2014

Towards Sustainable Middle Eastern Cities: A Local Sustainability Assessment Framework

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http://hdl.handle.net/10026.1/3010

http://dx.doi.org/10.24382/3288
Plymouth University

Towards Sustainable Middle Eastern Cities: A Local Sustainability Assessment Framework

By

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A thesis submitted to the University of Plymouth in partial fulfilment for the degree of

DOCTOR OF PHILOSOPHY

School of Architecture, Design and Environment

February 2014

ABSTRACT

Mustafa AL-ALwani

Towards Sustainable Middle Eastern Cities: A Local Sustainability Assessment Framework

The construction of a guiding methodological framework for local sustainability assessment is a key to achieving a sustainable future. This study develops an approach to local sustainability assessment (ALSA), a methodological framework that facilitates the formulation, selection and prioritisation of key indicators to guide the assessment of city sustainability at a local level in Middle Eastern cities. Based on a literature review, this research devised a methodological framework, ALSA, which is a combination of the Commission on Sustainable Development's (CSD)Theme Indicator Framework (2001) (themes, sub themes and indicators) and a Goal-Based Framework (indicators that most directly reflect the issues of a case study and its local communities and stakeholders). This combination framework is shown to be more appropriate in this instance than other types of frameworks, in terms of overcoming some inherent weaknesses, leading to the adoption of a top-down / bottom-up approach. Such an approach is shown to be the best way of developing indicators which are (top-down) scientifically valid and generic with (bottom-up) stakeholder and local communities needs. The ALSA methodological framework involves four steps, which are: issue identification, objective formulation, indicator formulation and indicator selecting and ranking. The first set of proposed indicators contained 98 indicators. This set of proposed indicators was revised and analysed by means of a series of shared ideas from literature and through consultation with experts from specific areas, using a workshop format. This revision stage was used to reformulate and select valid and useful indicators (comparable, measurable, and sensitive). The second set of valid and useful

indicators (after the first revisions) contains 57 indicators. The indicators were ranked on the basis of priority to identify a final set of indicators that cover the four dimensions of sustainability, which are defined within this work as environmental, social, economic and institutional. The evaluation (SWOT analysis) of this framework was examined during this study. The city of Hilla, Iraq, was selected as a case study to prove the applicability of the ALSA methodological framework in a real world case study. It is argued that this study is pioneering in adding knowledge and understanding of the development of a methodological framework to provide local sustainability indicators in a post-conflict, Middle Eastern city in an oil-rich country. It is concluded that the ALSA methodological framework provides an efficient and rigorous approach for the formulation, selection and prioritization of key indicators that will measure and encapsulate the essence of a sustainable city and could help Middle Eastern cities achieve higher levels of progress towards sustainability in practice.

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Acknowledgements

Finally, what I proactively pursue for years is achieved. This thesis has added a great deal of breadth and depth to my awareness. First and foremost, I wish to record and express my exceptional gratitude to the guidance, inspiration and support of my supervisors, Professor Steve Goodhew, Professor Christopher Balch and Professor Wei Pan whom I respect for their professional knowledge, experience and values. These combined with their thoughtful advice, compelled me to pursue the highest possible standards.

Without the efforts of many, this work would not have been accomplished. I owe my gratitude to all participants, most of whom became close associates, from the city of Hilla and Babylon University especially the head of architectural department, Dr Hamza Al Mamori. Also, I want to thank Ms. Denise Wilkins.

I am grateful to all the members of the School of Architecture, Design and Environment, University of Plymouth in particular Professor Alessandro Aurigi Head of the School of Architecture, Design and Environment, Mrs Susan Matheron and Dr Timothy Batchelor for providing me an assistance and co-operation during my stay in Plymouth.

Finally, a more personal note, I have no way to express my thanks to my wife whose caring and loving support enabled me to go through very difficult times and finally manage to finish this work, also my daughters Ruba and Fatima whose smiles have been an unending source of inspiration which giving me a refreshing hope for the future.

Author's Signed Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award, without prior agreement of the Graduate Committee. This study was self-financed. Relevant scientific seminars and conferences were regularly attended and external institutions were visited for consultation purposes and two papers prepared for publication and two published papers.

Publications:

1-Journal paper (A Local Sustainability Assessment Framework for Delivering Sustainable Middle Eastern Cities). Submitted to Environment Development and Sustainability journal for publications February 2014.

2-Journal paper (A Review of the Literature on Sustainability Indicator Frameworks) Submitted to Environment Development and Sustainability journal for publications February 2014

3- AL-Alwani, M. and Glewa, S., 2012. Heavy metal pollution of roadside dust samples with different traffic volumes in Hilla city. *Iraqi journal of mechanical and material engineering*, 12 (4), 660-672

4- AL-Alwani, M. and Glewa, S., 2013. Evaluation of the effect of Solid Waste leachate on Soil in Hilla City. *Journal of Babylon University*, 21 (3), 894-906

External Contacts:

Word count of main body of thesis: 46260

Signed **Date**

Chapter 1.

Introduction

1.1 Introduction to the Research Project

At the beginning of the 21st Century many factors pose a challenge to human existence (WCED, 1987) and contribute to social, economic and environmental crises in all parts of the world. These include the uncontrolled urbanisation, the industrialisation, the intensification of agricultural activities, the rapid population increase and expansion of resource consumption (UNEP, 2000). Consequently, there is an urgent need to adopt a comprehensive response to the harmful effects of man's activities and exploitation of the planet (social, economic, environmental and institutional development) by applying the principles of sustainability.

The World Commission on Environment and Development (the Brundtland report) represented one of the first attempts by the world community to identify the challenges facing mankind on a global scale. Recognising the twin challenges of addressing poverty/underdevelopment and environmental degradation, the Brundtland Report put forward the concept of sustainable development, which it defined as meeting the requirements of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). At first, these objectives were at an international (global) level and then cascaded down to national governments. However, many experts believed that these issues were best recognized and controlled at a local level in cities, communities and municipalities (Camagni, 2002).

Work in the sustainability area started under the title of 'green accounting' and was enhanced by Agenda 21, adopted at the Rio 'Earth Summit' (UNCED) in 1992. Agenda 21's aims included the development of a plan for progressing towards sustainability: 'Local Agenda 21s', setting specific indicators by local authorities and their communities (Gray, et al., 1999). Chapter 28 of Agenda 21 recognizes local authorities as the closest representative of the people, and calls upon all local authorities to develop

and apply a local plan for sustainability (a 'Local Agenda 21'). Accordingly, Division for Sustainable Development UNDESA (2012) mentioned that by 2002 more than 6,400 local authorities in 113 countries were developing and applying Local Agenda 21.

The assessment of sustainable cities is particularly challenging because of the complexity and uniqueness of interactions between the range of variables involved, which cover social, environmental, economic and institutional dimensions. In addition, the assessment of a city's sustainability will depend on the selection of indicators used to define the needs of each city (Choon et al., 2011).

Indicators can provide key guidance for decision-making and can help measure sustainability in multiple ways, converting complex physical and social science data into accessible information to facilitate decision-making (UNDESA, 2007). They can provide an early warning for the prevention of social, economic, institutional and environmental damage (Horner et al., 2007). Moreover, they are significant tools to connect thoughts, ideas and values (UNDESA, 2007).

Best practice suggests that indicators should be developed through logical structures, called frameworks (Pintér et al., 2005). Frameworks encourage interpretation and make the indicators more effective. They assist, explain and emphasise what to measure, what can be predicted from measurement and which indicators can be used (Pintér et al., 2005). If there is no framework, indicators will be unplanned, partial and will be aligned to particular knowledge; thus making interpretation more difficult, as research is excessively dense in some regions yet sparse in other significant regions (Bossel, 1999). One of the most important advantages of indicator frameworks is that they can be used as a device for categorizing indicators to confirm which issues have been covered and which have been ignored (Sustainable Measures Inc. & American Forests, 2003).

The United Nations Commission on Sustainable Development (UNCSD) 2001 recommended the use of a theme framework and a core set of indicators of

sustainability as a benchmark to verify or consolidate existing indicator programmes. In this thesis, the framework of sustainable indicators developed at local level is a modification and combination of the Commission on Sustainable Development (CSD) Theme Indicators Framework (2001) and goal-based framework (the problems, needs, visions and objectives of sustainability at the local level). This combined framework, which will help in finding local sustainability indicators, should be clear, understandable and easy to use. This introductory chapter presents the contextual approach to finding a framework of sustainability indicators at a local level relevant to the cities of the Middle East. It also introduces the aims and objectives of the research and the outline research methodology.

1.2 Research Context

For the first time, at the 'Earth Summit' in Rio in 1992, over 150 Governments agreed to a sustainable future. They decided that the way forward was 'sustainable development' and, in order to achieve this objective, to begin a process called Agenda 21. Topics such as health, employment, deforestation, waste and others were discussed at a global level and laid out within the forty chapters of Agenda 21. However, the summit recognised the essential truth that the majority of actions to address these topics can only be delivered at a local level (cities), and the summit has realized that the challenges of sustainability are better addressed at the local level (Camagni, 2002). So, chapter 28 of Agenda 21 called on all councils, communities, local organizations and businesses to prepare and implement a Local Agenda 21 action plan to support sustainable development. Reed et al. (2006) argue that to assist in making cities more sustainable, tools are needed at a local level to both facilitate and measure progress towards a broad range of social, environmental and economic goals.

The research presented in this thesis is concerned with the assessment of 'local' sustainability. Consequently, the formulation, as well as the demonstration of the methodological framework that makes up the main output of this thesis, is related to the assessment of sustainability at the city level. It is argued that the approach to local sustainability assessment ALSA, a methodological framework, is capable of being applied to any Middle Eastern city, due to growing interest in sustainability in the oil rich states, especially of the Gulf. Moreover, these countries still face a number of obstacles towards the long-term implementation of sustainable development, such as the absence of peace as well as security especially in the Arab country

With a focus on the increasing need for city sustainability assessment, the following section will outline the case for addressing/developing methods to allow/enable the use of sustainability indicators at a local level.

1.2.1 The Need to Address the Use of Local Sustainability Indicators

Agenda 21 identifies a range of purposes for sustainability indicators, such as the role of indicators in assisting decision makers when measuring sustainability (UNCED, 1992). To satisfy this need for meaningful indicator sets, information needs to be assembled for decision makers at international, national, and local levels.

Indicators can offer essential guidance for decision-making in a number of ways: firstly in translating the knowledge of physical and social sciences into useable data in order to facilitate and enhance the decision-making process; secondly in helping to measure and adjust progress towards achieving sustainable development; thirdly in providing a mechanism for early warning to prevent economic, social and environmental damage; and finally in providing important tools to communicate thoughts, ideas and values (UNCSD, 2001).

There is an agreement between city planners, researchers, urban designers, and scholars about the role that sustainability indicators play in terms of assessment and monitoring of sustainable cities, because main trends in the social systems, the environment, economy and human wellbeing are reflected by sustainability indicators (Josza and Brown, 2005). So, the development and use of an indicator approach is useful to obtain and communicate information about the sustainability condition of the urban system under examination and can be used as goals or targets to apply to future sustainable cities (Xu and Coors, 2012).

Chapter 28 of Agenda 21, which distinguishes the significance of actions at the local scale, led to the making of Local Agenda 21 which has been accepted by several thousand municipalities around the world (UNCSD, 2002). Local Agenda 21 stressed the importance of providing an 'action plan' for applying sustainable development at a local level, and makes clear reference to the use of indicators of sustainability (UN, 1992). Since the Rio Summit in 1992 most local authorities and Local Agenda 21 groups have been developing Local Agenda 21 strategy and many have designed or developed indicators to increase their understanding and to observe and report on progress in delivering sustainable development locally.

In addition to many problems such as rapid population and development growth, increasing emphasis on using cars, and poorly developed public transportation systems, many Middle Eastern cities have suffered from conflicts and instability. All these issues have led to sustainability challenges that influence the ability to attain social, environmental, economic and institutional goals (Menichetti and Vuren, 2011). In these circumstances a clear set of indicators can help local governments identify and correct social, economic and institutional problems and devise strategies for the environment. Additionally, the development of sustainability indicators provides a way of engaging with the local community and offering an effective tool for decision making support

(Lombardi, 1999). This is particularly important in a post conflict situation where sustainability indicators at a local level can influence urban planning and management, focused on reconstruction and the monitoring and evaluation of policies and local decision-making (Lombardi, 1999).

1.3 Research Questions

As discussed, there is a clear need for indicators to assess local sustainability, yet at present there is a lack of both research and frameworks which can be applied successfully at a local level in Middle Eastern cities. This poses a fundamental problem for sustainability assessment and leads to the question addressed in this thesis: 'How can a framework be developed which will provide appropriate sustainability indicators at a local level in Middle Eastern cities?' This primary research question is required in order to develop a methodological framework to find suitable local sustainability indicators to facilitate the assessment of local sustainability.

To enable the answering of this primary question this study sets the following four important secondary research questions:

1. What types of indicator frameworks currently exist for evaluating and assessing sustainability?
2. How might a local sustainability evaluation framework be constructed and structured?
3. How well does the sustainability evaluation framework work in practice as a tool and a mechanism for developing a sustainable city?
4. How does the sustainability evaluation framework need to be further adjusted to address problems faced during its application?

1.4 Aim and Objectives

Guided by the research questions and within the research context, the overall aim of this study is to develop an approach to local sustainability assessment, a methodological framework that will formulate, select and prioritise key indicators, which can then guide assessment and action to improve sustainability at the local level in Middle Eastern cities. To reach this aim, several research objectives have been developed:

1. To explore and explain the concept of sustainable cities
2. To understand the role and significance of sustainability indicators
3. To review the existing types of sustainability indicator frameworks and understand their strengths and weaknesses
4. To develop a practical approach to local sustainability assessment, a methodological framework which could be used as a tool and mechanism for developing local sustainability indicators in a Middle Eastern context
5. To test the proposed ALSA methodological framework in a selected case study in a Middle Eastern city
6. To rank local sustainability indicators in order of priority in the selected case study
7. To evaluate the ALSA methodological framework by using the SWOT analysis technique
8. To recognize key application problems and suggest modifications
9. To propose future research recommendations

1.5 Outline of Research Design and Methodology

This section contains an overview of the research and data collection methods. These are discussed below.

1.5.1 Overview of the Research

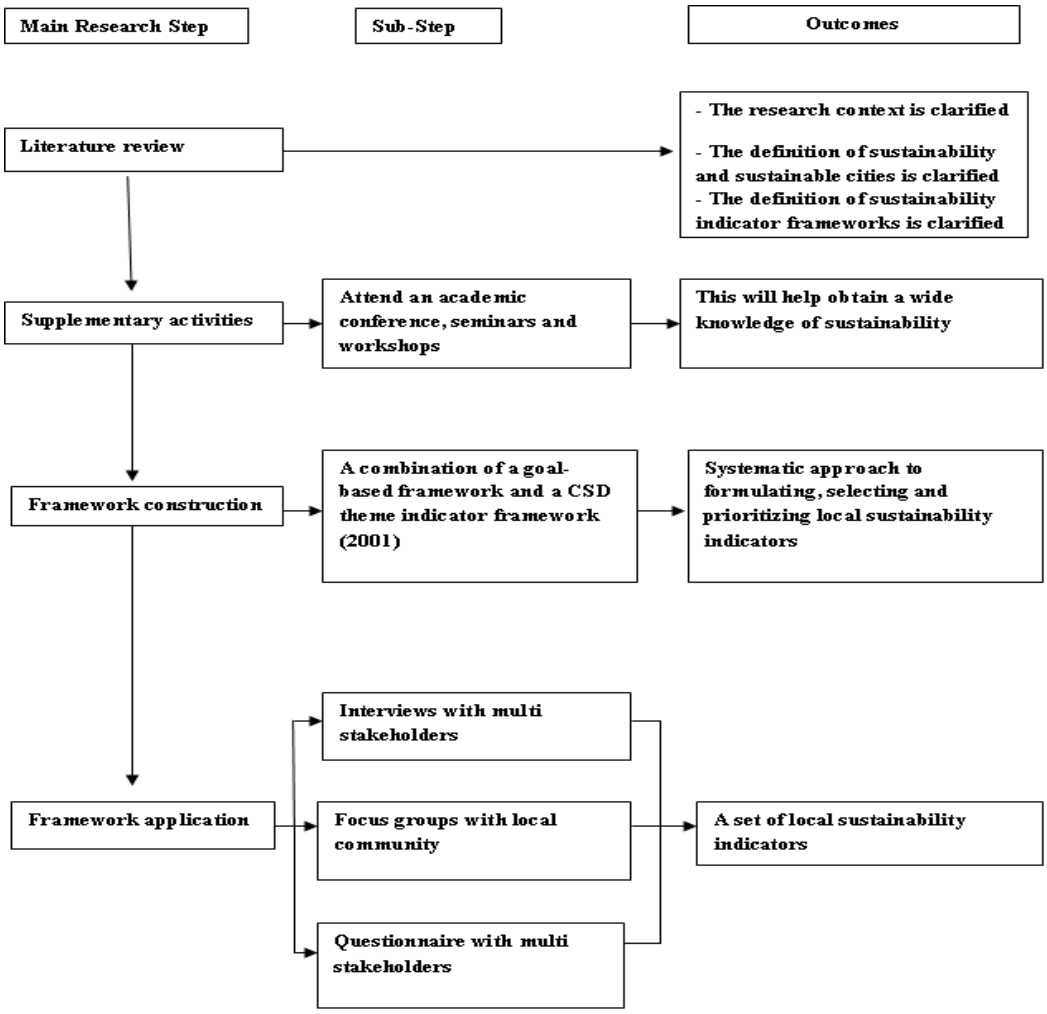
The research set out in this thesis follows a number of steps and processes to meet the previously stated research objectives: a literature review; supplementary activities (attend an academic conference, seminars and workshops); framework construction and framework application; formulating, selecting and ranking the indicators (see Figure 1.1).

The purpose of the methodological framework is to help decision makers and stakeholders recognize the purpose of a sustainability assessment. Moreover, recognizing what needs to be assessed, how and what objectives should be set and also how stakeholders, experts, and decision makers can be involved in the process. Thus, a framework is necessary when indicators need to be formulated and selected, the objectives linked to the evaluation methodology. Also, a framework is necessary when the vision or objectives need to be defined, and the development of the evaluation method needs to be guided (Becker, 2004).

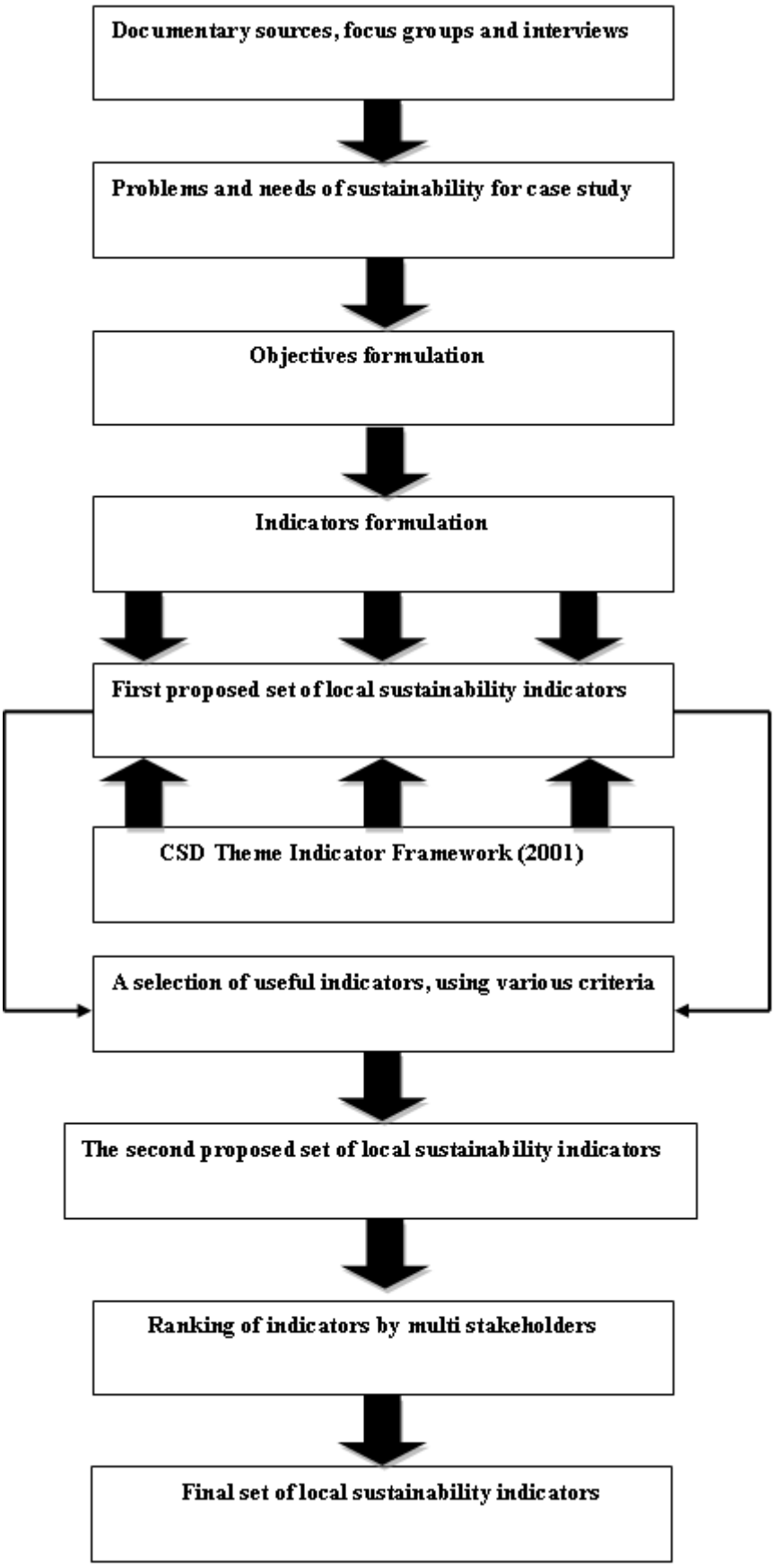
In this study, building a methodological framework for finding appropriate sustainability indicators at a local level in the Middle Eastern context involves a number of steps, as shown in Figure 1.2. The process starts with an analysis of the most relevant problems, needs and objectives. Public consultation is necessary and desirable from the early stages to ensure the correct identification of local problems and needs. Focus groups and interviews with local community groups, experts, decision makers and stakeholders are also suggested, in order to identify local issues and themes related to sustainability. This methodological framework seeks to formulate new locally relevant indicators, including some of the suitable sustainability indicators suggested by the United Nations (UNCSD, 2001). This initial formulation may also include the sustainability indicators encountered most commonly in the literature, which are

matched to the major problems and needs recognized by stakeholders and local communities and which are, in turn, matched to the main objectives of sustainability.

Using appropriate criteria, the first set of potential indicators will be analysed and selected and submitted to a final cooperative evaluation process by experts to rank indicators on the basis of importance, in order to identify a final set of indicators that contains the four key dimensions of sustainability (environmental, social, economic and institutional).



1. 1 Overview of the research steps and outcomes (The Author)



1. 2 A general scheme of the ALSA, methodological framework processes (The Author)

1.5.2 Data Collection Methods

There are multiple data sources and methods to increase comprehensive understanding, and to ensure reliability and validity (Denzin, 1989). This thesis includes three research methods: desk study, survey and case study. Specifically the survey makes use of: focus groups, interviews, questionnaire, and electronic and print document analysis. Rowe et al. (2004) stated that the mixture of documents, field notes, survey responses and interviews assembled throughout the research process is particularly useful. Triangulation of the data collection methods helps to avoid an over-dependence on recall in the data reported, especially when undertaking an overall assessment. For the results of this research to be significant, it is necessary to collect data from a range of stakeholders to capture the variety of visions about objectives, criteria and outcomes (Rowe et al., 2004). To understand the case study context, many methods will be used such as: document analysis, qualitative and quantitative documentation, interviews, focus group meetings, questionnaire with experts, and informal conversations. Adopting a multi method approach should underpin the credibility of the research, reduce the level of specificity of certain methods and provide the duplication logic for the researcher who is interested in the use of similar procedures and methods (Gillham, 2000).

1.5.3 Data Analysis Methods

Because this research study includes the use of participatory tools, such as focus group meetings and interviews, much of the information that will be collected is of a qualitative nature. So this study will use qualitative analysis approaches that can be

applied to qualitative data. However, where appropriate, quantitative analyses will be used to analyse the qualitative data collected by questionnaire.

It is important to employ rational and reasonable analytical techniques when using qualitative data. The analysis of qualitative data depends on the ability of the researcher to interpretation; therefore it is more affected by the researcher's perspective (Laws et al, 2003). In order to balance this effect it is necessary to evaluate the same thing from different perspectives in order to challenge or confirm the results of one method with those of another (Laws et al, 2003).

This study will show how qualitative information gathered during field work can be analysed to provide conclusions relevant to the questions and aims of this research.

1.6 Research Objectives, Issues and Contributions

The objectives of the research, research issues and relevant contributions are summarized in Table 1.1 which provides an overview of the key research stages. In this thesis, the term research 'issues' is used instead of 'hypotheses' because research issues can be general statements operating as a framework to help achieve the research aims and objectives, while hypotheses should be tested during the research (Pan, 2006; Silverman, 2005).

Table 1- 1 Research objectives, research issues and the contribution of thesis

Research objectives	Research issues	Relevant parts of the thesis	Research methods	Contributions of the thesis
To explore and explain the concept of sustainable cities	Despite many definitions of sustainability, there is a lack of understanding of 'sustainable cities'	Chapter 2	Literature review	The thesis reviews a number of definitions used in the literature on sustainability and sustainable cities
To understand the role and significance of sustainability indicators	There is a lack of understanding of sustainability indicators	Chapter 2	Literature review	The thesis provides a good level of understanding of construction and use of indicators in sustainability and sustainable cities
To review the existing types of sustainability indicator frameworks and understand their strengths and weaknesses	There is a lack of research which reviews the existing types of sustainability indicator frameworks	Chapter 2	Literature review	The thesis reviews some of the existing types of sustainability indicator frameworks and shows their advantages and disadvantages
To develop a practical approach to local sustainability assessment, a methodological framework which could be used as a tool and mechanism for developing local sustainability indicators in a Middle Eastern context	There is a lack of current methodological frameworks to allow the development of indicators for measuring sustainability at the local level	Chapter 3	Analysis	- The thesis constructs a methodological framework to evaluate sustainability at the local level - In this thesis the approach to local sustainability assessment (ALSA) methodological framework provides a robust process for identifying and involving multi stakeholders in formulating, selecting and prioritising indicators. - In this thesis, ALSA methodological framework enables indicators to reflect the problems and needs of a particular locality. - The key steps in framework development provide several benefits, including the ability to explain and justify how and why a particular indicator was formulated and selected

Table1.1 Continued

Research objectives	Research issues	Relevant parts of the thesis	Research methods	Contributions of the thesis
To test the proposed ALSA methodological framework in a selected case study in a Middle Eastern city	There is an important role for the application of the framework in a real world case study to test the strengths and weaknesses of the framework	Chapter 4 / 5 / 6	Case study, focus groups, interviews	- This thesis carries out a new empirical study in the selected case study city (the city of Hilla, Iraq) - This thesis proposes a set of indicators of sustainability for the selected case study city (the city of Hilla , Iraq)
To rank local sustainability indicators in order of priority in the selected case study	There is a lack of understanding regarding the relative importance of sustainability indicators and how to go about prioritising them	Chapter 6	Questionnaire	This thesis provides a set of priority indicators of local sustainability so as to concentrate upon the highest priorities when related to the case study in addition to provide a methodology for prioritising them
To evaluate the ALSA methodological framework by using the SWOT analysis technique	There are strengths and weaknesses in the proposed framework	Chapter 7	Analysis	The thesis provides the SWOT analysis technique to evaluate the proposed framework
To recognize key application problems and suggest modifications	There are problems and obstacles which will face the application of the framework	Chapter 5 / 6 / 7	Analysis	The thesis provides a continual modification and improvement to the proposed framework
To propose future research recommendations	There is a need for further research to maximize the future usefulness of the proposed framework	Chapter 7		The thesis provides some recommendations for further work

1.7 Thesis Structure

This thesis contains seven chapters as shown in Figure1.3. The chapters are as follows:

Chapter One presents the background to the study, introduces the aim and objectives, as well as briefly outlining the research methodology and the structure of the thesis.

Chapter Two reviews the literature that deals with the research area and establishes the relevant existing knowledge that can assist in defining the research aim and the methodology. This chapter examines the concepts relating to sustainability in general and sustainable cities in particular .Additionally, this chapter discusses Agenda 21 and Local Agenda 21 and also provides examples of sustainability indicator frameworks at different levels: international, national and local.

Chapter Three describes the rationale behind the research design, the methodological approach, the process used in data collection and subsequent analysis. This chapter demonstrates the approach for developing indicators that operate at a local level depending on the combination between the CSD Theme Indicators Framework (2001) contributions (themes, sub-themes and indicators) and goal-based framework (indicators that most directly reflect the issues of a case study and its local communities and stakeholders).

Chapter Four discusses the rationale for choosing a case study approach, the rationale for choosing a single case study, the strengths and weaknesses of the case study approach, and details the key characteristics that will be needed for the case study selected (city of Hilla, Iraq) for this research.

Chapter Five describe the application of the local sustainability evaluation framework to formulate, select and prioritise suitable local sustainability indicators for the selected case study city so as to highlight and assess the applicability, practicality and the ability of ALSA methodological framework. These chapters include the construction of

sustainability objectives and indicators which are developed through four steps: issue identification, objective formulation, indicator formulation and indicator selecting and ranking.

Chapter Six this chapter reviews the discussion of the result of the application of ALSA methodological framework as well as the evaluation of it using the SWOT analysis technique and examine its effectiveness

Chapter Seven this chapter reviews the outcomes of the research in relation to its stated aims and objectives and summarises the research findings. Moreover, this chapter highlights major contributions to the knowledge and discusses the main strengths, weaknesses, opportunities and threats of the ALSA methodological framework. Finally, it examines the limitations of the study and the chapter ends with recommendations for further work.

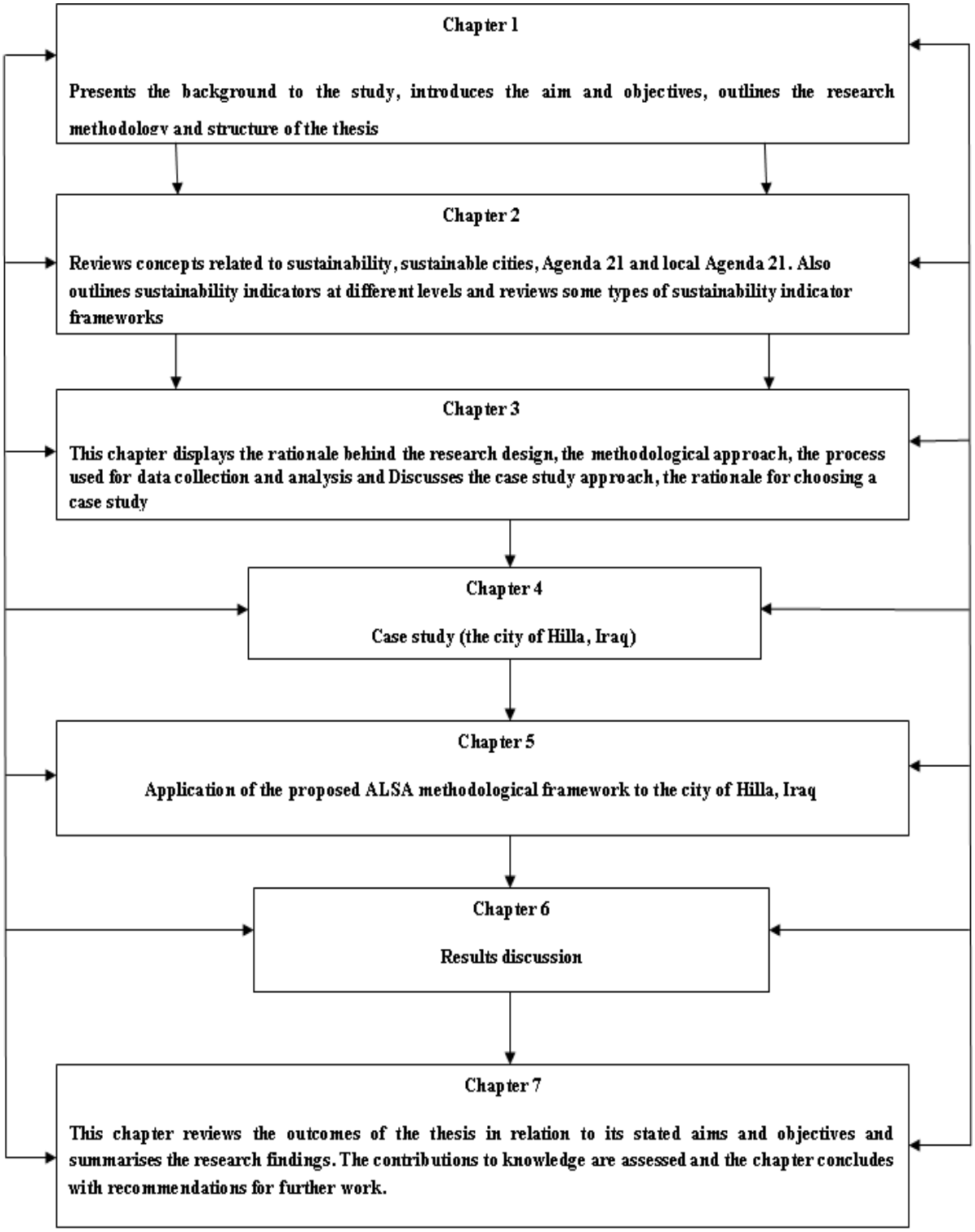


Figure 1.3 The structure of this thesis

1.8 Summary

This chapter has provided an outline of this thesis which is focused on the development of a local sustainability evaluation framework that will formulate, select and prioritise indicators to guide the assessment of, and action to improve, sustainability at the local level in Middle Eastern cities. The thesis argues that there is a clear need for indicators to assess local sustainability, yet at present there is a lack of both research and frameworks which can be applied successfully to Middle Eastern cities. The thesis tests a methodological framework for the development of sustainability indicators, which is a modification and combination of the CSD Theme Indicators Framework (2001) and goal-based framework (the problems, needs, visions and objectives of sustainability at the local level). It is argued that this approach is the most applicable at a local level and in the circumstances which prevail across much of the urban Middle East.

The next chapter, Chapter Two will investigate the elements of the concepts and definitions related to sustainability and their relationship with sustainable cities, the involvement of local authorities responsible for planning and sustainability indicators; the purpose and use of sustainability indicators/frameworks; the purposes of the development of sustainability indicators; criteria for selecting indicators; and reviews of sustainability indicator frameworks through an analysis of the available literature.

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Chapter 2.

Literature Review

2.1 Introduction

In order to reach a better understanding of local sustainability indicators, it is necessary to have a comprehensive and integrated understanding of the concept of sustainability in general and the concept of sustainable cities in particular. This chapter explores the literature related to Agenda 21, Local Agenda 21 and sustainability indicators and reviews a range of sustainability indicator frameworks, paving the way for the development of a sustainability indicator framework in Chapter 3 and application of this framework in the selected case study in the following chapters.

2.2 Sustainability Concept

Through a series of United Nations conferences in Rio, Kyoto, Bali, and Copenhagen, a distinctive, common, concept of contemporary global culture has emerged: 'Sustainability'(Alexis et al., 2011). One view is that sustainability is a matter of ethics and, when ethical grounds of sustainability are not taken into consideration, sustainability has lost its way (Alexis et al., 2011). This point of view has looked to the sustainability from the ethical aspect while Lumley and Armstrong believed sustainability was made up of a number of the following values and thoughts: equity within and between generations, worry for the future, selflessness, nature keeping, defence of natural resources and balanced development (Lumley and Armstrong, 2004).

Numerous cultures throughout human history aimed to achieve harmony between the environment, society and economy. But the birth of the concept of sustainability is regarded to be in the 1960s, when suitable technology was adopted in some developed countries (DuBoseet al., 1995). Those that adopt this timeline make a link between technology and sustainability but some disagree with this view.

Alexis et al. (2011) pointed to a publication that can be highlighted as significant in the evangelisation of what may be called the 'sustainability movement': the report 'Limits to Growth', which was commissioned by the Club of Rome (Meadows and Club of Rome, 1972). However, the Brundtland report promotes the popular idea of sustainable development as the answer to the problem of sustainability. This report defines sustainable development as development that meets the requirements of the present without compromising the ability of future generations to meet their own needs (WCED, 1987, p. 43). In 1992, leaders at the Earth Summit in Rio de Janeiro built upon the finding of Brundtland's Report to hold meetings on a number of defined topics. In the last decade, with an increasing consciousness of the danger of global warming, public consciousness of sustainability or sustainable development has grown progressively and spread across the world (Alexis et al., 2011).

2.2.1 Definitions of Sustainability

There are many differences in the definitions of sustainability, depending on the context of the discussion and the stance of the author. Furthermore, sustainability proponents vary in their views concerning what is to be sustained or what is to be developed and how to connect environment and development (Parris and Kates, 2003).

In its everyday use, there are many definitions of the word 'sustain', including 'to maintain'; 'to keep alive'; 'to support'; 'to subsist'; and 'to nourish' (ARDictionary). Tainter (2003) states that the most commonly used definitions of sustainability, offered by Brundtland in 1987, are vague and unlimited. The Brundtland Report defined sustainability as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987; 43). Bithas and Christofak (2006) is agreed with Tainter (2003) and confirmed that the definition offered by the Brundtland Report is a distinctive definition of sustainability.

Blewitt gave a different definition of sustainability, which is the idea that the future ought to be a better than the present (Blewitt, 2008), while Pope et al., (2004) stated that a general understanding of sustainability in policy is connecting economic, social, and environmental issues.

A great effort has been made since the Brundtland Report to explore and refine the concept of sustainability and our understanding of the complexities surrounding the concept and different historical backgrounds (Pezzoli, 1997). While the wide definition of sustainability gives rise to numerous understandings (Tanguay et al., 2010) this may lead to numerous attitudes. However, from an examination of the concept of sustainability, it is clear that there is little agreement on the operational content of sustainability (Fischer et al., 2007). Table 2.1 lists the alternative definitions of sustainability with their sources and the key issues of the definition.

Table 2-1 Alternative definitions of sustainability adopted with key issues identified

Definitions	Reference	Key issues
Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.	WCED - World Commission on Environment and Development. (1987) Our Common Future. Oxford University Press, Great Britain.	Development, present needs, future generation needs
The capacity of a system to maintain output at a level approximately equal to or greater than its historical average, with the approximation determined by the historical level of variability.	Lynam and Herdt (1989) 'Sense and sustainability: sustainability as an objective in international agricultural research', Agricultural Economics, Vol. 3,pp381–398.	Capacity of a system, output, historical average, historical level of variability
Maximizing the net benefits of economic development, subject to maintaining the services and quality of natural resources over time.	Pearce and Turner (1990) Economics of Natural Resources and the Environment, Harvester Wheatsheaf, Hemel Hempstead.	Economic benefits, development, services, natural resources, time

Table 2.1 Continued

Definitions	Reference	Key issues
The sustainability of natural ecosystems can be defined as the dynamic equilibrium between natural inputs and outputs, modified by external events such as climate change and natural disasters.	Fresco and Kroonenberg (1992) 'Time and spatial scales in ecological sustainability', Land Use Policy, Vol. 9, pp155–168.	Natural ecosystems, dynamic equilibrium, inputs, outputs, external events
Sustainability is whether the productive potential of a certain natural system will continue under a particular management practice (intensity and type of technical and social activities, e.g. inputs of energy, nutrients, genetic variety, harvesting procedures, and cyclic variations over time).	Carpenter (1995). 'Limitations in Measuring Ecosystem Sustainability'. In Trzyna, T., (ed.) A Sustainable World: Defining and Measuring Sustainable Development. Published for IUCN by California Institute for Public Affairs, Sacramento, CA.	Continued productive potential, particular management
Sustainability is the emerging doctrine that economic growth and development must take place, and be maintained over time, within the limits set by ecology in the broadest sense-by the interrelation of human beings and their works, and the biosphere.	Coplák, and Rakšányi(2003)"Planning Sustainable Settlements" Handbook Based On The Partial Results of The EC Research Project "Ecocity – Urban Development Towards Appropriate Structures For Sustainable Transport" Slovak University of Technology, Bratislava.	Emerging doctrine, economic growth, development, time, ecology, human beings, works, biosphere
The idea that the future should be a better healthier place than the present.	Blewitt (2008) Understanding Sustainable Development. London: Earth scan Publishers.	Idea, better healthier future, present

Beyond those definitions already presented, many other definitions of sustainability exist, often aligned towards a particular specialism. A universally accepted definition of sustainability is unattainable because many things are expected of it such as it must be realistic and scientific, but sustainability is also apolitical process and a call to action.

Therefore the established definitions of sustainability contained common goals and values.

In seeking to further explore the concept and definition of sustainability it is useful to examine its application in particular contexts, for example in relation to the sustainable city.

2.3 Sustainable Cities

A sustainable city which ought to be economically viable, socially non-violent and environmentally healthy is based on society's link with its environment, which is essentially a result of influential and considerate groups in that society (Buckingham and Turner, 2008). The UNCHS (1996) defines a sustainable city as a place that can maintain the success of economic, social, and environmental development. Girardet (1999) sees a sustainable city as a regulator, empowering all citizens to meet their needs and strengthen their well-being without damaging the natural world or threatening the living conditions of other people, now or in the future. The same researcher (Girardet, 2004) argues that a sustainable city allows residents to meet their basic needs and to increase their happiness without damaging the natural environment and human resources.

In reality, there is no consensus on the definition of a sustainable city (Satterthwaite, 2001). The Brundtland Report (WCED, 1987) issued an important warning concerning the changes that are necessary to conserve resources for future generations. The call for action emanating from the Brundtland Report and the Rio Conference was soon pursued by the European Commission, which published a Green paper on the urban environment (CEC, 1990). This addressed functional and social issues, economic and environmental impacts of cities and suggested the goals and directions that would lead towards a more sustainable urban environment. Haughton and Hunter (1994) define a sustainable city as

a place where people are constantly trying to improve their natural, cultural and built environments at regional and local levels and at the same time, it has usually carried the goal of global sustainable development.

Haughton (1999) classified the aspects of encouraging sustainable urban development in Western nations into four categories:-

1. 'Self-reliant cities': concentrating on trying to limit the negative externalities of the city outside its own bioregion.
2. 'Redesigning Cities': paying more attention to the establishment in the city of human conditions and less attention on nature in the city itself.
3. 'Externally dependent cities': following the traditional approach to managing environmental problems, believing these can be effectively addressed by improving the working methods of the free market within the existing capitalist system.
4. 'Fair shares cities': seeking to ensure that environmental assets are traded on an equitable basis to ensure they are not used in ways that lead to the degradation of the donor environments, economies and societies.

In an attempt to understand the concept of a sustainable city, Walker et al. (2004) suggest that the following questions need to be addressed:

1. What variables or characteristics must be considered for a city to be sustainable?
2. Should a city or other development be sustained forever, or for a lesser period of time?
3. What level of flexibility is required to provide a degree of resilience against external shocks?

