013). Despite the used wide range of global indicators in other regions, evidence suggests that assessed built environments do not perform well because of their climate and socio-economic factors (Oregi et al. 2015; Susilawati and Al Surf 2011).

Thus, in summary, there is a definite need to develop a framework for sustainable urban development specifically for developing countries this has arisen because; (a) a wide difference between developing countries and developed one, (b) locality-specific issues in the area being considered, and (c) global framework have designed suit developing countries countries.

This means, that, when adopting a new method or framework to tackle existing problems and future challenges, the evaluation of global indicators based on the local priorities and stakeholders' perception are required to ensure success (Schaffers et al. 2011; Susilawati and Al Surf 2011). Assessment tools such as LEED for US, BREAM for UK, CASBEE for Japan, and PERAL guidelines for UAE countries, originally designed for specific regions, are not applicable for use in all countries due to locality-specific conditions in politically-unstable countries such as Iraq (Fawzi et al. 2016; Habibi et al. 2014). Iraq has suffered from harsh conditions, which have served to damage infrastructures, public services and utilities in addition to impacting negatively on quality of life (Mohsin et al. 2018; Matthews et al. 2020). Currently, there are several construction projects underway and at the planning stage in Iraq: adopting new methods such as appropriately designed urban sustainability indicators will help designers and decision-makers mitigate undesirable impacts in the future.

Secondly, previous studies have not featured public participation in order to identify the local context, priorities, and weaknesses in existing applications nor have they measured people's social awareness of urban sustainable challenges (Fawzi et al. 2016). It is important to identify the priorities of the local population with respect to their daily-experience as users of the environment in which they live and to test their awareness of urban sustainability goals. This will facilitate the development of an optimal sustainable plan for a case study in Baghdad based on the local key priorities needed to improve the quality of life (Hasson and Hussain Al-Askari 2013; Mohsin et al. 2018).

Neither LEED nor BREEM consider public perceptions when they investigated locality-specific factors in developed regions, specifically the USA and UK (Pauleit et al. 2005; Seyfang 2010; Alyami et al. 2013). In contrast, in some developing countries a few authors have attempted to build new frameworks suitable for their regions after assessing their community's perceptions and carrying out expert consultations to achieve a consensus for their built environment(Iraq, Saudi Arabia and Jordan) (Fawzi et al. 2016; Aldossary et al. 2015b; Alyami et al. 2015; Aldossary et al. 2014a; Willis 2006).

Therefore, there is the necessity to identify an effective way to integrate public participation into the development of frameworks (Susilawati and Al Surf 2011; Alqahtani et al. 2017). Integrating public perception has become a significant challenge when creating urban frameworks (Fawzi et al. 2016). This involves investigating stakeholders' perceptions to recognise their priorities, testing their social awareness, consideration of cultural background and the standard of living. Some authors Fawzi et al. (2016), Alyami et al. (2015), Aldossary et al. (2015) and Willis (2006) have used urban sustainability indicators to create new frameworks/assessment tools for Iraq, Saudi Arabia, and Jordan. These authors have re-assessed global assessment tools by evaluating their community's views through surveys of urban sustainable development goals across several regions. These studies have built new assessment tools or frameworks, based on public perceptions about priorities, standards of living and community awareness, thus supporting policy-makers and designers by providing new indicators with respect to urban sustainability.

Public perceptions are a significant challenge, due to the need to assess global indicators suitability for developing countries by investigating locality- specific issues. Using a scientific, consensus-based consultation (Alyami and Rezgui 2012), the authors have identified new criteria not used in either LEED nor BREEAM, but which

are considered of importance when working in the Saudi built environment. In this context, socio-cultural, environmental issues and locally built environment aspects, should not be assessed based on global criteria. It is important to include locality-specific issues such as high energy consumption, traffic problems, rapid population growth and environmental pollution, such issues applicable in Saudi Arabia and Iraq (A'zami et al. 2005; Aldossary et al. 2014; Mohammed Ameen et al. 2014).

2.5 Recommendations for Future Development of Sustainability Frameworks

Urban populations will make up nearly 70% of the total world population by 2050 (Khandokar et al. 2016; Debnath et al. 2015b). Therefore, governments are facing major challenges regarding the provision of essential services and around how to mitigate environmental issues, in developing countries such as Iraq . Iraq suffers from major problems including population-inflation, the lack of an environmental agenda, and high energy and transport demands (Matthews et al. 2020; The United Nations 2014). However, several cities around the world have developed urban sustainability plans to manage their locality-specific problems in terms of urban sustainable development.

Various studies have analysed a series of urban sustainability frameworks, both commercial and academic (Grimmond et al. 2010; Sharifi and Yamagata 2016). Their findings suggest that global indicators can be used anywhere as a guideline but that the methodologies and assessment tools for specific regions as referenced in Table 2.3, such as developing countries, should be investigated locally ensuring specific issues for each country are dealt with (Aldossary et al. 2015a; Ruhé et al. 2013; Chen et al. 2014; Goel et al. 2014). This is due to a wide range of differences between developed regions and developing areas, in addition to the impact of different climatic conditions hot, dry, arid regions (Shashua-Bar et al. 2009; Mohsin et al. 2018).

As a result of the previous analysis of the literature, it has been identified that these studies have have re-assessed the global indicators based on their locality-specific countries including environment, water, energy, social, culture, transportaion, and etc (Alyami 2015; Aldossary 2015; Ameen and Mourshed 2017c; Habibi et al. 2014; Almutairi et al. 2019).

Thus, the key recommendation for future research is that global urban sustainability assessment tools such as BREEM and LEED, are not appropriate for developing countries such as Arab Gulf countries and Iraq, because of locality-specific issues that present problems in these regions (as identified in this chapter Sections 2.3 and

2.4). This study has presented multiple factors covering environmental, social, and economic and management issues relevant to the development of new frameworks by providing guidelines which deal with urban sustainable development goals. This will help decision-makers and designers in developing countries, specifically our case study-Baghdad, Iraq, to identify how successful strategies and technical policies have been in the implementation of sustainable goals. Section 2.4 has also explored issues around taking a global approach to urban sustainable indicators and argued why there is a need to re-assess urban sustainability development goals, based on locality-specific issues, meeting the need to create comprehensive sustainable living frameworks to address quality of life, minimise the use of resources, tackle environmental challenges, and mitigate current housing crises and traffic congestion.

2.6 Conclusion

There is broad agreement that urban issues are important for all countries, both now and in the future (Debnath et al. 2015b). Previous studies have not involved public perceptions of urban sustainable development frameworks/assessment tools and local ideas about local urban development, because global indicators were originally designed to be suited to developed regions (Hatem et al. 2012; Sharifi and Yamagata 2016). In developing countries, global sustainability indicators need to include locality-specific issues (Ameen et al. 2015a; A'zami et al. 2005a). As such, this study recommends the use of local and international indicators, based on selection of a set of indicators which reflect local views and priorities.

This chapter has discussed the omissions identified in previous sustainability frameworks. This study proposes to establish new sustainable guidelines using the priorities identified by those local to the area under consideration.

A second recommendation concerns refer to urban sustainability assessment tools such as BREEM and LEED in that these are not applicable for use in war-torn countries, due to the locality-specific problems present in these environments. They lack the inclusion of environmental strategies to tackle the consequences of the impact of war on the environment as well as little focus on socio-cultural factors.

Gathering public perceptions about urban development challenges is an essential task for policy-making. Participants' views of urban development indicators reflect their daily experience and their ambitions for the future.

It is suggested here that the best way to achieve this is by firstly collecting the views of those who live in the region under consideration, this, followed by consultation with experts, based on public opinion re their needs. These investigations ought to use

urban sustainability indicators from global assessment tools such as LEED or BREAM, as their foundation in order to create a new framework which is then based on the priorities of the local community.

This chapter has reviewed the state of the art in global practices for developing urban sustainability frameworks. The findings of this chapter show a clear research gap arising from previous studies. This gap is the lack of consideration and solving multiple locality-specific problems underlying sustainability framework (as shown in Table 2.4) in order to show the research gap between this study and the prior studies such as (Aldossary et al. 2014a; Alyami et al. 2013; A'zami et al. 2005b) that most of the researchers focused on the urban sustainability assessment tools and others highlighted the sustainability framework for low carbon and reduce energy consumption. While, the current study focuses on integrating some different innovative aspects such as urban planning, domestic features, in addition to a set of general urban sustainable development factors to improve the communities' requirements.

The key finding of this chapter is the identification of the research gap between the current study and the past research, including a lack of consideration of urban planning, domestic features, in addition to a set of urban sustainable development factors. In this study, a new comprehensive sustainability framework will be designed and developed in order to combat numerous locality-specific issues such as climate change, hot dry arid conditions, increase transport and energy demand, and housing deficit to improve the quality of life and meet the existing and future requirements.

This chapter has answered *RQ1: In what ways can a framework for a city level urban development pave the way towards sustainable city development and what are the requirements for such a framework to be deployed in unstable developing countries?*

Based on the findings in Table 2.4, this chapter has identified the innovative factors of the current study. This has led to the identification of the main categories/factors that are often missing from previous frameworks, and must be included, especially when considering developing countries. These are; urban planning, locality specific housing features, and a set of urban sustainable development indicators tailored to locality-specific issues.

This chapter then recommends that future urban sustainability frameworks should be developed by combining theoretical and practical knowledge about urban sustainable development goals including environmental, transportation, socio-cultural aspects and economic aspects, in addition to involve future urban planning and domestic

projects to mitigate most of the current and future challenges. In this context, new urban development projects need to tackle issues such as high energy consumption, rapid urbanization, and population growth and transportation problems. These locality-specific issues cannot be solved with traditional guidelines and old standards. This study, therefore, recommends updating existing criteria to include the domestic sector, towards establishing the concept of low energy domestic homes, bearing in mind that the highest percentage of electric energy consumption comes from the domestic sector, particularly in hot, dry regions.

Chapter 3 Research Methodology

This chapter will describe the research methodology that was developed to conduct and answer the hypothesis and research questions. It will also discuss the theoretical and practical approach taken in conducting this research. The methodological approach that is used in this study will rely on online questionnaires, including a public survey and a consensus-based method. Semi-structured interviews will be used to validate the results. Each research stage will answer the research hypothesis and the research questions to meet the main aim and the objectives of this study.

3.1 Introduction

Initially, a decision was made to select an appropriate philosophy; however, the interdisciplinary aspect of this research makes it a challenge to choose an appropriate philosophy.

The positivist research philosophy is the most commonly used approach. Positivism represents the reality of 'real' objects, which have reflected existence factors (Habibi et al. 2014).

A positivist method is usually adopted for collecting data about "an observable reality" and "regularities and causal relationships" (Jeanne and Terlet 2018). It also aims to provide clear and objective results of reality.

The researcher follows a positivist approach to investigate and test a hypothesis via quantitative data analysis, which will achieve time and context-free results that can be flexibly applied. While the positivist method is still the predominant philosophy in information systems studies, interpretivism is the most common research philosophy that is adopted and accepted in this discipline of urban sustainable development studies. Specifically, interpretivism is widely used in information systems research to understand the context, and to implement and influence the information system.

Although positivism is still the dominant philosophy in social studies, interpretivism is also widely used. In general, interpretivism aims at understanding and interpreting social contexts (Munda 2006). Positivism and Interpretivism are two main approaches to research methods in various academic fields. Positivist methods utilise scientific quantitative methods, while Interpretivism utilise humanistic qualitative methods.

Positivists prefer quantitative methods such as social surveys, structured questionnaires and official statistics because these have good reliability and representativeness (Susilawati and Al Surf 2011; Jeanne and Terlet 2018).

The positivist tradition stresses the significance of achieving quantitative research such as large scale surveys in order match the relationship between educational achievement and social level. This kind of sociology is more interested in trends and patterns rather than individuals.

The aim of this research is to develop a theoretical and practical sustainability framework based on the factors that affect urban development in developing countries. This study will use positivist methods, based on observation and data collection to achieve this aim. Thus, this work requires the adoption a mixed-method approach due to using qualitative and quantitative methods to identify the findings of this research (Opoku and Ahmed 2013; Lee et al. 2013), for data collection and to observe the reality of the research findings to establish a clear base for this research. Further justifying the need for a positive approach.

The research questions tackled in this thesis are:

- RQ1: In what ways can a framework for a city level urban development pave the way towards sustainable city development and what are the requirements for such a framework to be deployed in unstable developing countries?
- RQ2: What are the public's perceptions of sustainable urban development and locality-specific issues in Iraq?
- RQ3: How do the views of the public differ from the generally accepted view of experts in the context of sustainable urban development in Iraq?
- RQ4: How do the views of local experts' impact on the creation of a sustainable urban development framework for cities, including their vision for their development and desired future domestic features?
- RQ5: Is the developed framework considering the public survey, experts' consultation, have the potential to improve future urban development and is it fit for purpose in its target context?

This research has been designed in five stages, with each stage tackling different research questions. Each stage will use specific techniques and multiple approaches to answer the research questions, as shown in Figure 3.1.

The first stage will review the previous studies. This will enable the dimensions of the research problem to be identified and the focus of the study. This will give a better understanding of similar work (Saunders et al. 2009) and will help to develop a new sustainability framework (Aldossary et al. 2015b; Chen et al. 2014). This stage will answer research question one.

The second stage will identify local factors in Iraq, including demographic information, standard of living, domestic sector, and concern towards sustainability issues. This stage will also identify the domestic factors that influence Iraqi cities. This stage will be implemented through a nationwide survey. This stage will answer research question two.

The third stage will launch an expert consultation using a consensus technique to develop the comprehensive sustainability framework via an experts panel. This will utilise Delphi rounds. In this stage, the experts consultation will contribute to answering to the third research question and the fourth research question.

The fourth stage is the development of a comprehensive sustainability framework, which will be developed through analysis of the experts' consultation. This stage will also use statistical analysis to show the significant differences between the public's views and experts views within the proposed comprehensive framework. This stage will answer the third research question and the fourth research question.

The final stage will validate the new comprehensive framework by conducting semi-structured interviews to ensure that the framework is applicable and reliable. This stage will answer the fifth research question.

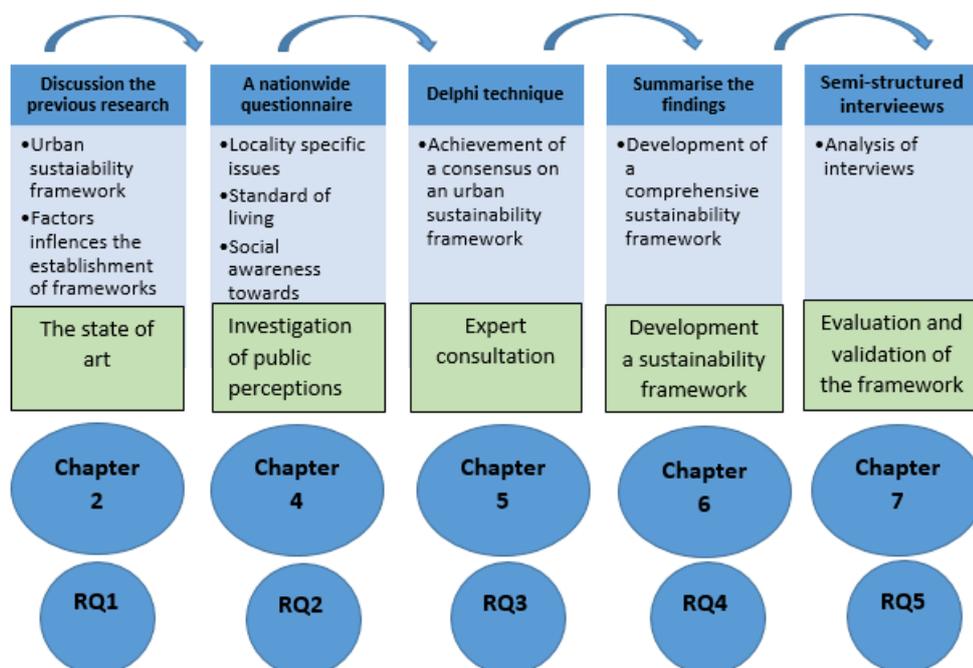


Figure 3.1 Theoretical and process model of a sustainability framework (mixed research approach)

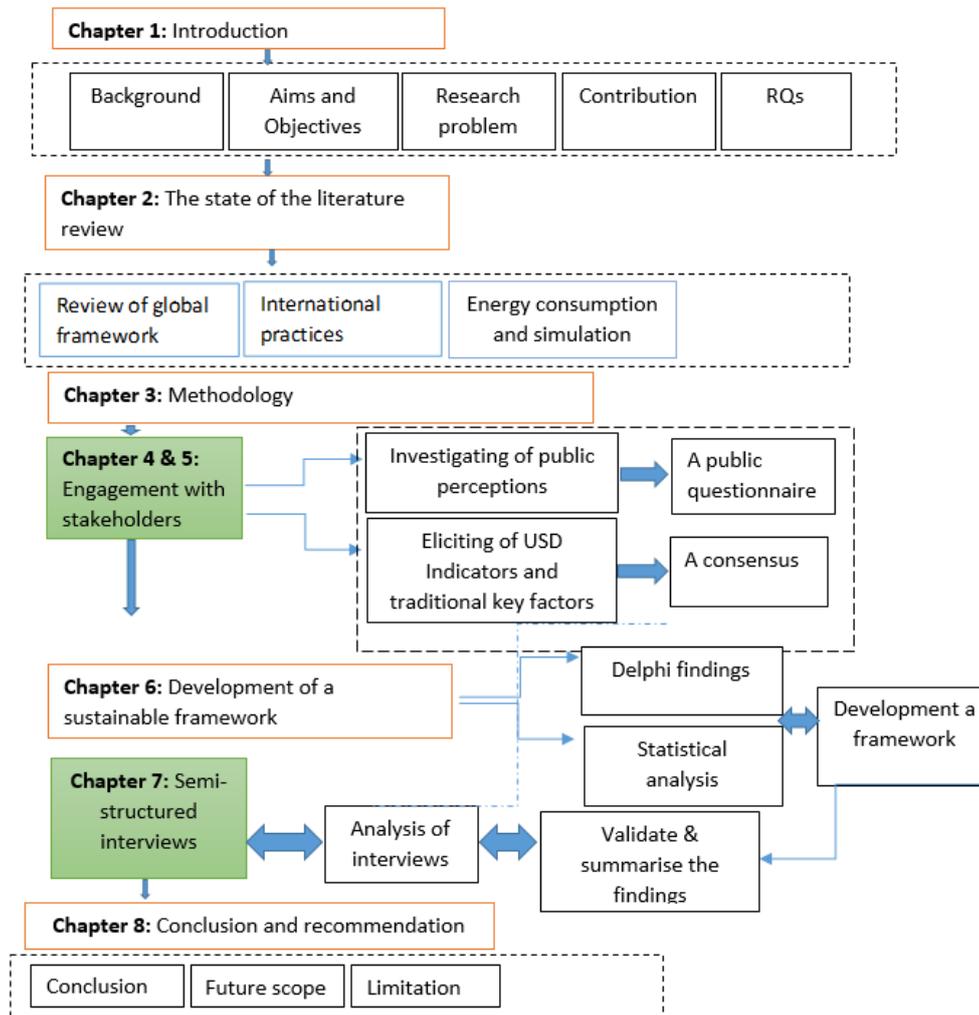


Figure 3.2 Flowchart of the thesis

The rest of this chapter will describe each of the stages shown in Figures 3.1 and 3.2 in more detail. A flowchart of this study is shown in Figure 3.2, which describes each stage of the research in more detail. The first stage reviews the state-of-the-art, outlining the international knowledge and practices on urban sustainability issues. The second stage focuses on the investigation of the locality-specific issues, as discussed in Chapter 1. This stage will utilise a public survey. Consequently, the third stage will conduct a consultation with experts to identify the local factors and design a new comprehensive sustainability framework. The proposed framework is based on analysing the findings of the Delphi rounds and statistical analysis to show the significant results and differences in viewpoints. The final stage will validate the proposed framework via semi-structured interviews with various intra-organisational

leaders to make the newly designed framework in reality and applicable to the case study region.

3.2 The state of the art

A review of the previous studies will be conducted to clarify the main dimensions of the problem statement, identify the focus of the research, and to find related work and any innovative methods that have emerged. This stage will inform the answer to RQ1. Furthermore, a search of the previous findings and reliable sustainability studies will reveal any areas of similarities and differences.

The development of a new sustainability framework requires starting with an analysis of the previous studies in the specified domain (Cole 2005). The state of the art provides a justification, or platform, to start collecting the sustainability indicators. Therefore, the first stage of this study was a critical analysis of a number of global studies and sustainability frameworks, as reported in Chapter 2. The identification of these research methods and dimensions of the new framework depend on a review of the previous research and the determination of how it can be developed to successfully create a new approach. The review of the state of the art can identify the context, aims, objectives, the methodologies to use to answer the research questions, and the reliability of applying these methods in different ways and in different geographical locations.

In this review of the state of the art, the analyses of existing sustainable urban development frameworks has found that new frameworks must consider the stakeholders' views. Public participation is a new challenge but addressing it will help to fill the gaps that were found between decision-makers opinions and public opinion. Consequently, Chapter 2 reviewed the previous research that has focused on global issues within developing countries, in addition to problems that are local to Iraq and the use of sustainability frameworks.

3.3 Identification of Local Factors

Previous studies on urban sustainable development have highlighted the importance of differing viewpoints being considered as part of the design, other than the decisions of policy-makers and developers. However, some studies have not shown evidence of the inclusion of public perceptions. Contemporary social studies have focused on the significance of public perceptions because they can play a vital role in the development of local sustainability. The public's perceptions are also considered to be a foundation of an effective comprehensive sustainability framework (Aldossary et al. 2015b; Ameen et al. 2015a; Alyami et al. 2015; Devuyt et al. 2001).

This phase will answer RQ2. An investigative approach is necessary, conducting research at the city scale, to understand the general social awareness and viewpoints towards urban sustainability. Thus, the instrument used by this research will be a public survey that will investigate these locality-specific issues.

As stated previously, this stage will consist of a public questionnaire of general perceptions, which will aim to identify locality-specific issues such as the standard of living, cultural background, social awareness towards sustainability issues, and the status of domestic sector properties. The details of the public investigation will help to identify the weakness of locality-specific problems in multiple properties.

Furthermore, it is important to understand locality-specific challenges and to recognise their importance in moving the public towards urban sustainability, with a view to identifying effective policies and challenges based on local feedback and their priorities. It can also point to the wide range of differences in environmental and socio-economic factors in the context of local priorities as opposed to those challenges addressed in developed regions, such as a healthy environment, social awareness and activities. Consequently, it is possible to adopt urban sustainability challenges through effective training programs and management plans (i.e., stakeholders' participation). However, attention must be given to the contribution of local feedback throughout the stages of establishing an urban sustainability framework in developing countries

This study will use survey techniques to identify, publish, collect, analyse and validate the data. This is considered to be an important technique because it can gather various viewpoints, attitudes and feedback from a wide group of local people (Ghauri and Grønhaug 2005; Mathers et al. 2009).

However, an effective survey design can affect the responses that are obtained, particularly of their final number and feedback. Thus, the survey will employ short simple clear questions and possess an appropriate structure to elicit the maximum level of response. Additionally, the snowball technique, which forwards the online questionnaire from one respondent to another (Ameen and Mourshed 2017), is used to further increase the number of potential respondents.

3.4 Expert Consultation

To design a new urban sustainable framework for a developing country, consultation with experts is essential because urban sustainable development factors are often considered to be controversial. Therefore, to develop a new framework, achieving consensus with experts is essential.

This section will use a consensus methodology to answer research question RQ3. This is the most commonly used technique to establish an agreement for decisions based on an expert consultation, which identifies the key factors of the issues and, therefore, establishes an effective framework (Ager et al. 2007; Kaupo and Palmore's 2014). The aims of this consultation is to: (a) develop a sustainable framework planning technique that is applicable to the context of Baghdad; (b) to identify suitable semi-automatic housing requirements for new domestic projects; and (c) elicit a set of urban sustainability indicators to enhance the quality of life. Consequently, the experts who will participate in this research project will have a background in construction, urban planning and urban sustainable development (Habibi et al. 2014; Giannarou and Zervas 2014).

Consensus approaches are not new, they have been used in the health sector for many years (SFC 2013). In this context, these approaches aim to organise and recognise levels of acceptance on controversial issues, and also to reach proposal agreement by majority. Consensus methods are considered to be a vital tool to avoid bias in the creation of new strategies, which can help to make appropriate decisions and avoid the loss of various proposals within discussions (Ager et al. 2007).

This method can provide a significant opportunity to express experts' opinions freely and lead to independent decisions for participants to address their proposals, offering an appropriate method for direct or indirect policy making for multiple strategies. It can also be adopted to understand critical issues in more depth and lead to practical knowledge under both agreement and disagreement strategies.

A wide range of multiple disciplines and academic areas have highlighted consensus methods including: creation of plans, determination of effective strategies, and policy making to develop multiple choices of alternatives resources instead of traditional methods (Hutchings et al. 2006; Nair et al. 2011; Wu et al. 2013).

In the last decade, the consensus approach has been adopted in the healthcare sector, education system, and socio-economic studies, and also in business, industry, and government policy (Fink et al. 1984; Potter et al. 2004, Aldossary et al. 2015b; Habibi et al. 2014; Alreshidi et al. 2018; Almutairi et al. 2019). Due to the rapid pace of globalisation, it has been necessary to use the consensus approach because technology has increased the need for interdependent decision making among policy-makers and academia, including stakeholders, official governments and nongovernmental organisations (NGOs) (Ager et al. 2007; Hsu and Sandford 2007).

This study has selected the Delphi technique (Aldossary et al. 2015b), which is a survey approach that is normally used to reach a consensus when complex issues are involved. Using this approach, experts can express their opinions freely, avoid face to face meetings and eliminate any possible conflict. The Delphi technique is carried out over several rounds, which gives the participants the opportunity to observe a variety of viewpoints and suggest additional factors to reach consensus. It also allows the respondents to control their feedback by providing them with information offered in the previous round, in addition to statistical information. The applications of the rounds are based on Likert-scale choices, while the statistical analysis measuring the results makes use of mean ranks and standard deviations. The Delphi technique has been chosen because it has been used extensively in the sustainable urban development domain (Nair et al. 2011, Aldossary et al. 2015b). Participant anonymity is another significant advantage of using the Delphi technique because it events out the effects that dominant individuals may have within the group of experts (Hsu and Sandford 2007; Ba 2000; Habibi et al. 2014; Giannarou and Zervas 2014).

The tool that was used to distribute the survey across Iraq was the Bristol Online Survey. To distribute the questionnaire to the expert panel, the survey was hosted through the BOS link (available at www.BOS.ac.uk). This tool helps the user to create an online questionnaire, which can then be published using email. The researcher can control, note, and then analyse the results.

In the first Delphi round, multiple strategies and a set of urban sustainability factors (indicators and sub-indicators) were found to be applicable to the local context. This round included brainstorming ideas by using open-ended questions to generate additional viewpoints regarding the urban sustainability factors that were suggested by the panellists. Meanwhile, the second round offered the expert panel the opportunity to present their viewpoints and give their feedback on the findings from the first round. It also gave them the opportunity to revise or accept their judgement. Finally, the third round summarised the findings of the previous rounds.

The commonly used mean and standard deviation (SD) statistical tools were used for all of the responses to measure and identify the degree of importance regarding the urban sustainability factors and the level of consensus. A number of studies (Geist 2010, Fawzi et al. 2016; Giannarou and Zervas 2014) have used SD to identify the degree of consensus of the panel of the experts by presenting their individual responses. Furthermore, previous research recommends that the value of SD should

be between 0 and 1 ($0 < \sigma < 1$) (Rayens and Hahn 2000; Giannarou and Zervas 2014).

3.5 Framework Development

Following the use of the Delphi technique described in the previous section, this stage will develop a sustainability framework as a guideline reference for policy-makers, designers and city developers who need to adopt local frameworks that are applicable for the development of a comprehensive sustainability plan for the case study in Baghdad.

This framework will be developed based on the analysis of the Delphi rounds. This stage of the research will answer RQ4. This phase will seek to identify the main categories and detailed contents required of a comprehensive sustainability framework, in order to enhance both well-being and the current applications at a city level.

3.6 Validation of the New Comprehensive Sustainability Framework

This stage will validate the proposed comprehensive sustainability framework via semi-structured interviews. These interviews will involve selected intra-organisational leaders in multiple organisations.

The aim of using semi-structured interviews to validate the proposed local framework is to ensure that it is relevant and applicable for the case study. Therefore, the most important issue is to fully understand the current and future challenges that face the policy-makers who wish to adopt new research findings. The conduct and analysis of the interviews will be presented in Chapter 7.

Semi-structured interviews are a commonly used approach by most evaluators. This is evidenced by a review of the term 'decision-makers interviews' or 'semi-structured interview', which yielded only a few articles (i.e., Lal & Mercier, 2002), and did not use an interview protocol. Thus, the methodological approach of this stage is achieved via these interviews with decision-makers and leaders in different organisations. The content of these interviews will be to: (a) discuss their understanding of the new proposed sustainability framework, (b) review its correctness and (c) analyse how it is applicable for the case study area being considered.

To achieve the main aim of this study, the semi-structured interviews approach is employed to identify the applicability of the proposed framework (Riege 2003; Bryman 2006; (Gugiu and Rodri 2007; Chauncey 2014; Galipeau et al. 2017), which can be

achieved by using a qualitative method to analyse the interviews (Darke et al. 1998; Habibi et al. 2014; Jeanne and Terlet 2018).

0.2

This stage is considered to be an important part of the framework development because it can increase confidence in its process (Kennedy et al. 2006). In this research, 15 local intra-organisational leaders have been selected to participate in the development process of the framework. The features of the interviews findings and process will be discussed in more depth in Chapter 7.

3.7 Summary

This chapter has described the methodologies that are used in the current study to achieve its aim and objectives. A mixed methodology has been selected as the appropriate approach to meet the main aim of this research. This involves five key stages: (a) a review of global practices with respect to urban sustainability issues with comparison to the local issues to the region being considered; (b) a nationwide survey, which was conducted in the various regions of the case study to investigate the public's perceptions of local urban sustainable development challenges, in addition to identifying locality-specific problems that are related to lifestyle and standard of living; (c) a consultation with a panel of the experts, implemented through the use of the Delphi technique, (d) developing a comprehensive sustainability framework based on the previous stage, and the evaluation of the differing viewpoints of experts and the general public; and (e) application of semi-structured interviews, to validate if the framework is appropriate for adoption by policy-makers in the case study area.

Chapter 4 Investigation of locality-specific issues and local public perceptions of urban sustainability challenges

Due to rapid urbanisation, population inflation, lack of governance in tackling environmental problems, and increased demand for energy and transportation, the problem of providing sustainable urban development has become a widespread challenge in developing countries (Ameen and Mourshed 2017a). In particular, many of these countries need to solve multiple local issues (as mentioned in Chapter 1).

*This chapter will describe the results of the public survey that was developed to conduct and answer the hypothesis and research question, **RQ2: What are the public's perceptions of sustainable urban development and locality-specific issues in Iraq?** It will also discuss the theoretical and practical approach taken in the public survey. The findings approach that is achieved in this chapter will rely on online questionnaire, a public survey. Each stage of this chapter will answer the research question 2 to meet the main aim and the objectives of this study.*

4.1 Introduction

Previous studies that focused on urban sustainability challenges were normally restricted to planners, designers and policy makers, and did not include wider public participation. Therefore, there is a need to identify solutions to customise suitably sustainable development challenges that investigate public perceptions to find acceptable solutions that can be adopted to achieve a balance between citizen happiness and well-being, and the priorities of the government (Alyami et al. 2013; Ameen and Mourshed 2017a). Thus, an understanding of locality-specific factors should be acquired from multiple viewpoints to investigate their challenges and to improve the standard of life.

This understanding is important if we are to overcome urban sustainability challenges regionally rather than depending on global indicators that are commonly unsuitable for developing regions thanks to the wide differences between locality-specific issues in developing regions such as Iraq (Ameen and Mourshed 2017a; Hamilton-MacLaren et al. 2013). In particular, Iraq has undergone a rapid transition from a country where the majority of the population live in rural areas to one where the majority of the population live in urban areas (as shown in Figure 4.1). In addition, approximately one-quarter of Iraq's population now live in the capital, Baghdad (The United Nations 2014).

Globally, the establishment of new urban projects is based on identifying designs, urban planning, selection of the site, topography, and services and utilities. Key urban planning

decisions are generally made by policy makers such as politicians, engineers, designers, etc., without widespread public consultation on urban construction projects, particularly in developing economies.

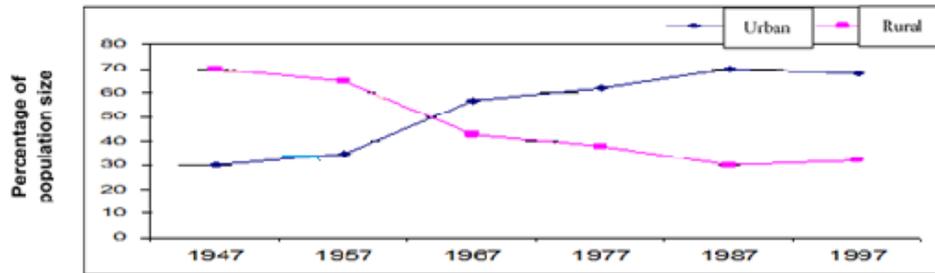


Figure 4.1 Population Distribution Trends (Urban and Rural), IRAQ. (Listing & Numbering Report, 2014)

In the case study of Iraq cities have suffered from harsh conditions for many years, which are caused by severe damage to services, utilities and infrastructure, and economic deterioration after past wars. Therefore, intensive efforts have been adopted to rehabilitate Iraq's cities, particularly its capital, Baghdad. However, despite many projects and attempts to upgrade the cities' services and infrastructure, more intensive programmes, systematic governance and creativity are still required to meet the current and future challenges. Consequently, urban sustainable development has become a significant issue in tackling environmental problems, rapid urbanisation, increased transport and energy demand, and a decline in the quality of life. These issues have provided an incentive to adopt a new framework based on the goals of urban sustainable development. However, it would be unacceptable to adopt such a framework without giving consideration to local opinions, which would allow us to assess the current and future challenges facing sustainability with the wide participation from the public perceptions on urban development challenges.

Conventional frameworks for urban projects focus on the competent authorities in the target locale, to act as the policy makers to execute urban projects, while not consulting the public to find their priorities, standard of living requirements, cultural concerns and future ambitions (Rodrigues et al. 2015; Lee et al. 2014). This creates a problem because there is still a wide gap between decision-makers and public's ambitions (Hamilton-MacLaren et al. 2013). Therefore, adding their perceptions in creation of a sustainable framework is a key factor for improving the current and future quality of life. Global frameworks and national criteria focus on the scientific viewpoint, the government's view and the professional viewpoint. Identifying the views of a cities' occupants can bring multiple benefits, such as by illustrating more effective factors, because the local context is being implicitly highlighted. In addition,

knowledge of the goals of the sustainable development can also be raised through a widespread survey across various regions that communicates with, and considers the views of the respondents.

This chapter will document the local public's perceptions on sustainable urban development challenges. The respondents' views have been gathered, including the level of importance of different aspects, acceptable solutions, and social awareness indicators. It will then subsequently investigate these public perceptions. More specifically, this chapter will answer research question two- RQ2: *What are the perceptions of the general public of sustainable urban development and what is their assessment of locality-specific issues in Iraq?*

This is achieved through a public survey and the respondents who completed the survey (n = 750) that was conducted across the many regions in the case study area, Baghdad. Within this survey, responses were rated on a five-point Likert-type scale. Statistical analysis used to measure the consistency reliability and acceptance level of the questionnaire items, which includes the standard of living, locality-specific issues (e.g. traffic congestion, population inflation, lack of environmental strategies, housing deficit, and increase transport and energy demand) cultural background, and public perceptions towards urban sustainability challenges.

The rest of this chapter is structured as follows. First, the urban development challenges in Iraq and similar developing economies are discussed, creating a list of key urban sustainable indicators on which the public perceptions are gathered. Second, the development processes of the questionnaire used in this study is described. Finally, the results and discussion are detailed, followed by an explanation of the findings. The chapter then concludes by discussing the local and development priorities for urban sustainability challenges in Iraq.

4.2 Methodology

This chapter presents an investigation of the public's perceptions via an online public survey in the case study area, highlighting their priorities, assessment of their existing regions, and their cultural background and awareness towards urban sustainability challenges.

This chapter will answer RQ2 to identify the public's attitudes towards urban sustainability challenges and assess their existing city's applications to consider the community's awareness and their background before designing a new framework.

Several types of research have highlighted the importance of simplifying and clarifying the questions because this develops the quality of answers and does not confuse the responders.

In this context, there are two kinds of questions: open-ended and closed-ended. In the first kind, participants answer the questions within their perceptions. In contrast, in the second type closed-ended, respondents will choose an answer from the multiple options (Hamilton-

MacLaren et al. 2013). It is optional to use both kinds in a survey. One of the most common types for conducting public perceptions is the Likert-type scale, which was developed by Dr Rensis Likert (Helton et al. 2006). In this study, most of the questions were designed to rate their answers of the survey categories on a five-point Likert-type scale, rating from 1 to 5.

