Towards more sustainable urban forms in the city of Benghazi: A study of urban fragmentation at the neighbourhood level

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A study of urban fragmentation at the neighbourhood level

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بسم الله الرحمن الرحيم

In the Name of God, the Merciful, the Compassionate

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Abstract

Urban sprawl is a challenge to the sustainability of many cities around the world. Fragmented urban development and vacant land are widespread problems in many Arab cities (UN-Habitat, 2012) which are, according to Ben-Hamouch, mainly a result of inappropriate modern planning and poor land management (2013).

This study addresses the problem of urban fragmentation at the neighbourhood level and examines to what extent the concept of compact urban form can contribute to the improvement of social and environmental sustainability in the Libyan city of Benghazi and Arab cities in general. The objectives and scope of the study have justified a morphological approach, where eleven case studies that present different urban typologies in the city have been investigated. The research strategy and selection of case studies were driven by the availability of data and meant to cover the main urban types and important issues defined within this context.

This research, which has been conducted to explore and explain the relationships that exist between local urban forms and their performance in terms of sustainability, has produced valuable knowledge and helped to identify measures which target the improvement of people's quality of life and environmental sustainability of the city. The research draws on the argument that adopting a type of human scale urban form, which is relatively compact and dense, well-connected and comfortably diverse, coupled with concepts of urban greening and flexible development relevant to the local context, would help to create a high quality urban form that is liveable and accessible, while causing minimum damage to the natural environment.

This work is an attempt to respond and add to the ongoing debate on sustainable urban form in the developing countries (see: (Jenks, 2000)). The findings have contributed to the understanding of urban fragmentation and highlighted the relevance of the theory of compact city to sustainable development in Benghazi and the South in general. It is anticipated that this work would raise awareness on the impact of urban fragmentation on the sustainability of the built environment within this context and help to advance research on planning theory and practice based on real-life experience and responses to local circumstances.

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Key words: Benghazi; Libya; MENA region; Sustainable development; Urban design; Urban sprawl; Urban fragmentation; Arab city; Compact city; Everyday urbanism; Case study; typo-morphology.

Chapter One

Introduction

1.1. Introduction

The overall aim of this thesis is to study the urban sprawl in Benghazi with a focus on the phenomenon of urban fragmentation and examine the relevance of the concept of compact city as a sustainable solution within this context. The main areas of investigation include the characteristics and sustainability performance of local urban patterns in the city and the extent to which planning theory and practice have had an influence on their development.

Benghazi city is a regional centre which contains different urban patterns and faces many urban problems common in Libya. Also, it is a city in the Arab region, known for its harsh climate, scarce water and a unique culture of urbanism. In common with any urban centre in the developing countries[1], Benghazi also faces the challenges of fast urban growth and lack of capacity regarding urban planning, management and development. It was clear that issues in the South and the demand on urban space are to an extent different from those that may be expected in the West[2], and hence the urban solutions which seek more sustainable development can be different as well.

This chapter presents an overview of the components of the study and main areas of interest. The first section addresses the urban problem under investigation. It focuses on urban fragmentation and its impact on the sustainability of the built environment.

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[1] Less Developed Country is a country with lower GDP relative to other countries (TheFreeDictionary, 2013). The UN notes that in common practice; Africa, Americas excluding Northern America, Caribbean, Central America, South America, Asia excluding Japan, Oceania excluding Australia and New Zealand are considered *Developing Regions*, while Northern America, Europe, Japan, Australia and New Zealand are *Developed Regions* (UN-org, 2013).

[2] The term "*the West*" is used frequently in this study to refer to the Developed Countries, excluding Japan, while "*the South*" is used to indicate developing countries. However, the terms South and West do contain more cultural and political than economic connotations- see (Bavaj, 2011).

It is followed by an outline of the theoretical context, where it is assumed that the objectives of sustainable development can be the driver towards more successful urbanism. The third section covers the aim of the study, and its main questions and objectives, while the fourth section describes the methodology and research methods. The overall structure of the study is presented in the fifth section.

1.2. The Urban Problem

The city is a small part of an ecological system that is unsustainable by definition. Urban areas are the main consumer of energy, fertile land and other natural resources; they produce different types of pollutants that threaten the local and global environments. The relationship between the city and its region of scarcity and changing climate represents a challenge to sustainable development.

Rapid urbanisation in main metropolitan areas, particularly in the developing countries, is quite often beyond the capacity of local communities to manage. Issues such as the shift of urban development to the outskirts, the decay of urban centres and incomplete and deteriorating housing estates are common in many cities across the globe and present a real threat to urban sustainability (Robbins, 2008). Many urban expansions have assumed a mix of urban and rural characteristics to become what Sieverts called a phenomenon of "Zwischenstadt" - a term that describes a polycentric structure with neither traditional cores nor clear edges (Sieverts, 2002, p. 3); a type of urbanisation which is, in part, an accidental outcome of planning policies and practice based on rational ideals (Robbins, 2008).

After World War II many countries around the world have based their urban policies on a paradigm of the separation of urban functions and low-density development; influenced by the Athens Charter drafted at the "Congrès International d'Architecture Moderne" - CIAM in 1933 (Rodenburg & Nijkamp, 2004). In effect, these policies have encouraged urban sprawl; this is a kind of development which has become common all over the world, whether urban or suburban, it is characterised by single-use zoning, detached single family buildings, minimal public open spaces, cul-de-sacs and car-dependency (Gillham, 2002, p. 23).

Generally, contemporary development that is associated with spacious arrangements has been criticised by Jane Jacobs (1993), who argued that dense and mixed-use urban quarters are more economically viable, more socially stable, more culturally and aesthetically interesting and safer than the mono-functional dormitory suburbs. Also, it is argued that interrupting the temporal continuity of urban development represents an identity crisis for many contemporary cities (Corsini, 2004). On the other hand, it is acknowledged that the urban sprawl - urban fragmentation, low-density development and scattered expansions outside urban centres - in both developed and developing countries, is unsustainable. It can cause damage to fertile land and ecosystems, increase development costs, and affect the quality of urban environments (Gillham, 2002), (Williams, et al., 2000).

Urban sprawl is anti-urban, destroys both the city and countryside and is often linked with certain types of poor urban environment, social inequality and unbalanced urban functions (Grant, 2006). However, its impact can be even worse in a country like Libya, with its very limited availability of fertile lands, scarcity of fresh water, harsh climate, and limited capacity of local communities (implicitly in (UPA, 2006)).

Since the 1950s, the growth of most Libyan cities and towns has been fast, scattered, fragmented and quite different from their historical parts. Contemporary urban areas in the country are, to an extent, similar to their counterparts in the Arab petroleum states, which grew faster than any expectation and have gained almost 80% of their extent during the last few decades (UN-Habitat, 2012). It is evident that residential densities in Libya are relatively low when compared with cities of neighbouring North African states like Tunis and Sfax in Tunisia, Algiers in Algeria and Marrakech in Morocco.

Contemporary urban centres in Libya have been influenced by Doxiadis' idea of "*Ekistics*"- the science of human settlements (Doxiadis, 1968). Standards for spacious subdivisions, reserving large open spaces for future expansions, and transport planning have been a major cause of urban sprawl and low quality development. Previous observations on the *status quo* of urban development in Libya have shown that urban sprawl, within this context, contains features and is associated with issues similar to those mentioned above, which differentiate urban sprawl from

any other type of development (see for instance the National Spatial Policy 2006-2030 (UPA, 2006), and the study of informal settlements in Benghazi metropolis (University of Garyounis, 2007).

The majority of recent studies for urban sprawl in Libya and the Arab countries have been limited to scattered and informal development at urban edges and in the countryside. However, the fragmented urban development is neglected in research; this is in spite of the fact that urban fragmentation is a common problem in most Arab cities and presents an essential challenge to urban sustainability, as it represents low levels of urban diversity and connectivity and is associated with different forms of "lost space". This research focuses on the phenomenon of urban fragmentation at the neighbourhood and street levels and addresses the role of urban planning in creating these realities.

Figure 1. 1: Low Density Development, Benghazi

Low-rise apartment buildings are arranged with large public space. The open space is not green by nature and is negative to the urban environment.
Source: Satellite image - *Quick-Bird*, UPA 2005

1.3. The Theoretical Context

Targeting economic growth, social equity and environmental protection is not new to the planning agenda (Border, 2005). However, the emphasis on sustainable development required that social and economic factors should be considered in the light of their possible impact on the natural environment, both locally and globally.

Indeed, acts for balancing these factors can face different conflicts (Border, 2005), such as whether to use available land for housing or the production of food, or the contradictory objectives of protecting privacy and improving the permeability of local areas.

In the West the debate about sustainable development in the area of urban planning and design, is mainly formulated around the idea of compact urban form. However, as with the objectives of sustainability, the suitable level of urban concentration is relative and depends on the scale of study (Cortes, 2005). It is expected that in spite of the differences between cities of the West and the South, compact urbanism can indeed be relevant to the developing countries as well, where accessibility to housing and basic services and mitigating climate change are the most pressing challenges to urban development (Bianca, 2000), (UN-Habitat, 2012).

Nevertheless, while the causal links between the urban density and some aspects of sustainability throw up conflicting evidence (Neuman, 2005), the counter stances to compact urbanism claim that the resulted higher densities could bring with them unfavourable conditions such as shortages of building land, traffic problems, social stress and an increase of both air pollution and the effect of heat islands (Frey, 1999), (Williams, et al., 2010).

There is a wide range of literature that promotes the *compact city* model as a sustainable alternative; describing a type of development which is relatively intense, dense, connected, diverse and green; and which can be achieved through a participatory process ((Neal, 2003), (Neuman, 2005), (Frey, 1999)). It is argued that a human scale urban form of small blocks, narrow streets and minimum open space can be more liveable, efficient and environmentally sustainable than any other type of development (Frey, 1999), whether being low density sprawl or high-rise dense development. However, in spite of the consensus on policies of compact development, urban models reviewed in this study reflect a variety in the context and underpinning theories.

In the case of the historic *Arab city*, which is characterised by a cohesive urban form, residential clusters have no fixed plans that describe urban elements and design, they

have been developed on the basis of clear urban grids and guided by a range of norms regarding private and public rights in the built environment and applied traditional design solutions that have been tested over a long period of time (Bianca, 2000).

Nowadays, *mainstream urbanism* of fine-grain patterns for streets, small land plots and moderate heights, common in many developing countries (Lloyd-Jones, 2006), has been a result of a two-level approach to development; guided by general codes regarding the urban mass, which is similar to the traditional one, but pays less attention to design. This type of urbanism, which was able to accommodate fast growth, helped to improve people's quality of life and is increasingly described as being liveable and affordable (Roo & Miller, 2000). It presents a case of "unselfconscious" urban design (Beckley, 1979), which is a result of decisions and actions made by people who most certainly do not see themselves as designers. However, in the absence of established social organisations, there is a danger that less-regulated development may lead to negative outcomes.

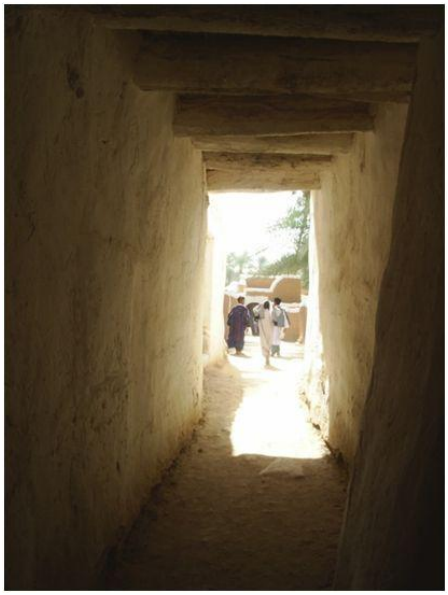


Photo 1. 1: The Old City of Ghadames

A unique system of narrow, winding and roofed streets represents measures that respond to harsh climate and other needs to the local community.
Source: Own photo, 2008

Nonetheless, within the context of the western world, models of *new urbanism* that have been inspired by examples of the medieval European city, with its characteristically low to medium-rise buildings and moderate densities, have been promoted as an alternative to urban sprawl (Neuman, 2005). Various urban models - e.g. the "Compact City" and "Neo-traditional Neighbourhood"- are frequently described as human-scale, liveable, accessible by all means of transport, containing

minimum but positive open spaces and expected to provide for human needs at lower ecological cost (Haas, 2008).