The key characteristics of a sustainable city identified by NSF are (NSF, 2000):

1. Adequate transportation, adequate construction techniques and materials, concentration of housing and food production to reduce the ecological footprint, per capita, of its inhabitants.
2. Use of recycling, biogas and composting to convert waste outputs into resources by developing a closed system.
3. Acclimatization to the prevailing local natural conditions of its bioregion, matching its type of construction, growth and production to the adjacent ecosystem.
4. The need for absorptive capacity of areas that have an excess ecological or an environmentally sustainable production; and;
5. Mechanisms for social debate and communication and political engagement to resolve local issues.

Peterson et al. (1999) argue that a sustainable city has a different dimension, distinct from a purely environmental dimension that includes economic expansion, defence, security, management, transparency and participation. De Plessis, et al. (1999) states that the major factors relating to the form of a sustainable city can be classified under three main dimensions: environmental, social and economic. However, there is a growing consensus that the problems faced by humanity require a global perspective, whilst solutions and actions must be at a local level. It can therefore be concluded that 'sustainable cities' is now a commonly used phrase, and there are even prizes for the most sustainable city in a number of countries and regions (Jarrar and Al-Zoabi, 2008).

To create more sustainable cities, Agenda 21called local governments to develop their own 'Local Agenda 21' which can be developed by local councils with the participation of local organizations and citizens to attain the goals of Agenda 21.

2.3.1 Challenges of Sustainability in Middle Eastern Cities

The Middle East is home to a lot of people with a variety of traditions, languages and religions, containing Arabs (people whose own language is Arabic), Turks, Iranians, and Kurds. However, Arabs are the majority group in Middle Eastern countries. The Arab region has made great achievements towards sustainable development since the Earth Summit in Rio 1992, especially in the areas of education, health and improvements in living standards. However, Arab countries still face a number of obstacles towards the long-term implementation of sustainable development. These obstacles include: the absence of peace as well as security, the continued foreign occupation of some Arab land, poverty and illiteracy, population growth, the debt burden, natural arid region, scarcity of water resources, lack of farmland which leads to lack of food and the modest capacity of the academy and research institutions. Moreover, there have emerged over the past decade some major challenges, including demographic change, unemployment, the Arab Spring, the financial crisis, energy security, climate change, natural disasters, drought, desertification, loss of biodiversity and migration. (ESCWA, 2011).

The League of Arab States (LAS) adopted a comprehensive regional approach, called the "Sustainable Development Initiative in the Arab Region"(SDIAR), which aims to develop a regional program for sustainable development(LAS, 2013). Furthermore, in Rio +20, Arab Ministerial Declaration confirmed political commitments to achieve sustainability of the Arab region and to continue implementation of the Sustainable Development Initiative in the Arab Region (SDIAR) at national and local levels (ESCWA, 2013).

Sustainability has received little attention by governments of Middle East countries but there are many factors that make it a significant issue for future growth strategies in some Middle East countries, especially in the Gulf, which faces energy shortages due to

plentiful gas consumption, with pollution due to heavy industry and extensive desalination of seawater (Smeets and Bayar, 2012). Therefore, there are major challenges to overcome to prevent a decline of the environmental footprint. Abu Dhabi (capital city of the United Arab Emirates) as one of the fastest growing and changing (since the discovery of oil) and rapidly developing cities in the Middle East region has been faced with unique challenges and opportunities. These challenges need to be addressed by developing a framework which guides the creation of a sustainable city for future generations. Abu Dhabi plans to do this by taking different themes into consideration, for instance community identification, the quality of the public realm, social cohesion and development of infrastructure (Abu Dhabi Council for Economic Development, 2008). Abu Dhabi's intended to achieve sustainability through an integrated design approach, called the Estidama Program. The Estidama Program has developed plans to guide future growth based on principles of sustainability, to protect and restore the natural systems (Madden, 2006). Since the most flexible cities may respond to the challenges through innovation, both Abu Dhabi and Masdar have innovations in urban design (Madden, 2010). Masdar city is located near Abu Dhabi and it is planned to be one of the first sustainable cities in the world (Lau, 2012). It has been under construction since 2007, combining efficient resource usage and renewable energy sources with amazing architectural elements and traditional Arabian design (Lau, 2012)

2.4 Agenda 21

Agenda 21, is a global plan of action for sustainable development approved by the international community at the United Nations Conference, known as the 'Earth Summit', which took place in Rio de Janeiro, Brazil, in 1992 (Ngah et al., 2011). Significantly, United Nations Conference on Environment and Development (UNCED)

expected that Agenda 21 would be a developing document, open to revision and reassessment, as agencies and organizations applied its principles in a real life context (Morpeth, 2002). The Bruntland report recognized that all agencies and international bodies of the UN system are responsible for sustainable development practices and policies (WCED 1987).

The chapters of Agenda 21 were offered in four sections which are:

1. Social and Economic Dimensions
2. Conservation and Management of Resources for Development
3. Strengthening the Role of Major Groups
4. Means of Implementation.

These were redefined by the UN into the four dimensions of sustainable development as shown in Table 2.2.

Table 2-2 Dimensions of sustainable development from UNCSD, Source: United Nations (UN, 1996)

Dimension Agenda 21	Chapters
Social	3,5,6,7,36
Economic	2,4,33,34
Environmental	9-22
Institutional	8,23-32,35,37,38,40

2.4.1 Areas of Agenda 21

Agenda 21 contains forty chapters and four main divisions which can be seen to cover the full range of issues of relevance to sustainable development, for which it is intended to provide a guide for Governments, aid agencies, local authorities and other actors in the field of environment and development (Spangenburg, 2004).

Agenda 21 highlights four broad areas of action covering a combination of elements and issues (Borne, 2006) as follows:

1. Social and economic dimensions of development: Poverty, human settlement, production and consumption, health, and integrated decision-making.
2. Conservation and management of natural resources: Atmosphere, mountains, toxic chemicals, oceans and seas, land, forests, biological diversity, ecosystems, biotechnology, fresh water resources, hazardous radioactive and solid waste.
3. Strengthening the role of major groups: Youth, women, indigenous people, NGOs, local authorities, scientific and technical communities, trade unions, businesses and farmers.
4. Means of implementation: Finance, technology transfer, legal instruments, information, public awareness, capacity building, education and institutional frameworks.

These broad areas develop a common vision about the best way to think through the growing problems of population growth and development. On the other hand, Agenda 21 confirmed the need for the local authorities in each country to consult its citizens to prepare ‘a Local Agenda 21’ for their community.

2.5 Local Agenda 21

At the UNCED Conference in 1992, world leaders agreed to the adoption of Agenda 21 as a global blueprint for delivering sustainable development. Agenda 21contains a call to local governments to develop their own ‘Local Agenda 21’ as well as identifying development priorities and a local vision. Indeed, over the past two decades, there has been an increasing recognition of the important role which local governments have to play in responding to the challenge of sustainable development (Gercheva, 2003).This reflects the fact that, as the level of governance closest to the people, local authorities

play a fundamental role in educating and encouraging the public to support sustainable development (Agenda 21, 28.1).

Chapter28ofAgenda 21, entitled 'Local Authorities Initiatives in Support of Agenda 21', describes the fundamental role of local authorities in the implementation of Agenda 21andtheachievementofitsobjectives. Thus, a local action plan for sustainability, Local Agenda 21 has been developed by local authorities with the participation of local organizations and citizens to create more sustainable communities and help attain the goals of Agenda21 at a local level.

In order for each local authority to develop a 'Local Agenda 21' action plan, they were encouraged to consult and engage in a dialogue with local organisations, citizens, and private enterprises.

Local authorities were expected to use consultation with citizens, together with local, civic, community, industrial and business organisations as a means of assembling the information and views required to formulate the preferred strategies (Agenda 21, 28.3). At the same time, the consultation process was expected to assist in raising awareness of sustainable development issues across households. Thus, those cities which have major improvements in the quality of local authorities have the most effective Local Agenda 21s (Gercheva, 2003).

Agenda 21is one of the most important innovations in the area of local planning for sustainability. Although it has an international network and identity, Gercheva (2003) argues that it should be locally driven and implemented. For the purpose of its successful implementation, Gercheva (2003) goes on to identify three key factors, which are transparency, accountability and local government capacity.

In order to reach a further understanding of Local Agenda 21, it is useful to review its definition.

2.5.1 Definition of Local Agenda 21

Local Agenda 21 is a process that assists sustainability at the community level, taking into consideration the participation of citizens as well as their present and future economic, social, environmental and institutional needs (Environmental, community and local government, 2013). Since each community is unique, each Local Agenda 21 process is unique too. Nonetheless, there are a number of similar fundamentals (Valentin and Spangenberg, 2000). These have been outlined by Gercheva (2003) as follows:

1. They are based on a broad and comprehensive consultation and coordination by the local authority, involving all major stakeholders.
2. They are based on reliable and comprehensive analysis in addition to an excellent understanding of the present state of local development issues.
3. They ensure that environmental issues from local to global level are at the heart of urban planning and management.
4. They offer fair and practical means of resolving conflicting interests, recognizing common goals and producing partnerships between local government, civil society groups and the private sector.

Local Agenda 21 focuses on local issues. In order to reach these issues, the local authority is the logical body to help enact this, as it is closer to citizens and therefore plays a fundamental role in promoting sustainable development.

2.5.2 Local Authorities' Involvement

Many of the issues that Agenda 21seek to address have roots in local activities; therefore, the participation and co-operation of local authorities is recognised as a potential limiting factor in the achievement of its objectives (Brugman, 1997). The

United Nations (UN, 1992a) identify local authorities as the entities that create, activate and maintain an economic, social and environmental infrastructure, oversee planning processes, develop local policies and enforce local environmental regulations. Furthermore, UN (1992a) indicated that local authorities do other tasks, including: assisting in the implementation of national and sub-national environmental policies; educating and motivating the public by promoting sustainable development at a local level and collecting the information required to develop the best strategies for their communities through consultation and consensus-building with citizens and local organisations, civil society organisations, and industry information. On the other hand, chapter 40 of the international action plan 'Agenda 21' recommends that sustainability indicators need to be developed and it calls on the international community, countries and local authorities to develop sustainability indicators which are giving strong bases for decision makers to build correct policies for sustainability (UNCED, 1992, Chapter 40).

Agenda 21 considered local authorities as major players in managing economic growth, social equity and environmental protection (Patterson and Theobald 1999). Therefore, it was thought they would be able to strongly affect the achievement of sustainable city (Lucas et al., 2001).

2.5.3 Local Authorities Participation Benefits

Quaid (2002) states that the participation of local authorities in the process of 'Local Agenda 21' should result in a number of benefits, including:

1. A healthier and cleaner environment for present and future generations.
2. An understanding of policy regarding the limits of local ecosystems as well as the needs and values of society.

3. Creation of solutions supported by an integrated decision-making process, which emphasise the value of cooperation between the various departments in the local authority.
4. A stronger partnership between the community and local government.
5. Creating a socially fairer society.
6. Provision of long term resources through more effective planning and integration of policy.

Chapter 28 of Agenda 21 calls for a consultation process between local authorities and communities on what should appear in a plan for Local Agenda 21. Specifically it advises that regional and local government should be the level at which the principles of sustainable development are operated. For the purpose of promoting the application of Local Agenda 21s, the UN General Assembly invited member states to apply national sustainability strategies with the indicators proposed (UN, 1997b).

2.6 Sustainability Indicators

It is clear from the report of the Brundtland Commission, that sustainability is a composite concept since it allocates significance to environmental, economic, social, and institutional issues. Given the multidimensional nature of sustainability, the first step of a Local Agenda 21 process ought to be the development of a vision of the sustainable society, attached to indicators that assist in measuring the distance from and progress towards targets, as well as identifying the failure of plans or their applications (Valentin and Spangenberg, 2000).

There is a set of sustainability indicators for international and national levels. However, local governments have developed sustainable development indicators for their own cities, based on Local Agenda 21, since 1993 (UNCSD, 1993), because national and international indicators are commonly not useful at a local level (Demetriades, 2007).

2.6.1 International, National and Local Indicators

Agenda 21 recognised that a range of institutions need to be involved in developing sustainability indicators. Specifically Chapter 40 makes it clear that the responsibility for measuring progress at the international level must lie with international governmental and non-governmental organisations, while at the national level the responsibility should be that of national governments.

Xing et al. (2009) argues that international and national sustainability indicators need to be:

1. Consistent in terms of themes and sub-themes.
2. Focused on a high level idea to provide a strategic view by comparison to local sustainability indicators.
3. Aggregated to reveal key trends, while local sustainability indicators need to be more disaggregated to allow a basis for detailed understanding and action.

The extent of the activity generated by Local Agenda 21 is revealed by a global survey undertaken by the International Council for Local Environmental Initiatives (ICLEI) between November 2000 and December 2001. This found that some 6,416 local authorities in 113 countries had either made an official commitment to Local Agenda 21 or were vigorously pursuing this process (Gercheva, 2003).

2.6.2 Why Develop Sustainability Indicators?

Many books and articles outline the purposes of the development of sustainability indicators at a local level. The UK Department of the Environment (DOE, 1996) argued that indicators are required because they provide information about the state of the economy and the environment, in order that people can understand government policies

and understand their role in bringing about change. Moreover, the indicators can offer early warnings of probable environmental problems caused by the activity of humans, as well as evaluate the extent to which policies focused on sustainability are being attained. In other words, it emphasized the necessity for sustainability indicators to facilitate and guide decision-making.

More specifically, Lombardi (1999) has argued that the aims of the development of sustainability indicators are; urban development checking; performance evaluation of policies and decision-making; identification of potential solutions by assisting the local administration; correcting social problems and strategies for the environment; a means of improving communication with the local community; and an effective tool for decision-making support.

There is agreement between researchers on the role of sustainability indicators in measuring progress toward sustainability (Josza and Brown, 2005). Additionally, the UN (2002) identifies that many countries have used the indicators to:

1. Put critical issues on the political agenda.
2. Assist in recognising key trends in priority sectors.
3. Assist in detecting the state of sustainable development in addition to informing decision-makers and the general public at both local and national levels.
4. Encourage national dialogue about sustainable development.
5. Assist in evaluating the achievement of government goals and reconsidering the need to reset them.
6. Help in preparing and monitoring plans.
7. Assist in the evaluation of the performance of policies when applying the plans.
8. Clarify the sustainable development concepts in practice.
9. Direct state budgets, sectoral programmes and national programmes on sustainability.

There is no doubt that sustainability indicators express the major trends in the economy, environment, human wellbeing, quality of life and social systems (Josza and Brown, 2005).

2.6.3 Indicator Development

The development of sustainability indicators is the first step in the sustainability evaluation process (Bossel, 1999). Thus, many European countries have adopted a top-down approach to the development of sustainability indicators and giving responsibility for the selection of indicators to experts (Cogo, 1997).Despite Agenda 21 (UNCED, 1992) recommending that the selection of indicators ought to be managed by a bottom-up approach, where citizens themselves have responsibility for identifying the most appropriate indicators.

Meadows (1998) introduced a report on a 5day workshop held by experts from an international sustainable development network, focused on the development of sustainable indicators. This report recognizes ten key steps in indicator development which are valuable references for the indicator development process (Mearns, 2010):

1. Choose a small group of stakeholders to assist the process.
2. Identify the objective of the indicator set.
3. Specify communities that share values and a vision.
4. Review current models of data and indicators.
5. Formulate a proposed indicators set.
6. Conduct a process of participatory selection.
7. Overview the performance.
8. Provide data investigation.
9. Strengthen results.
10. Give systematic update of work.

However, Tanguay et al. (2009) analyse 17 previous studies that develop local sustainability indicators. The analysis shows a lack of consensus on the selection procedure and optimal number of indicators

Wong (2004) in her work, dealing with creating systems for indicators, confirms that the building of indicators is not an exact science but is a consensual procedure. Moreover, she discusses the indicators of urban and regional development and investigates the process of developing indicators for sustainability and planning in England and a wider context, including those developed by the European Union and the United Nations.

The development of an appropriate set of sustainability indicators is difficult since, if few indicators are examined, many of the important developments will not be taken into consideration. On the other hand, when a large number of indicators are developed, the collection and analysis of data will be difficult, expensive and time consuming (Bossel, 1999). Consequently, it is necessary to select a set of representative essential indicators that give a comprehensive description, but not more than that, by using a list of criteria.

2.6.4 Criteria for Selecting Indicators

White (2006) argues that the criteria used for the selection of sustainability indicators ought to be built on the basis of sustainability goals and community values as established through the involvement of key stakeholders.

To establish an agreed basis for developing sustainability indicators, a meeting was held at Bellagio, Italy in November 1996. The aim of the meeting was to set some principles for monitoring progress towards sustainability (Bellagio Principles) (Hodge and Hardi, 1997). This meeting recommended that criteria are significant for selecting indicators (Hardi and Zdan, 1997). Around the same time as the Bellagio Principles were being

developed, the US Environmental Protection Agency declared a number of key characteristics of sustainability indicators (Corrales et al., 1996) as shown in Table 2.3. There are other important criteria for selecting national indicators for sustainable development; the Commission on Sustainable Development (CSD) Indicator Guidelines has suggested (UN 2001) sustainable development indicators should be:

- National in scope
- Capable of evaluating progress towards sustainable development
- Small in number, but adaptable to the requirements of the future
- Wide ranging in coverage of all aspects of sustainable development and related to the objectives of Agenda 21.
- Unambiguous
- Sound from a conceptual standpoint.
- Reflect any international agreement to maximum limits possible within the developmental potential of national governments.
- Based on cost effective data

Other authors propose additional criteria and have developed various lists for use in the selection of indicators (Kim, 2002, Hass et al., 2002, Lautso et al., 2002, Smith, 2002, Grey, 2011, Santana-Medina et al., 2013 and Department of the Environment, Transport and the Regions DETR, 1999). These are summarised in Table 2.3.

This reveals a broadly similar set of criteria proposed for use in developing sustainability indicators (Rice, and Rochet, 2005) with a number of criteria suggested more than five times (measurable, comparable and sensitive). These results inform the approach which will be used in this research, since these criteria will be used by the researcher in selecting appropriate and useful indicators

Table 2-3 Criteria to evaluate sustainability indicators

Sources / Criteria	UNCCD, 1994	Brecken -ridge et al., 1995	Corrales et al., 1996	Abbot and Guijt, 1997	Hardi and Zdan, 1997	Hodge and Hardi, 1997	DETR, 1999	Kim, 2002	Lautso et al., 2002	Hass et al., 2002	Smith, 2002	Santana-Medina et al., 2013
Simple					x	x		x			x	
Understandable				x			x	x	x	x	x	
Representative		x				x	x	x	x	x		
Show trends over time	x	x					x	x				
Offer an advance warning		x						x	x	x		
Sensitivity					x	x	x	x	x	x		x
Measurable	x	x	x	x	x	x	x	x		x		x
Comparable			x			x	x	x				x
Practical	x											x
Credible							x			x		
Relevance of policy					x				x			
Predictable									x			
Provides time-series data	x			x	x							
Scientifically valid					x			x	x			
Good quality					x							
Ability to collect information					x							
Reliable		x		x	x						x	
Small in number						x						
Flexible enough to cover public perceptions									x			
Concentrate on outcomes not outputs			x									
Offer detail for the target audience			x				x					
Reasonably certain			x									
Accurate	x	x										
Measure what is important to stakeholders				x								

2.7 Use of Sustainability Indicator Frameworks

Examination of the literature and practice reveal that indicators are generally developed and delivered through logical structures called frameworks. While many of the most commonly used frameworks were developed in the 1990s, only a few of them achieved acceptance, as others were never practically applicable or remain at experimental stage

(Pintér et al., 2005). Frameworks encourage interpretation and make the indicators broadly understandable. In addition they explain what to measure, what can be predicted from measurement and which indicators should be used (Pintér et al., 2005). In the absence of a clear framework, indicators will often be unplanned in nature, partial and unaligned with the data; moreover, research may be excessively focused in some areas, and sparse or empty in other significant areas (Bossel, 1999). One of the most important advantages of indicator frameworks is that they can be used as a device to categorise indicators into groups to confirm which issues have been covered and which have been ignored (Sustainable Measures Inc. & American Forests, 2003).

Other advantages of conceptual frameworks are that they help anchor indicator systems in theory, supply an organising structure, help recognise useful indicators and data gaps, ensure comparability of indicators and assist communication with the decision-makers and public (Pintéret al., 2005).

Sonntag (2010) highlights some additional advantages associated with the use of indicator frameworks. They organize and systemise indicators in relation to their planned uses; furthermore, they clarify what to measure and what actions are needed to encourage the positive direction of change as measured by the indicators.

As a result, a number of indicator frameworks have been introduced into use. The main differences in the frameworks include the following (Meadows, 1998):

1. The ways in which frameworks conceptualize the key dimensions and causal linkages of sustainability
2. The assumptions underlying the selection of indicators
3. The way in which frameworks group the issues to be measured
4. The implicit hierarchy and scales of data aggregation

However, the diversity of frameworks indicates that there is theoretical uncertainty, or at least ambiguity, with regard to the specific elements of sustainability (Pintér et al., 2005).

2.8 Review of Sustainability Indicator Frameworks

A review of existing indicator frameworks provides a means of establishing the key dimensions for a strong framework for assessing sustainability. Studies have identified a variety of approaches to the creation of sustainability indicator frameworks, which can be used to restructure the selection and development of a conceptual framework for measures, such as Walton et al. (2005).

There are no exact frameworks that allow one to facilitate or predict interactions that govern sustainability (Abolina and Zilans, 2002); moreover, there are indicator frameworks which have been developed for use at the national, regional and local levels as well as for sectors, companies and even households. A further variable is the level of public participation involved in the production of frameworks indicator which can range from high to non-existent (Bell and Morse, 2004).

Maclaren (1996) summarizes this diversity by enumerating the main framework types which could be used in order to develop sustainability indicators, including: domain-based frameworks, goal-based frameworks, sectoral frameworks, issue frameworks, causal frameworks and combination frameworks. He characterises each one as shown in Table 2.4.

Table 2-4 The main framework types used for developing sustainability indicators: (Maclaren, 1996)

Framework types	Description	Advantage and disadvantage
Domain-Based Frameworks	Uses the major dimensions of sustainability (environment, economy, and society) and then recognises indicators for each. Seattle's sustainability report is one of the well-known examples of a domain-based framework.	The key strength of this framework type is that it ensures coverage of the dimensions of sustainability. However, its weakness is that it does not appear to connect indicators with sustainability goals.
Goal-Based Frameworks	Starts with the identification of sustainability goals for a community and then produces indicators for each goal or combination of goals. The United Kingdom's Local Government Management Board (LGMB) is an example of an agency that uses a goal-based framework (LGMB, 1993).	The advantage of this framework type is that it decreases the number of indicators that have to be considered to only those relating to specified sustainability goals. This helps in evaluating whether indicators are showing movement towards or away from sustainability. However, the disadvantage is that it is quite simple and does not pick up some of the complex interrelationships among a variety of dimensions of sustainability.
Sectoral Frameworks	Develop indicators of sustainability for each sector under the responsibility of municipal government, e.g. housing, transportation, waste management, land use, police services. These sectors can be joined to individual government departments, which helps determine accountability for a particular problem or credit for the positive outcomes revealed by indicators.	A disadvantage of this framework is that the division of indicators into specific areas of government responsibility makes it difficult to establish connections across dissimilar areas of intervention.
Causal Frameworks	Seek to address the limitations of the previous framework approaches by introducing the concept of cause-and-effect relationships.	The advantage of this type of framework is that it should be capable of explaining why indicators are changing and whether policy interventions are having an impact.
Issue-Based Frameworks	These frameworks list the sustainability issues facing a community, such as waste management, air pollution, education, and employment	The key advantage of the issue-based frameworks is that they are more understandable and simple to construct, while the disadvantage is that there is limited match between indicators and sustainability goals, and inadequate coverage of the main dimensions of sustainability.
Combination Frameworks	This type of framework brings together two or more of the individual frameworks. By using a combination framework, a lot of the disadvantages of the individual frameworks described above can be overcome.	Since this framework approach brings together two or more of the individual frameworks, it may establish the advantages of some individual frameworks while at the same time overcoming some of their weaknesses.

Nathan and Reddy (2008) examined commonly used sustainability frameworks for indicator development and identified the frameworks as shown in Table 2.5.

Table 2-5 Commonly used sustainability frameworks for indicator development, (Nathan and Reddy, 2008)

Framework types	Description	Advantage and disadvantage
Capital Accounting Framework	This framework finds its origin in economics and was developed before the development of the concept of sustainability. The framework is used in environmental accounting where changes in natural resources are calculated like financial resources. In addition, social indicators are yet to be included in this environmental-economic accounting framework (Lundin, 2002).	The advantage of this framework lies in the fact that the connection to mainstream accounting allows comparability across environmental qualities as well as objectivity. On the other hand, the disadvantage is that it is not easy to quantify the qualitative environmental resources.
Issue –based, goal-oriented or thematic framework	These frameworks are usually created as a result of special interests at local, national and global levels (Newton et al., 1998) and together with the pressure-state-response (PSR) is found widely in the indicator literature. UNCSD has adopted a thematic framework, as the programme was created from Agenda 21 and divided into themes and sub–themes. Furthermore, they are categorised into four dimensions of sustainability: social, economic, environmental and institutional (UNCSD, 1996). The indicators are goal-driven and develop on the basis of various themes and issues.	The advantage of this framework is that the thought of connecting indicators to goals and targets enables their use in measuring performance and helps connecting indicators to policy priorities. However, the disadvantage is that a number of the goal-oriented frameworks are excessively specific and do not reflect the multidimensional nature of sustainability, except as already accepted within the policy procedure. As a result, they are neither comprehensive nor constant (IISD, 1999).
Systems Framework	This framework has been derived by Newman et al.(1996). It is developed from an expanded urban metabolism model (EUMM). EUMM demonstrates cities as systems where the desired outcome is enhanced lifestyle and decrease of waste.	EUMM as a concept is closely related to paradigm of sustainable development, where sustainability goals, future orientation and connections among various dimensions are made explicit (Australia, 1998; Newton, 2001). Regardless of its advantages over other frameworks, this system framework is not as widely used as causal and thematic frameworks.
Sectoral or domain framework	It is not a framework in itself but it is used frequently in combination with other frameworks. Indicators are structured under capital accounting, or causal or thematic or system frameworks can be grouped into different domains or sectors before being finally listed. Transport, domestic, commercial and industrial activities may be considered as sectors, which generally aligns with city government departments; moreover, land, water, energy etc., which are specific areas of interest or expertise , may considered as a domain under this approach.	

Bell and Morse (2003) present unusual frameworks; for example, using the concept of capitals, domains and system orientators as shown in Table 2.6, while Waldron and Williams (2002) explain five groups of frameworks as shown in Table 2.7.

Table 2-6 Unusual frameworks for indicator development (Bell and Morse 2003)

Framework types	Description	The author
Capitals	Considers sustainability in terms of context (trends, stresses, shocks) and capitals (social, natural, human, financial and physical).	Bell and Morse (2003)
Domains	Considers tables of indicators which cover all areas of anxiety that constantly occur in reviews of existing sustainability indicator sets, such as, resources, pollution, biodiversity, local needs, quality of life. Bell and Morse, confusingly, consider these as 'indicator frameworks'; however, following the definition of framework, these may be considered as tables rather than frameworks.	
System orientator approaches	Proposed by Bossel (1999) who did not develop indicator sets; however, he lists the criteria that indicators ought to cover in order to assess the sustainability of any system, e.g. existence, effectiveness, freedom of action, security, adaptability, co-existence and psychological needs (Bell and Morse, 2003).	

Table 2-7 Five groups of frameworks for indicator development **(**Waldron and Williams 2002)

Framework types	Description	The author
Domain-based	Dealing with tourism issues to include social, economic and environmental but not essentially connected with specific management goals	Waldron and Williams (2002)
Goal-based	Indicators connecting with sustainability goals, but not dealing with interrelationships	
Sectoral-based	Helpful in evaluating management response to specific topics	
Issue-based	Deals with the 'issue of the day'	
Causal frameworks	Evaluate the existing conditions, stresses and responses but ignored within domain communications	

2.8.1 International Frameworks and Common Local Frameworks

International frameworks have been mentioned by Farsari and Prastacos (2002) are as follows:

1. World Bank: measuring the wealth of nations
2. United Nations –CSD Indicators
3. Barometer of Sustainability
4. Ecological Footprint
5. Organization of Economic Co-operation and Development's (OECD) Pressure-State-Response framework

Besleme and Megan (1997) identify three basic conceptual frameworks adopted by community indicator projects taking place around the world. These are as follows:

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

2.9 Potential Approaches to the Organisation and Design of Indicators

The literature reveals a wide range of approaches to the organization and design of indicators that are top-down (expert), bottom-up (community) or a mixture of the two, with each having its own advantages and disadvantages (Hart, 1998). Reed et al. (2005)

also focused on expert-driven and community-driven indicator processes by classifying frameworks according to the wide methodological paradigms which are expert-led and top-down as opposed to community-based and bottom-up. Their argument is that these two approaches require integrating for greater understanding of system interferences (Sonntag, 2010). Government involvement can increase data credibility while the involvement of citizens in the process of choosing indicators ensures they are relevant to the community (Fraser et al., 2006). Reed et al. (2006) examined different approaches to developing methodological frameworks and sustainability indicators and characterized these as bottom–up or top–down approaches as shown in Table 2.8.

Table 2-8 Methodological frameworks for developing sustainability indicators showing their approach: (Reed et al. 2006)

Framework	Description	Reference
BOTTOM–UP APPROACH		
Softsystems analysis:	Based on experiential learning (Kolb, 1984) and systems thinking (Von Bertalanffy, 1968) to develop indicators as a dimension of a participatory learning process to improve sustainability with stakeholders	Checkland, 1981
Sustainable livelihoods analysis	Develops indicators of livelihood sustainability that can observe variation in human, social, natural, physical and financial capitals built on the entitlement theory which is a theory of distributive justice and private property created by Robert Nozick (Nozick 1974:150)	Carney, 1998
Classification hierarchy framework	Recognises indicators by increasing the resolution of the system element being evaluated, e.g., when the element is soil, property is productivity, the descriptor is soil fertility so the indicator will be % organic matter	Bellows, 1995
The Natural Step	Characterises four conditions for a sustainable society by developing indicators to recognize sustainability problems, visions, and strategies	TNS, 2004
TOP–DOWN APPROACH		
Panarchy theory and adaptive management	Recognise where complex systems present an adaptive cycle by using three wide groups of indicators. Additionally, the panarchy framework suggests that key indicators fall into one of three categories: wealth, connectivity, diversity	Gunderson and Holling, 2002
Pressure-state - response (PSR, DSR, and DPSIR):	Determines environmental indicators dependent on human pressures on the environment, environmental states, and community responses leading to change for environmental topics. Late formats changed pressure by using driving forces. Driving forces may be positive or negative, but pressures are always negative (DSR) and contain environmental impacts (DPSIR)	EEA, 1998

Table 2.8 Continued

TOP–DOWN APPROACH		
A framework for evaluating sustainable land management	A procedure for developing sustainability indicators to keep the social, economic and environmental opportunities for generations present and future while preserving the quality of the land	Dumanski, Eswaran, and King (unpublished manuscript)
Well-being assessment	Employs four indices to assess human and ecosystem wellbeing: a human well-being index, an ecosystem well-being index, a combined ecosystem and human well-being index, and measures the impact of progress in human well-being on ecosystem health as fourth index	Prescott-Allen, 2001
Thematic indicator development	Recognizes indicators in each of environmental, economic, social, and institutional themes	UNCSD, 2001

2.10 Some Indicator Initiatives

There are many organizations and governments that have developed national and local initiatives. Nathan and Reddy (2008) studied sixteen indicator initiatives which are summarized in Table 2.9. As may be seen from this table, most of the national initiatives are top-down while local initiatives are bottom-up. A multi–stakeholder approach, where the top-down and bottom-up approaches are combined to ensure all stakeholders are involved, yields the best results and has been established by South Africa (DEAT, 2001) Canada (NRTEE, 2003), and New Zealand (2002).

Table 2-9 Summary of indicator initiative studied (Nathan and Reddy 2008)

Project	Framework	Scope
Top-down Approach		
OECD (2003)	Causal framework (PSR) used in conjunction with sectoral grouping	(International) Country
WEF (2005)	Causal framework (PSR with 2 additional components)	(International) Country
Kitakyushu (Dhakal, 2002)	Causal framework (a modified version of PSR)	City
UK (1999, 2005)	Objective or goal oriented	Country
UNCHS (2002, 2004)	Objective or goal oriented	(International) Country
Argentina (UNDSD, 2005)	Systems	Country
Australia(1998)	Systems (EUMM Model)	Country
UNCSD(1996)	Thematic	(International) Country

Table 2.9 Continued

Bottom-up Approach		
EU Local Sustainability Indicator (Ambiente Italia, 2003)	Thematic	(International) City (Local authority)
UEQES (Angel and Rock, 2001	Target based	City (cities of PRC)
London QoL (LSDC, 2002)	Objective or goal oriented	City
Sustainable Seattle (2004)	Issue based and sectoral classification	City
Winnipeg (1997)	Issue based and thematic classification	City
Multi Approach		
Canada (NRTEE, 2003)	Capital based	Country
South Africa (DEAT, 2001)	Causal framework (DPSIR)	Country
New Zealand (2002)	Combination of Theme based and capital model	Country

2.11 Criteria for Selecting Framework

Environment Canada identifies a number of factors that should be considered in the selection of a good framework (Ditor et al., 2001). They propose that combination frameworks are most aligned with these factors (Ditor et al., 2001). Other authors refer to additional criteria that it would be preferable to fulfil in the selection of a conceptual framework, as shown in Table 2.10. These criteria will be useful in selecting the appropriate methodological framework in the following section.

Table 2-10 Suggested criteria to be used in selecting framework

References	Criteria
Ditor et al., 2001	Provides useful information
	Is workable, practical, flexible and not restricted by boundaries and jurisdictional mandates
	Recognizes and merges dimensions of sustainability through the modality of systems
	Is empowering for individuals and communities and inclusive of the needs of stakeholders and their interests
	Encourages involvement among stakeholders and between the public and private sectors
	Is agreeable to use of both quantitative and qualitative data
	Is compatible with other issues and frameworks, and thus can provide a basis for action
Reed et al., 2005	Balanced between the different needs and interests of stakeholders
	Balanced between the target users and the developers of indicators

Table 2.10 Continued

White et al., 2006	Flexible
	Responsive to variations in practice
	Proposes signs of change
	Permits management decisions to be made
	Reviews action and system responses
	Reviews the indicators chosen

2.12 Summary

This chapter has reviewed the definitions of sustainability in general and the sustainable city in particular; the global plan of action for sustainable development (Agenda 21), a process that assists sustainability at the community level (Local Agenda 21); the role of local authorities in achieving Agenda 21 objectives in addition to the benefits of the participation of local authorities in the process of 'Local Agenda 21'; the purposes of sustainability indicators and their development; various lists of the characteristics of sustainability indicators; important criteria for selecting indicators for sustainable development; the significance of indicator frameworks, and a review of some of their types; the potential approaches for the organization and design of indicators, and finally some initiatives' indicators have been reviewed.

The conclusions of this review are summarized as follows:

1. Through a review of existing definitions of sustainability and the sustainable city, this thesis will adopt a comprehensive view of the sustainable city and has identified it as a city which ought to be economically viable, socially non-violent and environmentally healthy.

2. Local sustainability is regarded as essential in order to reduce social, economic and environmental problems and it is fundamental in achieving sustainability at other levels. An international understanding has been reached that the problems of humanity need to

be identified at a global level, while processes and the actions that need to be adopted for solutions must be taken at a local level. It can therefore be concluded that from previous research 'sustainable cities' is now a commonly used phrase.

3. Through a review of existing types of sustainability indicator frameworks, a good level of understanding of the construction of indicators has been provided. This will assist the construction of a methodological framework to develop indicators to evaluate sustainability at the local level in the following chapter. Additionally, the advantages and disadvantages of these frameworks have been diagnosed to aid the choice and combination of frameworks which will be established and applied in this study (a combination between using a goal-based framework and using a CSD Theme Indicator Framework 2001). The combination framework brings together two or more of the individual frameworks; therefore, it may provide the advantages of individual frameworks at the same time as overcoming some of their weaknesses.

4. Through a review of the literature, three criteria (measurable, comparable and sensitive) have been chosen to select an appropriate and useful indicator for this study, because these criteria are the most commonly used in the previous studies.

The following chapter will explain the research methodology that is adopted in this study; criteria for selecting framework; the rationale behind the approach to the methodology of this study, and the research methodology, data collection and data analysis.

Chapter 3.

Research Methodology

3.1 Introduction

This chapter explains the rationale behind the research design, the methodological approach, the process used in data collection and the subsequent analysis. This chapter also demonstrates the methods related to the development of approach to local sustainability assessment ALSA, a methodological framework, in addition to investigating the requirements of a pilot study. Furthermore, this chapter examines the rationale for choosing a case study to apply the ALSA methodological framework, focusing on the key strengths and weaknesses of this approach. It then discusses whether single or multiple case studies should be used, making the argument for choosing a single case study. Moreover, it will discuss generalisations in a single case study. The chapter continues by indicating key criteria that could be applied to choose an appropriate case study city and sets out the reasons for selecting the city of Hilla, Iraq(as one of the Middle Eastern cities)as the focus for the research and as an appropriate test site for exploring the applicability of the proposed methodological framework.

The previous chapter (Chapter Two) has provided a literature and theoretical context for this study. This facilitates the formulation of the aim, objectives and issues of the research as it is shown in Table 1.1. The overall aim of this study is to develop an approach to local sustainability assessment ALSA, a methodological framework that will formulate, select and prioritise key indicators, which can then guide the assessment and action to improve sustainability at the local level in Middle Eastern cities. Four research questions (section 1.3) and nine objectives (section 1.4) have been developed to reach this aim.

Within the context of sustainable settlements, frameworks are logical structures which may be used to develop indicators. There are many advantages in using frameworks;

they increase the ability of indicators to be easier to understand and to help convey information that is of value to the decision makers (Mortensen, 1997). Taylor (2006) stated that indicator frameworks help to guide decision makers, policies and track progress over time. Moreover, Sonntag (2010) proposed that they help to organize and systemize the indicators according to their intended purpose, in addition to explaining what to measure and what actions are necessary to promote a positive trend.

Thus, this thesis has found that there is a real need for the development of systematic processes (methodological frameworks) consisting of a number of steps for formulating, selecting and pritorising indicators to assess sustainability.

3.2 Rationale behind the Approach to the Methodology of this Study

Many of the sustainability indicator frameworks examined in the previous chapter are frameworks used only for categorizing indicators. The use of such approaches for developing indicators without systematic mechanisms for selection may lead to long arbitrary lists of indicators because of the possible biases of the analysts (Hens and De Wit, 2003). As has been seen from the literature review, there is a real need for the development of a systematic process. This process is needed for the formulation and selection of indicators to assess sustainability, with the combination framework approach. Then providing the most promising avenue for investigation as it overcomes many of the weaknesses in the other approaches.

The framework proposed in this study meets many of the criteria mentioned in the previous section (3.2) that describe good combination frameworks. These are:

1. The combination of the CSD Theme Indicators Framework (2001) contributions (themes, sub themes and indicators) with the Goal-Based Framework (indicators that most directly reflect the issues of a case study and its local communities and stakeholders) leads to the adoption of a top-down / bottom-up approach. Such an

approach is the best way to develop indicators which are both (top-down) scientifically valid and generic with (bottom-up) stakeholder and local community needs (O'Connor and Spangenberg, 2007).

2. Generally a simple and clear framework.

3. It provides a means for local communities to identify needs and priorities and develop actions, programs and strategies which can demonstrably address these needs and priorities.

4. This framework considers social, economic, environmental and institutional aspects in one approach.

5. It can assist a partnership between stakeholder and local communities on the one hand and local authorities on the other hand.

6. The goals (objectives) and indicator development process in this framework are based on participation of different actors present at community dialogues.

Given these clear advantages the combined framework approach is viewed as being particularly suitable as a basis for the development of an approach to local sustainability assessment for this research.

3.3 The Research Methodology

The proposed methodology which underpins this thesis combines documentary research and analysis with case study research involving focus group interviews and questionnaires; this mirrors the approach required to develop a combined framework for the measurement of sustainability indicators.

It is necessary to develop indicator sets to assess progress towards sustainability at a local level which are useful for decision-makers and for policy monitoring and evaluation. Developing indicators should be an open communication and policy process rather than a purely technical or scientific process (Valentin and Spangenberg, 2000).

To achieve this broad principle and to reach Objective 4 in this thesis (to develop a practical methodological sustainability assessment framework which could be used as a tool and mechanism for developing local sustainability indicators), suitable steps should be applied to propose a set of local indicators as shown in Figure 3.1.

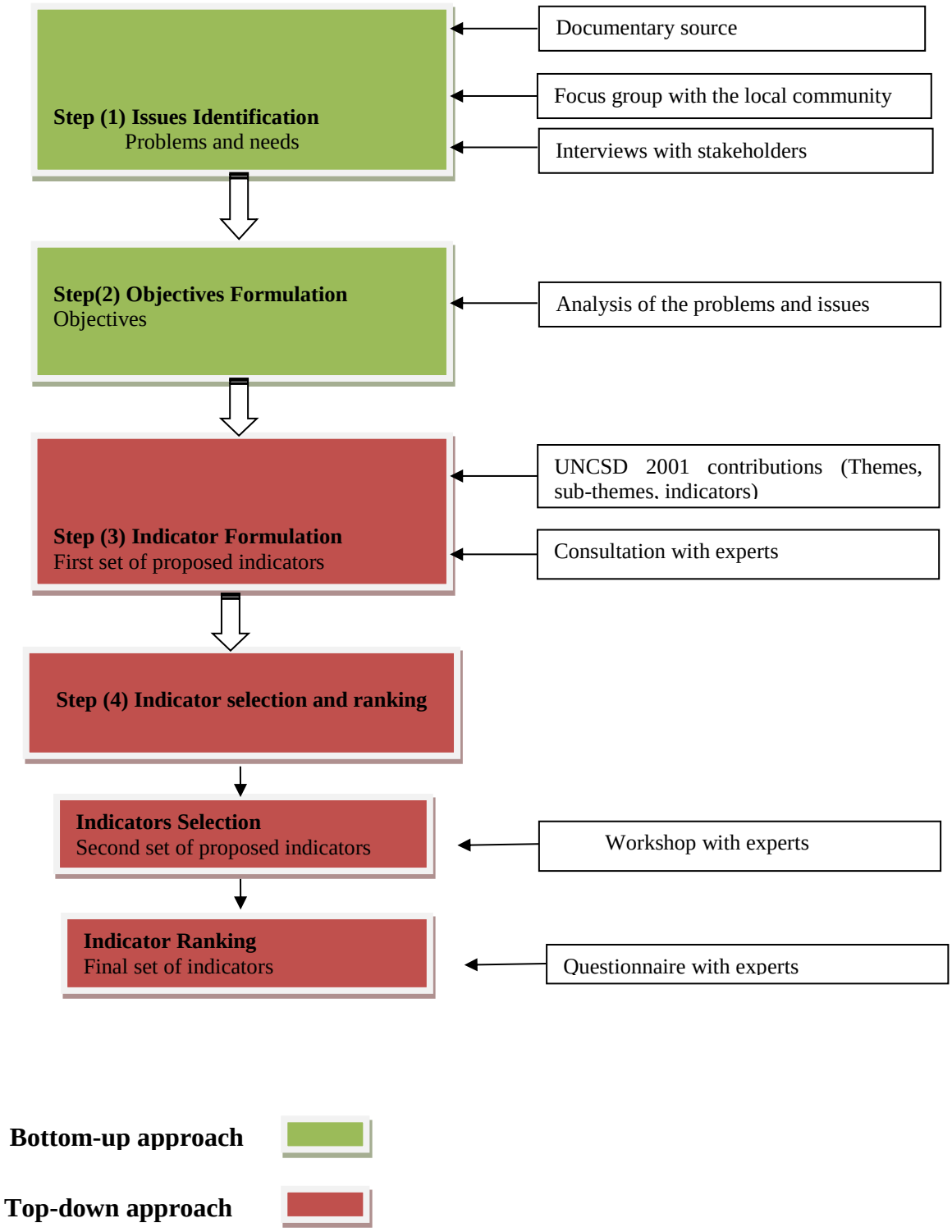


Figure 3-1 A detailed Scheme of the ALSA methodological framework process

3.3.1 Step One: Issues Identification

This step defines the main sustainability problems and their root causes (social, economic, environmental and institutional) and additionally, identifies and brings together local facts with wishes for the future of the locality, by asking the local community about their wishes for sustainable city development.