To obtain the large number of respondents required, this survey needs to cover the Iraqi capital. Consequently, an online survey was used in this study. It is considered a fast approach in comparison to utilising a manual questionnaire, in addition being less wasting time (Schmidt 1997). In particular, when it requires to be published over various regions (Hamilton-MacLaren et al. 2013). To gather the sufficient sample size, a snowball sampling technique was used as it considered a significant approach and suitable for large-scale sampling (Ahmad and Ahlan 2015). The survey was conducted via Bristol Online Survey (BOS). This application tool ensures the widespread distribution of the public perceptions survey and enables the researcher to monitor answers to have an initial analysis of the data within a short period of time (Helton et al. 2006).

This study was analysed statistically, considering mean rank one of the most important value available and widely used in the statistical analysis (Schmidt 1997). Descriptive statistics and all data analysis, were conducted using Excel.

BOS has an advanced export tool which is a suitable option if the data is designed in a numerical format. Therefore, one of the major purpose of using BOS is that the academic format and data can be easily transferred to statistical analysis very fast. This facility enables the researchers to make it easier, save time and data, and money.

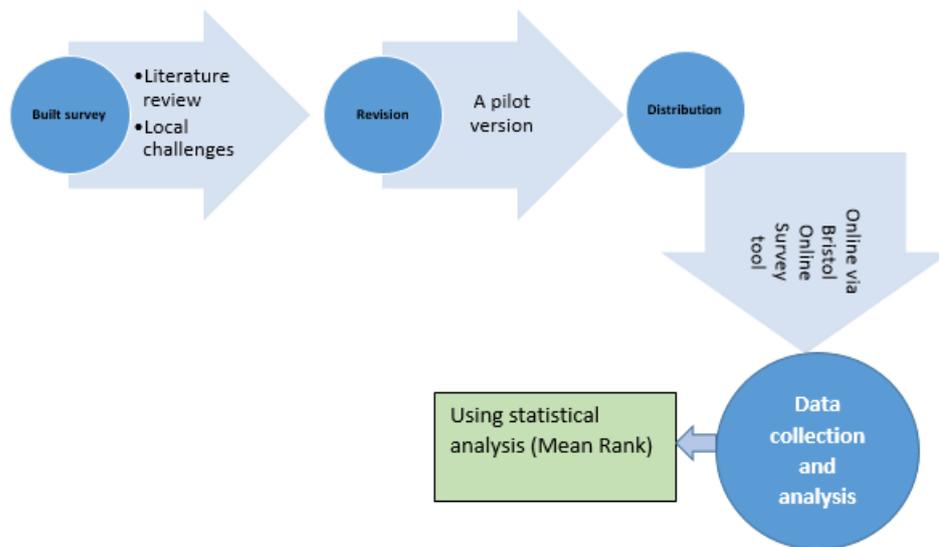


Figure 4.2 The public questionnaire process

The questionnaire stage is shown in Figure 4.2. The questionnaire was developed in five stages:

First, the initial survey context regarding locality-specific issues and urban sustainability challenges was identified by an extensive review of the problem statement and the state-of-the-art on urban sustainability development goals. Attention was given to the relevance of identification the locality-specific problems, combined with environmental, socio-culture, and economic factors of Iraqi cities, specifically the capital Baghdad.

Second, consultations were undertaken with stakeholders from public citizens, professional and government staff were contacted by social media and via internal communications with relevant official departments (e.g., the Ministry of Housing), and municipalities and the Institute of Urban and Regional Planning. Interviews were held with interested professionals from different relevant organizations to investigate their viewpoints on the list of the questionnaire sections, involved the locality problems and urban sustainability challenges as well as other various relevant issues, such as local socio-cultural factors. In light of these, local issues were investigated, the list of questionnaire sections were refined and reviewed to improve quality, clarity, and simplify, resulting in a final list of sections and categories. In terms of urban sustainability challenges, 18 factors were investigated via the nationwide questionnaire, involving environmental and socio-economic factors.

Third stage, a draft online survey was developed based on the first and two stages. The questionnaire was initially designed in English, then translated into Arabic to allow wider respondents to participate who might not be well-knowledge in English. Three professional translators reviewed the final draft of the survey to ensure the accuracy and clarity. In addition, the draft also reviewed as a pilot study to have initial analyse of the items and follow the sequence of structure.

Fourth, the 'online distribution technique' was utilised in this study. This is a fast delivery method when compared with adopting a manually distributed survey, and it is more safe and less expensive (Bourbia and Boucheriba 2010), particularly when it requires to be distributed at the national region (Hamilton-MacLaren et al. 2013) . A snowball sampling approach was also used, which is considered a valuable and appropriate technique approach for wider distributions across regions of a specific country (Alqahtani et al. 2017). The nationwide questionnaire was distributed between April 2016 and May 2016 using BOS. This web tool facilitates the wider distribution of survives and allows the authors to monitor and control responses and to offer a preliminary analysis (Ameen and Mourshed 2017c).

4.3 Questionnaire design

In this context, the sections of the designed questionnaire have been listed as follows:

Demographic information questions are used to recognise; gender, age group, occupation, qualification, type of regions and location.

Evaluation and knowledge questions identify what family information is required from the respondents to have an overview about the standard of living, economic aspect, housing patterns, their ambitions and perforation in their lifestyle.

Attitudes questions to investigate urgent urban sustainability challenges and their priorities.

Perception questions test the local people's awareness towards urban sustainability issues.

The questionnaire was designed for both genders, only above 18 years of age, with diverse social backgrounds, qualifications and occupations.

As part of this survey respondents were asked to rate their views of the survey items on a 5-point Likert-type scale, ranging from 1 to 5, where 1= unimportant; 2= of little importance; 3= moderately important; 4= important, and 5= very important. The survey also contained open-ended questions to allow respondents to provide their feedback on categories or significant items they thought were also important. Demographic characteristics included age, gender, occupation, academic professional, and the location of their region (i.e. urban, suburban or rural). More detail of the question design is described in the following section.

The public survey was conducted via using the BOS (www.onlinesurveys.ac.uk) across many regions around the capital Baghdad, inside the mayoralty of Baghdad, suburban regions, and also rural areas. The respondents were informed when filling out the survey that their participation is voluntary and that their data should be kept confidential according to ethical approval rules. This questionnaire contained open-ended questions to motivate respondents to express their opinions of other variables relating to urban challenges.

4.4 Results and data analysis

Significant urban development challenges were identified for the questionnaire based on a critical review of past studies to identify the challenges of urban development to be assessed by Iraqi citizens.

This study aims to investigate; (a) their priorities and the most important factors to illustrate effective indicators, and, (b) the goals of urban development challenges to provide designers with effective indicators for improving the existing applications and new urban projects under the concept of sustainability in Iraq.

The following sections will present the findings of the survey respondents and demographic information, the locality-specific issues including the family information, transportation challenges, energy consumption, public assessing for the existing applications, and public attitude towards sustainability issues for the existing applications to the area being considered, and public awareness towards sustainability issues.

4.4.1 Survey respondents and demographic characteristic

The public perceptions and their views are significant variables in identifying the important indicators for urban development challenges. People's experiences are formed based on their daily experiences- their daily life, job, knowledge and social activities. In terms of the local context, the public face daily problems that occur as a result of suffering from the difficult conditions. In this chapter, 18-items of urban development challenges in Baghdad have been investigated through their inclusion in the questionnaire, which were gathered from a critical review search into the social aspects of the problem.

The questionnaire received a total of 750 valid responses. About 75% completed the questionnaire and the online link was forwarded to 1000. The snowball technique was used to increase the number of people who received the link. Most of the respondents agreed and were eager to complete the survey. We received additional comments from the respondents about the survey's opening duration and their daily experiences, priorities, the standard of living, and their hopes towards future cities in Iraq.

Table (4.1) presents the demographic factors of the completed survey across various regions in the Iraqi capital Baghdad.

Table 4.1 Demographic factors and frequency

Variable	Scale		
		Frequency	Total
Gender	Male	424	56.5%
	Female	326	43.5%
Age group	18-24	61	8.1%
	25-30	204	27.2%
	31-35	103	13.7%
	36-40	85	11.3%
	41-45	88	11.7%
	46-50	63	8.4%
	51-55	63	8.4%
	56-60	54	7.2%
	Over 61	29	3.9%
Occupation	Government employee	541	72.1%
	Private sector employee	92	12.3%
	Re-tried	32	4.3%
	Other	85	11.3%
Qualification	Post-graduate degree	222	29.6%
	Under-graduate	453	60.4%
	Up to high school	57	7.6%
	No qualification	18	2.4%
Location	Municipalities of the capital	655	87.3%
	Suburban	21	2.8%
	Rural	17	2.3%
	New city outside mayoralty's bounders	57	7.6%

4.4.2 Family information and housing factors in Baghdad

The most important factors in this questionnaire indicated that the findings are compatible with government reports and expert suggestions on the important key of housing sector development in Iraq. The public questionnaire showed that respondents from the married were 67% and the single reached to 28.1%, while widowed or divorced were 4.8 %. In terms of the number of children for those who married respondents 37% that have four children, indicating that the results compatible with the official government report mentioned recently that the average number of Iraqi family is (6–6.4), followed by 28% who have three children.

The findings of questionnaire showed that 83% of Iraqi families in Baghdad live in houses, while only 17% live in flats.

In light of these findings, the item of preferences housing pattern for Iraqi families 90.5% of the respondents were voted prefer to live in a house (low-rise building), due to the cultural aspects and traditional background, while the item ' high-rise housing (flat)' was rated by 9.5% only as shown in Figures 4.3 and 4.4, respectively.

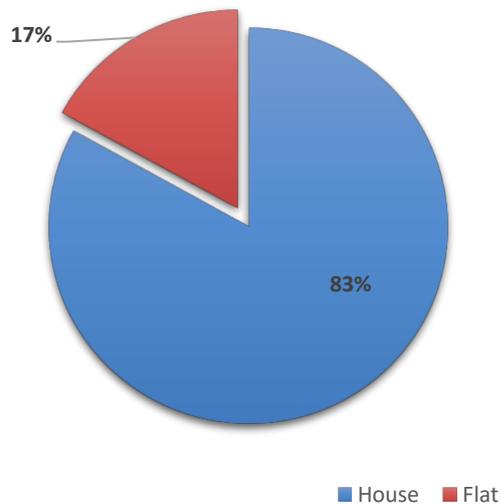


Figure 4.3 The common patterns for the existing housing in Iraq (Baghdad)

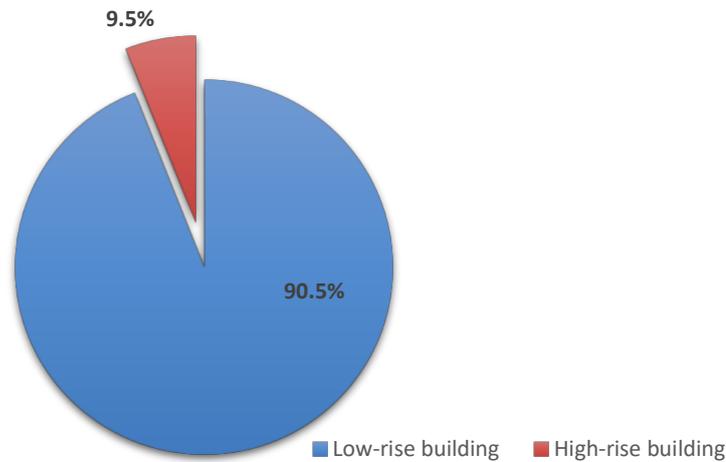


Figure 4.4 The importance factors and Iraqi citizens' preference for housing types

The questionnaire also highlighted that 'minimum standards dwelling size based on household size', 'the area of individual housing' showed between 150–200 sq. metre was ranked '29.8%', indicating that the survey results are compatible with official reports that mentioned the area of individual houses in Iraq were between 400–600 sq. metre in the past thirty years, while the survey found that only 9.6% of the respondent live in 400–600 sq. metre housing. Followed by the next majority area of the dwelling unit was rated as 100–150 sq. metre by 23%.

The survey has also revealed that the current challenge 'minimum standards dwelling size' has decreased over the period of time, due to the current challenges of housing deficit and economic factors.

Housing represents one of the most significant social factors for developing regions and it is considered to be one of the essential needs. It is a vital socio-economic urban challenge for this country because the housing requirements are not being met due to the country's inability to generate new homes in sufficient quantities to meet the needs of Iraq's population growth. Consequently, the overcrowding index has recently recorded as a highest social problem in Iraq, especially in low-income neighbourhoods. Recent research has claimed that 13%–15% of Iraqi households have more than 10 occupants sharing together in one dwelling unit (UNDP 2017). The current study revealed that more than 27% of the respondents live in one residential unit with more than four occupants in a household (extended families).

The public questionnaire also explored the 'minimum design requirements for the traditional Iraqi residential unit, 26.7 % were voted have three to four bedrooms, and also their dwelling

units have the essential design requirements, including living room and a kitchen. In addition, 46% of the respondent were rated have two bathrooms in their dwelling unit.

This section of the survey has highlighted the socio-economic factors in the local context to investigate the most important challenges in terms of the traditional families and housing sector, indicating the emergent challenges in the local area are comprehensively different from past issues, due to the difficult conditions that faced this country, such as housing deficit in Iraq. Therefore, it is necessary to investigate the local key factors and recognise the weak design in the existing applications before creating any new framework.

4.4.3 Transportation challenges

The second important challenge in the area being considered is transportation. This questionnaire was designed according to the weakness viewpoints that are faced recently in the capital, including traffic congestion. The results are compatible with official reports on the important role of the transportation sector in Iraq.

Transportation in Iraq, specifically in Baghdad, has increased gas emissions by 36.7%. This is the second highest level in the Middle East, after Cairo. Nearly 50% of these gasses are produced by vehicles (AlFaris et al. 2016; The United Nations 2014). The population of Baghdad is predicted to double by 2030, so the demand for energy and its consumption will only increase.

The survey revealed that 71% of the respondents use private cars only, while 24% rely on public transport; as shown in Figure 4.5.

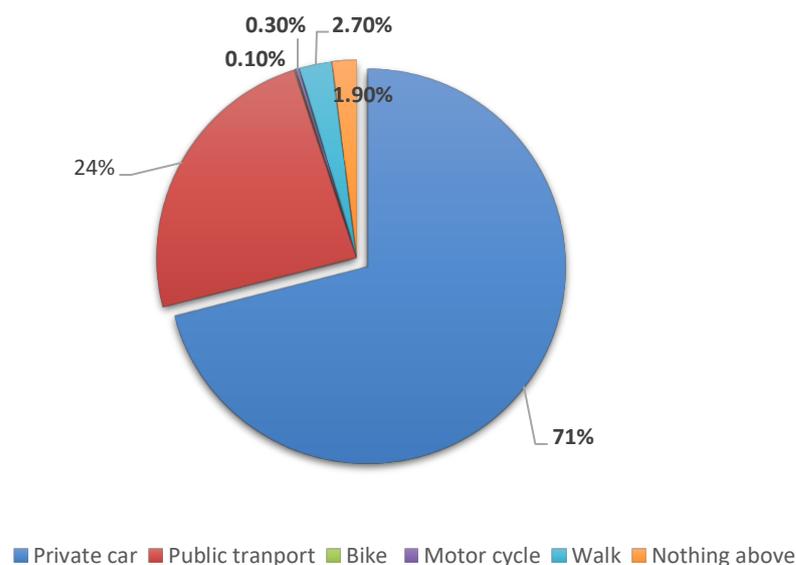


Figure 4.5 The common use of transport modes in Baghdad

In terms of the number of cars that owned from Iraqi families, the survey showed about 42% from the families have owned 2–3 cars, followed by 38 % who owned 1–2 cars, while 12% did not own a car. These findings are compatible with a recent government which reported that the average number of cars increased more than 14 times from the period (2003–2017) in the capital.

Diversity in transportation modes is an urban challenge for Iraqi cities, particularly the capital Baghdad where there is a lack of alternative modes of public transport, such as trains, buses and subways, and a lack of river and marine transport systems (Al-Akkam 2012). This indicator has not previously received any active plans and has not been highlighted in the previous studies as an essential public requirement. The national survey results indicate that the respondents suffer considerably from the transport problems in Baghdad. Their general feedback emphasises the need to build diverse transportation systems to solve traffic congestion. The public survey revealed that more than a quarter of the respondents were spending 'over three quarters of an hour to a hour' to reach their destinations, particularly during work time. Followed by, 21% who spent an hour and a half reach their work, while only 6.4% rated the option ' over a quarter of an hour to a half hour to reach their work .

In Iraq, public transportation systems have not received much attention and private cars are still the dominant form of road transport (UNEP 2015).

Environmentally speaking, most of the previous studies have not focused on the transport aspect in the local context. Therefore, this research revealed that the number of vehicles and the transport demand in the developing regions, such the case study area in Baghdad. This has increased sharply in the absence of effective planning. In Iraq, the number of cars have increased by about 300 times after the political regime changed in 2003, due to the improved economy and the end of international sanctions.

The key findings of this section indicate that most of the local people use private cars (by 71%) against public transport. This is reflected on the main roads as heavy traffic congestion, due to the economic prosperity followed the change in the political regime since 2003 and the lack of effective public transport modes.

4.4.4 Energy consumption

In this questionnaire, the participants revealed that 40% of the respondent have 3–4 cooling units in their own homes, followed by respondents who have 1–2 units (nearly by 31%), while only 5.6% of the respondents did not use cooling units. Most of the respondents sometimes used a cooler unit during the summer season as an alternative source, due to weather conditions and during a power shutdown. In addition, most of the participants used the same

AC conditioner units for heating in winter and cooling during the summer. In terms of the use of electric lights during daylight hours, 42% of the respondent were ranked 'Yes', followed by '39%' voted 'occasionally', while less than 19 % rated 'No', as shown in Figure 4.6.

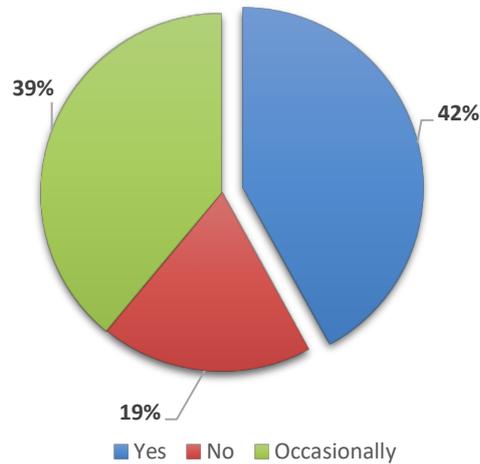


Figure 4.6 Use electric lighting during daylight hours

Iraq's buildings sector, specifically the domestic sector is predicted to experience a demand increase from around 7 Million Tonnes of Oil Equivalent (Mtoe) in 2010 to over 19 Mtoe by 2035. The residential sector occupies the largest sector of energy consumption over this period and accounted for nearly 83% of final consumption in 2010. Therefore, Iraq's energy sector suffers from critical challenges, including sharp shortages of electricity supply, which has made it difficult for this country to keep up with its growing energy demand.

Unwillingness to reduce energy consumption to compensate for the lack of electricity has led to the need to establish campaigns to increase social awareness towards sustainability issues, including reducing energy consumption to achieve sustainable urban development to meet the current and future requirements.

The findings of this section revealed that the usage/consumption of energy was recorded as being very high in the case study area, which is hot dry region-based. There was a high percentage of respondents' who have cooling units in their homes and who are unwilling to reduce energy consumption such as the use of lighting during daylight hours.

4.4.5 Assessment of current services in Baghdad

The current challenges relevant to the existing applications at a city level should be identified through a self-assessment survey of the public to understand the locality-specific problems by testing their opinions of the quality of public services in their regions and to determine if the

development projects that are currently underway have a weak design. The survey findings showed that there were many negative aspects and most of the respondents confirmed that they were dissatisfied with existing public services in their city or regions. It has also been found that a number of public services are not available at the city level.

As illustrated in Figure 4.7, more than half of the participants (51–58%) assessed 'public services', such as libraries, safety equipment, green parks, post office, and play area for children as 'not available' In addition, more than a quarter of the participants (25–30%) assessed 'national electricity grid' and 'quality of drinking water' as 'bad', which indicated that lack of urban development factors such using renewable energy projects was not an option. Meanwhile, other participants assessed sewage services, healthcare, and educational services as 'acceptable.' The majority of the respondents did not classify most items as 'good' and 'very good,' which reflected that the majority complained and were unsatisfied with the existing public services and facilities in their regions.

As discussed above, urban development currently suffers from major challenges, both in terms of the quality of services provided to the public or that they are currently not an option in Iraqi cities. The findings have been reflected an urgent requirement for a preliminary strategy to tackle the current conditions of local citizens in various regions with attention paid to improve national electricity, quality of drinking water, cultural activities, recreational facilities, essential infrastructure, social services, in addition creation of periodic assessments of the both current and future urban development challenges. This survey has used common terminology that is accessible to the public such as 'good', 'bad', in order to be clear and understandable for the local citizens.

The results revealed that the respondents were unsatisfied with most of the existing public services and utilities, including a lack of safety equipment, green parks, cultural centre/libraries, and so on.

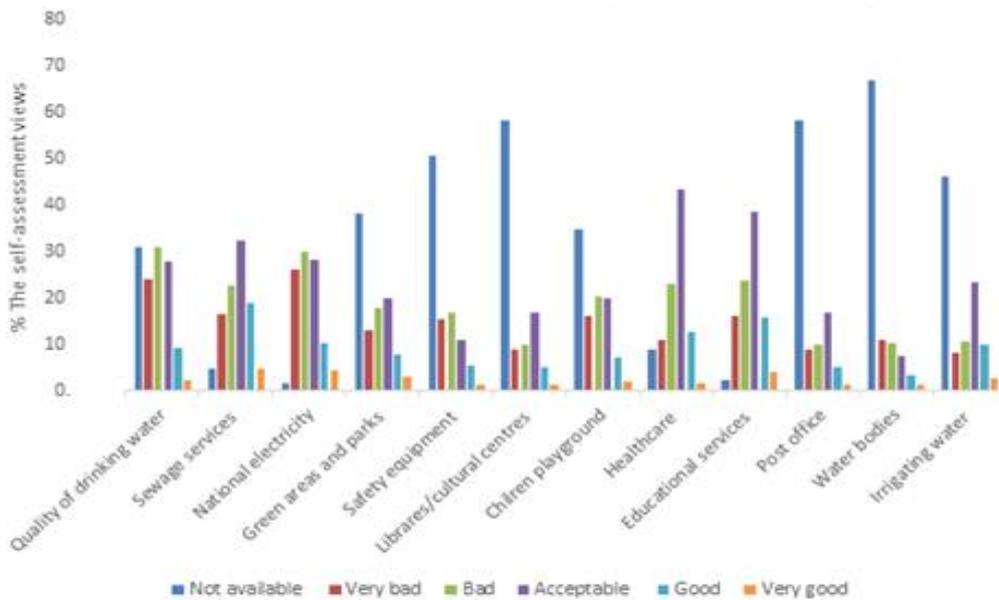


Figure 4.7 The self-assessment views of the respondents in the existing regions

4.4.6 Public awareness towards urban sustainability issues

Another challenge of the public survey was to assess social awareness towards sustainability issues. The findings show that citizens are informed and interested in multiple issues of sustainable urban development, in so far as they expressed their willingness to pay extra to live in sustainable regions in the coming years.

In terms of the aspects of the sustainable cities, as shown in Figure 4.8, '33%' of the respondents voted that they are moderately concerned and also informed, followed by 25% claiming the concept 'very concerned. While, 6.5% only of the participants did not know much knowledge regards sustainability issues.

Consequently, nearly two-thirds of the respondents (68.4%) totally agreed that the Iraqi cities should be developed in sustainable ways (Figure 4.9). Figure 4.10 presents that 71.6% of the participants have a willingness to pay extra fee to live in a sustainable city, this a significant indication of public awareness. This is a positive result for Iraqi policy makers who plan to adopt sustainability issues as an effective strategy to address urban challenges in order to meet the current and future requirements needs of the local community and respecting social and cultural background.

From the findings discussed above, the results revealed that the willingness to pay extra in order to live in a sustainable city, reflecting the respondents' concerned towards applications

of urban sustainability issues and their awareness regarding the development of Iraqi cities should be achieved under sustainable methods.

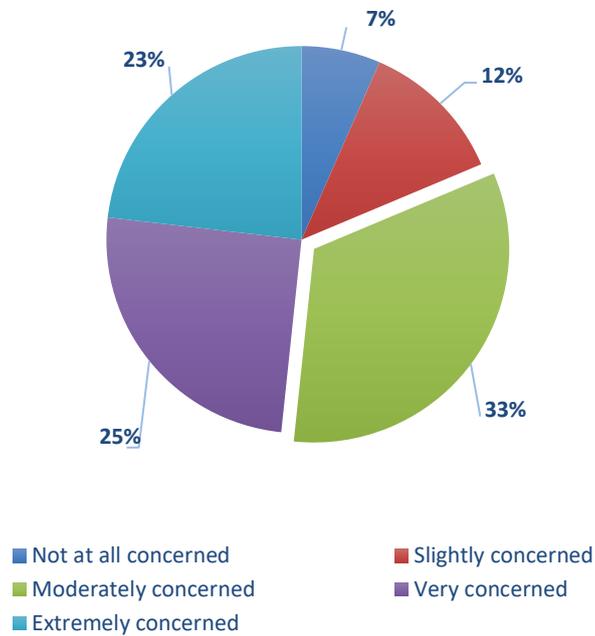


Figure 4.8 Concern towards sustainability issues in Iraq

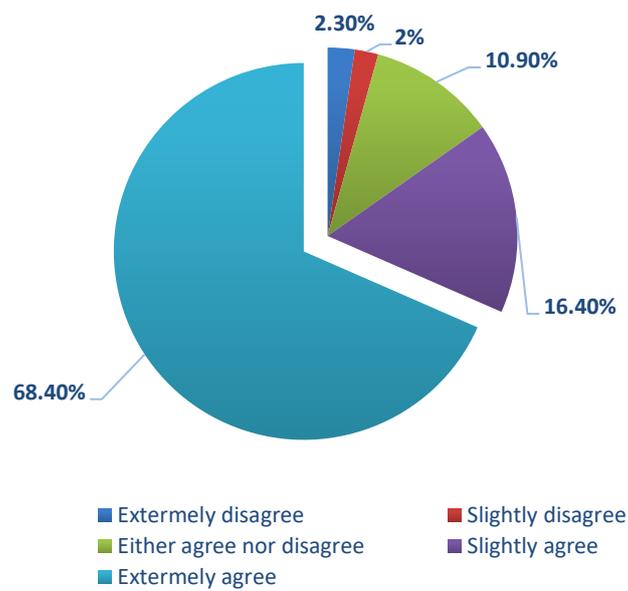


Figure 4.9 The development of Iraqi cities by sustainable methods

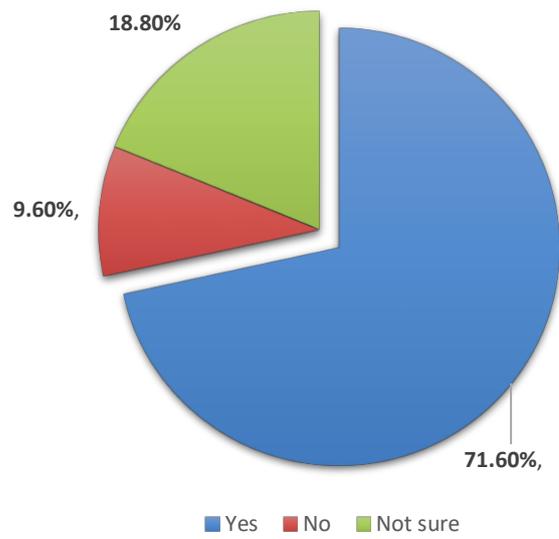


Figure 4.10 Willingness to pay additional fees to live in a sustainable city

4.4.7 Public perceptions of urban sustainability challenges

Understanding the public's views and perceptions is important if we wish to achieve successful urban development. The public's perceptions, priorities and ambitions reflect their experience of daily activities, standard of living and work, in addition to their views on current urban challenges. From analysing the respondents' responses to these urban sustainable challenges on the questionnaire, the 18-items investigated have been ranked in terms of their priority and importance to respondents statistically by the mean value of the recorded high ranking range, from 4.68 to 3.92, top to down, on a 5-point Likert scale (1- 5), as shown on the urban challenges items in Table (4.2).

There are many factors that hinder urban sustainable development in Iraq. Overall, 81% of the participants selected 'providing green areas and parks' as the most important item for urban sustainable development in Iraq. This factor has been ranked as significant with a mean score ($\bar{x}=4.68$), and has the lowest SD ($\sigma=0.8$). The next most important was 'waste recycling and separation', followed by the indicator 'mitigate traffic congestion', and then 'promote investment' and 'establish a training centre for increasing social awareness'. The participants viewed 'minimise energy consumption' as the least important factor of the identified public aspects, with the lowest mean score ($\bar{x}=3.92$) and the highest SD ($\sigma=1.80$).

The findings indicate that the respondents are widely concerned about the items related to environmental and development aspects including green areas, waste recycling, transport modes, reducing pollution, promoting investment and increasing renewable energy with smart management. The public's views broadly suggested the need for a comprehensive improvement in their standard of living. Seventeen of the investigated 18 indicators had mean scores more than 4 (=important), while only one had a mean rank greater than 3 (=moderately important).

The findings of the statistical analysis focused on the mean, mode and standard deviation to structure the importance indicators, while investigating the priorities in the respondents' views, even though one factor was considered to be the least important (as represented by 'minimise energy consumption') for several reasons. First, Iraq's population has suffered from electricity power-downs for more than 20 years; and, second, it could reflect the respondents' social background and level of social awareness, highlighting their limited knowledge about sustainability development. In terms of 'promoting investment', which is the fourth most important factor, intensive efforts from the investment sector to reconstruct areas of Iraq have essentially been needed to restructure the framework because of weak governance, the lack of

security and occasional corruption. 'Provide green areas and parks' is the most important factor, due to respondents' realising the significance of increasing vegetation cover, which has a direct impact on improving climate conditions, and reducing the amount of CO₂ emissions. Green spaces also improve humans' well-being and health, helping them against diseases such as depression, as well as mitigating the effects of dust and sandstorms, particularly in Iraq (Niemelä 2014; Al-Salihi et al. 2010). This factor was followed by 'waste recycling and separation', which could indicate that the local inhabitants have been suffering from an increase in waste pollution and therefore they saw this item as more of a challenge than others and felt that it should be addressed in order to tackle pollution. Meanwhile, 'reduce pollution' came sixth. Pollution rises with population increases, urbanisation and economic growth, in addition to increased energy and transport demands (Cohen 2006). In developing economies, pollution has a wide impact, causing severe damage to the quality of life. Iraq has faced several wars in more than four decades, which has led to widespread chemical pollution and problems with hazardous materials. Moreover, Iraq is one of the leading countries in terms of oil reserves; thus, Iraq is entirely dependent on burning fossil fuels for power generation (Nader 2009a; Alasady 2011).

The third most significant priority in the eyes of the respondents was to mitigate traffic congestion because Baghdad has recently experienced significant economic prosperity, leading to a large increase in the number of cars as well as rapid urbanisation and population growth. Hence, Baghdad has become a more crowded city and our national experts have forecast that the population will double in size by 2030. Nowadays, the Iraqi government is stressing that effective solutions must be found to mitigate the nuisance of traffic congestion. However, in terms of tackling local problems, the challenge of establishing a training centre for increasing social awareness was ranked the fifth most important aspect because respondents realised that to address the significant issue of achieving urban sustainable development, there is a need to raise Iraqi's awareness of the goals of urban challenges. The factors 'maximise the use of renewable energy' and 'smart energy management' are, respectively, the seventh and eighth most important items in urban development challenges. Today, energy has become the lifeblood of countries, influencing effective energy management. Additionally, minimising dependency on conventional fossil fuel combined with the adoption of renewable energy results in a healthier environment and weather by reducing CO₂ emissions (Ahmad, Mourshed, et al. 2016; Peng et al. 2013). Globally, clean energy resources are significantly widespread in developed countries (Abbasi and Abbasi 2000). While there are only limited efforts made to use

renewable resources in developing regions, Iraq has a wide potential for clean energy resources (e.g. solar). 'Smart energy management' is targeted at flexible, economic and safe distribution of energy with an increasing combination of renewables (Zyadin et al. 2014). A smart grid system can be adopted in Iraq to implement creative and practical practices in the local context, but this requires an effective investment and policy framework.

The remaining challenges in the urban development variables have been forwarded the following factors: improve public services, increase social activities, improve educational activities, provide jobs inside urban projects, use of public transport, use of alternative materials, use of clean transport mean like bike, maximise the use of insulation, and use grey water. Reportedly, local responses exist to tackle the urban and environmental issues. They also need to look forward to the present and the future well-being of the country (Cohen 2006; Munier 2011).

The results show most of the urban sustainability factors rated between very important and important, except for the last factor 'minimise energy consumption', which rated the lowest factor. This could be due to the weather conditions and lack of sufficient power electricity in Iraq, reflecting the community's awareness towards urban sustainable development goals.

Table 4.2 Urban development factors

Urban Challenges Items	Responses* (%)					Mean	Mode	SD
	1	2	3	4	5			
Providing parks and green spaces	16	11	31	84	608	4.68	5	0.8
Waste recycling and separation	18	16	53	108	555	4.55	5	0.90
Mitigate traffic congestion	17	18	47	139	529	4.53	5	0.89
Promote investment	18	20	56	131	525	4.50	5	0.92
Establish a training centre for increasing social awareness	17	12	63	159	499	4.48	5	0.89
Reduce pollution	19	24	53	138	516	4.48	5	0.94
Renewable energy resources	20	16	76	127	511	4.46	5	0.95
Smart energy management	20	13	70	147	500	4.46	5	0.93
Improve public services	17	15	64	163	491	4.46	5	0.90
Increase educational activities	15	25	67	176	467	4.41	5	0.93
Provide jobs within the urban projects	18	30	74	167	461	4.36	5	0.98
Use of public transport	21	25	79	170	455	4.35	5	0.99
Use of alternative materials	19	12	91	217	411	4.32	5	0.93
Utilise walking and bike as transport means	16	11	31	84	608	4.27	5	0.98
Increase cultural activities	20	26	98	197	409	4.27	5	0.99
Maximise the use of insulation	27	36	96	194	397	4.20	5	1.07
Utilise grey water	49	28	95	176	402	4.14	5	1.18
Minimise energy consumption	29	41	175	222	283	3.92	5	1.08

Notes* 1=Unimportant 2= Of little importance 3= Moderately important 4= Important 5= Very important

4.5 Limitations of the public survey

This survey was conducted across many regions in the capital regions. Therefore, the responses represent the public's perceptions. The diversity in public responses feedback was due to disparities in age groups, qualifications, occupations, and the evaluation of the respondents' appreciation of the survey's items.

The main obstacle that faced this national survey was its dependence on participants using an online link to answer the questionnaire. Iraq still has limited services in some places, such as rural regions. (Heshmati et al. 2014). In general, Internet services are usually unavailable in the countryside.

In total, 86.4% of educated citizens in Iraq use the Internet (Al-hammadany and Heshmati 2011). Therefore, the online questionnaires and feedback tended to come from educated citizens more than non-educated people, many of whom live in rural regions that have no Internet facilities. Another barrier that was faced this survey was

the difficulty to obtain viewpoints from the elderly population (i.e. those aged over 61 years). Together with the lack of any qualifications, this group are less unlikely to have a chance in participation in this survey in comparison with the younger age groups who can access the Internet anywhere.

Another limitation is that the electricity shutdown across Iraq and the capital regions resulted in the lack of results received online from the respondents, the challenge was in reaching these responses rather missing them. However, the findings that have been explained in this chapter reflect the local context of these limitations and problems.

4.6 Conclusion

There is a broad agreement on the fact that urban issues are important to all countries, both presently and in the future. This is a key challenge to engage public perceptions in investigating urban development challenges for policy-making and effective indicators to identify the level of important challenges in terms of the local context. The respondents' views of the urban development indicators reflected their daily experience in the existing applications, and also their ambitions for the future. A number of these local factors have occurred because of the unstable policy since the 1980s. This chapter may provide designers and decision-makers with the most important indicators in terms of urban sustainable. These indicators are the most important factors to investigate the local views and their priorities under the concept of sustainable development goals.

This chapter answered research question two: *What are the perceptions of the general public of sustainable urban development and what is their assessment of locality-specific issues in Iraq?* This indicates the most important local problems in the Iraqi context to show the public's priorities, their standard of life and cultural background, and their assessments regarding the existing city's applications and social awareness of sustainability issues. This illustrates the community's attitudes towards sustainability issues before designing a new comprehensive framework.