Moreover, the "Charter of New Urbanism" (CNU, 2001) has promoted a concept of diverse neighbourhoods consisting of traditional patterns of narrow streets and plazas and encourages higher quality urban development celebrating history, the environment and local character. The charter suggests a model for diverse neighbourhoods with an adequate size, which is compact at an appropriate urban density; contains a mix of land uses and range of facilities; and provide good access to transit services, tenure alternatives and a pedestrian-friendly environment (Neal, 2003). This model is expected to be delivered through specific design-codes and master-planning.

However, different urban approaches deal differently with certain aspects of the new urbanism model, some may value order, visual quality and traditional architecture more than affordability, flexibility and environmental responsibility (Grant, 2006), (Haas, 2008). In practice, projects of new urbanism are rarely completed and could even be blamed for facilitating suburbanisation by making growth more attractive and legitimate (Grant, 2006). They lack the overall diversity and spontaneity of real-life developments (Haas, 2008). New Urbanism projects are often characteristically homogenous with regards to the style and value of housing, and functions such as light industry are excluded, while social and functional diversity is very limited (Grant, 2006).

Generally, compact urban development as a sustainable solution is more than a dense urban form (Neuman, 2005). The concepts and targets of the sustainable development in different regions may have many commonalities, but they are also influenced by regional differences. However, within the context of urban sustainability, the concept of compact urban form contains a connotation of a human scale urbanism of high quality and good performance in terms of social and environmental sustainability.

The literature review shows that it is widely accepted that sustainable urbanism should be *compact, green and democratic*. It describes a type of urban form that is

relatively compact and dense, contains mixed land uses, a fine grain grid pattern and minimum open space. It is expected to enhance walk-ability and public transport, encourage sustainability initiatives such as the use of renewable energy and of being produced through a participatory approach to planning (Roseland, 2000), (Haas, 2008), (Neuman, 2005), (Newman & Kenworthy, 1999), (Jenks, et al., 1996), (Grant, 2006).

Relevant measures to the idea of sustainable development may include permeable urban blocks of relatively small land parcels, clear boundaries, good coverage of civic infrastructure and transport services and an urban design that encourages a high degree of social and economic interactions (Neuman, 2005). This is in addition to a mix of housing types and tenures, attractive and pedestrian-friendly streetscape that enhances local character and a hierarchy of open spaces (Grant, 2006), (Haas, 2008).

Nonetheless, in spite of the lack of a general theory about the sustainable urban form, the debate presented in this study has helped to identify basic concepts about this idea and has facilitated the structure of a conceptual framework. This study investigates the different aspects that are expected to help improve urban quality and the sustainability performance of different residential areas in Benghazi. It has been designed to focus on themes of local concern include accessibility, urban quality and environmental sustainability; with an emphasis here on measures for urban affordability, privacy and climatic comfort.

Photo 1. 2: Pedestrian Street, the Downtown Benghazi

Human scale
Source: own photo, 2008

1.4. The Context and Research Questions

Generally, the urban context as described by Davies is the character and setting of the area under study, including aspects such as the natural and human history; urban form and typology; urban ecology, and location and connections (Llewelyn-Davies, 2000).

At this stage, it can be argued that in spite of the relevance of the general concept of the compact city, the promoted approaches to urban development that underline this idea are not necessarily suitable to the city of Benghazi; this is due to real differences regarding history, priorities and local practices. However, it is evident that planning policies in Benghazi lack a mature concept for sustainable urbanism which recognises differences and responds to local issues.

The planning system in the city has promoted modern concepts, which have different contextual references, and hence failed to respond to the reality of local urban development. The experience in Benghazi shows that planning tools including the layout plan which defines general road networks and zones for different land uses (Doxiadis-Associates, 1984), in addition to other planning regulations and standards although being essential in shaping the existing urban structure, are arguably too general, out of date and in many cases not properly understood.

On the other hand, the *Everyday Urbanism* in the city, which explains not only temporary events as described by Kelbaugh (2007), but also spontaneous interventions at the scale of the street and building block, has been successful, to an extent, for creating urban realities which can be described as sustainable. It is a process that negotiates the capacity of urban areas, not only by fine-grain patterns and mix of housing types, but also through a process of urban intensification that absorbs residual spaces and vacant land, while helping to improve the quality of urban environment.

This study argues that current urban development in Benghazi, which has been a result of mixed factors such as planning tools, urban management and other socio-economic and historic factors, contains types of fragmented and unbalanced urban patterns which are distinctive for this context. This has, in turn, raised questions about

their performance in terms of sustainability and has led to the main question of the study which is:

"To what extent can the concept of the compact city contribute to the sustainability of residential areas in Benghazi?" and "*how this can be achieved?"*

To this end, this study has examined different urban typologies in the city, in an attempt to understand their physical characteristics and their impact on environmental sustainability, and also to find out how this knowledge can be used to refit local areas and enhance the sustainability of urban development. This study has addressed specifically the following questions:

- What are the characteristics of existing urban forms; how have they been developed and what are the consequences if they continue to be developed in this way?
- How close are local urban forms to the objectives of sustainability?
- Is the compact model relevant to Benghazi and Libya in general? How does it relate to traditional urbanism in the area?
- How can different urban forms be measured? What are the indicators of urban sustainability in this context? And how can they influence each other?
- How can the tools of planning be improved to better inform a sustainable process of development?

The research has drawn on eleven case studies for different urban typologies in Benghazi, where it has identified the characteristics and quality of local areas at the street and neighbourhood levels. At the city level, the investigation covered examples for vacant land and a review for the process of urban land development. The focus has been on urban fragmentation and the *lost space* - wasted space within the city – rather than scattered formal or informal patterns of development in the urban periphery.

Also, the investigation covered actual uses for the public space, the streetscape and spontaneous interventions in the urban environment, where a state of balance for urban intensity has been identified based on the judgement of the quality and sustainability performance of different urban areas in the city. The identified level of

urban compactness in each case study is associated with moderate density, suitable public open space per dwelling and flexible streetscape. This investigation for real-life urbanism in the city has explored the role of planning theory and practice in influencing the characteristics, quality and actual uses of public open space. *Lost-space* in Benghazi is a result of multiple factors and has specific characteristics. The over-sized public space, residual land and vacant areas are negative to urban quality and overall urban sustainability.

The exercise of design-intervention that combines intensification strategies and urban design solutions, in an attempt to address urban fragmentation, has tested a set of principles and indicators which can be relevant to compact urbanism in Benghazi and Libya in general. They define suitable levels of urban intensity that balance between competing objectives such as the urban enclosure and access to public open space. These results are expected to contribute in the establishment of a new planning approach that is flexible, incorporates design and engage different parties in the process.

Preference of certain building types, lack of development control and motorisation, in addition to other socio-economic and spatial factors, can influence the characteristics of urban form. However, it was evident that the extent of urban fragmentation is mainly associated with the urban typology in each area, either urban or suburban, due to elements such as private gardens, the size and intensity of land plot and streets' standards. The findings show that a compact urban form and principles that based on local needs such as affordability, and the protection of microclimate and privacy can be more successful in the city, compared with other New Urbanism models developed in a quite different context.

The study has demonstrated that these principles and indicators are applicable to different urban areas in the city, either core areas, urban or suburban, and they can be adopted in the planning regulations to help refit or develop new areas. This argument includes the case of urban patterns outside the city; thus, while they might be subject to specific strategies such as the upgrading of informal settlements and urban containment and can be influenced by regional networks, it is expected that the

specified urban principles and targets for local residential clusters would be relevant to respond to the problem of urban fragmentation.

Nevertheless, the current planning system needs to be upgraded in order to achieve the qualities mentioned above. Planning tools have been criticised throughout the course of this research for being inflexible and inconsistent with real-life practices. It is expected that adopting a flexible and form-based approach and a participatory process of planning would help create variety, respond to changing circumstances and build on local experiences.

In general, the literature often represents urban sprawl as a regional phenomenon. However, investigating urban sprawl and its impacts on the quality of urban environment at the local level is limited (Ghosh & Vale, 2009). Urban sprawl is mainly made up of housing, and this makes it an important subject to study (Duany, et al., 2000). The research has shown that Benghazi has been a suitable case to accommodate the objectives of this study. In addition, it is anticipated that in a time of political change and high expectations such a study that reflects on the performance of existing situations in terms of sustainability would be more demanding.

Indeed, the lack of research on urban fragmentation within the context of developing countries and the scarcity of data on the topic in Libya has been a challenge for this study. On the other hand, local practice of informal development and uncompleted public works, in addition to the current unstable political situation, have influenced the scale of study and methods of investigation, where the research has focused on the local scale and relied on direct observations more than approved plans and zoning regulations.

The general definition of urban sprawl in Benghazi that addresses, in parallel to outward extensions, urban fragmentation and issues of informal development, incompleteness and negative spaces, which are poor in quality and contain different types of vacant and underused land, can be an important step that helps to improve an understanding of and encourage debate on urban sprawl within the context of developing countries, based on real-life experience. It can also provide essential

evidence to raise awareness of the drawbacks of rational planning and help advance the search for better strategies for sustainable development.

Apart from random attempts to study the model of historic Arab cities and some debates on experimental projects, mainly in the oil-rich countries - e.g. the Masdar city project in Abu Dhabi - reference to mainstream urbanism in the Arab region is rare. This study opens an important debate on contemporary development in Benghazi and the Arab region and discusses its sustainability performance in the light of certain local issues, actual capacity, and common practices.

The case study approach and multiple methods applied in this research to investigate the urban form at the neighbourhood level have also been helpful to define normative design propositions and test them in real-life contexts. This critical approach provides a useful tool for reflecting on the concept of a compact city and examining its suitability for other Arabic cities. However, while literature on this topic is limited and assumes internationality, the findings of this study define parameters and urban principles for compact development in Benghazi and open possibilities for research. Future research is crucial to examine these findings, through widening the extent of research and the conduct of more systematic surveys.

1.5. Methodology and Methods of Research

The study shows that current planning concepts and practice in the city have been a reproduction of concepts that over-generalise human needs, neglect differences across contexts and between urban zones - such as the difference between the inner areas and the urban edge. However, to create more sustainable urban environment, the literature suggests a type of compact urbanism, *characterised* by physical intensity, density, diversity, connectivity and green solutions and is *realised* through a participatory approach, which recognises differences and enhances local character and existing practices of development.

In order to investigate the urban problem and test the assumption that compact development can contribute to the sustainability of urban development in Benghazi

and its wider Arab region, a multiple case study research has been designed to investigate the characteristics of different urban typologies in the city and their performance in terms of environmental and social sustainability, and examine the role of planning theory and practice in shaping of these localities.

The results have been useful to set measures for more sustainable urban forms within this context. The focus on the residential clusters is justified by the fact that residential areas are the dominant use of land in the city, occupying about 60% of urban land; they are the places where people spend most of their time; and their development is more responsive than any other type to the local context.