The UNDP (UNDP, 2003) recommends that a number of requirements should be borne in mind in seeking to establish local sustainability issues/problems. These include:

1. Should be complete, to cover all the significant issues in complying with the probable objectives
2. Should be selective since it does not include everything and should not go into too much detail in order to stay focused and brief
3. Should highlight the connections and interdependence between the different themes and aspects of development
4. Should be thoughtful, illuminating the substance and clarifying the facts and the links between them, to permit the formulation of conclusions
5. Should be forward-oriented, although reflective of past and present experience
6. Should take into account the main current and future trends of local development
7. Should be built on the appropriate use of analytical methods which are clear and easy to understand/interpret.

In this study, documentary sources are used to assist identify the main problems. Additionally, strong community participation is essential from the start, through focus group meetings, in order to highlight problems and wishes related to local sustainability. Furthermore, to collect further information, interviews with a range of stakeholders need to be performed. In this step (issues identification) the determining and

setting/diagnosis of local sustainability aspects can be achieved, which is a critical step in the overall framework process. The results of this step are recognition of problems and issues that have an adverse effect on the sustainability of the city.

Documentary Sources

Analysis of documentary sources, including a review of local literature/sources such as books, newspapers, journal articles, government records, unpublished reports, non-government reports, academic reports, local historical records, maps, socio-economic studies and other sources relevant to the case study. It can also be used to help identify the main problems and needs regarding sustainability at the local level. Data from documentary sources is useful in the preliminary stage of this study in that it helps to form a more detailed understanding of issues related to the case study. Additionally, documentary sources are very significant in the verification of interview and focus group data.

In this study, documentary data includes: books, newspapers, journal articles, government records, unpublished reports, non-government reports, academic reports, local history, maps and socioeconomic studies.

Focus Groups

Focus groups may be used as an effective means of collecting qualitative information and views from a range of people. They are used in multi-methodology research strategies within triangulation to support other methods (Finn et al, 2000). Moreover, they are usually carried out with small groups to obtain insights about people's perceptions and values (Gercheva, 2003).

Neuman (Neuman, 2003) stated that focus group meetings are particularly valuable in the generation of new ideas for hypotheses and exploratory research. Moreover, they are

particularly useful in the collection, clarification and analysis of information, in addition to interpretation of results.

In the context of exploring sustainability, focus groups can be used for the following reasons:

1. Help the researcher during the subsequent investigation and clarification due to the emergence of contrasting views (Finn et al, 2000).

2. Cover all parts of the study area in terms of the collection of information, as focus groups were an effective way to reach a greater number of people (Finn et al.,2000).

3. Encourage communication amongst a group of people which could produce a variety of answers and opinions within groups (Gillham, 2000).

4. Revision of the initial ideas and provision of information to be used in other participation activities (ICLEI et al., 2010)

5. Help to obtain ideas about community issues and priorities (ICLEI et al., 2010)

Holding focus group meetings would prefer to continue until 'saturation' is reached, when no new significant themes have appeared. After completing each focus group meeting the outcomes data can be evaluated and gathered with the previous focus group meeting, if saturation point is reached, no additional focus groups will be necessary.

Interviews

As interviews are often the best source of additional information, where there is limited existing information (Gold, 1997), nearly all types of qualitative investigation may at several stages use some form of interview plan (Morse, 2002). Interviewing has been the foundation of many forms of qualitative research (Silverman, 2000). Interviews involving face to face communication are generally favoured, although it is still possible to create a rapport with respondents through telephone interviews, which can be effective in engaging respondents with the genuineness and the importance of the

research (Czaja and Blair, 1996). There are various types of interview design that are capable of obtaining thick, rich data (Creswell, 2007). Moreover, using a semi structured interview approach ensures that all the related topics are covered. The more personalised the level of contact, the higher the response rate (Newsome et al, 2002). There are many advantages of the interview, such as performing as vehicles for gathering genuine data and in-depth information in order to get the true and real meaning of a phenomenon (Seale, 1998). Furthermore, interviews can provide empirical information to expose problems and bring in issues in an unstudied area (Kvale, 1996). Brenner (Brenner et al, 1985) states that interviews offer the benefit of instant openness of the information and a high response rate often not attainable in other ways.

However, experience suggests that a pilot exercise needs to be used to assess the interview process and allow revision before the final version of the interview is adopted. Semi structured interviews with open-ended questions will be employed in this research (see Appendix A).

Open ended questions have a number of advantages (Marvasti, 2004), including ease of gathering multiple perspectives, along with detailed information. They provide the respondents with the scope to set up their own views and enable the generation of detailed descriptions. Furthermore, they encourage an understanding of, and uncovering of, complex issues, while detailed information encourages understanding of the situation (Marvasti, 2004).

It is important that any interview programme is organized and conducted following a clear protocol (Kvale, S., et al., 1996). The interview protocol should follow the guidelines provided by Steinar (1996) which help to avoid bias in the process of research and interpretation: The key steps proposed (Kvale S., et al., 1996) are:

Step 1. Thematizing: Formulating the aim of the interview.

Step 2. Designing: Setting the interview questions and determining the type of questions.

Step3. Interviewing: Conducting the interviews, including obtaining permission and writing and recording responses.

Step 4. Transcribing: Organising the responses for each interviewee in writing.

Step 5. Analysing: Deciding methods of analysis which are appropriate to the purpose of the investigation.

This research used interview analyses focusing on the meaning condensation of the interviews (an abridgement or shortening of something, especially of a written work or speech, see The Free Dictionary, 2013) as the mode of interpretation.

Step 6. Verifying: Making sure of the generalizability, validity (investigates what is intended to be investigated) and reliability (consistency) of the interview results.

The analyses (meaning condensation) of the interviews in this research have been verified by returning the interpretation to interviewees by email or calling them by phone.

Step7. Reporting: organizing the findings along with taking scientific criteria into consideration.

Modern technology such as Skype enables face-to-face interviews to be conducted remotely. In essence this requires an approach which combines the features of both face-to-face and telephone interviews. The snowballing sampling technique can be used to recruit a range of interviewees and ensure that a range of stakeholders are included in the research, as suggested by Patton (2002). Furthermore, Patton explains that researchers who are considering qualitative studies should take validity into account. The validity of results obtained from interview surveys can be improved by adopting the following approach:

1. Concealing the detailed focus (problems and needs) of the research to prevent respondents from providing 'socially desirable' answers (Miller, 2001). In other words, avoid the use of interview questions that make the respondents give the answer they think the interviewer wants.
2. Avoiding the possibility of contradictory answers by not asking the same questions in different ways, and thereby annoying respondents. This will strengthen the measurement validity of the research tool (Sapsford, 1999).
3. Careful phrasing and ordering of questions also reduces the possibility of respondents becoming angered by the researcher, and consequently strengthens the validity of answers received (Miller, 2001).
4. The interview survey needs to be piloted prior to the study proper. This process may reveal a number of points of confusions or issues and, consequently, adjustments can be made. This will allow the survey to be clear and easy to answer and the validity and reliability of the survey form will be verified.
5. Combining various informants allows the gathering of rich data and reveals the participants' thinking; consequently this will enhance the validity and reliability of data (Pan, 2006).

3.3.2 Step Two: Objective/Goal Formulation

Step 2 seeks scope of the framework to ensure that it addresses the key issues and problems emerging from Step 1 in relation to local sustainability. The framework should also provide a clear indication of what needs to occur in order to encourage local sustainability, as well as the programme for its achievement. Using the assessment of the problems and needs developed during the first step, the reformulation of those into solution statements or objectives is best prepared with the help of experts. The result of such reformulation must not lead to senseless solution statements (objectives).

Subsequently, indicators must be attached to the objectives or goals which set terms in concrete, and this attachment will be easier when objectives are more developed and localized (Gercheva, 2003). The objectives should be distributed in a well-balanced way and not directed to only one or two dimensions. Moreover, objectives should be displayed with characteristics as detailed and accurate as possible since the city's potential for further data collection may be limited (Valentine and Spangenberg, 2000). Gercheva (2003) argued that every suitably developed objective should include only one essential item and active and strong verbs in each objective formulation. Moreover, it should respond to the vision for the development of the city; be real, achievable, understandable and acceptable; guide rational utilization of natural resources; cover a given issue (problems or needs) and give attention to the major changes necessary to achieve sustainable development. Gercheva (2003) mentioned that the formulated objective ought to be expressed broadly enough to cover all aspects of the issue and specific enough to permit targets to be defined. After all it ought to be a criterion for assessment of results achieved; and moreover, be a guide for the selection of suitable actions, the implementation of which will lead to the realization of the objective and the vision (Gercheva, 2003). Finally, after objectives or goals have been agreed upon, they will be the starting point to develop meaningful performance indicators.

3.3.3 Step Three: Indicator Formulation

There are a variety of indicator reports about sustainable cities that can be used as a starting point; however, they should not be copied directly because indicators should reflect local identity (Valentin and Spangenberg, 2000). As each city is individual, developing indicators at a local level will enhance visibility of this individuality (Valentin and Spangenberg, 2000). In other words, despite the similarity of some

indicators among cities and the possibility of their duplication, each city has individuality, so both similarity and individuality ought to be taken into consideration.

Indicators should always be explained in an understandable manner so that people with no scientific or administrative background can understand why the specific indicators are selected and why some aspects have priority (Valentin and Spangenberg, 2000).However, fundamentally, indicator formulation is based on public participation. Each indicator will be built on a logical procedure, developed by consultation, through sharing the ideas of the author with experts from across the environmental sciences, government, business, non-governmental groups, research centres and the academic sector. As well as through a careful review of the relevant environmental, social, economic and institutional science and literature. Preferably, these indicators will be (Smith, 2002) simple, credible and understood by the public and policy makers.

Since each city is different, the suitable set of sustainability indicators will differ also, but as a starting point they may be chosen from any source and combined in the form that most suits the objectives included (Valentin and Spangenberg, 2000). So, existing lists of indicators for a city could be useful as models but never as a blueprint for other cities. In combining the CSD Theme Indicator Framework(UN, 2001) (themes, sub-themes and indicators) with the Goal-Based Framework, which is a participative process aimed at identifying indicators that most directly reflect the issues of local communities and stakeholders, a top-down/bottom-up approach can be achieved. It has been argued that such an approach is a superior way to develop indicators which are top-down/bottom-up (O‘Connorand and Spangenberg, 2007). Subsequently, at the following step this first draft set of proposed indicators will be transformed (using a process of selection) into a second set of indicators for the sustainable city.

3.3.4 Step Four: Indicator Selecting and Ranking

As is discussed in Chapter Two that there is a need for a more systematic, auditable and transparent approach to the selection and identification of priorities of local sustainability indicators. Thus, this step contains two processes, indicator selection and indicator ranking.

Indicator Selection

The first set of potential indicators will be revised and analysed through a workshop with a panel of experts from various fields. The workshop approach will be adopted in this study because; firstly, the technique appears to be able to generate more effective discussion about the selection of useful indicators, and secondly, a broad consensus on the result may be rapidly achieved. This revision stage will be used to reformulate and select valid and useful indicators by applying a recommended set of criteria which are comparable, measurable and sensitive (see Table 2.3).

This will decrease the number of indicators and make them methodologically strong, readying them for use in the final participative assessment process: a questionnaire.

Indicator Ranking

In this step the expert participants will be asked to choose the level of importance of each indicator listed in a questionnaire survey. The questionnaire uses an applied itemized rating scale which has a number and a concise description connected with each reply category. The experts participants will then be invited to select the categories which best explain their responses related to the indicator. These can then be rated, using categories that are arranged in a logical order. One of the most broadly used itemized scales is the Likert scale. The advantages of the Likert scale are its simplicity,

both for the researcher to construct and administer and for the respondent to understand. The aim of this step is to rank the indicators on the basis of priority so as to identify a final set of indicators that covers the four dimensions of sustainability: environmental, social, economic and institutional. Experts participants in the questionnaire survey will be asked to show the relative importance of each of the listed indicators on a scale of 1 to 4 where 1 is 'not important'; 2 is 'less important'; 3 is 'important' and 4 is 'very important'. The average score for each indicator can then be calculated. This average score will therefore be an average value of the associated importance of each indicator. In the current study, the numbers of participants in the questionnaire will be the same as the number of those who participate in interview; however, the saturation point theory will be used in selecting the number of interviewees. The researcher will expand the sample size until the interviews yield no new data.

To ensure the reliability and the validity of results, a pilot exercise will need to be undertaken to test the questionnaire on a small sample of participants to recognize and reduce potential problems. As a general rule, a questionnaire should not be used in a field study without pilot exercise; therefore, even the best questionnaire could be enhanced by piloting (Malhotra and Peterson, 2006).

3.4 Data Collection

In addition to data collection, supplementary activities are carried out in relation to this study, which include attending workshops, seminars, conferences, searching the internet and meeting with other researchers in the same field. The purpose of these activities is to improve communication between the researcher, academics and others. Moreover, allow the researcher to share the primary results of research with others to receive useful feedback and ensure the researcher's knowledge of current issues/ thinking on sustainability.

For data collection, there are six key sources of evidence in case study research (Yin, 1994). These six sources are:

1. Documentary sources: Documents could be letters, memoranda, agendas, study reports, or any items that could add to the data base.
2. Archival records: Archival records could be useful in some studies since they include service records, maps, charts, lists of names, survey data, and even personal records such as diaries.
3. Interviews: The interview could take one of several forms: open-ended, focused, or structured.
4. Direct observation: Direct observation occurs when the investigator makes a site visit to gather data.
5. Participant observation: Participant observation is a unique mode of observation in which the researcher may actually participate in the events being studied.
6. Physical artefacts: Physical artefacts could be any physical evidence that might be gathered during a site visit. This might include tools, art works, notebooks, computer output, and other such physical evidence.

Another author, Twumasi (2001) offers a list which sets out possible approaches to collecting data in the case study when there are challenges concerning the collection of data, as is the case in Middle Eastern cities. These approaches include: questionnaires, interviewing, direct observation, participant observation, life history, the use of documentary evidence, letters, personal memoranda, diaries, Public records, panel discussion and group discussions. Each research method has some strengths and weaknesses; Table 3.1 specifies the strengths and weaknesses of each type.

Table 3-1 Types of evidence (Yin, 1994, p. 80)

Research techniques	Strengths	Weaknesses
Documentation	stable - repeated review unobtrusive - exist prior to case study exact - names etc. broad coverage - extended time span	retrievability - difficult biased selectivity reporting bias - reflects author bias access - may be blocked
Archival Records	precise and quantitative stable - repeated review unobtrusive - exist prior to case study exact - names etc. broad coverage - extended time span	privacy might inhibit access retrievability - difficult biased selectivity reporting bias - reflects author bias access - may be blocked
Interviews	targeted - focuses on case study topic insightful - provides perceived causal inferences	bias due to poor questions response bias incomplete recollection reflexivity - interviewee expresses what interviewer wants to hear
Direct Observation	reality - covers events in real time contextual - covers event context	time-consuming selectivity - might miss facts reflexivity - observer's presence might cause change cost - observers need time
Participant Observation	insightful into interpersonal behavior reality - covers events in real time contextual - covers event context	bias due to investigator's actions time-consuming selectivity - might miss facts reflexivity - observer's presence might cause change cost - observers need
Physical Artifacts	insightful into cultural features insightful into technical operations	selectivity availability

The strengths and weaknesses of research methods mentioned above should be taken in to consideration when making decisions about the best approach to data collection. The use of each approach to evidence gathering is likely to require different research skills which might influence the selected approach. On the other hand, not all sources have to be used as they are often complementary and may be used side-by-side. Indeed, it is

well established that multiple data sources add to the reliability of research investigations (Stake, 1995).In other words, some research approaches produce complementary data and there are advantages to combining approaches to add robustness to the data collection and research process. Hakim (1987) recommends that case study research ought to adopt more than one method of data collection so as to provide more diverse and full accounts of issues and processes. In addition, analysis which relies on data taken from a number of data sources enables triangulation (Yin, 1994). Triangulation increases the reliability of the data and the process of gathering it.

There is a range of possible techniques for case study research that have been successfully applied in both developed and developing countries that could be employed in Middle Eastern cities. The techniques which used in this thesis include:

1. Documentary sources: designing the research project (Chapter One); the literature review (Chapter Two); Critical analysis of the literature to develop the local sustainability evaluation framework (Chapter Two and Three); case study description (Chapter Four).
2. Focus groups, which are part of the data collection process with the local community (Chapter Five).
3. Interviews, which are part of the data collection process with stakeholders (Chapter five).
4. A questionnaire which is used to identify the priorities with experts (Chapter five).

By using these different research methods, triangulation can be achieved in order to increase the validity and the reliability of the results.

3.5 Data Analysis

To enable this study to draw appropriate conclusions from the qualitative research data, the author should employ rational and reasonable analytical techniques. The analysis of qualitative data, as already noted, can be affected by the researcher's perspective (Laws et al, 2003). In order to balance this effect the researcher must examine the same thing from different perspectives and thus be able to challenge or confirm the results of one method with those of another (Laws et al, 2003).

In this study the issue of different perspectives can be addressed in several ways. The literature search (document source) includes a wide range of perspectives from Governmental and non-Governmental stakeholders, including views from the selected case study. Data collected from the local community through focus groups and from stakeholders through interviews provides different perspectives on sustainability. The documentary sources focus group, interview notes and transcripts can be regrouped and a systematic process of sifting and sorting of material according to key issues and themes adopted. However, interview transcripts will be processed using the following the analytical approach identified by Lacey and Luff (2007) which shows that analysis of qualitative data usually goes through the following stages:

1. Repeated review of responses to notice and observe the primary data
2. Successive reading of source documents
3. Analysis of the data to identify key issues and related themes
4. Gathering of data into groups
5. Refinement and decrease in number of categories
6. Making a table including distilled summaries of the data (interviewees responses)

Microsoft Excel can be used to store, analyse and present the data collected from the questionnaire, since quantitative data of the questionnaire is not based on a large number of samples; Excel generates clear figures and is easy to use.

3.6 The Rationale for Choosing a Case Study Approach

Different types of case studies are used under different research conditions. Table 3.2 provides an overview of the findings of Stenhouse (1985) who classified case study research into four types, Yin (1993) who identified three types of case study by the analytic level of the study result, and Robson (1993) who classified six types of case study.

Table 3-2 Identification of different types of case study

Case study type	Description	References
Ethnographic	Highlighting causal or structural patterns of the actors to study the outsider'sperspective.	Stenhouse (1985)
Evaluative	To supply decision makers with information for the evaluation of a programme or a model.	
Educational	To understand models of learning.	
Action research	Using feedback to guide adjustment of an action / to study the development of a case.	
Exploratory	The goal is to specify questions and hypotheses	Yin (1993)
Descriptive	To provide a description of a situation within its context	
Explanatory	To clarify the causal relationships to formulatea theory.	
Individual case study	To investigate cause and procedures and spotlight one case	Robson (1993)
A set of individual case studies	To study a small number of individual case studies with a number of general characteristics	
Studies of events, roles and relationships	To study particular events	
Studies of organisation and institution	To assess programmes in an institution	
Social group studies	To study direct contact groups and to examine their relationship	
Community studies	To study local communities, essentially descriptive	

Table 3.2 highlights the wide range of circumstances in which case studies are used by researchers. Yin (1994) states that case studies are the ideal strategy when: the study is about a contemporary phenomenon within some real-life context; the researcher has slight control over events; and when 'how' or 'why' questions are being posed. Other authors have encouraged researchers to adopt a case study approach for a variety of reasons. For example, Punter (1986) supports adopting a case study approach when there is a need for testing the formulation of a framework which can be accomplished by outlining, commenting on and linking it to a case study. This view is consistent with the opinion of Soy (1997) who stated that a case study is suitable for validating a framework developed earlier. Stake (1998) also promoted the dependence of the case study approach because it permits researchers to study contemporary events and the naturalness of phenomena. Moreover, Yin (1994) explained that case studies offer the scope to study real life situations by means of multiple sources of data. Yin also emphasized the role of a case study approach in exploring complex social phenomena (Yin, 2003).

In summary, there are a number of reasons propounded for adopting a case study approach. Table 3.3 seeks to summarise some of the arguments used by authors in favour of adopting a case study approach.

Table 3-3 Reasons propounded for adopting a case study approach

References	Reasons
Punter,1986	Testing a framework can be accomplished by outlining, commenting on and linking it to a case study
Yin,1994	It offers the scope to study contemporary phenomena in real life situations by means of multiple sources of data
	It enables advancement of theories on complex social phenomena
Soy, 1997	The case study is appropriate to validating earlier frameworks
Stake,1998	Permits study contemporary events and study of the naturalness of phenomena
Yin, 2003	Permitting ideas to be prepared on complex social phenomena

A case study is considered to be the appropriate and accurate research methodology for this research based on the reasons listed in Table 3.3. Moreover, based on the fact that the issue of urban sustainability arises in the real world along with an understanding that the challenges of sustainability are best approached through case study based investigations. Case study aims to test and validate the previously formulated ALSA methodological framework. In consequence, there are some strengths and weaknesses which should be taken into consideration when using a case study approach.

3.7 Strengths and Weaknesses of the Case Study Approach

Kim (2002) examined the methodological strengths and weaknesses associated with the use of the case study approach. These are discussed in the following paragraphs.

3.7.1 Weaknesses of the Case Study Approach

A number of authors have identified weaknesses which are inherent in the use of case studies as a research approach. Yin (1994) argues that as a method of research, case studies suffer from a number of restrictions, and research needs to be designed in such a way to eliminate or minimise them. The case study 'weaknesses are that: it is ambiguous; it offers a small source for scientific generation; it is long; and results in unreadable, irrelevant and large documents that are excessively descriptive. In addition to the personal viewpoint of the researcher, problems of verification arise when the researcher has to respect the privacy of individuals by ensuring the anonymity of the actors or events (Punter, 1986). Khettai (2000) explains that the case study method does not provide a wide basis for statistical analysis of cases. On the other hand, as the selected case study may not be representative, this makes generalisation difficult or

confusing (Punter, 1986). Other weaknesses are a lack of precision and objectivity (Punter, 1986).

In order to overcome these identified weaknesses, researchers need to exercise great care in designing and using case studies (Yin, 1994). In spite of these possible inadequacies, it is hoped that the present study will set the foundations for future studies or research in this area.

3.7.2 Strengths of the Case Study Approach

While weaknesses must be acknowledged, there are significant advantages and strengths associated with the application of a case study approach. Authors such as Hakim (1978) have discussed these strengths and have suggested that it offers flexibility to test hypotheses, as well as to simulate experiments, and it can be explanatory, exploratory and descriptive in nature. The case study approach is flexible, since the designs of its project confirm exploration instead of prediction and researchers are freer to detect and address issues which appear in their researches. Denscombe (1998) suggested other strengths for the case study approach, which enables the following: experiences, in-depth account of events, relationships and processes. Knight (2002) states that case studies go beyond superficial research approaches and compels researchers to work in-depth. Yin (2009) emphasizes the ability to deal with a wide range of evidence collected in a variety of ways. Punter (1986) highlights additional strengths, such as providing the basis for further research for the future; appropriateness for answering ‘how’ and ‘why’ type questions; appropriateness for research into process links which have a requirement to be traced over time; providing the opportunity of in-depth analysis; allowing the researcher to conduct practical processes; and enabling investigation of a broad range of causal links. Moreover, he states that case studies are closer to the reader's worldview which is made up of a collection of events or cases and

it can be used to generate, reformulate and test hypotheses through normal or typical cases.

In spite of the limited use of case studies in theory testing, Gummesson (2005) confirmed the use of case studies in this area; moreover, there are examples of its application in areas such as strategy implementation (Voss et al., 2002).

Summing up, case studies are a suitable research strategy when there is focus on contemporary events, when the researcher has little control over events, when a holistic, in-depth investigation is needed and when evaluating programmes and testing the theory in a natural setting is needed.

The case study is a reliable methodology when implemented carefully and knowledgeably. Like many other research methods, it has both strengths and weaknesses and as a result great care must be exercised by researchers in order to overcome its weaknesses (Yin, 1994).

3.8 The Rationale for Choosing a Single Case Study

Having determined that a case study approach is appropriate, it is necessary to consider whether a single or multiple case studies should be used. The key question is how many case studies are required to examine a specific problem. Khuraibet (1990) argues that relevance is more significant than the number of case studies used.

Yin (1989) puts forward three principal reasons for the use of a single case study as a research approach, also supported by both Schell (1992) and Rowley (2002). These are:

1. Extreme and rare or unique cases
2. Critical case: when the case study provides the means of testing a well formulated theory or model

3. Prevalent phenomenon: when the case study can uncover some prevalent phenomenon which was previously inaccessible to scientists.

Yin argues that one or a combination of these conditions justifies the use of a single case study in research. Schell (1992) and Rowley (2002) agree with Yin (1989) that there are three rationales for the single case study.

However, as noted from the above, one rationale for the single case study is when it is testing a well formulated theory (critical case). To confirm, challenge or extend the theory, a single case may meet all of the circumstances for testing the theory. Then, the single case can be used to decide if the theory proposition is correct or if there are some alternative that is more relevant. Yin (1994) adds that generalization of findings from either single or multiple studies is made to theory and not to populations, which mean that the findings could be applied to support theories but not applied to populations. Additionally, Allisons (1971) declared that the single case can represent an important contribution to knowledge and the building of theory.

Yin (1994) matched the unique case strategy, the extreme case strategy and the critical case strategy to the purpose of the case inquiry. A matching purpose for each of these strategies are: analysing a phenomenon that is unreachable/immeasurable to scientific investigation, documenting a rare case, testing a theory or model and exploring or piloting a case in preparation for a multiple case design.

Table 3.4 shows a list of the principal reasons for the use of a single or multiple case studies as a research approach.

Table 3-4 Selection strategies for single and multiple case design

Single case	Critical	- Testing well formulated theory
	Extreme or unique	- Documentation and analysis of a rare case
	Revelatory	- Observation and analysis of a phenomenon inaccessible to scientific investigation
	Prelude	- Exploratory .e.g . the first phase of a multiple case study research
Multiple case	Literal replication	- Cases selected to predict similar results - When rival theories are grossly different - Three to four cases
	Theoretical replication	- Cases selected to predict contrasting results - When rival theories have subtle differences or increase the degree of certainty of result - Two (or three) sets of three to four cases to pursue two (or three) patterns of theoretical replications

From the preceding discussion, and given the need to adopt a methodology suitable for testing the previously formulated ALSA methodological framework, the research method in this study will be based on a single case study to be used as a critical case. This should permit logical generalisation to other cases, since if its findings are true for the critical case it is probable that they will be true for all other cases (Patton, 1990). Considering these arguments, one case study will be investigated in considerable depth.

3.9 Generalisation

Generalisation from case study research provides a foundation on which other researchers can build and enables a portion of the research to be incorporated into the knowledge base of a field of study. It is therefore important to confirm that the ability to draw general findings has been considered during a research study (Rowley, 2002).A numbers of definitions of generalisation have appeared in the literature as shown in Table 3.5.

Table 3-5 Some definitions of generalisation

Definition	References
Generalisation points out the degree that research findings are viable for other populations or samples	Ryan and Bernard, 2000
Generalising is essential to the identification and formation of valid public knowledge	Metcalfe, 2005
Generalising is occasionally equalized with the terms of 'external validity' and 'transferable'	Tashakkori and Teddlie, 2003
Generalising enables the utility of a set of results in the interpretation of other similar situations	Grbich, 1999
Generalisation is one of five kinds of validity arising from qualitative research methodology which are: a. Descriptive validity (realistic accuracy). b. Interpretive validity (understanding from the point of view of the group that is under study) c. Theoretical validity (the proportion of data and theoretical description) d. Evaluative validity (application of an evaluation framework)	Maxwell, 1992
Internal generalisation is applied within the setting or group studied	Onwuegbuzie and Leech, 2005
External generalisation is applied beyond the group, setting, context, or time (Onwuegbuzie and Leech, 2005). It is often termed external reliability	Kincheloe and McLaren, 2000
External validity is a currently a popular term for the generalisation of a result	Campbell and Stanley, 1963
External validity is a question about treatment variables, measurement variables, populations and settings for which the effect can be generalised. This is the commonly recognised definition of external validity	Campbell and Stanley,1966

Drawing on the definitions of generalisation indicated in Table 3.5, one could suppose that the most powerful grounds for generalisation in qualitative research require careful attention to the definition of the term itself (Falk and Guenther, 2006). Furthermore, the definition of terms is always a good idea (Metcalfe, 2005). However, generalisation might mean various things. What is important is that, generalisation from case studies needs accurate application and a rigorous selection of case study areas.

In the literature, the issue of generalisation has come into view continuously. Tellis (1997) states that one of the common criticisms of case study research is that, the results

may not broadly apply in real life. But by offering an explanation of analytical generalisation (theory creation and verification), Yin (1984) refutes that criticism. Within analytical generalisation, a previously developed theory would be a model for other case studies (Yin, 1984). Moreover, Steinar (1996) stated that analytical generalisation includes a judgement about the extent to which the results from one study can be used as a guide to what might happen in another location, and the responsibility would be put on the reader to judge the accuracy of the generalisation.

A good selection case would be a case that is most important and crucial to the theory (Eckstein, 1975). In critical cases, the theory could be tested in two ways:

1. Most likely manner: a case where the theory should apply, but research has found that it does not
2. Least likely manner: the theory is not intended to apply here, but the case study research reveals that it does (Eckstein, 1975).

In these circumstances single case study based research may be used to evaluate a theory or model (Yin, 1994). However, in designing a case study methodology, the generalisability of a single case study remains one of the most dialectical issues (Simons, 1996). Firestone (1993) proposes that the most useful generalisations in qualitative studies are analytic (from findings to theory or revisions of a previously formulated theory) but not from sample to population; furthermore, it is possible to generalise analytically within a single case study. From that viewpoint, one can examine generalisation in a single case study. Flyvbjerg (2004) highlighted that one can frequently generalise from a single case and the case study may be central to scientific development through generalisation. Additionally, Ragin (1992) explains that criticism of single case studies being of less value than multiple case studies is misleading, because single case studies have multiple dimensions in most research, since evidence

and ideas may be connected in various ways. Thus, Gummesson (2003), Stuart et al. (2002) and Tellis (1997b) emphasise the possibility of generalisation from a single case study and especially for theory testing (Bensabat et al., 1987).

Patton (1990) identified a critical case as one that allows logical generalization to other cases, since if it is true in this one case; it is probably true for all other cases. In other words, if it is valid in this case, it is valid for all (or many) cases, and if it is not valid in this case, then it is not valid for any (or only few) cases.

There are no methodological principles by which one can confidently identify a critical case (Flyvbjerg, 1998). The only universal recommendation that can be given when in search of critical cases is to look for either 'most likely' or 'least likely' cases, that is, cases that are likely to either verify or falsify hypotheses and propositions (Flyvbjerg, 1998). As a result, locating a critical case requires care and experience.

3.10 Selection of a Case Study

The random selection of a case study may produce misleading findings. Stake (1994) recommends that the selection of a case study should not be based on the some typicality but should tend towards those cases that provide an opportunity to learn.

As the aim and object of the research could have an effect on selecting an appropriate case study, Kim (2002) suggests a number of criteria based on his research aims and definition of local sustainability in order to select the best case study. Denscombe (2007) also recognises a number of criteria that could be applied to justify the selection of particular case studies and Elshukri (2000) stated that the selection of the case study could be made on three main grounds, as listed in Table 3.6.

Table 3-6 Criteria that could be applied in the selection of case studies

References	Criteria
Elshukri (2000)	Availability
	Level of access to the evidence afforded
	Apparent typicality of other cities in developing countries
Kim (2002)	Accessibility of the locations to the researcher
	Availability of data
	Time and resource constraints
Denscombe (2007)	Suitability criteria which include: typical instance, extreme instance, test-site for theory, least likely instance
	Pragmatic criteria, which include: intrinsically interesting, willingness to participate, a matter of convenience
	No real choice criteria: the study is a part of commissioned research, there are unique opportunities

Case studies aim to test the applicability of the theoretical dimension of the research. In this research, the city of Hilla, Iraq, has been selected as a case study, using it as a site to test out previously a formulated ALSA methodological framework which may be generally applicable to other Middle Eastern cities owing to the above criteria and the following reasons:

1. Iraq has characteristics typical of many other countries in the Middle Eastern area, especially as an oil rich country which has suffered from several conflicts, in addition to having similar cultural backgrounds and sustainability problems. Likewise, the city of Hilla relates to different Middle Eastern cities.
2. The city of Hilla has characteristics typical of other cities in Iraq, as it forms a hub between the Middle Euphrates region and northern and southern Iraq because it is located in the centre of the country. Moreover, the climatic conditions and geography of the city are similar to the climatic conditions and geography of most cities in Iraq. In addition, it has a diversity of population with

a mix of Shia and Sunni Muslims as well as Christians and other sects living peacefully, which represents a microcosm of the religions and sects in Iraq.

3. There is a unique opportunity for the city of Hilla because of its location close to the site of the ancient city of Babylon, which have given the city a significant importance in terms of development opportunities.
4. The researcher is familiar with Hilla city, with an established network of friends and colleagues who can assist research into the subject. As a result, the researcher easily has good access to the data and locations in Hilla, certainly in comparison with other cities in Iraq and other Middle Eastern countries.
5. The citizens and authorities of the city of Hilla are interested and have shown willingness to cooperate and the city is convenient.
6. The size of the city is neither large nor small, allowing control and conduct the study easily.
7. Most citizens and authorities in this city have either the sustainability knowledge or the skills to empower themselves to achieve sustainability; thus, the selection of the city of Hilla as a case study will provide an opportunity to learn.
8. The city of Hilla is a fast growing city where the majority of the population is concentrated together with much of the economic and social activity (see Figure 4.14).This is likely to be typical of the challenges which other Iraqi cities face when developing sustainability plans. Moreover, the city of Hilla has typical examples of almost all sustainability problems with which other Iraqi cities have to cope because of their similar cultural and legislation.

Therefore, the chosen case study is appropriate to the aim and objectives of this study; it provides a substantial content to the practical problems widely under discussion in Middle Eastern countries, particularly those related to sustainability. Furthermore, this research looked for best practices in Middle Eastern countries, and chose Iraq because

Iraq has established a supporting policy and a funding scheme for the implementation of sustainability projects nationwide.

3.11 Summary

This chapter has provided a detailed account of the research methodology. The combination framework is the most promising type of framework, overcoming the weaknesses in other approaches. To develop local sustainability indicators, four suitable steps that compose the ALSA methodological framework should be applied. The proposed methodology which underpins this thesis combines documented research and analysis with case study research involving focus group interviews and questionnaires; this mirrors the approach required to develop a combined framework for the measurement of sustainability indicators. This chapter has also discussed the rationale for choosing a case study to test the applicability of the ALSA methodological framework. The case study approach is a reliable methodology when put into practice carefully and knowledgeably. However, like many other research methods, it has both strengths and weaknesses. In order to overcome its weaknesses, the researchers must be careful in undertaking a case study.

Appropriately used, a single case can provide the means of making a significant contribution to knowledge and building up of theory. In this thesis the single case study approach is used to test the previously formulated ALSA methodological frameworkand is used as a critical case which permits logical generalization to other cases. Thecity of Hilla, Iraq has been selected as the single case study, because of the reasons and pragmatic criteria which are set out in Section 3.11. The next chapter provides and an overview of the historical and geographical context, social, economic, environmental and institutional arrangements of the city of Hilla as the selected case study.

Chapter 4.

Case Study

4.1 Introduction

This chapter deals with a brief description and some important facts about the city of Hilla, Iraq. To use the city of Hilla as a case study requires a comprehensive understanding of the historical, social, geographical, and economic context and the current local government structure. Using available literature on the city of Hilla, this section has been divided into five categories as follows:

- Historical and geographical context
- Social/cultural background
- Economic background
- Environmental background
- Institutional arrangements

4.2 Historical and Geographical Context

Iraq is in the Middle East, bordered by Turkey to the north, the Islamic Republic of Iran to the east, the Arabian Gulf to the southeast, Saudi Arabia and Kuwait to the south, and Jordan and the Syrian Arab Republic to the west (see Figure 4.1). The unique characteristics of Iraq, such as the existence of the fertile plains of the rivers Tigris and Euphrates, provided the basis for one of the first urban civilizations, founded 7000 years ago (Al-Taie et al, 2012). The Greeks called this land "Mesopotamia", which means the land between the rivers (Rodriguez and Duginski, 1979).

This location between two rivers offered two main advantages: fertile land which through irrigation could produce a lot of food, and a central location in respect of historic trade routes. These advantages allowed the region to be one of the most important sites for the development of human civilization. These natural advantages

also resulted in the area being subject to repeated invasions throughout its history (Johnson, 2004). As one of the cradles of human civilization, Mesopotamia was the source of early invention and innovation. These include: agriculture, including herding and animal husbandry; wheeled carts; pottery making use of bronze; mathematics; codes of law; calendars and maps; written language; and early cities and urban civilization (Rodriguez and Duginski, 1979).

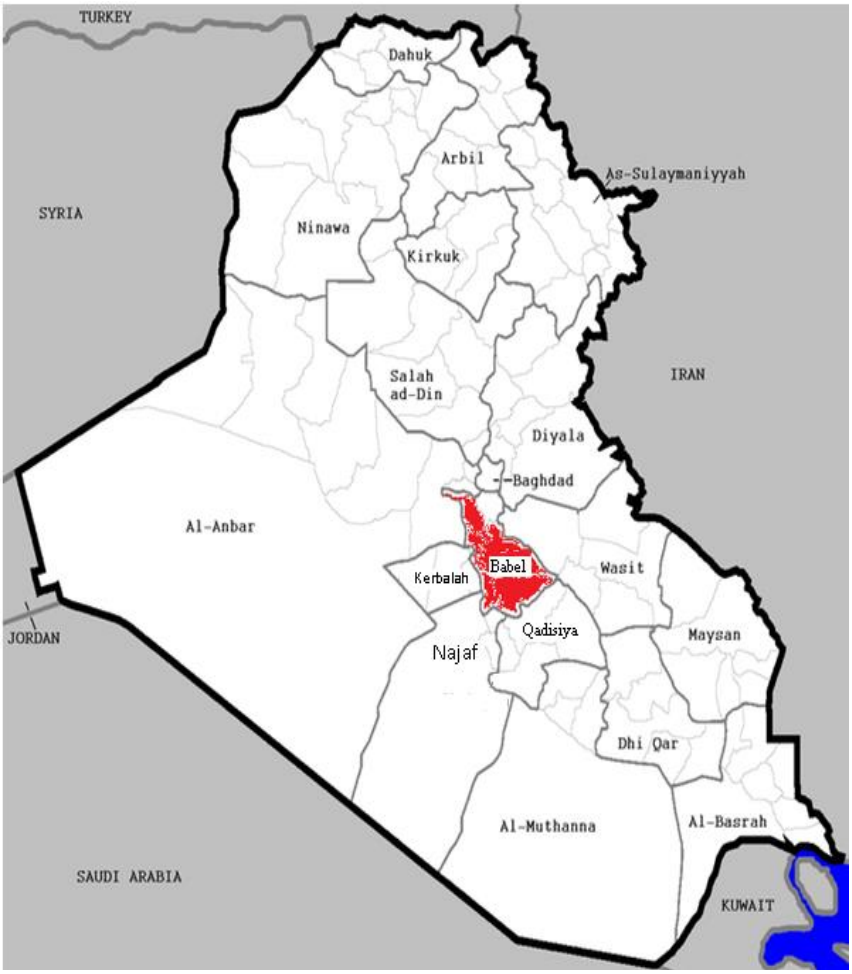


Figure 4-1 Babel province location (Dar al Handasa, 2006)

The ancient city of Babylon in the land of Mesopotamia is referred to in both the Holy Quran and Bible. The word "Babylon" in the Akkadian language means “Gate of God". The city was a commercial and religious centre which was established by Hammurabi around 2100 BC. Hammurabi ruled for 43years, during which time Babylonian civilizations flourished creating a golden age for the present day country of Iraq.

Subsequently, the city of Hilla drew on the cultural heritage of the civilization of Babylon and her Hanging Gardens and the Stele of Hammurabi on which the Babylonians wrote the first laws of humanity.

In the seventh and eighth century Hilla attracted people seeking security and food. The many intellectuals, scientists and writers led to the growth of a scientific and literary spirit which is referred to as the Intellectual Renaissance of Hilla (Hermazi, 2013). As a consequence, the city of Hilla possesses significant heritage features within its old city, although today Hilla is also renowned for ancient crafts like knitting, pottery and other crafts and fine arts.

Modern day Hilla lies at the heart of the Babel governorate in central Iraq (see figure 4.2).

4.2.1 Location of Babel Governorate

There are 18 governorates (provinces) in Iraq, of which Babel governorate is the third youngest, covering a surface area of 5119 km, see Table 4.1. Babel governorate is located in central Iraq and in the western part of the alluvial plain, which descends gradually towards the south. The central position of the governorate of Babel is emphasised by the fact that it is surrounded by six other governorates: Baghdad to the north; Al-Ambar to the northwest; Kerbalah to the west; Najaf to the southwest; Diwaniyah to the southeast; and Wasit to the east and northeast.

The governorate centre (Hilla) together with Districts (Qadha centres) and Sub districts (Nahia centres) form the urban areas of the Babel Governorate (see Figure 4.2)(Khalaf, 1998).