In this chapter, several aspects were highlighted that contributed to the exploration of the local context and problems prevailing in society, as follows:

- The demographic information of the population of the study area illustrates the rates of gender, age group, qualifications and occupation, as well as the proportion of participants in many areas across the capital. The results showed that about 43.5% of the respondents are female, while 56.5% who are men. This is in agreement with the national reports from the Ministry of

Planning, which show that about 53%-57% of the Iraqi population are male while 43%-47% are female.

- Important information about Iraqi families and the challenges of the housing sector were identified through a public survey, which highlighted the family size, the standard of life regarding the housing patterns and challenges faced by the size of the homes, and the preferred housing style of Iraqi families. This study highlighted the challenges of housing in Iraq, specifically the decrease in the area of home units over time.
- The study also investigated the transport problems and the challenges faced by the families, including traffic congestion. The results revealed that the limited use of public transport against the private cars, which approximately reached more than 70%. Therefore, there is a need to promote public transport and diversity modes to reduce traffic problems over the coming years.
- The existing public services and utilities have been assessed and it has been found that the quality of life can be improved by correcting the weak design.
- The role of sustainable urban development and measuring community' awareness and cultural background regarding urban sustainability issues has been highlighted. The survey presented the public perceptions towards urban sustainability challenges, which included 18 different factors to identify their interest and priorities to meet the current and future requirements, as shown in the summary of the key points.
- The provision of green areas and parks has been identified as the most important requirement for citizens in Iraq. In particular, green areas can improve the standard of life through making an acceptable significant investment to promote their use. This should be addressed as a priority in existing and new urban projects.
- Pollution should be reduced and waste recycling and separation of waste should be adopted. In addition, pollution resulting from traffic congestion and burning fossil fuel should be reduced, as should water pollution. These factors have been found to be widely important to the Iraqi population. Waste recycling and separation can also lead to a decline in the consumption of raw materials.

- The combination of renewable resources and smart management of the energy infrastructure can meet future environmental sustainability and energy-efficiency policy goals, while mitigating the present-day acute electricity shortage.

This study has identified a series of priorities for the local population, the local standard of living, the cultural background, and social awareness towards implementing the goals of urban sustainable development in existing and future urban projects. Therefore, a new framework can be adopted with wide participation from the public to suit the local context, in order to investigate locality-specific issues including their priorities, assessment on the current city's applications, the standard of living and cultural background, and awareness towards urban sustainability issues.

Chapter 5 Consensus based Delphi technique

*This chapter focuses on identifying urban sustainability factors (indicators and sub-indicators) for Iraqi cities, with a case study in Baghdad. It will adopt the Delphi method, which is a robust tool, as one of the most important technique for consensus-build approach, is used conducted in three consecutive and sequences consultation rounds with engaging experts and professionals in the field of urban sustainable development domain from academia, government, and private sector. These local factors were addressed and discussed regarding their relative significance in the local context, after which the new proposed comprehensive sustainability framework will be discussed. This section contribute towards answering **RQ3: How do the views of the public differ from the generally accepted view of experts in the context of sustainable urban development in Iraq?** And **RQ4: How do the views of local experts' impact on the creation of a sustainable urban development framework for cities, including their vision for their development and desired future domestic features?** In order to identify the process of the experts' consultation to reach consensus-based the newly designed framework.*

5.1 Introduction

When designing any new urban sustainability framework urban, especially for developing regions such as Iraq, urban sustainable development factors are considered a controversial issue. Because of this, a consensus is required to implement new plans/frameworks. One way to achieve this consensus is based on consultation with a panel of experts. There are three commonly used consensus techniques (Hsu and Sandford 2007; Habibi et al. 2014; Aldossary et al. 2015): (a) survey (Delphi rounds), (b) group meetings, and (c) survey and meeting.

This chapter will focus on identifying urban sustainability factors (indicators and sub-indicators) for Iraqi cities, with a case study in Baghdad using the Delphi method approach. This will include specific unique locality issues for unstable countries, such as Iraq, which need a specific roadmap/framework for own its cities application, in particular the capital Baghdad. As such, a panel of experts will be selected with a background in construction, urban planning and urban sustainable development for participation in the Delphi process .

In the remainder of this chapter, the background in consensus methods is first, followed by process of the Delphi sequence rounds will be discussed to illustrate the sequence of rounds, followed by the abstract background of consensus methods, then the coming section will justify the using of the Delphi technique, followed by the development of the Delphi questionnaires. The third section will describe the selection of the experts' panel, and the remaining sections will present the Delphi rounds and the distribution of the questionnaire. The following section

will present a brief background of consensus methods, including the Delphi technique which is used in this study.

5.2 Selection of the Delphi technique for this study

The appropriate selection of a research method is an important issue for the success of the research process. There are several kinds of consensus techniques, but there is a lack of evidence in the previous studies to select a particular approach. Moreover, there is a lack of detailed information regarding the characteristics of consensus methods, also there is limited data on structure and approach, number of applications and the related works (Fink et al. 1984; Nair et al. 2011).

According to the literature review of some previous studies, three common consensus approaches include:

- Consensus-based surveys: A survey/questionnaire(s) based on communication among experts panel to forwards their suggestions and ideas via online questionnaires, they will reach a consensus for decision-maker. The Delphi Technique is a common tool that has been adopted in various applications. This method avoids face to face meeting between respondents.
- Consensus-based group meetings: Official group meetings, with various group sizes, allow the appropriate opportunity for experts' panel to offer and generate ideas through face to face meeting in order to reach a consensus. This type of consensus has a number of tools such as Focus groups, Nominal Group Technique (NGT), Brainstorming meetings, and Simon Circles. Some of these techniques have been widely applied such as (NGT) in many cases over multiple fields (Potter et al. 2004).
- Consensus-based data synthesis and group meetings: These techniques have been identified based on combining the questionnaire method with experts' consultation. The RAND/UCLA Appropriateness Method (RAM) is one of the most significant tools in this approach.

One of the most widely used of these methods is the Delphi technique (Hsu and Sandford 2007). This was developed in 1960 by the RAND organization as an important tool to reach consensus, the Delphi method is developed to achieve the concrete consensus of experts panel on different fields in a systematic approached. It is used via conducting fellow rounds of questionnaires for data gathering based on surveys and feedback (Dalkey and Helmer 1963).

The Delphi technique establishes panel consensus from experts decision (Habibi et al. 2014). It has been widely adopted to solve and identify various issues, based their priority, addressing forecasting frameworks. Therefore, to achieve this issue, specialists experts with a wide

practical knowledge of related problems need to engage via decision-made (Okoli and Pawlowski 2004). The Delphi technique is best used in situations where expert opinion is required from a range of professions such as sustainability, engineering and policy making (Giannarou and Zervas 2014). One of the most significant advantages of using the Delphi Technique is participant anonymity, this levelling out the effects that dominant individuals may have within the group of experts (Hsu and Sandford 2007; Aldossary et al. 2015b). Online communication by e-mail also helps maintain confidentiality.

The Delphi technique includes the publication of a series of questionnaires to experts panel. After each individual round, the researcher gives an anonymous proposal of the experts' feedback, this technique allows the respondents to review their earlier viewpoints of the other experts, by providing them with information offered in the previous round. Also experts can express their opinions freely, avoid face to face meetings and eliminate any possible conflict between them, carried out over several rounds, this gives participants the opportunity to observe a variety of viewpoints and suggest additional factors to reach consensus. It allows respondents to control feedback, in addition to statistical information.

The applications of rounds are designed based on Likert-scale choices, the statistical analysis used to measure the results making use of mean ranks and standard deviations. This process continues in order to reach a consensus on the different issues. The Delphi tool has a number of vital features (Hsu and Sandford 2007) as follows: a) Iteration of rounds: this technique is a multi-level process involving the engagement of experts in more than one round. This consequence application provides participants the opportunity to review the other experts' responses feedback to allow revise their opinions and suggest additional viewpoints if need be. b) Anonymity: The administrator of the questionnaires rounds should save expert anonymity.

This study has selected the Delphi technique, a survey approach, due to its widespread use in reaching a consensus when complex issues are involved.

This selection has been made because; (a) it has been used extensively in the sustainable urban development field domain (Nair et al. 2011), (b) it can generate and forecast innovative ideas to inform the hypothesis for the research (Giannarou and Zervas 2014), (c) it can provide 'Anonymity' and 'avoids face-to-face meetings eliminating possible conflict, (d) as proven from previous work, the Delphi technique is highly suitable for use in reaching a consensus when dealing with complex issues where there is a lack of effective knowledge of participants, and (d) it allows experts to be provided with statistical information such as the mean rank and SD in order to understand the panel's viewpoints quantitatively. These are described below in more detail:

Sequences of rounds: this technique is normally a 2 or 3 stage process, the aim to achieve consensus by the end of the process. This gives participants the opportunity to see their colleagues' points of view, to revise their judgment or stay as they are and to suggest additional insight and further details if need be. Anonymity: Respondent anonymity is preserved during the Delphi process to avoid any influence of position or dominance by any expert. In this context, this application allows experts to express and add their viewpoints freely without any pressure from others.

Controlled feedback: The Delphi organiser receives the experts' view after each round and conducts the relevant analysis in order to proceed to the next stage. This eliminates the need for personal exchanges and facilitates the transition to the next stage in the process. Electronic questionnaires are used to allow easy exchange of questions, to conduct communications between experts online and to carry out the analysis and transition of information smoothly. This makes the technique cost and time effective.

Statistical analysis of responses: Because the Delphi technique deals with complex issues, it is essential to analyse responses reliably and accurately. The following descriptive statistics, the mean, median, standard deviation (SD) or interquartile range (IQR) are used in this case. The SD's of Likert rating scale responses for each indicator in each round are used where each SD should be between 0 and 1 ($0 \leq SD \leq 1$) (Giannarou and Zervas 2014; Galipeau et al. 2017). The rounds involve experts narrowing down their decisions to achieve consensus.

Anonymity: The researcher of the Delphi rounds should be saved respondent anonymity during the Delphi stages to avoid the influence of position and the security dominant of several experts. In this context, this application allows experts to express and add their viewpoints freely without any pressure from others.

Thus, the main purpose of using the Delphi technique is because this method is considered a better way to gain and generate new ideas and innovative viewpoints via the expert feedback (Alyami et al. 2013). This is shown in Figure 5.1 which describes the process of the Delphi rounds.

5.3 Development of the Delphi questionnaire

The Delphi questionnaire was developed using comprehensive urban sustainability factors identified from review of the previous research (Aldossary et al. 2017; Ameen and Mourshed 2017a; Alyami 2015), in addition the findings of the public survey of the local perceptions in the capital, Baghdad. The respondent's viewpoints were provided on a 5-point Likert-type scale, ranted from 'Unimportant' to 'Very important'.

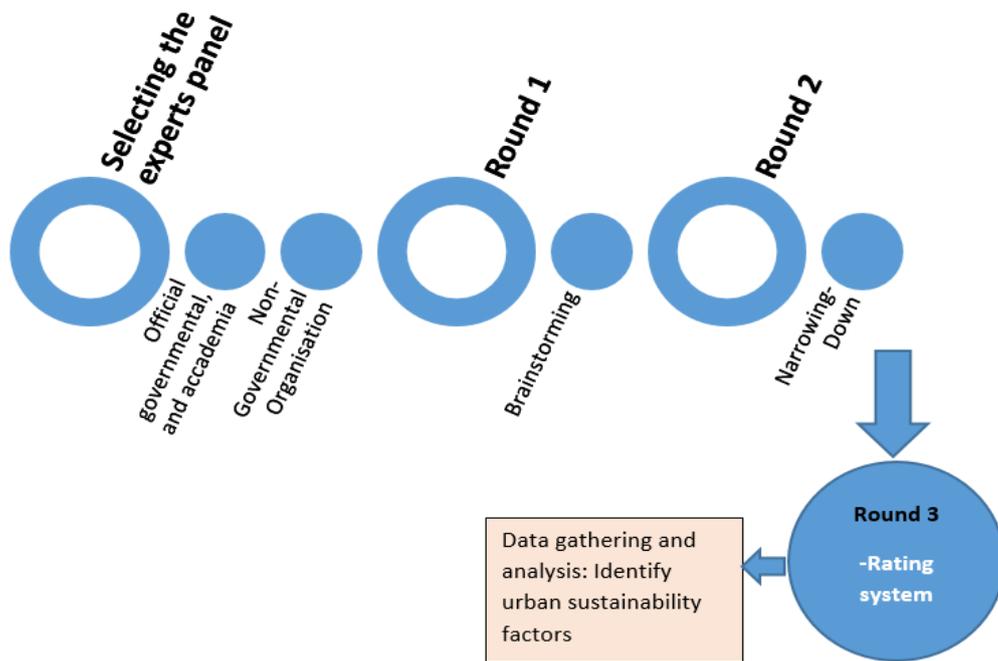


Figure 5.1 The process of the Delphi rounds

For the current study, the Delphi rounds adopted of three successive rounds, in line with the ideal Delphi format (Powell 2003). The following sub-section will discuss the selection of the experts panel and the process of how can choose them based on their knowledge, experiences, and their position as will list Table 5.1.

5.3.1 Selecting of the expert panel

Prior to conducting a delphi consultation it is a significant issue that the qualified experts are selected properly (Aldossary et al. 2015). It is essential need to recommend when inviting

expert panels in the rounds of Delphi consultation that the last rated number within an acceptable range of common panel size to avoid the unsuitable risk of error in consequence rounds. In response to this, the size of the suggested panel is in scale line with the recommended guideline in a number of previous Delphi studies. Hsu and Sandford (2007) have reported a suitable size for Delphi expert panels is less than 50 consultants. By contrast, Masoso and Grobler (2008) proposed that panels average between 10 and 30 provide an acceptable range. Several different studies have claimed that expert can rate in size from 10 to 18 (Maguen et al. 2012; Aldossary et al. 2015). Consequently, 50 experts have carried out the three rounds consultant process in this study. The experts were invited by face to face meeting and also some of them individually by email, Figure 5.2 shows the process of selecting the expert panel.

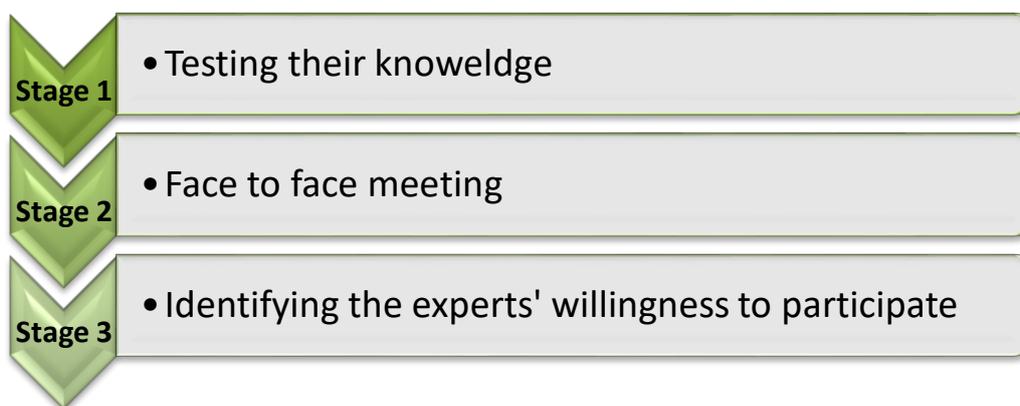


Figure 5.2 The process of selecting experts' panel

This study has focused on the experts' background and professional experience. According to (Hsu and Sandford 2007; Aldossary et al. 2015) experts should be selected from the various field including (decision-makers, academic, and private sector/industries, including international professionals). Therefore, this study has focused on a meeting session with an individual expert to recognise their knowledge and background, in order to avoid any unimportant class of experts. In response to this, Delphi technique is a panel decision engines that need qualified experts with professionals experiences in their background and investigate in depth the locality-specific problems (Maguen et al. 2012). This was a mechanising factor in picking experts in multiple fields and different organization from the ministry of planning, the ministry of housing and construction, the private sector and international experiences, and academia across Iraq as listed in Table 5.1. Their background knowledge and experience is different according to the organisation, that they occupy and their particular role.

In this study, the expert panels have a different background in terms of construction, industry, renewable energy and sustainability, and urban studies, as summarized below:

- (a) Academics:** There are many universities across the country, for this study has selected the professional academia, because they have different background and experience, also different points of view in comprising with to decision-makers group. According to their research fields, these experts can add new concepts and suggest strategies based on new knowledge and update techniques, which are already used in most developed countries. These experts have completed their PhD degree in different developed countries, such as UK, USA, Australia, and other regions. In addition, their practical skills from being lecturing in universities have enough experience in various fields. Academics are selected from several universities and schools across Iraq, including University of Baghdad, Al-Nahrain University, Al-Mustansyria University, and Centre of urban and regional planning, Technology University, and the University of Diyala.
- (b) Decision-makers:** experts have chosen as decision-makers engage with governmental organization in various ministries and those have the power in policy-making, involving one minister, managers, head of departments, engineers, architect, urban designers, managers of municipalities who work at different ministries and organization centres, such as ministry of water resources, ministry of housing and construction, the centre of statistical organization, ministry of municipalities, and other related ministries. This using the prior selected based on testing the experts knowledge through intensive period that is spent as face to face meeting, also some experts (decision-makers) have recommended to invite other specialist experts to participate through Delphi rounds. The important issue for engaging with those experts to gain important feedback based on their practical experience, the reality of locality-specific issues, policies conditions, and regulations system in the country and how the difficulty to achieve the new plans in terms of policies situations and the construction sector to update the national schemes towards low energy construction, sustainable plans, and adopt urban sustainability indicators, which have been used in many developed regions.
- (c) Private sector (NGO):** The experts who involve as engineers, contractors, consultant can engage and give a feedback according to their experience as experts. Their participation in the Delphi rounds have focused on how to link sustainable plan/urban development with private sector and future urban projects. A number of experts from construction companies and general contract offices in the private sector. Moreover, the international industries/experience have involved through these rounds, such as foreign companies, international organization, like Un-Habitat, and other organizations. Overall, these experts have a sufficient background in construction, urban planning,

and sustainability and the categories expert panels are shown in the table and figure below.

Table 5.1 The background of the Delphi panellists

	Organization	Percentage %
Decision -makers	Council of ministries	32%
	Mayoralty of Baghdad	
	Ministry of water resources	
	National centre for engineering consultancy	
	Ministry of planning	
	Ministry of housing	
	Ministry of municipalities	
	Ministry of electricity	
	Renewable energy centre	
	National Investment committee	
Academics	University of Baghdad	30%
	Al-Nahrain university	
	Al-Mustansyria university	
	University of Karbla	
	Centre of urban and regional planning	
	University of Kufa	
	Technology university	
	Environment research centre	
	University of Wasit	
	University of Erbil	
	University of Dylia	
	Construction centre- Najran university/Saudi Arabia	
	DBG Dr. Bluhm GmbH company/Germany	
	Hanwah/ Korean construction company	

International experiences	NB-consultancy	%16
	University of Nottingham	
	Vienna city council	
	University of Strathclyde	
Private sector (NGO)	UN-Habitat-Iraq program	22%
	Bunatt Organization	
	Dar-Al-Imara consulting Engineers	
	Al-Ghalaow construction company	
	Alamco construction engineering centre	
	Al-Qaram construction company	
	Adnan group company	
	Consultation syndicate engineering	
	Alsaqa'a Co. For general Contracts	
	<i>All total categories</i>	

5.3.2 The Delphi Questionnaire

The three rounds of questionnaires were divided into three main categories as mentioned in the previous section. The questionnaire for each individual round comprised three main sections, these different sections were identified and explored through the investigation of the prior studies, mentioned previously in chapter 2. These were augmented through the integration of the local issues identified in chapter 4. These dimensions are: (1) planning strategies and future vision for the capital city, (2) housing/ domestic sector regarding semi-automatic design requirements, and (3) a set of urban sustainability indicators which will also include strategies for on-site renewable energy. These dimensions were identified based on the locality-specific issues in the case study area as described in Chapter 1 and the review of the state-of-the art, described in chapter 2, that showed the the research gap between this study and the past studies.

A Likert rating scale was used for the three dimensions, including the indicators and sub-indicators, where 1= Not important; 2= Little importance; 3= Moderately important; 4= Important, and 5= Very important.

Each of these sections is described in more detail below:

- **Planning strategies and future vision:** this section includes planning strategies that help urban designers and decision-makers to plan the shape of the future city. With reference to Baghdad, a high density and crowded city, a sustainable framework should include plans for establishing satellite cities.
- **Housing design, requirements and strategies:** this section includes categories designed to establish the minimum requirements for new domestic projects. These strategies are related to the use of on-site renewable energy and low energy housing designs.
- **A set of urban sustainability indicators;** a set of indicators have been used in this framework, covering the environment, water, energy, transportation and infrastructure, social, economic, safety, innovation and management, in addition to on-site renewable energy such as solar energy as PV systems. Experts assess each indicator and technique individually and add further feedback if necessary. The list of urban sustainability factors is shown in Chapter 6 with the results of the three rounds. Following the design of the questionnaire, the Bristol Online Survey (www.BOS.ac.uk) tool was utilised to distribute the questionnaire and analyse the feedback.

5.4 The findings of the Delphi rounds

This section presents the findings from the Delphi process described previously, reporting on results of each of the rounds.

This study used the Delphi technique, a systematic method applied over three rounds with the aim to achieve a consensus amongst expert participants. The mean rank and standard deviation were selected as the most common statistical methods to measure consensus for each individual factor/indicator in this framework.

It is valuable to mention that 16 experts withdrew during the three rounds of the Delphi approach. In this context, the proportion of academics was reached to 32.2% in the first round, declining slightly to 30% in the last round. The second category, Governmental Organisations estimated for 34.5% in the first round, this decreasing slightly to 32 % by the last round. The number of non-governmental organisations raised slightly from 20% to 22% from the first to the third rounds. While, the international experiences dropped slightly from 18% to 16% between the first round and the last round. The final number size of the panel was reached 51, which can be known more appropriate, so that these two aspects represented by the panel size and balance of experts' percentage are considered the final experts panel was not biased.

Table 5.2 shows the level status of consensus achieved for the local framework and strategies identified throughout the consultation. The main dimensions and strategies in the proposed

framework, were agreed on by the expert panel as relevant for a local framework for Baghdad. In this context, a locally sustainable framework can be adopted by decision-makers and professionals in the construction sector to meet future needs and requirements as shown in Table 5.2.

Table 5.2 The main dimensions of the proposed framework

Framework items	Main categories	Total number of indicators/factors	Status of consensus
<i>Future city</i>	Planning and land use	11	✓ Achieved
<i>Domestic future requirements</i>	Housing patterns	12	✓ Achieved
<i>Urban sustainability indicators</i>	Environment, social, and economy factors	63	✓ Achieved
Total indicators		86	

Planning strategies and land use were also evaluated by the experts over the three rounds. With reference to the concept of satellite cities around the capital to mitigate pressure on the city, 29 of 50 (58%) experts rated this strategy as very important, achieving a mean rank of 4.33. The creation of a green belt was also voted as very important by 75% of the panellists. They suggested that satellite cities and the green belt should be located around the capital, in other words in suburban regions in order to keep the optimum size of the city and avoid more pressure on existing city's applications.

It was found that the suggested strategies, such as the concept of establishing cities around the capital, the green belt, and a few additional indicators from the experts, were considered to play a vital role in replacing the traditional plans lack in depth involving sustainability concept to tackling the existing and future challenges, including saving energy and replacing the traditional methods by adopting renewable solutions such as investing

Another significant subject in the survey, is how to design future housing projects which have reduced house sizes, in order to monitor and reduce cooling and heating requirements. This study suggested a variety of building areas and number of rooms/spaces, the panellists voting to provide multiple housing areas within the same project. The minimum domestic design requirements for a single-family house was voted as 150-200 sq. metres (mean rank 3.9). The experts rated mix-pattern dwellings as the most significant feature (mean rank =4.25). Affordable housing and improvements in the quality of the indoor climate were suggested in the second round as additional factors, consequently voted as very important at means of 4.7

and 4.64, respectively. Several different strategies can be adopted to standardise domestic buildings and create low energy housing as well the use of on-site renewable energy.

5.5 Conclusions

This chapter has described the use of the Delphi technique to reach consensus on the indicators and sub-indicators of the three main dimensions, including the city's future vision, semi-standardised domestic projects, and a set of urban sustainable development factors. These dimensions will feed into the design of a new comprehensive sustainability framework to develop the current and future requirements.

The Delphi technique is a robust tool to reach a consensus where a topic deals with controversial issues and a lack of theoretical and practical practices to adopt new strategies. This use of the Delphi technique was online, via a series of rounds of questionnaires to an expert panel. Following each individual round, the researcher received anonymous feedback from the experts, giving the respondents an opportunity to review the viewpoints of their colleagues.

In the use of Delphi in this current study, the expert panel has a varied background in terms of the construction industry, renewable energy, sustainable development, and urban studies, as summarised in the previous table. It is an important to mention that only 16 experts withdrew during the three rounds of the Delphi survey.

The questionnaire for each individual round included three main sections: city's future vision, semi-automatic/standardised design requirements, and a set of urban sustainability indicators. The results of the Delphi rounds results in an agreed set of indicators and sub-indicators including 86 agreed factors for the three main dimensions.

These results will feed into the development of a new sustainability framework in the following chapter. The views of the experts will also be compared with the public perceptions using statistical analysis.

Chapter 6 Development of a comprehensive sustainability framework

This chapter proposes a comprehensive sustainability framework for urban development projects in hot, dry developing regions. As discussed in Chapter 1, such a framework is required due to a lack of knowledge in these regions of issues including population-inflation, traffic congestion, environmental pollution, water shortages and high energy consumption.

Iraq is one such developing country having a hot, dry, semi-arid climate with unique socio-cultural factors which have been impacted by four decades of war. New development projects are underway but scant attention has been paid to sustainability, specifically in cities, e.g. Baghdad.

This chapter will answer **RQ3: How do the views of the public differ from the generally accepted view of experts in the context of sustainable urban development in Iraq?** *The statistical analysis methods will describe the different views between both the public and the experts' views in order to fully understand the significant difference between both of them, reflect the level of awareness before designing the new framework, this can be considered one of the novelties and the research gap between this study and the previous studies, and* **RQ4: How do the views of local experts impact on the creation of a sustainable urban development framework for cities, including their vision for their development and desired future domestic features?**

6.1 Introduction

In order to answer RQ3, the views of both the public and the experts' will be analysed. These results are taken from the public survey (Chapter 4) and the delphi questionnaires (Chapter 5). These will be analysed using statistical methods in order to identify the significant differences. This will enable investigation of the different perceptions between the public perceptions and the experts' views towards urban sustainability development factors. This is important due to the fact that differencing viewpoints between policy-makers and the public will impact on the usability of the framework in practice. To answer RQ4, this chapter will utilise the results of the three rounds of the Delphi questionnaires that have been conducted with the expert panel to design the proposed comprehensive sustainability framework.

As described previously, three Delphi rounds were used to develop the framework. Each round aims to reach consensus and receive feedback about the list of indicators. The analysis of the public and expert views and the development of the new sustainability framework will be built on ratings of the factors proposed in the three Delphi rounds. The factors receiving low ranks will not feature in the new framework. The sections of the Delphi rounds included the indicators

and sub-indicators listed in both Tables 6.1 for the two dimensions represented by future urban planning and future domestic requirements, (Italicised items were suggested by the experts in the round 1.) and 6.2 will show the indicators and sub-indicators a set of urban sustainable development factors below, (Italicised items were suggested by the experts in the round 1.)

Table 6.1 The indicators and sub-indicators of two main dimensions (city's future vision and domestic features) (* Italicised items were suggested by the experts in the round 1.)

Dimension	Indicator	Sub-indicators	Round 1		Round 2		Round 3		Status
			Mean	SD	Mean	SD	Mean	SD	
Future vision	Planning strategies	Establish satellites cities around the capital	4.31	0.87	4.34	0.70	-	-	Achieved
		Residential cities	3.32	1.41	4.28	0.90	-	-	Achieved
		Industrial	4.72	0.53	4.04	0.61			Achieved
		commercial	4.37	0.69	3.57	0.85	-	-	Achieved
		Administrative city	4.6	0.65	3.	0.85	-	-	Achieved
		<i>Comprehensive environmental protections laws</i>	-	-	4.26	0.75	4.72	0.88	Achieved
	Land use and site selection	Green belt	4.77	0.6	4.7	0.53	-	-	Achieved
		Location of multiple satellites cities: Suburban	3.9	0.9	4.1	0.88	-	-	Achieved
		<i>Develop the suburban areas</i>	-	-	3.91	0.98	3.94	0.8	Achieved
		<i>Attractive tourist places within a green belt</i>	-	-	4.39	0.84	4.42	0.71	Achieved
<i>Buffer zone</i>		-	-	4.11	0.9	4.2	0.77	Achieved	
Future domestic features	Minimum design requirements	A single family dwelling unit: Area of 150-200 sq.m	3.56	0.83	4.05	0.8	-	-	Achieved
		Reduce no. of spaces: Living room, kitchen, 2 bathrooms	4.05	0.82	4.04	0.68	-	-	Achieved
		No. of bedrooms: 3-4	3.68	0.44	4.01	0.65	-	-	Achieved
		<i>Adopt green building design</i>	-	-	4.4	0.62	4.35	0.59	Achieved
	Housing patterns	A mix pattern	4.26	0.85	4.25	0.82	-	-	Achieved
		A single family house	3.75	0.93	4.04	0.88	-	-	Achieved
		High-rise building (flats)	3.72	0.96	3.68	0.97	-	-	Achieved
		<i>Multiple types of housing areas</i>	-	-	4.44	0.66	4.53	0.63	Achieved
	Housing well-being	Use daylight vs. artificial lighting	4.55	0.67	4.79	0.45	-	-	Achieved
		Adopt effective natural ventilation	4.6	0.55	4.74	0.55	-	-	Achieved
		<i>Affordable housing</i>	-	-	4.7	0.5	4.71	0.53	Achieved
		<i>Improve quality of indoor climate</i>	-	-	4.61	0.6	4.68	0.58	Achieved

The remainder of this section will firstly, summarise the set of indicators generated following the Delphi consultation, then the differing views between the public and experts based on statistical analysis will be analysed. Finally, the sustainability framework will be presented.

6.2 Summary of urban sustainability indicators

This section will describe the set of sustainability indicators that were generated from the Delphi Survey. Many of the suggested indicators were considered very important or important and added as additional indicators integrated throughout each of the categories. Table 6.2 documents the detailed indicators, sub-indicators, and the additional indicators with their results as a set of urban sustainability factors, which is represented the third dimension of the proposed framework, while the following text discusses each category in more detail:

Environmental Indicators: includes six factors from the environmental indicators and four factors from the ecology indicator. Most of these environmental and ecology factors were rated very important and important, the average mean rank between 4 and 4.5. The results show the top factor in this category was to reduce pollution, ranked 4.85, followed by green areas e.g. parks, rated 4.81 out of 5. This was followed by waste separation and recycling, rated at 4.77. The least important item was water bodies, rated 4.04.

Water indicators: The most significant factor in hot dry regions including Iraq. Because of, Iraq has recently experienced water shortages because of an increase in desertification. There are different strategies to monitor water usage for future applications and enhance the efficiency of the water system. This category involves 5 factors. The findings revealed that 'Water conservation', 'Provide onsite water quality' and 'efficient water systems' were deemed to be very important with mean ranks of 4.8, 4.71 and 4.7, respectively. The remaining factors 'diversity of water resources' and 'wastewater recycling' were rated as important with means of 4.14 and 4.45, respectively as listed in Table 6.2. Regarding

Energy indicators, this study emphasised the minimisation of energy consumption as one of the most important factors to reduce CO₂ emissions and environmental pollution. The findings of three Delphi rounds showed that 'Use alternative renewable energy e.g. PV solar' and 'minimising energy consumption' were rated the most important indicators with means of 4.57 and 4.55, respectively. This study also focused on the using of solar energy techniques for new buildings, but some suggested techniques were not rated as functional e.g. 'Use solar wall techniques' and 'PV on external windows'.

Transportation, infrastructure and public services and utility factors: these included public transport, walkability, and safe streets. The most popular factors were 'mitigate traffic congestion' and 'walkability' (means = 4.77) to tackle the major problem of traffic congestion in the capital Baghdad. The third important factor was 'diversity of transport modes' (mean =

4.53) as compensation for the acute shortage of alternative transport solutions including buses, subways and trains. The lowest rated factor was 'use of private car' (mean = 2.89) as an essential method of transportation. Current acute traffic congestion is the result of the use of private cars by local families as there are no other modes of public transport available.

Cultural factors: this category includes four urban factors that deal with community culture. The most important indicator was 'preservation of traditional building' rated with a mean of 4.58. This was followed by 'promote the use of natural lighting for diversity building' (mean = 4.42). The lowest rated factor was 'promote traditional design for the new buildings' (mean = 3.99). In the context of **Social factors**, there are three urban indicators in terms of social context, a further two indicators added by the expert panel. The most important factor was 'fines for violators' (mean = 4.67) including those who tamper with public services, violate laws and regulations thus increasing social problems. The next important indicator was 'provide social awareness programs through educational system (curriculum)' (mean = 4.57). The remaining indicators were considered to be the least important and included 'promote intensive social programs', 'stakeholders' participation in decision-making', 'skills improvements programs', and 'women involvement'.

In terms of **Innovation factors**, the five factors related to the innovation indicators were all rated as less important because the experts considered this category as secondary to the need to enhance essential requirements. That said, the most important indicator was 'Use of innovative methods' (mean = 4.37) because of the aim to develop current and future applications.

Safety and security factors: the experts rated safety and security indicators as a significant issue because of policy problems and deteriorations in security. Four safety indicators emphasised identifying protection policy, both at the city and individual building level. The most important indicator in this context was 'provide camera security onsite' and 'provide smart existing doors' (means = 4.49) because of the aim to improve difficult living conditions in politically-unstable regions. 'Fire alarm system' was rated to be the important factor. One of the most important factors is **Economic factors**, this category includes eight indicators all of which were rated as important to the development of the local economy. That said, two were rated as less important than the others; 'foreign experience' and 'commercial awareness programs onsite' (means of 3.96) because of encouragement from the experts to employ locals to reduce the high percentage of unemployment. 'Diversity of economic activities instead of a single economy (oil)' has occupied the most important position (mean = 4.9) among a set of overall urban sustainability indicators due to the sharp decrease in the state budget which is dependent on the export of oil, this declining from time to time. As a result, this issue has negatively affected the labour market and the economy of the country. This was followed by,

'employment' (4.75) as the second important factor, strongly related to the previous indicator. **Management factors**, there are six factors in this section which were rated as important or very important, the experts considering these key to enhance public services and facilities for the local population. One of the most significant indicators was 'ensure long-term maintenance' (mean = 4.66) followed by 'use an electronic governance system' (mean = 4.61) because of the need to change the traditional system. In addition, 'mitigate traffic congestion and 'comprehensive updates schemes' were rated as very important factors (means = 4.51) due to the essential need to mitigate traffic problems and develop institutional work i.e. municipality activities and research, as illustrated in Table 6.2.