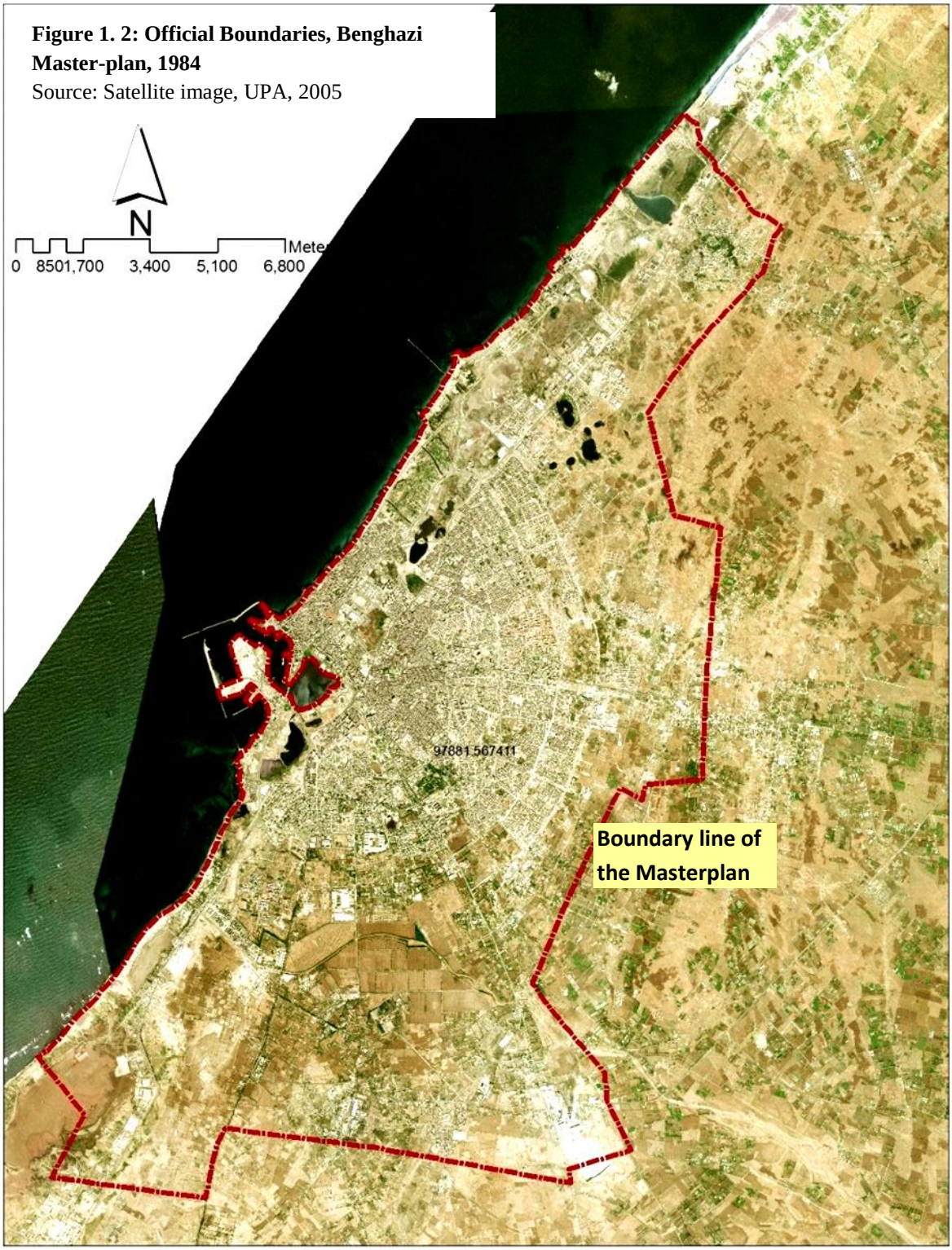
The research relied on methods of direct observation and map analysis as main sources of data; this is in addition to secondary sources. The case studies have been an important analytical tool, where cross-case comparisons are employed to examine the existing relationships between characteristics of local urban forms and their sustainability performance. The typo-morphological understanding of the urban environment has provided a suitable basis for the study of the city within the context of urban sustainability.

A multi-method survey strategy has been employed to obtain data on different urban issues. At the metropolitan level, the study has investigated two types of information; urban density and the phenomenon of vacant land. Four types of vacant land have been identified: (i) vacant plots, (ii) residual areas within urban blocks or between them, (iii) unused urban zones and (iv) underused sites. Moreover, a classification of existing urban typologies based on the leading-building type, urban layout and urban density has been established to inform the selection of case studies, including compact quarters of courtyard buildings, dense terrace-building areas, low-density detached-building areas and superblocks of apartment buildings.

At the local level, a multiple case study approach was adopted, whereby eleven residential sites of different typologies were purposely selected. Generally, the information-oriented selection of critical case studies has been utilised to allow analytical generalisation, assuming that what is valid for these cases, should be valid for all or many others in the city. The case studies represent different urban forms,

which have been influenced by planning decisions and codes at different levels. In-depth investigation has relied more on involvement than on statistical-based surveys or precise performance measurements, involving techniques of direct observation and map analysis; in addition to secondary sources including official reports and maps.

Figure 1. 2: Official Boundaries, Benghazi Master-plan, 1984
Source: Satellite image, UPA, 2005



The comparative analysis has been employed in order to examine, classify and combine evidence, which addresses the main proposition of the study and allows conclusions to be drawn. Internal and cross case comparisons have been applied to evaluate the sustainability performance of different case studies and examine the role of urban planning in the creation of these localities. Based on these results, an exercise of design interventions has been used to upgrade four case studies; targeting the investigation of the relevance of certain urban principles and strategies to the local context, and which can be useful to facilitate the setting of form-based guidelines that aim for flexible and participatory urban design process.

1.6. The Structure of the Study

This introductory chapter has already introduced the type and substance of information, which is presented in the study. Urban fragmentation in Benghazi and the search for suitable tools to improve the quality of local areas and enhance their sustainability performance are the main themes of research design. The thesis' main body has been arranged into nine chapters as follows:

Chapter Two looks at the country's background, and reviews the potentials and challenges to urban development in Libya. It discusses issues such as the scarcity of water, harsh climate, fast urban growth and the demand on building land and housing. It also reviews the historical development of human settlements in an attempt to explain the nature of urban development in Libyan cities and towns, and how urban development responded to local context.

Chapter Three is divided into two parts: the first part focuses on the urban problem and reviews the ongoing debate on sustainable development and covers the considerations of human needs and ecological sustainability. The discussion reflects on the relationship between regional issues and the type of urban development, where urban sprawl has been described as a consequence of multiple factors including the theory and practice of urban planning and a main challenge to urban sustainability.

The second part focuses on the debate about urban sustainability and the idea of compact urban development. It discusses characteristics of the compact urban form, flexible planning process and sustainable design solutions. It reflects on concepts and approaches of urban development suitable to Benghazi city and examines the chances of compact urban development as an alternative to urban fragmentation. Although the idea of a compact city has been perceived as a relevant urban strategy, urban forms can be different depending on the local context for each city or town. The knowledge gained from the critical analysis has been used to set a conceptual framework and inform the next stage of the research.

Chapter Four covers the research methodology and methods of data collection and analysis that have been used in this study. The strategy of case study has provided a framework for data collection and analysis, where a multi-method approach is applied to generate different types of data at two levels: the city and the neighbourhood.

Chapter Five is also divided into two parts. The first part reviews the theory and practice of urban planning in Libya and makes an attempt to explain the role of planning in the formation of contemporary urban forms. Also it includes a thorough analysis of planning standards and an observation of the process of land development, which was helpful to evaluate the appropriateness of current planning tools to the sustainability of urban environments. It is evident that central planning and guidance that seeks efficiency and over-generalised human needs are among the main factors which cause urban sprawl of fragmented patterns. The argument here is that there is an urgent need to upgrade planning tools and practice in order to create more sustainable urban environments.

The second part presents important information about the urban form of the city of Benghazi and discusses the main reasons for urban fragmentation. This chapter concludes that the official definition of urban sprawl in Libya has been superficial, in that the phenomenon is quite often described as if it is no more than a scattered urban expansion and mainly informal, while overlooking its nature as an urban morphology with specific characteristics. This chapter helps to set a working definition for the urban problem in order to inform the next stage, which focuses on the explanation of

causal relationships between different urban forms and their sustainability performance.

Chapter Six introduces the case studies and consists of two parts which cover different aspects of urban development at the neighbourhood level. Different methods have been used to investigate the characteristics and sustainability performance of eleven case studies representing different urban types in the city. The relationships between the characteristics and qualities of local areas show that spontaneous interventions and a gradual process of development are important factors that need to be considered as part of any solution despite the fact that uncontrolled urban intensification can be unbalanced and a source of real concerns.

Chapter Seven reflects on the urban concept and presents the results of the analysis which test the relevance of several strategies and urban principles to local areas and suggests the adoption of certain planning tools to facilitate the proposed measures. The exercise of design interventions was an effective tool for the investigation of the potentials of different intensification strategies and urban design principles to mitigate the problem of urban fragmentation in the city.

Chapter Eight covers results and lays out the elements of the planning approach adopted at this stage, which is based on a group of urban principles that reflect the local context and responses to the objectives of urban sustainability.

Finally, Chapter Nine is devoted to a general discussion of the results of the study together with contribution to knowledge, where generalisations are made to encompass the wider regional context. Suggestions and recommendations for future research are also presented.

Chapter Two

Libya - Challenges and Potentials for Urban Development

2.1. Introduction

Human settlements are that part of an ecological system which is, by definition, unsustainable. However, according to Moore, the formation of a consensus on what should be done as a response to a given issue, such as urban sprawl or urban decline, can in turn overshadow the identification and debate of the issue itself (Moore, 2013).

This chapter presents a brief review of the main regional issues facing urban development in Libya, with a focus on scarcity of water, harsh climate and desertification, while reflecting on the urban encroachment over agricultural land. Also, this chapter reviews main stages of the historical changes that have taken place in Libyan cities and towns over the last century and discusses urban issues such as shortages in building land and housing, and lack of resources. The last section examines characteristics of urban centres in Libya. It is concluded that current national policies for sustainable development are independent from each other and lack clear vision and concrete targets for an urban development that would meet national commitments to sustainability.

2.2. Country Facts

Libya is a North African country located between Longitudes 10° and 25° to the East, and Latitudes 20° and 33° to the North. It has a total area of about 1.775 million km² and a coastline on the Mediterranean Sea of about 1820 km². The country is bordered on the north by the Mediterranean Sea, to the east by Egypt and the Sudan, on the south by Chad and Niger and on the west by Algeria and Tunisia (John, 1998), (UPA, 2006)[1]- see Figure 2.1.

The country's strategic location on the Mediterranean Sea has had a considerable role in its historical and modern development. Many early trade routes passed through Libya running from Sub-Saharan Africa to the Northern African coast. Trade and the servicing of maritime and caravan routes were among the main functions of many ancient cities in the area (see Photo 2.1). Succeeding civilisations brought prosperity to a number of settlements and supported many of them and this has continued right up to the present (Amoura, 1998). However, land, water and climatic conditions have always been a challenge to urban development.