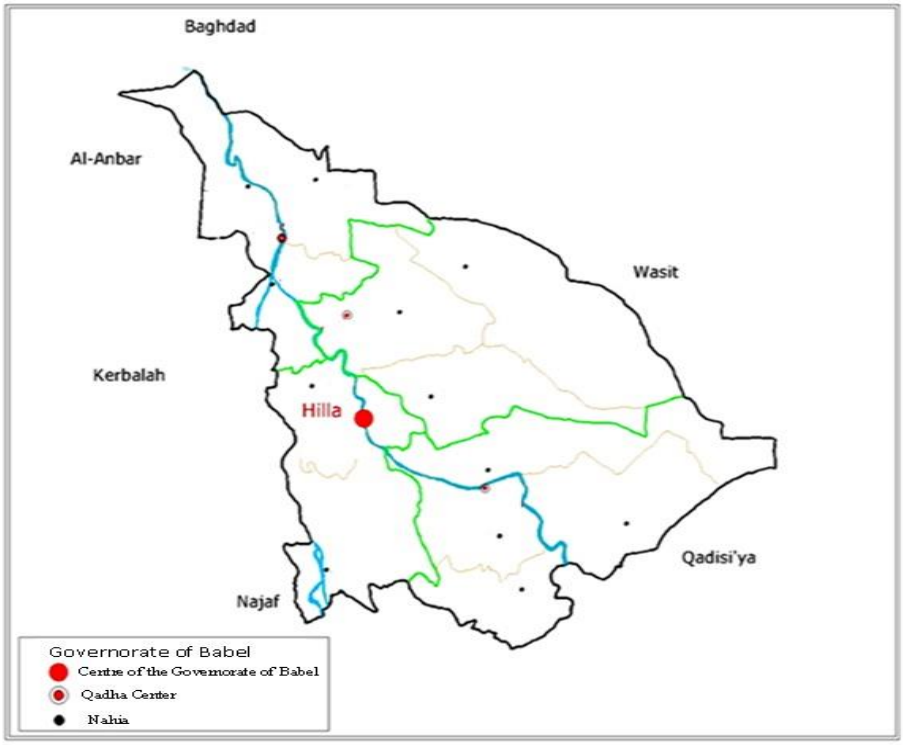


Figure 4-2 Babel province map (Dar al Handasah, 2006)

Table 4-1 Sub districts and districts in all provinces of Iraq (Statistical Annual Abstracts, MPDC, Central Organization for Statistics & Information Technology, 2010)

Province (capital)	Number of Sub district	Number of districts	%	Area (km 2)
Ninveh	18	9	8.6	37323
Thummim	9	4	2.2	9679
Diyala	16	6	4.1	17685
Anbar	14	8	31.7	137808
Baghdad	18	9	1	4555
Hilla	12	4	1.2	5119
Karbala	4	3	1.1	5034
Wasit	11	6	3.9	17153
Salah al-Din	9	8	5.6	24363
Najaf	7	3	6.6	28824
Qadisiyah	11	4	1.9	8153
Muthanna	7	4	11.9	51740
Dhi Qar	15	5	3.0	12900
Maysan	9	6	3.7	16072
Basrah	8	8	4.4	19070
Dohuk	5	4	1.5	6553
Arbil	10	4	3.5	15074
Asalmsanah	8	8	3.9	17023
Total	191	103	99.8	434128
Lands	–	–	0.2	924
Total	191	103	100	435052

4.2.2 Location and History of the Emergence of the City of Hilla

Hilla is the administrative centre for the Babel governorate (see Figure 4.2). It is located on both sides of the Hilla river which is a branch of the Euphrates river in the position of the intersection of longitude (44.26) east and with latitude (32.29) north (Al Khatib, 1972). Hilla has become a hub between the Middle Euphrates region and northern and southern Iraq because of its location in the centre of Iraq. In addition to the city's location on the Euphrates as a key source of water in an arid terrain, Hilla is the centre for a number of small urban communities in the province of Babel called Qadha (district) and Nahia (sub-district). These settlements are linked to Hilla by an efficient network of roads (see Figure 4.3).

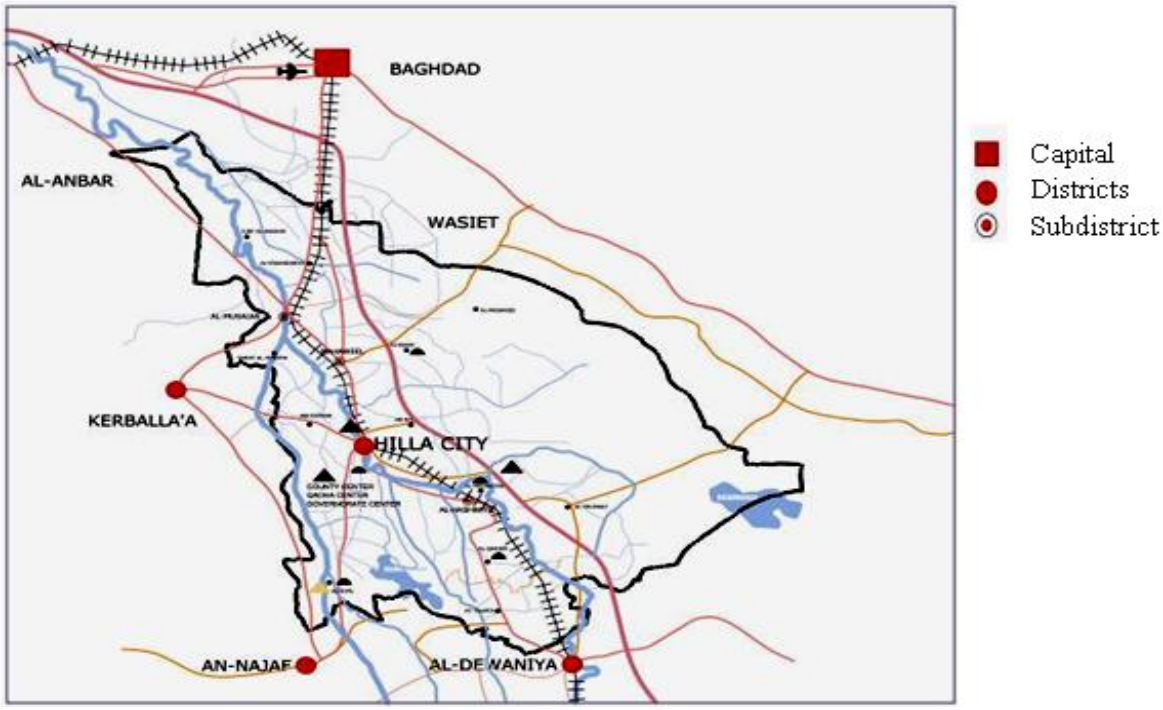


Figure 4-3 Regional transportation map of the city of Hilla (Dar Al Handasah, 2006)

The city of Hilla was established in 1101 by the powerful Arab tribe of Bani Assad, under Ali bin Mazyid Al-Asadi of Bani Assad, founder of the Mazayid State. Hilla was not chosen arbitrarily, but because it enjoys many advantages including:

- Proximity to the ancient site of Babylon, which is located 8 km north of the city of Hilla (see Figure 4.4)
- Fertile soil and the passage of the Hilla river, which provides a means of irrigating the land
- River transportation between the south and north of the Mesopotamian alluvial plain. The merchants of Baghdad and Basra, in general, preferred to send their goods from one town to another via Hilla rather than on the Tigris (Niebuhr, 1955)
- The city of Hilla is located in the centre of the Mesopotamian alluvial plain (Khalaf, 1998)

As mentioned, one of the main reasons for choosing Hilla as a location is its closeness to Babylon, the ancient city that was built upon Sha't Al-Hilla, a branch of the Euphrates, which divided the city in equal parts along its left and right banks (see Figure 4.5 and 4.6) with steep embankments to contain the river's seasonal floods.

In Babylonian scripts it is mentioned as Bab-Eli which meant the Gate of God. In Sumerian language it was called Ka-Denkar-Ra. It also had names such as Tin-Terki, meaning Home of Life, and Tin-Ki, meaning City of Canals. The Greeks called it Babylon. It was the capital of Babylonia in the 2nd and 1st millennium BC. The earliest mention of Babylon is in a tablet of the reign of Sargon of Akkad dated from the 24th century BC. (Dar Al Handasah, 2006).

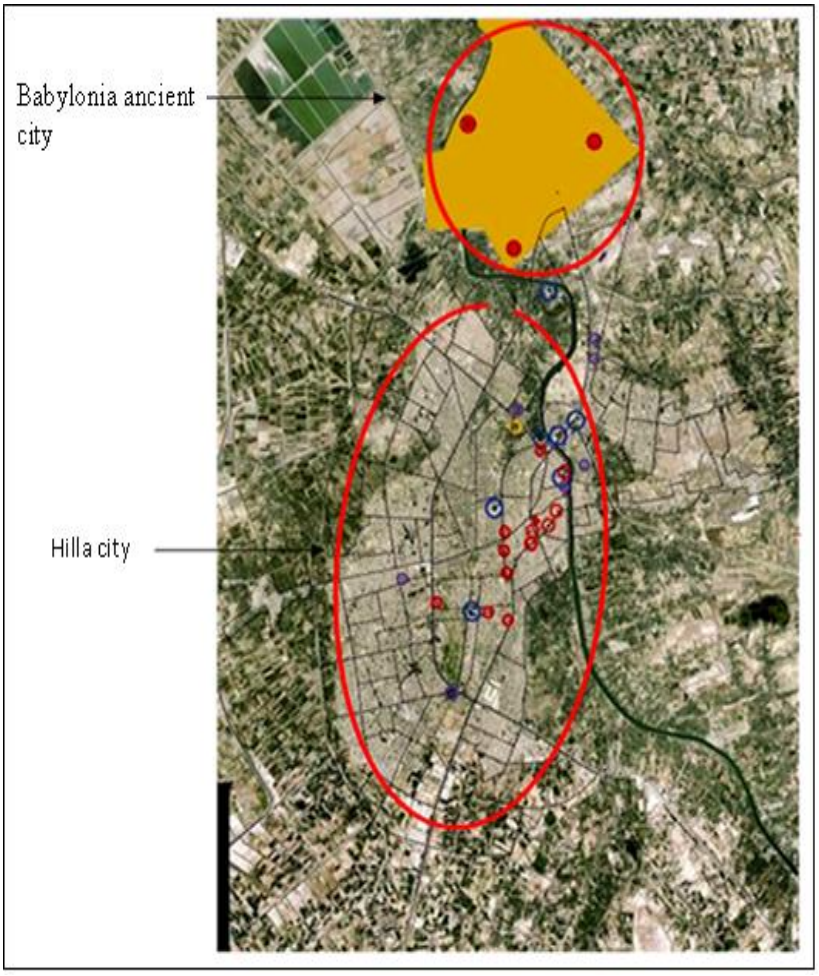


Figure 4-4 The location of the ancient city (Babylon) and Hilla city (Dar AL Handasah, 2006)

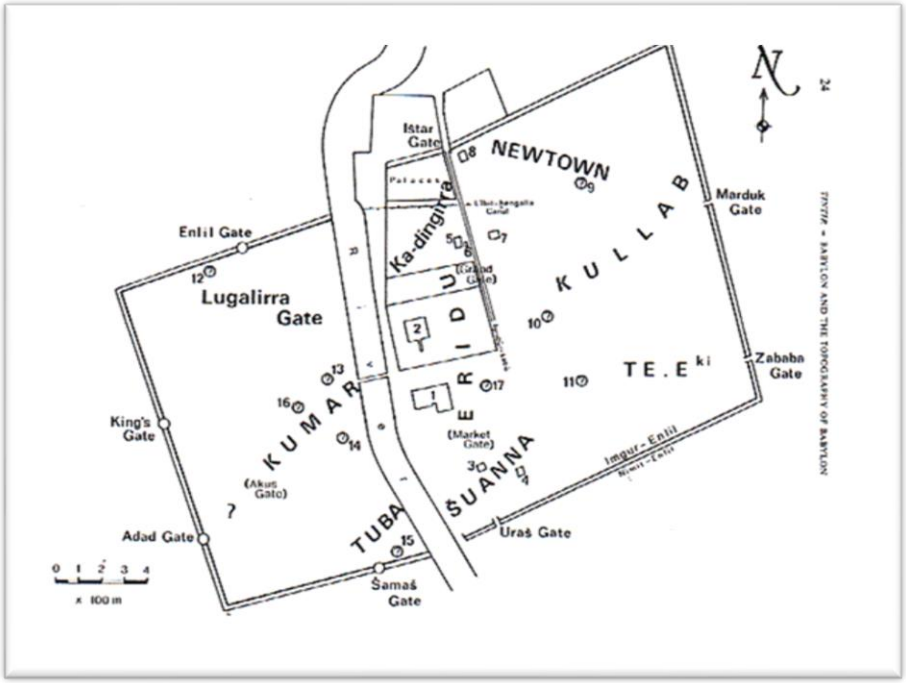


Figure 4-5 Babylon ancient city (George, 1992)

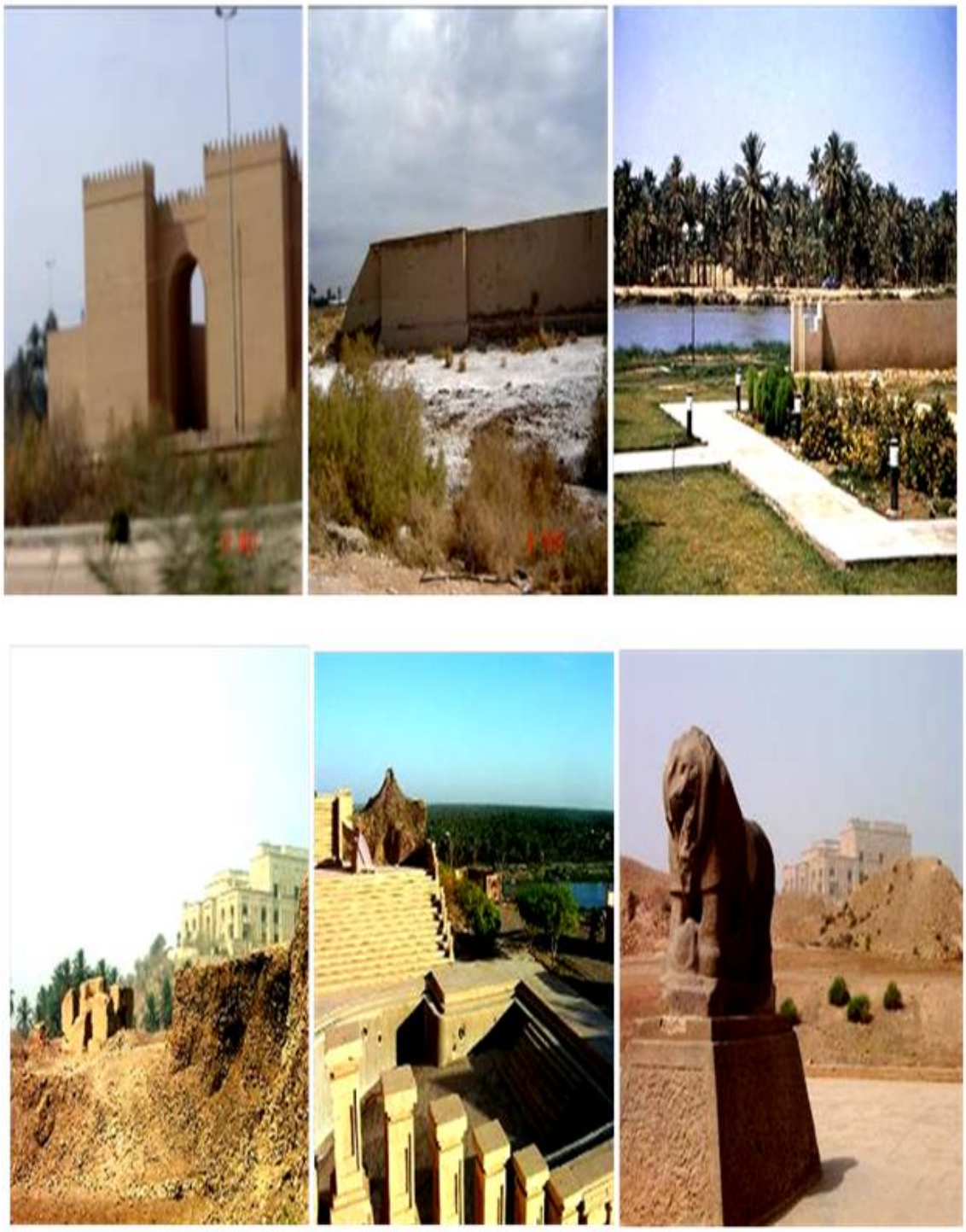


Figure 4-6 Areas of historic and archaeological interest within the historic site of old Babylon (Dar Al Handasah, 2006)

4.2.3 Main Parts of the City of Hilla

The four main residential areas of Hilla are illustrated in Figure 4.7 and described below. They are:

- The Heritage District, including parts of the city which are more than 100 years old
- Older suburbs, which comprise areas which were constructed more than 50 years ago
- Modern suburbs, which have been constructed in the last fifty years
- Recent slum (informal housing) areas which have grown up in the last ten years

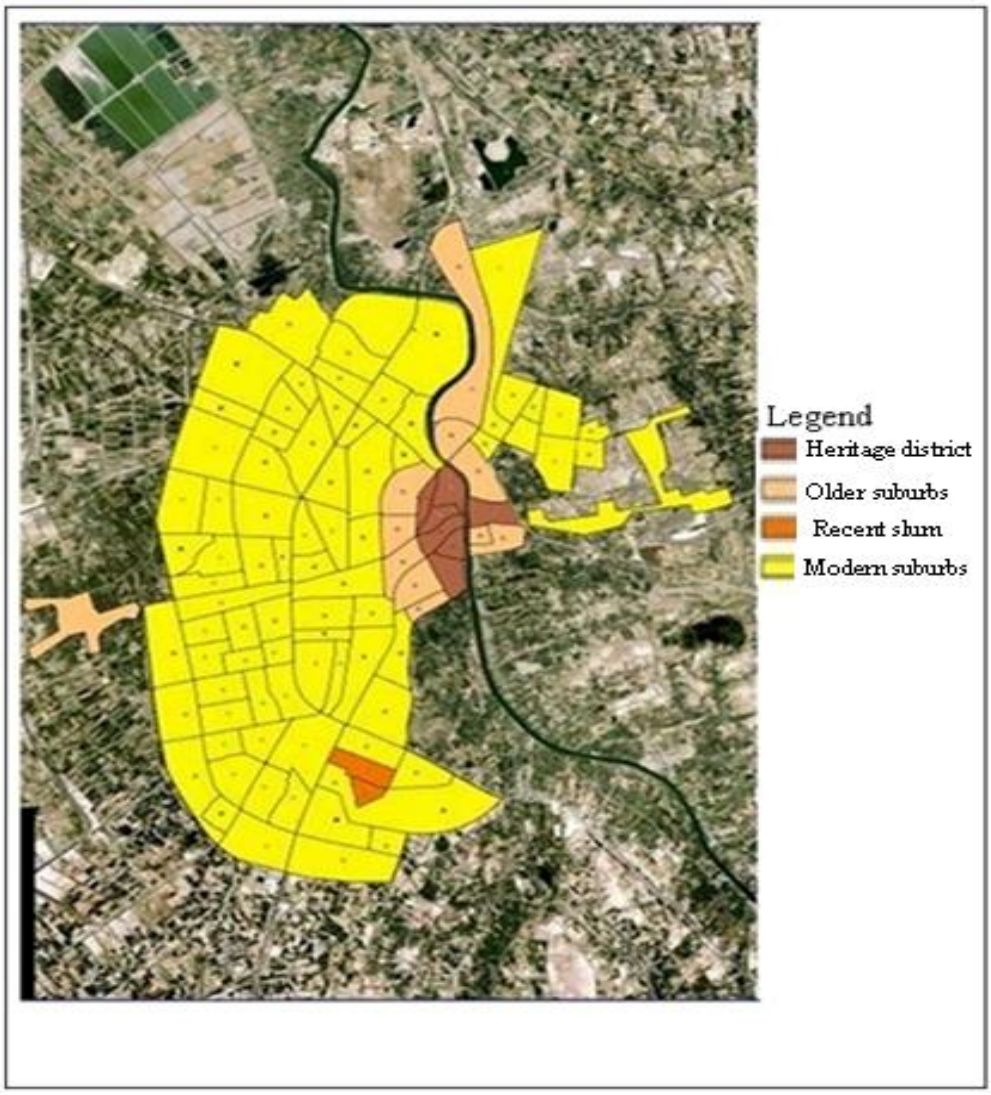


Figure 4-7 The four main areas of the city of Hilla (Dar Al Handasah, 2006)

Heritage District

The heritage district includes the neighbourhoods of Al-Karad, Al-Kallach, Al-Wardiah, Al-Taq, Jubran, Al-Jam'een, Al-Jumhouri, Al-Jabaween, Al-Mahdiah and Al-Shawi, which are all older than 100 years. Al-Jam'een is the oldest neighbourhood in the city, being situated near the west bank of Sha't Al-Hilla (Hilla River). The old bridge is located in the middle of the area, in front of the big market (Suq Al-Kaber). Within the heritage district the urban fabric is complex and streets are narrow, which means that vehicles cannot enter. Unsurprisingly, many of the buildings have architectural and historical value as shown in Figure 4.8

Figure 4-8 Heritage district in Hilla (Author)

Older Suburbs

The old city stretches in a longitudinal form in a north-south direction. It extends outwards from the heritage district on both sides of Sha't Al-Hilla (Hilla River) for around 1.65 km in length and about 0.2 to 0.5 km in width. Given the age of construction (50 to 100 years) this part of the city is characterized by a lack of urban features and architectural character. In addition, the area suffers from a lack of proper maintenance and good care. This is illustrated in Figure 4.9.

Figure 4-9 Older suburbs (Author)

Modern Suburbs

After the 1950's, the modern city of Hilla started to be developed by middle and higher income groups who began to leave their old traditional houses in the heritage district. Developed to higher space standards and adopting a more modern layout (separate rooms and living spaces), the density of the modern city is much lower, with plot sizes ranging from 200 to 600 square meters. Construction is generally of reinforced concrete and brick. A typical example of the character of the modern city is shown in Figure 4.10. Changes in the urban fabric of the city of Hilla were a result of societal change resulting from new technology and the use of the car as the principal means of transportation for a large section of the population. At that time there was a growing demand for land within the city because of a growing population and the need to accommodate the car, resulting in a requirement for broad streets, parking areas and changing uses of land from residential to commercial or industrial, in addition to a concentration of commercial activity within the city centres (Krier and Rowe, 1979).

Figure 4-10 Modern suburbs in Hilla (Author)

Recent Slum

Squatter housing is one of the main problems of the city. This is concentrated in the neighbourhood of Hay Al-Noor and some parts of Al-Afrah. Besides these concentrations, illegal housing occurs across the city and typically consists of poor quality houses with associated environmental and social challenges, (see Figure 4.11).

Figure 4-11 Slum area in Hilla (Author)

4.2.4 Panorama of Hilla

Figures 4.12and 4.13; show some of the salient and architectural features of Hilla, such as old and new bridges on the River, the old Bazaar and Religious University of Hilla.

Figure 4-12 Views from the city of Hilla, old Bazaar and Hilla River (Dar Al Handasah, 2006)

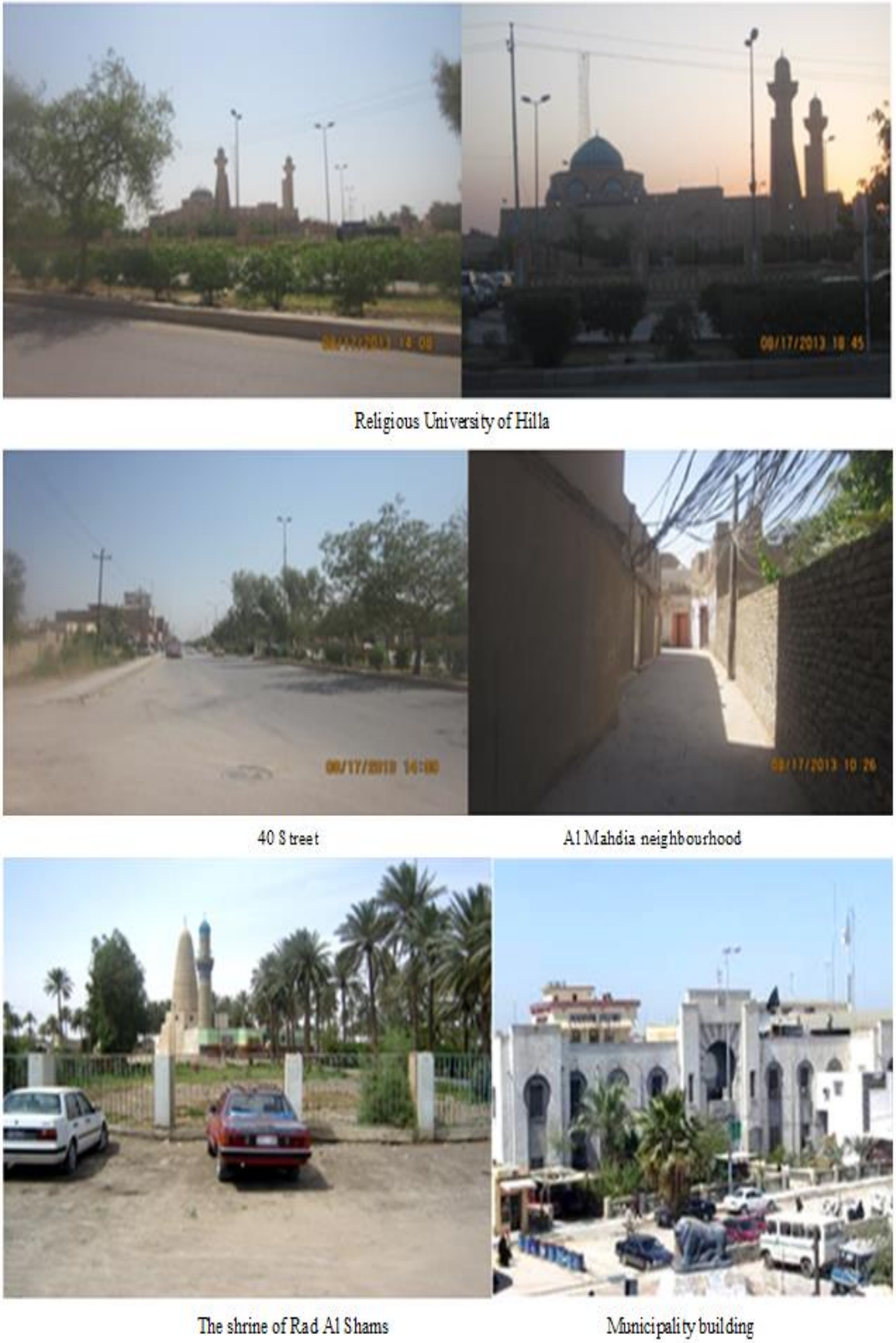


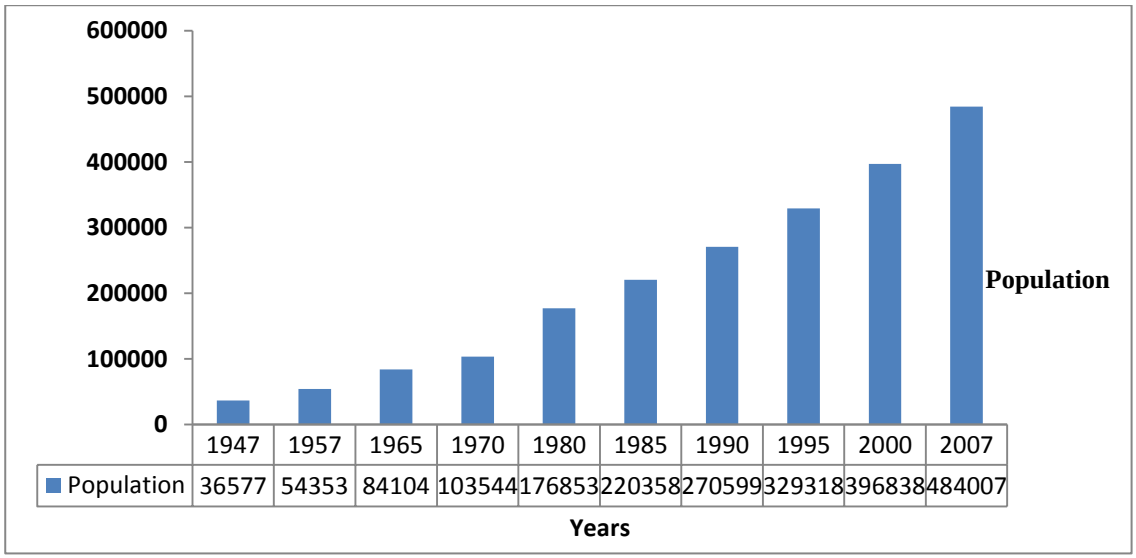
Figure 4-13 Key architectural features in the city of Hilla (Author)

4.3 Social /Cultural

This section provides a brief social snapshot of the present day city of Hilla. A number of social themes are examined, such as population growth, the diversity of the population, age distribution within the population, average per capita income and elementary education.

4.3.1 Population

National statistics indicate that in 1957 the number of residents in the city of Hilla was 54,353 people, an increase of just 4% from the previous census in 1947. By 1965 the number of residents in the city had risen to 84,104 people, representing an increase of 5.6% from the previous census in 1957 (Dar Al Handasah, 2006). Based on annual population estimates for 2007 the total population of the centre of Hilla was 484,007 people. Figure 4.14 shows the progressive and broadly consistent rate of growth of Hilla over the past 60 years.



	1947	1957	1965	1970	1980	1985	1990	1995	2000	2007
Population	36577	54353	84104	103544	176853	220358	270599	329318	396838	484007

Figure 4-14 Total population of the centre of Hilla between 1947 and 2007(Master Plan Report, 1978 and PCB, 2010)

4.3.2 Age Distribution within the Population

Based on the annual estimates for 2006 from the statistics of population and labour force in the city of Hilla, the percentage of the population between the ages of 0-4, 6-9 and 10-14 years is about 11.3, 8.5 and 11.5 percent of the entire population respectively, as it is shown in Figures 4.15. Thus, it can be seen that the age pyramid in the city is not dominated at the base by the younger age groups. This could be explained by two factors (Dar Al Handasah, 2006): the first factor is fertility rate which, in general, tends to decline with time, reflecting the progress achieved in levels of education, style of living and technology; it also reflects a lack of security and uncertainty regarding the future. The second factor is a war which caused the disproportionate death over an extended period of conflict.

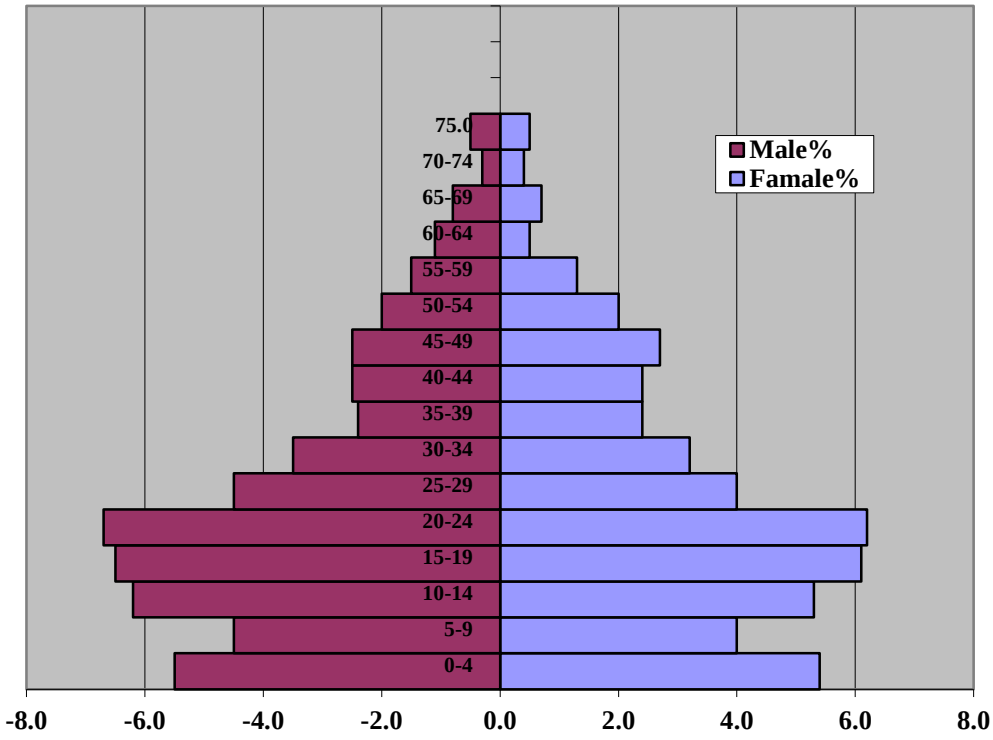


Figure 4-15 Hilla city age pyramid in 2006 (Dar AL Handasah, 2006)

4.3.3 Diversity of the Population

The majority of the population in the city of Hilla is ethnically Arab. A substantial majority of the population is Muslim (Shia and Sunni), although there is a small proportion of Christians, and generally there is peaceful co-existence between religions. Moreover, Muslims and Christians enjoy equal rights and duties in terms of their involvement in the political and economic decision making process. Every person is given equality and security before the law. Arabic is the official and most commonly used language in the city. The diversity of the population gives Hilla demographic characteristics typical of many other cities in Iraq.

4.3.4 Average per Capita Income

The average monthly household income in the city of Hilla is 1.12million Iraqi Dinars ($860). The per capita income is 144,571 Iraqi Dinars ($124) when the average monthly income of a family is divided by the average number of family members as shown in Figure 4.16 (UNOPS, 2010).

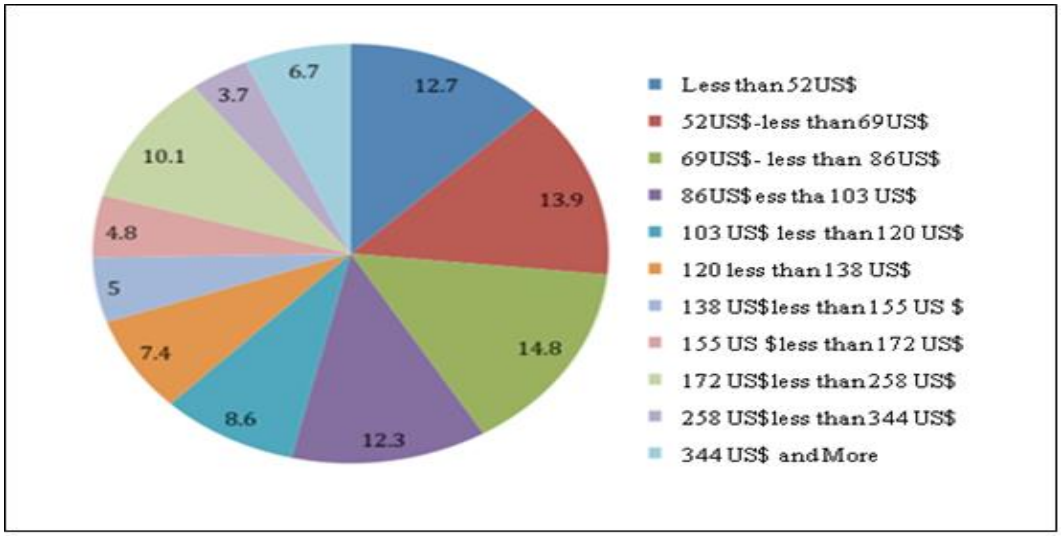


Figure 4-16 The distribution of households by level of per capita income (US$/ Month) for the city of Hilla in 2007 (UNOPS et al., 2010).

4.3.5 Elementary Education and Rates of School Dropout

In Iraq, children must complete sixth grade education (to the age of 12), according to the Compulsory Education Law. Although all levels of study as well as study at universities are free there are a large percentage of students who drop out of school. This is one of the main reasons for illiteracy.

The most important reasons for school dropout are lack of family concern, lack of nearby schools and social reasons (UNOPS, 2010). The number of illiterate people in Hilla was 71,028 in 2007, 72,073 in 2008, and 73,084 in 2009 (UNOPS, 2010).

4.4 The Security Situation

The security situation in Hilla after the year 2003(the war) is affected by three issues which are (UNOPS, 2010):

1. Conflicts and legal issues related to land rights
2. The number of corruption cases investigated by the Commission on Public Integrity
3. Protection from crime and violence

There are many legal issues recorded after the year 2003 related to conflicts overland rights, such as possession, removal of common status, borders, ownership, and acquisition. The number of violent offences, and criminal / terror cases in the city of Hilla during 2007 were 783 and 192, respectively; while in 2008 there were 468 crimes of violence and 201 cases of criminal/terrorist (UNOPS, 2010).Table 4.2 shows criminal /terrorist cases in Hilla and other Iraqi cities in 2009.

Table 4-2 Number of violent crimes per 10,000 people in the city of Hilla in 2009 (Jafar, 2012)

Number of violent crimes	Province
1704	Baghdad
433	Anbar
152	Salahuddin
574	Diyala
1066	Nineveh
322	Kirkuk
45	Karbala
332	Hilla

4.5 Economics

In this section, the commerce, industry, tourism and banking will be mentioned briefly.

4.5.1 Commerce

Due to the lack of local industries, Hilla has become dependent on imports of both necessities and luxury items. As a result, the wholesale and retail trade sector has become an important area of activity.

4.5.2 Industry

Hilla has a number of manufacturers including producers of medical syringes, hand-made carpets and textiles. However, after the war in 2003, Hilla's industrial sector in common with many other cities in Iraq, suffered declining importance (PCB, 2010).

4.5.3 Tourism

Given its proximity to Babylon, Hilla has many nearby archaeological and historical sites as well as tourist resorts. There are about 365 archaeological and historical sites, and 150 religious shrines (UNOPS, 2010). However, all of them are neglected since there has been an absence of investment in both the commercial and tourism sectors (UNOPS, 2010).

4.5.4 Banking

Hilla is a significant sub-regional centre providing well developed banking services to its business and population. The most popular banks are: Al Rasheed, Al Rafedain, Commercial, Real Estate and Baghdad (PCB, 2010).

4.6 Environmental

The events that have affected the country since 2003 still cast a shadow over the environmental situation in the city of Hilla. Despite significant improvement in the management of work, projects and services, many problems still exist and cause damage, with serious repercussions, to the environment.

4.6.1 Environmental problems

The city of Hilla suffers from three main environmental problems (Imad Al Zamili, 2009):

1. The problem of noise pollution due to an electric power generating plant in the centre of the city. There are many environmental problems caused by this gas powered plant since the level of noise exposes residents in the neighbourhoods adjacent to the station to noise ranging between 70-125 dB for 24 hours a day. This represents a significant increase in the level of exposure to noise since it exceeded maximum permissible noise level.
2. The problem of dioxin resulting from burning of medical waste at hospitals that lies between neighbourhoods. Dioxin is one of the most dangerous components because it remains in the environment for a very long time. This material results from the combustion of plastic materials such as medical waste, including syringes and bottles and medical supplies that are for single use, as well as normal waste in hospital incinerators in the city of Hilla. These hospitals (Maternity and Children's Hospital and the Republican Hospital and Respiratory Diseases Hospital), which are located between neighbourhoods, cause the dioxin emissions.
3. There is serious abuse of the River of Hilla, which includes pollutants that are discharged into the water. The most dangerous pollutant is mercury, which is comes from Dentist Clinics through the city's sewer. One gram of mercury is able to contaminate four billion litres of water according to international standards.

4.6.2 Climate in the city of Hilla

Generally, the climate in Hilla city is hot and dry in summer and cold and rainy in winter. The highest average temperature reaches 49.5 C º in the month of July, while the average minimum temperature may reach 4.1 Cº in January. The humidity range lies

between 70% in January and 28% in July. The average annual rainfall is 121 mm, which largely falls between November and May (Seismographic & Meteorological Commission, 2003).

4.7 Institution

The weakness of governance and the absence of effective civil institutions in Hilla contribute to problems of poverty, violence, corruption and hunger. On the other hand, an effective government response and responsibility supports the provision of fair and equitable services to citizens. (Counterpart International, 2011)

4.7.1 Services

In the field of communication, Hilla is provided with postal services, parcel delivery and telephone lines. These services are government run, while the private sector is also an effective provider of the mobile phone and internet networks (UNOPS, 2010).

4.7.2 Local Governance Institutions

In Iraq, Law of Governorates (not organized in a region) No.21 of 2008established the province as a unit of administration within defined geographical boundaries which consist of districts and sub districts. The Law established three levels of elected councils within each province: Provincial Council, District Council and Sub-District Council as shown in Figure 4.17. The Provincial Council is the highest legislative and regulatory authority within the administrative borders of the province and has powers to enact legislation. The Governor, who is chairman in the province, has two deputies elected by the Council from either inside or outside it. While, at the District level the Mayor and at Sub-District level the Director are the highest executive officers in their administrative

unit and both of them are elected. The Provincial Council consists of twenty five seats plus one seat for each two hundred thousand citizens. District Councils consist of ten seats plus one seat for every fifty thousand citizens while Sub-District Councils consist of the seven seats plus one seat for every twenty five thousand citizens. Council members are elected by direct secret election by the electoral law of the boards (Iraqi Local Governance Law Library, 2013).

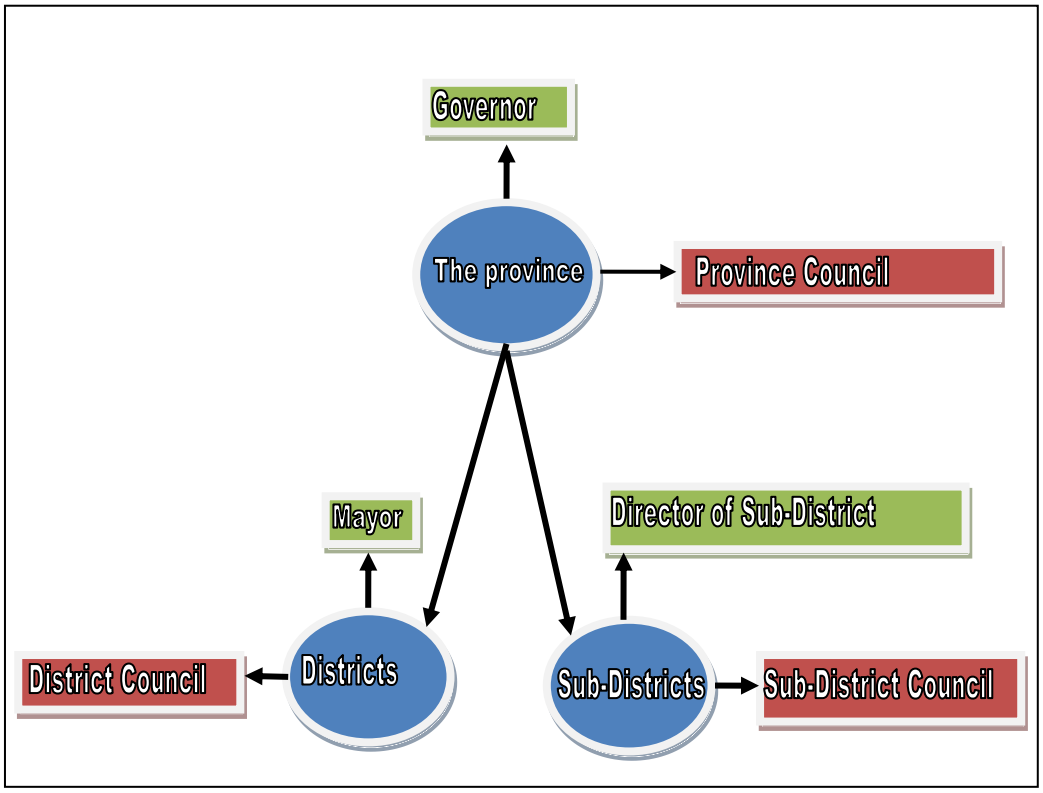


Figure 4-17 Administrative units and administrative positions in the province of Babel, 2013(Author)

4.7.3 Corruption

The local government in the city of Hilla has adopted several mechanisms to prevent and combat cases of corruption in the city, such as: bids announced for public projects, labour and employment opportunities, contracts, transparency in the budget, control over expenditure, monthly undertaking, quarterly or yearly reviews. The local

government offices that combat corruption are the: Financial Audit Department, Commission of Public Integrity, Committee on Integrity in the Governorate Council, the Governorate Council, the District Council, and the competent courts. The most important and most effective office is the Commission of Public Integrity, which was establishedin2010. Based on the information shown in Figure 4.18the new Commission has had a clear impact on reducing the cases of corruption coming before the courts. One might argue however that they have been less effective in identifying and prosecuting cases of corruption.