Table 6.2 The indicators and sub-indicators for a set of urban sustainable development factors (* *Italicised items were suggested by the experts in round 1.*)

Indicator	Sub-indicators	Round 1		Round 2		Round 3		Status
		Mean	SD	Mean	SD	Mean	SD	
Environment and Ecology	Reduce pollution	4.72	0.53	4.85	0.36	-	-	Achieved
	Vegetation cover and green areas	4.7	0.53	4.81	0.5	-	-	Achieved
	Site micro-climate	4.37	0.69	4.45	0.66	-	-	Achieved
	Waste separation and recycling	4.6	0.65	4.77	0.46	-	-	Achieved
	Use sustainable construction materials	4.26	0.75	4.34	0.7	-	-	Achieved
	Shaded streets and protected open spaces	4.36	0.71	4.51	0.66	-	-	Achieved
	Water bodies	4.01	0.86	4.06	0.86	-	-	Achieved
	Balance ratio between green spaces and built-up areas	4.56	0.59	4.72	0.56	-	-	Achieved
	<i>Conservation of agriculture land</i>	-	-	4.74	0.55	4.71	0.6	Achieved
Water	Water conservation	4.77	0.53	4.83	0.42			Achieved
	Onsite wastewater recycling	4.32	0.71	4.58	0.66			Achieved
	Provide onsite water quality	4.67	0.6	4.75	0.47			Achieved
	Diversity of water resources onsite	4.07	0.8	4.21	0.83			Achieved
	<i>Efficiency water system</i>	-	-	4.6	0.62	4.8	0.44	Achieved
Energy	Minimise energy consumption	4.52	0.69	4.58	0.63			Achieved
	Use of insulation	4.4	0.73	4.58	0.63			Achieved
	Use alternative renewable energy	4.44	0.7	4.7	0.6			Achieved
	Smart energy management	4.19	0.79	4.31	0.89			Achieved
	<i>Smart and safe energy distributed system</i>	-	-	4.06	0.75	4.34	0.64	Achieved
	<i>Smart solar heating water</i>	-	-	4.22	0.83	4.24	0.8	Achieved
	Use the PV on top of the building	4.33	0.77	4.35	0.77	-	-	Achieved
Transportation	Promote of public transport	4.75	0.45	4.89	0.37	-	-	Achieved
	Walking as a mean of mobility particularly nearby distance	4.34	0.7	4.89	0.37	-	-	Achieved
	Use of private car	3.08	0.94	2.7	0.81	-	-	Achieved
	Mitigate traffic congestion	4.7	0.56	4.83	0.42	-	-	Achieved
	Provide bicycle streets networks	3.91	0.9	4	1.05	3.96	0.98	Achieved
	Safe streets network onsite	4.27	0.74	4.43	0.77	-	-	Achieved
	Diversity transport modes	4.67	0.63	4.83	0.42	-	-	Achieved
	Public car parking availability	4.38	0.77	4.45	0.72	-	-	Achieved
Public services and infrastructure	Provide activities areas for the elderly and disabled	4.2	0.81	4.45	0.72	-	-	Achieved
	Designated activities areas for children's play areas	4.49	0.64	4.77	0.46	-	-	Achieved
	Provide recreational facilities	4.36	0.72	4.6	0.53	-	-	Achieved
	Promote cultural activities	4.04	0.85	4.21	0.81	-	-	Achieved

	Develop health care centres	4.24	0.61	4.66	0.55	-	-	Achieved
	Emergency paths network	-	-	4.42	0.71	4.4	0.6	Achieved
	Use of camera security system	-	-	4.55	0.69	4.62	0.6	Achieved
Social and cultural	Preservation of traditional building	4.55	0.72	4.6	0.65	-	-	Achieved
	Promote traditional design for the new buildings	3.98	0.84	4	0.87	-	-	Achieved
	Provide the hierarchy in public and residential places	4.07	0.82	4.19	0.75	-	-	Achieved
	Promote use of natural lighting and for diversity buildings	4.41	0.68	4.43	0.66	-	-	Achieved
	Promote intensive social programs	4.57	0.62	4.57	0.6	-	-	Achieved
	Provide social awareness programs through educational curriculum	4.55	0.59	4.53	0.6	-	-	Achieved
	Stakeholders' participation in decision-making	4.53	0.64	4.51	0.6	-	-	Achieved
	Skills improvements programs, women involvement	-	-	4.18	0.71	4.23	0.73	Achieved
	Fines for violators	-	-	4.7	0.57	4.64	0.56	Achieved
		Smart shading devices	3.91	0.8	3.91	0.78	-	-
Innovation factors	Use travel time management system	4.21	0.7	4.32	0.61	-	-	Achieved
	Use smart traffic system	4.38	0.75	4.36	0.65	-	-	Achieved
	Provide smart guidelines in the buildings	4.04	0.85	4.26	0.76	-	-	Achieved
	Adopt Building Information Modelling (BIM)	-	-	4.17	0.77	4.14	0.8	Achieved
Economic factors	Promote investment	4.63	0.58	4.62	0.58	-	-	Achieved
	Develop the tourism sector	4.45	0.66	4.55	0.69	-	-	Achieved
	Employment	4.74	0.5	4.75	0.51	-	-	Achieved
	Foreign experience	4.11	0.8	3.81	0.83	-	-	Achieved
	Promote use of local materials	4.56	0.64	4.7	0.5	-	-	Achieved
	Diversity of economic activities instead of single economy (oil)	-	-	4.87	0.44	4.92	0.27	Achieved
	Cooperating between public and private sector	-	-	4.58	0.6	4.64	0.55	Achieved
	Commercial awareness's programs onsite	-	-	3.87	0.91	4	0.69	Achieved
Management factors	Reduce Life Cycle Assessment (LCA) cost	4.24	0.7	4.47	0.66	-	-	Achieved
	Ensure a long- term maintenance and management	4.59	0.55	4.72	0.56	-	-	Achieved
	Use an electronic governance system	4.57	0.62	4.64	0.68	-	-	Achieved
	Establish postal code system	4.21	0.72	4.3	0.86	-	-	Achieved
	Create various opportunities for local people to participate in multiple activities	4.39	0.77	4.3	0.77	-	-	Achieved
	Comprehensive updates schemes	-	-	4.4	0.76	4.62	0.56	Achieved

6.3 Analysing the differing views of experts and the general public

This section answers the third research question by comparing the views of experts and the general public in Iraq, which will reveal any differences in the public's and experts' views of urban sustainable development factors/indicators. This is important as differences in viewpoints will identify areas of the developed framework that will face increased tension when deployed in reality.

To compare the views of experts and the general public, the 18 urban sustainable development goals were analysed to identify the differences in viewpoints.

There were 19 common elements between the two surveys, questions regarding the 18 urban sustainable development indicators and an open question regarding' the importance of establishing sustainable cities in Iraq. This was included in order to measure the community's awareness towards urban sustainable development issues.

These common elements have been tested via statistical methods (internal consistency and reliability by using Cronbach's alpha coefficient; sample adequacy with Bartlett's test ; factor analysis principal component analysis, PCA) to generate a significance value for each variable and to identify the significant factors depending on the characterisation of a group of correlated variables. The t-test will then be applied to identifying the differences among the 19 common items), as shown in Tables 6.3, 6.4 and 6.5.

6.4 Statistical methods used in the analysis

To explore the common factors of the relationships between the viewpoints of experts and the public the following statistical tools have been used;

First, internal consistency and reliability were identified via Cronbach's alpha coefficient (α) (Cronbach 1951). This coefficient α provides a single value to assess internal consistency or average correlation of survey factors to measure reliability (Webb et al. 2006). Many studies have claimed that $\alpha = 0.70$ and higher is an acceptable level of reliability (Katz et al. 2007; Tavakol and Dennick 2011).

Second, Factor analysis attempts to identify underlying variables that explain the pattern of correlations within a set of observed variables and is often used in data reduction to identify a small number of factors that explain most of the variance that is observed in a much larger number of manifest variables. The factor analysis model specifies that variables are determined by common factors (estimated by the model) and unique factors (which do not overlap between observed variables).

The purpose of factor analysis is to uncover the latent structure of multiple variables; that is to reveal any latent variables that explain the correlations among the variables, called dimensions. Therefore, factor analysis is based on the assumption that all variables are correlated to some degree.

There are many methods to extract factor analysis results, PCA (Principal Components Analysis), which is available in many statistical software packages, including SPSS, is an easiest method for creating new structures called (principal components). Principal Component Analysis (PCA) is an important statistical tool to identify the underlying structure by characterising/classifying a group of correlated variables. The significant of a component is evaluated by examining scree plots and the contribution of each individual component to the total of variance more than 5 %. Variance Maximization (varimax), as an orthogonal rotational strategy, is used as the result of the PCA. Rotation generally reduces the number of factors, where the variables under investigation/processing have high loadings, resulting the interpretation of the analysis easier (Floyd and Widaman 1995; Mourshed and Zhao 2012).

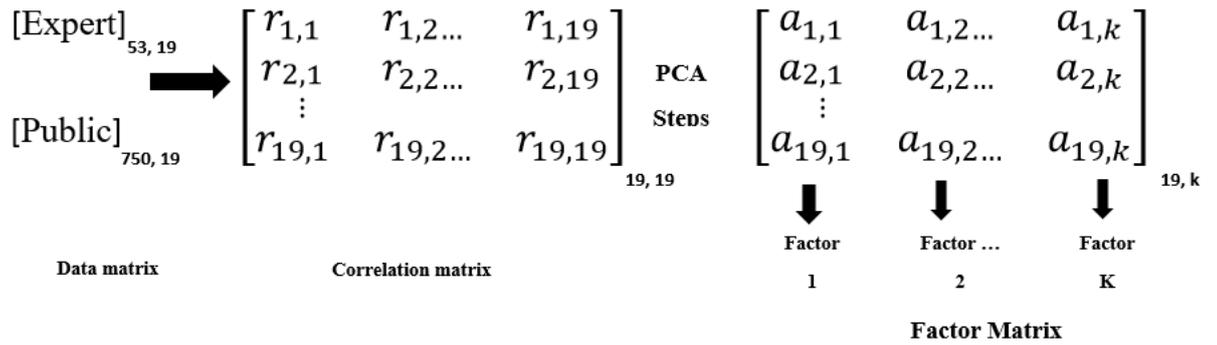
These structures are considered linear composites of the original variables and are uncorrelated. The first principal component accounts for as much as possible of the variance; the second principal component accounts for as much as possible of the remaining variance, and successively for the rest of the principal components.

Since the PCA is based on a mathematical transformation resulting from a number of vectors that is equal to the dimension of the correlation matrix in the factor analysis, i.e. to the number of variables (r).

Eigenvalues are a special set of scalars associated with a linear system of a correlate matrix. They are used to reduce dimension space in such a way that instead of analysing r factor ($r= 19$ in this study), it is meaningful to select a few of them much less than r . The rule of determining the number of factors is simply restricted to the number of Eigenvalues that their values exceed (1) (Tools 2018).

$$\frac{E_1 \geq E_2 \geq \dots \geq E_K}{\text{No. of selected factors}} \geq \frac{E \leq 1.0 \geq \dots \geq E_{19}}{\text{factors ignored}}$$

This means that PCA begins with 19×19 correlation matrix, to extract a factor matrix of $19 \times k$ dimensions, where k is the number of factors. Generally, k is much less than r and this facilitates the explanation of the interrelationships between the nineteen variables (Schmidt 1997).



Each factor represents a structure (pillar) that should be explained as a package. The researcher takes each factor, looks at the significant values (a 's > 0.4) of the factor and defines the factor in the light of its components (Schmidt 1997; Tools 2018).

The extracted PCA factors are usually followed by a rotation process to reduce the number of items on which the different variables have high loadings (usually < 0.4), which makes interpretation of the analysis easier (Floyd and Widaman 1995; Mourshed and Zhao 2012). Variance Maximization (Varimax), was applied using the initial findings of the PCA.

Third, Bartlett's test of sphericity is used to identify significant correlations between items. Sampling adequacy is assessed using Kaiser-Meyer-Olkin (K-M-O). If the value of K-M-O is more than 0.8, then it can be considered good and indicates that PCA is a useful way to interpret these variables (Cerny and Kaiser 1977).

The t-test method can measure and investigate the size of the difference of two means relative to the variation in the sample data. The t-value is simply estimated as follows:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1-1} + \frac{s_2^2}{n_2-1}}}$$

where \bar{x}_1 and \bar{x}_2 are the expected means; s_1^2 and s_2^2 are the corresponding variances; and n_1 and n_2 are the sample sizes. The calculated value is compared with t - standard table, under $n_1 + n_2 - 2$ degrees of freedom. The comparison result gives the evidence of the significant difference if $t_c > t_t$.

6.5 Results

Fitness of data is an important value to show in this study, there are two datasets have been used, as shown in Tables 6.3 and 6.4. The first dataset is the experts, with a matrix of 53 observations and 19 variables as a part of urban sustainable development factors. The second dataset is used for the public, with a matrix of 750 observations and 19 variables.

The variables of the two sets are quantitative, and the data for which Pearson correlation coefficients can sensibly be calculated are suitable for factor analysis. Cronbach's alpha (α) test has been used to test the assumption of reliability (internal consistency) (i.e. how closely related a set of items are a group), where: $\alpha \geq 0.9$ shows an excellent internal consistency; $0.8 \leq \alpha \leq 0.9$ shows a good internal consistency; and $0.7 \leq \alpha \leq 0.8$ shows an acceptable internal consistency. The results of Cronbach's test have shown that: (a) the public's data is of excellent internal consistency, where $\alpha=0.934$; and, (b) the experts' data set is of good internal consistency, where $\alpha=0.830$.

The K-M-O test measures how suited the data is for factor analysis. The results of the K-M-O test show that: (a) the level of public sampling adequacy is good. (K-M-O=0.956), where the sample size of the public survey is ($n=750$); and, (b) the level of experts sampling adequacy is less than public sampling adequacy, (K-M-O= 0.599), which is considered a mediocre level because the sampling size is less than the public respondents. The factor analysis model is extracted (by using PCA) for each of the two sets to investigate the number of underlying factors. The extracted factors have been rotated by the varimax method. The next sub-sections will present the findings of the PCA, in terms of the public's views and the experts' consultation, then the results of the t-test for the same 19 common items in order to show the differences among the categories as shown in the following Tables 6.3, 6.4, and 6.5.

6.5.1 Results of the Expert Views Analysis

The main results of PCA will analyse the experts' views (see Table 6.3). There are 19 variables listed in the first column, followed by the Rotated Component Matrix, which contains six factors. The last two columns of Table 6.3 represents the explained variance (communalities) and the unexplained variance, which means (1- explained variance). At the end of the table, there are three rows, one of the Eigenvalues (E.V), followed by total variance explained % and the Cumulative %. Six Eigen values are < 1 ; $e.v1= 4.133$, $e.v2= 1.99$, $e.v6=1.228$, and hence the rotated component Matrix has six factors.

Table 6.3 Factor analysis of experts' variables

Rotated Component Matrix-Experts

Variables	Factors						Communalities (explained variance)	Unexplained variance (1-explained)
	1	2	3	4	5	6		
1. Walking or bike as a mean transport	0.781						0.732	0.268
2. Improve social activities	0.680			0.354			0.697	0.303
3. Social awareness programs	0.676	0.331					0.702	0.298
4. Renewable energy sources		0.736					0.700	0.3
5. Reduce pollution		0.711					0.627	0.373
6. Parks and green areas		0.598	0.339				0.752	0.248
7. Mitigate traffic congestion		0.565		0.516			0.712	0.288
8. Promote investment			0.863				0.603	0.397
9. Employment			0.711				0.594	0.406
10. Minimise energy consumption	0.336		0.530	0.469			0.710	0.29
11. Promote cultural activities				0.746			0.632	0.368
12. Improve educational and health services			0.433	0.586			0.754	0.246
13. Smart energy management	0.351	0.393		0.561	0.349		0.706	0.294
14. Alternative materials					0.735		0.565	0.435
15. Waste recycling and separation					0.726		0.499	0.501
16. Use of insulation					0.632		0.655	0.345
17. The importance of establishing sustainable cities in Iraq	0.425					-0.708	0.771	0.229
18. Promotion of public transport	0.473					0.606	0.606	0.394
19. Wastewater recycling						0.587	0.634	0.366
Eigenvalues (E.V)	5.133	1.990	1.671	1.361	1.269	1.228		
Total variance explained %	27.015	10.473	8.795	7.164	6.676	6.465		
Cumulative %	13.500	25.970	37.611	48.459	58.980	66.587		

These factors explained 66.6% of the total variance. The first factor explained the maximum variance of 27% and the second explained 10.5%. The other four successive components explain progressively smaller portions of the variance, as shown in the lower part of Table 6.3. The first factor includes significant loadings (< 0.4) of the walking or bike as a mean of transport, improve social activities, and social awareness programs variables, with 0.78, 0.68, 0.68 respectively, and with less loading value (0.47) of promotion of public transport. This reflects the “impact of social consideration as a most important pillar” of the proposed local comprehensive sustainability framework for Baghdad.

The second factor includes four significant loadings of renewable energy sources, reduce pollution, parks and green areas, and mitigate traffic congestion variables, with 0.74, 0.71, 0.60, 0.57 respectively. It is obvious that the second-factor structure reflects an “energy and environment pillar”.

The third factor, which explains 8.8% of the total variance, includes the promote investment (0.86); employment (0.71) and with less loading value of minimum energy consumption variables. This factor reflects the impacts of “creating jobs”.

The fourth factor, with less variance explained (7%), refers to the impact of basic service basic needs. The highest loadings of this factor are shown with (promote cultural activities and improve educational and health services) with 0.75 and 0.59, respectively.

The fifth factor explains about 6.6% of the total variance and reflects the impact of “smart energy and management”, including alternative materials (0.74); waste recycling and separation (0.73); use of insulation (0.63).

The last factor explains 6.5% of the total variance only, which is the least importance of the six factors, high loadings of promotion of public transport (0.6) and wastewater recycling (0.59) towards a negative high loading of -0.71 reflects the unstable vision of the respondents.

Communality can now be defined as an individual variable that represents the total variance of the variable, this means that the variable is considered related highly with other variables, and vice versa. The communalities in Table 6.3 indicate the common variance shared by factors with given variables. Higher communality indicates that a larger amount of the variance in the variable has been extracted by the factor solution. To achieve better measurement of factor analysis, communalities should be 0.4 or greater.

To show the relative importance of each of the 19 variables of the sustainability approach, the common variance, shared by the main six factors has been used. The main pillars of the expert consensus have shown that the 19 variables are being listed from the high level of common variance extracted from the factor model to the lower level as follows: 17, 12, 6, 1, 7, 10, 13, 3, 4, 2, 16, 19, 11, 5, 18, 8, 9, 14, and 15. It is obvious to indicate that the relative importance of each variable decreases as the value of its communality decreases.

6.5.2 Analysing the Public's Views

The main findings of the public factor analysis are shown in Table 6.4. In this table, the same 19 variables shown in the first column, followed by the Rotated Component Matrix, including two factors. While the last two columns represent the explained variance (communalities) and unexplained variance, considering (1- explained variance). At the end of the table there are three rows same as shown in Table 6.3, but the Eigenvalues (E.V) in Table 6.4 has two factors of the Rotated Component Matrix from the highest value (E.V) = **10.156** of the first, while the lowest value (E.V) = **1.670** of the second factor.

Two common rotated factors are extracted with a total variance explained of 62.2%. The first factor explained more than half a total variance (53.5%) and hence is considered as the main pillar of public vision on local comprehensive sustainability framework for Baghdad. The structure of this factor shows a very interesting conclusion: 12 variables out of the 19 variables are of significant factor loadings values (each ≥ 0.4).

Unlike the expert's vision, with six deterministic pillars on the local comprehensive sustainability framework for Baghdad, the first factor of public vision shows clear consensus. These variables are described as traditional indicators of socio-economic characteristics. Therefore, factor one is considered as a "traditional socio-economic pillar."

The second factor, explains only 8.8% of the total variance. This factor consists of significant factor loadings of the rest six variables; waste recycling and separation; smart energy management; alternative materials; wastewater recycling; renewable energy sources; walking or bike as a mean of transport; and concern about future sustainable cities. This means that the new approach of management and materials comes as a secondary interest from a public point of view. Therefore, the second factor could be defined as a "little knowledge of urban sustainable development

approach' reflecting on the application/adoption of the new local comprehensive sustainability framework for Baghdad.

Table 6.4 Factor analysis of public variables

Variables	Rotated Component Matrix		Communalities (explained variance)	Unexplained variance (1-explained)
	Factors			
	1	2		
1. Improve social activities	0.840		0.313	0.687
2. Increase educational and health services	0.833		0.381	0.619
3. Mitigate traffic congestion	0.816	0.334	0.719	0.281
4. Promote cultural activities	0.773	0.324	0.778	0.222
5. Employment	0.733		0.780	0.220
6. Reduce pollution	0.772	0.350	0.703	0.297
7. Promotion of public transport	0.765	0.333	0.766	0.234
8. Maximise the use of insulation	0.701		0.734	0.266
9. Minimise energy consumption	0.506	0.354	0.696	0.304
10. Waste recycling and separation		0.782	0.655	0.345
11. Smart energy management	0.336	0.755	0.577	0.423
12. Alternative materials		0.732	0.593	0.407
13. Wastewater recycling		0.716	0.684	0.316
14. Renewable energy sources		0.707	0.628	0.372
15. Walking or bike as a mean transport		0.657	0.708	0.292
16. Social awareness programs	0.443	0.652	0.520	0.48
17. Promote investment	0.359	0.642	0.663	0.337
18. Parks and green parks	0.534	0.615	0.541	0.459
19. Concern about future sustainable cities		0.489	0.622	0.378
Eigenvalues (E.V)	10.156	1.670		
Total variance explained %	53.451	8.790		
Cumulative %	53.451	62.241		

The total variance of each variable explained by the two common factors is shown in Table 6.4. Except two variables (improve of social activities and increase of educational and health services), which show high unexplained variance (0.69, and 0.62 respectively), all the other variables are considered to have significant common variances. The relative importance of the seventeen common variables in terms of their communality value are as follows: 5 ,4 , 7,8 ,3,15, 6, 9, 13, 17, 10,14,19,12,11,18, and 16.

The most important variable is 'employment' with communality, 78%, which could be reflected the ambition of the public towards job opportunities to enhance their economic aspect and improve the quality of life. Followed by the second important variable, which is 'promote cultural activities' about 77%, then 'promote public

transport' ranked as the third important variable by 76%. While the lowest communality is 'Improve social activities' rated by 31%.

6.5.3 Discussion and description of the differences

In this study, there is a need to understand the differences between the responses of both the public and the experts. It is believed that the level of awareness, experience, and cultural background of the public and experts have their effects on the responses of each of the two groups in terms of the nineteen indicators of the local comprehensive sustainability framework of Baghdad. T-test has been used to identify the evidence of significant differences. Table 6.5 shows the final calculations of the t-test.

Therefore, this study has used a t-test approach to identify the evidence of a significant difference between two means ranks for both the public survey and the experts' questionnaire, reflecting their awareness, experience, and cultural background.

Table 6.5 shows the final calculations of t-test: 13 of the differences between the public-expert mean responses are significant.

Table 6.5 T-test summary of the differences between public-expert mean responses

Indicator	Mean Response		t-value	Conclusion
	Public	Experts		
1.The importance of establishing sustainable cities in Iraq	4.47	4.34	-1.36	No difference
2.Minimise energy consumption	4.48	4.85	9.96	High significant difference
3.Reduce pollution	4.55	4.77	3.87	High significant difference
4.Mitigate traffic congestion	4.32	4.34	0.26	No difference
5.Improve social activities	4.68	4.79	1.98	Significant difference
6.Increase cultural activities	4.14	4.58	5.41	Very high significant difference
7.Increase educational activities	3.92	4.58	8.41	Very high significant difference
8.Promote the use of public transport	4.2	4.58	4.83	Very high significant difference
9.Providing job opportunities	4.46	4.70	3.09	Very high significant difference
10.Maximise the use of insulation	4.46	4.13	-2.74	High significant difference
11.Renewable energy sources	4.53	4.83	7.11	Very high significant difference
12.Smart energy management	4.35	4.89	13.75	Very high significant difference
13.Use of alternative materials	4.27	4.49	2.24	Significant difference
14.Waste recycling and separating	4.46	4.45	-0.09	No difference
15.Use wastewater recycling	4.27	4.21	-0.55	No difference

16. Walking and bike as a mean transport	4.41	4.66	3.63	Very high significant difference
17. Parks and green spaces	4.5	4.62	1.56	No difference
18. Promote investment	4.48	4.57	1.17	No difference
19. Social awareness programs	4.36	4.75	6.17	Very high significant difference

* Compared to t- tabulated value with $n_1 + n_2 - 2$ degree of freedom

$$t(801, 10\%) = 1.65 \quad t(801, 5\%) = 1.96 \quad t(801, 0.01) = 2.58, \quad t(801, 0.001) = 3.29$$

This has shown the vision and attitudes of the public and the experts are different in most of the variables. The mean response of six variables are similar, those variables are 1, 4, 14, 15, 17, and 18, as shown in Table 6.5. This indicates that the effect of the specialist and high education levels is not significant in terms of these variables, which could be because of most of the public respondents and the experts expressed their opinions according to their daily experience and the assessment of the existing city's applications, as well as their hope to raise and improve the quality of life for the current and coming years.

The impact of using statistical analysis *t* to validate the findings of this study show the significance and differences of the respondents' attitude with the various variables. These statistical methods can be used for further studies of the public's views or experts' consultation to validate the results. The PCA method and t-test are the most common methods to identify the differences and significant values between the two groups. The findings of the statistical analysis revealed that there are considerable differences between both the general public's perceptions and the experts' views, due to practical experience, cultural background, and awareness towards urban sustainable development issues, reflecting their priorities and daily experience. Consequently, further studies can be adopted for any relevant work need to validate and concrete the results.

This conclusion reflects the effect of awareness, experience, and cultural background of experts on their different views in terms of the thirteen variables compared to public views.

6.6 Development of a comprehensive sustainability framework

The findings of the Delphi rounds produced the information required to form the dimensions, indicators, and sub-indicators based on the consensus-achieved approach.

The new sustainability framework comprises 86 different factors organised into three hierarchical levels, as shown in Table 6.1, Table 6.2, and Table 6.6. The first

dimension is future vision, this consisting of two major strategies, planning strategies and land use, and 11 sub-indicators/strategies. The second dimension includes 3 key indicators and 12 sub-indicators, the third dimension including 12 main indicators and 63 sub-indicators.

The following Table 6.6 details the three main categories, each section including many strategies/indicators which could constitute a locally sustainable framework for the future development of the built environment in Baghdad as described in chapter 5 (Section 5.3.2 and 5.4) . The three main categories are: planning and future vision, semi-automatic criteria for low carbon domestic sector housing, and a set of urban sustainability indicators encompassing the environment, water, energy and socio-cultural indicators in order to enhance well-being at a city level.

In response to this, the proposed framework in Table 6.6 details different strategies including satellite city projects and a green belt around the city.

- Multi-purpose satellite cities and a green belt around the capital: planning and land use play an important role when developing a city plan to meet future requirements including population growth, traffic congestion and environmental pollution. Planning needs to mitigate pressures in the capital city such as high population density and traffic problems while still considering the optimum size of the city. Features which may provide a comprehensive solution and form the shape of a future city, include low energy housing and the use of on-site renewable energy. Suggestions also include establishing a green belt around the city to combat climate change, help to enhance weather conditions and observe the size of a city. One of the problems of existing applications in Iraq is poorly designed strategies to mitigate current and future challenges. This vision for planning and land use strategies could therefore play an important role in the development of the city.
- As Iraq has a hot dry climate, homes need to be built which will reduce energy consumption because this sector currently produces the highest energy demands. One of the most significant problems for existing homes is their poor design. Minimum requirements involve housing area, shading techniques and a minimum number of spaces/rooms (Aldossary et al. 2014a; Ahmad, Hippolyte, et al. 2016; Assefa and Frostell 2007), reducing the homes' area could be required for the average Iraqi family. Air conditioning accounts for almost 70% of the energy demand in the domestic sector. These strategies

would allow for the use of innovations such as on-site renewable energy, solar PV systems, this helping to establish a semi-automatic framework for housing.

- A set of urban sustainability indicators for well-being: The classification of various urban sustainability factors depends on their priority according to the level of importance scale and evaluation process. For example, current guidelines and criteria are not sufficient to meet future requirements such as traditional methods for planning, housing features, environment pollution, water shortages and intensive energy consumption. Therefore, a new set of effective urban sustainability indicators will play an important role enhancing well-being and tackling current and future challenges. The new comprehensive sustainability framework includes dimensions, indicators, and sub-indicators as shown in Table 6.6.

Table 6.6 Local Comprehensive Sustainability Framework for Baghdad (LCSFB)

Dimension	Indicator	Sub-indicators	
Future vision	Planning strategies	Establish satellites cities around the capital	
		Residential cities	
		Industrial	
		commercial	
		Administrative city	
			<i>Comprehensive environmental protections laws</i>
	Land use and site selection	Green belt	
		Location of multiple satellites cities: Suburban	
		<i>Develop the suburban areas</i>	
		<i>Attractive tourist places within a green belt</i>	
<i>Buffer zone</i>			
Future domestic features	Minimum design requirements	A single family dwelling unit: Area of 150-200 sq.m	
		Reduce no. of spaces: Living room, kitchen, 2 bathrooms	
		No. of bedrooms: 3-4	
		<i>Adopt green buildings design</i>	
	Housing patterns	A mix pattern	
		A single family house	
		High-rise building (flats)	
		<i>Multiple types of housing areas</i>	
			Use daylight vs. artificial lighting

	Housing well-being	Adopt effective natural ventilation
		Affordable housing
		Improve quality of indoor climate
A set of urban sustainable development indicators	Environment and Ecology	Reduce pollution
		Vegetation cover and green areas
		Site micro-climate
		Waste separation and recycling
		Use sustainable construction materials
		Shaded streets and protected open spaces
		Water bodies
		Balance ratio between green spaces and built-up areas
		Conservation of agriculture land
		Water
		Onsite wastewater recycling
		Provide onsite water quality
		Diversity of water resources onsite
		Efficiency water system
	Energy	Minimise energy consumption
		Use of insulation
		Use alternative renewable energy
		Smart energy management
		Smart and safe energy distributed system
		Smart solar heating water
	Transportation	Use the PV on top of the building
		Promote of public transport
		Walking as a mean of mobility particularly nearby distance
		Use of private car
		Mitigate traffic congestion
		Provide bicycle streets networks
		Safe streets network onsite
		Diversity transport modes
	Public services and infrastructure	Public car parking availability
		Provide activities areas for the elderly and disabled
		Designated activities areas for children's play areas
		Provide recreational facilities
Promote cultural activities		
Develop health care centres		
Emergency paths network		
Use of camera security system		
Social and cultural	Preservation of traditional building	
	Promote traditional design for the new buildings	
	Provide the hierarchy in public and residential places	
	Promote use of natural lighting and for diversity buildings	
	Promote intensive social programs	

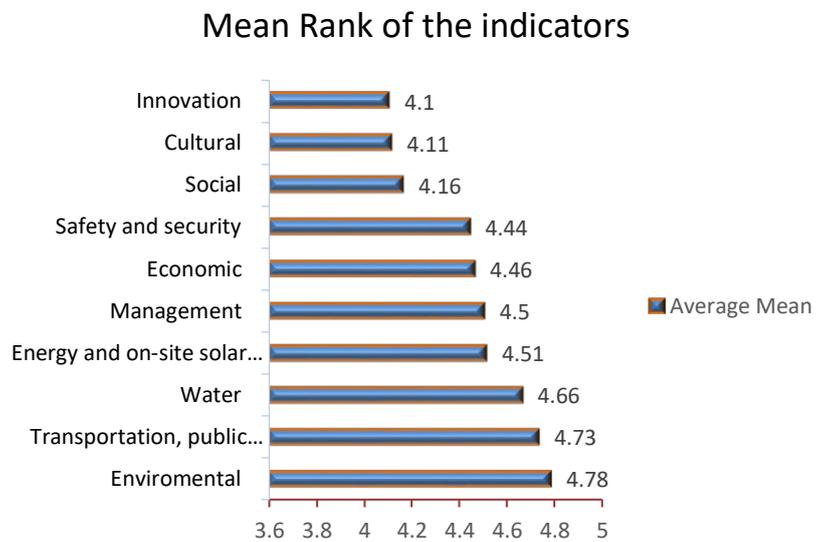
		Provide social awareness programs through educational curriculum
		Stakeholders' participation in decision-making
		<i>Skills improvements programs, women involvement</i>
		<i>Fines for violators</i>
	Innovation factors	Smart shading devices
		Use travel time management system
		Use smart traffic system
		Provide smart guidelines in the buildings
		<i>Adopt Building Information Modelling (BIM)</i>
	Economic factors	Promote investment
		Develop the tourism sector
		Employment
		Foreign experience
		Promote use of local materials
		<i>Diversity of economic activities instead of single economy (oil)</i>
		<i>Cooperating between public and private sector</i>
	Management factors	<i>Commercial awareness's programs onsite</i>
		Reduce Life Cycle Assessment (LCA) cost
		Ensure a long- term maintenance and management
		Use an electronic governance system
		Establish postal code system
		Create various opportunities for local people to participate in multiple activities
		<i>Comprehensive updates schemes</i>

6.7 Prioritisation of the urban sustainability indicators

This section describes the prioritisation given to urban sustainability indicators based on the experts' views. This is the identification of the most important factors required to mitigate problems in the local context. Environmental and ecology indicators were deemed the most important followed by transportation, public services and infrastructure factors (4.73). Water factors were rated as the third important priority because of a recent decline in rainfall percentage and global concerns about climate change. Energy and solar energy techniques were voted as the fourth important priority, with an emphasis on renewable sources such as solar energy. The least significant factor among the ten indicators was innovation possibly because of the need to identify essential factors required to improve the city. The remaining factors were also rated at different mean ranks as illustrated in Table 6.6. This section discusses the order of importance of factors starting with the most important challenges according to expert feedback via the Delphi rounds.

Table 6.7 Rankings of urban sustainable indicators

Indicators	Average/ Mean	SD
Environmental and ecology indicators	4.78	0.45
Water indicators	4.67	0.55
Energy and solar energy indicators	4.51	0.65
Transportation, public services, and infrastructure factors	4.73	0.73
Cultural indicators	4.11	0.67
Social factors	4.16	0.58
Innovation indicators	4.1	0.83
Safety and security indicators	4.44	0.66
Economic indicators	4.46	0.66
Management indicators	4.5	0.69



6.8 Summary

This chapter has highlighted the development of the proposed comprehensive sustainability framework that has been designed based on the findings of the Delphi rounds described in chapter five. It has also analysed the differences between the viewpoints and the general public that have been elicited in the construction of this framework.

86 indicators/factors have included the new comprehensive sustainability framework, represented by three main dimensions as discussed in the previous sections.

The PCA results for both public and experts attitudes showed wide difference between them, due to the wide knowledge and experience between the public and the experts, while the public findings, reflecting their daily experiences and ambition towards the current and future city's applications to enhance their standard of living and quality of life.

The results of the statistical analysis has answered **RQ3: How do the views of the public differ from the generally accepted view of experts in the context of sustainable urban development in Iraq?** The key findings of the statistical analysis revealed that most of the common items showed differences views between the public and the experts, except the mean response of six variables are similar that mean

there are no differences among them. Those variables are 1 (The importance of establishing sustainable cities in Iraq), 4 (Mitigate traffic congestion), 14 (Waste recycling and separating), 15 (Use wastewater recycling), 17 (Parks and green spaces), and 18 (Promote investment), as shown in Table 6.5. This indicates that the effect of the specialist and high education levels is not significant in terms of these variables 6 variables, which might be because of most of the general public and the experts expressed their views based on their daily experience and the assessment of the current public services and utilities.

The findings of the Delphi rounds answered ***RQ4: How do the views of local experts impact on the creation of a sustainable urban development framework for cities, including their vision for their development and desired future domestic features?*** The proposed comprehensive framework was then built based on the findings of the three sequence Delphi rounds as mentioned in the previous sections. In this context, each individual round aimed to achieve consensus and rate the factors of each round to reach consensus and develop the newly created framework. As discussed above, the factors receiving low rates will not be included in the designed framework, this framework has three main dimensions with total factors reached to 86 indicators, including city's future vision, semi-standardise housing features, and a set of urban sustainable development factors. Thus the views of local experts have significantly impacted on the framework by reflecting the effect of their practical experience and knowledge from a variety of different fields.

The expert viewpoint impacted significantly in areas where it differed greatly from the public viewpoint. For example the following variables; 'Minimise energy consumption', 'Reduce pollution', 'Increase educational activities', 'Promote the use of public transport', 'Renewable energy sources', 'Smart energy management', 'Walking and bike as a mean transport', and 'Social awareness programs'. These variables showed 'very high significant differences' as shown in Table 6.5. This indicates that to avoid negative impacts of the implementation of sustainable development the local community needs to raise the level of awareness and influence cultural views towards sustainability issues, especially for those factors that highlighted highly significant differences from the experts' views. If these issues are not overcome then deployment of a sustainable development framework will face significant obstacles.

Chapter 7 Framework Validation: Conduct of Semi-Structured Interviews in Baghdad

*This chapter will validate the proposed comprehensive framework based on semi-structured interviews with 15 intra-organisational leaders. The profiles of 15 experts and leader will be described first. Their interviews with then be analysed. The model will then be discussed with the Baghdad Mayoralty. This will all answer **RQ5: Does the developed framework considering the public survey, experts' consultation, have the potential to improve future urban development and is it fit for purpose in its target context?***

7.1 Introduction

This chapter will answer the fifth research question (*Does the developed framework considering the public survey, experts' consultation, have the potential to improve future urban development and is it fit for purpose in its target context?*) by critically validating the proposed framework via semi-structured interviews (face to face meetings) with different intra-organisational leaders, such as academics, and policy-makers.

The aim of this chapter is to investigate and validate the proposed sustainability framework via interviews with intra-organisational.

The next section will describe the methodology, which uses semi-structured interviews for data collection. This is followed by the description of the experts' panel profile and their occupation. Then, the next section will analyse the interviews. This is followed by a brief description of the modelling approach of the proposed project regarding the capital city's future vision. The final section summarises the chapter.

7.2 Methodology

This study uses a mixed-method approach that combines qualitative and quantitative opinions/viewpoints. It also analyses the results for both interview and worksheet questions.

Combining methods provides in-depth viewpoints through multiple interpretations of experiences, utilising mixed methods allows researchers to reduce and reduce the overdependence on statistical data to discuss a social impact, feasibility, challenging, and applicability, which are mostly subjective to develop sustainability practices (Jogulu and Pansiri 2011). Creswell (2003) claimed that using a mixed methods research approach provided wide viewpoints to avoid the weaknesses of both

categories (quantitative and qualitative), providing researchers with more comprehensive evidence.