Photo 2. 1: The Ancient Town of Shahat, Libya

One of the five ancient cities on the coastal line of Cyrenaica, which played an important role in maritime trade during the old ages
Source: Own photo, 2008

Figure 2. 1: Location Map, Libya

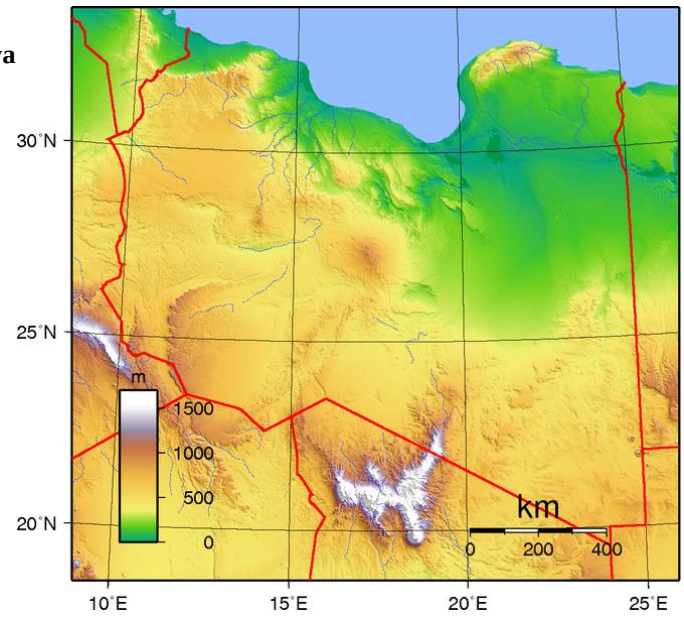
Source: www.clickafrique.com, accessed in 04/2010

[1] The National Spatial Policy 2006-2030 by the Urban Planning Agency 2006 is a comprehensive background study containing the results of several studies and reports that cover national policies and other socio-economic and natural data.

The Libyan territory consists of three main geographical zones: (1) the coastal plains along the coastal line, which vary in depth, and are characterised by fertile soil and a moderate climate of dry summers and relatively wet winters; (2) the northern highlands- consist of Jabal Nafusah in the West and Jabal Akhdar in the East, which stretch close to the coastal plains- distinctive for their plateau climate of relatively higher rainfalls and low winter temperatures; and (3) the internal depressions and southern mountains, which cover almost 90% of the national territory, and comprise mainly of deserts with scattered oases of shallow water barely sufficient for subsistence farming, while the climate is semi-desert and desert with high temperatures and rare rains (UPA, 2006) - see Figure 2.2.

Figure 2. 2: Topographic Map, Libya

Source: Wikimedia Commons; http://commons.wikimedia.org; accessed in 15.03.2013



The desert, though being harsh, contains most of the national oil reserves and has huge potential for the production of solar energy (REVE, 2010). Although in the near future, energy is *per se* not a pressing issue, the efficient use of those resources and reduction of air-pollution are essential targets to sustainable development.

Generally, the climate is hot and dry most of the year influenced by both the Mediterranean Sea to the north and the Sahara to the south. Overall the annual rainfall is extremely low and about 93% of the land surface receives less than 100 mm/year. The highest rainfall occurs in the northern mountains in the regions of

Tripoli and Benghazi[2], where the average annual rainfall exceeds the minimum value of 250-300 mm/year; a level considered necessary to sustain seasonal agriculture (The Centre of National Studies, 1999). However, it is projected that by 2050 the mean annual temperature will increase by 2°C and the mean annual precipitation to decrease by 7% (World Bank Group, 2013).

Arable land is estimated at 2.2 million hectares or 1.2% of the national territory. With the exception of a few oases, most productive agricultural land is in the coastal strip and the adjacent highland steppes (The Centre of National Studies, 1999). However, arable lands, which are essentially marginal in productivity, have frequently been affected by urbanisation and scarcity of water, in addition to traditional farming methods and overgrazing, which in turn accelerate the use of subsoil water deposits, affect the green cover, and increase problems of soil salinity and erosion (The Centre of National Studies, 1999). Indeed, this ultimate picture describes a desertification process that threatens many areas in the Arab region.

To demonstrate the impact of urban activities on agricultural potential, Misrati (1983) has examined the rate of land use conversion of those areas that enjoy an average rainfall of 200mm or more per year against the quality of their soil. Seven categories of soils were identified in the four climatic zones; (i) high quality, (ii) good quality, (iii) medium quality, (iv) satisfactory, (v) poor quality, (vi) very poor quality, (vii) worst land- unproductive. The study covered a total area of about 30,993 km² - see Table 2.1.

Table 2. 1: Categories for Land Capacities by Climatic Zone; Libya

Source: Libyan Government; Secretariat for Agricultural Reclamation and Land Development, Soil Studies in the Western and Eastern Zones, Tripoli, 1980; in: (Misrati, 1983)

Climatic zone	Areas by land category (in hectares)					Total
	I	II	III	IV	V-VI-VII	
moderate	300	56,900	55,400	78,300	306,200	492,100
Semi-arid	100	28,000	125,300	107,300	569,400	831,100
Arid	2,500	89,300	529,000	204,400	861,800	1,687,000
Very arid	--	1,000	10,700	8,700	63,700	84,100
Total	2,900	176,200	720,400	398,700	1,801,100	3,099,300

[2] Arabic words may be spelled differently, according to the pronunciation. For instance Benghazi may also be spelled Banghazi or Ben-Ghazi.

Changes in the percentage of urbanized land in each category area between 1966 and 1978 showed that within one decade, the higher quality land taken by urban uses nearly doubled from 9.1% to 17.6%, while second grade land taken for urban uses increased fourfold from 1.4% to 6.0% (see Table 2.2). He concluded that areas of higher quality soil in the more favoured zones had been subject to a continuous urban growth more than the others (Misrati, 1983). Indeed, the threat is particularly alarming in a country with very limited agricultural capacity, both in terms of soil quality and precipitation, and whose underground water resources are being rapidly depleted.

Table 2. 2: Percentages of Urban Land by Climatic Zones and Soil Qualities, Libya

Source: Libyan Government; Secretariat for Agricultural Reclamation and Land Development, Soil Studies in the Western and Eastern Zones, Tripoli, 1980 and Secretariat of Utilities and Urban Planning, Tripoli, 1980; In: (Misrati, 1983)

Climatic zone	Year	Urban land as percentage of each land category				
		I	II	III	IV	V-VI-VII
moderate	1966	--	0.3	0.4	0.1	0.1
	1978	--	1.3	1.3	0.5	0.3
Semi arid	1966	12.0	6.5	1.6	0.4	0.03
	1978	14.0	31.0	7.0	1.1	0.06
Arid	1966	10.1	0.5	0.07	0.4	0.2
	1978	20.0	1.1	0.3	0.8	0.6
Very arid	1966	--	--	0.6	0.7	0.1
	1978	--	--	3.6	2.3	0.4
Total	1966	9.1	1.4	0.4	0.4	0.1
	1978	17.6	6.0	1.6	0.9	0.4

Available water resources include ground water and surface water which rely on seasonal rainfalls, desalinated water and treated sewage effluent. The average capacity of water supply from these sources taken together is about 4,886 million m³/ year (see Table 2.3). The annual urban demand on fresh water in Libya is estimated to increasing from 517 million m³ in 1995 to about 1,759 million m³ in 2025, and for industrial purposes from 74 million m³ in 1995 to about 566 million m³ in 2025 (The Centre of National Studies, 1999).

Table 2. 3: Main Sources of Water, Libya

Source: the Centre of National Studies, the National report on Human Development; Tripoli (1999)

Water resource	Million m³	%
Ground water	4,670	95.6
Surface water	110	2.3
Desalinated water	70.1	1.4
Reused water	36.05	0.7
Total	4,886.15	100

The country depends heavily on deep groundwater and there are regional differences in the rate of water extraction, especially for urban use. However, coastal aquifers are the only reservoirs that are being recharged by rainfall, but the uncontrolled use of these resources exceeds their annual replenishment. The depletion of ground water causes an ever lower water table, low water quality and damage to vegetation. This situation is expected to accelerate in the future and could even become catastrophic in the long run due to the dependence on non-renewable sources of water to meet the increasing demand (UPA, 2006).

To compensate for the shortages in water supply, the project of "Man-Made River"- the Libyan scheme of inter basin water transfer- has been planned to transport, through a system of pipe networks, about 4.5 million m³ / day of fossil aquifer water from the desert to the northern part of the country (Arab-Water-Council, 2009). The implemented phase of the project, which is essentially designed for agricultural use, has been used almost exclusively for domestic and industrial purposes in Libya's major cities (UPA, 2006). The demand for drinking water grows rapidly and will need to be met increasingly through the transfer of water away from the agriculture.

The Man-Made River Programme has succeeded in reducing the current deficit, but in the long run these regions will continue to experience a substantial deficit in water supply due to the decline in groundwater deposits and increased consumption (UPA, 2006). The prudent management of limited water resources has been a central target to water policy. The current national policies focus on meeting the direct urban demand for fresh water at the expense of food security, while the desalination of sea-water has been considered as a long-term solution. Indeed, as water became scarce and costly, policies to protect agricultural land of high quality and ecological zones from the urban encroachment have gained more acceptances.

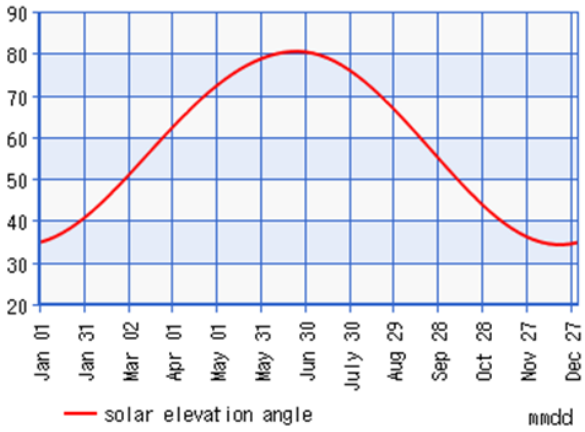
2.3. Quality of the Urban Climate

Generally, it is expected that situations of scarce resources and harsh environments are going to deteriorate even more due to climate change, which is, in part, a by-product of global warming. Indeed, Libya relies mainly on its petroleum industry, which in parallel to urban activities, is an important contributor to the emission of greenhouse-gases. According to the World Bank, the emission of CO_2 in Libya in 2009 was 10.0 tons per capita, higher than the average in both European Union and the Arab World 7.2 and 4.5 tons per capita respectively. However it is much lower than the USA and some other petroleum-producing nations like Saudi Arabia (World Bank Group, 2013).

Climate change is expected to bring about changes in temperature, precipitation, wind patterns, cloudiness and humidity, coupled with a rise of sea level (Williams, et al., 2010). According to the United Nations Development Programme "UNDP", it is expected that climate change would lead to an increase in the severity of current challenges in the Arab region including problems of desertification, scarcity of water and poor land capacity (UNDP, 2009)- see Figure 2.3. At the urban level, it is expected that the impact of climate change will be significant. Heat island effect and poor air quality are expected to affect people's health, level of comfort and quality of life, in addition to the impact on the built environment, the economy and social equality (Williams, et al., 2010). However, in the area of urban planning, the debate about sustainable development has emphasised not only *mitigating* climate change, but also *adapting* to this change.

Figure 2. 3: Solar Elevation Angles for a Year at 12.00 O'clock, Benghazi.

The long sunny hours in summer, while increases potentials for solar energy, are associated with high levels of heat and dry weather.
Source: Solar elevation angle calculator; Casio Computer CO. http://keisan.casio.com/exec/system/1224682277; accessed in 13.04.2013



Transport is one of the main contributors to air pollution in most cities. The table below (Table 2.4) compares the ownership and usage of passenger cars in Libya compared with other Arabic countries and the UK (World Bank Group, 2013). The figure of 225 passenger cars per 1000 persons in Libya in 2007 is notably higher than those for Tunisia, Algeria and Morocco – 73, 66 and 53 respectively, and approaching the figures in the more urbanised countries of the UK and UAE - 293 and 463 respectively. However, these figures show that car ownership per 1000 inhabitants has been more related with levels of urbanisation than fuel price.