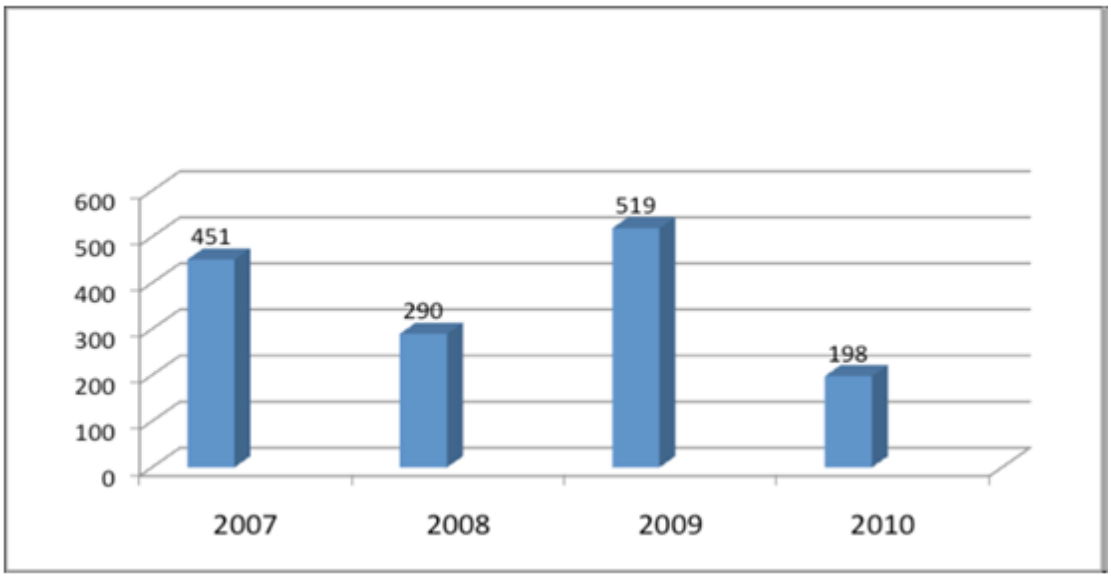


Figure 4-18 Cases of corruption before the Commission on Public Integrity in 2010 (UNOPS et al., 2010)

4.8 Summary

The information presented in this section provides an overview of the historical, social, geographical and economic context, and the current local government structure and more recent development of Hilla. The following chapter goes on to assess sustainability issues facing the city, by investigating the city's sustainability problems

and setting objectives or goals to solve these problems. This process represents the first and second steps of the generation of the ALSA methodological framework. In addition, the following chapter will present the result of the application of the third and fourth step of the ALSA methodological framework. The first step (issue identification) aims to explore the major issues, needs and problems within the city of Hilla, Iraq. The second step (the formation of objectives) consists of the reformulation of the problems and needs developed during the first step into solution statements or objectives. The third step is the formation of the indicators and the fourth step is the selection of the indicators and their ranking.

Chapter 5.

Application of the Proposed ALSA Methodological Framework for the City of Hilla, Iraq

5.1 Introduction

As discussed in the section dealing with the research aim and objectives in Chapter one (section 1.4), there is a need to test the ALSA methodological framework through the use of a selected case study. As such to achieve objective 5 as well as objective 6 (section 1.4), a case study analysis is presented to highlight and assess the utility of the ALSA in developing sustainability indicators at a local level. The application of steps 1-4 of ALSA methodological framework is described in detail. Step1 involves identifying the major issues, needs and problems within the case study area using documentary sources, focus group discussions and interviews. Following this, step 2 consists of reformulating the problems and needs which have emerged into objectives (solution statements).The next two steps consist of the formulation of indicators (step 3) in addition to the selection and ranking of indicators (step 4).

The purpose of this chapter is as set out below:

1. To evaluate the framework through a case study approach
2. To assess the applicability of the framework in a real world case study
3. To test the feasibility of developing the framework using a systematic process
4. To identify any major application related problems concerning the implementation of the local sustainability framework
5. To identify key themes and those which require to be given priority

Underlying these purposes this Chapter seeks to address the following key questions:

1. To what extent will the proposed ALSA methodological framework function in the context of a real world scenario as a mechanism for evaluating local sustainability?
2. How will the ALSA methodological framework need to be adjusted with respect to themes, objectives and indicators?

3. How can the ALSA methodological framework be employed in the selected case study?

4. What are the key themes that require to be given priority in the selected case study and why?

5. Can the selected case study be used to develop a set of suitable indicators for future city development and management in the city of Hilla and elsewhere?

5.2 The First Step (Issues Identification)

The first step in the development of the ALSA methodological framework is to explore the major issues, needs and problems within the case study. The process by which this task has been addressed is shown in Figure 5.1.

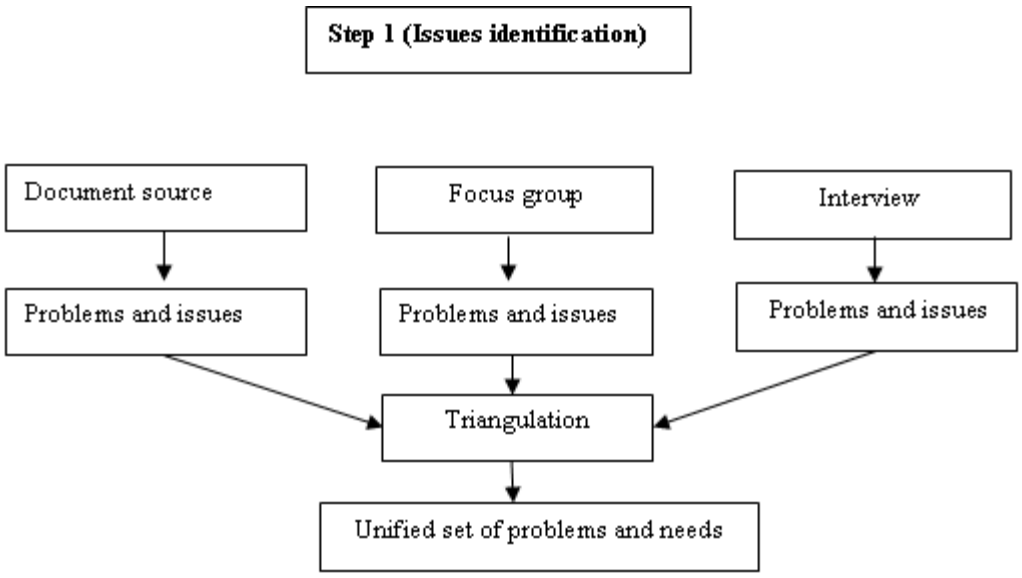


Figure 5-1 A general scheme of the first step (issues identification) of ALSA Methodological framework (Author)

Patton (2002) recommended a series of procedures to allow the appropriate construction of case study data for analysis: collect the raw case study data; construct a case record

and write a final case study narrative which can be presented thematically, chronologically, or both. To collect raw case study data, a variety of research techniques can be adopted including: interviews; observation; questionnaires; focus groups; documentary sources; visual methods; and ranking exercises (Laws et al., 2003). This variety of techniques is often implemented in both developed and developing countries and is used in this study. Basically, there are three principles of data collection for case studies: propose multiple data sources; create a case study database; and maintain a chain of evidence (Yin, 1994).

Using multiple sources of data, triangulation is one of the important protocols that are employed to ensure accuracy and alternative explanations (Stake, 1995). Moreover, the need to confirm the validity of the processes increases the necessity of triangulation. Triangulation can be achieved in case studies by using multiple sources of data (Yin, 1984). Denzin (1984) recognized four types of triangulation: data source triangulation, theory triangulation, investigator triangulation and method triangulation.

In the case study of Hilla, triangulation of data sources is adopted to identify the main problems, needs or issues related to sustainability. The main methods of data collection and therefore major triangulation points are: document sources, focus groups and interviews. In this study the data are presented to allow an understanding of the main problems or issues within Hilla as a case study city. The findings from documentary sources, focus group discussions and the interviews were faithfully transcribed, analysed and classified into the following four key areas: social, economic, environmental and institutional, depending on the CSD Theme Indicator Framework (2001) adopted for the ALSA methodological framework. This is critical as the concept of sustainable development involves achieving a balance between economic, social, environmental and institutional aspects, since they are interrelated, with the effects from

one influencing others. This is reflected in the fact that sets of indicators are (generally) required for each of these four dimensions of sustainability (FAO, 2003).

A systematic process of sifting and sorting of material was applied to the document sources, focus groups and interview results. Moreover, each set of results were regrouped and classified according to the four dimensions (social, economic, environmental and institutional) and key themes as suggested by the CSD Theme Indicator Framework (2001). Social related themes include equity (poverty, gender equality), health (mortality, sanitation, drinking water, and health care delivery), education (educational level, literacy), housing (living conditions), security (crime) and population (population change) issues. Economic related themes include economic structure (economic performance, trade, financial status) and consumption and production patterns (material consumption, energy use, waste generation and management, transportation), while environmental related problems include atmosphere (climate change, air quality), land (agriculture, desertification, urbanization), fresh water (water quantity, water quality) and sustainable tourism (tourism) issues. Finally, institutional related problems include institutional framework (strategic implementation of SD, international cooperation), institutional capacity and governance (information access, communication infrastructure, science and technology, disaster preparedness and response) issues.

5.2.1 Documentary Sources

The documentary sources related to the whole study can be found in the following locations:

1. Critical analysis of the literature to develop the local sustainability framework (Chapters 2 and 3)
2. Description and some important facts about case study (Chapter 4)
3. Analysis of the literature to identify the main problems or issues of local sustainability in the city of Hilla, Iraq (Chapter 5)

Data from documentary sources was useful in the preliminary stages of this study in allowing an understanding of the case study issues and verifying interview and focus group data. Documentary sources used include: books, newspapers, journal articles (such as AL- Anbary, et al., 2011, AL- Anbary, et al., 2008, AL- Anbary, et al., 2001, Alwash, 2012),government records, unpublished reports, non-government reports, academic reports, local historical records, maps, socio-economic studies and other sources relevant to the case study. Some of the data found in documents provided important background for the case study in spite of the possible lack of accuracy and confidence in some of these more 'local' resources.

Results of Documentary Sources

A systematic process of sifting and sorting of material was applied to the information gleaned from the documentary sources used. The results were regrouped and classified according to the CSD Theme Indicator Framework (2001). The final results from this work are shown in Table 5.1.

Table 5-1 Classification and listing of social, environmental, economic and institutional problems in the city of Hilla identified through document source analysis

Social Problems	Environmental problems	Economic problems	Institutional problems
-Inefficiency of the existing sewerage network -Inefficiency and degradation of sanitation services -Lack of provision of potable water -Inefficient potable water network -Inefficient solid waste collection services -High unemployment -Prevalence of illiteracy among slum dwellers -Prevalence of chronic and incurable diseases among slum dwellers -A shortage of doctors and health professionals -Low annual per capita income annually -Lack of women working in the nursing profession -Shortage of medicines and medical supplies -Limited number of health centres -Limited number of nurses -Lack of ambulances -Deterioration in the urban poor neighbourhoods -Expansion of slum housing units -High rate of poverty -Lack of adequate housing for poor families -The lack of building codes that unite the facades of buildings -Lack of interest in graduates and suitable graduate job opportunities	-Scarcity of agriculture machinery and equipment and the ageing of the working equipment. -Deterioration of land fertility and the disregard of the agriculture cycle by farmers -Lack of policy to protect agricultural production -Lack of support for the requirements of agriculture. -Increasing soil salinity -Lack of green areas within the city -Lack of green belt surrounding the city -Pollution of Hilla river water with organic matter and heavy metals due to industrial effluent disposal -High groundwater table -Primitive agricultural production. -Increasing desertification and water scarcity -Air pollution due to gas emissions from vehicles -Scarcity of water for agriculture -Lack of attention to the historic city of Babylon - Absence of recreation centres - Increasing noise from the power station - Increasing dioxins from hospital incineration	-Lack of storehouses and the poor quality of the existing ones -Lack of bridges in the city -Lack of power and fuel supply -Decline in specification of raw materials used in production. -Haphazard policy of importing vehicles and equipment -Increasing traffic congestion -Inefficient electricity grid -Lack of and poor quality of paved streets -Lack of finance for the unemployed to set up their own projects -Inefficiency of electricity services -Dependence on the central government as the only source of funding -Weakness of trade exchange between the city and the other provinces -Backwardness and weakness of local industries -Collapse of the industrial sector and manufacturing -Lack of manufacturing industries in addition to the backwardness of agro-industries	-Inefficiency of the existing telephone network - Inefficiency of the existing emergency services -Weakness of central planning -Dominance of bureaucrats during the preparation of annual plans and budget -Ineffectiveness of the role of civil society

5.2.2 Focus Groups

The use of focus groups aimed to gauge the opinions of the inhabitants of the city of Hilla in relation to their priorities and their views of a sustainable future for their city. Hilla is divided into four parts (heritage district, older suburbs, modern suburbs and recent slum). Thus, in order to achieve a geographic representation of the population, the researcher sought to meet with residents from each of the four parts of the city.

The overwhelming majority of the population regularly prays at a local mosque (see Figures 5.2 and 5.3) and the culture of this regular event leads the faithful to be open to other activities. Following discussion with the local Imam and after the residents of the region assembled for daily prayers or to take part in another regular activity, the opportunity was taken to hold some focus groups. The participants would be at liberty to opt in or opt out of the focus group so there would be no coercion. At these meetings the residents who agreed to participate discussed their views and wishes in relation to achieving a more sustainable city. The researcher recorded (non-electronic and no video recordings) their views in writing because most of the participants did not wish to be identified for fear of getting into trouble.

In accordance with the Ethical Research protocol, it was made clear that participants had the right to withdraw both during the focus group or at any time after the focus group had finished.

The researcher observed some imbalances, such as a lack of women and minorities who do not visit the mosque e.g. the Christian community, in these samples. Remedies to address the anticipated imbalances were implemented by increasing the number of female participants in the interview component of the research. Six to twelve people are recommended as optimum sizes for effective group discussions (Robson, 2002). Every

focus group in this case study contained eight to ten participants, although in most meetings the number of participants was 10. This avoided the problem of groups being too small or too large, which can result in shallow discussion of experiences and ideas or difficulty in controlling the direction of the discussion.

Focus group meetings were continued until 'saturation' was reached, when no new significant themes were gained. After completing each focus group the results were evaluated and added to the information gained from previous meetings. This helped establish whether a saturation point had been reached, at which point it was deemed that no additional focus groups were necessary. A total of 9 focus group meetings were held across the city with 2 focus group meetings in three areas and 3 in the modern suburbs area (see Figure 5.4).Eighty-seven participants took part in all focus group meetings from the four parts of Hilla. Most of the people who attended the focus groups were not familiar with each other (e.g., family, friends).

Typically, the focus group discussions lasted for one and a half to two hours. Each participant was asked to write his opinions, problems and views onto a piece of paper. Information from focus group discussions was transcribed to capture the discussion details and arranged together with participants' paper notes. Then all the issues raised were grouped into their relevant dimensions using the transcripts of discussions and notes to extract all relevant information that was expressed by respondents and to prevent the loss of the original meaning. Organising these focus groups began in April, 2013.

Figure 5-2 One of the local mosques where a focus group meeting was conducted (Author)

Figure 5-3 Local Imam (Author)

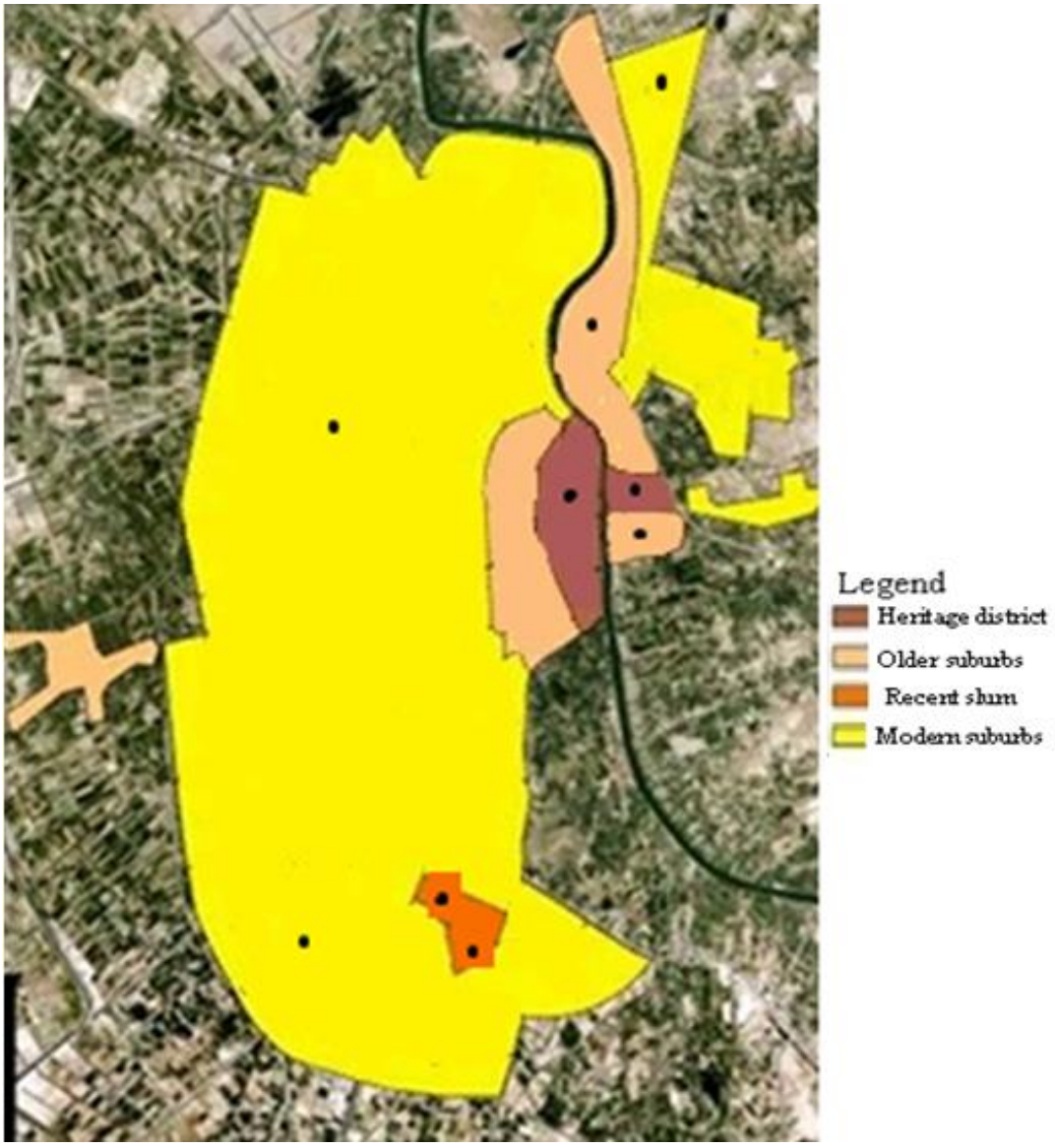


Figure 5-4 The location of the mosques where the focus groups were held, 2013 (Author)

Results of Focus Groups

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

Table 5-2 Social, environmental, economic and institutional problems in the city of Hilla gathered through focus group discussions

Social problems	Environmental problems	Economic problems	Institutional problems
-Lack of qualitative control of medicines which are sourced from the private sector -Weakness of the legislation which prevents violation of public rights -Increasing levels of crime -Lack of job opportunities -Increasing number of low-income households -High housing costs -Limited proportion of the population receiving social assistance - Reducing educational attainment of young people leaving school -Decrease of cultural events in the schools -Poor health status -Increasing number of women dying during pregnancy and childbirth -Increasing numbers of deaths under the age of 70 -Increasing number of students who drop out of school at the primary level -Low cultural awareness -Falling number of newspaper readers -Lack of job opportunities available for women -Increase in infant mortality rate -Lack of specialized hospitals equipped with modern equipment -Lack of specialized healthcare staff -Lack of female staff in the health sector -Inefficiency of university science education	-Absence of drainage networks in most areas -Raised levels of ground water -Deteriorating land fertility due to unscientific agricultural use -Lack of regular maintenance for the covered and open conduits and pumping stations -Increase in violations against irrigation networks -Damage to many agricultural crops by pests -Lack of government support for agricultural products -Weak agricultural guidance -Weak government support for agriculture sector -Limited financial capacity of farmers -Scarcity of irrigation water during summer in many lands -Backwardness and ageing of the water networks -Decreasing production per dunam -Scarcity of fertilizers and their high prices -Lack of utilization of some agricultural lands -Use of agricultural land for other purposes	-Increased percentage of unpaved roads -Lack and deterioration of the specification of raw materials -Increased consumption of electrical energy -Lack of available fuel in all its forms -Lack of shopping centres and shops with international standards -Neglect of the date industry as well as other agricultural products -Neglect and lack of attention to transport links between the city and the other provinces -Ageing of water projects and networks -Lack of ready energy sources for water projects -Absence of awareness in power rationalization. -Lack of electrical power processed to the city -Lack of financial allocations for the city -Increased vandalism and violations of service networks (water and electricity) -Lack of modern warehouses in the province and not rehabilitating the existing ones -Non-use of alternative and renewable energy	-Poor mobile communication service -Poor and inadequate internet service -Lack of e-government service in government departments -Neglect of postal mail service -Spread of administrative corruption -Lack of civil society organizations -Lack of coordination between ministries -Adoption of centralization rather than decentralization in the management of some institutions -Inefficiency of the existing telephone network Inefficiency of the presence of emergency services -Bureaucracy in government departments -Low numbers of beneficiaries of modern communication and information technology

Table 5.2 Continued

Social problems	Environmental problems	Economic problems	Institutional problems
-Lack of support and adequate housing for teachers -Lack of support for the private sector in education -Lack of attention to the elderly and orphans -Presence of religious sectarianism -Terrorism and instability of the security situation -Inefficient use of modern technology to enhance the security situation -Decrease in number of citizens who love their city -Lack of interaction between the city and the university -Lack of attention to youth and support for marriage -Lack of housing complexes for the families of the martyrs, widows and poor families -Increase the private lessons for students -Insufficient number of schools -Weakness of some educational curricula -Remoteness of schools for students in some areas especially in the countryside -Lack of interest in school activities -Demographic changes -Lack of water projects -Lack of attention to quality control of water processed for drinking -Insufficient waste water treatment plant -Lack of sanitary landfills -Shortage of potable water -Wasteful water consumption -Lack of constructive labs and veering away from international specifications -Growth of parasitic plants in water networks and tanks -Focus on humanitarian disciplines and human resources rather than scientific and technical disciplines	-Lack of plant and animal products -Absence of modern irrigation systems -Increased salinity in farmland -Ageing and lack of agricultural machines and equipment. -Absence of environmental monitoring process for air pollution -Inefficiency of agriculture pesticides -Lack of support for requirements of agricultural products -Weak laws regulating the ownership of agricultural land -Decrease of green space -Air pollution by gases emitted from the car especially carbon monoxide -Lack of attention to air pollution -Discharging untreated waste water into the river -Shortage of potable water -Lack of hotels and airport for the ancient city of Babylon. -Absence of good tourist hotels -Neglect of the tourism sector -Lack of efficient specialized cadres to implement drainage projects	-Ageing of the electricity network and its unsuitability for urban expansion -Lack of the electrical distribution network -The low voltage of provided power -Neglect of industries -Lack of support and encouragement for foreign investment - Increase the consumption of gasoline, oil and kerosene -Inefficient public transport. -Lack of investment in power station sector -Weak marketing -Neglect of the private sector -Absence of large trading companies -Absence of modern banks -Absence of laws to protect the investor -Inactive investment law -Accumulation of solid waste in residential areas -Absence of waste recycling process -Increased number of traffic accidents -Lack of quality control over imports -Not reusing treated wastewater -Increasing number of vehicles	-Increase in financial and administrative corruption -Lack of environmental research studies -Weak coordination between service directorates -Weakness of administrative monitoring

The result of the documentary sources, focus group meetings and the following interviews were further analysed in step 2 to formulate objectives.

5.2.3 Interview Method

The semi-structured interviews used in the case study were designed to achieve the following:

1. To attain detailed responses from the interviewees and to reason/explore the answers/issues in-depth.
2. To attempt to remedy anticipated imbalances in the previous focus groups, particularly with respect to female participation and the minorities of non-Muslim communities such as Christians.
3. To explain and increase accuracy of uncertain responses in the previous focus groups.

The interview survey was piloted prior to the study proper, as shown in the following section. This enabled a number of points of confusion and problems to be identified leading to alterations to the final version of the interview schedule, ensuring the survey was clear and easy to answer.

Pilot Study of the Telephone Interview

Without a pilot survey, research interviews may potentially contain unsuitable or ineffective questions (Shipman, 1988). As a result the Skype telephone interview was piloted with five academics and five randomly selected participant stakeholders in early of May, 2013.The findings of the pilot revealed some issues in the interview process,

including some important information and suggestions for improvement. The advice and recommendations received were taken into consideration when the final version of the interview schedule was drafted. As a result of the pilot study, the researcher was able to achieve the following:

1. Clear up any ambiguity in the questions
2. Determine the time to be allotted for each interview
3. Make sure that the necessary categorization of results could be achieved.
4. Understand the degree of difficulty of the questions
5. Identify the best method of analysing the answers
6. Discover potentially biased questions
7. Identify the need for additional explanations of the questions.

Selection of Interviewees for the Main Study

Stakeholders were selected for participation in the interview by two methods. These were:

1. Previous knowledge, literature and governmental sources
2. Recommendations using the snowballing technique.

Snowball sampling is an approach for selecting interviewees who can provide a potential additional source of information. The procedure begins with asking an already known interviewee, with whom else one might conduct an interview. The 'snowball' gets progressively bigger as new interviewees are gathered (Patton, 1990). The technique may be used to secure a wider range of stakeholders using a stakeholder already known by the researcher to recommend other stakeholders who might have knowledge or expertise in areas of sustainable development so as to produce relevant

data. The recommended stakeholder was then contacted to get his or her agreement to join in the interview process. If the interviewees wished to withdraw at a later date they were able to email the researcher to be withdrawn from the study, following which their data would be deleted. While this was offered, none of the interviewees decided to withdraw.

In order to establish how many interviewees are required in undertaking research, Mark Mason (2010) examined a sample of five hundred and sixty PhD studies which used qualitative approaches and qualitative interviews as the method of data collection from theses.com and analysed their sample sizes. Results showed that the mean sample size was 31. He also noted that the most common sample sizes were 20 and 30 followed by 40, 10 and 25. However, in the current study, rather than predetermine the number of interviews required, the saturation point theory was again used. Interviews continued to be conducted until no new significant knowledge was gained. The researcher continued expanding the sample size until the interviews supplied no new data, resulting in a total of 40 participants. These participants remain anonymous to maintain confidentiality

Process of Telephone Interview

The interview programme was organized and conducted following a clear protocol (Kvale, et al., 1996). This interview protocol consisted of the following steps:

- Formulating the aim of the interview
- Setting the interview questions and setting the type of questions
- Conducting the interviews
- Organising the responses for each interviewee in writing
- Deciding methods of analysis

- Making sure of the generalisability, validity and reliability of the interview results
- Organizing the findings

Skype was used to enable face-to-face interviews remotely, along with telephone interviews. All respondents that were contacted showed eagerness about the subject and were happy to share their views. Each interview was between half to one hour in duration, to prevent interviewee fatigue. Before starting the interview, the researcher gave each participant an outline of the background of the study and the way in which the information was to be used. In addition, each interviewee was briefed on the issue of confidentiality and was asked for approval to participate in the research, following which the interview was carried out.

The interviews were carried out with stakeholders in May, 2013.During the interview process, the interviewer noted the responses. When the interviewees said something which appeared significant or related to the purpose of the interview, they were asked to confirm the point recorded in the notes. Note-taking was carried out instead of recording because most of the interviewees did not wish to be identified for fear of 'getting into trouble'. Forty persons contacted agreed to be interviewed by Skype. The semi structured interview (Appendix A) involved open-ended questions, such as: What is your idea about the future of Hilla? What are your wishes for the development of Hilla? How can Hilla be improved in your view? Inevitably, more follow up questions emerged during the discussion.

The time after an interview has been argued as a crucial period of qualitative investigation (Patton, 2002). The researcher reserved the time after the interviews to organise the findings into a readable format.

Results of Interviews

This research used interview analysis focusing on meaning condensation as the mode of interpretation, which is an abridgement or shortening of something, especially a written work or speech (The Free Dictionary, 2013). This method is a very common and applicable technique in analysing interview results. The analysis of the interviews in this research was verified by resending the interpretation to interviewees by email or calling them by phone. The findings of the interviews were organised and classified according to key themes that were suggested by CSD (2001).

Table5.3 shows the city of Hilla's problems and needs which are obtained from interviews using the same social, environmental, economic and institutional categorisation.

Table 5-3 Social, environmental, economic and institutional problems in the city of Hilla gathered through interviews

Social problems	Environmental problems	Economic problems	Institutional problems
-Lack of housing complexes -Unstable security situation -Shortages of health and medical staff in institutions that provide health services -Random waste disposal and environmental pollution which will impact negatively on the health. -Limited role of the private sector in health services -Lack of investment in building residential properties -Increase of slums and the absence of serious preventative action -Deterioration of residential areas in the city centre, old neighbourhoods and Iraqi heritage features -Rise in the number of families who are unable to get decent housing -Lack of women's awareness of their rights -Increase in number of women getting married before the completion of their studies -Increased discrimination against women -Negative attitude towards females working outside the home -Lack of female employment in the private sector -Lack of social programmes for vulnerable groups -Lack of specific mechanisms for removing rubbish -Increasing unemployment -Lack of coordination between the educational system and the needs of the labour market -Deterioration of the security situation -Weakness of teachers' capabilities -Insufficient number of teachers -Old fashioned teaching methods -Weakness of teaching methods -Lack of specialized hospitals -Increase in the number of displaced families in the city -Increased housing crisis -High prices of construction materials	-Weak legislation and laws concerning the agricultural sector -Air pollution -Lack of monitoring and control systems concerning the quality of the air -Increasing use of small generators which leads to air pollution -Weak human and material resources and technical expertise in environmental institutions -Lack of interest in environment-friendly technology and clean energy sources -Increased use of black heavy products such as oil in the operation of power plants and many other industrial areas -Lack of green areas (gardens, parks) -Shortage of agricultural and reclamation processes -Use of old techniques for irrigation -Lack of care and lack of irrigation for green space -Increased unjustified felling of trees -Lack of use of greenhouses in agriculture -Lack of governmental support for farmers -Increasing dust storms and high temperatures in summer -Increase in arid and semi-arid land -Desertification and water scarcity -Scarcity and age of agricultural machinery and equipment -Deterioration of land fertility -Disregard of the agricultural cycle by the farmers	-Rising of prices faster than individual incomes -Increase in traffic congestion -Dependence on central government funding -Lack of investment in transportation -Shortage of electrical power supply -Ageing of industrial projects -Dependence on imports to meet the local market needs -Increased consumption of electricity because of backing tariff -Destruction of part of the road network -Lack of ring roads around the city -Lack of trust between customers and banks -Poor banking services -Ageing electricity generating units, and transmission and distribution networks -Water scarcity and its impact on the operation of hydroelectric plants -Absence of airport -Lack of asphalt production -Shortage of footbridge to cross roads -Bad paving of roads	-Poor mobile communications service -Poor and inadequate internet service -Lack of regular maintenance of telephone networks -Neglect of e-government service -Neglect of the postal mail service -Limited role of civil society organizations -Merging of religion and politics -Lack of coordination between administrations -Adoption of centralized management rather than decentralization -Inefficiency of the existing telephone network -Inefficiency of the existing emergency services -Shortage of implementation of the communications network -Increasing administrative corruption -Limited numbers of beneficiaries of modern communication and information technology -The failure of some individuals within the institutional structure to adopt modern techniques -Mismanagement of government departments

Table 5.3 Continued

Social problems	Environmental problems	Economic problems	Institutional problems
-Lack of local building materials -Brain drain -Lack of special places to practice religious rites and rituals -Decrease in the number of primary and secondary schools -Lack and inefficiency of education services -Lack and inefficiency of leisure and sports facilities -Insufficient training and rehabilitation of the poor -Increasing political problems -Continuity of disagreements between political parties -Lack of interest in graduates -Lack of potable water -Lack of adequate housing for poorer families -Degradation of sanitation services -Inefficient sewerage system -Inefficiency of health services -Lack of women working in the nursing profession -Shortage of medicines and medical supplies available -Imbalance in index health centre/people -Lack of ambulances -Imbalance in index doctor / population and nurse / population -Increasing population -Decrease in average household income -Increasing horizontal expansion rather than vertical expansion in universities -Need to strengthen the quantitative rather than the qualitative aspects of teaching in higher education -Increasing immigration from the countryside to cities -Lack of domestically produced construction materials -Lack of trained manpower -The lack of a sustainable system for the management of residential land	-Lack of protective policy for agricultural production -Lack of treatment units in industries -Lack of foreign investment in tourism sector -Limited financial resources to support tourist activity -High groundwater levels near archaeological sites -Lack of hotels and entertainment services -Lack of expertise in management of tourism -Lack of trained tourist cadres -Exposure of archaeological sites to theft -Poor protection of archaeological sites -The lack of interest in the archaeological sites -Lack of maintenance of archaeological sites -The lack of the necessary equipment to detect the archaeological collections -Lack of finance for archaeological site maintenance -Lack of interest in the heritage part of the city	-Lack of road maintenance -Lack of government support to industrial centre -Lack of pedestrian road crossings -Increasing violations of the electric grid -Ageing rainwater drainage networks -Frequent power shutdown -Ageing of industrial projects -Lack of provision for recycling rubbish -Increase the consumption of gasoline, oil and kerosene -Lack of interest in environment-friendly technology and clean energy sources -Consumption of telephone cables -Ageing and collapse of the infrastructure of the communication network -Ageing of the devices and machines used in the plants -Lack of bus stop on most routes	-Administrative corruption and little interest in work -Poor enforcement of laws -Lack of updated/revised laws -Lack of trust between citizens and Council -Weakness and lack of attention to potential EIA studies, especially for strategic projects -Llimited use of modern techniques to obtain information, such as the use of GIS -Decrease in the number of participants in local elections -Difficulty in meeting environmental requirements, especially for old projects -Lack of integration of the environmental dimension in development activities -Dominance of political parties over city departments

The findings from the three data sources have been triangulated into a comprehensive whole to verify and validate the findings within this study (see Figure 5.5). Triangulation is a valid process where researchers look for convergence among multiple information sources (Creswell & Miller, 2000). The confirmation of the multiple techniques through data triangulation enhances the reliability and the credibility of the results (Brewer and Hunter, 1989). Moreover, by using this technique the internal validity of the case study is enhanced as a result of limiting the bias of the researcher and of each individual technique (Decrop, 1999).

There are four types of triangulation techniques (Denzin, 1978)

- Methodological triangulation: the use of multiple data collection techniques or research methods
- Data triangulation: the use of multiple data sources or respondent groups
- Investigator triangulation: contribution of two or more researchers in the analysis
- Theoretical triangulation: the use of alternative disciplines to view research findings

The type of triangulation chosen and the choice to use triangulation techniques is dependent on the nature of the research (Dootson, 1995). However, in this study two types of triangulation were employed:

1. Methodological triangulation: using three methods of data collection (interviews, documentary source analysis and focus groups)
2. Data source triangulation: representing a range of respondents in the interviews (stakeholders, experts, local communities)

After each list of data which derived from interviews, focus groups and documentary sources was simplified, organized and classified, then the result was separated into

broad categories including social, economic, environmental and institutional issues although, as discussed above these categories overlap.

When all the data sets have been analysed separately, the process of triangulating findings from different methods takes place as the results are then triangulated into a comprehensive whole (Silverman, 2000).

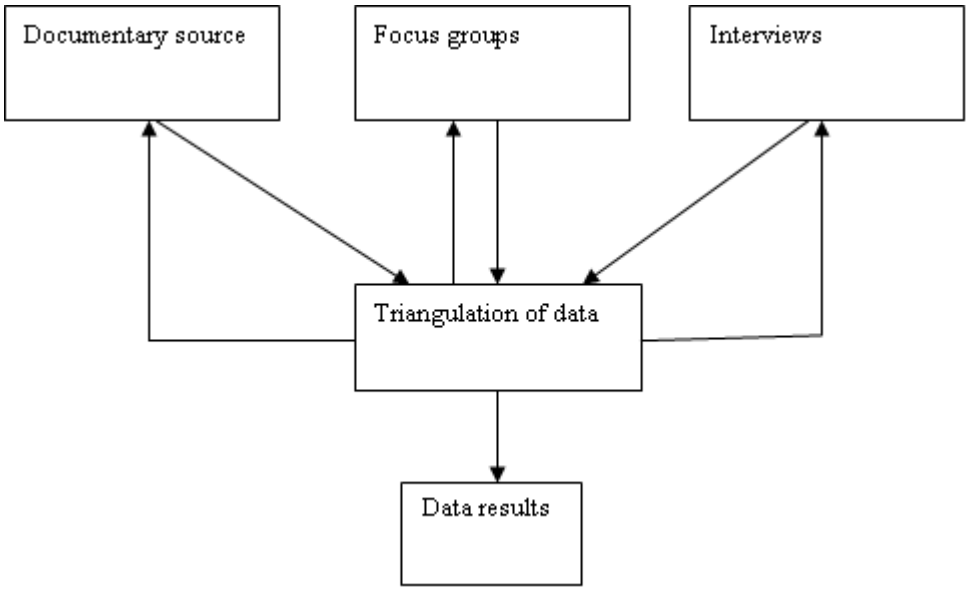


Figure 5-5 Flow diagram of analysis of issues gathered in the case study (Author)

The triangulation process used in this thesis has followed the triangulation protocol developed by Farmer et al. (2008) that led to the formulation of a unified and valid findings set list of problems. This involved:

- Sorting: the results were reviewed and the findings from each research technique were listed on the same page. Prevalent themes in the documentary sources, focus groups and interview method were recognized
- Convergence coding: findings from each method were checked to find where there was full agreement, partial agreement, silence (a problem was addressed in one set of results,

but it does not appear in the other sets of results), or if there was dissonance among each set of results.

- Convergence assessment: all compared problems were reviewed to give a total assessment of the level of agreement or convergence. The assessment showed either partial or full agreement between the three data sets on 80% of the problems and there were no disagreements in the comparison of these three data sets. Furthermore, 20% of the problems showed a presence in one or two data sets and silence or absence in the other data sets.
- Feedback: the summary of triangulated results was shared with research teams for feedback, comment, review, clarification and discussion of the unified set. Then the modified list was sent to the panel of experts (four experts from the city of Hilla) to provide feedback. This expert checking reinforced the validity of the findings. Through this process, the panel of experts indicated that the findings accurately reflect the problem and the needs of the city of Hilla.

Ultimately, this created a summary of the unified findings set which includes the triangulating of valid results (see Appendix B). This unified set was used in the following step to formulate the objectives.

5.3 The Second Step (Objectives Formulation)

The reformulation of the problems and needs developed during the first step of issues identification into solution statements or objectives has been prepared with the help of experts from across the environmental sciences, government, business, non-governmental groups, research centres and the academic sector (see Figure 5.6).

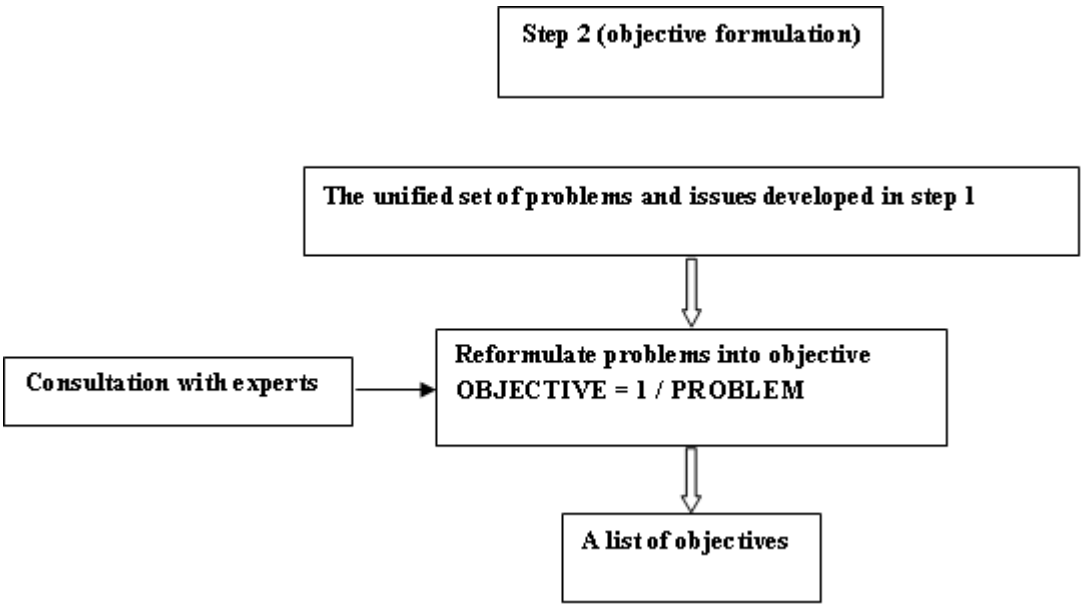


Figure 5-6 General scheme of the second step (objective formulation) of the ALSA methodological framework

5.3.1 Approaches to Objectives Formulation

The most important step in the process of determining what the people want their city to become is objective formulation. A badly formulated objective prevents progress toward a good plan because it will be difficult to find the correct solution to the impediments. Moreover, any move that the people of the city make without clear objectives runs the risk of being purposeless and without direction (Bureau of Local Government Development and DILG, 2008).

In the current study, the generation of objectives has been derived through a thorough analysis of the problems and issues using the following two formulas (Bureau of Local Government Development and DILG, 2008):

1. Problem =Objective + Impediments to Achieving the Objective

Therefore

Objective = Problem – Impediments

2. Objective =1 / Problem

The second approach, which is used in this thesis, is based on the dictum that the objective is the inverse of the problem. As an example, when the problem is prevalent corruption the objective will be the inverse of this problem which is corruption prevented.

5.3.2 Results

Table 5.4 shows a sample of results of objectives (Top three) which was derived through the analysis of the problems and issues. These objectives were formulated using the above formulas. The full sets of objectives formulated in the second step of the ALSA methodological framework are shown in Appendix C.