This study approaches a mixed-method data collection based on using both interview and simple design research (questionnaire/worksheet). The interviews are aimed at collecting detailed information, viewpoints, and opinions from policy-makers, professionals, academics, and industrial/private sector figures in Iraq. The promotion of sustainability solutions based on their experiences and knowledge will validate and improve sustainability practices in the delivery of future construction projects. This was engaged through a worksheet of questions/sampling of the interview viewpoints from leading various governmental officials and non-governmental organisations. Sampling worksheets were used to eliminate bias and reduce wasted time through interviews and also to receive wider viewpoints from the respondents (Yin 2003). This study has used semi-structured interviews and has included a worksheet of important questions to be asked to the respondent to validate the proposed framework. This will avoid wasted time with experts, as the time available with each individual was between 30-45 minutes.

The panel of interviewees were selected from both official government and non-governmental organisations through purposeful sampling. The panel of interviewees has been selected based on the assessment of responses of the previous rounds of the Delphi questionnaire. The criteria for selecting the panel of the intra-organisational leadership are shown below:

- Their expertise was in the area of water resources management, energy and renewable studies, urban planning, city developers, housing sector, or sustainable development.
- They should have a wide range of intra-organisational leadership with a wide experience and practical knowledge in multiple fields in their organisations.
- They should have the power/influence to effect decision making in relation to the adoption of new policies/plans.

In all, 15 intra-organisational leaders were interviewed. This is a sufficient sample set as, from previous work, where the aim of research is to understand common viewpoints and experiences among a panel of relatively homogeneous expert individuals, 12 interviews should be sufficient (Guest et al. 2006). In fact, some past studies have proven successful with as few as 10 interviews (Opoku and Ahmed 2013).

The interviews were held individually with a duration of between 45 and 60 minutes. A worksheet was used to guide the structure of the interview. The researcher prepared this worksheet of questions to guide the discussion with intra-organisational leaders. The structure of the worksheet is outlined below:

Q1/ What is a level of your understanding as a specialist of the proposed sustainable framework)?

Q2/ What is a level of your acceptance as a specialist of the proposed sustainable framework)?

Q3/ What do you think of the applicability of this framework in Baghdad and what are the challenges facing its implementation (challenges and feasibility)?

Q4/ In your opinion, what are the urgent steps / strategies within the proposed framework of which should be initiated as priorities within the plans for development of Baghdad?

1. Current applications of the capital Baghdad (existing municipalities inside Baghdad)
2. Future projects (new urban development areas)

Q5/ Do you have any further comments/suggestions regarding the proposed sustainability framework (future scope)?

After the interviews, the results were analysed to highlight their results against the key concepts of the validation stage. The process of analysing involves recoding the answers associated with each individual for a each question.

It is important that leaders have a clear understanding of what sustainability framework means to them and their organisations. Even though most interviewees understand sustainability to comprise of the three dimensions of social, environmental and economic impacts of their activities, some simply refer to environmental and social issues as their understanding of sustainability and based on their domains and specialist knowledge.

These interviews with the intra-organisational leadership will help to identify how to apply the proposed sustainability framework in the case study region by adopting a new comprehensive framework.

7.3 Profiles of the Intra-organisational Leaders who were interviewed

Qualitative data was collected through in-depth semi-structured interviews carried out with 15 intra-organisational leaders from different organisation and seven intra-

organisational leaders from several official governments departments charged with the promotion of sustainability practices, as shown in Figure 7.1 These leaders were responsible for promoting, planning, developing and implementing schemes/plans regarding environmental, social and economic sustainability issues in their respective organisations.



Figure 7.1 Intra-organisational leadership (multiple organisations)

These leaders were selected from the expert panel used within the the Delphi rounds based on their positions, qualifications, and their quality of answers, reflecting their knowledge and practical experience.

There is diversity in the job titles of the interviewees, all of whom are engaged in driving the agenda relating to sustainable practices in the construction sector. The profile of leaders within different Iraqi organisations, in particular in urban development and construction sector who were interviewed are listed in Table 7.1.

Table 7.1 Profile of 15 intra-organisational leaders interviewed in Iraq

Interview	Job title	Type of organisation
A	Minster of water resources	Ministry of water resource

B	Manager of national consultation engineering centre	National consultation engineering centre
C	Head of general secretary of prime minister	General secretary of prime minister
D	Head of urban studies institute	National institute of urban studies
E	Manager of housing studies department	Ministry of housing and construction
F	Leader of environmental sustainable development centre	Environmental sustainable development centre
G	Manager of urban design department	Mayorality of Baghdad
H	Leader of renewable energy department	Ministry of electricity
I	Leader of construction projects	Ministry of planning
J	Leader of Iraqi engineers syndicate	Engineers Syndicate
K	Manager of Urban and Regional Planning	Ministry of planning
L	Leader of UN-HABITAT in Iraq	UN-HABITAT program in Iraq
M	Expert in Architecture Sustainable Design	National consultation engineering committee
N	Manager of construction company	Al-Mumar construction company
O	Project Officer and Research Associate in Advanced Sustainable Manufacturing Technologies/ Academia	Centre for Advanced Manufacturing Systems, UK/ University of Technology, Iraq

7.2.1 Analysis of the Interviews

This section will analyse the results of the interviews.

The first expert, 'A', as in Table 7.1, is a leader of water resource management in the Ministry of Water Resources, who mentioned:

I totally agree with the main dimensions of the proposed framework to mitigate the local current and future challenges including water issue in Iraq.

In addition, the minister highly recommended adopting this framework as a roadmap for the local government to solve the locality-specific issues. In terms of challenges, the leader of the water sector claimed that there is a wide consensus from the official government and experts, and water shortage is considered a new challenge that has recently emerged thanks to climate change and rainfall scarcity, and also due to the construction of a large number of dams on the Iraqi border between Turkey and Iran. To combat climate change and water shortage effectively, it is necessary to establish a set of environmental protection laws, particularly in the water sector. Current practice is implemented without attention to sustainability and there is a lack of

evidence to adopt urban sustainable development goals, particularly 'water efficiency system', to tackling water shortage and rainfall scarcity. However, new urban development projects should adopt the concept of 'water conservation' and 'wastewater recycling' to avoid more pressure on the existing applications.

The second expert, 'B', was a manager who expressed his opinion regarding the understanding of the framework:

I highly recommended adopting this framework as a governmental guideline through a qualified teamwork engage with the governmental committee to implement the national strategy for the capital Baghdad.

In terms of existing and future challenges, public services and utilities are the most important priorities that need improvement. Therefore, this issue needs to implement a novel plan to adopt a new framework that should be divided into multiple stages to process the urgent priorities. The successful plan to implement this framework must consider the multiple stages within a limited schedule, such as 2022–2030.

In the interview, expert 'C' described the understanding of the framework:

This framework is considered a key role to develop new urban zones and improve current city applications unless the politically problems impact directly to pose the implementation of the development frameworks.

However, expert 'D' agrees to the three dimensions of sustainability, saying that:

Sustainability framework considers a comprehensive vision of how to develop the whole aspects of our cities and how it impacts directly to improve quality of life and human well-being on the wider local communities.

The understanding of the comprehensive sustainability framework has three dimensions. There are numerous local issues that need to be solved by sustainability research, which will increase the level of understanding among a number of practices in the construction sector. The construction sector is considered to be more aligned towards the sustainability dimensions, including environmental, social, and economic. Intra-organisational leadership and policy-makers have to identify and understand the concept of sustainability framework to adopt its implementation. For instance, expert 'E' mentioned that:

A comprehensive sustainability framework is difficult to implement in this duration due to the politically-unstable conditions in Iraq but it might be applicable whenever the local conditions will enhance towards a government of independent competencies that takes into account the main objectives of

community development; citizen first, climate change and how to mitigate the undesirable impacts, responsible behaviour and social awareness programs, environment issues energy and carbon emissions and low energy homes towards renewable energy.

In addition, expert 'E' demonstrated some of the important challenges need to implement them, including a comprehensive transportation plan, before planning and carrying out of new construction projects/ satellite cities around the capital. Moreover, providing public services and utilities, and strict enforcement laws are the most important factors to create urban sustainable development and a sustainable community.

Expert 'F', who is head of an environmental sustainable development centre, expressed his understanding of sustainability framework by saying that:

I believe in the urban sustainable development framework, there are three fundamental concepts need to be addressed in any sustainability framework represented by; effective governance, innovated technology, and SD educated community, those factors called sustainability wheels. This is shown in Figure 7.2.



Figure 7.2 Sustainability wheels (Opoku and Ahmed 2013)

Interviewee 'G' view pointed that a sustainability framework is essential if we wish to mitigate major issues for the capital Baghdad by dividing the city into three to four main zones, while establishing a green belt around the capital'

Based on his long practical experience, expert 'G' noted that:

This city has suffered from harsh conditions impact directly to increase the level of degradation in multiple aspects such as public services and utilities, educational system and healthcare. Therefore, a comprehensive sustainability

framework is considered a significant value to improve the quality of life-based on enhancing the level of public services, infrastructure, and social awareness programs through 14 municipalities inside the capital. However, a compressive sustainability framework can be adopted through slected various neighbourhoods (see the highlighted section in Figure 7.3), because a neighbourhood is a basic part from the city level, so that by selecting different parts of neighbourhoods across the capital.

This is shown in Figure 7.3.

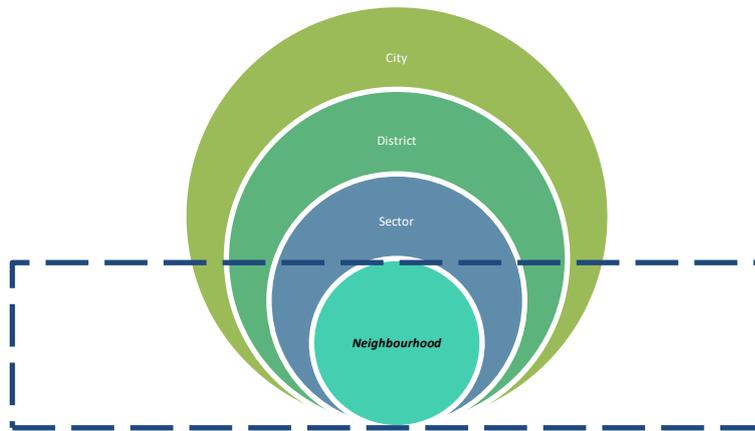


Figure 7.3 The standard of a city scale in Iraq (source: Iraqi housing standard)

Expert 'H' highlighted that:

On-site renewable energy is an essential need to meet future requirements by adopting green architectural design within a ceiling roof in order to implement this technology for the coming years.

He also noted that politically-unstable conditions in Iraq delay the effective planning towards sustainability to move from consumer houses into producer homes by using a PV system for each individual dwelling unit. Expert 'H' also revealed that the current challenge to provide governmental guideline regarding the financial policy to promote demand price marketing of PV cells to be applicable for the coming years, which would increase the quality of life and reduce CO₂ emissions.

Experts 'I' and 'J' claimed similar opinions regarding the understanding of sustainability framework. In terms of urban development projects:

New criteria regarding the housing sector and construction project needed to update according to the current and future challenges. In addition, there is an

essential need to adopt strict laws and establish environmental laws protection in order to create the basic part towards urban sustainable development.

Expert 'K' noted that:

The understanding of a comprehensive sustainability framework including multiple directions of planning stages inside and outside the capital in order to tackle the current and future requirements, e.g. develop the domestic sectors under effectiveness pilot studies, specifically improve the neighbourhoods parts inside the capital, in addition to the establishment the concept of satellite cites or integrated cities around the capital, in particular, administrative city in order to mitigate traffic congestion in the centre of Baghdad.

Interview 'L' recommended adopting urban agenda/strategies with intensive analysis by participating multiple organisations including the consultation committee of the prime minister with various directions, such as the UN-Habitat leaders in Iraq, the Mayoralty of Baghdad, and the Ministry of Planning to optimise the comprehensive plan. In terms of urban strategies:

Sustainable urban criteria regarding the city's applications can be adopted to mitigate the current and future issues including green belts around the capital. Also, there is an essential need to adopt strict laws and establish environmental laws protection in order to create the basic foundation towards urban sustainable development.

Experts 'M' and 'N' advised to update the construction projects criteria in Iraq according to green code or friendly environmental design as a conditional criterion to pose the random projects with lack of effective planning:

The use of effective planning and a comprehensive sustainable framework can lead to developing this city within a short and long term by understanding the weakness design in the current applications, then improving the existing and future requirements.

Finally, Expert 'O' claimed that sustainable manufacturing strategy is the most important issue should be established in Iraq to mitigate multiple problems involving employment due to the economic crisis in this country:

The understanding of a sustainability plan priority should be given to creating jobs opportunities by activating the private sector and setting up smart industrial cities around the capital, including the location of these projects, in order to ensure a comprehensive vision for the near and distant future, effectively contribute to mitigate the organization of the mother city and create of sustainable urban development poles/satellite cities.

The analysis of interviews revealed the full understanding of the experts to adopt the categories of the proposed framework with different directions, beginning with the most important priorities (e.g. environmental issues, water, energy, transportation, and infrastructure and public services) to solve the most urgent issues and improve the community's sense of well-being.

Most of the experts (about 75%) recommended the adoption of the new strategies for the capital city future vision that includes a proposed framework to mitigate major problems in the current and future applications. Consequently, the next section will describe a brief model regarding the capital's future vision, particularly for future planning and land use for the new urban development areas.

The summary and the outline of the semi-structured interviews with the important questions that were discussed are shown in the following Table 7.2 Questions 1 and 2 are not summarised as their role is to establish the understanding of the experts, not perform validation.

Table 7.2 The summary of the key interview analysis (***Bold-italic sentences are quotations***)

Interview	Q3 (challenges & feasibility)	Q4 (urgent strategies/steps)	Q5 (future scope)
A	<p>This framework can be adopted as a roadmap for the local government to solve the locality-specific issues</p> <p>The minister claimed to be applied this framework in the current and future challenges</p> <p><i>'Very highly recommended'</i></p>	<p>A new challenge that has recently emerged, climate change and rainfall scarcity, this issue need to be solved for new generation projects under the concept of environmental sustainability</p> <p><i>'Highly positive commented as there is a wide consensus from the official government and experts to combat water shortage'</i></p>	<p>'To combat climate change and water shortage effectively, it is necessary to establish a set of environmental protection laws, particularly in the water sector'</p> <p><i>'highly recommended establish environmental laws and apply them'</i></p>
B	<p>This framework can be applied as a guideline by developing this work with a qualified teamwork engage with the governmental leaders</p> <p><i>'Highly recommended'</i></p>	<p>Public services and utilities are the most important priorities that need improvement in the existing applications</p> <p><i>'This issue needs to implement a novel plan to adopt a new framework that should be divided into multiple stages to process the urgent priorities'</i></p>	<p><i>'The successful plan to implement this framework must consider the multiple stages within a limited schedule, such as 2022–2030'</i></p>
C	<p>The head of general secretary of prime minister <i>'This framework is considered a key role to develop new urban zones'</i></p> <p><i>'Highly recommended'</i></p>	<p>Improve the <i>existing city applications (infrastructure and public services) the essential challenge</i></p> <p><i>'Improve current city applications unless the politically problems impact directly to pose the implementation of the development frameworks'</i></p>	<p>Pose politically problems and conflict to allow the qualified intra-organisational leaders improve the current and future challenges</p>
D	<p>The capital's future vision is an important issue to improve this city</p> <p><i>'Sustainability framework considers a comprehensive vision of how to develop the whole aspects'</i></p>	<p>There are a number of local issues that need to be solved underline the sustainability practices to avoid more pressure on the existing applications, e.g., housing and construction sector</p> <p><i>'The local communities how it impacts directly to improve quality of life and human well-being'</i></p>	<p>The construction sector should be accumulated towards the sustainability aspects for future projects, including environmental, social, and economic dimensions.</p> <p><i>'Intra-organisational leadership and policy-makers have to identify and understand the concept of</i></p>

	<i>'Positively recommended'</i>		<i>sustainability framework to adopt its implementation'</i>
E	<p>This framework is the key role to implement and solve multiple problems in different directions, but it might be difficult to adopt this duration</p> <p><i>'Mainly recommended'</i></p>	<p>-Combat climate change and undesirable environmental impacts</p> <p><i>'The main objectives of community development; citizen first, climate change and how to mitigate the undesirable impacts'</i></p>	<p>-Establish intensive social programs</p> <p>- Comprehensive transportation plan need to be used</p> <p>- Strict enforcement laws</p>
F	<p>Sustainability wheels need to be implemented via this framework as commented;</p> <p><i>'There are three fundamental concepts need to be addressed in any sustainability framework represented by; effective governance, innovated technology, and SD educated community those factors called sustainability wheels'</i></p> <p><i>'Highly positively commented'</i></p>	<p>Three mainly essential challenges need to be solved throughout this framework; lack of effective governmental plans, pose pressure on the existing applications, and rise the local community towards sustainability issues</p>	<p>-Intensive SD programs for the city developers and policy-makers to adopt the key role of this proposed framework.</p>
G	<p>-Dividing the city into 3-4 main zones to improve the current and future the capital's applications</p> <p><i>'This framework is essential if we wish to mitigate major issues for the capital Baghdad by dividing the city into three to four main zones, while establishing a green belt around the capital'</i></p> <p><i>'Very highly recommended'</i></p>	<p>Improve the current situation of 14 municipalities</p> <p><i>'Enhancing the level of public services, infrastructure, and social awareness programs through 14 municipalities inside the capital'</i></p>	<p>A compressive plan underlines this comprehensive framework can be adopted via zoom in into various neighbourhoods and apply the main dimensions of this framework.</p>
H	<p>This framework can be applied directly if the politically conflict pose</p>	<p><i>'Politically-unstable conditions in Iraq delay the effective planning towards sustainability to move from</i></p>	<p>-Essential need to move into consumer homes in Iraq to reduce carbon emissions</p> <p>-Adopt green architectural design homes with a smart</p>

	'Very positively recommended'	consumer houses into producer homes'	celling roof for generation projects 'On-site renewable energy is an essential need to meet future requirements by adopting green architectural design within a ceiling roof in order to implement this technology for the coming years'
I & J	Leaders of construction projects & Iraqi engineers syndicate , commented the similar opinion; This framework must be adopted from Iraqi government, i.e., the ministry of planning and UNDP programme to be adopted 'Very highly recommended'	-Update Iraqi housing criteria 'New criteria regarding the housing sector and construction project needed to update according to the current and future challenges'	-Adopt strict laws -Establish environmental laws protection
K	A comprehensive sustainability framework including multiple directions of planning strategies can be forwarded to prime minister consultations to be applied 'Very positively commented'	-Develop the current applications, represented by the domestic sector 'Develop the domestic sectors under effectiveness pilot studies, specifically improve the neighbourhoods parts inside the capital'	-Establish administrative city is an essential need 'The establishment the concept of satellite cites or integrated cities around the capital, in particular, administrative city in order to mitigate traffic congestion in the centre of Baghdad'
L	Leader of UN-HABITAT in Iraq claimed to adopt urban agenda/strategies with intensive analysis by participating multiple organisations 'Very highly recommended'	-Highly qualified committee work with the prime minister 'Consultation committee of the prime minister with various directions, such as the UN-Habitat leaders in Iraq, the Mayoralty of Baghdad, and the Ministry of Planning to optimise the comprehensive plan'	- Green belt around the capital and green fabric design inside the municipalities - Adopt strict laws and establish environmental laws protection
M & N	This framework should be applied within short and long term to pose the random	-Update the construction projects criteria in Iraq according	-Use of effective governmental planning engage with private

	<p>projects with lack of effective planning/strategies</p> <p><i>'Very positively noted'</i></p>	<p>to green code or friendly environmental design</p>	<p>sector in Iraq for coming projects.</p>
<p>O</p>	<p>The proposed framework can be developed with sustainable manufacturing strategy in Iraq to mitigate multiple problems involving employment due to the economic crisis</p> <p><i>'Very positively recommended'</i></p>	<p>-Jobs opportunities</p> <p><i>'creating jobs opportunities by activating the private sector and setting up smart industrial cities around the capital'</i></p>	<p>- Development of industrial poles and establish the essential laws to achieve it.</p> <p><i>'Ensure a comprehensive vision for the near and distant future, effectively contribute to mitigate the organization of the mother city and create of sustainable urban development poles/satellite cities'</i></p>

This table shows that most of the validation panel (12 out of 15 leaders) commented on the framework as 'very highly recommended' and 'highly recommended' the adoption the proposed sustainability framework.

7.2.2 Validation with the Baghdad Mayoralty

The comprehensive sustainability framework proposed by this thesis has three main dimensions- the city's future vision, semi-standardised domestic projects, and a set of urban sustainability indicators.

The first dimension of the designed comprehensive framework considers the capital's future vision, which means that the planning and land use of this city should be improved in new urban development areas around the capital, this is shown in Figure 7.4. This aspect of the city's future vision is considered to be controversial because it requires investment in new urban development zones around the capital. Therefore, this aspect was commented on by some of the experts in the Delphi rounds, for example:

A manager of the Mayoralty of Baghdad said : ***The city's future vision is become an essential need to combat the current and future challenges of the capital, e.g. traffic problems, housing deficit, environmental pollution, and etc.***

Although this dimension is very important, due to the political problems and conflict, this may not be adopted by policy-makers. Therefore more efforts are needed to make it a reality based and further discussion with Mayoralty of Baghdad will be required in order to implement a specific plan to meet the current and future requirements. To demonstrate this, new urban development zones were developed as an example project which was then reviewed by the Mayoralty of Baghdad.

This project, named Ziggurat, deals with the planning the new urban development zones around the capital. This project hopes to allow city developers to recognise how to improve the city in the future by adopting the innovative concepts, including the establishment of satellite cities around the mother city for different purposes (e.g. residential, industrial, commercial, and administrative) to mitigate local issues, as mentioned in Chapter 1. In addition, this work involves the creation of a green belt around the capital to observe the optimum size of the city, decrease the desertification, and combat climate change (as discussed in the previous chapters and as shown in the figure below). Hence, policymakers can be informed about the potential benefits of the adoption of the proposed framework, as discussed in the previous sections.

The results of applying the developed framework to the Ziggurat project have been reviewed and discussed with the head of the Mayorality of Baghdad to ensure that the work in this thesis is valid for the case study area. The model, as shown in Figure 7.4, was used to convey this message. The meeting included the Mayor of Baghdad, a project manager in the Mayorality, and the head of the Department of Urban Development Studies. They recommended and emphasised the need to adopt this strategy for the capital's future vision, including planning and land use over both short and long term; for example, they suggested to adopt this aspect between 2022–2030. This is because, given that Baghdad's population will double by 2030, there is still a lack of effective planning. Therefore, this city must be developed based on a comprehensive and sustainable roadmap to mitigate numerous local issues, as discussed in Chapter 1.

Most of the policy-makers (70-75%), including the leaders of the Mayorality of Baghdad, emphasised that achieving this plan within the limited time given for applying the major categories of this proposed framework requires the adoption of this framework by a high-level leader in the government, such as the prime minister. This plan should then be adopted as national project/roadmap to avoid political conflict. A key challenge is how a controversial plan or roadmap can be adopted in unstable-political countries such as Iraq. In particular, a national project needs attention from the national decision-makers to apply and adopt it instead of sticking with routine and local problems.

This project hopes to improve the quality of life and social satisfaction, such as mitigating traffic congestion in the mother city, solving the housing deficit, reducing transport and energy management, and implementing effective environmental strategies. This project can be developed by breaking down the goals into practical stages or levels. For example, the current comprehensive goals (such as satellite cities and the green belts around the capital) will be broken down to include a spatial analysis of the locations to apply the green belt based on practical

investment plans.



Figure 7.4 shows the city of Baghdad including the current municipalities. Additions proposed to this based on this work include 3 boxes pointing at the proposed satellite cities around the capital and the proposed green belt.

7.4 Summary

There is a growing demand in developing countries, particularly in hot dry climatic regions such as Iraq, to address the issue of urban sustainable development. Therefore, intra-organisational leadership, decision-makers, urban developers, architects, and engineers within Iraqi government and construction sector were invited to participate in the validation of the comprehensive sustainability framework through a set of semi-structured interviews. This will validate the proposed framework as a comprehensive guideline to develop the city of Baghdad.

This study presents empirical evidence that validates the local sustainable framework through intra-organisational leadership, policy-makers, and academics within various organisations. This chapter answered the fifth research question (**RQ5: Is a framework that is developed by considering future vision and city planning,**

future domestic features, and a set of urban sustainability indicators fit for purpose in its target context?). The findings of the semi-structured interviews with 15 intra-organisational leadership approved the proposed framework, the applicability of the categories based on their expertise and the future scope of how it can be applied in reality to meet current and future challenges, including housing deficit, transportation problems, lack of environmental strategies, increased energy consumption. Most of the experts/leaders emphasised **'strict laws and establishment of environmental law protection in order to create the basic path towards urban sustainable development'**.

All of the intra-organisational leaders, including the Mayoralty of Baghdad, reviewed the aspects of the proposed framework and expressed their impression that it should be applied in reality. In particular, the capital's future vision represented by the modelling done by the researcher, (called the Ziggurat project), has shown that the proposed sustainability framework is appropriate for the case study area and can help to solve multiple problems. The participants reflected on how their practical experiences can develop the implementation of the new framework and make it applicable for the current and future requirements i.e. the leaders of the Capital's Mayoralty stated **'The city's future vision is becom essential to combat the current and future challenges of the capital, e.g. traffic problems, housing deficit, environmental pollution, and etc.'**

Chapter 8 Conclusion and Recommendations

This chapter reviews the motivations for this research and it summarises the key findings that answer the research questions which were posed in Chapters 1 and 3. It provides a number of recommendations for urban sustainable development in the context of the case study in Iraq. This chapter also summarises the main limitations and outlines a few recommendations for further research.

8.1 Motivation of the research

Since the early-1990s, developed countries have faced a significant challenges to make sustainable development issues a priority, particularly to create and develop urban development and sustainability methods. These systems primarily focus on declining environmental pollution, on the built environment, and they consider the demands of energy and transport for population growth.

Developed countries have recently witnessed serious attempts to establish sustainability strategies to develop their cities and to create a construction sector that uses sustainability standards and building regulations. However, the existing global sustainability frameworks can also be designed specifically for developing economies using environmental issues, socio-cultural background, and local contexts, including war-torn regions such as Iraq. In particular, Iraq has experienced considerable urban development challenges that have been caused by its political instability, which has led to serious environmental, social and economic problems. These problems have had a significant effect on its public services and infrastructure.

Iraq has recently introduced an ambitious plan to develop new urban development areas in a wide variety of sectors, involving the creation of post-war programs and the rebuilding of current cities. Although many large urban projects are currently under construction, these projects lack depth of effective planning to rebuild cities under sustainability standards.

Unfortunately, most current development programmes have been established without giving attention to sustainability practices. Therefore, there is an urgent need for policymakers to adopt sustainable plans and innovative effective solutions to guide decision makers. Consequently, the aim of the current study is to design a new comprehensive sustainability framework and to investigate active factors that affect urban sustainability in Iraqi cities, specifically the capital Baghdad. This study also hopes to influence the development of a comprehensive urban sustainability framework that can combat the challenges of local issues, such as housing deficit,

population growth, growing demand for energy and transport, and lack of environmental strategies.

8.2 Answering the research questions

The overarching hypothesis of this research is as follows:

That the application of a comprehensive sustainability framework incorporating a future vision, future domestic requirements, and a set of urban sustainable development factors can lead to improved future urban development when applied at a city-scale.

The leading global urban sustainability frameworks cannot be applied to post-war countries because of locality-specific issues, and their environmental and social-economic priorities. Therefore, in their existing applications, they need to recognise the weak design of regional variations, involving the constraints sectors, available resources, local properties, environmental and weather conditions, and economic and socio-cultural background. To achieve the main aim and objectives of the research of an urban sustainability framework domain, a 'mixed methodology approach' was used to identify the research questions. The main research questions have been answered via the five theoretical and practical levels of this research.

The first stage of this study reviewed the state-of-art, which identified the various urban studies and sustainability methods. It also investigated the current and future urban development challenges in the local context of Iraq. This stage will answer the first research question, which is:

RQ1: *In what ways can a framework for a city level urban development, use sustainability indicators to pave the way towards sustainable city development?*

Chapter 2 reviewed the previous studies, including global practices and theoretical knowledge. The findings revealed that the systems used in developed economies are totally different from those used in the developing world. In addition, most of the previous studies have focused on reducing environmental impacts. Most of developing countries, including unstable countries such as Iraq, face many existing and future challenges in applying sustainability frameworks.

This chapter answered RQ1 by identifying the main dimensions required of a sustainability framework for a developing country. These include: a city's future vision, semi-standardised future domestic features, and a set of urban sustainability indicators.

This led to the investigation of the need to develop a comprehensive sustainability framework for Iraqi development projects, which led to the second research stage of this study and the second research question:

RQ2: What are the public's perceptions of sustainable urban development and locality-specific issues in Iraq?

Some previous studies aimed to understand the local context and recognize different factors and priorities for the public, including the process of developing policies and effective solutions based on addressing local priorities. Consequently, a public survey was conducted to engage with local people and evaluate their perceptions towards local priorities and urban sustainable development factors, including their importance, awareness, and, the standard of living. Exploring the public's viewpoints was a significant step towards integrating their aspirations into the development of guidelines and policies for decision making.

The findings of the survey provided critical data from the local context, such as the standard of living and social awareness towards key factors of urban sustainable development, which are considered to be an essential requirement to develop a comprehensive local sustainability framework. The general public perceptions indicate that most of the local people accept improvement by adopting the goals of urban sustainable development in order to enhance their quality of life. This was discussed in the findings of the public survey in chapter 4.

The third research question addressed the differing views of experts and the general public:

RQ3: How do the views of the public differ from the generally accepted view of experts in the context of sustainable urban development in Iraq?

To answer this question, an empirical study was conducted that used the Delphi technique to obtain feedback from an expert panel by via consensus rounds with controlled feedback. This study was conducted over three successive consultation rounds. The first step was a brainstorming stage to identify key factors applicable in the local Iraqi context. The second step was to narrow down the findings of the series rounds. The third step was to rate the indicators on the agreed proposed urban sustainability framework, including indicators and sub-indicators.

To answer RQ3, this study applied statistical analysis to the delphi findings and the public perceptions survey to show the significant differences between the public's attitude and the experts' viewpoints towards urban sustainable development. This

showed that there were wide differences between public perceptions, and expert views. The identification of these differences is critical in ensuring appropriate measures can be taken to ease any tensions caused by the introduction of sustainable development.

The next stage of the research sought to develop the LCSF through analysis of the findings of the expert consultation, the public perceptions survey and the statistical analysis. This led to the answering of the fourth research question:

RQ4: How do the views of local experts' impact on the creation of a sustainable urban development framework for cities, including their vision for their development and desired future domestic features?

This RQ addressed and developed the new comprehensive framework using questionnaires and formal interviews to develop and validate the LCSF. The findings revealed that the indicator 'water conservation' was rated the most important factor in terms of environment, while 'promoting public transport' and 'diversity of transport modes' indicators were scored second and third in terms of transportation. This was followed by 'local economy', 'social and 'management'. The uniqueness of the new framework is that it focuses on identifying several different directions to design a comprehensive framework based on the city's future planning, semi-standardised domestic projects, and general urban indicators and services, such as transportation and infrastructure, socio-economic factors and environment. This framework is considered a vital and an essential need for the existing and future circumstances in the case study region, which is the war-torn city of Baghdad in the country of Iraq (CSO 2013).

The final stage was the validation process. This was conducted via semi-structured interviews, engaging with intra-organisational leaders to provide a multi-concept for the decision-making process, which allows policy-makers to model and develop the newly designed framework to make it applicable to the area being considered. The validation stage answered the fifth research question:

RQ5: Does the developed framework considering the public survey, experts' consultation, have the potential to improve future urban development and is it fit for purpose in its target context?

To answer this RQ a validation process using a semi-structured interviews was employed. This considered the need for and the validity of the framework for Iraq. The findings confirmed the appropriateness of the proposed LCSF for the capital Baghdad in the context of urban development. These key findings answer the

research hypothesis, as described in the next section. This stage of the research and the use of interviews with an expert panel was a crucial approach to make the proposed framework applicable for the case study area.

8.3 The findings of the research

The findings are summarised as follows:

- Differences in terms of urban development factors are common, due to locality-specific issues and challenges.
- The findings of the public survey, reflecting their daily experience regarding their assessments of the existing city found that most of the local people were unsatisfied with current public services and utilities. In addition, the findings of the public survey revealed that the Iraqi standard of living (in terms of dwelling size) has totally changed.
- The development of the LCSF framework. The proposed LCSF scheme has specifically been developed to match locality-specific issues and the needs of urban development projects. The framework was developed using Delphi rounds. This identified the 86 local different factors/indicators including, 11 factors related to the capital's future vision, followed by 12 related to semi-standardised domestic projects. In addition, the consultation elicited a set of 63 urban sustainable development factors,.
- This study revealed key differences between the LCSF urban framework and the urban frameworks from previous studies. In this study the key differences were the inclusion of the city's future vision, domestic features for coming projects, and a set of urban sustainable development factors.
- Intra-organisational leaders, specifically in urban design and development, must have a solid background in urban sustainable development to update whole local schemes including the concept of sustainability and they should engage in a comprehensive intensive training program regarding urban sustainable development.
- The validation process of LCSF has been successfully conducted via semi-structured interviews, engaging with various leaders and experts. The result of this validation is the recommendation to adopt the new framework and its innovative ideas by policy-makers.
- Most of the local urban standards, specifically housing and construction standards, that are approved by the Iraqi Ministries such as the Ministry of

Planning and the Ministry of Housing and Construction date to 1972. Therefore, they should be updated to include new urban development areas and new housing standards, such as; using semi-standardised plans for future domestic projects, including renewable energy, reduction of CO₂ emissions, waste recycling, and the provision of appropriate infrastructure and public services.

8.4 Recommendations and further research

This study highlights future areas for further research, aiming to develop frameworks for the urban development sector in Iraq, as follows:

- In terms of the main problems of Iraqi cities, specifically the capital Baghdad, further studies on sustainable transportation, energy, water, and infrastructure are strongly recommended due to inefficient public services and utilities infrastructure, and limited public transport modes, such as trains and buses. This should aim to provide appropriate infrastructures and transport systems that are more friendly to the environment.
- Local schemes should be extended for recycling waste, increasing renewable energy use and education to improve the local knowledge of sustainability in the urban environment. There are also some global practices that could be adopted for local challenges, including enhancing both the standard of living and public services and infrastructure.
- The adoption of the green belt could be achieved through 'green urban fabric design' and environmentally friendly projects, which are cheaper than conventional projects. Hence, it is important to investigate any development project with ecological and economic aspects.
- The local Iraqi standards for urban development projects should be updated and new codes for housing standards appropriate for the current and future challenges should be implemented.
- The most important issue for politically-unstable countries, such Iraq, is the establishment of active and practical rules to judge development projects, such as the creation of development poles around projects such as residential, industrial, and administrative to mitigate future problems.
- It is important to implement an enforcement system to ensure that these recommendations will be applied for the case study region.

- To achieve the key factors and findings of this study, a leadership committee should be established, involving different intra-organisational leaders and local and international experts. This should be in consultation with the prime minister to document and forward the most important priorities and draw up an investment roadmap underling the sustainable development strategies which impact on developing current and future plans over a short and long period of time (e.g. 2030-2050).
- Further studies will be required to further develop the proposed comprehensive sustainability framework by breaking-down the multiple dimensions and factors into individual indicators, considering how to apply each one practically and achieve their specific objective in order to highlight the development process with decision-makers and urban developers.

8.5 Summary

This chapter highlighted the motivation for this research, namely the locality-specific issues such as environmental, social, economic, and political issues, as well as the recommended viewpoints of Iraqi urban development over the past few decades and the consequent pressures towards the residential and industrial projects. The adoption of LCSF, limitations, recommendations, and future studies have also been presented. The exceptional conditions that face Iraq need to be specifically addressed with appropriate monitoring to tackle the locality-specific issues facing the case study area and to inform the developers regarding sustainability issues.

The issue of the role of policy-makers in a sustainable built environment is becoming more important due to the growing need for sustainability in order to mitigate current and future environmental problems. Urban construction needs intra-organizational leadership at different levels so that it can adopt new strategies and recommendations and rewards the adoption of sustainable practices. Social aspects should be addressed at the centre of development strategies because culture, social, economic, and management factors impact directly on the level of development. The integration of the environmental, social, and economic dimensions of sustainability should be adopted through the education system and public practices. The economy contributes to developing sustainable policies through the establishment of development poles, promotion of sustainable urban projects, and investment in urban sustainable development and sustainable cities.

This study has highlighted the significant role of intra-organizational leadership in achieving and adopting a sustainable framework. This research approach and the

very important factors regarding the link between policy-makers and the creation of a sustainable framework leadership in the built environment are currently being considered. However, the establishment of sustainable frameworks is necessary to fully understand the role of organisational leadership or policy-makers in delivering comprehensive sustainable guidelines.