Moreover, experience has shown that the reasons for the relatively high car-ownership in Libya include the absence of reliable public transport (see Photo 2.2), the improved road network, improved lifestyle and other cultural aspects such as the negative cultural attitude to bikes and motorbikes. Generally, cars are accepted for convenience, though they are big killers- statistics show that the fatalities due to road traffic accidents in Libya reached 5.33% of total deaths (World-Life-Expectancy, 2011). Indeed, because cars are different from traditional means of transport with regards capacity, speed and isolation, their impact on the urban form has been radical and profound (Colville-Andersen, 2012).

Table 2. 4: Number of Passenger Cars, Fuel Price and the Ratio of Urban Population, Compared

Data for Libya and other Selected Countries
Source: The World Bank Group, Data, http://data.worldbank.org/indicator/EN.POP.DNST; accessed in 02.06.2013

Countries	Passenger cars per 1000 people		Fuel price ($) 2005	GNI per capita ($) 2007	Urban population to the total 2005
	2005	2007			
Libya	229	225	0.14	16,510	0.77
Tunisia	67	73	0.96	7,960	0.65
Algeria	58	66	0.34	7,660	0.63
Morocco	47	53	1.29	3,990	0.55
UAE	263	293	0.37	62,610	0.78
The UK	457	463	1.44	36,310	0.90

Photo 2. 2: The Destroyed Main Railway Station; Benghazi, 1943

The Destruction of the railway system in 1943 led to the termination of the service since then - behind the smoke the cathedral building.
Source: Wikipedia; http://en.wikipedia.org; accessed 01.06.2013

2.4. Urbanization and the Demand on Urban Land

Libya, up until the beginning of the twentieth century, may be defined as a rural country, which was mainly reliant on seasonal agriculture to a subsistence standard. Urban centres were limited in number, small in size and scattered, while most of them were situated on the northern coast (Misrati, 1983). In 1911 only four cities had a population in excess of 5,000; all of them were regional centres on the Mediterranean coast and their combined population was 60,000 inhabitants, making up about 7% of the total population. It is estimated that the total urban area of the four settlements together was about 250 hectares, which included Tripoli with an estimated gross density of over 400 inhabitants per hectare and Benghazi with over 160 inhabitants per hectare (Amoura, 1998).

Between 1911 and 1954 the overall population growth was negligible, one reason being the war against colonialism and the mass murder committed in the colonial concentration camps in Cyrenaica between 1930 and 1932 (UNESCO, 1990). However, by 1954 the urban population reached 270,000 or about 25% of the total population, and the total urban area rose to 2,100 Hectares (Amoura, 1998). Generally, the urbanisation process, which was a result of the concentration of civic

services and opportunities, had been accompanied with an expansion of slums (Amoura, 1998).

By mid century, and as a result of political stability and economic changes, Libya, along with almost all Arab states witnessed high rates of population growth and even higher rates of urbanisation. Generally, the urbanisation process in the Arab-region is characterized by the concentration of a substantial proportion of the population in a few central cities, with these cities dominating most services, industrial infrastructure, communication networks and educational and cultural activities (Singh, 1983).

The discovery of oil in the country, a few years after independence in 1951, has significantly influenced the national economy, with Libya turning into a country where agriculture is a marginal sector. Consequently, population growth and movement have followed those areas where benefits from the oil were most greatly felt. It has happened that these are the same areas of previous population concentrations; areas of climatic advantage and high quality agricultural land (Misrati, 1983).

The improvement in living standards brought with it an increase of land requirements per capita. The land-use inventory in 1966 that was conducted as part of a nationwide planning program by Doxiadis Associates showed that the total urban land covered about 9,670 hectares (Doxiadis-Associates, 1980), which was a significant increase compared with the year 1954. The inventory identified fast urbanisation with an increase of land consumption per capita, though the figure has influenced by the reclassification of small towns.

Factors such as the service sector, central planning and the concentration of public services and investments in main urban centres have widened the gap between the growth rates of the urban population and the total population. Between 1966 and 1973 urban population growth was 11% per year, about threefold the rate of total population growth (Doxiadis-Associates, 1980). Recent figures from the census of 2006 showed that about 89% of Libyan population were living in urban areas (Libya-GOV, 2008).

The percentage of urban population in Libya is remarkably higher than that predicted for the Arab world in 2009 - 56% (World Bank Group, 2013). However, Libya experienced a sharp drop in the rate of total population growth throughout the period 1973 to 2006. It dropped from 4.21% in the period 1973-1984 to 2.86% in the period 1984-1995 and lastly to 1.52% in the period 1995-2006 (Libya-GOV, 2008). This is in line with the prediction by the World Bank, which states that the less-developed countries, where more than 75% of people live in the urban areas, will experience a decline in the rate of net-population growth (World Bank Group, 2013).

Generally, apart from the two main metropolitan regions Benghazi and Tripoli, most of the national territory remained by far under-populated. The national population density in 1995 was about 2.47 inhabitants per km² but with large variations. For areas of high population concentration in the coastal zone, the residential density has reached 45.0 inhabitants per km² (see Figure 2.4). Also, the data show that more than 90 percent of the population and the majority of urban centres are located in the coastal region and cover less than 10 percent of the national territory (UPA, 2006). A comparison for population densities based on the World Bank data shows that Libya is among the least populated countries in the world - see Table 2.5.

Figure 2. 4: Population Distribution, Libya

Source: The Statistical, Economic and Social Research and Training Centre for Islamic Countries
http://www.sesric.org/, 07.11. 2009

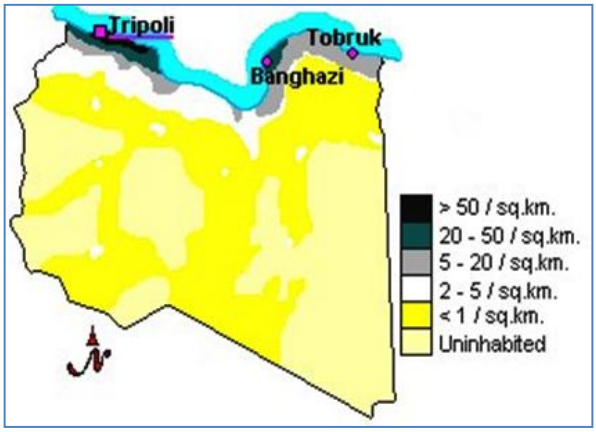


Table 2. 5: Total Population and Population Density 2011, Compared

Libya and other Selected Countries,2011
Source: The World Bank Group, Data, http://data.worldbank.org/indicator/EN.POP.DNST; accessed in 02.06.2013

Country	Total population -millions-	people per km² of land area
Libya	6.4	4.0
Egypt	82.5	83.0
Tunisia	10.7	69.0
Algeria	36.0	15.0
UK	62.7	259.0
USA	311.6	34.0
Australia	22.3	3.0

Many settlements are small, remote from each other and lacking public amenities and work opportunities. The study of Benghazi Region 2006-2030, which has reclassified the 202 settlements of the region into six categories based on population size and level of urban functions (see Table 2.6 and Figure 2.5), shows that the first five of the six categories have been concentrated in a zone parallel to the costal line and around the main sub-regional centres of Benghazi, Al Marj, Al Bayda, Darnah and Tobruq (Al-Emara, 2008).

Table 2. 6: The Classification of Human Settlements for Benghazi Region

Based on Census 2006
Source: Benghazi Regional Plan, Al-Emara Engineering Consultants, 2008, Benghazi

Classification	Population	Number
Metropolis	Above 200,000	1
City	50,000- 200,000	4
Town	10,000- 50,000	8
Small town	5,000- 10,000	23
Village	3,000- 5,000	21
Hamlet	500- 3,000	49
Fringe	Less than 500	96
Total		202

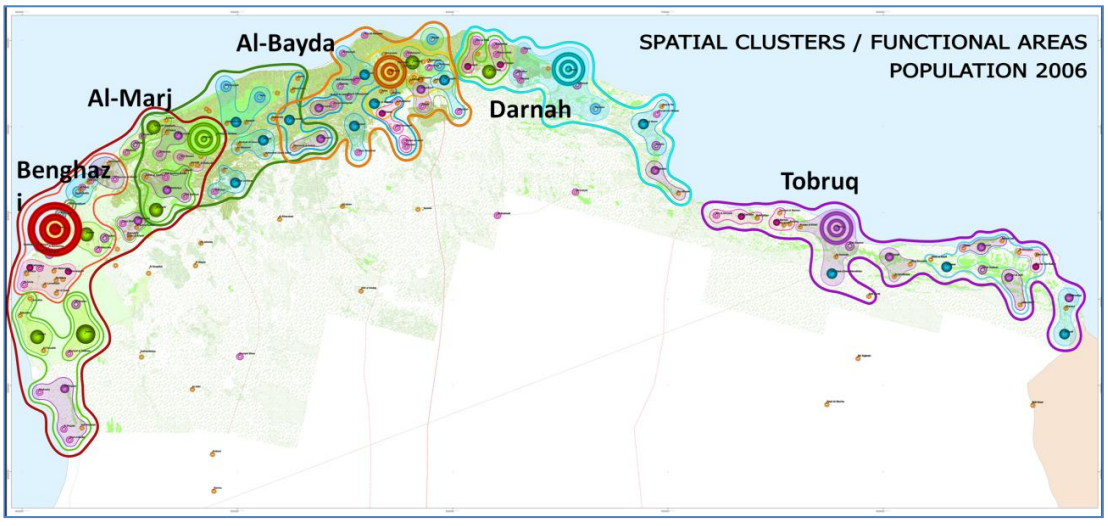


Figure 2. 5: Classification of Human Settlements; Benghazi Region

Source: Benghazi Regional Plan 2000-2030, El-Emara Consultant Office, 2008

Nonetheless, in spite of the decrease in the rate of population growth, delivering affordable housing remains an unresolved issue. It is predicted that the total population in Libya will continue to grow by 2.0 per cent a year, and increase from 5,657,692 inhabitants in 2006 to about 9,000,000 people in 2025, with an estimated

decrease in the average size of household from 6.0 in 2006 to 5.0 persons (UPA, 2006)- see Figure 2.6. It is evident that such demographic change would eventually lead to an increase in the rate of households which is greater than that of population growth and hence lead to an increase in housing demand.

Throughout the 1970s the public sector was the main provider of housing and public services, and built about 23,000 housing units, equal to between 9 and 8 units a year per 1000 persons. However, the delivery of housing by the public sector fell back in the 1980s and 1990s, to account for about 4 to 5 housing units a year per 1000 persons within the period between 1985 and 1995. This was followed by a policy change, away from direct funding of housing projects to supporting developers, investment companies, associations and semi-public organisations to invest in housing (Bu-Grarh, 2003).

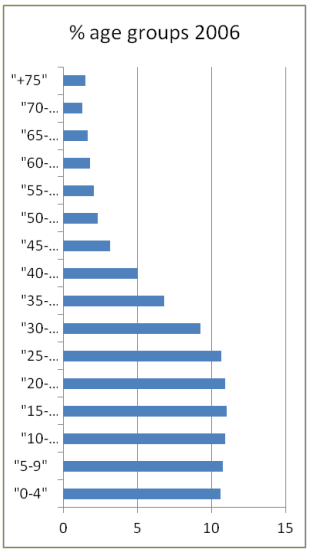


Figure 2. 6: Population Pyramid, Libya

Source: the National Census; Libya; 2006

Official surveys for living conditions in Benghazi (Table 2.7) show that about 60% of housing stock is single dwellings, while more than 86% of the housing dwellings contain 3 to 6 rooms. However, the knowledge that about 25% of Libyan families consist of 1 to 3 members, may support the impression that room occupancy in Libya is lower than it would be in some other regions i.e. Asia. The housing project, "7000 Residential Units" (www.daewooenc.com) which was launched in Benghazi in the 1980s, in response to local demand for living space, produced housing dwellings with a size of 120 to 160 m^2 – matches the survey results of 28 m^2 per person.