Table 5-4 Sample of social, environmental, economic and institutional problems in the city of Hilla and objectives derived

Problems	Objectives	Suggested actions
Social		
High unemployment Lack of interest in graduates or provision of suitable job opportunities	To reduce unemployment	Creation of job opportunities
Lack of provision of potable water Scarcity of drinking water	Increase the geographical coverage provision of potable water	To follow up and complete all Ministry contracts to implement all water projects for the city
Shortage of health centres Lack of specialized hospitals equipped with modern equipment Limited role of the private sector in the provision of health services	To increase the number of health centres To construct specialized hospitals equipped with modern equipment To increase the role of the private sector in the provision of health services	To provide specialized hospitals with modern equipment To build health centres with modern medical equipment To encourage the private sector to invest in the provision of health services
Environmental		
Increasing dust storms and unprecedented high temperatures in summer	To reduce the impact of dust storms and high temperatures	Provide vegetative cover (green belt) around the city and green areas within it
Pollution of air by gases especially carbon monoxide and carbon dioxide Lack of attention to air pollution Increased use of smaller generators which lead to air pollution Using black heavy products such as oil in the operation of power plants and many other industrial areas Using black heavy products such as oil in the operation of stone ovens for baking	To reduce air pollution	To ensure that residents are not exposed to harmful levels of air pollution as reflected in international standards Raise awareness among members of the community of the risks of air pollution To put in place a set of controls over emissions from power generation and industrial plants To impose minimum emission standards for domestic and industrial appliances
Increasing desertification and water scarcity Weakness of awareness about desertification	To raise awareness and understanding of the risks of desertification	Develop appropriate mitigation measures for desertification

Table 5.4 Continued

Economic		
Lack of support for foreign investment and the need to encourage it The absence of laws to protect investors	To support and protect investors	Create a legal framework and an environment that will encourage and support foreign investment
Dependence on imports to meet the local market's needs Weakness of trade exchange between the city and the other provinces	To increase the competitive supply of local goods and services To increase the trade exchange between the city and the other provinces	Encourage the production and consumption of local goods and services Encourage trade exchange between the city and the other provinces
Neglect of factories Backwardness and weakness of local industries Limited self-sufficiency and reliance on imports Limited food and agricultural products industry	To support industries	Encourage investment in and the sustained growth of local food and manufacturing industries
Institution		
Weakness and lack of attention to potential EIA studies	To promote EIA studies	To put in place a requirement that major projects and programmes are subject to EIA undertaken by appropriate experts
Adoption of management centralization rather than decentralization	To adopt management decentralization	Achieve an appropriate devolution of authority/power, resources and decision making to the city authority
Weakness of administrative monitoring Increase of financial and administrative corruption	To eradicate administrative and financial corruption	Activate the role of the Integrity Commission

Table 5.4 shows samples of reformulation of the problems identified during the issues identification step into objectives through the second step (objective formulation). The outcomes of step1 are regrouped and organized into four categories (social, environmental, economic, institutional). The social dimension demonstrates 76 problems and sequentially 54 objectives are formulated, while, the environmental and economic dimensions which have 50 and 33 problems as well as 20 and 23 objectives respectively, and the institutional dimension with 21 problems and 15 objectives. Generally, there was one objective formulated for each problem, but at most there was one objective for two or more problems.

5.4 The Third Step (Indicators Formulation)

As mentioned in Chapter three (the methodology) each indicator, built up through a logical procedure, had been developed in consultation with experts from various fields and through a careful review of literature on sustainable development covering the environmental, social, economic and institutional dimensions (see Figure 5.7). Additionally, indicators have been influenced by reflecting the following essential characteristics of a sustainability indicator namely (Smith, 2002): simple, credible and understood by the public and policy makers.

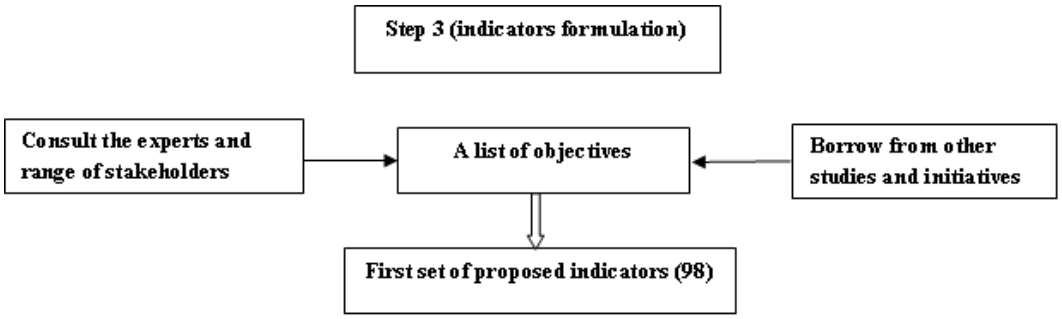


Figure 5-7 General scheme of the third step of the ALSA methodological framework Indicators formulation)

Essentially, the indicator formulation process used in this thesis has followed the basic approach developed by UNESCO (2003) for formulation of a list of potential indicators. This involved:

- Reviewing all objectives developed through step 2
- Thinking in an unconstrained way about possible indicators for each objective
- Carrying out deep thinking
- Consulting experts and a range of stakeholders
- Drawing on findings from other studies and initiatives

It is necessary at the formulation stage to think about how to measure progress towards the objectives during implementation and choose the most suitable indicator. For instance, the formulation of an indicator to track progress towards the objective of 'reducing unemployment' required brainstorming, consulting with experts and drawing guidance from other studies. In this specific case guidance used was from UNCSD (2001) resulting in the selection of 'Unemployment Rate' as the appropriate indicator.

Applying this approach to the objectives derived from step 2 led to the creation of a first set of some 98 proposed indicators. These are set out in Tables5.5 to 5.8. Maintaining the framework approach, the proposed indicators cover the four dimensions of sustainability (social, environmental, economic and institutional).

Table 5-5 The objectives and their formulated indicators attached (social)

Objective	Indicator
To reduce unemployment	Unemployment rate (UNCSD 2001)
To reduce poverty	Proportion of population living on less thanUS$1 per day
To rehabilitate and train the poor and vulnerable groups	The amount of public funding for training and support to the unemployed to establish their own business with a focus on vulnerable groups
To increase social assistance	Amount of social assistance funding provided
To increase women's awareness of their rights To decrease the number of women who leave education to marry before completing their studies To decrease discrimination against women To increase the number of women working in the private sector	The amount of public funding provided to address gender inequality
To reduce the level of perinatal mortality	The number of women dying during childbirth/pregnancy
To reduce the level of deaths under the age of 40	Life expectancy at birth (UNCSD 2001)
To improve potable water network and sewerage network To improve sanitation services	Proportion of the city population served by modern sanitation facilities and water networks
To provide well managed landfill sites	The number of managed landfill sites
To establish a waste recycling process	Percentage of waste which is recycled
To remove violations of water supply networks	Number of recorded violations of the water supply network
To increase potable water provision To improve the water quality	Percentage of population with access to safe drinking water (UNCSD 2001)
To reduce communicable and chronic diseases	Number of people contracting communicable diseases and cancer
To improve health status and life expectancy	Percentage of population with access to primary health care facilities (UNCSD 2001)
To increase importation of medications from reliable sources	Percentage of medications imported from reliable sources
To increase the number of ambulances	Number of ambulances serving city hospitals
To increase the number of health centres To construct specialized hospitals equipped with modern equipment To increase the role of the private sector in the provision of health services	Number of beds in public and private hospitals per 1000 people living in the city.
To increase the number of trained medical staff	Amount of public funding for the training of medical staff
To increase the number of nurses	Number of nurses per 1000 people
To increase the number of doctors	Number of doctors per 1000 people
To support the elderly and orphans	The amount of public funding provided to support the elderly and orphans
To reduce the number of young people without secondary education	Secondary or primary school completion ratio (UNCSD 2001)
To improve teachers' capabilities	The amount of public funding provided for the training of teaching staff
To improve curricula and teaching methods	Number of schools applying modern teaching standards
To provide a sufficient number of primary and secondary schools	Number of modern school places per 1000 children of school age by neighbourhood
To increase the quality of teaching in a university in terms of scientific methods	Number of lecturers who have received scholarships

Table 5.5 Continued

Objective	Indicator
To support the private sector in education	Number of private schools and universities
To increase interaction between the city and the university	Number of activities between city and the University of Babylon in various fields
To raise level of coordination between the educational system and the needs of the labour market	Number of academic research papers in the university that meet market needs and city problems
To focus on scientific and technical disciplines in higher education	Percentage of scientific and technical students in higher education
To emphasis on vertical expansion	Number of subspecialties in higher education
To provide sufficient number of schools	Average class size
To improve education services	Amount of public funding for the basic necessities of education
To reduce the need for private lessons	Percentage of pupils receiving private tuition
To reduce brain drain	Number of qualified and skilled people returning to the city of Hilla
To reduce and eliminate illiteracy	Adult literacy rate
To increase the number of readers of newspapers	Percentage of sales of newspapers and other print media
To eliminate of the housing crisis	The number of people who do not have suitable housing
To improve the residential environment in the city centre and old neighbourhoods	Public funding for development and rehabilitation of the residential environment in the city centre and old neighbourhoods.
To enforce laws	The number of crimes and terrorist incidents reported/ detected and convictions per month
Effective use of modern technology to enhance the security situation	Proportion of city covered by monitoring cameras in the streets and using explosives detection devices
To improve the capability of the police	The amount of public funding for developing the capabilities and increasing the professional level of the police
To increase preventive processes against Terrorism	Number of preventive processes against terrorism
To prevent racial discrimination and sectarianism and increase a culture of tolerance and citizenship	Number of marriages taking place between citizens of different religious sects
To decrease migration from the countryside to the city	Proportion of immigration from the countryside into the city
To provide decent housing for university teachers	Number of houses for university teachers equipped to a high standard

Table 5-6 The objectives and their formulated indicators attached (environmental)

Objective	Indicator
To minimize the impact of dust storms and high temperatures	Amount of sustainable or natural vegetative cover surrounding the city and green spaces within it
To reduce air pollution	Ambient Concentration of Air Pollutants in Urban Areas (UNCSD 2001)
To support agricultural production	Proportion of local agricultural production and its price compared with foreign production
To utilize agricultural lands To decrease soil salinity	Arable and Permanent Crop Land Area (UNCSD 2001)
To support the agriculture sector To use modern irrigation systems	Proportion of farmland which uses modern methods in agriculture, irrigation and harvesting

Table 5.6 Continued

Objective	Indicator
To raise awareness and understanding of the risks of desertification	Amount of sustainable or natural vegetative cover surrounding the city and green spaces within it
To increase green spaces	Amount of green space per 1000 population
To prevent use of agricultural lands for other purposes	Amount of agricultural land that has been converted to residential and other purpose
To prevent pollution of Hilla river water	Biochemical oxygen demand in water bodies (UNCSD 2007)
To ensure that the ancient city and archaeological sites are fully protected from high groundwater levels and salinity	Rising of groundwater levels and salinity in ancient city and archaeological sites
To encourage the development and promotion of sustainable tourism	Number of tourists who visit the city annually
To build the capabilities of workers in the tourism sector	Public funding for training and increasing the skills workers in the tourism sector
To secure the necessary funding for the development of sustainable tourism and recreational activities	Number of good quality hotels, recreation centres and other facilities serving the city
To provide and support the use of fertilizers and pesticides	Proportion of agricultural yields per dunum

Table 5-7 The objectives and their formulated indicators attached (economic)

Objective	Indicator
To support and protect investors	The number of foreign companies with investments in the city
To depend on local goods and services To increase the trade exchange between the city and the other provinces	Proportion of goods and services sourced locally
To regulate the importing of vehicles	Number of imported new and second hand cars in year
To emphasis quality control of imports	Proportion of seizure of imported goods which do not meet minimum standards
To support food industry	Proportion of food produced locally
To develop banking services	Number of banks that use modern and robust systems
To enhance the private sector	Percentage of total employment in the private sector
To support the production and marketing of livestock and livestock products (cows, sheep, chicken, meat, eggs, milk)	Proportion of self-sufficiency resulting from local production of livestock and livestock products
To expand shopping centres and shops with international standards	Number of modern shopping centres and shops with international standards
To ensure that water supply provides adequate supplies of good quality water across the city	Proportion of the city's population served by modern water supply
To deliver adequate and reliable electricity supplies to meet demand	Number of hours of processing power achieved daily
To decrease consumption of electricity	Annual proportion of citizen consumption of electricity
To encourage the use of clean energy sources	Price of a litre of gasoline, oil and kerosene
To raise level of interest in environment-friendly technology	Number of stations that produce renewable energy
To prevent accumulation of solid waste in residential areas	Accumulation of solid waste in the city centre and residential areas

Table 5.7 Continued

Objective	Indicator
To support the reuse of treated wastewater	Proportion of wastewater reused
To emphasise importance of availability of waste water treatment plant in each factory	Number of factories with no wastewater treatment units
To increase pedestrian crossing lines and footbridges	Number of footbridges and pedestrian crossing lines on all roads in city
To decrease traffic congestion	Number of hours of traffic congestion during the day
To increase and improved paved road	Percentage of unpaved and badly paved roads
To increase of bus stops	Number of bus stops in the city

Table 5-8 The objectives and their formulated indicators attached (institutional)

Objective	Indicator
To promote EIA studies	Percentage of projects which have been subjected to an EIA prior to approval
To activate the role of civil society organizations	Number of civil society organisations participating in city affairs
To increase coordination between departments of the ministries with each other	Number of meetings and symposia between ministries and institutions
To adopt management decentralization	Proportion of powers, resources and decisions devolved to the city authority
To increase central planning bureaux	Proportion of the city covered by clear development plans
To improve internet services	Number of Internet Subscribers per 1000 Inhabitants (UNCSD 2001)
To promote the postal mail service	Proportion of people who use the postal mail service
To increase number of modern telephone landline	Main Telephone Lines per 1000 Inhabitants
To improve the mobile communication services	Proportion of the population with access to mobile phone and mobile data services
To ensure the comprehensive use of ICT across public administration departments	Proportion of staff in government departments who have access to and make effective use of ICT
To improve the existing emergency services	Response times from emergency services police, fire/rescue and ambulance
To eradicate administrative and financial corruption	Number of financial and administrative corruption cases prosecuted in institutions and government departments
To overcome and resolve the disagreements between political parties	Number of political parties and religious groups competing for power
To increase citizens' confidence in government institutions	Percentage of civic participation of citizens in government institutions
Separation of religion and politics	Number of religious parties in the local authority

Following on from the call for sustainability indicators in Agenda 21, a list of indicators was published by the United Nations Commission on Sustainable Development (CSD),

which cover social, environmental, economic, and institutional dimensions of sustainability within the theme indicator framework (CSD, 2001). The CSD (2001) framework contains 4 categories, 15 themes, 38 sub-themes and 58 indicators, and was arranged as follows:

- Social category consists of 6 themes and 12 sub-themes;
- Environmental category consists of 5 themes and 13 sub-themes;
- Economic category consists of 2 themes and 7 sub-themes; and
- Institutional category consists of 2 themes and 6 sub-themes.

Since a structure for organizing indicators is important and to achieve the combined bottom-up/top- down approach referred to in chapter three(methodology), the CSD (2001) Theme Indicator Framework was used to organize a first set of 98 proposed indicators as is shown in Table 5.9.

Each proposed indicator was placed on a main list without testing whether it was useful or not. Rather, it was an attempt to respond to the problems and objectives identified during Steps 1 and 2 of the methodology. This results in a mix of indicators reflecting different sources of information. In general, the proposed indicators set has 48 social sustainability indicators, 14 environmental sustainability indicators, 21 economic sustainability indicators and 15 institutional sustainability indicators.

Table 5-9 First set of proposed local sustainability indicators for the city of Hilla, Iraq

Social		
Theme	**Sub-theme**	**Indicator**
Equity	Poverty	Unemployment rate
		Proportion of population living on less than US$1per day
		The amount of public funding for training and support to the unemployed to establish their own business, with a focus on vulnerable groups
		Amount of social assistance funding provided
	Gender Equality	The amount of public funding provided to address gender inequality
Health	Mortality	Life expectancy at birth
		The number of women dying during childbirth/pregnancy
	Sanitation	Proportion of the city population served by modern sanitation facilities and water networks
		The number of managed landfill sites
		Percentage of waste which is recycled
	Drinking Water	Number of recorded violations of water supply networks
		Percentage of population with access to safe drinking water
	Healthcare Delivery	Number of people contracting communicable diseases and cancer
		Percentage of population with access to primary health care facilities
		The percentage of medications not reaching required quality standards
		The number of ambulances serving city hospitals
		Number of beds in public and private hospitals per 1000 people living in the city
		Amount of public funding for the training of medical staff
		Number of nurses per 1000 people
		Number of Doctors per 1000 people
		The amount of public funding provided to support the elderly and orphans
Education	Education Level	Secondary or Primary School Completion Ratio
		The amount of public funding provided for the training of teaching staff
		Number of schools applying modern teaching standards
		Number of modern school places per 1000 children of school age by neighbourhood
		A number of lecturers who have received scholarships
		Number of houses for university teachers equipped to a high standard
		Number of private schools and university places
		Number of activities and collaborations between city and the university of Babylon in various fields
		Number of academic research papers in the university that meet market needs and city problems
		Percentage of scientific and technical students in higher education
		Number of sub-specialities in higher education
		Average class size
		Amount of public funding for the basic necessities of education
		Percentage of pupils receiving private tuition
		Number of qualified and skilled people returning to the city of Hilla
	Literacy	Adult illiteracy rate
		Percentage of sales of newspapers and other print media

Table 5.9 Continued

Housing	Living Conditions	The number of people who do not have suitable housing
		Public funding for development and rehabilitation of the residential environment in the city centre and old neighbourhoods
Security	Crime	The number of crimes reported/detected and convictions per month
		Proportion of city covered by monitoring cameras in the streets and using explosives detection devices
		The amount of public funding for developing the capability and professionalism of the police
		Number of preventive processes against Terrorism
		Number of marriages taking place between citizens of different religious sects
Population	Population Change	Proportion of immigration from the countryside into the city
Environmental		
Theme	**Sub-theme**	**Indicator**
Atmosphere	Climate Change	Amount of sustainable or natural vegetative cover surrounding the city and green spaces within it
	Air Quality	Ambient Concentration of Air Pollutants in Urban Areas
Land	Agriculture	Proportion of farmland which uses modern methods in agriculture, irrigation and harvesting
		Proportion of local agricultural production and its price compared with foreign production
		Arable and Permanent Crop Land Area
		Proportion of agricultural yields per dunum
	Desertification	The amount of sustainable or natural vegetative cover surrounding the city and green spaces within it
	Urbanization	Amount of green space per 1000 population
		Proportion of agricultural land that has been converted to residential and other purpose
Fresh Water	Water Quality	Biochemical oxygen demand in water bodies
Sustainable Tourism	Tourism	Rising of groundwater levels and salinity in ancient city and archaeological sites
		The number of tourists who visit the city annually
		Public funding for training and increasing the skills of workers in the tourism sector
		Number of good quality hotels, recreation centres and other facilities serving the city
Economic		
Theme	**Sub-theme**	**Indicator**
Economic Structure	Economic Performance	Number of foreign companies with investments in city
	Trade	Proportion of goods and services sourced locally
		Number of imported new and second hand cars in year
		Proportion of seizure of imported goods which do not meet minimum standards
	Financial status	Proportion of food produced locally
		Number of banks that use modern and robust systems
		Percentage of total employment in the private sector
		Proportion of self-sufficiency resulting from local production of livestock and livestock products
		Number of modern shopping centres and shops built to international standards

Table 5.9 Continued

Consumption and production patterns	Material consumption	Proportion of the city's population served by modern water supply
	Energy use	Number of hours of processing power achieved daily
		Annual proportion of citizens' consumption of electricity
		Price of a litre of gasoline, oil and kerosene
		Number of stations that produce renewable energy
	Waste generation and management	Accumulation of solid waste in the city centre and residential areas
		Proportion of wastewater reused
		Number of factories with no wastewater treatment units
	Transportation	Number footbridges and pedestrian crossing lines on all roads in city
		Number of hours of traffic congestion during the day
		Percentage of unpaved and badly paved roads
		Number of bus stops in the city
Institutional		
Theme	**Sub-theme**	**Indicator**
Institutional Framework	Strategic implementation of SD	Percentage of projects which have been subjected to an EIA prior to approval
	Institutional Cooperation	The number of civil society organizations participating in city affairs
		Number of meetings and symposium between ministries and institutions
		Proportion of powers, resources and decisions devolved to the city authority
		Proportion of the city covered by clear development plans
Institutional Capacity	Information access	Number of Internet Subscribers per 1000 Inhabitants
		Proportion of people who use the postal mail service
	Communication infrastructure	Main telephone lines per 1000 inhabitants
		Proportion of the population with access to mobile phone and mobile data services.
	Science and Technology	Proportion of staff in government departments who have access to and make effective use of ICT
	Disaster Preparedness and Response	Response times from emergency services police, fire/rescue and ambulance
Governance	Corruption	Number of financial and administrative corruption cases prosecuted in institutions and government departments
		Number of political parties and religious groups competing for power
	Role of civic society	Percentage of civic participation of citizens in government institutions
		Number of religious parties in the local authority

Once this first set of 98 untested indicators was developed, the next step was to select a second, more refined set of indicators, in order to get the appropriate and limited number of indicators. Indicators ought to be selected carefully so that only useful and valid indicators are used in order to maximise their contribution to the local

sustainability decision making process and enhance their applicability and eligible characteristics. Eventually, ranking process of the second set of indicators was performed to develop the final set of indicators.

5.5 The Fourth Step (Selection and Ranking of Indicators)

This section sets out a description of the process of selecting a refined list of sustainability indicators for the city of Hilla which could be subsequently ranked to provide a complete ALSA framework. The key steps to achieving this are set out in Figure 5.8.

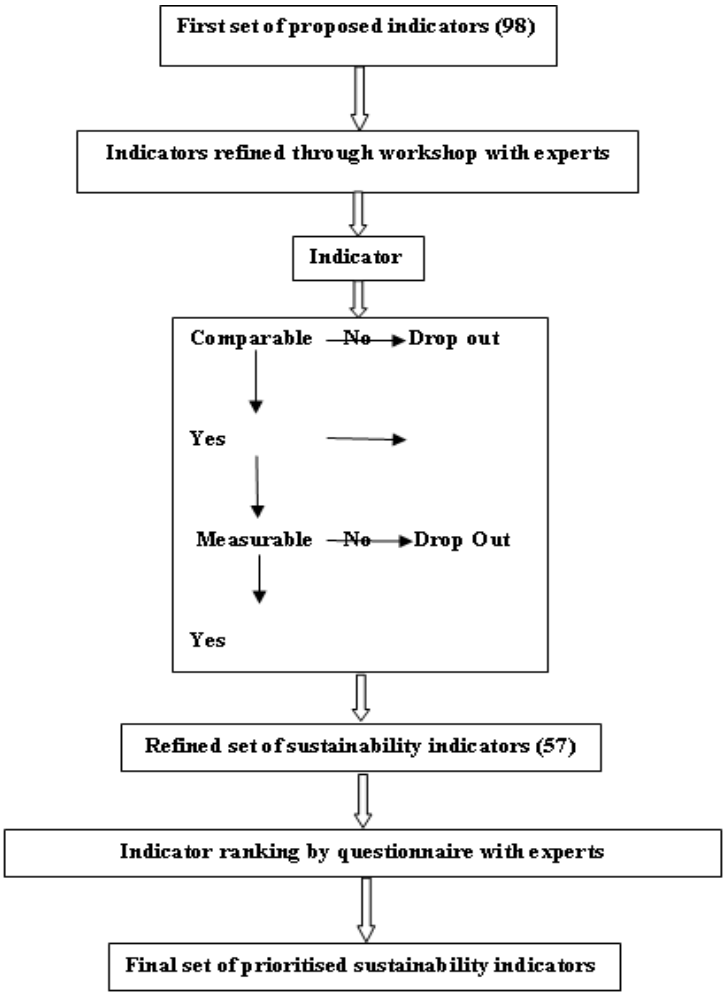


Figure 5-8 General scheme of the fourth step of ALSA methodological framework (Selection and ranking of indicators)

5.5.1 Indicator Selection

The selection of the most appropriate number of indicators is important because when there are a very small number of indicators this can lead to the failure to clarify and deliver an idea or concept whilst if there are a large number of indicators this can lead to the dispersion and lack of focus on the main goal. Therefore, in order to reach the appropriate number of indicators from a long potential list, a set of selection criteria needs to be used (Nathan and Reddy, 2010). In addition, many authors recommend that the number of indicators should be 'limited' such as Hens, De Wit (2003), UN (2001), and Hodge, Hardi (1997).

Identifying the criteria against which potential indicators will be evaluated is a significant part of the process of selecting indicators in a transparent way (Keirstead, 2007). However, the published lists of criteria on which indicators ought to be assessed are generally similar (Rice and Rochet, 2005) which allows the author to reflect and observe these similarities, as shown in Table 2.3.

In this research study, the long list of potential indicators was analysed, revised and selected through a workshop held in July, 2013. A panel of six experts from the city of Hilla (four experts with academic qualifications and two with relevant experience) participated in the workshop, in addition to making use of bibliographic review. The panael of experts were selected by two methods: 1- Previous knowledge, literature and governmental sources 2- Recommendations using the snowballing technique. This refinement stage was considered experts in reformulate and select useful indicators because their knowledge scientifically valid

In Western management practices, the usual device for gathering of stakeholders together is a workshop. The gathering can create a consensus and executable plan for action (Bell and Morse, 2008). The workshop may be for a day or more and may involve regular meetings over an extended period and include many devices to support understanding and discussion such as: presentations; discussion groups; small group work sessions; plenary sessions; visits and video or audio presentations. The aim of all these devices is to bring the workshop participants together to discuss a specific subject and to reach a common understanding. However, the consensus and understanding may be rapidly achieved in homogeneous and small groups (Bell and Morse, 2008).

The workshop approach was adopted in this study because; firstly, the technique appears to be able to generate effective discussion about the selection of useful indicators, and secondly, a broad consensus on the result may be achieved rapidly. Since workshops predominantly contain six to ten participants (Pan, 2006), the first list of proposed indicators was presented to a panel of six experts of approximately the same 'level' of expertise (four academics and two practitioners participated in the workshop). In these circumstances an effective discussion and reaching of consensus was probable. The participants were asked to select valid and useful indicators by evaluating them against three criteria that had been derived from the literature review (Table 2.3): that they should be comparable, measurable and sensitive. These terms were explained to the workshop participants as follows:

- **Comparable:** the indicator can be compared to past conditions or to existing data sets
- **Measurable:** the indicator can be measured using some scale. Moreover, that the data are readily available, frequently updated and affordable (Keirstead, 2007).

- **Sensitive:** A sensitive indicator will change commensurately with the level and in the same direction of change as the item or the condition being measured. Thus, a sensitive indicator should act as an early warning of changing conditions (McCoy et al., 2005).

The experts were also asked to provide justification for their answers. As a result of their deliberations, they suggested that the refined list should comprise some 57indicators. They met twice for debate and eventually agreed that the indicators selected were useful and valid. Transcriptions were made by the researcher; this enhances the validity and reliability of results because no other people were involved and minimized the chance of recording errors.

Appendix D shows the indicators which were dropped from the original list. As previously mentioned, one of the central challenges in this process was to get a shorter list of indicators without creating significant gaps in coverage. This appears to have been successfully achieved through the production of a refined list of 57 key sustainability indicators for Hilla city as shown in Table 5.10.

Table 5-10 Refined listing (second set) of proposed local sustainability indicators for the city of Hilla, Iraq

Social		
Theme	**Sub-theme**	**Indicator**
Equity	Poverty	Unemployment rate
		Proportion of population living on less thanUS$1 per day
		Number of institutions that rehabilitate the unemployed and help them to get jobs
	Gender Equality	Number of married girls under the age of 18

Table 5.10 Continued

Health	Mortality	Life expectancy at birth
		Number of women dying during childbirth/pregnancy
	Sanitation	Percentage of population with adequate sewage disposal
		Number of managed landfill sites
		Percentage of waste which is recycled
	Drinking Water	Percentage of population with access to safe drinking water
	Healthcare Delivery	Number of people who have infectious diseases and cancer
		Percentage of population with access to primary health care facilities
		Number of beds in public and private hospitals per 1000 people living in the city
		Number of nurses per 1000 people
		Number of doctors per 1000 people
		Number orphanages and hospices
Education	Education Level	Secondary or primary school completion ratio
		Number of modern school places per 1000 children of school age by neighbourhood
		Number of academic research papers in the university that meet market needs and city problems
		Average class size
	Literacy	Adult illiteracy rate
Housing	Living Conditions	Number of people who do not have suitable housing
Security	Crime	Number of crimes and terrorist incident reported/ detected and convictions per month
		Proportion of city covered by monitoring cameras in the streets and using explosives detection devices
		Number of political parties and religious groups competing for power
		Number of mixed married
Environmental		
Theme	**Sub-theme**	**Indicator**
Atmosphere	Climate Change	Amount of sustainable or natural vegetative cover surrounding the city and amount of green spaces per 1000
	Air Quality	Ambient concentration of air pollutants in urban areas
Land	Agriculture	Proportion of farmland which uses modern methods in agriculture, irrigation and harvesting
		Arable and permanent crop land area
		Proportion of local agricultural production and its price compared with foreign production
		Proportion of agricultural yields per dunum
	Urbanization	Proportion of agricultural land that has been converted to residential and other purpose
Fresh Water	Water Quality	Biochemical oxygen demand in water bodies

Table 5.10 Continued

Sustainable Tourism	Tourism	Number of tourists who visit the city annually
		Rising of groundwater levels and salinity in ancient city and archaeological sites
		Number of good quality hotels, recreation centres and other facilities serving city
Economic		
Theme	**Sub-theme**	**Indicator**
Economic Structure	Economic Performance	Number of foreign companies with investments in city
	Trade	Proportion of goods and services sourced locally
	Financial status	Number of banks that use modern and robust systems
		Percentage of total employment in the private sector
Consumption and production patterns	Material consumption	Proportion of the city's population served by modern water supply
	Energy use	Number of hours of processing power daily
		Annual proportion of citizens' consumption of electricity
		Price of a litre of gasoline, oil and kerosene
		Number of stations that produce renewable energy
	Waste generation and management	Number of factories with no wastewater treatment units
	Transportation	Number footbridges and pedestrian crossing lines on all roads in city
		Number of hours of traffic congestion during the day
		Percentage of unpaved and badly paved roads
Institutional		
Theme	**Sub-theme**	**Indicator**
Institutional Framework	Strategic implementation of SD	Percentage of projects which have been subjected to an EIA prior to approval
	Institutional Cooperation	Proportion of powers, resources and decisions devolved to the city authority
Institutional Capacity	Information access	Number of internet subscribers per 1000 inhabitants
	Communication infrastructure	Main telephone lines per 1000 inhabitants
		Proportion of the population with access to mobile phone and mobile data services.
	Disaster Preparedness and Response	Response times from emergency service police, fire/rescue and ambulance
Governance	Corruption	Number of cases prosecuted of financial and administrative corruption in the institutions and government departments

5.5.2 Indicator Ranking

To establish a more effective list of indicators, the World Trade Organisation (WTO, 2004) recommended attaching priorities to the indicators. A group of forty experts (academics and practitioners) from the city of Hilla were sent a questionnaire for ranking indicators for local sustainability at the end of May 2013.

As explained in Chapter 3, each participant was asked to choose the level of importance of each indicator listed in the questionnaire. The questionnaire applied the Likert scale which has a number and a concise description connected with each reply category (see Appendix E). Experts who participated in the questionnaire were asked to show the relative importance of each of the refined list of 57 indicators on a scale of 1 to 4, where 1 was defined as not important; 2 was defined as less important; 3 defined as important and 4 defined as very important. The participants selected the categories which best explain their responses about the indicator that will be rated. The aim of this step was to rank the indicators on the basis of priority so as to identify a final set of indicators. The average score for each indicator was calculated as a means of revealing the overall preferences of the respondents.

As a general rule, a questionnaire should not be used in the field study without extensive pilot practice (Malhotra and Peterson, 2006). Thus, to ensure the reliability and the validity of the results as well as identify and resolve potential problems with the questionnaire, a pilot survey was undertaken involving 10 participants, including five professional colleagues and five stakeholders from the city of Hilla. The pilot survey yielded useful information on the level of understanding of the questionnaire, the appropriateness of the response choices and the time required to complete the questionnaire.

The questionnaire was carried out using the questionnaire technique developed by Creswell (2009). The procedure of the questionnaire survey was as follows:

1. Identify the purpose of the investigation
2. Develop the questionnaire tool together with the help of consultations with the supervisory discussion group
3. Conduct pilot test and revise the instrument to check the accuracy and reliability
4. Select probable respondents in the city of Hilla
5. Conduct the survey (carried out at the end of July, 2013)
6. Analyse the data using Excel to compute the average, standard deviation and rank
7. Report and discuss the results

The results of the survey and the data analysis which included the average; standard deviation and rank of each indicator are shown in Table 5.11.

Questionnaire Results and Discussion

Excel was used to calculate the mean score which is the average and the standard deviation which is a measure of variation or spread in the data for each of the 57 indicators based on questionnaire responses which have been presented at Appendix F.Many authors have shown that Likert scales can definitely be analysed efficiently as interval scales and analyses them as such with descriptive statistics like means, standard deviations, etc., such as Baggaley and Hull, 1983; Maurer and Pierce, 1998; Vickers, 1999;Allen and Seaman, 1997. Moreover, Brow (2011) supports treating Likert scales as interval data, because Likert scales contain multiple items and can be taken to be

interval scales so descriptive statistics can be applied. According to the Carifio and Perla (2007) the myth of only non-parametric statistical tests should be used with Likert scales are wrong. In this manner, Norman (2010) **s**uspended the controversy on this subject as he proved that parametric statistics (Parametric statistics use the mean and standard deviation) can be used with Likert data, with unequal variances, with non-normal distributions and with small sample sizes, with outa significant risk of reaching an incorrect conclusion. Thus, the average score for each indicator was used to rank the priority ascribed to each indicator. Moreover, Green et al (1990) and Miller (2001a) use the standard deviation to measure the degree of convergence. The lower the standard deviation is, the less dispersion or variation in the data, subsequently the consistency or the degree of convergence is higher. On the other hand, the higher the standard deviation is, the more dispersion or variation in the data or in other words a wider range of opinions has been encountered and subsequently the consistency or the degree of convergence is lower. Table 5.11 shows the average, standard deviation and rank of each indicator.

Table 5-11 Results of questionnaire data analysis

Indicators	Average	SD	Rank
Unemployment Rate	3.725	0.505736	1
Number of crimes and terrorist incident reported/detected and convictions per month	3.7	0.563869	2
Proportion of population below US$1 a day	3.65	0.579567	3
Number of hours of processing power daily	3.625	0.49029	4
Number of people who do not have suitable housing	3.45	0.597001	5
Number of doctors per 1000 people	3.4	0.632456	6
Number of modern school places per 1000 children of school age by neighbourhood	3.4	0.744208	6
Number of cases prosecuted of financial and administrative corruption in the institutions and government departments	3.325	0.729858	8
Percentage of population with adequate sewage disposal	3.3	0.882886	9
Number of nurses per 1000 people	3.2	0.757865	10
Biochemical oxygen demand in water bodies	3.175	0.747217	11
Number of beds in public and private hospitals per 1000 people living in the city	3.15	0.921259	12
Proportion of city covered by monitoring cameras in the streets and using explosives detection devices	3.15	0.83359	12

Table 5.11 Continued

Percentage of population with access to safe drinking water	3.075	0.997111	14
Price of a litre of gasoline, oil and kerosene	3.075	0.828576	14
Proportion of the city's population served by a modern water supply	3.05	0.875595	16
Annual proportion of citizens' consumption of electricity	3.025	0.946993	17
Number of factories with no wastewater treatment units	3.025	0.80024	17
Proportion of the population with access to mobile phone and mobile data services	3.025	0.973692	17
Number of foreign companies with investments in city	3	0.784465	20
Number of orphanages and hospices	2.95	0.875595	21
Percentage of unpaved and badly paved roads	2.925	0.79703	22
Number of mixed married	2.9	0.841244	23
Number of institutions that rehabilitate the unemployed and help them to get jobs	2.825	1.174243	24
Number of managed landfill sites	2.825	0.930605	24
Ambient concentration of air pollutants in urban areas	2.8	0.723241	26
Number of hours of traffic congestion during the day	2.775	0.831665	27
Number footbridges and pedestrian crossing lines on all roads in city	2.675	0.858965	28
Number of political parties and religious groups competing for power	2.65	1.051251	29
Indicators	**Average**	**SD**	**Rank**
Percentage of population with access to primary health care facilities	2.625	1.004796	30
Main telephone lines per 1000 inhabitants	2.625	1.029999	30
Secondary or primary school completion ratio	2.6	1.057331	32
Percentage of projects which have been subjected to an EIA prior to approval	2.6	1.057331	32
Proportion of agricultural land that has been converted to residential and other purpose	2.575	1.106797	34
Proportion of goods and services sourced locally	2.575	1.059451	34
Number of banks that use modern and robust systems	2.575	1.129727	34
Number of tourists who visit the city annually	2.55	0.959434	37
Number of people who have infectious diseases and cancer	2.525	1.03744	38
Number of women dying during childbirth/pregnancy	2.5	0.960769	39
Proportion of powers, resources and decisions devolved to the city authority	2.5	0.847319	39
Average class size	2.475	1.03744	41
Proportion of local agricultural production and its price compared with foreign production	2.475	0.84694	41
Percentage of total employment in the private sector	2.45	0.959434	43
Number of married girls under the age of 18	2.425	1.083383	44
Number of internet subscribers per 1000 inhabitants	2.425	0.957762	44
Adult illiteracy rate	2.4	0.841244	46
Rising of groundwater levels and salinity in ancient city and archaeological sites	2.375	0.867874	47
Number of good quality hotels, recreation centres and other facilities serving city	2.375	0.837808	47
Amount of sustainable or natural vegetative cover surrounding the city and amount of green space per 1000	2.35	0.948683	49
Response times of emergency services police, fire/rescue and ambulance	2.35	0.892993	49
Proportion of farmland which uses modern methods in agriculture, irrigation and harvesting	2.325	0.916725	51
Arable and permanent crop land area	2.225	0.919518	52

Table 5.11 Continued

Number of academic research papers in the university that meet market needs and city problems	2.15	1.075365	53
Proportion of agricultural yields per dunum	2.125	0.822364	54
Number of stations that produce renewable energy	2.125	0.822364	54
Life expectancy at birth	2.05	1.036513	56
Percentage of waste which is recycled	1.9	0.955416	57

Based on the results of the questionnaire, data analysis of the final set of indicators is shown inTable 5.12.

Table 5-12 Final set of indicators suggested for measuring the sustainability of the city of Hilla

Dimension	Theme	Sub-theme	Indicator
Social	Equity	Poverty	Unemployment rate
Social	Security	Crime	Number of crimes and terrorist incidentreported/detected and convictionsper month
Social	Equity	Poverty	Proportion of population below US$1 a day
Economic	Consumption and production pattern	Energy use	Number of hours of processing power daily
Social	Housing	Living Condition	Number of peoplewho do not havesuitable housing
Social	Health	Healthcare Delivery	Number of doctors per 1000 people
Social	Education	Education Level	Number of modern school places per 1000 children of school age by neighbourhood
Institutional	Governance	Corruption	Number of cases prosecuted of financial and administrative corruption in the institutions and government departments
Social	Health	Sanitation	Percentage of population with adequate sewage disposal
Social	Health	Healthcare Delivery	Number of nurses per 1000 people
Environmental	Fresh water	Water quality	Biochemical oxygen demand in water bodies
Social	Health	Healthcare Delivery	Number of beds in public and private hospitals per 1000 people living in the city
Social	Security	Crime	Proportion of city covered by monitoring cameras in the streets and using explosives detection devices
Social	Health	Drinking water	Percentage of population with access to safe drinking water
Economic	Consumption and production pattern	Energy use	Price of a litre of gasoline, oil and kerosene
Economic	Consumption And production pattern	Material consumption	Proportion of the city's population served by modern water supply

Table 5.12 Continued

Economic	Consumption and production pattern	Energy use	Annual proportion of citizens' consumption of electricity
Economic	Consumption And production pattern	Waste generation and management	Number of factories with no wastewater treatment units
Institutional	Institutional capacity	Communication infrastructure	Proportion of the population with access to mobile phone and mobile data services
Economic	Economic structure	Economic Performance	Number of foreign companies with investments in city
Social	Health	Healthcare Delivery	Number of orphanages and hospices
Economic	Consumption and production pattern	Transportation	Percentage of unpaved and badly paved roads
Social	Security	Crime	Number of mixed married
Dimension	**Theme**	**Sub-theme**	**Indicator**
Social	Equity	Poverty	Number of institutions that rehabilitation the unemployed and help them to get a jobs
Social	Health	Sanitation	Number of managed landfill sites
Environmental	Atmosphere	Air quality	Ambient concentration of air pollutants in urban areas
Economic	Consumption And production pattern	Transportation	Number of hours of traffic congestion during theday
Economic	Consumption and production pattern	Transportation	Number footbridges and pedestrian crossing lineson all roads in city
Social	Security	Crime	Number of political parties and religious groupscompeting for power
Social	Health	Healthcare Delivery	Percentage of population with access to primary health care facilities
Institutional	Institutional capacity	Communication infrastructure	Main telephone lines per 1000 Inhabitants
Social	Education	Education Level	Secondary or primary school completion ratio
Institutional	Institutional framework	Strategic implementation of SD	Percentage of projects which have been subjected to an EIA prior to approval
Environmental	Land	Urbanization	Proportion of agricultural land that has been converted to residential and other purpose
Economic	Economic structure	Trade	Proportion of goods and services sourced locally
Economic	Economic structure	Financial status	Number of banks that use modern and robust systems
Environmental	Sustainable tourism	Tourism	Number of tourists who visit the city annually
Social	Health	Healthcare Delivery	Number of people who have infectious diseases and cancer
Social	Health	Mortality	Number of women dying during childbirth/pregnancy
Institutional	Institutional framework	Institutional Cooperation	Proportion of powers, resources and decisions devolved to the city authority
Social	Education	Education Level	Average class size

Table 5.12 Continued

Environmental	Land	Agricultural	Proportion of local agricultural production and its price compared with foreign production
Economic	Economic structure	Financial status	Percentage of total employment in the private sector
Social	Equity	Gender equality	A number of married girls under the age of 18
Institutional	Institutional capacity	Information access	Number of internet subscribers per 1000 Inhabitants
Social	Education	Literacy	Adult illiteracy rate
Environmental	Sustainable tourism	Tourism	Rising of groundwater levels and salinity in ancient city and archaeological sites
Dimension	**Theme**	**Sub-theme**	**Indicator**
Environmental	Sustainable tourism	Tourism	Number good quality hotels, recreation centers and other facilities serving city
Environmental	Atmosphere	Climate change	Amount of sustainable or natural vegetative cover surrounding the city and amount of green space per 1000
Institutional	Institutional Capacity	Disaster preparedness and response	Response times of emergency services police, fire/rescue and ambulance
Environmental	Land	Agricultural	Proportion of farmland which uses modern methods in agriculture, irrigation and harvesting
Environmental	Land	Agricultural	Arable and permanent crop land area
Social	Education	Education Level	Number of academic research papers in the university that meet market needs and city problems
Environmental	Land	Agricultural	Proportion of agricultural yields per dunum
Economic	Consumption and production pattern	Energy use	Number of stations that produce renewable energy
Social	Health	Mortality	Life expectancy at birth
Social	Health	Sanitation	Percentage of waste which is recycled

As shown in Table 5.12 the final set of indicators consist of (26) social indicators, (13) economic indicators, (11) environmental indicators and (7) institutional indicators. So these 57 indicators are suggested to be the local indicators for measuring the sustainability of the city of Hilla.