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Appendix

Appendix A Public Perception Survey

Public perceptions of urban projects in Iraq: current and future challenges التصورات العامة للمشاريع الحضرية في العراق : التحديات الحالية والمستقبلية

Introduction المقدمة

التصورات العامة للمشاريع الحضرية في العراق : التحديات الحالية والمستقبلية

Due to wars and economic sanctions imposed over a long period, Iraq is suffering from hard challenges since 1980. As a result, there has been a direct impact on the economy, education, infrastructure, health and the lifestyle in Iraq. Despite the growing interest in rebuilding cities after 2003; urban projects will require additional attention in future projects. In order to avoid pressure on the environmental and infrastructure problems, major issues like traffic problems, energy consumptions and pollution should be considered carefully. National experts are expecting that Baghdad population will be doubled by 2030 and this will raise a serious demand in increasing energy and transport. Therefore, a sustainable framework is essential in order to enhance the quality of life for the citizens of this city.

Sustainable development in the residential sector is an upcoming challenge for future projects in the Iraqi cities and adopting a sustainable framework for new urban development's plays a vital role in maintaining the quality of lifestyle in terms of health, economic, cultural and social satisfaction.

This questionnaire is a part of a doctoral research at Cardiff University, UK, which aims to identify a semi-automatic framework for the new urban development projects which

mitigate the national problem.

The findings of this research hope, to minimise the use of resources including energy consumption, mitigate traffic congestion, and increase social activities.

As an academic researcher the feedback of public, which is a significant value for us to recognise the keys of residential pattern and the services priorities on the Iraqi context. Therefore, we are promoting you to share us your opinions by filling out this survey. Collected data will be utilized for academic research purposes only.

For any questions about this survey, please contact us:

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يعاني العراق من تحديات قاسية منذ عام 1980، بسبب الحروب والحصار الاقتصادي المفروض عليه في ذلك الوقت. و كنتيجة لهذه الحروب، كان هناك تأثير مباشر على الأقتصاد، التعليم، البنى التحتية، الصحة ونمط الحياة العراقية. وعلى الرغم من الاهتمام المتزايد في الأونة الاخيرة خاصة بعد 2003 لإعادة بناء المدن، لكن لازالت المدن الحضرية والسكنية تحتاج إلى الكثير من الاهتمام والتنظيم للمشاريع المستقبلية. من أجل تجنب المزيد من الضغوط على البيئة والبنى التحتية للمدن بما في ذلك؛ الإزدحامات المرورية، إستهلاك الطاقة، والتلوث وتعتبر هذه من ابرز المشاكل في العاصمة بغداد. ويتوقع الخبراء الوطنيون إن حجم السكان في هذه المدينة سوف يتضاعف بحلول عام 2030. وبذلك، فإن النمو السكاني المتزايد سيؤثر على زيادة طلب السكن، الطاقة، والخدمات الأخرى

التنمية المستدامة في قطاع المدن الحضرية يمثل تحدياً جديداً للمشاريع المستقبلية في العراق. لذلك، إعتقاد إطار عمل مستدام لمشاريع التنمية الحضرية الجديدة في بغداد قد يلعب دوراً حيوياً في الحفاظ على جودة الحياة من حيث: الصحة، الأقتصاد، المستوى الثقافي، والانشطة الاجتماعية

هذا الأستبيان هو جزء من بحث الدكتوراة في جامعة كاردف/ المملكة المتحدة، والذي يهدف إلى تحديد إطار عمل شبه تلقائي للمشاريع الحضرية المستقبلية لتخفيف المشاكل السائدة

نتائج هذا البحث تهدف، لتقليل إستخدام الموارد بما في ذلك إستهلاك الطاقة، تقليل الطلب على النقل، وزيادة الانشطة الاجتماعية.

كباحث أكاديمي، نعمل على تعزيز ملاحظاتك حول هذا الأستبيان، لتوفر لنا صورة واضحة عن النمط والسياسات الاجتماعية العراقية

وسوف نستخدم هذه البيانات التي يتم جمعها لأغراض البحث العلمي فقط

للحصول على أي أسئلة حول هذا المسح، يرجى الاتصال بنا:

مروة مهدي محسن

تدريسية في كلية الهندسة

طالبة دكتوراه في جامعة كارديف / المملكة المتحدة

Email: MohsinMM@Cardiff.ac.uk

الموافقة على الاستمرار بالأستبيان Consent to proceed

1. Please indicate your age **الرجاء تحديد الفئة العمرية الخاصة بك** * Required

- Over 18 years (يزيد عن 18 سنة)
- Under 18 years (أقل من 18 سنة)

Place of residence مكان الإقامة

2. Please specify your residence ? الرجاء تحديد مكان الإقامة ؟ *Required*

- Within the governrate of Baghdad ضمن محافظة بغداد
- Outside the governrate of Baghdad خارج محافظة بغداد

مغادرة المشار كفي الاستطلاع

شكراً لمشاركتكم ونعتذر لذلك، هذا الإستطلاع مخصص لسكان محافظة بغداد حصراً

المعلومات الشخصية Demographic Information

3. الرجاء تحديد مكان إقامتك? In which of the area are you live in Baghdad governrate? *** Required** في محافظة بغداد؟

Please select exactly 1 answer(s).

- Karkh الكرخ
- Russafa الرصافة
- Suburban في الاقضية والنواحي
- Rural area مناطق ريفية
- Bismayah New City مدينة بسمايا الجديدة

4. الرجاء تحديد نوع الجنس * Required Please indicate your gender

Please select exactly 1 answer(s).

- Male ذكر
- Female أنثى

5. الرجاء اختيار الفئة العمرية الخاصة بك * Required Please select your age group

Please select exactly 1 answer(s).

- 18-24
- 25-30
- 31-35
- 36-40
- 41-45
- 46-50
- 51-55
- 56-60

أكثر من 61 Over 61

6. Please indicate your occupation المهنة * Required

Please select exactly 1 answer(s).

- Government employee موظف حكومي
- Private sector employee قطاع خاص
- Re-tired متقاعد
- Other (please specify) أخرى يرجى التحديد

6.a. If you selected Other, please specify: أخرى الرجاء ذكرها

7. What is your qualification? ما هو تحصيلك العلمي * Required

Please select exactly 1 answer(s).

- Post- graduate degree (MSc, PhD, etc.) ماجستير او دكتوراة
- Under-graduate degree (e.g. BSc) بكالوريوس
- Up to high school certificate خريج ثانوية أو ابتدائية
- No qualification بدون مؤهلات

Family and Residential Unit Information معلومات الأسرة والوحدة السكنية

8. Please indicate your status? **الرجاء تحديد حالتك الاجتماعية** * Required

Please select exactly 1 answer(s).

- Single أعزب
- Married متزوج
- Widowed or divorced أرمل او مطلق

9. Please specify how many children do you have? **يرجى تحديد عدد الأطفال لديك** * Required

Please select exactly 1 answer(s).

- 0 لا يوجد
- 1
- 2
- 3
- 4
- 5
- 6
- 7 or above (7 أو أكثر من 7)

10. Which of the following pattern of the housing you live in? **ما هو نمط السكن الذي تشغله؟** * Required

Please select exactly 1 answer(s).

- House دار سكني
- Flat شقة

Other (please specify) (أخرى (يرجى التحديد)

10.a. If you selected other, please specify: أخرى الرجاء ذكرها

10.b. Do you prefer to live in? هل تفضل العيش في

- Low-rise residential building دار سكني
- High-rise residential building عمارات سكنية

11. Please specify how long have you lived in your current residential unit? كم مضي على
إقامتك في الوحدة السكنية * Required

Please select exactly 1 answer(s).

- 1-5 years سنوات
- 5-10 years سنوات
- 10-15 years سنه
- 15-19 years سنه
- Above 20 سنه

12. Is your residential unit ما حالة ملكية وحدتكم السكنية؟ * Required

Please select exactly 1 answer(s).

- Owned by the family مملوكة من قبل الأسرة
- Tenant مستأجر
- Other (please specify) أخرى (الرجاء ذكرها)

13. Except your family members (parents and children), how many other people share house ? * **عدا** افراد أسرتك (الزوجين والاطفال)، كم عدد الأشخاص الآخرين الذين يعيشون معك في مسكنك؟

Required

Please select exactly 1 answer(s).

- 0 person
- 1-2 person
- 3-4 person
- 5-6 person
- 7-8 person
- Above 8 person

14. What is the area of your housing unit? * **ملاهي مساحة** الوحدة السكنية التي تشغلها الأسرة (متر) مربع

Required

Please select exactly 1 answer(s).

- 51-100 (square meters) متر مربع
- 101-150 (square meters) متر مربع
- 151- 200 (square meters) متر مربع
- 201-300 (square meters) متر مربع
- 301-400 (square meters) متر مربع
- 401-500 (square meters) متر مربع
- 501-600 (square meters) متر مربع
- Above 600 (square meters) متر مربع أكثر من 600

15. Do you have garden in your residential unit? * **هل لديك حديقة في** مسكنك

Required

- Yes نعم
- No كلا

16. Do you have car park (Carage) in your house? هل لديك مرآب سيارة (كراج) في مسكنك? * Required

Required

- Yes نعم
 No كلا

17. Please indicate how many spaces do you have in your home (including guesting room, living rooms, and kichten)? الرجاء تحديد عدد الفضاءات (الغرف) في مسكنك من ضمنها غرفة المعيشة (الصالة) , غرفة الضيوف, غرف النوم , و المطبخ * Required

Please select exactly 1 answer(s).

- 1-2
 3-4
 4-5
 6-7
 8-9
 9-10
 11-12
 13-14
 15 or above

18. Please specify how many bathrooms in your home? يرجى تحديد عدد (الحمامات والمرافق) * Required (الصحيحه) في مسكنك?

Please select exactly 1 answer(s).

- 1
 2
 3
 4
 5

6

أکثر من 6 Above 6

Electricity Devices الأجهزة الكهربائية

19. What are the Electricity sources for your residential unit? ماهي مصادر الطاقة الكهربائية المستخدمة في مسكنك [يمكن تحديد خيارين او ثلاثة حسب ماتستخدمه] * Required

Please select between 2 and 3 answers.

- National grid الشبكة الوطنية
- Public generator كهرباء من مولدة المنطقة
- private generator كهرباء من مولدة خاصة

20. Please specify approximate rate of electricity cut-off hours from the national grid (summer and winter) in your area? يرجى تحديد معدل تقريبي لساعات قطع الكهرباء من الشبكة الوطنية (صيفاً وشتاءاً) في منطقتك * Required

Please select exactly 1 answer(s).

- 0 (hours/day) ساعة/اليوم
- 2-4 (hours/day) ساعة/اليوم
- 5-7 (hours/day) ساعة/اليوم
- 8-10(hours/day) ساعة/اليوم
- 11-14 (hours/day) ساعة/اليوم
- Over 15 (hours/day) (أكثر من 15) ساعة/اليوم

21. How many units of (Ambers) you are sharing from the public generator during summer season? *عدد (الأمبيرات) التي تشترك بها من (مولدة المنطقة) خلال فصل الصيف كمعدل شهري Required

Please select exactly 1 answer(s).

- 0 غير مشترك
- Less than 5 (Ampere) (أقل من 5)
- 5 (Ampere) أمبير

- 6-9 (Ampere) أمبير
- 10 (Ampere) أمبير
- 11- 14 (Ampere) أمبير
- Over 15 (Ampere) أمبير

21.a. How many units of (Ambers) you are sharing from the public generator during winter season? عدد (الأمبيرات) التي تشترك بها من (مولدة المنطقة) خلال فصل الشتاء كمعدل شهري?

Please select exactly 1 answer(s).

- غير مشترك 0
- Less than 5 (Ampere) (أقل من 5)
- 5 (Ampere) أمبير (ساعة/اليوم)
- 6-9 (Ampere) أمبير (ساعة/اليوم)
- 10 (Ampere) أمبير (ساعة/اليوم)
- 11- 14 (Ampere) أمبير (ساعة/اليوم)
- Over 15 (Ampere) (أكثر من 15 أمبير) ساعة/اليوم

Cooling Part الجزء الخاص بالتبريد

22. Please specify how many split units do you have in your home for the following types? يرجى تحديد عدد أجهزة التبريد (السبلت أوالمكيف) المستخدمة في مسكنك وحسب الأنواع التالية

	* عدد أجهزة التبريد (السبلت) Required						
	0 لا يوجد	1-2	3-4	5-6	7-8	9-10	أكثر من 10
(1 Ton) (صغير) (سعة 1 طن)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2 Ton) (متوسط) (سعة 2 طن) (الحجم)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3 or 5 Ton) (كثوري)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22.a. Please specify how many split units do you have in your home for the following types? يرجى تحديد عدد أجهزة التبريد (السبلت) المستخدمة في مسكنك عند توفر الكهرباء الوطنية حسب الأنواع التالية؟

	No. of cooling units (السبلت) * Required						
	0 لا تستخدم	1-2	3-4	5-6	7-8	9-10	Over 10 أكثر من
(1 Ton) صغير (سعة 1 طن)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2 Ton) متوسط الحجم (سعة 2 طن)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3 or 5 Ton) كتوري	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22.b. Please specify how many split units do you have in your home for the following types? يرجى تحديد عدد أجهزة التبريد (السبلت) المستخدمة في مسكنك عند توفر الكهرباء من مولدة المنطقة أو (الخاصة) حسب الأنواع التالية؟

	No. of cooling units (السبلت) * Required						
	0 لا تستخدم	1-2	3-4	5-6	7-8	9-10	Over 10 أكثر من
(1 Ton) (صغير) (سعة 1 طن)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2 Ton) (متوسط الحجم) (سعة 2 طن)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3 or 5 Ton) كتوري	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22.c. Where do you use normally, AC conditioner units of the type (5 or 3 Tons) in your home? في أي من (لفضاءات الآتية) في مسكنك تستخدم أجهزة التبريد نوع (كتوري) (يمكن تحديد أكثر من خيار)؟
* Required حسب العدد الذي تستخدمه؟

Please select between 1 and 4 answers.

- None لا تستخدم
- Guest room غرفة الضيوف
- Living room الصالة
- Kitchen المطبخ
- Bedroom غرف النوم

23. Have you use a cooler as ? هل تستخدم مبردة الهواء * Required

Please select exactly 1 answer(s).

- Main source مصدر تبريد رئيسي في كل الاوقات
- Alternative source مصدر تبريد بديل أثناء فترة المولدة فقط
- Not use لا تُستخدم

24. Except AC conditioner, how many coolers do you have in your house? ما هو عدد مبردات الهواء المستخدمة في مسكنك؟ * Required

Please select exactly 1 answer(s).

- لا يوجد 0
- 1-2
- 3-4
- 5-6
- 7-8
- أكثر من 8 Over 8

الجزء الخاص بالتدفئة Heating Part

25. Have you utilise the same AC conditioner units for the heating and cooling purposes? هل تستخدم أجهزة التكييف (السبلت) لأغراض التدفئة * Required

- Yes نعم
- No كلا

26. Except AC conditioner units, how many other electrical heating units do you used in your home? ما هو عدد المدافئ (الكهربائية فقط) المستخدمة في مسكنك؟ * Required

Please select exactly 1 answer(s).

- لا يوجد 0
- 1-2
- 3-4
- 5-6
- 7 or above أو أكثر

27. How many Water Heaters (W.H) of capacity do you have in your home? ماهو عدد سخانات المياه الكهربائية المستخدمة في وحدتك السكنية حسب الأنواع التالية؟

	* عدد السخانات الكهربائيّة المستخدمة في وحدتك السكنية حسب الأنواع التالية؟							
	No. of Water Heater units Required							
	0 لا تستخدم	1	2	3	4	5	6	Over أكثر من 6
كبير الحجم سعة (120-160 L) (-120) لتر	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
صغير الحجم سعة (80 L or less) (80) لتر أو أصغر	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. Do you use electric light during daylight hours? هل تستخدم الإنارة الكهربائية في ساعات النهار؟

- Yes نعم
- No كلا
- Occasionally أحياناً

معلومات النقل و الطاقة Transportation and Energy Information

29. الرجاء تحديد كم سيارة **كم سيارة** Please specify how many cars do you have in your family?
* Required * تملك الأسرة

Please select exactly 1 answer(s).

- لا توجد 0
- 1
- 2
- 3
- 4
- 5 or above (أكثر من 5)

30. كم تستغرق من الوقت تقريباً لوصول **كم تستغرق من الوقت تقريباً لوصول** Approximately, how long does it take to get to work ?
* Required * الى عملك

Please select exactly 1 answer(s).

- A quarter hour or less (ربع ساعه او أقل)
- Over a quarter hour- Half hour (أكثر من ربع ساعة - نصف ساعة)
- Over half hour-Three quarters of an hour (أكثر من نصف ساعة - ثلاثة أرباع الساعة)
- Over three quarters of an hour- an hour (أكثر من ثلاثة أرباع الساعة - ساعة)
- Over an hour- an hour and half (أكثر من ساعة - ساعة ونصف)
- Over an hour and half- two hours (أكثر من ساعة ونصف - ساعتين)
- Two hours or above (ساعتين فأكثر)

31. what are you normally use as a transport means for the following places accessible? **ماهي وسيلة النقل المعتمد لوصول الى الاماكن التالية؟**

* Required * وسائل النقل Transport means

	Nothing لا يوجد	Car سيارة	Public transport(e.g. Bus, Taxi, and etc) (النقل العام (باص, تكسي وغيرها	Motor cycle دراجة نارية	Bike دراجة هوائية	Walk مشياً
Work العمل	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Primary school المدرسة الابتدائية	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Secondary school الثانوية	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
University(if, you have a college student in your family) الجامعة	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31.a. Use of transport means for other activities? ماهي وسيلة النقل المستخدمة للأنشطة الأخرى؟

	Transport means وسائل النقل * Required					
	None لا يوجد	Car سيارة	Public transport(e.g. Bus, Taxi, and etc) (النقل العام (باص, تكسي, وغيرها	Motor cycle دراجة نارية	Bike دراجة هوائية	Walk مشياً
Daily shopping التسوق اليومي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Civil services (e.g. medical centers, police station, post office , places of worship,and etc) الخدمات المدنية (مثلا, المراكز الطبية , مكتب بريد, محطة أطفال, دور العبادة وغيرها	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fun activities (e.g. parks, cinema, malls, restaurants, and etc) , الأنشطة الترفيهية, مثل: المتنزهات , مراكز التسوق, مطاعم, وغيرها	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Social activities (e.g. visits to friends, visits to relatives, national festivals and etc) الأنشطة الاجتماعية، مثلًا: زيارات الأصدقاء، زيارات الأقارب، المهرجانات الوطنية وغيرها	<input type="checkbox"/>					
Mobility for the accomplishment of official transactions التنقل لإنجاز المعاملات الرسمية	<input type="checkbox"/>					

Energy Expenses مصروفات الطاقة

32. How to describe how much your family spends on fuel and energy? كيف تصف مقدار ما تنصرفه أسرتك على الطاقة من ضمنها النقل، الوقود، والكهرباء

	Required * وصف حالة الصرف					
	None لا يوجد	Very expensive مكلف جداً	Relatively expensive مكلف نسبياً	Acceptable مقبول	Simple بسيط	Very simple بسيط جداً
Cooking fuel such as: gas وقود الطبخ مثل الغاز:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heating oil fuel وقود التدفئة النفطية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fuel for cars وقود السيارات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Private fuel generator وقود المولدات الخاصة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generating wages of the region إجور مولدة المنطقة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

National electricity bills إجور قوائم الكهرباء الوطنية	<input type="checkbox"/>					
Public transport fees (bus or taxi) إجور النقل (العالم : باص أو تكسي)	<input type="checkbox"/>					
Special monthly transport fees, (e.g.: schools and university transport lines) أجور النقل الخاص (شهرياً مثلاً: خطوط نقل المدارس والجامعات)	<input type="checkbox"/>					

32.a. Please specify the percentage of your family's monthly on energy expenditure for the above mentioned paragraphs according to the previous question **يرجى تحديد النسبة** المئوية المصروفة من دخل أسرتك الشهري (الراتب) على نفقات الطاقة لفقرات المذكوره أعلاه تبعاً للسؤال السابق
* Required

Please select exactly 1 answer(s).

- لا يوجد مصروفات 0
- تقريباً ربع A quarter
- تقريباً نصف A half
- تقريباً ثلاثة أرباع A three-quarters
- أكثر من ثلاثة أرباع Above a three-quarters

Public Services الخدمات العامة

Public Services الخدمات العامة في المنطقة السكنية

33. Please indicate your evaluation for the following infrastructure services in your district ?
يرجى تقييم مستوى خدمات **البنى التحتية** التالية في منطقتك ?

	* Required					
	Not available غير متوفرة	Very poor سيئة جدا	Poor سيئة	Acceptable مقبول	Good جيد	Very good جيد جدا
The national electricity grid الكهرباء من الشبكة الوطنية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Availability of drinking water توفر مياه الشرب	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of drinking water جودة المياه، الصالحة للشرب	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irrigating water in your area مياه سقي الحدائق	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewage services الصرف الصحي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34. How can describe the affordability of the following public services in your area ?
كيف تقييم مستوى الخدمات التالية في منطقتك

	* Required					
	Not available غير متوفره	Very poor سيئه جدا	Poor سيئه	Acceptable مقبول	Good جيد	Very good جيد جدا
Health care مركز صحي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Children play area مساحة لعب الأطفال	<input type="checkbox"/>					
Local market السوق المحلي	<input type="checkbox"/>					
Safety equipment (e.g. cameras security system, and etc) معدات الامان, نظام المراقبة (بالكاميرات	<input type="checkbox"/>					
Educational services (e.g. primary schools, secondary schools, nursery, and etc) خدمات التعليم كالمدارس الابتدائية, الثانوية ودور الحضانة	<input type="checkbox"/>					
Cultural center or youth center مركز ثقافي أو مركز شباب	<input type="checkbox"/>					
Post office مكتب بريد	<input type="checkbox"/>					
Libraries المكتبات	<input type="checkbox"/>					
Parks and green spaces المساحات الخضراء و المتنزهات	<input type="checkbox"/>					
Water bodies (المسطحات المائية) (كالنافورات, البحيرات الصناعية, الخ	<input type="checkbox"/>					

34.a. Other please specify (الرجاء تحديدها) أخرى

The goals of urban sustainable development (أهداف التنمية) الحضرية المستدامة

تعريف المدن المستدامة: وهي المدن التي تحقق أقل إستهلاك للطاقة (من ضمنها النقل والكهرباء) وأقل تأثير بيئي (تلوث) وبما يحقق رفاهية المجتمع

Sustainable Cities: They are cities that achieve lower power consumption, transportation and less environmental impact (pollution) and to achieve the quality of life of the community

35. What is your concern about the issue of its future cities in Iraq? مامدى إهتمامكم بشأن
Required * موضوع الاستدامة لمستقبل المدن الحضرية في العراق

Please select exactly 1 answer(s).

- Not at all concerned غير مهتم مطلقاً
- Slightly concerned قليل الاهتمام
- Moderately concerned مهتم بشكل معتدل
- Very concerned مهتم جداً
- Extremely concerned مهتم للغاية

35.a. What is your concern about the issue of its future cities in Iraq? إلى أي مدى توافق أو
Required * تعارض إن المشاريع الحضرية المستقبلية في العراق يجب تطويرها بطرق الاستدامة

Please select exactly 1 answer(s).

- Extremely disagree أعارض جداً
- Slightly disagree أعارض قليلاً
- Neither agree nor disagree لا أوافق ولا أعارض
- Slightly agree موافق قليلاً
- Extremely agree موافق جداً

36. In your opinion, indicate the importance of the following perceptions for the future

يرجى تقييم مدى أهمية العوامل التالية للمدن المستقبلية ? cities

	* Required				
	Unimportant غير مهم	Of little importance قليل الاهميه	Moderately important مهم بشكل معتدل	Important مهم	Very important مهم جدا
Minimise energy consumption الحد من استهلاك الطاقة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduce pollution تقليل التلوث	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mitigate traffic congestion تخفيف الازدحام المروري	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve social activities (e.g playgrounds, shopping center,schools ,health care , and etc.) تحسين الخدمات (مثل مراكز الاجتماعية، التسوق، المراكز الطبية، مراكز الاطفال، مركز شرطه، مكتب بريد وغيرها	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increase cultural activities (e.g. libraries, youth centers, and etc) زيادة الانشطة الثقافية ، كالمكتبات مراكز الشباب ، الملاعب، واخرى	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Increase educational activities (primary schools , secondary schools ,and etc.) زيادة الانشطة (مثل: المدارس الابتدائية، الثانويه، تعليم المهن الخاصه، رياض الاطفال، وغيرها)	<input type="checkbox"/>				
Promote the use of pubic transport (e.g. train, metro, buses, etc.) إستخدام وسائل النقل العام، مثل المترو، الحافلات، القطار	<input type="checkbox"/>				
Providing job opportunities within the geographical area of housing توفير فرص العمل ضمن الرقعة الجغرافية للسكن	<input type="checkbox"/>				
Maximise the use of insulation إستخدام العوازل الحراريه	<input type="checkbox"/>				

36.a. Other (please specify) أُخرى الرجاء ذكرها

37. To what extent do you **agree** or **disagree** the use of the objectives of sustainable development for the following future cities? **الى أي مدى توافق أو تعارض إستخدام أهداف التنمية المستدامة** التالية للمدن المستقبلية؟

	* Required				
	Extremely disagree اعراض جدا	Slightly disagree اعراض قليلا	Neither agree or disagree لا اوافق ولا اعراض	Slightly agree موافق قليلا	Extremely agree موافق جدا
Renewable energy sources (e.g. solar sources, wind , and etc.) إستخدام مصادر الطاقة المتجددة كالطاقة الشمسية ، وطاقة الرياح	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smart energy management (e.g. smart meters for housing units and site) إستخدام الإدارة الذكية للطاقة مثل العدادات الذكية في المساكن وغيرها	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of alternative materials إستخدام مواد البناء البديلة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waste recycling and separation فرز وإعادة تدوير النفايات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utilise gray water recycling إعادة تدوير وإستخدام المياه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use walking and bike as a mean transport for nearby distance إستخدام المشي والدراجات الهوائية كوسيلة نقل للمسافات القريبة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing parks and green spaces توفير المتنزهات والمساحات الخضراء	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promote investment تشجيع الاستثمار	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Establishment of a training center for increasing social awareness
إنشاء مركز تدريب وطني لنشر الوعي الاجتماعي



37.a. Other (please specify) أخرى الرجاء ذكرها

37.b. If sustainability goals, have been achieved as stated above, do you have the willingness to pay additional fees to live in a sustainable city?
لو تحققت أهداف الاستدامة كما ورد أعلاه, هل لديك الاستعداد كمواطن لدفع إيجور إضافية للعيش في مدينة مستدامة?
* Required

- Yes نعم
- No كلا
- Not sure غير متأكد

الأستطلاع الخاص بالمُختصين The questionnaire on specialization

ملاحظة مهمة: الرجاء الاجابة على السؤال التالي بدقة , حيث يتضمن السؤال عن التخصص, إذا كان المشارك في المسح؟

- 1- لا يختص بالمجالات الخمسة التالية يرجى النقر على الإختيار (كلا)
- 2- الرجاء إختيار (نعم) على من يقع تخصصه ضمن إحدى المجالات الخمسة الآتية

38. هل يقع تخصصكم ضمن إحدى المجالات الخمسة التالية ؟
Urban studies , Architectural Engineering , Enviromental Engineering , Sustainable Development , الهندسة المعمارية, الهندسة , دراسات التخطيط الحضري , الهندسة المدنية ملاحظة: يرجى قراءة (التخصصات) بدقة * Required

- Yes نعم
- No كلا

Specialization مجال التخصص

39. Please specify your spealised ؟ *Required* *يرجى تحديد تخصصكم

Please select between 1 and 4 answers.

- Urban studies التخطيط الحضري
- Architectural Engineering الهندسة المعمارية
- Environmental Engineering الهندسة البيئية
- Development التنمية
- Civil Engineering الهندسة المدنية

Perceptions of the experts تصورات المختصين

إستطلاع رأي المختص (التعبير عن الرأي) (writing questionnaire) Open access
كتابة

40. In your opinion as an expert, what is more favourite pattern for future residential projects? Low-rise building or high-rise building? يرجى بيان رأيكم بالنمط السكني المفضل الدور
* Required السكنية ب- العمارات السكنية؟

40.a. Can you explain the causes, please? وهل يمكن بيان السبب، من فضلكم؟

41. How do you assess the impact of community awareness on achieving sustainable cities in Iraq? كيف تقيم تأثير وعي المجتمع في تحقيق المدن المستدامة في العراق؟
* Required

Please select exactly 1 answer(s).

- Not all influential غير مؤثر مطلقاً
- Slightly influential مؤثر قليلاً
- Moderately influential مؤثر بشكل معتدل
- Very influential مؤثر جداً
- Extremely influential مؤثر للغاية

42. بتوقعك كمختص هل يستطيع العراق أن يحقق تقدماً واضحاً بأنجاز أهداف التنمية المستدامة (التي أقرتها الأمم المتحدة لغاية عام 2030)؟ With your expectation as a specialist, can Iraq make clear progress in meeting the goals of sustainable development (endorsed by the United Nations up to 2030)? * Required

Please select exactly 1 answer(s).

- نعم يحقق تقدماً جيداً Yes, is making good progress
- نعم يحقق تقدماً بسيطاً Yes, it makes little progress
- لا أتوقع ذلك I do not expect that

43. Please , release your suggestions in the development of residential future projects من فضلكم، بيان مقترحاتكم في مجال تطوير مستقبل المشاريع الحضرية في العراق ؟ * Required

44. Please offer your suggestions to reduce the demand for energy (transportation and electricity) for future urban projects يرجى التفضل بعرض مقترحاتكم لتقليل الطلب على الطاقة (من ضمنها النقل والكهرباء) للمشاريع الحضرية المستقبلية؟ Optional

Thank you إنتهى الأستطلاع شكراً لمشاركتكم

Thank you for completing this survey إنتهى الأستبيان وقد تم إستلام إجاباتكم بنجاح شكراً لمشاركتكم

Appendix B Experts consultation- The Delphi Rounds

Experts consultations- Questionnaire samples (Round 1) (1)

Page 1: Introduction المقدمة

Urban sustainability framework for Iraq cities: a case study Baghdad/ Delphi technique- Round 1

إطار عمل الاستدامة الحضرية لمدينة العراق: حالة الدراسة بغداد - الجولة الأولى من إستبيان الخبراء

Dear Expert,

Due to wars and economic sanctions that have been imposed over a long period of time, Iraq is suffering from challenging circumstances since 1980. As a result, there has been a direct impact on the economy, education, infrastructure, health and the lifestyle in Iraq. Despite the growing interest in rebuilding cities since 2003; urban development projects will require additional attention in future projects. In order to avoid pressure on the environmental and infrastructure problems, major issues like transportation, energy consumption and pollution should be considered carefully. National experts are expecting that Baghdad's population will double by 2030 and this will raise a serious demand in increasing energy and transport requirements. Therefore, a sustainable urban development framework is essential in order to enhance the quality of life for the citizens of this city.

Sustainable development in the urban projects sector is an upcoming challenge for future projects in Iraqi cities and adopting a sustainable framework for new urban development's plays a vital role in maintaining the quality of life for citizens in terms of health, economic, cultural and social satisfaction.

This questionnaire is part of doctoral research at Cardiff University, UK, which aims to identify a framework for the new urban development projects which mitigate the national problem, however a list of urban sustainability indicators, local housing pattern in Iraq, and planning of land use have been identified through:

(a) An extensive review of the literature on urban sustainability indicators.

(b) Conducted a nationwide survey in Baghdad (a case study region) to investigate the public perceptions of urban development challenges in Iraq.

The findings of this research hope to minimise the use of resources including energy consumption, mitigate traffic congestion, and increase social satisfaction.

As an academic researcher, the feedback as an expert possesses significant value for us to recognise how rate the importance points of this questionnaire, in order to, build the ideas for a framework. The study employs Delphi technique, a scientific consensus-building approach, as a methodology for evaluating the urban sustainability indicators. Therefore, we are promoting you to share us your opinions by filling out this survey. Collected data will be utilized for academic research purposes only.

For any questions about this survey, please contact us:

Mrs. Marwah Mahdi Mohsin

Doctoral researcher

School of Engineering/Cardiff University/UK

Cardiff, CF23 9JD

Email: MohsinMM@Cardiff.ac.uk

يعاني العراق من تحديات قاسية منذ عام 1980، بسبب الحروب والحصار الاقتصادي المفروض عليه في ذلك الوقت. ونتيجة لذلك، كان هناك تأثير مباشر على الاقتصاد، التعليم، البنى التحتية، الصحة ونمط الحياة. وعلى الرغم من الاهتمام المتزايد في الآونة الأخيرة خاصة بعد 2003 لإعادة بناء المدن، لكن لازالت المدن الحضرية والسكنية تحتاج إلى الكثير من الاهتمام والتنظيم للمشاريع الحالية والمستقبلية، من أجل تجنب المزيد من الضغوط لتلك المدن على البيئة والبنى التحتية بما في ذلك؛ الإزدحامات المرورية، زيادة إستهلاك الطاقة، والتلوث والتي بدورها تعتبر من ابرز المشاكل في العاصمة بغداد التي يتوقع ذوي الاختصاص إن حجم السكان في هذه المدينة سوف يتضاعف بحلول عام 2030. مما يؤدي حتما لزيادة طلب السكن، الطاقة والخدمات الأخرى

تمثل التنمية المستدامة في قطاع المدن الحضرية تحدياً جديداً للمشاريع المستقبلية في العراق. لذلك، إعتدنا **إطار عمل مستدام** لمشاريع التنمية الحضرية الجديدة او المدن التوابع قديعب دوراً حيويًا في الحفاظ على جودة الحياة من حيث: الصحة، الاقتصاد، المستوى الثقافي، والانشطة الاجتماعية

ان هذا الأستبيان هو جزء من بحث الدكتوراة في جامعة كارديف/ المملكة المتحدة، والذي يهدف إلى تحديد إطار عمل مستدام للمشاريع الحضرية المستقبلية لتخفيف المشاكل السائدة الحالية والمستقبلية والتي اصبح من اللازم إيجاد حلول جذرية لمنع تفاقم الأزمات والضغط على مراكز المدن والبنى التحتية مع استمرار تزايد السكان للسنوات القادمة

نتائج هذا البحث تهدف، لتقليل إستخدام الموارد بما في ذلك إستهلاك الطاقة، تقليل الطلب على النقل، وتحسين جودة الخدمات العامة وزيادة الأنشطة الاجتماعية

كباحث أكاديمي، نعمل على تعزيز ملاحظتك حول هذا الاستبيان ورأيك كمختص بفقرات الاستبيان وإضافة المقترحات التي تجدها مناسبة لتطوير إطار العمل المستقبلي للمشاريع الحضرية

ملاحظة: سوف يرد ذكر مصطلح **المدن التوابع** أو **المشاريع الحضرية المستقبلية** في أسئلة الاستبيان

هذه البيانات التي يتم جمعها سوف تستخدم **لأغراض البحث العلمي فقط**

للحصول على أي أسئلة حول هذا المسح، يرجى الاتصال بنا:

مروة مهدي محسن

تدريسية في كلية الهندسة

طالبة دكتوراه في جامعة كارديف/ المملكة المتحدة

Email: MohsinMM@Cardiff.ac.uk

ملاحظة: سوف يذكر لاحقاً في نهاية كل سؤال إضافة مقترح من قبل المختص في الفراغ المخصص له وبإمكان المختص سرد ما يراه مناسباً من المقترحات أو التعبير عن الرأي على شكل نقاط

Stages of the Questionnaire

1. Name الاسم * Required

1.a. Email address العنوان البريدي * Required

1.b. Qualification التحصيل العلمي * Required

1.c. Organazation المؤسسة * Required

1.d. City/Town المحافظة او المدينة * Required

2. Please provide the area of specialization ? يرجى تحديد مجال التخصص * Required

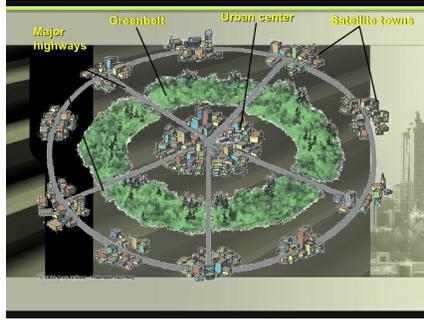
Please select between 1 and 4 answers.

- Urban studies التخطيط الحضري
- Architectural Engineering الهندسة المعمارية
- Sustainable Development التنمية المستدامة
- Environmental Engineering الهندسة البيئية
- Civil Engineering الهندسة المدنية
- Project Management إدارة المشاريع
- Renewable Energy الطاقة المتجددة

2.a. Other specialization (please specify) تخصصات اخرى يرجى ذكرها

Page 2: Planning of Land Use and Site Selection في التخطيط في إستعمالات الارض وإختيار الموقع

المدن **التوابع**: وهي المدن التي تنشأ خارج حدود المدينة لتلبية متطلبات التحديات الحالية والمستقبلية



وتصنف المدن التوابع حسب المتطلبات الآتية :

مدن توابع للاستخدام السكني

مدن صناعية

مراكز تجارية

مدينة إدارية

3. Please indicate, as a specialist, how important is the establishment of satellites cities **Required** يرجى إبداء رأيك كمختص, بمدى أهمية إنشاء المدن التوابع في العراق: حالة الدراسة بغداد

Please select exactly 1 answer(s).