Table 2. 7: Buildings by Type and Occupancy, Benghazi, 2006

Source: Adapted from the National Census 2006 (NSA, 2007) and The Benghazi Planning Study, El-Emara Engineering Consultants, 2009

Number of rooms per household			Buildings by type		
Number	Per-cent		Type	Per-cent	
1-2	7.8%		Flats	39.5%	
3-4	74.0%		Courtyard & Terraced Houses	48.0%	60.5%
5-6	12.5%		Villas	12.5%	
Total number	106,428		Total number	86,859	
Average number	5.7		Families per household	1.18	

According to the National Physical Plan, the yearly demand on housing until 2025 is expected to grow gradually from 24,000 units in the base year 2000, to 38,000 units in 2025 (UPA, 2006). The Plan predicts that the land area required to accommodate about 495,000 new residential dwellings during the period 1996-2010 is about 18,464 hectares, and to build 543,900 units in the period 2010- 2025 would be about 20,257 hectares, at an average gross-density of 27.0 dwellings per hectare. It follows that the total urban area required to accommodate the development of new housing through the whole planning period, including all services and facilities, is expected to be about 200,000 Hectares (UPA, 2006).

Where and how to accommodate future urban growth is a real dilemma to urban planning. In spite of the aim of the National Physical Plan to contain a large part of the new development within current urban boundaries and through strategies including urban infill, control of urban boundaries and the increase of urban densities (UPA, 2006), paradoxically most new housing projects that have been carried out recently have been on the outskirts of main urban centres. Questioning whether this mismatch between the policy and practice is a result of communication failure, an administrative issue, or due to ineffectiveness of planning tools to respond to these objectives, is a central theme which will be addressed in this study.

2.5. Characteristics of the Urban Form

Many settlements in the country have evolved as market centres either on the intersections of caravan routes or close to seaports. In most cases, the city or town had taken its shape gradually around a central market place and important buildings such as the mosque with its minaret as a landmark. They were shaped by topography, constrained by agricultural land and other natural features, and influenced by cultural values and socio-economic activities, where issues such as defence and protecting microclimate were solved by different compact arrangements (Amoura, 1998). Farm land was used as greenbelt surrounding human settlements, which helped to control urban expansion, increase urban densities and improve the microclimate. The remaining parts of the old city of Tripoli - the *Gasbah* - show that it was compact and dense, with patterns of low-rise buildings and narrow winding streets and containing a mix of residential, commercial, religious, administrative and light industrial uses (see Photos 2.3).

Generally, the construction of traditional Arab city starts by defining main axes and public buildings, while allowing local areas to take shape gradually through the negotiation between different stakeholders and controlled by local organisations. This includes the commitment to certain Islamic norms which have spatial implications such as the segregation by gender and differentiating between the community members and outsiders (Bianca, 2000). However, the resultant urban fabrics though being irregular and highly sophisticated, were capable of meeting various socio-economic and cultural needs, such as visual privacy inside dwellings and in the semi-public open space, more than many other contemporary areas (Ben-Hamouche, 2008).

Photo 2. 3: Narrow Street, the Old Town, Tripoli

Street corner and meeting places
Source: Own photo, 2009

Natural and man-made constraints, such as agriculture, roads, mountains, valleys and the seashore, in addition to factors such as state intervention and regional importance, can influence not only the spatial distribution of human settlements, but also their form and structure. Indeed, cities in Libya can be categorised according to their site, such as cities on flat plains like Ajdabia; mountain cities influenced by the topography like Gharian; coastal cities extending alongside the seashore like Tripoli; cities influenced by natural lakes, marsh land or other natural features like Benghazi; and desert settlements like Ghadames, which is founded on an oasis - valley of fertile soil, a source of underground water, and often surrounded by dense palm trees (Amoura, 1998). Cities like Tripoli, Benghazi, Darna, Murzig and Ghadamis still contain parts of their old quarters, which are characterised by their fine-grain patterns of streets and low-rise buildings, and are marked by their mosques, castles, public squares and courtyard buildings (El Mahmudi, 1997).

Traditional fabrics of the Libyan cities have been treated in a similar way as the case of their Arabic counterparts, which have been influenced over the last century by technological development, auto transport and modern lifestyle. They have been subject to modern planning and its accompanying concepts including functional classification of roads, allocating the Central Business District "CBD" area adjacent to old centres, low density neighbourhoods, a hierarchy of urban centres and locating light industry in the peripheral areas and along arterial roads, while most cities have been restructured as multi-functional multi-nuclei cities (Ehlers, 1992). Quite often traditional quarters are perceived as independent entities, isolated from their surroundings and become susceptible to redevelopment - see Photo 2.4 and 2.5, and Figure 2.7.

Photo 2. 4: Jami' Al-Atiq, Benghazi

The two Ottoman style mosques - Al-Atiq and Osman - are of the few buildings of pre-colonisation era survived WWII and the following renewal programs in Benghazi. Source: own photo, 2009

Photo 2. 5: The Old City; Tripoli

New high-rise building behind city walls
Source: own photo, 2009

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Figure 2. 7: The Old City, Tripoli

Fine-grain pattern disturbed by the modern Coarse-grain blocks and straight streets
Source: Google Earth, 2013

Furthermore, while most contemporary cities in Libya can be defined as planned, new quarters are frequently dispersed, contain informal developments, and lack character, in that they are similar to many contemporary Arab settlements that are driven by the oil industry. They did not evolve gradually, but grow rather faster than any expectation, to gaining most of their land during the last few decades (UNDP, 2009).

Residential densities in Libya are relatively low when compared with cities of the neighbouring North African states, where the mean residential densities in Libya range from 130 persons per hectare (around 21 dwellings per hectare) in the main cities, 100 persons per hectare in middle size cites, and in small towns about 70 persons per hectare (Libya-UPA, 2006). It is evident that rational planning is a major

factor to blame for low densities within this context (see- Ekistics- ideas on system planning by C. A. Doxiadis, 1942).

Doxiadis Associates has been influential in urban planning in Libya since the early 1960s, where development programs for Libyan cities were based on Doxiadis' theory of "Ekistics" - the science of human settlements (Doxiadis, 1968). The theory addresses the issue of rapid growth and the need to balance elements of zoning, transport and communication in order to solve problems like urban crowd and noise and protect nature. It introduces ideas include leaving room for future expansion of the core area along a predetermined axis and channel growth along a single direction, in addition to promoting a multi-nodal structure of self-contained centres linked with transport to facilitate sprawling growth (Doxiadis, 1968). Aspects such as standards for spacious subdivisions, vacant land based on high expectation for future growth and transport planning have been the main instruments of institutional planning and influenced contemporary urban centres in Libya.

Generally, while the view of rational planning has, to an extent, failed to meet the expected qualities, the traditional city model, which sets a framework of urban grid and main functions and lets the social organisations act locally, has been successful in responding to local needs, the protection of privacy and microclimate, the provision of flexible public space and the use of affordable technology and inherited design solutions. In the traditional Arab city, the open space is matters more than the building; the concept which is omitted by modern planning. However, modern technology and lifestyle have brought new challenges, which could not fully met by either the traditional or contemporary approaches (Germeraad, 1993), while informal interventions are in some cases independent, random and a cause of different urban problems.

2.6. Conclusion

Regional challenges such as scarcity of freshwater and arable land, in addition to the harsh climate, have had a number of implications on the quality of urban areas in Libya. However, in a dominantly urban society, while demand over urban land and housing soar, it is quite understandable that meeting human needs such as housing and food production can be in conflict. This clearly reinforces the argument that sustainable development is not a choice but a matter of necessity that must find the right balance between different objectives based on their urgency and possible impact on global and local environments.

In spite of the differences of the natural conditions between regions in Libya, urban centres do have common characteristics, which reflect the influence of central planning and common historical events. Such a balance between demand on urban space and functions on one hand, and protection of the nature and its resources on the other, has been always a prime goal of urban planning in the country. However, rational planning that focuses on systems and narrow functions has been a cause of urban fragmentation and scattered expansions.

Generally, while current public policies in the area of urban planning have addressed concerns on regional issues and promoted sustainable development, practically, there is little evidence that serious actions have been taken regarding the national commitments towards mitigating the impact of global warming or adapting to the impact of climate change on the quality of human settlements. The next chapter of the literature review covers the theory underpinning sustainable development, the issue of urban sprawl and the concept of the compact city within the context of sustainable development. It focuses on the issues relevant to the Libyan context.

Chapter Three

Literature review

3.1. General

The chapter is divided into two parts; the first one reviews the debate on the concept of sustainable development with focus on the phenomenon of urban sprawl as a threat to urban sustainability, while the second part is devoted to the concept of compact urban form and the approaches that are expected suitable to sustainable urbanism; with the aim of arriving at a conceptual framework that enhances the achievement of the objectives of this study. The conceptual framework is a less formalised type of theory, consists of statements that link abstract concepts to empirical data and account for or describe abstract phenomena that occur under similar conditions (Rudestam & Newton, 2001, p. 6).

Fast and chaotic urbanisation

Traditionally, high levels of urbanisation are perceived as a sign for a healthy and successful economy. The growth of urban population is a result of natural increase of people and immigration. Metropolitan areas normally attract immigrants due to expectations of better employment opportunities and higher quality of life. However, it is noted that urbanisation in many developing countries is generally not linked with industrialisation and has a weak relationship with the urban economy (Davis, 2006); thus even a significant fall in the incomes in urban areas may not necessarily lead to a short term decline in rural-urban immigration. Indeed, it is evident that while global forces do push people out from the countryside, urbanisation seems to be sustained even if the pull factor of cities is weakened by debt and economic depression (Davis, 2006).

It is argued that quite often rapid urbanisation in main metropolitan areas, particularly in the developing countries which lack technical and management

capacity, has negative impact on the quality of the built environment and enhances the expansions over urban edges and in the countryside (Dave, 2010). In many cases, as cities spread out they decrease in density, absorb the adjacent small towns and become more fragmented (Lloyd-Jones, 2000).

Many urban expansions have gained a mix of urban and rural characteristics to become what Sieverts called a phenomenon of "Zwischenstadt" (Sieverts, 2002, p. 3); this term describes a polycentric structure with neither traditional cores nor clear edges. It is a type of urbanism which is in part an accidental outcome of planning policies based on modernists' ideals (Haas, 2008). Thus while modern planning and design ideas have encouraged urban sprawl, urban standards and codes tended to erode local and regional vernacular differences (Watson & Bentley, 2007).

Issues such as the shift of development to the outskirts, the decay of urban centres, single land-uses, and incomplete low quality housing projects represent a real challenge to urban sustainability (Haas, 2008), (Calthorpe & Fulton, 2001). Given the fact that the Arab World[1] is located in a zone with a harsh climate, this type of scattered, fragmented and low density development can have an even deeper impact on people's quality of life. Yet, the cities, which are almost environmentally unsustainable, can indeed be considered as an important intermediary in any effort towards the realisation of sustainability objectives (Haughton & Hunter, 1994).

The role of physical planning

Libya, from the early 1950s, a date singling a new era of national stability and the dominance of a service economy based on the oil industry, has been experiencing high rates of urban growth (UPA, 2006). However, as with other Arab countries, the majority of contemporary urban development in Libya is characterised by low densities and dispersed and incomplete patterns, a type of development which by its very nature consumes more land, energy and other natural resources and produces more wastes and air pollution per capita than any other more compact development. This is in addition to its link to such issues as poor access to basic services and poor urban environment (UN-Habitat, 2012) – see Photo 3.1.