5.6 Summary

In summary, this chapter has presented the result of the application of the first, second, third and fourth steps of the ALSA methodological framework in the city of Hilla, Iraq. The first step, issue identification, aimed to explore the major issues, needs and problems within the city of Hilla, Iraq. This methodological framework successfully gathered social, environmental, economic and institutional related problems in the city of Hilla through the use of document source analysis, focus groups and interviews. Using multiple sources of data, triangulation is one of the important protocols employed to ensure accuracy and alternative explanations. Moreover, the need to confirm the validity of the data increases the necessity of the triangulation.

The findings from documentary sources, focus group and the interviews, were faithfully transcribed and analysed and classified according to key themes and into the following four key areas: social, economic, environmental and institutional, depending on the CSD Theme Indicator Framework (2001) adopted for the ALSA methodological framework. In this study two types of triangulation were employed:methodological triangulation and data source triangulation. The triangulation process in this study consisted of the following steps: Sorting, Convergence coding, Convergence assessment and Feedback. This led to creation of a unified set which includes the triangulated valid results. This set of findings was used in the second step (the formation of objectives), which consists of the reformulation of the problems and needs developed during the first step into solution statements or objectives. These were prepared with the help of experts from various fields. In the current study, the objectives were formulated using formulas develop by the Bureau of Local Government Development and DILG (2008).

Generally, one objective was formulated for each problem, but at most there was one objective for each two or more problems.

The ALSA methodological framework was found to be capable of integrating the views of stakeholders. The Chapter describes the next two steps of ALSA methodological framework: the development of the indicators (step 3) as well as the selection of the indicators and their ranking (step 4). Through step 3 each indicator was developed in consultation with experts from various fields and through a careful review of the literature in the environmental, social, economic and institutional fields. This step produced the first set of proposed indicators which contained 98 indicators covering the four dimensions of sustainability (social, environmental, economic and institutional). Overall, the proposed indicators set have 48 social sustainability indicators, 14environmental sustainability indicators, 21economic sustainability indicators and 15 institutional sustainability indicators. The first set of potential indicators was then analysed, revised and selected through a workshop with a panel of experts from various fields, in addition to making use of bibliographic review. This revision stage was used to reformulate and select useful indicators. This resulted in the production of a refined list of 57 useful and valid sustainability indicators. A group of forty experts from the city of Hilla, Iraq then contributed to the process of ranking indicators on the basis of priority (final set of indicators). This chapter has illustrated the capabilities, applicability and practicality of the use of the first and second steps of the ALSA methodological framework. The results of the application of the ALSA methodological framework to the city of Hilla, Iraq, are discussed in the next chapter.

Chapter 6.

Discussion of Results

6.1 Introduction

This chapter discuses the results of the application of the ALSA methodological framework for the city of Hilla, Iraq. The final set of local sustainability indicators for the city is discussed and the ALSA findings and previous studies are compared to each other. When the comparison shows disagreement between the ALSA findings and the previous studies, the reasons for this disagreement are given. This chapter also refers to some arguments about the effectiveness of ALSA outputs, moreover, the strength, weaknesses, opportunities and threats (SWOT) of the ALSA methodological framework are discussed.

6.2 A comparison of the findings of the three techniques

A comparison of the findings from documentary sources, focus groups and interview techniques, shows that the richest data are obtained from the interviews because this method allows the researcher to explore sensitive topics that may be more difficult for the interviewee to raise in a focus group setting. In addition, interviews provide a practical way of obtaining detailed information about personal feelings, insights and views. In contrast, the level of information obtained from documentary source analysis was the lowest. Despite the advantages of using documentary sources, which include cost and ease of access, many of the sources are limited and incomplete resulting in missing data.

However, the analysis contained in Figure 6.1 shows a broad consistency between documentary sources, focus groups and interviews in those social problems were the most frequently mentioned category of problems. This suggests that in terms of achieving sustainable development in Hilla significant priority needs to be given to addressing the city's social problems.

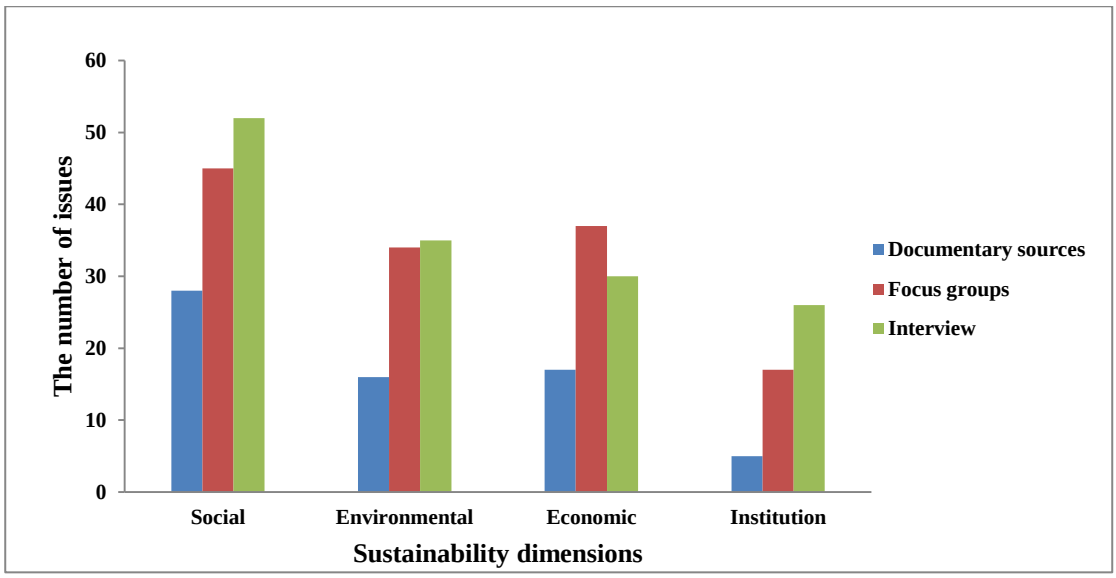


Figure 6-1 The four sustainability dimensions and number of related issues with respect to documentary sources, focus groups and interview

Analysing the problems identified by the three research methods in terms of themes, as shown in Figure 6.2, reveals that the subject of land has the highest priority amongst focus group participants while the consumption and production pattern has the highest priority amongst interviewees. On the other hand, the population theme had the lowest priority across all research methods (documentary sources, focus groups and interviews). In addition it is significant to note that there was a number of sustainability topics not mentioned at all including nutritional status, ozone layer depletion, ecosystem and species status.

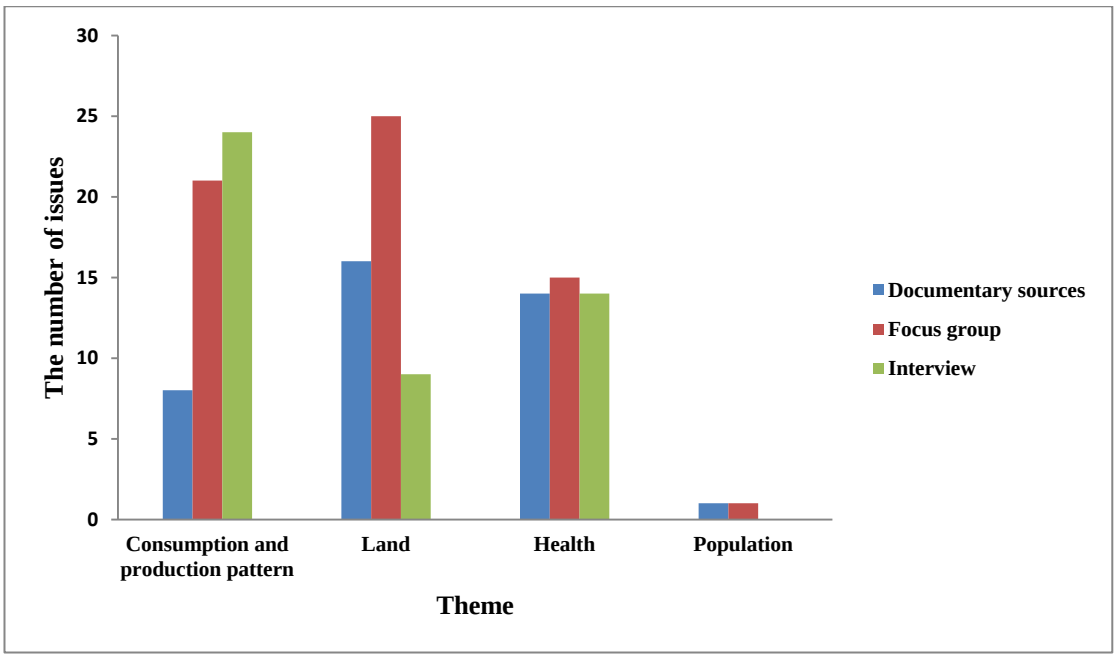


Figure 6-2 Some themes and numbers of related issues with respect to document sources, focus group and interview

The classification of issues into the four dimensions of sustainability assists in emphasising the multidimensional nature of sustainability. However, it is apparent there are complex overlaps between issues. For example, the lack of potable water is classified as a social problem as it falls within the health category. However, there is a possible secondary link with water quality as fresh water is the major source of drinking water for most countries and can be classified as an environmental problem. However, the CSD Theme Indicator Framework (2001) did not consider the overlaps among dimensions or theme. Similarly, in this study overlaps have been disregarded to facilitate the understanding of the majority of stakeholders.

6.3 Final Set of Local Sustainability Indicators for the city of Hilla

Following the analysis, revision and selection processes that were applied to the first set of potential indicators and led to the production of a refined list of 57 useful and valid

sustainability indicators, the process for ranking indicators on the basis of priority (final set of indicators) was undertaken. The results which are presented in Table 5.11 show that there is a high level of consistency on the most highly ranked indicators and issues across the expert participants since the standard deviation of the data set from the questionnaire ranged from 0.49 to 1. The results show that the ten most important issues in the city of Hilla given the highest priority by experts have the highest level of consistency as revealed by standard deviations ranging from just 0.49 to 0.88, though with average scores ranging from 3.725 to 3.2. The 'Unemployment Rate' emerges as the indicator which is seen as having the highest priority, followed by 'the number of crimes and terrorist incidents reported/detected and convictions per month'. Some eight out of the ten highest priority indicators measure social issues while economic and institutional issues each have one priority indicator. Environmental indicators do not feature in the 'top ten', as shown in Figure 6.3.

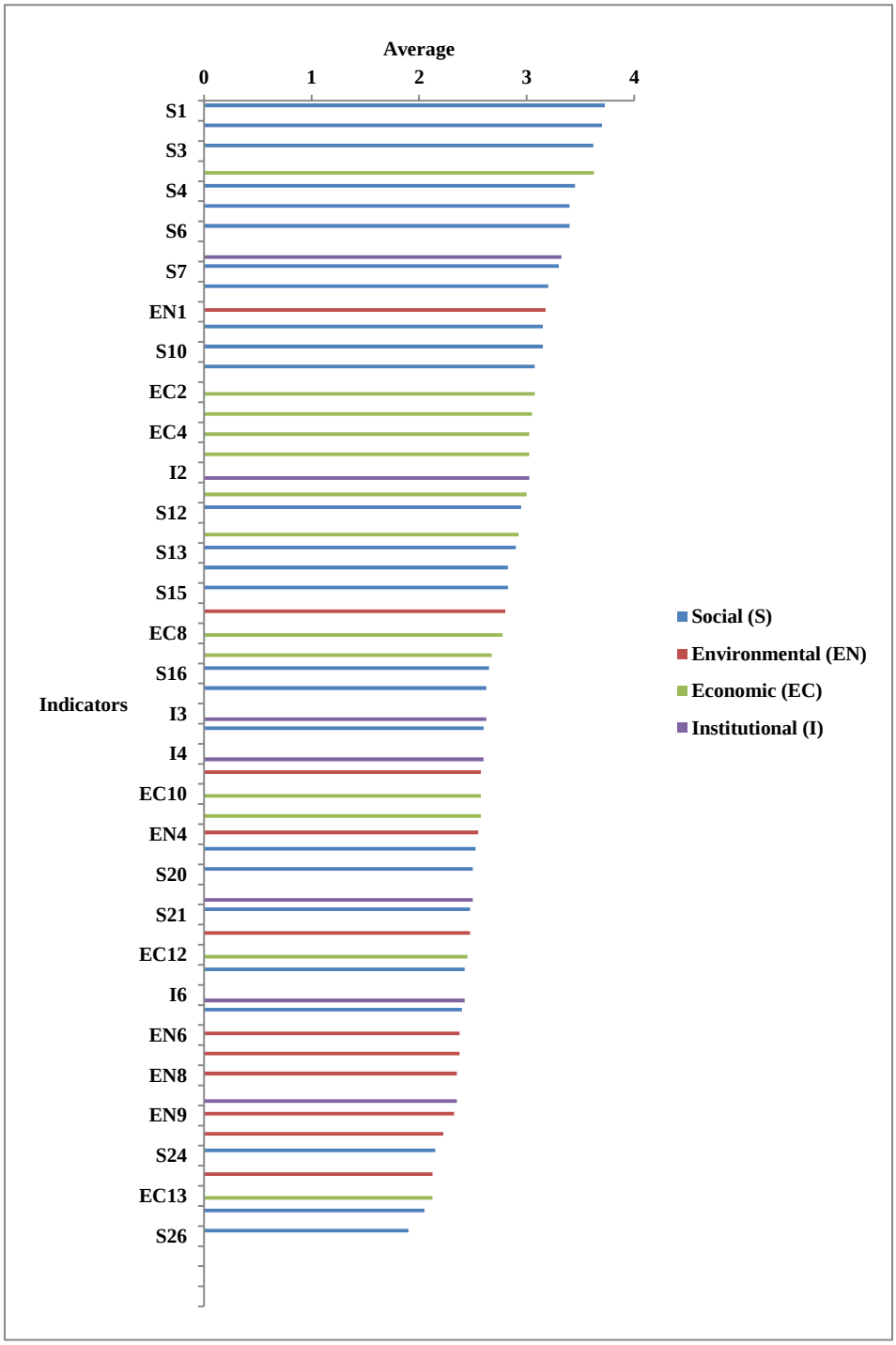


Figure 6-3 Social, environmental, economic and institutional indicators priorities

With an average score of 1.9 which is somewhere between ‘not important’, and ‘less important’ the participants gave the lowest priority to the ‘Percentage of waste which is

recycled' as an indicator. This judgment had a degree of consistency between the participants (the standard deviation is 0.955). Furthermore, some issues were marked as less or not important, like 'Number of stations that produce renewable energy'. On the other hand, high marks were given to those indicators which relate to poverty and security. These results may appear surprising at first glance, but they are considered normal and expected, especially in a situation such as Iraq where many conflicts have resulted in insecurity and poverty. Moreover, participants gave importance to these issues to reflect the necessities of the city of Hilla because it suffers from major problems in these areas as seen in step 1 of the ALSA methodological framework, which included issues identification.

Social related issues are given broadly differing importance, 'unemployment rate' and 'proportion of population below 1$ a day' are indicated as having a high priority (see Table 5.11), but some social related issues are given the lowest importance such as 'life expectancy at birth'. Some health issues are not considered as significant issues, e.g. 'Number of people who have infectious diseases and cancer' which has a rank of 38.

While there is an overall consensus on the majority of significant issues as noted above, there are important variations between participants on some issues like 'number of banks that use modern and robust systems', 'proportion of agricultural land that has been converted to residential use and other purposes' and 'number of institutions that rehabilitate the unemployed and help them to get a job', which have a standard deviation of 1.129, 1.106 and 1.174respectively.

In summary, there was a high level of consistency on the most ranked indicators and most issues across the expert's participants especially in the highest ranked indicator. The highest ranked indicator 'unemployment rate' and 'number of hours of processing power daily' have the lowest standard deviation (0.50), (0.49) respectively, and they are

the two indicators which the majority of experts participants regard as important or very important.

Furthermore, as mentioned earlier, the ten highest priority issues had eight social related indicators while economic and institutional issues had one indicator each. Environmental issues did not get any advanced rank. This point could be overcome by enforcing a balance between the four pillars of sustainability through forcing people to choose issues from each four pillars.

6.4 Comparison between ALSA findings and previous studies

It is instructive to compare ALSA findings from Hilla with the available local indicators from a few other countries to show similarities and differences. Tanguay et al. (2009) examined a sample of 17 sets of local sustainability indicators from cities, in the US, Canada and Europe. Analysis of these 17 studies reveals a lack of consensus on the approach and conceptual framework favoured. The approach varies between studies, depending on the objectives for the use of sustainability indicator and the definitions of sustainability. Moreover, the absence of standard and universal classification methods or approaches to develop local sustainability indicators (Tanguay et al., 2009) led to the difficulty of comparison of an ALSA methodological framework with other approaches or frameworks.

With regards to indicators, there is a lack of consensus on the optimal number of indicators in these 17 studies. They use between 10 and 86 sustainability indicators, while the number of indicators in the current study is 57, which falls within that range. On the other hand, these previous studies do not provide priorities to the key indicators unlike the ALSA methodological framework.

Although, the 17 studies cover cities of western countries that share many of the same characteristic and values, very few indicators are repeated in more than five studies.

These trends obviously reveal the lack of consensus on local sustainability indicators. However, 9 indicators in the findings of the current study are found and repeated more than four times in previous 17 studies, such as: Unemployment rate; 8 times, Number of crimes reported/ detected and convictions per month; 7 times, Proportion of population below 1$ a day; 6 times, Percentage of waste which is recycled; 6 times, Secondary or Primary School Completion Ratio; 5 times, Amount of sustainable or natural vegetative cover surrounding the city and amount of green space per 1000; 4 times, Proportion of the city's population served by modern water supply; 5 times, Average class size; 4 times.

The most common classifications of the 17 studies indicators were regrouped according to the three classic dimensions of sustainability: economic, environmental and social. ALSA findings are consistent with this classification, but with the addition of the institutional dimension, depending on the CSD Theme Indicator Framework (2001) adopted for the ALSA methodological framework. On the other hand, the number of indicators related to the environmental dimension of the 17 studies exceeds that of the other dimensions. This is not consistent with ALSA results as social indicators exceed the environmental indicators. The reason for this is due to the fact that the environmental dimension is characterized by a large variety of indicators because of a lesser consensus on them while the social, economic and institutional dimension indicators are more consensual. Moreover, in the current study the classification does not take into consideration the indicators that overlap two or three dimensions, a situation often disregarded in studies of sustainability. In addition, these results may appear unexpected at first sight, but they are likely to reflect the situation found in the city of Hilla, Iraq, which has suffered from many conflicts resulting in insecurity and poverty, as mentioned in the previous section, leading to increased interest in social

themes to reflect the necessities of the city of Hilla at the expense of environmental themes.

6.5 Outputs' Effectiveness

When applying a methodology such as the ALSA methodological framework, it is necessary to assess the effectiveness of its outputs (indicators) and in this way, check whether the framework has really developed key local sustainability indicators in line with its aim. For this reason, various desirable characteristics of indicators were specified. Given that these desirable characteristics collectively provide a 'wish list' of sorts for sustainability indicators, it would be useful to examine how well they are met by the ALSA methodological framework outputs.

A number of sustainability indicator characteristics have been suggested in the literature (Harger and Meyer, 1996; Hardi and Zdan,1997; Meadows, 1998; Bossel, 1999 and Valentin and Spangenberg, 2000), however, as discussed, the ALSA methodological framework outputs (indicators) reflected the following essential characteristics of a sustainability indicator, namely that they should be simple, credible and understood by the public and policy makers as mentioned previously in step 3 (Indicators formulation). Moreover, indicators must be selected carefully in order to select only those with most potential usefulness (Meadows, 1998). This appears clearly at step 4 (the selection and ranking of indicators) when the indicators were evaluated against three key criteria to select valid and useful indicators: that they should be comparable, measurable and sensitive. In that regard, the suite of indicators shown in Table 5.12 (final set of indicators), which was obtained from the application of the ALSA methodological framework in the city of Hilla, collectively met most of the desirable attributes. Therefore, the ALSA methodological framework can be considered applicable, practical, capable and effective in constructing local sustainability indicators although it

has not produced a balanced outcome. However, there are some areas where the processes of the ALSA methodological framework could be improved, as applied to the city of Hilla, Iraq, which will be discussed in Chapter seven as well as the evaluation of ALSA methodological framework which will be examined in the following section (6.5) by discussing the main strengths, weaknesses, opportunities and threats associated with the ALSA methodological framework.

6.6 SWOT Analysis Technique

In this section the strengths, weaknesses, opportunities and threats of the ALSA methodological framework will be discussed. The understanding of the strengths and weaknesses of the current ALSA methodological framework, tested in the specific context of the Hilla case study, enables further improvement of the existing framework, encourages thinking about issues that may impact the success of a new framework and helps to focus on strengths, avoid weaknesses, make the most of opportunities and reduce threats. Valentin (2001) stated that according to the SWOT analysis approach, these factors are inherent to the four aspects:

1. Strength (S): which is an internal, favourable factor
2. Weakness (W): which is an internal, unfavourable factor
3. Opportunity (O): which is an external, favourable factor
4. Threat (T): which is an external, unfavourable factors

The SWOT analysis reveals the links between various fields and thus shows the importance of the categories (Gercheva, 2003):

1. The link between the opportunities and strengths gives an idea about the development levels.

2. The link between the weaknesses and threats helps to formulate the main problems to be addressed by the development.
3. The link between the strengths and threats defines the development risks.
4. The link between the weaknesses and opportunities identifies the limitations of the development process.

After applying the current ALSA methodological framework at the city of Hilla, its strengths, weaknesses, opportunities and threats have been identified and summarised below.

6.6.1 Strengths

1. Compared to other frameworks produced by authors mentioned in Chapter two, one of the most important strengths of the ALSA methodological framework is that it combines both Bottom–Up and Top–Down approaches; such an approach is the best way to develop indicators which are (Top-Down) scientifically valid and generic with (Bottom-Up) stakeholders and local communities needs. The two approaches, Top-Down and Bottom-Up have been combined in some projects; South Africa (DEAT), 2001, New Zealand, 2002 and Canada (NRTEE), 2003. This reinforces the use of Bottom–Up/Top–Down approaches, exemplified by the ALSA methodological framework developing valid and understandable results for both developers and citizens.
2. The ALSA methodological framework contains systematic and verifiable processes for integrating the views of stakeholders and the local community. Like many previous indicators frameworks (Checkland, 1981 and Bell and Morse, 2004), the ALSA emphasizes the importance of stakeholder

participation. Furthermore, the ALSA considers stakeholder's participation one of the important aspects of the current methodological framework as stakeholder participation plays a fundamental role in step1 of ALSA (issues identification). This provides a contribution in raising awareness of sustainability at a local level through involvement of the local community in the application of the process of ALSA. Also, it offers a transparent and strongly participative process for the development of indicators. Furthermore, ALSA methodological framework acknowledges the need for a shared vision, commitment and participation.

3. The ALSA methodological framework produces a large pool of sustainability indicators and formulates indicators by connecting issues, themes and sustainability objectives together, which lead to a starting point for the future development of sustainability indicators. Furthermore, the ALSA methodological framework relates directly to the principles of sustainable development and coverage of social, economic, environmental and institutional aspects of sustainability. This is in direct contrast to other work which uses either only one dimension (OECD, 2003 and South Africa, (DEAT), 2001) or three dimensions (Canada (NRTEE), 2003, UNCSD, 1996 and UK, 2005). In addition, the ALSA methodological framework enhances the ability to classify systems by identifying a wide diversity of themes.
4. The ALSA methodological framework is a flexible approach due to its applicability in the context of Middle Eastern cities. The final set of indicators (Table 5.12) provides a good reflection upon the investigated case study because of the systematic procedures for selecting the issues, themes and indicators. This point is useful for places with specific conditions (e.g. post conflict) such as Middle Eastern/Iraqi cities that require a focus on

different issues and priorities to other cities (the sustainability indicators which are typically and commonly used might not reflect the issues and priorities of these places).However, previous literatures highlighted the absence of systematic procedures and arbitrary selection of indicators. This produced indicators which do not reflect the real picture (Briassoulis, 2001).

5. The ALSA methodological framework helps to quickly identify problems and different needs followed by finding solutions to them and linking with a framework to assist decision makers to reach and achieve these solutions. The ALSA methodological framework uses a triangulation technique as part of its analysis of collected data. This is an important protocol that ensures the accuracy, the alternative explanations and to confirm the validity of the data.

6.6.2 Weaknesses

1. This proposed new framework combines more aspects related to human activities and needs (social, environmental, economic and institutional issues) compared with the majority of those contained in the previous literature. This could be argued to introduce greater complexity
2. The overlap between themes is not shown explicitly in the framework because the CSD Theme Indicator Framework (2001) which was adopted by the ALSA methodological framework did not consider these overlaps and that led to facilitate the understanding of the majority of stakeholders.
3. There is uncertainty over a number of issues that have been dealt with or addressed as a result of use of the Bottom –Up approach
4. Some resulting indicators do not permit adjustments that reflect either national or other specific circumstances. This has resulted because

ALSA indicators translate the concept of the sustainable city in clear practical terms and that genuinely reflect the problems, issues and themes that are owned by relevant stakeholders and local communities

5. The ALSA methodological framework has not produced a balanced outcome since the environmental issues were not appear at advanced ranking in the final set of indicators. However, these do reflect the necessities of the investigated case study city

6.6.3 Opportunities

1. The ALSA methodological framework can be improved in the future by using the recommendations, further study and assistance from feedback from stakeholders. This might involve highlighting any overlaps between the themes and addressing uncertainties around a number of issues
2. The ALSA methodological framework may help to improve the understanding of a local sustainability problem by using a common language between stakeholders and experts
3. The use of the ALSA methodological framework could result in the activation of the principles contained in the concepts that underpin sustainability
4. The ALSA methodological framework may assist in the development and improvement of existing sustainability evaluation systems
5. The ALSA methodological framework may encourage connection between experts and non-experts and facilitate participation in decision making

6.6.4 Threats

1. The ALSA methodological framework requires changes in traditional thinking, which could be perceived as threatening
2. The variety and number of sustainability dimensions included in the current framework could be discouraging for the first-time user
3. The users may be unable to effectively employ all the methods of gathering information.
4. The decision makers could be confused at the end of the process, particularly where rankings of indicators are similar
5. Because of the broad and complex concept of sustainability and due to the large amount of information and issues that have to be considered, trying to pick the significant issues within a rational framework will be a considerable challenge
6. Because of the broadness and complexity of sustainability, it is difficult to enable consideration of all possible contexts

The next Chapter will highlight the contributions of the research to a larger body of knowledge. Moreover, it will examine the extent to which the objectives set for this research have been met and consider the limitations of the study and recommendations for further work. The suggested directions through which the ALSA methodological framework can be improved in the future are stated in the next Chapter.

Chapter 7.

Conclusions and Further Study

7.1 Introduction

This Chapter highlights major contributions to the body of knowledge on the development of indicators of city sustainability and the achievement of the research objectives is summarized. Finally, it examines the limitations of the study and ends with recommendations for further work.

7.2 Answering the Research Questions

The research sets to address the primary research question: "How can a framework be developed which will provide appropriate sustainability indicators at a local level in Middle Eastern cities? "In order to address this primary research question, the thesis built an ALSA, methodological framework to develop suitable local sustainability indicators to facilitate assessment of local sustainability and tested the framework for its applicability in the city of Hilla as a case study. ALSA succeeded in developing valid and useful indicators to assess the sustainability at the local level.

However, the secondary research questions and consequent findings are reviewed in this section.

The first secondary research question asked was: "What types of indicator frameworks currently exist for evaluating and assessing sustainability?"

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

frameworks as the combination framework may provide the advantages of individual frameworks while at the same time overcoming some of their weaknesses.

The second secondary research question asked was: "How might a local sustainability evaluation framework be constructed and structured?"

To answer this question, a review of existing types of sustainability indicator frameworks in Chapter two had carried out to assist the construction of the new ALSA methodological framework. Additionally, the advantages and disadvantages of these frameworks, which had been diagnosed in the second Chapter aided the choice and combination of frameworks. In the third Chapter a practical ALSA methodological framework was constructed by a combination of a goal-based framework (bottom-up) and a CSD Theme Indicator Framework 2001 (top-down) which could be used as a tool and mechanism for promoting local sustainability assessment.

The third secondary research question asked was: "How well does the sustainability evaluation framework work in practice as a tool and a mechanism for developing a sustainable city?"

This question has been answered through the application of steps 1-4 of the ALSA methodological framework of case study (the city of Hilla) from which insights have been gained and conclusions may be drawn about the practicality of the approach.

The fourth secondary research question asked was: "How does the sustainability evaluation framework need to be further adjusted to address problems faced during its application?"

This question was answered in Chapters 5 and 6. By recognizing some application problems, it has been suggested a number of modifications should be made to the ALSA methodological framework. These proposed modifications or improvements in the initial structure and content of the ALSA methodological framework are mentioned briefly in section (7.3)

This thesis has successfully answered the questions set at the beginning of the study. However, the summary of the aim and objectives achievement also offers an overview with details of how the research questions were addressed in relation to the nine stated objectives of the study.

7.3 Aim and Objectives

The overall aim of this thesis has been to develop an approach to local sustainability assessment using a methodological framework that formulates, selects and prioritises key indicators, which can then guide the assessment and action to improve sustainability at a local level in Middle Eastern cities. Additionally the ultimate output of this ALSA methodological framework is a set of indicators which will be valuable in assessing local sustainability. To reach this aim, several research objectives were developed. The achievement of these research objectives is considered below.

Objective 1: 'To explore and explain the concept of sustainable cities'

Chapter 2 (Literature Review) sought to provide a comprehensive and integrated understanding of the concept of sustainable cities through a review of the definitions of sustainability in general and the sustainable city in particular. Agenda 21 which is the global plan of action for sustainable development, Local Agenda 21 which is a process that assists sustainability at the community level, the role of local authorities in achieving Agenda 21 objectives as well as the benefits of the participation of local authorities in the process of 'Local Agenda 21' were mentioned in this Chapter.

A sustainable city is a city with adequate transportation, adequate construction techniques and materials, a concentration of housing, and food production to reduce the ecological footprint, per capita, of its inhabitants, in addition to use of recycling. Moreover, a sustainable city has the ability to acclimatise to the prevailing local natural

conditions of its bioregion, matching its type of construction, growth, and production to the adjacent ecosystem. It ought to have mechanisms for social debate and communication and political engagement to resolve local issues. However, this thesis adopts a comprehensive view of the sustainable city and has identified it as a city which ought to be economically viable, socially non-violent and environmentally healthy. The first objective of this research was met in this Chapter.

Objective 2:'To understand the role and significance of sustainability indicators'

The literature review described the meaning of sustainability indicators in a general sense by offering an insight into how Agenda 21 assists local authorities in taking numerous actions through consultation with local organizations, citizens, and private enterprises. The first step of a Local Agenda 21 process ought to be the development of a vision of the sustainable society with clear indicators attached (Valentin and Spangenberg, 2000). The literature review also described international, national and local indicators, the purpose of the development of sustainability indicators, indicator development, and criteria for selecting indicators. Generally, a sustainability indicator is a tool for assessing and monitoring change in social, environmental, economic and institutional systems' characteristics. The indicators provide information about the state of the economy and the environment, in order that people can understand government policies, business and voluntary sectors and understand their role in bringing about change. Moreover, the indicators can offer early warning of probable environmental problems caused by the activity of humans as well as evaluate the extent to which policies focused on sustainability are being attained. In other words, sustainability indicators facilitate and guide decision making, assist in recognising key trends in priority sectors, assist in detecting the state of sustainable development. In addition, they inform decision-makers and the general public at both local and national levels, encourage national dialogue about sustainable development, assist in evaluating the

achievement of the government goals and reconsider the need to reset them. So the second objective of this research was met in this Chapter.

Objective 3:'To review the existing types of sustainability indicator frameworks and understand their strengths and weaknesses'.

The review of literature, practice and whole learning from the research based on Hilla case study suggest that sustainability indicators are necessarily developed and delivered through logical structures called frameworks. The literature review set out in Chapter two provides an assessment of some of the existing indicators and frameworks developed for different levels (local, national and international) and review of potential approaches which are used to organize and design indicators. Through a review of existing types of sustainability indicator frameworks, a good level of understanding of the organisation and construction of frameworks has been provided. However, the combination framework is shown to be more appropriate in this instance than other types of frameworks as the combination framework may provide the advantages of individual frameworks while at the same time overcoming some of their weaknesses. So the third objective of this research was met in this Chapter.

Objective 4: 'To develop a practical approach to local sustainability assessment, a methodological framework which could be used as a tool and mechanism for developing local sustainability indicators in a Middle Eastern context'

A review of existing types of sustainability indicator frameworks in Chapter two assisted the construction of the new ALSA methodological framework to develop indicators. Additionally, the advantages and disadvantages of these frameworks, which had been diagnosed in the second Chapter, aided the choice and combination of frameworks. In the third Chapter a practical ALSA methodological framework was constructed by a combination of a goal-based framework (bottom-up) and a CSD

Theme Indicator Framework 2001 (top-down) which could be used as a tool and mechanism for promoting local sustainability assessment.

Middle East countries, especially Arab countries face a number of obstacles towards the sustainability. These obstacles include: the absence of peace as well as security, the continued foreign occupation of some Arab land, poverty and illiteracy, population growth, the debt burden, natural arid region, scarcity of water resources, the modest capacity of the academy and research institutions, demographic change, unemployment, the Arab Spring, the financial crisis, energy security, climate change, natural disasters, drought, desertification, loss of biodiversity and migration. (ESCWA, 2011). Therefore, there are major challenges to overcome to reach sustainable city in this context. It is argued that this ALSA methodological framework offers a transparent and strongly participative process for developing sustainability indicators in a Middle Eastern context.Accordingly the fourth objective of this research is met.

Objectives 5 and 6: ‘To test the proposed ALSA methodological framework in a selected case study in a Middle Eastern city**’** and **‘**To rank the local sustainability indicators in order of priority in the selected case study’.

These two objectives are to test the applicability of the ALSA methodological framework. This has been achieved through the application of steps 1-4 of ALSA methodological framework at case study (the city of Hilla) from which insights have been gained and conclusions may be drawn about the practicality of the approach. A questionnaire was designed in order to rank the local sustainability indicators in order to priorities the indicators in the case study. The survey results were analysed and summarised, as shown in Table 5.14. These objectives have been met in Chapters 5.

Objective 7: ‘To evaluate the ALSA methodological framework by using the SWOT analysis technique’.

Evaluation of the ALSA methodological framework was achieved by using the SWOT analysis technique to identify its strengths, weaknesses, opportunities and threats. The seventh objective was achieved in Chapter six

Objective 8:'To recognize key application problems and suggest modifications'

This objective was addressed in Chapters 5 and 6. By recognizing some application problems, it has been suggested a number of modifications should be made to the ALSA methodological framework. These proposed modifications or improvements in the initial structure and content of the ALSA methodological framework are as follows:

The first improvement was in term of key sustainability themes, the draft forms of the sustainability indicators, CSD Theme Indicator Framework, (UNCSD, 2001) have 13 sustainability themes: 6 social themes (Equity, Health, Education, Housing, Security, Population); 3 environmental themes (Atmosphere, Land, Fresh Water), 2 economic themes (Economic structure and Consumption and production patterns) and 2 institutional themes (Institutional Framework, Institutional Capacity). The 13 sustainability themes were rearranged in the ALSA methodological framework. However, sustainable tourism and governance were introduced as new themes because of the emerging need for them to support the sustainability in the city of Hilla. This change brought consequent improvement and specification to the existing themes.

The second improvement was made regarding stakeholders participation in interviews to gather information. There was difficulty in achieving a gender balance using focus groups recruited in mosques because of the nature of the Muslim community that it avoids the mixing of men and women. Efforts were made to avoid this problem by trying to focus on a larger number of women in the interviews. The same problem has been recognized and modified with respect to the Christian community and other religious minorities. In such studies, the cultural context needs to be taken into account. However, these application problems belong to the city of Hilla, Iraq, and do not affect

the substance of the ALSA methodological framework. Furthermore, they probably will not appear in other cities in the Middle East.

Therefore, a more powerful, accurate and comprehensive mechanism has ultimately been achieved in this research for promoting local sustainability assessment.

Objective 9: 'To propose future research recommendations'

This objective has been met in section 7.5, as some recommendations for further work have been mentioned.

The revised methodological framework, including key sustainability themes, sub themes, and indicators, provides an important tool and a mechanism for promoting local sustainability. Thus, the overall aim and the attendant objectives of the research have been achieved.

7.4 Limitations of the Research

Although the development and the application of the ALSA methodological framework has resulted in useful outcomes, a number of limitations ought to be acknowledged. There were some restrictions on the research, such as finance and time because it was undertaken within the context of a Ph.D. In an ideal setting, there were some parts of the work that could have been carried out in a different way. This was especially the case with the application of the ALSA methodological framework to the city of Hilla, Iraq.

In order to improve the research process and the ALSA methodological framework, the following limitations should be taken into account in future studies:

1. Holding an open conference

A public participation open conference was supposed to be held (planned by author but did not take place) in the city for local communities and local authorities in order to promote understanding of the concept of sustainability and to identify their hopes and wishes for achieving a sustainable city. Since people with knowledge or understanding

can be relied upon as a source of information in generating a local sustainability indicator framework.

2. Selected issues and indicators:

The majority of significant issues has been identified and selected in this study. However, some of important issues (not identified by stakeholders and local communities) and their related indicators were absent in this study despite their growing importance, especially ozone layer depletion and water quantity, which expected to be included in future applications of the ALSA methodological framework. However, a combined Top- Down and Bottom-Up approach addressed this issue

3. Formulation of indicators by a workshop with a team of experts

The formulation of indicators during the application of the proposed framework for the city of Hilla was conducted by the researcher with the assistance of expert consultation. However, to ensure the highest levels of appropriate indicators, it would be more suitable to formulate indicators by a workshop with a team of experts. Because of the time and financial constraints mentioned previously, it was very difficult to conduct such a workshop. Thus, the researcher needed to reduce any possible biases in the formulation process by conducting consultation with experts in various fields and using respected literatures.

4. Selection of case study for future investigations

The researcher was based in the UK and the case study was in Iraq, which led to many problems. Thus, it would be better to select the case study from the same country of origin as the researcher, if possible. This would ensure ease of conducting practical implementation of the evaluation framework.

5. Skype interviews

Skype interviews were considered to be the most appropriate technique for assembling the required data from the 40 stakeholders in the city of Hilla. However, some

deficiencies emerged: a number of stakeholders could not be contacted because of the time difference between the UK and Iraq; some of the calls were of poor quality; and there was a problem with dropped calls owing to the weak internet connection and bad internet service in Iraq.

This thesis makes an important contribution to our knowledge of assessing local sustainability, regardless of these obstacles. Additionally, many of these limitations will be overcome through the continual adaptation and updating of the ALSA methodological framework. As a result, this study has succeeded in constructing the ALSA methodological framework for assessing sustainability at a local level.

7.5 Recommendations for Further Work

Although the ALSA methodological framework is strong, some recommendations for further work are mentioned below.

1. Identifying the indicators potential targets:

There has been a desire to embrace the targets measurements of the indicators, but obstacles such as finance and time prevented that. Thus, further work will be advisable to identify targets in order to demonstrate the accomplishment of the goal.

2. Enforcing a balance between the four pillars of sustainability to overcome the ignorance of some important sustainability issues by forcing people to choose issues from each four pillars.

7.6 Contribution of the Thesis to Knowledge

The key contributions of the present study were mentioned earlier, briefly, in Table 1.1 and will be mentioned here with some detail as the following**:**

The original contribution of this thesis is the ALSA methodological framework that combines Bottom–Up and Top–Down approaches and provides a flexible, participatory and systematic approach for the formulating, selecting and prioritisation of key indicators for local sustainability assessment in Middle Eastern cities.

The other contributions of the thesis are as follows:

1. This thesis seeks to be pioneering by adding knowledge and understanding of the development of a sustainability methodological framework to develop local indicators in a post conflict, Middle Eastern city in an oil rich country.

2. The thesis reviews a number of definitions of sustainability and sustainable cities along with providing a good level of understanding of construction and use of indicators in sustainability and sustainable cities.

3. The thesis reviews existing types of sustainability indicator frameworks and shows their advantages and disadvantages.

4. The ALSA methodological framework enables indicators to reflect the problems and needs of local sustainability through its Bottom–Up approach. Thus, this process will assist decision makers to make better decisions in the context of local sustainability assessment.

5. This thesis provides a set of priority indicators of local sustainability and a methodology for prioritizing these by experts in a post conflict, Middle Eastern city in an oil rich country.

6. The process of applying the ALSA methodological framework to the city of Hilla which has been illustrated in this study, provides a variety of benefits for the practice and research of local sustainability.

7. The thesis has developed a tool for developers and local authorities which is a new inclusive local sustainability assessment ALSA methodological framework.

Additionally, recommendations for its successful application in practice have been proposed.

8. This research has carried out a new empirical study in the city of Hilla, Iraq, which supports and promotes the adoption of mechanisms to achieve local sustainability in this city for the first time.

9. A practical contribution to local sustainability assessment in Iraq and other Middle Eastern countries has been made by this research. It has ascertained 15 themes that should be prioritized for future development and elaborated the details of the application of the proposed local sustainability evaluation framework.

10. The various four steps of the ALSA methodological framework have many advantages. Firstly, they facilitate the explanation and justification for how and why a particular indicator was formulated and selected for those who are interested. Secondly, the systemization of the ALSA methodological framework provides a clear structure that can be reviewed to enable any modification or any auditing needed when a question is later raised and there is a need to audit the indicator formulation or selection process.

11. The objectives, in addition to their related attached indicators, can play a valuable role in translating the concept of the sustainable city in clear practical terms since together they reflect those problems, issues and themes that are taken by relevant stakeholders and local communities to be of most importance to the local sustainability assessment.

12. Since the participation of stakeholders is key to sustainability analysis, the ALSA methodological framework provides a robust process for identifying and entering the opinions of multiple stakeholders into sustainability analysis. This process of identifying and entering stakeholder views into the local sustainability assessment process has been explained in detail in this thesis and has been verified through the application of the ALSA methodological framework for the city of Hilla, Iraq.

As a result, the author believes that this study has made a major contribution to the body of knowledge on sustainability by developing an ALSA methodological framework that combines Bottom–Up and Top–Down approaches and provides a flexible, participatory and systematic approach that will facilitate the formulation, selection and priorities of key indicators which can then guide the assessment and action to improve sustainability at the local level in Middle Eastern cities.

Appendix

Appendix A: Semi Structured Interviews

ENVIRONMENTAL
BUILDING
WITH
PLYMOUTH
UNIVERSITY

Towards Sustainable Middle Eastern Cities: A Local Sustainability Assessment Framework

I am Mustafa Al-Alwani a PhD student at Plymouth University, as part of my on-going research into sustainability at the level of Hilla city, Iraq. I am carrying on a survey concerning the problems and needs of Hilla city in relation to Hilla's Sustainable future. Your views are important to this research and I would be grateful if you could respond to each of the questions below describing your own views in relation to a sustainable future for Hilla city.
Please write your responses below each question, continuing on a separate sheet if necessary. The survey should not take long to complete and all of the information provided will be treated in strict confidence. I would be happy to furnish you with a copy of the findings of the work if you are interested in them. Your support for our research is greatly appreciated.