- Unimportant ليست مهمة
- Of little importance قليلة الأهمية
- Moderately important مهمة بشكل معتدل
- Important مهم
- Very important مهم جدا

4. In your opinion as a specialist, in which regions is it most important to develop new residential urban developments projects (satellite cities) for the capital Baghdad? برأيك

كمختص، بين المناطق التالية هي الأكثر أهمية لتطوير المشاريع الحضرية الجديدة
"كالمدن توابع" مُحددة للاستخدام: **السكني**

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Inside the mayoralty border of Baghdad ضمن حدود امانة بغداد	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suburban regions الاقضية والنواحي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rural areas المناطق الريفية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.a. يرجى ذكر نقاط مقترحة
اخرى والتي لم يرد ذكرها اعلاه وتعتبرها مهمة في استعمالات الارض للمدن السكنية

5. In your opinion as a specialist, in which regions is it most important to develop new industrial urban developments projects (satellite cities) for the capital Baghdad ?
برأيك كمختص، بين المناطق التالية هي الأكثر أهمية لتطوير المشاريع الحضرية الجديدة: **المدن الصناعية**، مثل: المصانع،
المخازن الكبرى، معامل خصخصة وتدوير النفايات، الخ

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Inside the mayoralty border of Baghdad ضمن حدود امانة بغداد	<input type="checkbox"/>				
Suburban regions الاقضية والنواحي	<input type="checkbox"/>				
Rural areas المناطق الريفية	<input type="checkbox"/>				

5.a. Please list further suggestions, which are not mentioned above يرجى ذكر نقاط مقترحة اخرى والتي لم يرد ذكرها اعلاه وتعتبرها مهمة في استعمالات الارض للمدن الصناعية

6. In your opinion as a specialist, in which regions is it most important to develop new commercial urban developments projects (satellite cities) for the capital Baghdad? برأيك كمختص, بين الميناطق التالية هي الأكثر أهمية لتطوير المشاريع الحضريّة الجديدة المراكز التجارية

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Inside the mayoralty border of Baghdad ضمن حدود امانة بغداد	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suburban regions الاقضية والنواحي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rural areas المناطق الريفية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.a. Please list further suggestions, which are not mentioned above يرجى ذكر نقاط مقترحة اخرى والتي لم يرد ذكرها اعلاه وتعتبرها مهمة في استعمالات الارض للمراكز التجارية

7. In your opinion as a specialist, in which regions is it most important to develop new administrative urban developments projects (satellite cities) for the capital Baghdad? برأيك كمختص, بين المناطق التالية هي الأكثر أهمية لتطوير المشاريع الحضرية الجديدة: مدينة إدارية , مثل: مؤسسات حكومية , إدارة منظمات, إدارة شركات القطاع الخاص

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Inside the mayoralty border of Baghdad ضمن حدود امانة بغداد	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suburban regions الاقضية والنواحي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rural areas المناطق الريفية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7.a. Please list further suggestions, which are not mentioned above يرجى ذكر نقاط مقترحة اخرى والتي لم يرد ذكرها اعلاه وتعتبرها مهمة في إستعمالات الارض لانشاء مدينة إدارية

8. Please indicate, how important is the use of the green belt around Baghdad city to combat climate change, desertification, and maintain the optimal size of the city بين مدى أهمية إستخدام الحزام الاخضر حول مدينة بغداد, لغرض: تخفيف حدة التغير المناخي, مكافحة التصحر, والمحافظة على الحجم الأمثل للمدينة * Required

Please select exactly 1 answer(s).

- Unimportant ليست مهمة
- Of little importance قليل الاهمية
- Moderately important متوسط الاهمية
- Important مهم
- Very important مهم جدا

8.a. Please list further suggestions, which are not mentioned above يرجى ذكر نقاط مقترحة
Optional والتي لم يرد ذكرها بخصوص الحزام الاخضر

Page 3: Housing Patterns أنماط السكن

9. Please indicate how important to the following housing patterns are for new urban projects الرجاء بين أفضلية أنماط السكن الآتية للمشاريع الحضرية المستقبلية: للاستخدام السكني

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Low-rise building دور منفردة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High-rise building (الابنية) متعددة الطوابق (عمارة سكنية)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mix-pattern نمط مختلط: افقي وعمودي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9.a. Please rate any further housing patterns, which are not mentioned above يرجى ذكر مقترحات حول أنماط السكن التي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

10. In your opinion, what is the preferred area for a housing unit (square meters), taking into account that the average size of the Iraqi family is approximately 6? حسب رأيك كمختص، ماهي المساحة المفضلة لمتطلبات الوحدة السكنية (بالمتر المربع) الاخذ بنظر الاعتبار ان معدل حجم الاسرة العراقية 6 تقريباً * Required

Please select exactly 1 answer(s).

- 50-100 (square meters) متر مربع
- 101-150 (square meters) متر مربع

- 151- 200 (square meters) متر مربع
- 201-300 (square meters) متر مربع
- 301-400 (square meters) متر مربع
- 401 or above (square meters) متر مربع

10.a. Please rate further suggestions regardless a housing area, which are not mentioned above يرجى ذكر مقترحات اخرى فيما يخص مساحة الوحدة السكنية والتي لم يرد ذكرها اعلاه

10.b. As a specialist, how many bedrooms should be available in housing unit area taking into account that the average size of the Iraqi family is approximately 6 برأيك كم عدد غرف النوم ينبغي توفرها في الوحدة السكنية مع الاخذ بنظر الاعتبار ان معدل حجم الاسرة كمختص، العراقيه 6 تقريبا * Required

Please select exactly 1 answer(s).

- 1-2
- 3-4
- 5-6
- 7-8
- 9-10
- Above 10

11. In relation to the housing unit, please rate the importance of the following design requirements for future projects فيما يخص الوحدة السكنية، بين مدى أهمية المتطلبات التصميمية الاتية للمشاريع المستقبلية

* Required

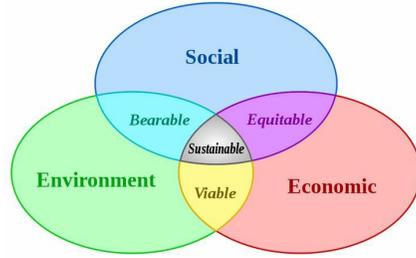
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Car park (private and public) موقف سيارات خاص او عام	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Back garden حديقة منزلية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guest room غرفة ضيوف	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Living room غرفة معيشة (صالة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dining room غرفة طعام	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Balcony شرفة (بالكون)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Design requirements المتطلبات التصميمية للدار السكني suggest a number of rooms/ spaces for the above area: (8-9) spaces/ rooms including kitchen, hall, bathroom(2), (3-4) bedrooms, storage room, 2 stories عدد الفضاءات المقترحة لتلك الدور (المذكورة اعلاه) (8- 9) فراغات/غرف من ضمنها: مطبخ, صالة, حمام عدد 2, (4-3) غرف نوم, مخزن صغير (1), طابقين	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

High-rise building at least 100-150 sq.metre (الابنية متعددة الطوابق (شقق سكنية باقل مساحة ملائمة 150-100 متر مربع	<input type="checkbox"/>				
Design requirements المتطلبات التصميمية للشقة السكنية : suggest a number of spaces/rooms for the above area (7-8) spaces/rooms including: kitchen, hall, bathroom(2), (2-3) bedrooms, storage room(1) عدد الفضاءات المقترحة لتلك (المذكورة اعلاه) (8-7) فراغات/غرف من ضمنها: مطبخ, صالة, حمام عدد 2, 3-2 غرف نوم, مخزن صغير	<input type="checkbox"/>				
Resealiance housing قابلية الوحدة السكنية للتوسع	<input type="checkbox"/>				
Multiple types of housing areas توفر انواع مساكن بمساحات مختلفة	<input type="checkbox"/>				
Use daylight vs. artificial lighting استخدام الاضاءة الطبيعية وتقليل الصناعية	<input type="checkbox"/>				
Adopt effective natural ventilation استخدام التهوية الطبيعية	<input type="checkbox"/>				

11.a. Please rate further design requirements, which are not mentioned above يرجى
ذكر مقترحاتكم الاخرى حول المتطلبات التصميمية للوحدة السكنية والتي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق
التنمية الحضرية المستدامة

Page 4: Urban Challenges of Sustainable Development

تحديات التنمية الحضرية المستدامة



Dimensions of Urban Sustainability: is a widely used term, which is increasingly influential in various aspects such as; social, environment, and economic, in order to improve human well-being. This section will lunch a list of urban sustainability indicators, which are achieving three main goals: social, environmental, economic dimensions to mitigate the current and future challenges.

As an overview of the urban sustainability dimensions is provides in the Figure above.

أبعاد الاستدامة الحضرية: هو مصطلح يستخدم على نطاق واسع، واخذ يتزايد بصورة مؤثرة في جوانب متعددة مثل؛ الاجتماعية، البيئية، والاقتصادية من أجل تحسين رفاهية الحياة. وسيتناول هذا القسم قائمة بمؤشرات الاستدامة الحضرية التي تحقق ثلاثة أهداف رئيسية ومنها: الأبعاد الاجتماعية، البيئية والاقتصادية لمواجهة التحديات الحالية والمستقبلية

الشكل أعلاه يوضح بشكل مبسط أهداف التنمية الحضرية المستدامة

12. Please rate how important the following **enviromental factors** are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية العوامل البيئية التالية لتحقيق التنمية الحضرية المستدامة في العراق ؟

* Required				
Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

Reduce pollution (air, water, noise etc) تقليل التلوث	<input type="checkbox"/>				
Waste separation and recycling فصل وتدوير النفايات	<input type="checkbox"/>				
Vegetation cover الغطاء النباتي	<input type="checkbox"/>				
Use sustainable construction materials (production, use, and recyclable) استخدام مواد البناء المستدامة وتضم مراحل: الانتاج, الاستخدام واعادة التدوير	<input type="checkbox"/>				
Site micro-climate (e.g. solar orientation, air movement, building configuration, shading device, and etc) المناخ المصغر (المايكرو-مناخي) للموقع (على سبيل المثال التوجه الشمسي، حركة الهواء، تكوين المبنى، جهاز التظليل، وما إلى ذلك)	<input type="checkbox"/>				

12.a. Please rate further factors of enviromental challenges, which are not mentioned above يرجى ذكر المقترحات التي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.b. Please rate how important the following **ecology factors** are for the sustainable

يرجى تقييم مدى أهمية العوامل البيئية التالية لتحقيق التنمية الحضرية المستدامة في العراق ؟
urban development in Iraq ?

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Green areas and parks المساحات الخضراء والمتنزهات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shaded streets and protected open spaces الشوارع المظللة والمساحات المفتوحة المحمية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water bodies البحيرات الصناعية والنفورات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Balance ratio between green spaces and built-up areas نسبة التوازن بين المساحات الخضراء والمناطق المبنية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.b.i. Please rate further ecology indicators, which are not mentioned above
يرجى ذكر مقترحات أخرى والتي لم يرد ذكرها في المؤشر البيئي والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.c. Please rate how important the following **water indicators** are for the sustainable urban development in Iraq ?
يرجى تقييم مدى أهمية مؤشرات المياه التالية لتحقيق التنمية الحضرية المستدامة في العراق

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Water conservation المحافظة على المياه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Onsite wastewater recycling:treatment of waste ans sewage water إعادة تدوير واستخدام المياه في الموقع لاغراض السقي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide onsite water quality توفير مياه الشرب في الموقع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diversity of water resources onsite: underground and rainwater تنوع استخدام مصادر المياه في الموقع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.c.i. Please rate further water indicators, which are not mentioned above يرجى ذكر مقترحات اخرى والتي لم يرد ذكرها في مؤشر المياه وتعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.d. Please rate how important the following **energy sub- indicators** are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية المؤشرات الفرعية التالية للطاقة لتحقيق التنمية الحضرية المستدامة في العراق

* Required

	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Minimise energy consumption: from HVAC systems(heating, ventilation, and air conditioning) and (lighting, hot water system) تقليل استهلاك الطاقة من (التدفئة , التهوية , التبريد , الاضاءة و نظام الماء الساخن	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of insulation استخدام العوازل	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use alternative renewable energy (e.g PV solar and wind) onsite or near-site. استخدام الطاقة المتجددة : الطاقة الشمسية وطاقة الرياح في الموقع او بالقرب منه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smart energy management (monitor, control, sensors, and optimize performance buildings) إدارة الطاقة الذكية : المراقبة، والتحكم، وأجهزة الاستشعار، وتحسين المباني الأداء	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.d.i. Please rate further energy indicators, which are not mentioned above يرجى ذكر مقترحات اخرى حول مؤشر الطاقة والتي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.d.i.a. Please specify , how important you think the following uses of solar energy are?
برايك كمختص, مامدى أهمية إستخدام تقنية الطاقة الشمسية في الحالات الاتية?

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Use the PV on top of the building إستخدام منظومة الطاقة الشمسية على سطوح الابنية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use slanted ceilings with solar technology vs. traditional السقوف المائلة المزودة بتقنية الطاقة الشمسية بدل السقف التقليدي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use solar wall technique إستخدام الخلايا الشمسية عن طريق الجدران الخارجية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PV on external windows تركيب الشرائح الشمسية على الشبايك الخارجية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.d.i.a.i. Please rate further factors of using solar energy, which are not mentioned above
يرجى ذكر مقترحات اخرى حول الطاقة الشمسية التي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية
Optional الحضرية المستدامة

Transportation, Infrastructure, and Public services

12.d.ii. Please rate how important the following transportation, public services, and Infrastructure indicators sub- indicators are for the sustainable urban development in Iraq ?
 يرجى تقييم مدى أهمية المؤشرات التالية للنقل, الخدمات العامة, والبنى التحتية لتحقيق التنمية الحضرية ?
 المستدامة في العراق؟

	<i>* Required</i>				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Mitigate traffic congestion تخفيف الازدحام المروري	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promote of public transport تعزيز استخدام النقل العام	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Walking as a mean of mobility particularly nearby distance (e.g from the houses to the diverse activities) المشي كوسيلة للتنقل وخاصة للمسافات القريبة: على سبيل المثال من المنازل إلى الأنشطة المتنوعة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of private car استخدام السيارة الخاصة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Provide bicycle streets networks توفير شبكات شوارع الدراجات	<input type="checkbox"/>				
Safe streets network onsite (e.g. walking bridge, tunnels) شبكة شوارع آمنة في الموقع ((مثل جسر المشاة والأنفاق	<input type="checkbox"/>				
Diversity transport modes (inside and outside) projects (e.g. train, buses, metro) تنوع وسائل النقل (داخل وخارج) المشاريع , مثل: القطار والحافلات والمترو	<input type="checkbox"/>				
Infrastructure services availability (drinking, sewage) توفر خدمات البنى التحتية في الموقع (الشرب، الصرف الصحي)	<input type="checkbox"/>				
Public car parking availability توفر مواقف السيارات العامة	<input type="checkbox"/>				
Provide activities areas for the elderly and disabled توفير مجالات الأنشطة لكبار السن والمعوقين	<input type="checkbox"/>				
Designated activities areas for children's play areas مساحات مخصصة لمناطق لعب الأطفال	<input type="checkbox"/>				

Provide recreational facilities(e.g. public parks, malls,etc) توفير المرافق الترفيهية: مثل الحدائق العامة, المراكز التجارية وغيرها	<input type="checkbox"/>				
Promote cultural activities تعزيز الأنشطة الثقافية: المكتبات, مراكز الشباب, مكاتب البريد	<input type="checkbox"/>				
Increase health care centres زيادة المراكز الصحية	<input type="checkbox"/>				

12.d.ii.a. Please rate further factors, which are not mentioned above يرجى ذكر مقترحات أخرى لم يرد ذكرها اعلاه في مؤشرات النقل, البنى التحتية والخدمات العامة والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

Social, Cultural, Safety and security, Innovation, and Economy

12.d.iii. Please rate how important the following cultural **indicators** are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية العوامل الثقافية التالية لتحقيق التنمية الحضرية المستدامة في العراق ؟

* Required				
Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

Preservation of traditional building المحافظة على الابنية التراثية	<input type="checkbox"/>				
Promote traditional design for the new buildings تعزيز التصاميم التراثية للابنية الجديدة	<input type="checkbox"/>				
Provide the hierarchy in public and residential places توفير التدرج في الاماكن العامة والسكنية	<input type="checkbox"/>				
Promote use of natural lighting and for diversity buildings تعزيز استخدام الانارة الطبيعية للابنية المتنوعة	<input type="checkbox"/>				

12.d.iii.a. Please rate further factors, which are not mentioned above يرجى ذكر مقترحات اخرى حول المؤشر الثقافي والتي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.d.iii.b. Please rate how important the following social indicators are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية العوامل الاجتماعية التالية لتحقيق التنمية الحضرية المستدامة في العراق

* Required				
Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

<p>Promote intensive social programs (e.g. minimise energy consumption, water conversation, etc)</p> <p>تعزيز برامج التوعية الاجتماعية المكثفة , مثل : تقليل استهلاك الطاقة والمحافظة على المياه</p>	<input type="checkbox"/>				
<p>Provide social awareness programs through educational system (curriculum)</p> <p>توفير برامج التوعية الاجتماعية ضمن المنهج التعليمي</p>	<input type="checkbox"/>				
<p>Stakeholders' participation in descion-making</p> <p>مشاركة اصحاب العلاقة باتخاذ القرارات مثل: المختصين, المهنيين, الاكاديميين, الخ</p>	<input type="checkbox"/>				

12.d.iii.b.i. Please rate further factors, which are not mentioned above يرجى ذكر مقترحات اخرى حول المؤشر الاجتماعي والتي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.d.iii.c. Please rate how important the following **innovation indicators** are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية عوامل الابداع لتحقيق التنمية الحضرية المستدامة في العراق

* Required

	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important متوسطة الاهمية	Important مهمة	Very important مهمة جدا
Smart shading devices أجهزة التظليل الذكية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use travel time management system استخدام نظام ضبط وقت تنقل المركبات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use smart traffic system إستخدام أنظمة المروور الذكية, مثل: نظام عبور المشاة الضوئية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide smart guidelines in the buildings توفير لوحات ارشادية ذكية في المباني	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.d.iii.c.i. Please rate further factors, which are not mentioned above يرجى ذكر مقترحات اخرى حول مؤشر الابداع والتي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.d.iii.d. Please rate how important the following **safety and security indicators** are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية عوامل السلامة والامن التالية لتحقيق التنمية الحضرية المستدامة في العراق

* Required				
Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

Ensure safety construction ضمان سلامة البناء والعاملين	<input type="checkbox"/>				
Provide smart existing doors مخارج طوارئ ذكية	<input type="checkbox"/>				
Fire alarm system نظام اذار الحرائق	<input type="checkbox"/>				
Provide camera security onsite توفير نظام الكاميرات داخل الموقع	<input type="checkbox"/>				

12.d.iii.d.i. Please rate further factors, which are not mentioned above يرجى ذكر عوامل ومقترحات حول مؤشرات الحماية والامان والتي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

12.d.iii.e. Please rate how important the following local economic factors are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية العوامل الاقتصادية لتحقيق التنمية الحضرية المستدامة في العراق

	<i>* Required</i>				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Promote investment (local and international) تعزيز الاستثمار المحلي والدولي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Develop the tourism sector تطوير قطاع السياحة	<input type="checkbox"/>				
Employment التوظيف او خلق فرص العمل	<input type="checkbox"/>				
Foreign experience الخبرات الاجنبية	<input type="checkbox"/>				
Promote use of local materials تعزيز استخدام المواد المحلية	<input type="checkbox"/>				

12.d.iii.e.i. Please rate further factors, which are not mentioned above يرجى ذكر عوامل ومقترحات حول المؤشر الاقتصادي والتي لم يرد ذكرها اعلاه والتي تعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

13. Please rate how important the following management factors are for the sustainable urban development in Iraq ? يرجى تقييم مدى أهمية عوامل الادارة التالية لتحقيق التنمية الحضرية المستدامة في العراق

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Reduce Life Cycle Assessment (LCA) cost تقليل كلفة دورة حياة المشروع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Ensure a long- term maintenance and management for all activities to maximize efficiency ضمان الصيانة والادارة لفترة طويلة لضمان كفاءة المشروع</p>	<input type="checkbox"/>				
<p>Use an electronic governance system to ensure participate local people in all activities إستخدام نظام الحوكمة الالكترونية مع المواطنين من ضمنها المعاملات الادارية , ايصال الخدمات داخل البلدية او المشروع , الشكاوي وغيرها</p>	<input type="checkbox"/>				
<p>Establish postal code system to connect all activities إنشاء نظام الرمز البريدي لضمان ربط جميع الانشطة</p>	<input type="checkbox"/>				
<p>Create various opportunities for local people to participate in social, cultural, and economic activities , خلق فرص متنوعة لمشاركة السكان في فعاليات متنوعة: ثقافية , اجتماعية, واقتصادية , مثلا : الاعمال الطوعية داخل البلدية او المشروع , مشاركة منظمات المجتمع, الخ</p>	<input type="checkbox"/>				

13.a. Please rate further management factors, which are not mentioned above يرجى ذكر عوامل ومقترحات حول مؤشر الادارة والتي لم يرد ذكرها اعلاه وتعتبرها مهمة لتحقيق التنمية الحضرية المستدامة

14. In your opinion as a specialist, what are the other factors that are not mentioned in the questionnaire that require consideration in order to provide for the success of urban projects and their applicability in Iraq for the coming years? برأيك كمختص, ماهي العوامل الاخرى التي لم يرد ذكرها في جميع فقرات الاستبيان والتي تعتبرها مهمة لانجاح المشاريع الحضرية او المدن التوابع وإمكانية تطبيقها في العراق للسنوات القادمة كأن تكون سنة الهدف 2030

Page 5: Acknowledgments شكر وتقدير

Thank you for complete the questionnaire. Many thanks for your participation and interest
انتهى الاستبيان..شكراً لمشاركتكم وإهتمامكم

Experts consultations- Questionnaire samples - Round/2 (2)

Page 1: Introduction المقدمة

Urban sustainability framework for Iraqi cities: A case study in Baghdad/ Round (2)

إطار عمل الاستدامة الحضرية لمدينة العراق: حالة الدراسة في بغداد - الجولة الثانية من إستبيان الخبراء

Dear Expert,

I would like to express my thanks for your efforts and time in completing the first round survey. I especially want to thank you for your significant feedback.

The urban sustainability indicators that have been rated by experts in the previous round of this survey and will feed into the proposed urban sustainability framework. In addition, new indicators have been suggested by experts in the previous round, relating to planning and future vision of new development projects, housing patterns, thus a forming new set of urban sustainability indicators designed to improve well-being for the current city applications along with meeting future requirements.

I would like to invite you to participate in the second round of this survey, which requests you re-evaluate the urban indicators that achieved consensus during the first round, as well as evaluating the new indicators that have been proposed.

Collected data will be utilized for academic research purposes only.

For any questions about this survey, please contact:

Mrs. Marwah Mahdi Mohsin

Doctoral researcher

School of Engineering/Cardiff University/UK

Cardiff, CF23 9JD

Email: MohsinMM@Cardiff.ac.uk

الخير/الخيرة المحترم،

أود أن أعرب عن شكري لجهودكم المبذولة لانجاز الجولة الأولى. وأود بصفة خاصة أن أشكركم على ملاحظتكم الهامة

مؤشرات الاستدامة الحضرية في الجولة الأولى من المسح والتي تم تقييمها من قبل الخبراء سوف تغذي إطار الاستدامة الحضرية المقترحة. وبالإضافة إلى ذلك، إقترح خبراء في الجولة السابقة مؤشرات جديدة تتعلق بالتخطيط والرؤية المستقبلية للمشاريع الإنمائية الجديدة وأنماط الإسكان، مما يشكل مجموعة جديدة من مؤشرات الاستدامة الحضرية المصممة لتحسين جودة الحياة في المدن الحالية وكذلك تلبية الاحتياجات المستقبلية.

وأشرف هنا بدعوكم للمشاركة في الجولة الثانية من هذا المسح الذي يتطلب إعادة تقييم المؤشرات الحضرية التي حققت توافق الآراء خلال الجولة الأولى، فضلاً عن تقييم المؤشرات الجديدة التي تم اقتراحها

ملاحظة: سوف يرد ذكر مصطلح **المدن التوابع** او **المشاريع الحضرية المستقبلية** في اسئلة الاستبيان

هذه البيانات التي يتم جمعها سوف تستخدم **لأغراض البحث العلمي فقط**

للحصول على أي أسئلة حول هذا المسح، يرجى الاتصال بنا:

مروة مهدي محسن

تدريسية في كلية الهندسة

طالبة دكتوراه في جامعة كارديف/ المملكة المتحدة

Email: MohsinMM@Cardiff.ac.uk

Stages of the Questionnaire

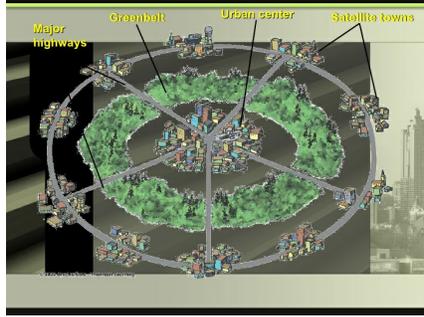
1. Name الاسم * Required

1.a. Email address العنوان البريدي * Required

1.b. Organization المؤسسة * Required

Page 2: Planning of Land Use and Site Selection (Future Vision) التخطيط في إستعمال الارض وإختيار الموقع (رؤية مستقبلية)

المدن **التوابع**: وهي المدن التي تنشأ خارج حدود المدينة لتلبية متطلبات التحديات الحالية والمستقبلية



وتصنف المدن التوابع حسب المتطلبات الآتية :

مدن توابع للاستخدام السكني
مدن صناعية
مراكز تجارية
مدينة إدارية

Note: This survey utilises the "**Mean Rank**" as a statistical method to analyse the results of the previous round. The Mean Rank numbers will appear in the questionnaire questions in the brackets on a scale of (1-5), e.g. (4.5/5).

The **purpose** of presenting the '**Mean Rank**' in the survey questions is to inform you of the votes of your colleagues in the previous round. This gives you the opportunity to understand their views and opinions regarding the indicators to be confirmed or condemned by your vote in the second round.

ملاحظة: يستخدم هذا المسح "**المتوسط الحسابي**" كطريقة إحصائية لتحليل نتائج الجولة السابقة. وستظهر أرقام المتوسط الحسابي في أسئلة الاستبيان بين الأقواس على مقياس (1-5) درجات، على سبيل المثال 4.5/5

الغرض من اظهار ارقام 'المتوسط الحسابي' في اسئلة المسح لتعريفكم بتصويت زملائكم في الجولة السابقة مما يتيح لحضراتكم الفرصة للتعرف على وجهات نظرهم بخصوص المؤشرات المطروحة لتأكيداها او اذانتها من خلال تصويتكم في الجولة الثانية

2. **Feedback and re-evaluation:** There is a significant consensus among experts from

the first round of the survey on the importance of urban sustainability indicators, related to the planning of future projects in the Iraqi capital, Baghdad. Therefore, please assess the level of importance of the establishment of satellites cities near the capital, in order to relieve pressure on the city center. **Mean Rank in this question is (4.31) إجابات الخبراء**

وإعادة التقييم: لقد حصل توافق واجماع علمي بين الخبراء في الجولة الاولى من المسح على اهمية المؤشرات الحضرية ومنها التخطيط للمشاريع المستقبلية للعاصمة بغداد, لذا يرجى اعادة تقييم أهمية إنشاء مدن توابع قريبة من Required *العاصمة لتخفيف الضغط على مركز المدينة (4.31/5) المتوسط الحسابي لهذا السؤال هو

Please select exactly 1 answer(s).

- Unimportant ليست مهمة
- Of little importance قليلة الأهمية
- Moderately important مهمة بشكل معتدل
- Important مهم
- Very important مهم جدا

2.a. Other comments ملاحظات اخرى

3. In your opinion, as a specialist, which of the following projects are the most important for the capital of Baghdad over the coming years (a new indicator) برأيك كمختص, اي؟
الفقرات التالية هي الأكثر أهمية (تحديد الاولويات للعاصمة بغداد للسنوات القادمة) (مؤشر جديد)؟

* Required				
Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

Residential urban developments projects (satellite cities) مشاريع سكنية/مدن توابع محددة للاستخدام السكني	<input type="checkbox"/>				
Industrial projects مشاريع المدن الصناعية	<input type="checkbox"/>				
Commercial projects المراكز التجارية	<input type="checkbox"/>				
Administrative city/centre مدينة إدارية / مركز إداري شامل	<input type="checkbox"/>				
Green belt حزام اخضر	<input type="checkbox"/>				

3.a. Other comments ملاحظات اخرى

4. Feedback and reassessment: There was consensus among the experts in the first round of the survey on the importance of urban indicators for the selection of future project sites, so please re-evaluate the selection of the following sites **إجابات الخبراء وإعادة التقييم:** لقد حصل توافق واجماع علمي بين الخبراء في الجولة الاولى من المسح على اهمية المؤشرات الحضرية لاختيار مواقع المشاريع المستقبلية للعاصمة بغداد , لذا يرجى إعادة تقييم اهمية الفقرات التالية والحاصلة على معدلات التصويت الاتية في الجولة الاولى

* Required				
Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

Residential satellite cities: Suburban regions obtained (4.01/5) مدن توابع سكنية ضمن الاقضية والنواحي	<input type="checkbox"/>				
Residential satellite cities within the mayoralty border (3.32/5) مدن توابع سكنية ضمن حدود أمانة بغداد	<input type="checkbox"/>				
Residential satellite cities within rural regions (3.16/5) مدن توابع سكنية ضمن المناطق الريفية	<input type="checkbox"/>				
Industrial projects within suburban regions (4.06/5) مشاريع او مدن صناعية ضمن الاقضية والنواحي	<input type="checkbox"/>				
Industrial projects within the mayoralty border (2.47/5) مشاريع او مدن صناعية ضمن حدود امانة بغداد	<input type="checkbox"/>				
Industrial projects within rural regions (3.25/5) مشاريع او مدن صناعية ضمن المناطق الريفية	<input type="checkbox"/>				
Commercial projects within the mayoralty border (4.06/5) مراكز تجارية ضمن حدود امانة بغداد	<input type="checkbox"/>				

Commercial projects within suburban regions (3.81/5) مراكز تجارية ضمن الاقضية والنواحي	<input type="checkbox"/>				
Commercial projects within rural regions (2.65/5) مراكز تجارية ضمن المناطق الريفية	<input type="checkbox"/>				
Administrative city/centre (4.04/5) within the mayoralty border مدينة ادارية ضمن حدود امانة بغداد	<input type="checkbox"/>				
Administrative city/centre (3.56/5) within suburban regions مدينة ادارية ضمن الاقضية والنواحي	<input type="checkbox"/>				
Administrative city/centre (2.27/5) within rural regions مدينة ادارية ضمن المناطق الريفية	<input type="checkbox"/>				
Green belt around Baghdad (4.91/5) الحزام الاخضر حول مدينة بغداد	<input type="checkbox"/>				

4.a. Other comments ملاحظات اخرى

5. Further urban indicators: The experts recommended these new indicators in the first round of the questionnaire. Please rate the importance of the following factors for the planning and land use in the capital Baghdad **المؤشرات الاضافية: العوامل الحضرية التالية اقترحها الخبراء في الجولة الاولى لتطوير التنمية الحضرية**

	<i>* Required</i>				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Development in the suburbs of cities: Within the municipal and administrative boundaries for multiple purposes e.g. huge commercial stores تطوير اطراف المدينة ضمن الحدود البلدية والادارية لاغراض متعددة مثل مخازن كبرى وغيرها	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
To pass on comprehensive environmental protection laws, and apply them for a specified period of time تشريع القوانين الشاملة لحماية البيئة وتطبيقها بفترة زمنية محددة ومنها: ازالة العشوائيات، ايقاف التجاوزات بكافة اشكالها وغيرها	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Provision for attractive tourist activities within green belt أنشطة سياحية جذابة ضمن الحزام الأخضر</p>	<input type="checkbox"/>				
<p>Buffer zones: A safe space area in front of construction sites, buildings, infrastructure services, and etc. المناطق العازلة: مساحة آمنة أمام موقع المشروع, المباني, وخدمات البنية التحتية, وما إلى ذلك</p>	<input type="checkbox"/>				

5.a. Other comments ملاحظات اخرى

Page 3: Housing Patterns أنماط السكن

6. Please indicate how important the following housing patterns are الرجاء بيان أفضلية أنماط السكن الاتيه للمشاريع الحضرية السكنية

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Mixed- pattern 4.26/5 نمط مختلط: أفقي وعمودي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Single- family house دور منفردة او منخفضة (ثلاث طوابق فما دون) 3.21/5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High-rise building 3.68/5 الابنية متعددة) الطوابق (عمارة سكنية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.a. Other comments ملاحظات اخرى

7. In relation to a single housing unit, please rate the importance of the following design elements for future projects فيما يخص الوحدة السكنية, بين مدى أهمية المتطلبات التصميمية الاتيشاريع الاسكان المستقبلية والتي توافق واجماع الخبراء في الجولة الاولى

* Required

	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Car park (private and public): موقف سيارات: خاص او عام 4.38/5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Back garden (3.94/5) حديقة منزلية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guest room (3.49/5) غرفة ضيوف	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Living room (4.34/5) غرفة معيشة (صالة)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dining room (3.35/5) غرفة طعام	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Balcony (3.53/5) شرفة (بالكون)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resilience housing unit (3.96/5) قابلية الوحدة السكنية للتوسع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multiple types of houses units areas onsite (4.44/5) توفر انواع مساكن بمساحات مختلفة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of daylight vs. artificial lighting (4.55/5) استخدام الاضاءة الطبيعية وتقليل الصناعية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adopt effective natural ventilation (4.6/5) استخدام التهوية الطبيعية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>A Single-family house (average size of Iraqi family 6 people) with a minimum area of 150-200 square meters دور سكنية (لمتوسط حجم العائلة العراقية 6 افراد) وبأقل مساحة ملائمة 200-150 متر مربع % 52</p>	<input type="checkbox"/>				
<p>Design requirements المتطلبات التصميمية suggest a number of rooms/ spaces for the above area: (8-9) spaces/ rooms including kitchen, hall, bathroom(2), (3-4) bedrooms, storage room, 2 stories عدد الفضاءات المقترحة لتلك الدور (المذكورة اعلاه) (8-9) فراغات/غرف من ضمنها: مطبخ, صالة, حمام عدد 2, (3-4) غرف نوم, مخزن صغير (1), طابقين</p>	<input type="checkbox"/>				
<p>High-rise building at least 100-150 sq.metre الابنية متعددة الطوابق (شقق سكنية بأقل مساحة ملائمة 150-100 متر مربع</p>	<input type="checkbox"/>				

<p>Design requirements المتطلبات التصميمية للشقة السكنية : suggest a number of spaces/rooms for the above area (7-8) spaces/rooms including: kitchen, hall, bathroom(2), (2-3) bedrooms, storage room(1) عدد الفضاءات المقترحة لتلك المساحة (المذكورة اعلاه) (8-7) فراغات/غرف من ضمنها: مطبخ، صالة، حمام عدد 2، 3-2 غرف نوم، مخزن صغير</p>	<input type="checkbox"/>				
<p>Improve the quality of indoor climate (thermal comfort): (a new indicator) مؤشر جديد: تحسين جودة المناخ الداخلي للوحدة السكنية / الراحة الحرارية</p>	<input type="checkbox"/>				
<p>Affordable housing: (a new indicator) مؤشر جديد: السكن بأسعار معقولة</p>	<input type="checkbox"/>				
<p>Adopt green housing design: (a new indicator) مؤشر جديد: اعتماد تصميم الابنية الخضراء</p>	<input type="checkbox"/>				
<p>Underground garage or car parking: (a new indicator) مؤشر جديد: داب لكراج السيارة</p>	<input type="checkbox"/>				

7.a. Other comments ملاحظات اخرى

8. Please indicate the importance of the following suggestions concerning the suitable area of the residential unit and the number of rooms, taking into account that the average size of the Iraqi family is approximately 6 people. الرجاء بين أهمية الفقرات التالية الخاصة بمساحة الوحدة السكنية وعدد الغرف الملائمة لتلك المساحة التي حصل عليها توافق الخبراء من الجولة الاولى مع الاخذ بنظر الاعتبار ان معدل حجم الاسرة العراقية 6 تقريبا

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Number of rooms/house (83%): عدد الغرف المقترحة (3-4) لمساحة الدار السكني المذكوره اعلاه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A Single-family house (average size of Iraqi family 6 people) with a minimum area of 150-200 square meters دور سكنية (لمتوسط حجم العائلة العراقية 6 افراد) وباقل مساحة ملائمة 200-150 متر مربع % 52	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Design requirements المتطلبات التصميمية للدار السكني suggest a number of rooms/ spaces for the above area: (8-9) spaces/ rooms including kitchen, hall, bathroom(2), (3-4) bedrooms, storage room, 2 stories عدد الفضاءات المقترحة لتلك الدور (المذكورة اعلاه) (8- 9) فراغات/غرف من ضمنها: مطبخ, صالة, حمام عدد 2, (3-4) غرف نوم, مخزن صغير (1), طابقين</p>	<input type="checkbox"/>				
<p>High-rise building at least 100-150 sq.metre (الابنية متعددة الطوابق (شقق سكنية باقل مساحة ملائمة 100-150 متر مربع</p>	<input type="checkbox"/>				
<p>Number of rooms/ flat: (a new indicator): عدد (2-3) الغرف المقترحة لمساحة الشقة السكنية المذكوره اعلاه السكنية</p>	<input type="checkbox"/>				

Design requirements

المتطلبات التصميمية للشقة

السكنية : suggest a

number of

spaces/rooms for the

above area (7-8)

spaces/rooms

including: kitchen,

hall, bathroom(2),

(2-3) bedrooms,

storage room(1) عدد

الفضاءات المقترحة لتلك ا

(المذكورة اعلاه) (8-7)

فراغات/غرف من ضمنها:

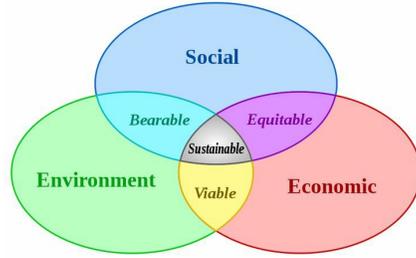
مطبخ, صالة, حمام عدد 2,

3-2 غرف نوم, مخزن صغير



8.a. Other comments ملاحظات اخرى

تحديات التنمية الحضرية المستدامة



الشكل أعلاه يوضح بشكل مبسط أهداف التنمية الحضرية المستدامة

The figure above illustrates in a simplified manner the factors of sustainable urban development.