[1] The Arab world comprises the 22 countries and territories of the Arab League. They are the Arabic-speaking countries in North Africa, Western Asia and elsewhere- See (League-of-Arab, 2013).

Photo 3. 1: Wide Local Street, the Mountainous City of Shahat

The idea of reserving space for future needs (Doxiadis, 1968) appears influential even at the street level, where neighbourhood streets for detached buildings in such a small town can range in width from 26 to 32 meters
Source: Own photo, 2008

It is evident that rational planning, based on modernists' concepts such as order, straight angle and large scale urban blocks (see - The city of tomorrow and its planning (Le-Corbusier, 1973)), has, to a large extent, been part of the problem rather than the solution. Planning policies and regulations such as floor space index and streets' standards, which were intended to better manage urban development, proved in many cases to be a driver for more urban sprawl (Duany, et al., 2000). However, constraints placed by the planning on housing options for the poor in many developing countries became a driver for informal development (Devas & Rakodi, 1993).

Rational planning promotes abstraction as it reduces the urban environment into separate zones linked by transport and other means of communication (Allmendinger, 2002). However, since the type of planning describes only the process of the reasoning that underpins the making of rational decisions and says little about the actual substantive ends or targets that the planning should be aiming at, it is more a theory about the methods and means of planning, rather than about the outcomes (Taylor, 1998).

Generally, it is argued that common features for urban sprawl may include cul-de-sacs, detached single-family housing, single-use areas, minimum public space and car-oriented (Gillham, 2002, p. 23). It is acknowledged that urban sprawl; the low-density, fragmented and scattered development, in both developed and developing nations, is unsustainable. It destroys fertile land and ecosystem, increases development costs, and causes the degradation of the urban environment (Calthorpe & Fulton, 2001) (Gillham, 2002). In fact, the consequences of this type of development can be even worse in a country like Libya with its very limited fertile land and water resources, harsh climate and limited capacity of local communities - see Chapter 2.

Compact Urbanism

The history, urbanisation trends and environmental challenges in the Arab World show that compact urban development can be a key strategy for more sustainable cities and towns (UNDP, 2009). Urban compactness within this context can be justified for its continuity through the long urban history, the need to maintain social organisations and due to its responsiveness to the hot climate in terms of energy-saving and thermal comfort (Ben-Hamouche, 2009).

Planning measures such as urban containment and upgrading of informal settlements have been frequently adopted by many metropolitan areas as strategies to make the city more urban and the countryside more rural. They are targeting better use of urban land and investments, while at the same time protect agriculture and the natural environment (UNDP, 2009). However, at the local level, measures such as higher levels of physical intensity, higher residential densities and mix of land uses have been promoted as a mean of optimising the use of urban space and infrastructure, improving accessibility to local amenities and transport facilities, and creating liveable communities (Dave, 2010).

Good examples of traditional urban forms have frequently been re-produced to represent new urban approaches, such as *Compact City, New Urbanism* and *Multifunctional Land Use*, which target higher quality and liveable urban environment (Jabareen, 2006). However, other concepts like the *Eco-city* and *Tech-*

city focus more on protecting green cover and microclimate and promoting technologies for recycling and renewable energy (Frey, 1999). Although some versions promote human-scale development, they require access to relatively larger open space.

Ras-Lanuf city in Libya (Figure 3.1) and Masdar city in the UAE are examples that demonstrate the revival of historical concepts of the Arab city form into the contemporary context by including the idea of semi-private mews in the first example and narrow and shaded streets in the second. However, they have been built as mega projects to accommodate a homogenous society. Moreover, it is argued that Masdar city may represent an experimental work of composite solutions rather than an integrated work and designed to communicate visitors' preferences rather than the needs of the local community (Bullivant, 2012), (Cugurullo, 2013).

Figure 3. 1: Residential Cluster, City of Ras-Lanuf

In spite of the relevance to mews idea, the scheme has been separated from the beach and open spaces remained deserted
Source: Google earth, 2013

On the other hand, the densely populated nations mainly in the Far East seem to be keen to follow the modernism project, where the high-rise option has been accepted to reach levels of density much higher than the target in the Arab World or the West.

Although compact development represents a sustainable alternative to urban sprawl, the type and characteristics of the urban development and hence its performance in terms of sustainability can only be defined within the local context (Williams, et al., 2000).

This chapter now outlines results of the literature review and critical analysis of theories and concepts in the field of urban sustainability. The work reflects on both international and regional experiences in regard to compact urban development and the revival of traditional urban principles. It also discusses their relevance to current issues on urban sustainability in Benghazi and Arab countries in general. The first part focuses on the urban problem within the context of sustainable development, while the second part is devoted to theory of compact urban development.

Part One: the Urban Problem

3.2. Introduction

Sustainable development is about balancing maintenance and utility. In the field of urban planning, this logic justifies the call for more spatial concentration and the arrangement of urban functions and human activities in such a way that helps to improve the sustainability of environmental, social and economical systems.

This part of the literature review consists of three sections; the first section reviews the idea of sustainable development and the related issues of human needs and natural constraints of scarcity and climate change. The second section discusses the phenomenon of urban sprawl and its impact on the sustainability of local areas, followed by the last section which examines the measurements of urban sprawl at different scales from the regional and city levels to the neighbourhood and block levels. For the purpose of this study, urban sprawl is defined as a type of low density development, characterised by scattered and fragmented patterns, which can be incomplete and less-controlled.

3.3. What is "Sustainable Development"?

The idea of Sustainable Development reflects a refusal to allow continuing damage to the ecosystem by human activities. Severe global events warn all nations that this destruction of the natural environment is a real threat to the survival of humanity (Roseland, 2000). Rachel Carson's book, "Silent Spring", published in 1962, focused on the harm that is wrought on our natural environment through the use of pesticides, has led to wide reactions (Cuthbert, 2006). The report of "Limits To Growth" in 1972 (Meadows, 1975) has warned all nations that such global trends as industrial pollution, rapid population growth, poverty, depletion of non-renewable resources and deteriorating ecosystems can have a devastating impact on the global environment and the future of mankind (Frey & Yaneske, 2007). This dilemma of the

relationship between mankind and its surrounding environment has been discussed in the Quran as shown in the extract below:

> (ظهر الفساد في البرّ والبحر بما كسبت أيدي الناس ليُذيقهم بعض الذي عمِلوا لعلّهم يرجعون)
> "Corruption has appeared throughout the land and sea by [reason of] what the hands of people have earned so He may let them taste part of [the consequence of] what they have done that perhaps they will return [to righteousness]" (The-Quran, n.d., pp. 408-Roman §41).

Sustainable Development is basically about how to make best use of natural resources to meet human needs in such a way that it does not affect the durability of these resources or lead to the deterioration of the natural environment. The concept is embedded in the theory of "Renewable Resource Management", which was adopted in 1980 as a conservation and development approach to the World Conservation Strategy before becoming the slogan of the Brundtland Commission in its "Our Common Future"- the World Commission Report on Environment and Development in 1987 (Rees, 1998).

The concept should be perceived, not merely as a green development that prioritises environmental benefits over social or economic gains, but one which provides a dynamic balance between the functions of maintenance- sustainability on the one hand and transformation- development on the other (Chan, et al., 2004); a concept which harmonises all investments, exploitation of resources, technologies, social institutions, and chances of development that satisfy human needs while at the same time protecting the natural environment (WCED, 1987). However, although holding inherently conflicting objectives, the *Brundtland Commission* placed particular emphasis on the dimension of social justice, by stating that Sustainable Development is "The development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

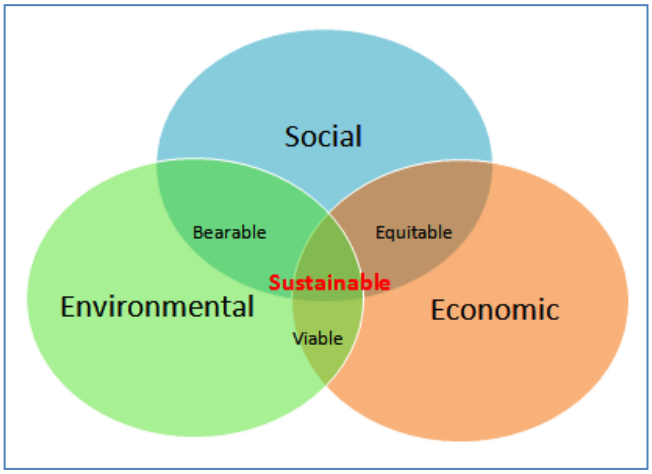
Because Sustainable Development is generally about protecting the environment for the sake of all people and across generations, it aims to pass to future generations opportunities similar to those enjoyed by the current generation; it prioritises activities which support the integration of economic and ecological systems, in such a way that all people can share the benefits (Curwell, et al., 2005). This includes preventing the handing down of the consequences of economic choices to remote

regions, to other people or to the future. Here indeed social justice is of fundamental importance, especially in those situations where it is quite difficult to sustain the natural environment in a world struggling with poverty and human conflicts (Petrucci, 2002).

Sustainable Development has been represented by three interdependent and mutually reinforcing policy areas: (1) economic development, (2) social development and (3) environmental protection (UN, 2005), which aims to bring together the goals of economic prosperity, social justice and ecological stability for the benefit of current and future generations (see Figure 3.2). The inclusion of cultural development can provide the fourth dimension of Sustainable Development. This is in line with the Universal Declaration on Cultural Diversity of UNESCO 2001, which has emphasised the importance of culture diversity - human development and psychological needs - as part and parcel of the overall sustainability (UNESCO, 2001).

Figure 3. 2: Pillars of Sustainable Development

(economic, environmental and social dimensions)
Source: http://en.wikipedia.org, - accessed 02/2011



Despite the fact that science and technology have given mankind the power to change the environment which, when wisely used, can help improve people's quality of life while at the same time sustain the ecosystem; there is, nevertheless, an argument that the idea of Sustainable Development is vague and can mean anything (Rees, 1998). It could be interpreted, for example, as a way to control individuals' freedom or interrupt the market mechanism, which may be perceived by some parties as a more capable way to protect the environment (Petrucci, 2002).

For such reasons, developing countries are often sceptical about the purpose of the concept of sustainable development, where there is a feeling that a request to reduce pollution may have an adverse impact on their economic growth and in effect widen the South-North development gap (Ghabbour, 1982). Ecological measures are frequently criticised in the developing countries, where basic human needs and economic development are to an extent unsatisfied (*ibid*). However, global challenges like climate change and scarcity of resources would affect different communities irrespective of their footprint; the matter which should convince all parties to act responsibly. Hence the concept of Sustainable Development is basically about environmental ethics; a way of life and economic activities based on a kind of relationship with the environment. Indeed, despite the claim that the concept is vague, it has generated important reactions across all fields of life (Rees, 1998). It has raised awareness about common responsibilities and a morality that denies anti-environment behaviours.

3.3.1. Human Needs

Individuals are driven by varied social and physical demands, which need to be satisfied. According to Katrin Gillwald (1989) "Needs are requirements of human existence and driving forces of human development, manifested in wishes" (In: (Bayrhuber, 1992)).

The international recognition of the immediate human needs as basic human rights was first announced by the Universal Declaration of Human Rights, which states that "everyone has the right to a standard of living adequate for health and well-being for himself and his family, including food, clothing, housing and medical care" (UN, 1948, p. §25). Nowadays, the satisfaction of basic human needs is increasingly viewed as an issue allied to global sustainability, especially in the "war against poverty", urged on by the recognition of global responsibilities and interdependence, and the limited capacity of some societies and individuals to face serious problems (Ghabbour, 1982). Therefore, a definition of basic human needs becomes an

important planning requirement to estimate and measure levels of satisfaction and to allocate the required resources (*ibid*).