Identification
Name:
Position:
Company name:
Postal address

Would you like to receive a summary of the results of this survey? Y/N

Interview Questions

The overall aim of this study is to develop a relevant approach which will create a series of appropriate sustainable indicators for Hilla city by identifying Hilla city's problems and needs. So the interview will start with a general discussion about the problems and needs which face Hilla city in the short, medium and long term, during discussion will ask these questions:

What is your idea about the future of Hilla?
What are your wishes for the development of Hilla?
How can Hilla be improved in your view?
(More questions will be pick up through discussion)

Appendix B: Unified findings set which includes the triangulating valid results reflect the problems and needs of the city of Hilla

Social Problems
High unemployment
Lack of interest in graduates and provides suitable job opportunities
High rate of poverty
Insufficient activity in the training and rehabilitation of the poor
Lack of social programs for vulnerable groups
Lack of social assistance
Weakness of women's awareness of their rights
Increased married women before their completion their study
The discrimination against women
Lack of women work in the private sector
Increasing number of deaths of women during pregnancy and childbirth
Increasing numbers of deaths under the age of 40
Ageing and Inefficient potable water network
Inefficient or non-existent sewerage network
Degradation of sanitation services
Lack of well managed landfill sites
Absence of waste recycling process
The presence of violations on water supply networks
Lack of potable water provision
Scarcity of drinking water
Undrinkable water
Weakness of qualitative control over water supplies
Prevalence of chronic diseases among slum dwellers
Controlling communicable diseases
Poor health status
Decreasing life expectancy
Lack of qualitative control on medications which imported from the private sector
Lack of ambulances
Shortage of health centres
The lack of specialized hospitals equipped with modern equipment
The limited role of the private sector in the provision of health services
Inefficiency of health services
Lack of specialized healthcare staff
Shortage of nursing staff
Shortage of Doctors
Lack of attention to the elderly and orphans
Increased number of students who drop out of school at the primary level
Increased number of young people without secondary education
Weakness of teachers' capabilities
Inadequate and outdated teaching methods
Weakness of educational curriculum
Remoteness of schools for students in some areas
Insufficiency of school buildings
Decrease in the number of primary and secondary schools of the population
Inadequacy of some schools for students
Inefficiency level of university education in terms of scientific methods
Lack of support and adequate housing for University teachers

Appendix B Continued

Lack of support for the private sector in education
Lack of effective interaction between the city and the university
Lack of coordination between the educational system and the need of the labour market
Focusing on humanitarian disciplines and human resources rather than scientific and technical disciplines
Increase horizontal expansion rather than vertical expansion in universities
Strengthen the quantitative development rather than the qualitative development in higher education
Lack of and inefficiency of education services
Growth of private lessons in primary and secondary schools
Brain drain
Prevalence of illiteracy
The rarity number of readers of newspapers
Lack of adequate housing for poorer families
The presence of a large housing deficit
The increasing phenomenon of random housing
Expansion of slum housing units
Lack of housing for the families of the martyrs, widows and poor families
Increasing the number of displaced families
Deterioration in the residential environment in the city centre and old neighbourhoods
Poor enforcement of laws
Inefficient use of modern technology to enhance the security situation
Increasing of crimes
Terrorism and instability of the security situation
Bad security situation
Weakness of the government's role of reducing the ongoing migration from the countryside to the city
Environmental Problems
Increasing dust storms and unprecedented high temperatures in summer
Pollution of air by gases especially carbon monoxide and carbon dioxide
Lack of attention to air pollution
Increase the use of smaller generators which lead to air pollution
Using black heavy products such as oil in the operation of power plants and many other industrial areas as an industry bricks
Using black heavy products such as oil in the operation stone ovens for baking
Lack of using the modern irrigation system
Lack of protective policy for the agricultural production
Lack of government support for agriculture product
Lack of utilization of some agricultural lands
Increase soil salinity
Absence of drainage networks in most areas
Lack of land reclamation projects
Raised levels of ground water
Primitive agricultural production
The scarcity of agriculture machinery and equipment
Ageing of agricultural machines, Irrigation water network, equipment
Lack of support for the requirements of agriculture
The disregard of agricultural cycle by the farmers
Lack of support for producing agricultural requirements
Weak agricultural guidance
The deterioration of land fertility
Scarcity of fertilizers and their high prices
Wounding of many agricultural crops by pests
Inefficiency of the agriculture pesticides
Increasing desertification and water scarcity

Appendix B Continued

Weakness of awareness about desertification
Lack of green areas (gardens, parks)
Weakness of laws regulating the ownership of agricultural land
Use of agricultural lands for other purposes
Pollution of Hilla river water with organic matter and heavy metals
High groundwater levels of irrigation projects and sanitation near the ancient city and archaeological sites
High salinity in the ancient city and archaeological sites
Absence of awareness regarding the importance of tourism in the province
Bad tourism management
lack of interest in the archaeological sites
lack of promotion and marketing tourism methods.
lack of the necessary equipment to detect the archaeological collections
Poor protection of archaeological sites and a continuation of abuses
Lack of experience in specific fields of archaeological sites
Lack of good quality hotels and transport facilities serving the ancient city of Babylon.
Limited financial resources destined for tourist activity
Lack of financial to archaeological site maintenance
Absence of recreation centres
Economic Problems
Lack of support for foreign investment and the need to encourage it
The absence of laws to protect the investor
Depending on imports to meet the local market's needs
Weakness of trade exchange between the city and the other provinces
The haphazard policy of importing vehicles and equipment
Increasing traffic jams
Lack of quality control over imports
Neglecting factories
Backwardness and weakness of local industries
Limited self-sufficiency and reliance on imports
Limited food and agricultural products industry
Undeveloped banking and financial services
Breakdown of trust between banks and their customers
Poor access to credit and banking facilities for customers
Dependence on central government as source of funding
Weakness of the private sector and difficulty in accessing financial and technical support from the state
Increase the consumption of gasoline, oil and kerosene
Lack of support for the production and marketing of livestock and livestock products (cows, sheep, chicken, meat, eggs, milk)
Lack of shopping centres and shops with international standards
The ageing and leakage of water networks
Inadequate supply of energy to meet demand
Poor quality and unreliability of electricity generation and supply networks
Increase consumption of electricity because of backing tariff
Lack of interest in environment-friendly technology and clean energy sources
Accumulation of solid waste in residential areas
Not reusing treated wastewater
Insufficient waste water treatment plant in many industries
Absence of pedestrian crossing lines
Shortage of footbridge to cross
Increasing traffic congestion
Increased percentage of unpaved roads and bad pavement of roads
Lack of roads' comprehensive maintenance
Destruction of roads by transfer largest proportion of the good son the road network

Appendix B Continued

Lack of bus stop stations in most roads
Institutional Problems
Weakness and lack of attention to potential EIA studies
Lack of the role of civil society organizations
Lack of coordination between departments of the ministries with each other
Adoption of management centralization rather than decentralization
Poor and inadequate internet services
Neglect of the postal mail service
Insufficient telephone network
Ageing and collapse of the infrastructure of the communication network
Poor mobile communication services
The failure of some individuals within the institutional structure to embrace modern information technology
Inefficient the existing of emergency services
Weakness of administrative monitoring
Increase of financial and administrative corruption
Political problems

Appendix C: The full sets of objectives formulated in the third step of the ALSA methodological framework

Social Problems	Objectives	Suggested actions
-High unemployment -Lack of interest in graduates and provides suitable job opportunities	-To reduce unemployment	-Creation of job opportunity
-High rate of poverty	-To reduce poverty	-Improve life level
-Insufficient activity in the training and rehabilitation of the poor -Lack of social programs for vulnerable groups	-To rehabilitate and to train of the poor and vulnerable groups	-Providing financial, training and support to the unemployed to help them establish their own business with a focus on vulnerable employment
-Lack of social assistance	-To increase social assistance	-Provide of social support for vulnerable citizens
-Weakness of women's awareness of their rights -Increased married women before their completion their study -The discrimination against women -Lack of women work in the private sector	-To increase of women's awareness of their rights -To decrease the number of women getting married before their completion their studies. -To decrease discrimination against women -To increase the number of women working in the private sector	-Opening institutes for training, employment and awareness development for females under the supervision of the Governorate -Establishing a centre for research into female issues, allocating required budget from the Ministry of Women -Opening vocational education institutes for women and lending money for women to have small projects
-Increasing number of deaths of women during pregnancy and childbirth	-To reduce the level of perinatal mortality	-Providing welfare for women during childbirth/pregnancy
-Increasing numbers of deaths under the age of 40	-To reduce the level of deaths under the age of 60	-Raising health awareness among all members of the community
-Ageing and Inefficient potable water network -Inefficient or non-existent sewerage network -Degradation of sanitation services	-To improve the potable water network and sewerage network -To improve sanitation services	-Maintaining and rehabilitating of the old and the inefficient water and wastewater networks -Improve sanitation facilities
-Lack of well managed landfill sites	-To provide well managed landfill sites	-Allocating suitable land by a municipality for managing landfills
-Absence of waste recycling process	-To establish a waste recycling process	-To establish, support and promote recycling to maximize use of waste as primary material
-The presence of violations on water supply networks	-To remove violations of water supply networks	-Prevent violations of water supply networks

Appendix C Continued

Social Problems	Objectives	Suggested actions
-Lack of potable water provision -Scarcity of drinking water	-Increase the geographical coverage provision of potable water	-To follow up and complete all Ministry contracts to implement all water projects for the city
-Undrinkable water -Weakness of qualitative control over water supplies	-To improve drinking water quality	-Establishing modern laboratories
-Prevalence of chronic diseases among slum dwellers -Controlling communicable diseases	-To reduce communicable and chronic diseases	-Increasing health awareness among slum dwellers
-Poor health status -Decreasing life expectancy	-To improve health status and life expectancy	-Providing health care services that meet modern standards
-Lack of qualitative control on medications which imported from the private sector	-To increase importation of medications from reliable sources	-Import good quality medicines -enforce laws about counterfeit medicines
-Lack of ambulances	-To increase the number of ambulances	-Improved provision of ambulances
-Shortage of health centres -The lack of specialized hospitals equipped with modern equipment -The limited role of the private sector in the provision of health services	-To increase the number of health centres -To construct specialized hospitals equipped with modern equipment -To increase the role of the private sector in the provision of health services	-To provide specialized hospitals with modern equipment -To build health centres with modern medical equipment - To encourage the private sector to invest in the provision of health services
-Inefficiency of health services Lack of specialized healthcare staff	-To increase the number of trained medical staff	-Conducting training courses supervised by foreign developed staff
-Shortage of nursing staff	-To increase the number of nurses	-Establishing of new nursing colleges and employing them
-Shortage of Doctors	-To increase the number of doctors	-Establishing of new medical colleges and employing them
-Lack of attention to the elderly and orphans	-To give increased priority to the needs of the elderly and orphans	-Providing welfare for the elderly and orphans
-Increased number of students who drop out of school at the primary level -Increased number of young people without secondary education	-To reduce the number of young people without secondary education	-Activation of the Compulsory Education Law
-Weakness of teachers' capabilities	-To rise level of teachers' capabilities	-Increase training and qualifications of teaching staff
-Inadequate and outdated teaching methods -Weakness of educational curriculum	--To improve curricula and teaching methods	-Develop advanced curricula and educational programs that are in line with the advances in the field worldwide
-Remoteness of schools for students in some areas -Insufficiency of school buildings	-To provide a sufficient number of primary and secondary school -Construct a sufficient number primary and secondary school	

Appendix C Continued

-Decrease in the number of primary and secondary schools of the population -Inadequacy of some schools for students		
Social Problems	**Objectives**	**Suggested actions**
Inefficiency level of university education in terms of scientific methods	To increase the quality of teaching in universities in terms of scientific methods	Providing scholarships to the university lecturers
Lack of support and adequate housing for University teachers	To provide decent housing for university teachers	Construct decent housing for university teachers to attract and retain good teachers
Lack of support for the private sector in education	To support private sector involvement in education	Encourage the private sector to invest in the education sector
Lack of effective interaction between the city and the university	To increase interaction between the city and the university	Support the mechanisms of interaction between the city and the university
Lack of coordination between the educational system and the need of the labour market	Raise level of coordination between the educational system and the needs of the labour market	Encourage study the disciplines that meet the labour market needs
Focusing on humanitarian disciplines and human resources rather than scientific and technical disciplines	To focus on scientific and technical disciplines in higher education	Support of scientific can technical disciplines in higher education
-Increase horizontal expansion rather than vertical expansion in universities -Strengthen the quantitative development rather than of the qualitative development in Higher education	To emphasis on vertical expansion (qualitative development)	Strengthening the qualitative development in Higher education
Lack of and inefficiency of education services	To improve education services	Provide the basic necessities for education: laboratories, equipment, sports utilities and teaching aids
Growth of private lessons in primary and secondary schools	To reduce the need for private lessons	Improve education methods
Brain drain	To reduce brain drain	Encourage qualified and skilled people to return to the city
Prevalence of illiteracy	To reduce illiteracy	Constructing school for eliminating illiteracy
The rarity number of readers of newspapers	To increase the number of readers of newspapers	Promote interest in the newspapers and other print media
-Lack of adequate housing for poorer families -The presence of a large housing deficit -The increasing phenomenon of random housing	-To eliminate of the housing crisis	-Design of a strategic development that includes the implementation of new housing complexes using modern technology can accommodate the inhabitants of the slums , poor families, families of the martyrs , widows and displaced families

Appendix C Continued

-Expansion of slum housing units -Lack of housing for the families of the martyrs, widows and poor families -Increasing the number of displaced families		
Social Problems	**Objectives**	**Suggested actions**
Deterioration in the residential environment in the city centre and old neighbourhoods	To improve the residential environment in the city centre and old neighbourhoods	Supporting the development and rehabilitation of the residential environment in the city centre and old neighbourhoods
Poor enforcement of laws	To enforce laws	Support enforcement of laws against criminal activity
Inefficient use of modern technology to enhance the security situation	Effective use of modern technology to enhance the security situation	Provide new technological apparatus
-Increasing of crimes -Terrorism and instability of the security situation -Bad security situation	-To improve the capabilities of police members -To increase preventive processes against terrorism -To prevent racial discrimination and sectarianism and increase a culture of tolerance and citizenship	-Improving the capabilities and increasing the professional level of police members -Formation an intelligence centre to support security personnel with information -Establish a law prohibiting racial discrimination and sectarianism between citizens, preventing incitement. -Promote a culture of tolerance and citizenship and support media programs to detect the tragic dimensions of sectarian policy and the call to renounce violence
Weakness of the government's role of reducing the ongoing migration from the countryside to the city	To decrease migration from the countryside to the city	Designing a strategy to raise the standards of living in the rural areas in order to reduce urban immigration from the countryside

Appendix C Continued

Environmental Problems	**Objectives**	**Actions**
Increasing dust storms and unprecedented high temperatures in summer	To reduce the impact of dust storms and high temperatures	Provide vegetative cover (green belt) around the city and green areas within it
-Pollution of air by gases especially carbon monoxide and carbon dioxide -Lack of attention to air pollution -Increase the use of smaller generators which lead to air pollution -Using black heavy products such as oil in the operation of power plants and many other industrial areas as an industry bricks -Using black heavy products such as oil in the operation stone ovens for baking	-To reduce air pollution	-To ensure that residents are not exposed to harmful levels of air pollution as reflected in international standards -Raise awareness among members of the community of the risks of air pollution -To put in place a set of controls over emissions from power generation and industrial plant -To impose minimum emission standards for domestic and industrial appliances
Lack of using the modern irrigation system	Use of modern irrigation systems	Provide farmers with access to sustainable irrigation systems
-Lack of protective policy for the agricultural production -Lack of government support for agriculture product	To support agricultural production	To provide government subsidies for agricultural products
Lack of utilization of some agricultural lands	-To utilize of agricultural lands	-Using the potentially productive agricultural land
-Increase soil salinity -Absence of drainage networks in most areas -Lack of land reclamation projects -Raised levels of ground water	-To decrease soil salinity	-Restore/ reclaim damaged agricultural land
-Primitive agricultural production -The scarcity of agriculture machinery and equipment -Ageing of agricultural machines, Irrigation water network, equipment -Lack of support for the requirements of agriculture -The disregard of agricultural cycle by the farmers -Lack of support for producing agricultural requirements -Weak agricultural guidance -The deterioration of land fertility	To support the agriculture sector	Promote the agriculture sector based on scientific knowledge and best practice
-Scarcity of fertilizers and their high prices -Wounding of many agricultural crops by pests -Inefficiency of the agriculture pesticides	To provide and support the fertilizers and pesticides	Ensure that farmers have access to competitively priced agricultural inputs (Seeds , pesticides and fertilizers)

Appendix C Continued

Environmental Problems	**Objectives**	**Actions**
-Increasing desertification and water scarcity -Weakness of awareness about desertification	-To raise awareness and understanding of the risks of desertification	-Develop appropriate mitigation measures for desertification
Lack of green areas (gardens, parks)	To increase green spaces	Provide adequate support for the establishment of green areas
-Weakness of laws regulating the ownership of agricultural land -Use of agricultural lands for other purposes	-To prevent use of agricultural lands for other purposes	Activate laws which regulating the ownership of agricultural land
Pollution of Hilla river water with organic matter and heavy metals	To prevent pollution of Hilla river water	To develop and enforce laws and regulations regarding the disposal of untreated sewage and industrial effluent into watercourses
-High groundwater levels of irrigation projects and sanitation near the ancient city and archaeological sites -High salinity in the ancient city and archaeological sites	To ensure that the ancient city and archaeological sites are fully protected from high groundwater levels and salinity	Develop appropriate mechanisms to reduce the level of groundwater and salinity
-Absence of awareness regarding the importance of tourism in the province -Bad tourism management -The lack of interest in the archaeological sites -The lack of promotion and marketing tourism methods.	To encourage the development and promotion of sustainable tourism	Allocate sufficient funds for the development of the tourism sector
-The lack of the necessary equipment to detect the archaeological collections -Poor protection of archaeological sites and a continuation of abuses -Lack of experience in specific fields of archaeological sites	To build the capabilities of workers in the tourism sector	Provide specialized training programs in addition to benefiting from the expertise of other countries
-Lack of good quality hotels and transport facilities serving the ancient city of Babylon. -Limited financial resources destined for tourist activity -Lack of financial to archaeological site maintenance -The absence of recreation centres	To secure the necessary funding for the development of sustainable tourism and recreational activities	Encourage the investment in tourism sector

Appendix C Continued

Economic Problems	**Objectives**	**Actions**
-Lack of support for foreign investment and the need to encourage it -The absence of laws to protect the investor	-To support and protect investors	-Create a legal framework and an environment that will encourage and support foreign investment
-Depending on importsto meet the local market's needs -Weakness of trade exchange between the city and the other provinces	-To increase the competitive supply of local goods and services -To increase the trade exchange between the city and the other provinces	-Encourage the production and consumption of local goods and services -Encourage the trade exchange between the city and the other provinces
-The haphazard policy of importing vehicles and equipment -Increasing traffic jams	To regulate the importation of vehicles	Put in place clear regulations over the importing of vehicles
Lack of quality control over imports	To enforce on quality control over imports	Supporting quality control over imports and seizure of imported goods which do not meet minimum standards
-Neglecting factories -Backwardness and weakness of local industries -Limited self-sufficiency and reliance on imports -Limited food and agricultural products industry	To support industries	Encouraging investment in and the sustained growth of local food and manufacturing industries
-Undeveloped banking and financial services -Breakdown of trust between banks and their customers -Poor access to credit and banking facilities for customers	To develop efficient and effective banking services	Establish a modern and robust banking system capable of meeting the needs of its customers for loans and services
-Dependence on central government as source of funding -Weakness of the private sector and difficulty in accessing financial and technical support from the state	To support the private sector	Facilitate and encourage development and growth of the private sector across the economy
Lack of support for the production and marketing of livestock and livestock products (cows, sheep, chicken, meat, eggs, milk)	To support for the production and marketing of livestock and livestock products (cows, sheep, chicken, meat, eggs, milk)	Increase the supply of livestock and livestock products for local consumption
Lack of shopping centres and shops with international standards	To expand of shopping centres and shops with international standards	The citizens of Hilla should have access to a full range of competitively priced goods
The ageing and leakage of water networks	To ensure that water supply provide adequate supplies of good quality water across the city	Improve water networks
-Inadequate supply of energy to meet demand -Poor quality and unreliability of electricity generation and supply	To deliver adequate and reliable electricity supplies to meet demand	Construct new electric power generation
Increase consumption of electricity because of backing tariff	To decrease consumption of electricity	Raise awareness among citizens in order to rationalize electricity consumption

Appendix C Continued

Increase the consumption of gasoline, oil and kerosene	To encourage the use of clean energy sources	Raise 0gasoline, oil and kerosene prices
Lack of interest in environment-friendly technology	To rise level of interest in environment-friendly technology and clean energy sources	Develop plans to increase the contribution of alternative energy in the total energy production, and increased reliance on renewable energy
Accumulation of solid waste in residential areas	To prevent accumulation of solid waste in residential areas	Increasing proportion of lifting solid waste in the city centre
Not reusing treated wastewater	To support the reuse of treated wastewater	Increase the awareness about the importance of reusing treated wastewater
Insufficient waste water treatment plant in many industries	Emphasis on importance of availability of waste water treatment plant in each factory	Setting treatment units at each factory
-Absence of pedestrian crossing lines -Shortage of footbridge to cross	-To increase of pedestrian crossing lines and footbridge	Building pedestrian bridges using the most recent methods to alleviate the suffering of citizens
Increasing traffic congestion	To reduce traffic congestion	Provide public transportation
-Increased percentage of unpaved roads and bad pavement of roads -Lack of roads' comprehensive maintenance -Destruction of roads by transfer largest proportion of the good son the road network	To increase and improved paved road	Maintaining and upgrading the internal road networks
Lack of bus stop stations in most roads	To increase of bus stop stations	Build a bus stop station

Appendix C Continued

Institutional Problems	**Objectives**	**Actions**
Weakness and lack of attention to potential EIA studies	To promote EIA studies	To put in place a requirement that major projects and programs are subject to EIA undertaken by appropriate experts
Lack of the role of civil society organizations	To activate the role of civil society organizations	Developing the capacity of institutions of civil society
Lack of coordination between departments of the ministries with each other	To increase coordination between departments of the ministries	Develop effective coordination between departments of the ministries with each other
Adoption of management centralization rather than decentralization	To adopt management decentralization	Achieve an appropriate devolution of authority/power, resources and decision making to the city authority
Poor and inadequate internet services	To improve internet services	To provide businesses and residents with good and affordable access to high capacity Internet services
Neglect of the postal mail service	To promote the postal mail service	To ensure that business and individuals have access to a reliable and cost effective postal service
-Insufficient telephone network -Ageing and collapse of the infrastructure of the communication network	To increase number of modern telephone landline	Develop modern telephone landline distribution networks across the city and its surroundings
Poor mobile communication services	To improve the mobile communication services	To establish modern mobile communications networks and services through the participation of private telecommunications companies
The failure of some individuals within the institutional structure to embrace modern information technology	To ensure the comprehensive use of ICT across the public administration	Rehabilitation of employees through training programmes
Inefficient the existing of emergency services	To improve the existing emergency services	Provide modern and effective emergency services across the city
-Weakness of administrative monitoring -Increase of financial and administrative corruption	To eradicate administrative and financial corruption	Activating the role of the Integrity Commission
-Political problems -Continuing disagreements between political parties	To overcome and resolve the disagreements between political parties	Develop law which limiting the political problems
-Lack of trust between citizens and local councils -Decrease the number of participants in local elections	To increase the institutional or organizational confidence	Promote civic participation of citizens in religious and government institutions
Merge of religion and politics	Separation of religion and politics	Develop law which limiting the merge of religion and politics

Appendix D: Indicators excluded from initial list

Indicator	Reason
Amount of social assistance funding provided	Not comparable and not sensitive
Number of recorded violations on water supply networks	Not measurable
The percentage of medications which imported from reliable sources	Not measurable
The number of ambulances serving city hospitals	Not sensitive
Amount of public funding for the training of medical staff	Not comparable
A number of cultural institutions and activities	Not measurable , Not comparable
The amount of public funding provided for the training of teaching staff	Not comparable
Number of schools applying modern teaching standards	Not comparable
A number of lecturers who have received scholarships	Not sensitive
Number of housing equipped with best standards for university teachers	Not comparable
Number of private schools and universities	Not comparable
Number of activities between city and the university of Babylon in various fields	Not comparable
Percentage of scientific and technical students in higher education	Not sensitive
Number of subspecialties in Higher education	Not comparable
Amount of public funding for the basic necessities of education	Not sensitive
Percentage of pupils receiving private tuition.	Not measurable
Number of qualified and skilled people returning to Hilla City	Not measurable
Percentage of Sales of newspapers and other print media	Not measurable
Public fund for development and rehabilitation of the residential environment in the city centre and old neighbourhoods	Not sensitive
The amount of public funding for developing the capabilities and increasing the professional level of police members.	Not sensitive
Number of preventive processes against Terrorism	Not comparable
Proportion of immigration from the countryside into the city.	Not measurable
Public fund for Training and increasing the skills workers in the tourism sector	Not sensitive
Number of imported new and second hand cars in year	Not sensitive
Proportion of seizure of imported goods which do not meet minimum standards	Not sensitive
Proportion of Production and employment in food and manufacturing locally.	Not measurable

Appendix D Continued

Proportion of self-sufficient from local production of livestock and livestock products	Not measurable
Number of modern shopping centers and shops with international standards	Not comparable
Accumulation of solid waste in the city centre and residential areas	Not measurable
Proportion of reused wastewater	
Number of bus stations in the city	Not sensitive
The number of civil society organizations participating in city affairs	Not measurable
Number of consultations and discussions between ministries and institutions	Not measurable
Proportion of the city covered by clear development plans	Not measurable
Number of PO boxes in the city	Not sensitive
Proportion of staff in government departments who have access to and make effective use of ICT.	Not measurable

Appendix E: Questionnaire survey

Name: _____Today's date:_____

Address: _____

City, _____ district, _____ sub district: _____,

Neighborhood_____

Telephone: home ( ) Date of birth: _____

Work ( ) Sex: □Female □ Male

Background

Please circle Area of expertise

□ Academic

□ Practitioner

Please circle Level of education

□ BSc. □ MSc.

□ PhD □ Other: _____

3. How long been living at Hilla city?

More than 5 years □ more than 10 years □

More than 20 years □ more than 30 years □

Please select one of the four importance levels for the flowing Hilla city sustainability indicators

Note: Not important=1, Less important=2, Important=3, Very important=4

Appendix E Continued

Indicators	Not important	Less important	Important	Very important
Unemployment Rate				
Proportion of population below 1$ a day				
Number of institutions that rehabilitation the unemployed and help them to get a jobs				
A number of married girls under the age of 18				
The number of women dying during childbirth/pregnancy				
Life Expectancy at birth				
Percent of population with adequate sewage disposal				
The number of landfill sites				
Percentage of waste which is recycled				
Population with access to safe drinking water				
Number of people who have infectious diseases and cancer				
Percentage of population with access to primary health care facilities				
Number of beds in public and private hospitals as a percentage of the population of the city				
Number of nurses per 1000 people				
Number of Doctors per 1000 people				
Number of orphanages and hospices				
Secondary or Primary School Completion Ratio				
Number of modern school places per 1000 children of school age by neighbourhood				
Number of published research in the university that meet market needs and city problems				
Average class size				
Adult literacy rate				
Number of new housing complexes can accommodate the inhabitants of the slums , poor families, families of the martyrs , widows and displaced families				
The number of crimes and terrorist incident reported/ detected and convictions per month				
Proportion of cities covered by monitoring cameras in the streets and use of explosive monitoring devices				
Number of political parties and religious groups competing for power				
Number of mixed married				
Amount of sustainable or natural vegetative cover surrounding the city and amount of green space per 1000				
Ambient Concentration of Air Pollutants in Urban Areas				

Appendix E Continued

Proportion of land farm which use modern methods in irrigation system agriculture and harvesting				
Arable and Permanent Crop Land Area				
price of local agricultural production in markets				
Proportion of agricultural yields per dunum				
Proportion of agricultural land that has been converted to residential and other purpose				
Biochemical oxygen demand in water bodies				
The number of tourists who visit the city annually				
Proportion of groundwater levels and salinity in ancient city and archaeological sites				
Number good quality hotels ,recreation centers and other facilities serving city				
The number of foreign companies with investments in city				
Proportion of goods and services sourced locally				
Number of banks that use modern and robust system				
Percentage of employment in both the public and private sectors				
The proportion of the city served by the modern water network				
Number of hours of processing power daily				
Proportion citizen consumption of electricity annually				
Price of a liter of gasoline, oil and kerosene				
Number of factories with no wastewater treatment units				
Number footbridges, pedestrian crossing lines				
Number of hours of traffic congestion during the day				
Percentage of unpaved roads and paved badly				
Number of stations that produce renewable energy				
Percentage of projects which have subjected to an EIA prior to approval				
The proportion of devolution of authority/power, resources and decision making to the City authority				
Number of Internet Subscribers per 1000 Inhabitants				
Main Telephone Lines per 1000 Inhabitants				
Proportion of the population with access to mobile phone and mobile data services				
Response times from emergency services police, fire/rescue and ambulance				
proportion of financial and administrative corruption in the institutions and				

government departments				

Appendix F: Responses of questionnaire

	Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5	Indicator 6	Indicator 7	Indicator 8
Respondent 1	2	2	4	2	2	4	4	4
Respondent 2	3	4	1	1	1	1	1	1
Respondent 3	4	3	2	1	3	2	3	3
Respondent 4	3	4	1	3	1	1	2	1
Respondent 5	4	3	3	1	4	1	4	2
Respondent 6	4	4	1	4	1	2	3	2
Respondent 7	3	3	4	3	3	1	4	3
Respondent 8	3	4	1	1	2	4	3	2
Respondent 9	4	3	4	4	1	1	4	3
Respondent 10	3	3	2	1	2	3	3	2
Respondent 11	4	4	1	2	2	1	3	4
Respondent 12	4	3	2	2	3	1	1	2
Respondent 13	3	4	3	2	2	1	3	2
Respondent 14	4	4	2	1	2	2	3	4
Respondent 15	4	4	2	2	4	1	4	3
Respondent 16	4	4	3	2	2	2	3	3
Respondent 17	4	2	3	3	2	1	4	3
Respondent 18	4	4	1	2	2	2	3	2
Respondent 19	3	4	3	4	2	2	4	3
Respondent 20	4	4	3	2	3	2	3	3
Respondent 21	4	4	3	2	3	1	4	3
Respondent 22	4	4	2	3	1	2	4	2
Respondent 23	4	3	3	3	3	2	3	3
Respondent 24	4	4	3	1	3	2	4	3
Respondent 25	4	4	4	3	3	1	4	3
Respondent 26	4	4	4	3	2	2	3	3
Respondent 27	3	4	4	3	3	2	4	1
Respondent 28	4	4	4	1	3	2	3	3
Respondent 29	4	3	4	3	3	3	4	3
Respondent 30	4	4	2	2	3	3	3	3
Respondent 31	4	4	4	3	3	1	4	4
Respondent 32	4	4	4	3	1	3	4	3
Respondent 33	4	4	1	4	3	3	3	4
Respondent 34	4	3	4	2	3	3	4	2
Respondent 35	3	4	4	4	4	3	4	4
Respondent 36	4	4	4	1	4	4	2	4
Respondent 37	4	3	4	4	1	1	4	1
Respondent 38	4	4	4	1	4	4	4	4
Respondent 39	4	4	4	4	2	4	4	4
Respondent 40	4	4	1	4	4	1	1	4

Appendix F Continued

Indicator 9	Indicator 10	Indicator 11	Indicator 12	Indicator 13	Indicator 14	Indicator 15	Indicator 16	Indicator 17
1	1	1	4	1	1	3	4	2
1	4	4	2	3	2	2	1	1
3	1	1	1	2	4	2	4	1
1	2	3	1	4	3	3	2	3
2	4	1	3	2	2	4	3	1
1	2	1	1	3	2	3	2	1
3	2	4	2	2	3	3	2	1
1	3	1	1	4	3	3	4	2
3	2	2	2	2	2	2	2	2
1	2	2	2	2	3	4	4	1
1	4	3	3	4	3	3	2	2
1	2	2	2	2	4	3	2	2
4	3	2	4	3	3	4	3	3
1	3	2	2	4	3	3	3	2
1	4	2	2	2	3	3	2	2
2	3	2	3	3	3	4	3	3
1	2	2	2	3	4	3	3	2
2	3	3	2	2	3	3	4	4
1	3	2	3	3	3	4	3	2
2	4	3	3	4	3	3	3	3
2	3	3	1	3	4	3	4	3
2	3	2	3	4	3	4	3	1
2	4	3	4	4	3	4	3	3
1	4	3	3	3	4	4	3	2
2	3	1	2	4	3	3	3	3
2	4	3	3	4	4	4	3	4
4	2	3	3	2	3	4	3	3
2	4	3	3	4	4	3	3	3
2	4	3	2	4	4	4	4	2
2	3	3	3	2	3	4	3	3
3	4	2	3	4	4	3	4	4
1	4	3	4	4	2	4	3	4
3	1	4	4	4	4	4	4	2
1	4	4	1	4	4	4	1	4
3	4	1	4	3	3	3	4	3
1	4	4	4	2	4	4	2	4
3	4	4	3	4	4	4	2	4
4	2	1	4	4	4	4	4	4
1	4	4	4	4	4	4	4	4
2	4	4	2	4	3	3	2	4

Appendix F Continued

Indicator 18	Indicator 19	Indicator 20	Indicator 21	Indicator 22	Indicator 23	Indicator 24	Indicator 25
1	4	2	3	2	4	3	4
4	4	1	3	3	4	1	3
2	2	3	1	3	3	4	4
4	1	1	4	3	4	3	2
3	1	1	1	3	3	4	1
2	3	4	2	2	4	3	3
3	1	1	2	3	3	2	1
3	1	2	3	4	3	3	2
4	4	2	2	3	4	3	4
3	1	2	4	3	3	1	2
4	1	1	2	3	4	3	3
3	1	2	3	4	3	3	2
3	2	2	2	3	4	2	1
4	1	2	2	3	4	3	2
3	2	2	2	4	4	4	4
3	1	3	2	4	4	3	2
4	2	2	4	3	3	2	2
3	3	2	2	4	4	4	3
3	2	4	2	3	4	3	1
4	2	2	3	4	3	2	3
4	2	2	2	4	4	3	1
3	1	2	2	4	4	3	3
4	2	2	2	4	4	4	2
4	2	3	3	3	4	3	3
4	2	2	3	4	4	3	3
2	2	3	2	4	2	4	4
4	3	1	1	3	4	4	3
4	3	3	3	4	4	2	4
3	3	4	1	4	4	4	3
4	1	3	3	3	4	3	3
3	3	3	3	4	4	4	2
4	2	4	2	4	4	4	1
3	3	4	3	3	4	3	3
4	3	4	2	4	2	4	4
4	1	3	3	4	4	4	2
3	4	4	3	3	4	3	4
4	4	1	2	4	4	3	3
4	1	4	4	3	4	4	4
4	4	4	1	4	4	4	4
4	1	2	2	4	4	4	1

Appendix F Continued

Indicator 26	Indicator 27	Indicator 28	Indicator 29	Indicator 30	Indicator 31	Indicator 32	Indicator 33
3	1	3	2	2	3	2	1
1	4	2	1	1	2	1	1
2	2	4	3	3	4	3	3
3	2	3	1	1	1	1	2
4	1	2	4	4	2	2	1
2	4	3	1	1	1	1	4
4	1	2	3	2	2	3	1
2	1	3	2	1	3	1	3
4	2	2	2	2	2	2	1
2	2	4	1	2	4	1	2
3	3	2	2	2	2	2	1
2	2	2	4	1	3	2	2
3	3	3	2	2	2	1	3
3	2	4	2	1	3	2	2
2	2	2	2	2	2	1	4
3	1	3	3	2	4	2	2
2	2	2	2	3	2	1	4
3	2	3	2	2	2	2	2
1	2	2	3	2	2	2	3
4	1	3	2	1	2	3	3
3	2	3	2	2	3	2	1
3	2	3	2	2	2	2	3
4	2	2	3	3	3	3	2
3	3	3	2	2	1	2	3
3	3	3	2	2	3	3	1
3	2	2	3	2	2	2	3
4	3	3	2	3	3	3	3
3	3	3	1	3	2	1	4
3	3	2	3	1	3	3	3
3	3	3	2	3	2	3	3
4	3	3	3	3	3	1	4
3	3	4	1	2	3	3	2
2	2	3	3	3	2	3	4
4	3	2	2	2	3	2	1
2	3	4	3	4	3	3	4
4	1	2	4	3	4	2	2
3	4	4	1	4	2	3	4
2	4	2	4	1	4	2	3
4	4	4	2	4	2	3	4
3	1	3	4	3	1	4	4

Appendix F Continued

Indicator 34	Indicator 35	Indicator 36	Indicator 37	Indicator 38	Indicator 39	Indicator 40	Indicator 41
4	4	2	3	1	3	1	3
3	4	4	3	4	4	1	3
4	1	4	2	2	2	4	1
4	3	3	3	3	1	3	4
2	1	1	1	2	3	4	1
3	1	3	1	3	1	1	2
4	3	1	2	2	1	4	1
2	2	2	1	3	2	3	2
3	4	1	2	2	2	1	2
2	2	2	4	4	1	2	3
3	3	3	2	3	2	2	2
2	2	2	3	2	4	3	1
3	2	3	2	3	2	2	2
4	3	2	3	3	3	3	3
3	2	3	2	2	2	2	2
4	3	3	2	3	4	4	2
3	4	2	3	4	3	2	2
4	2	2	2	3	2	4	3
3	2	2	2	3	3	2	2
4	1	2	3	4	2	1	2
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2	3	1	1	2	3	2	1
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3	3	2	1	3	2	2	2
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3	3	3	3	4	4	4	3
4	2	1	2	3	3	3	2
3	3	3	3	4	4	4	4
4	4	3	2	4	4	2	4
3	2	3	3	3	2	4	3
4	4	1	2	4	4	1	4
4	1	4	4	3	4	4	1
3	1	1	4	2	1	2	4

Appendix F Continued

Indicator 42	Indicator 43	Indicator 44	Indicator 45	Indicator 46	Indicator 47	Indicator 48	Indicator 49
1	3	2	2	1	4	3	1
4	4	1	1	4	4	1	2
3	3	3	2	2	4	2	3
2	3	1	3	3	3	3	2
4	4	2	4	2	2	4	4
2	3	2	2	4	4	2	3
3	4	1	3	4	2	3	2
2	3	3	2	2	2	2	4
2	4	2	3	4	2	3	2
2	4	3	3	4	3	2	3
3	3	3	2	3	2	2	4
2	4	1	3	3	2	2	2
3	3	4	2	3	3	2	3
3	4	3	3	2	4	2	3
2	3	2	3	3	2	2	2
3	4	4	4	3	3	4	3
4	4	3	3	2	2	3	2
3	3	4	4	4	3	2	3
3	4	3	3	3	2	3	3
4	4	3	3	3	3	3	4
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3	3	3	3	4	3	3	2
4	4	3	3	3	2	3	3
3	3	4	4	3	3	2	4
3	4	3	3	3	3	3	3
3	3	3	4	4	3	3	3
2	4	4	3	3	2	1	4
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4	4	3	4	4	3	4	4
3	4	4	3	2	2	3	3
4	3	3	3	4	3	4	2
4	4	4	4	3	3	3	3
3	4	3	3	3	3	4	2
4	3	4	4	4	4	3	4
4	4	3	3	3	2	4	2
3	4	4	4	2	4	3	3
4	3	3	4	2	2	4	4
1	4	4	3	3	1	2	3
4	4	4	4	4	1	4	4
4	4	4	4	2	1	3	3

Appendix F Continued

Indicator50	Indicator 51	Indicator 52	Indicator 53	Indicator54	Indicator55	Indicator 56	Indicator57
3	2	4	1	4	4	1	4
3	1	1	4	1	1	1	3
1	3	4	1	4	4	2	4
4	4	1	3	3	3	3	2
2	1	2	1	1	2	1	3
3	2	3	2	1	4	4	2
1	1	2	1	4	2	1	4
2	2	2	1	2	4	2	4
1	1	3	2	3	2	2	3
1	2	2	1	2	3	1	2
2	1	3	2	4	2	2	3
1	2	2	2	2	2	2	3
2	4	2	3	2	3	2	4
2	2	4	2	3	4	4	3
1	2	2	2	2	2	3	2
2	3	2	4	3	3	2	3
2	2	2	2	2	4	2	4
3	2	4	2	1	2	3	3
2	2	2	3	3	3	2	4
2	1	3	2	3	4	2	3
3	3	2	3	2	3	2	3
2	4	3	3	3	2	3	4
3	3	3	1	4	3	2	3
2	2	2	3	3	3	3	4
2	3	3	2	2	4	1	2
2	4	2	3	3	3	3	4
1	3	3	3	4	3	3	3
3	4	3	2	3	4	2	4
1	3	2	3	3	1	3	3
3	3	3	3	2	4	3	4
1	1	3	4	3	4	2	4
3	4	2	3	1	1	3	3
2	2	3	3	1	4	3	4
3	4	3	3	2	3	4	4
3	3	3	3	4	4	3	2
2	4	4	4	3	4	2	4
3	3	1	3	4	3	1	3
3	4	2	2	4	4	2	4
2	4	2	1	3	2	4	4
1	3	1	4	1	4	3	4

Appendix G: Information Sheet

Information sheet relating to the research into the sustainability of a range of indicators that relate to Hilla City Iraq.

I am Mustafa al-alwani a PhD student at Plymouth University, as part of my on-going research into sustainability at the level of Hilla city, Iraq. I am carrying on a survey concerning the problems and needs of Hilla city in relation to the Hilla Sustainable future. Thank you for helping to support this research.

Please feel free to contact the researcher at any time if you need to clarify any aspects of the research using the following email address; mustafa.al-alwani@plymouth.ac.uk

Please note the following

1- You have a right of refusal and withdrawn at any time during, before and after the Focus Group/Interview or completing the questionnaire.
2- If you wish to withdraw from the focus group please make this known to the researcher either during or directly after the focus group has just finished.
3- If you wish to withdraw from an interview please let the researcher know during the phone conversation. If you are still happy for the comments that you have made to be written down but just wish to stop the interview early please let the researcher know. If you wish to withdraw your comments after the interview is over please email mustafa.al-alwani@plymouth.ac.uk.
4- If you wish to withdraw your information concerning the ranking of the sustainability indicators after you have sent the questionnaire back to the researcher please let the researcher know using the following email address; mustafa.al-alwani@plymouth.ac.uk.
5- Your name will be anonymous to maintain confidentiality, however, the descriptions of your job or positions are offered.
6- There will be no electronic recording of data.
7- The findings of the research will be available in electronic format from the email address mustafa.al-alwani@plymouth.ac.uk.

Best Regards
Mustafa al-alwani

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