ملاحظة: يتعامل مع مؤشرات التنمية الحضرية المستدامة وفقراتها في هذا البحث كمجموعة مؤشرات حصلت على اجماع الخبراء المحليين لتحسين جودة الحياة وتمثل احدي فقرات اطار العمل المستدام في هذه الدراسة

9. Please rate how important the following **environmental factors** are for the sustainable urban development in Iraq? يرجى إعادة تقييم أهمية العوامل البيئية التالية لتحقيق التنمية الحضرية المستدامة في العراق والتي حصل عليها توافق الخبراء من الجولة الاولى ؟

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Reduce pollution (air, water, noise etc) 4.72/5 تقليل التلوث	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waste separation and recycling 4.6/5 فصل وتدوير النفايات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetation cover 4.72/5 الغطاء النباتي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Use of sustainable construction materials (production, use, and recyclable) 4.26/5</p> <p>استخدام مواد البناء المستدامة وتضم مراحل: الانتاج, الاستخدام واعادة التدوير</p>	<input type="checkbox"/>				
<p>Site micro-climate (e.g. solar orientation, air movement, building configuration, shading device, and etc) 4.37/5</p> <p>المناخ المصغر (المايكرو-مناخي) للموقع (على سبيل المثال التوجه الشمسي، حركة الهواء، تكوين المبنى، جهاز (التظليل، وما إلى ذلك)</p>	<input type="checkbox"/>				
<p>Conservation of agriculture land: (a new suggestion)</p> <p>مؤشر جديد: المحافظة على الاراضي الزراعية</p>	<input type="checkbox"/>				

9.a. Other comments ملاحظات اخرى

9.b. Please rate how important the following **ecology factors** are for the sustainable urban development in Iraq are? يرجى تقييم مدى أهمية **العوامل البيئية** التالية لتحقيق التنمية الحضرية والتي حصل عليها توافق الخبراء من الجولة الاولى

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Green areas and parks 4.82/5 المساحات الخضراء والمنتزهات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shaded streets and protected open spaces 4.36/5 الشوارع المظللة والمساحات المفتوحة المحمية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water bodies 4.01/5 البحيرات الصناعية والنافورات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Balance the ratio between green spaces and built-up areas 4.56/5 نسبة التوازن بين المساحات الخضراء والمناطق المبنية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9.b.i. Other comments ملاحظات اخرى

9.c. Please rate how important the following **water indicators** are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية مؤشرات المياه التالية والتي حصل عليها توافق الخبراء من الجولة الاولى لتحقيق التنمية الحضرية المستدامة في العراق

* Required

	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Water conservation 4.77/5 المحافظة على المياه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Onsite wastewater recycling: treatment of waste and sewage water 4.32/5 إعادة تدوير واستخدام المياه في الموقع لاغراض السقي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision onsite water quality 4.67/5 توفير مياه الشرب في الموقع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diversity of water resources onsite: underground and rainwater 4.07/5 تنوع إستخدام مصادر المياه في الموقع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distillation system for irrigation green areas/parks: (a new indicator) مؤشر جديد: نظام سقي المساحات الخضراء بالتقطير	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9.c.i. Other comments ملاحظات اخرى

9.d. Please describe how important the following energy sub-indicators are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية مؤشرات الطاقة التالية لتحقيق التنمية الحضرية المستدامة في العراق

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Minimise energy consumption from heating, ventilation, air conditioning, lighting, and hot water system 4.52/5 تقليل استهلاك الطاقة من (التدفئة, التهوية, التبريد, الانارة و نظام الماء الساخن)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of insulation 4.4/5 استخدام العوازل	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use alternative renewable energy (e.g PV solar and wind) onsite or near-site. 4.44/5 إستخدام الطاقة المتجددة: الطاقة الشمسية وطاقة الرياح في الموقع او بالقرب منه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smart energy management (monitor, control, sensors, and optimize performance of buildings) 4.19/5 إدارة الطاقة الذكية: المراقبة, التحكم, أجهزة الاستشعار, وتحسين المباني الأداء	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Smart and safe energy distributed system: (a new indicator): مؤشر جديد: نظام توزيع الطاقة بطرق آمنة	<input type="checkbox"/>				
Smart solar heating water:(a new indicator): مؤشر جديد: استخدام السخان الشمسي	<input type="checkbox"/>				

9.d.i. Other comments ملاحظات اخرى

9.d.i.a. Please specify, how important you think the following uses of solar energy are? يرجى تحديد, مدى أهمية استخدام تقنية الطاقة الشمسية في الحالات الآتية؟

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Use the PV on top of the buildings 4.33/5 إستخدام منظومة الطاقة الشمسية فوق سطوح الابنية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use slanted ceilings with solar technology 3.71/5 السقوف المائلة المزودة بتقنية الطاقة الشمسية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Use solar wall techniques 3.38/5 إستخدام الخلايا الشمسية عن طريق الجدران الخارجية	<input type="checkbox"/>				
PV on external windiows 3.09/5 تركيب الشرائح الشمسية على الشبائيك الخارجية	<input type="checkbox"/>				

9.d.i.a.i. Other comments ملاحظات اخرى

Transportation, Infrastructure, and Public services

9.d.i.a.ii. Please rate how important the following transportation, public services, and Infrastructure indicators sub-indicators are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية المؤشرات التالية للنقل, الخدمات العامة, والبنى التحتية لتحقيق التنمية الحضرية المستدامة في العراق؟

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Mitigate traffic congestion 4.7/5 تخفيف الازدحام المروري	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promotion of public transport 4.75/5 تعزيز استخدام النقل العام	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Encourage walking as a mean of mobility particularly nearby distance (e.g from the houses to the diverse activities)</p> <p>4.34/5 المشي كوسيلة للتنقل وخاصة للمسافات القريبة: على سبيل المثال من المنازل إلى الأنشطة المتنوعة</p>	<input type="checkbox"/>				
<p>Use of private car</p> <p>3.08/5 استخدام السيارة الخاصة</p>	<input type="checkbox"/>				
<p>Provide bicycle paths streets networks</p> <p>3.91/5 توفير ممرات خاصة بالدراجات الهوائية</p>	<input type="checkbox"/>				
<p>Safe streets network onsite (e.g. walking bridge, tunnels)</p> <p>4.27/5 شبكة شوارع آمنة (مثل جسر المشاة والأنفاق)</p>	<input type="checkbox"/>				
<p>Diversity transport modes (inside and outside) projects (e.g. train, buses, metro)</p> <p>4.67/5 تنوع وسائل النقل (داخل وخارج) المشاريع، مثل: القطار والحافلات والمترو</p>	<input type="checkbox"/>				

<p>Infrastructure services availability (drinking, sewage) 4.73/5 توفر خدمات البنى التحتية في الموقع ((الشرب، الصرف الصحي</p>	<input type="checkbox"/>				
<p>Public car parking availability 4.38/5 توفر مواقف السيارات العامة</p>	<input type="checkbox"/>				
<p>Provide activities areas for the elderly and disabled 4.2/5 توفير مجالات الأنشطة لكبار السن والمعوقين</p>	<input type="checkbox"/>				
<p>Designated play areas for children 4.49/5 مساحات مخصصة لمناطق لعب الأطفال</p>	<input type="checkbox"/>				
<p>Provide recreational facilities(e.g. public parks, malls, etc) 4.36/5 توفير المرافق الترفيهية: مثل الحدائق العامة، المراكز التجارية وغيرها</p>	<input type="checkbox"/>				
<p>Promote cultural activities 4.04/5 تعزيز الأنشطة الثقافية: المكتبات، مراكز الشباب، مكاتب البريد</p>	<input type="checkbox"/>				
<p>Improve and increase health care centres 4.24/5 زيادة وتحسين خدمات المراكز الصحية</p>	<input type="checkbox"/>				

Emergency paths e.g. ambulance, fire trucks, police cars, and buses line: (a new indicator) مؤشر جديد: ممرات طواريء (إسعاف, حريق, خط باص)	<input type="checkbox"/>				
Use of electrical cars:(a new indicator) مؤشر جديد: استخدام السيارات الكهربائية	<input type="checkbox"/>				
Vehicles paths/networks: (a new indicator) مؤشر جديد: ممر او مسار خاص للمركبات الثقيلة(الشاحنات)	<input type="checkbox"/>				
Use of camera security system in motorways:(a new indicator) مؤشر جديد: نظام المراقبة بالكاميرات للطرق السريعة والرئيسية	<input type="checkbox"/>				

9.d.i.a.ii.a. Other comments ملاحظات اخرى

Social, Cultural, Safety and security, Innovation, and Economy

9.d.i.a.iii. Please rate how important the following cultural **indicators** are the sustainable urban development in Iraq? يرجى تقييم مدى أهمية العوامل الثقافية التالية لتحقيق التنمية الحضرية المستدامة في العراق؟

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Preservation of traditional buildings 4.55/5 المحافظة على الابنية التراثية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promote traditional design for new buildings 3.98/5 تعزيز التصاميم التراثية للابنية الجديدة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide the hierarchy of planning in public and residential places 4.07/5 توفير التدرج في الاماكن العامة والسكنية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promote use of natural lighting for diversity buildings e.g. libraries, playground, offices, and etc 4.41/5 تعزيز استخدام الالوان الطبيعية للابنية المتنوعة, مثل المكتبات, الملاعب, مكاتب العمل	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9.d.i.a.iii.a. Other comments ملاحظات اخرى

9.d.i.a.iii.b. Please rate how important the following social **indicators** are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية العوامل الاجتماعية التالية لتحقيق التنمية الحضرية المستدامة في العراق

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Promote intensive social programs (e.g. minimise energy consumption, water conversation, etc) 4.57/5 تعزيز برامج التوعية الاجتماعية المكثفة، مثل: تقليل استهلاك الطاقة والمحافظه على المياه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide social awareness programs through educational system (curriculum) 4.55/5 توفير برامج التوعية الاجتماعية ضمن المنهج التعليمي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stakeholders' participation in decision-making 4.53/5 مشاركة اصحاب العلاقة باتخاذ القرارات، مثل: المختصين، المهنيين، الاكاديميين، الخ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Skills improvements programs, women involvement e.g. volunteers works برامج تطوير القدرات من ضمنها مشاركة المرأة مؤشر (a new indicator) جديد	<input type="checkbox"/>				
Fines for violators: (a new indicator) العمل بنظام الغرامات للمخالفين: مؤشر جديد	<input type="checkbox"/>				

9.d.i.a.iii.b.i. Other comments ملاحظات اخرى

9.d.i.a.iii.c. Please rate how important the following **innovation indicators** are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية عوامل الإبداع لتحقيق التنمية الحضرية المستدامة في العراق

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important متوسطة الأهمية	Important مهمة	Very important مهمة جدا
Smart shading devices 3.91/5 أجهزة التظليل الذكية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Travel time management 4.21/5 استخدام نظام ضبط وقت تنقل المركبات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Use smart traffic system 4.38/5 إستخدام أنظمة المرور الذكية, مثل: نظام عبور المشاة الضوئية	<input type="checkbox"/>				
Provide smart guidelines for the buildings 4.41/5 توفير لوحات ارشادية ذكية في المباني	<input type="checkbox"/>				
Adopt Building Information Modelling (BIM) as essential criteria: (a new indicator) مؤشر اعتماد نمذجة BIM جديد معلومات الابنية ك معيار اساسي لتصاميم المشاريع القادمة	<input type="checkbox"/>				

9.d.i.a.iii.c.i. ملاحظات اخرى Other comments

9.d.i.a.iii.d. Please rate how important the following **safety and security indicators** are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية عوامل السلامة الامان التالية لتحقيق التنمية الحضرية المستدامة في العراق

* Required				
Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

Ensure safe construction 4.65/5 ضمان سلامة البناء والعاملين	<input type="checkbox"/>				
Provide smart emergency doors 4.38/5 مخارج طوارئ ذكية	<input type="checkbox"/>				
Fire alarm system 4.6/5 نظام انذار الحرائق	<input type="checkbox"/>				
Provide security camera onsite 4.44/5 توفير نظام الكاميرات داخل الموقع	<input type="checkbox"/>				

9.d.i.a.iii.d.i. Other comments ملاحظات اخرى

9.d.i.a.iii.e. Please rate how important the following local economic factors are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية العوامل الاقتصادية لتحقيق التنمية الحضرية المستدامة في العراق

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الأهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Promote investment (local and international) 4.63/5 تعزيز الاستثمار المحلي والدولي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Develop tourism sector 4.45/5 تطوير قطاع السياحة	<input type="checkbox"/>				
Employment 4.74/5 التوظيف او خلق فرص العمل	<input type="checkbox"/>				
International experiences 4.11/5 الخبرات الاجنبية	<input type="checkbox"/>				
Promote use of local materials 4.56/5 تعزيز استخدام المواد المحلية	<input type="checkbox"/>				
Diversity of economic activities instead of single economy (oil): (a new indicator) مؤشر جديد: تفعيل مصادر التنوع الاقتصادي بدل الاعتماد على النفط	<input type="checkbox"/>				
Participation between public and private sector: (a new indicator) مؤشر جديد: الشراكة بين القطاع العام والخاص	<input type="checkbox"/>				
Commercial awarenesses programs onsite e.g workshop to develop commercial activities: (a new indicator) برامج التوعية التجارية في الموقع لتطوير الفعاليات التجارية: مؤشر جديد	<input type="checkbox"/>				

10. Please rate how important the following management factors are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية عوامل الادارة التالية لتحقيق التنمية الحضرية المستدامة في العراق

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Reduce Life Cycle Assessment (LCA) cost 4.24/5 تقليل كلفة دورة حياة المشروع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ensure a long-term maintenance and management of all activities to maximize efficiency 4.59/5 ضمان الصيانة والادارة لفترة طويلة لضمان كفاءة المشروع	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Use an electronic governance system to ensure participation of local people in all activities</p> <p>4.57/5 إستخدام نظام الحوكمة الالكترونية مع المواطنين من ضمنها المعاملات الادارية, اىصال الخدمات داخل البلدية او المشروع, الشكوي وغيرها</p>	<input type="checkbox"/>				
<p>Establish postal code system to connect all activities</p> <p>4.21/5 إنشاء نظام الرمز البريدي لضمان ربط جميع الأنشطة</p>	<input type="checkbox"/>				
<p>Create various opportunities for local people to participate in social, cultural, and economic activities</p> <p>4.39/5 خلق فرص متنوعة لمشاركة السكان في فعاليات متنوعة: ثقافية, اجتماعية, واقتصادية, مثلا: الاعمال الطوعية داخل البلدية او المشروع, مشاركة منظمات المجتمع, ورش عمل للمحافظة على الممتلكات, الخ</p>	<input type="checkbox"/>				

Comprehensive updates schemes (get a chance to the existing applications to be sustainable): (a new indicator) مؤشر جديد: خطط تحديث شاملة منها: إعطاء الفرصة لبغداد ان تكون مستدامة تدريجيا البدأ من البلدية	<input type="checkbox"/>				
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10.a. Other comments ملاحظات اخرى

11. As a specialist, which of the following indicators, which were mentioned in the previous questions, are the highest priority for future projects in order to improve the quality of life in the Baghdad regions
برأيك كمختص، اي المؤشرات التالية والتي وردت في الاسئلة السابقة بفقراتها هي الأكثر أولوية للمشاريع المستقبلية من اجل تحسين جودة الحياة في مناطق بغداد للسنوات القادمة

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Environmental and ecology indicators المؤشر البيئي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water indicator مؤشر المياه	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Energy and solar energy indicators مؤشر الطاقة واستخدام الطاقة الشمسية	<input type="checkbox"/>				
Transportation, public services, and infrastructure indicators مؤشرات النقل, الخدمات العامة, والبنى التحتية	<input type="checkbox"/>				
Cultural indicator المؤشر الثقافي	<input type="checkbox"/>				
Social indicator المؤشر الاجتماعي	<input type="checkbox"/>				
Innovation indicator المؤشر الابداع	<input type="checkbox"/>				
Safety and security indicators مؤشرات السلامة والامان	<input type="checkbox"/>				
Economic indicator المؤشر الاقتصادي	<input type="checkbox"/>				
Management indicator مؤشر الادارة	<input type="checkbox"/>				

11.a. Other comments ملاحظات اخرى

12. Any further feedback and comments for all sections above, please mention it here?

أي ملاحظة اضافية لما ورد اعلاه في فقرات الاستبيان يمكن ذكرها هنا



Page 5: Acknowledgments شكر وتقدير

Thank you for completing the questionnaire. Many thanks for your participation and interest إنتهت الجولة الثانية من الاستبيان..شكراً لمشاركتكم وإهتمامكم

Experts consultations- Questionnaire samples - Round/3 (3)

Page 1: Introduction المقدمة

Urban sustainability framework for Iraqi cities: A case study in Baghdad/ Round (3)

إطار عمل الاستدامة الحضرية لمدينة العراق: حالة الدراسة في بغداد - الجولة الثالثة والأخيرة من إستبيان الخبراء

Dear Expert,

I would like to thank you for your efforts in completing the second round of the Delphi questionnaires and providing us with important observations.

Following analyse the results, we found a scientific consensus in your opinions on the urban indicators proposed in the previous round. These indicators will feed into the urban sustainability indicators, which are part of the proposed sustainable framework.

This survey includes three sections; the planning and future vision of new urban development projects, the housing patterns which will be used to provide input variables for the simulation model, and, finally, a set of urban sustainability indicators designed within a sustainable framework to improve the quality of life in the current urban applications and to meet future needs.

I invite you to participate in the third and final round (a concise review of the proposed framework, with emphasis on the reassessment of additional urban indicators proposed by the Panel of Experts)

This questionnaire will be for additional indicators with the emphasis on priority setting.

Collected data will be utilized for academic research purposes only.

For any questions about this survey, please contact:

Mrs. Marwah Mahdi Mohsin

Doctoral researcher

School of Engineering/Cardiff University/UK

Cardiff, CF23 9JD

Email: MohsinMM@Cardiff.ac.uk

الخبير/الخيرة المحترم،

أود أن أتقدم اليكم بالشكر والامتنان لجهودكم المبذولة لانجاز الجولة الثانية من سلسلة استبيانات دلفي وتزويدنا بالملاحظات المهمة .

بعد فرز الاجابات وتحليل النتائج، حصل توافق علمي في آرائكم على المؤشرات الحضريية في الجولة السابقة وسوف تغذي هذه المؤشرات إطار الاستدامة الحضريية التي تعتبر جزءاً من الاطار المستدام المقترح للعاصمة بغداد ومنها ما يتعلق لتخطيط والرؤية المستقبلية للمشاريع الإنمائية الجديدة وأنماط الإسكان المفترضة لتكون مدخلات لنموذج محاكاة يخص الباحث، ما يشكل مجموعة جديدة من مؤشرات الاستدامة الحضريية المصممة ضمن اطار عمل مستدام لتحسين جودة الحياة في التطبيقات الحالية للمدن و لتلبية الاحتياجات المستقبلية .

وأشرف هنا بدعوكم للمشاركة في الجولة الثالثة والاخيرة (وهي جولة إستراتيجية ومُلخصة لبناء اطار العمل المقترح مع التأكيد على اعادة تقييم المؤشرات الحضريية الاضافية والتي تم اقتراحها من قبل فريق الخبراء فقط

هذه البيانات التي يتم جمعها سوف تستخدم لأغراض البحث العلمي فقط

للحصول على أي أسئلة حول هذا المسح، يرجى الاتصال بنا:

مروة مهدي مُحسن

تدريسية في كلية الهندسة

طالبة دكتوراه في جامعة كارديف/ المملكة المتحدة

Email: MohsinMM@Cardiff.ac.uk

Stages of the Questionnaire

1. Name الاسم * Required

1.a. Email address العنوان البريدي * Required

1.b. Organization المؤسسة * Required

Page 2: Planning of Land Use and Site Selection (Future Vision) التخطيط في إستعمال الارض وإختيار الموقع (رؤية مستقبلية)

الجزء الأول: يتضمن مؤشرات التخطيط المقترحة والرؤية المستقبلية لاستيعاب التضاعف السكاني المتوقع حصوله لبغداد بحلول عام 2030. ويقدم البحث رؤية شاملة بما في ذلك استخدام المدن النوايح حول العاصمة لأغراض متعددة منها (السكنية، الصناعية، التجارية، والإدارية)، بالإضافة إلى أهمية الحزام الأخضر لمكافحة التصحر، التغير المناخي، والحفاظ على الحجم الأمثل للمدينة

Part 1: includes the proposed planning indicators and future vision for mitigating the population-inflation projected by 2030. This research presents a comprehensive vision including the use of satellite cities around the capital for various purposes (residential, industrial, commercial and administrative, in addition to understanding the importance of the green belt to combat climate change, desertification, and conservation of optimal size of the city)

الجزء الثاني: مُخصص لتحديد معيار شبه تلقائي لمشاريع الاسكان المستقبلية وذلك بتحديد نمط افضل واقل مساحة ملائمة لمتطلبات متوسط حجم العائلة العراقية، لغرض ادخال هذه المعايير المتفق عليها في برنامج محاكاة يستخدمه الباحث (دراسة تجريبية) (لذا يرجى الاجابة بدقة بالتأكيديعلى الفقرات او إاداتها)

Part 2: is designed to determine a criterion for future housing projects by suggesting the minimum requirements for an average size Iraqi family in order to use these indicators as inputs for a simulation model by the researcher (a pilot study).

الجزء الثالث: مُخصص لتحديد مؤشرات التنمية الحضرية المستدامة والتي من الممكن ادراجها في اطار العمل المُصمم لتحسين جودة الحياة في التطبيقات الحالية والمشاريع القادمة وحسبالاولويات والبدأ بشكل تدريجي

Part 3: The purpose of this section to identify a set of urban sustainability indicators to improve human well-being in the current and future city applications.

Note: This survey utilises the "**Mean Rank**" as a statistical method to analyse the results of the previous round. The Mean Rank numbers will appear in the questionnaire questions in the brackets on a scale of (1-5), e.g. (4.5/5).

The **purpose** of presenting the '**Mean Rank**' in the survey questions is to inform you of the votes of your colleagues in the previous round. This gives you the opportunity to understand their views and opinions regarding the indicators to be confirmed or condemned by your vote in the second round.

ملاحظة: يستخدم هذا المسح "**المتوسط الحسابي**" كطريقة إحصائية لتحليل نتائج الجولة السابقة. وستظهر أرقام المتوسط الحسابي في أسئلة الاستبيان بين الأقواس على مقياس (1-5) درجات، على سبيل المثال 4.5/5

الغرض من اظهار ارقام '**المتوسط الحسابي**' في اسئلة المسح لتعريفكم بتصويت زملائكم في الجولة السابقة مما يتيح لحضراتكم الفرصة للتعرف على وجهات نظرهم بخصوص المؤشرات المطروحة لتأكيداها او اذانتها من خلال تصويتكم في الجولة الثالثة والاخيرة

2. Further urban indicators: Please re-evaluate the additional indicators for the planning and land use in the capital Baghdad **المؤشرات الاضافية:** يرجى اعادة تقييم المؤشرات الاضافية الخاصة بالجزء الاول من التخطيط والرؤية المستقبلية للعاصمة

* Required				
Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

<p>Development in the suburbs of cities: Within the municipal and administrative boundaries for multiple purposes e.g. huge commercial stores(3.92/5) تطوير اطراف المدينة ضمن الحدود البلدية والادارية لاغراض متعددة مثل مجمعات تجارية ومخازن كبرى ورش تصليح وغيرها غيرها</p>	<input type="checkbox"/>				
<p>To pass comprehensive environmental protection laws, and apply them for a specified period of time (4.72/5) تشريع القوانين الشاملة لحماية البيئة وتطبيقها بفترة زمنية محددة ومنها: ازالة العشوائيات، إيقاف التجاوزات بكلفة اشكالها وغيرها</p>	<input type="checkbox"/>				
<p>Provision for attractive tourist activities within green belt (4.43/5) أنشطة سياحية وترفيهية.جذابة ضمن الحزام الأخضر</p>	<input type="checkbox"/>				

Buffer zones: A safe space area in front of construction sites, buildings, infrastructure services, and etc.

المناطق العازلة: (4.21/5)
مساحة آمنة أمام موقع
المشروع، المباني وخدمات
البنية التحتية، وما إلى ذلك



2.a. Other comments ملاحظات اخرى

Page 3: Housing Patterns أنماط السكن

3. Please re-evaluate the additional indicators for the housing requirements, which were agreed by consensus in the previous round يرجى إعادة تقييم المؤشرات الإضافية الخاصة بجزء الاسكان والتي حصل توافق واجماع الخبراء في الجولة السابقة بالنسب الاتية

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Improve quality of indoor climate (thermal comfort) تحسين جودة (4.68/5) المناخ الداخلي للوحدة السكنية / الراحة الحرارية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Affordable housing (4.71/5) السكن بأسعار معقولة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adopt green housing design (4.41/5) اعتماد تصميم الابنية الخضراء	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Underground garage or car parking (3.09/5) سرداب لكرارج (3.09/5) السيارة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.a. Other comments ملاحظات اخرى

Page 4: Urban Challenges of Sustainable Development

تحديات التنمية الحضرية المستدامة

الشكل أعلاه يوضح بشكل مبسط أهداف التنمية الحضرية المستدامة

The figure above illustrates in a simplified manner the factors of sustainable urban development.

ملاحظة: يتعامل مع مؤشرات التنمية الحضرية المستدامة وفقراتها في هذا البحث كمجموعة مؤشرات حصلت على اجماع الخبراء المحليين لتحسين جودة الحياة وتمثل احدى فقرات اطار العمل المستدام في هذه الدراسة

4. Please re-evaluate the importance of additional **environmental** and **water** indicators? يرجى إعادة تقييم أهمية المؤشرات الاضافية فقط **البيئية** و **المياه** التالية ؟

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Conservation of agriculture land: (a new suggestion) (4.75/5) المحافظة على الاراضي الزراعية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Efficient Water Use System: Watering distillation of green areas and exploitation of rainwater storage (4.62/5) النظام الكفوء لاستخدام المياه: سقي المساحات الخضراء بالتنقيط واستغلال تخزين مياه الامطار	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.a. Other comments ملاحظات اخرى

4.b. Please assess the importance of the following additional **energy** and **solar** indicators? يرجى تقييم مدى أهمية مؤشرات **الطاقة** و **الطاقة الشمسية** **الاضافية** التالية؟

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Smart and safe energy distributed system (4.07/5) نظام توزيع الطاقة بطرق آمنة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smart solar heating water(4.27/5) استخدام السخان الشمسي	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.b.i. Other comments ملاحظات اخرى

5. Please re-evaluate the importance of **additional transportation, infrastructure, and public services** indicators? يرجى إعادة تقييم أهمية مؤشرات **النقل**, **البنى التحتية**, و**الخدمات العامة** **الاضافية** فقط

* Required

	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Emergency network/way e.g. ambulance, fire trucks, police cars, and buses way/lane(4.46/5) ممرات طواريء (إسعاف), حريق, خط باص	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of electrical cars(3.79/5/5) استخدام السيارات الكهربية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vehicles ways/networks (4.26/5) ممر او مسار) خاص للمركبات الثقيلة(الشاحنات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of camera security system in motorways(4.58/5) نظام المراقبة بالكاميرات للطرق السريعة والرئيسية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5.a. Other comments ملاحظات اخرى

6. Please assess the importance of the following additional social, cultural and creative indicators? يرجى تقييم مدى أهمية المؤشرات الاجتماعية, الثقافية والابداعية الاضفية التالية

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Skills improvements programs, women involvement e.g. volunteers works برامج تطوير القدرات من ضمنها مشاركة (المرأة) 4.29/5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fines for violators (e.g. who infringe on public services and utilities) (4.73/5) العمل بنظام الغرامات للمخالفين	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adopt Building Information Modelling (BIM) as essential criteria (4.18/5) BIM اعتماد نمذجة معلومات الابنية كمعيار اساسي لتصاميم المشاريع القادمة	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.a. Other comments ملاحظات اخرى

7. Please rate how important the following economical and management indicators are for the sustainable urban development in Iraq? يرجى تقييم مدى أهمية

المؤشرات الاقتصادية و الادارية الاضافية التالية

	* Required				
	Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا
Diversity of economic activities instead of single economy (oil) تفعيل مصادر (4.90/5) التنوع الاقتصادي بدل الاقتصاد الاحادي للنفط	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Collaboration between public and private sector الشراكة بين (4.65/5) القطاع العام والخاص	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Commercial awarenesses programs onsite e.g workshop to develop commercial activities برامج التوعية (3.88/5) التجارية في الموقع لتطوير الفعاليات التجارية	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Comprehensive updates schemes (identifying the role of the research centres to develop institutional work, developing the municipality's towards sustainable development)</p> <p>خطط تحديث (4.45/5) شاملة منها: انشاء و تفعيل دور المراكز البحثية لتطوير العمل المؤسساتي، تطوير عمل البلدية بالتوجه للتنمية المستدامة تدريجيا وغيرها</p>	<input type="checkbox"/>				
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7.a. Other comments ملاحظات اخرى

8. Please re-evaluate the priorities of the following indicators mentioned in the previous questions in order to improve the quality of life for the future urban projects of Baghdad (the target year 2030)? يرجى إعادة تقييم أولويات المؤشرات التالية والتي وردت في الاسئلة السابقة بفقراتها (من اجل تحسين جودة الحياة في المشاريع الحضرية للسنوات القادمة (سنة الهدف 2030)

* Required				
Unimportant ليست مهمة	Of little importance قليلة الاهمية	Moderately important مهمة بشكل معتدل	Important مهم	Very important مهم جدا

Environmental and ecology indicators (المؤشر البيئي (4.69/5)	<input type="checkbox"/>				
Water indicators (مؤشر المياه (4.54/5)	<input type="checkbox"/>				
Energy and solar energy indicators (مؤشر الطاقة (4.50/5) واستخدام الطاقة الشمسية	<input type="checkbox"/>				
Transportation, public services, and infrastructure indicators (مؤشرات النقل, الخدمات العامة والبنى التحتية (4.71/5)	<input type="checkbox"/>				
Cultural indicators (المؤشر الثقافي (4.06/5)	<input type="checkbox"/>				
Social indicators (المؤشر الاجتماعي (4.12/5)	<input type="checkbox"/>				
Innovation indicators (مؤشر الابداع (4.03/5)	<input type="checkbox"/>				
Safety and security indicators (مؤشرات السلامة والامان (4.41/5)	<input type="checkbox"/>				
Economic indicators (المؤشر الاقتصادي (4.43/5)	<input type="checkbox"/>				
Management indicators (مؤشر الادارة (4.37/5)	<input type="checkbox"/>				

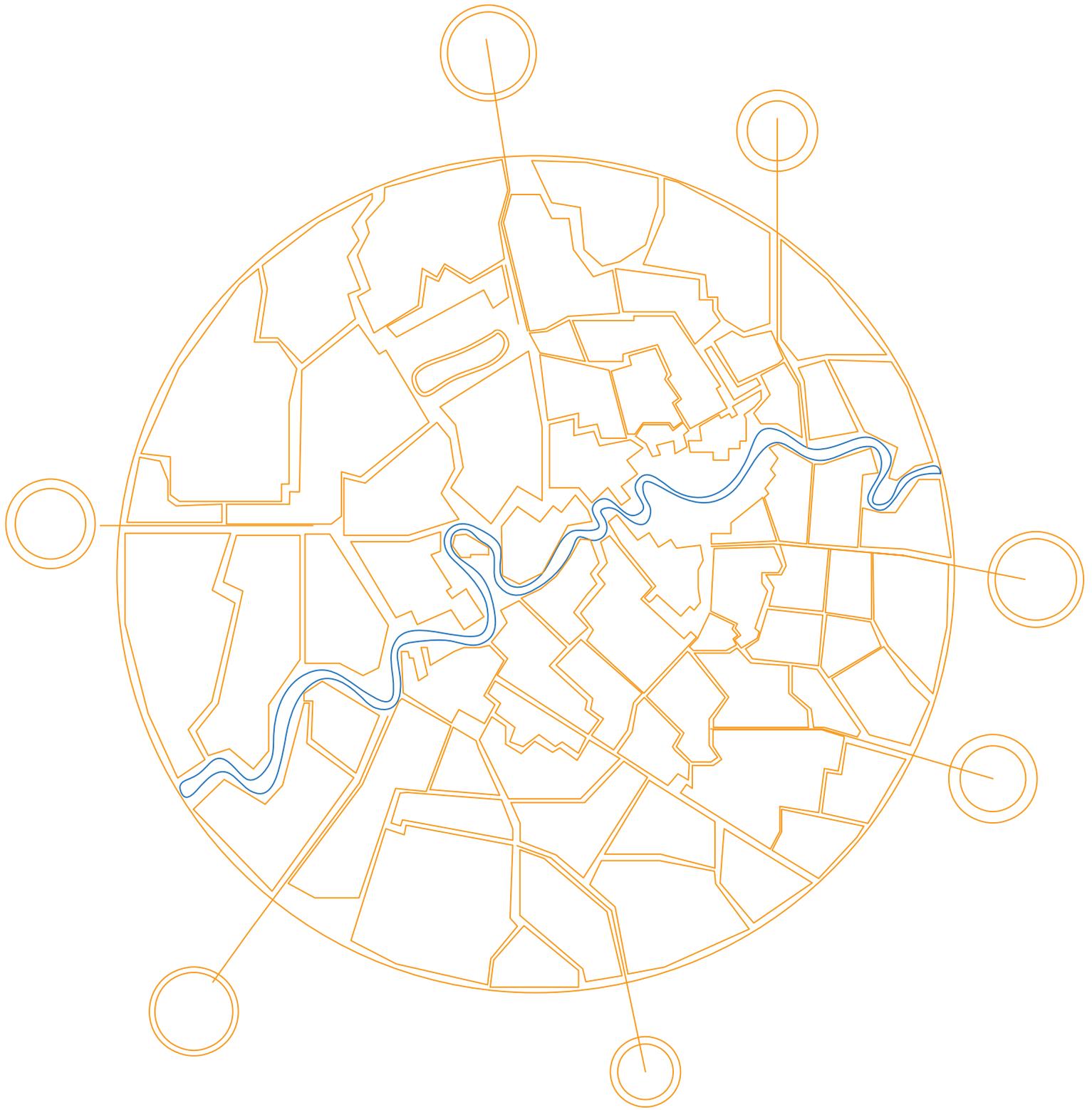
8.a. Other comments ملاحظات اخرى

9. Any further feedback and comments for all sections above, please mention it here?
أي ملاحظة إضافية لما ورد اعلاه في فقرات الاستبيان يمكن ذكرها هنا

Page 5: Acknowledgments شكر وتقدير

The third and final round of the questionnaire is completed. Thank you for your participation and interest إنتهت الجولة الثالثة والاحيرة من الاستبيان..شكراً لمشاركتكم وإهتمامكم

Appendix C Modelling of the capital Baghdad- Ziggurat
Project





University IT Services
Certificate of Attendance
(Course Programme for Academic Year 2016-2017)

This is to certify that

Marwah Mohsin

has attended the course

An Introduction to BOS (Bristol Online Surveys)

on

Wednesday 15th February 2017 13:30-16:30

University IT, Cardiff University
insrvEducation, Julian Hodge Study Centre
Telephone: (029) 2087 4698
Email: insrvEducation@cardiff.ac.uk

Dr David J Atkins
Course Presenter
Education and Training Manager



WESSEX INSTITUTE



It is certified that Mrs M Mohsin has participated in the conference

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9th International Conference on Sustainable Development and Planning

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Director
June 2017