According to Bayrhuber, meeting wishes and hence the satisfaction of needs entails morality issues and therefore may or may not be ethically justifiable. It is argued that ethically justifiable wishes are those based on desires which bring with them good consequences to the whole "*Naturalistic reasoning"*, and serve or maintain human dignity "*Personalistic reasoning"* (Bayrhuber, 1992). Personal desires are quite variable for different sex/age groups and societies, yet may be more influenced by external factors such as education, the physical and cultural environment, and access to information (Schaefer, 1992). However, in spite of the differences of personal desires, it is accepted that there is a unified universal category of basic human needs - not desires - that justifies all the wants of people worldwide (Schaefer, 1992). The notion "everyone has a right to the city" (UN-Habitat, 2010) implicitly refers to the right to a better quality of life.

Maslow argues that basic human needs can be listed in a hierarchical order: "Physical needs and needs for Safety; Belongingness; Esteem; and Self-actualisation". As lower levels of need are satisfied, other needs such as self-expression and self-fulfilment may appear to be more important and urgent, although different levels can be overlapped (Maslow, 1943) – see Figure 3.3.

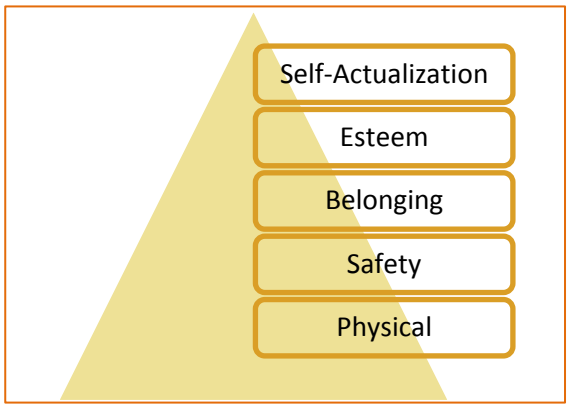


Figure 3. 3: Hierarchy of Basic Human Needs

Source: A Theory of Human Motivation; Maslow (1943)

It is argued that the feeling of needs and their priorities are culturally-related and influenced by the level of needs already satisfied (Schaefer, 1992), thus as the need is fulfilled it will no longer be felt as an urgent need. For instance, in the West, where most material needs are satisfied, it seems that spiritual needs are expressed more vocally. This is in contrast with the developing countries, where poverty shows less-satisfaction for basic physical needs. However, basic immediate needs are limited

and can be satisfied, whereas the secondary more social needs are varied, seem unlimited and cannot always be fully satisfied (Ghabbour, 1982).

A critic of Maslow's classification claims that it misses "the deterministic motivation from physiological to psychological stages of needs satisfaction" (Ghabbour, 1982). Thus for instance the provision of basic material needs such as food and housing in some traditional communities could indeed disrupt the social system essential for the satisfaction of spiritual needs. In response to these concerns, and based on the definition of basic human needs by ILO Report on Employment, Growth and Basic Needs – "A One-World Problem"; Geneva 1976, it is recommended that human needs should be classified into two categories: *Primary needs* and *Secondary needs*, which are more straightforward in regard to the natural relationships between different needs (Sharif & Jabaji, 1982), (Ghabbour, 1982).

Primary needs - to an extent biologically-inherited, consist of the biophysical needs necessary to preserve life and the immediate psychological needs to secure basic resources such as earning a living in a coherent society and basic education necessary for living.

Secondary needs - essential to meet the primary needs include psychosocial needs- aesthetic, spiritual and creativity, and social needs- including all public services and utilities (Sharif & Jabaji, 1982), (Ghabbour, 1982).

In contrast to the basic immediate needs "*standards of living*", in order to understand the needs of human development and dignity "*quality of life*" it is important to cover aspects such as built environment, social capital and public services, which are context relevant and require the investigation of local categories of human needs (Fischler, 2000), (Ghabbour, 1982). For instance, the need for a service such as park, in spite of its environmental importance, may be accounted low on the social scale of a poor community as long as immediate needs remained unsatisfied, yet the same need could gain a higher grade on that scale at a later stage of development.

This study argues that planning policies in Libya, as in many other developing countries that adopt a simplistic hierarchical classification of human needs based on assumed priorities such as housing production, have failed to create a sustainable

urban environment necessary for human development. For instance, the provision of housing estates that are incomplete, lack civic infrastructure and transport alternatives were widely unsatisfactory. Indeed, overgeneralization of human needs can overlook the increasingly recognised and intrinsic link between human needs and cultural background (Zukin, 1995).

On a practical level, the assessment task of human needs would start with a list of basic needs and their priorities within the local context at different periods (Schaefer, 1992). Indeed, the complete set of needs is more than a simple sum of individuals' wishes, but should be flexible enough to meet the expectations of different ages, sexes, ethnic groups and cultures and to fit various socio-economic conditions. Also, there is no fixed threshold of needs that defines the minimum acceptable level of quality of life, identifying a range of wants is useful as general guidance, which can help to represent real problems and identify all possibilities (Schaefer, 1992).

Figures on quality of life can be complex, varied and continue to change. They may obtain different results depending on the chosen sets of variables, the weight given to each variable, the approach adopted, the participants engaged in the process and the homogeneity of the geographical analysis units that the research is based on (Ulengin, et al., 2001). However, general indicators are used in different ways to compare the achievements of countries and regions in regard to the improvement of people's quality of life.

It is noted that people may pick a well-paid job with a less happy lifestyle, i.e. long working hours, stress, and uninteresting tasks, thus promoting happiness could lead to fewer opportunities. It is argued that a higher GDP (Gross Domestic Product) for a nation can be more important as a policy objective for human development than GNH - Gross National Happiness (Heffetz, et al., 2012).

The Human Development Index (HDI) is a measure for the satisfaction level of human needs. It goes beyond income to measure the human development through three indicators of *health, education* and *living standards* (UNDP, 2009). The Human Development Report 2009 showed large differences between countries with regards to the two indicators of well-being and life expectancy. Libya has been

ranked the 55th out of 182 countries in the Human Development Report as its HDI was increased from 0.821 to 0.847 between 2000 and 2007. Interestingly, although Libya has a level of income below that in Saudi Arabia, it gained a slightly higher grade on this index of human development (Figure 3.4) which reflects a better accessibility to social services in Libya than in Saudi Arabia (UNDP, 2009).

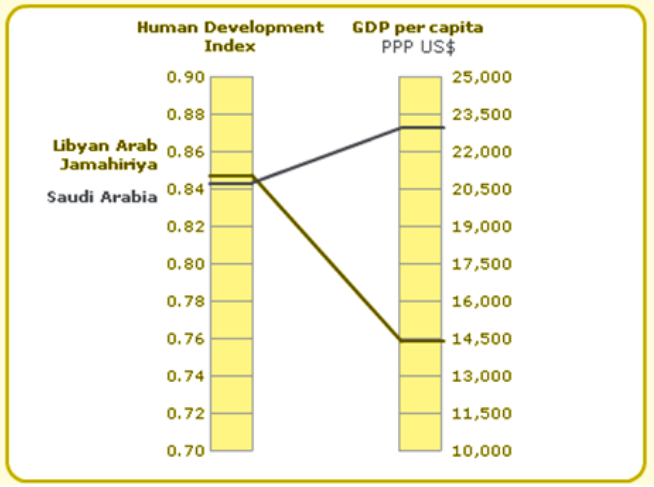


Figure 3. 4: Human Development Index and GOP Compared - Libya and Saudi Arabia

Source: the Human Development Report 2009,

3.3.2. Ecology, Natural Resources and the Climate

It is argued that population growth and global economy can be a challenge to global sustainability due to their link with the increase of exploitation of natural resources and release of pollutants, which in turn cause problems such as depletion of natural resources, deterioration of the ecosystem and global warming (Frey & Yaneske, 2007).

The data on national human development and ecological footprint in different countries and regions shows an interesting relationship (UNDP, 2009) - see Figure 3.5. The scatter diagram shows that as the human development index exceeds the rate 0.75, the corresponding level of the ecological footprint for that country, as measured by hectares per person, increases sharply. However, even in countries of low energy consumption per capita, a good percent of energy used in urban areas goes to buildings and transport. A survey conducted in Bangalore, India found that about 39% of energy consumed in the city went to domestic functions- mainly for cooking and heating water, while transportation took 27% (Reddy, 2000).

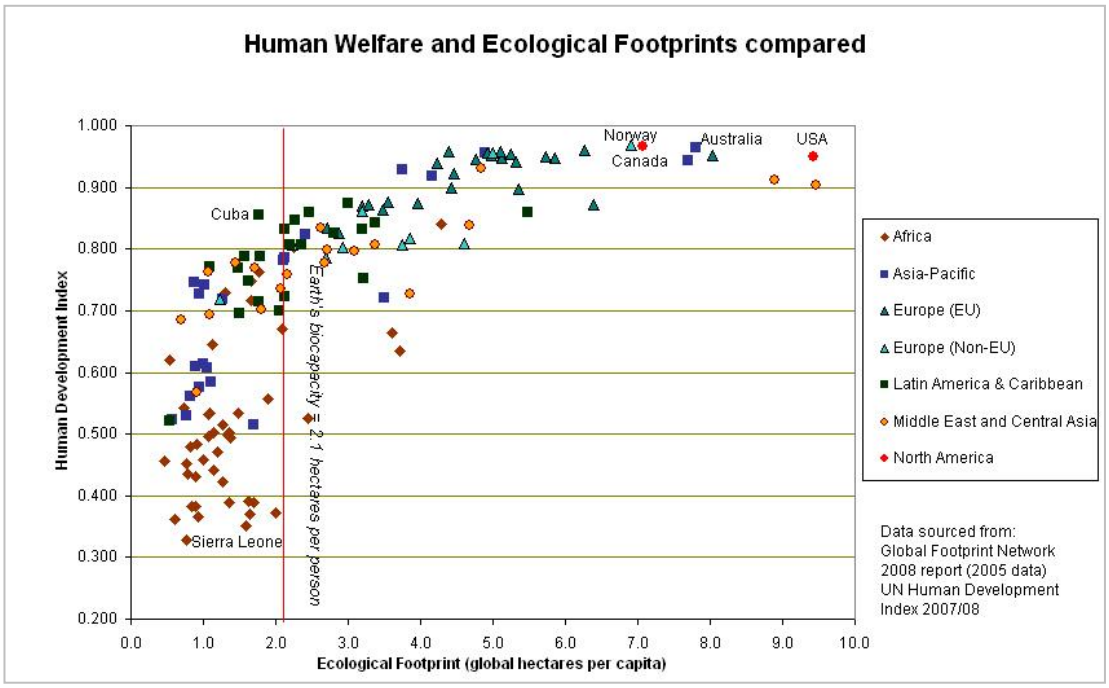


Figure 3. 5: Human Welfare and Ecological Footprints Compared

The human development index (HDI) measures development by combining indicators of life expectancy, educational attainment and income (the Human Development Report; UNDP, in: http://hdr.undp.org)
Source:Global Footpint Network, UN Human Development Index 2007/2008
http://upload.wikimedia.org/wikipedia/commons/0/0f/Human_welfare_and_ecological_footprint.jpg; accessed in 12.11.2012

Environmental issues can impose an increasing challenge to national security. In the Arab Region there is a potential for future conflicts over scarce natural resources (UNDP, 2009). Scarcity of resources, information or other capitals means limitations and competition and these can lead to struggle. However, security is relative; there is no absolute secure place and there is not an unlimited access to any aspect in human life (Davis, 2006). According to the United Nations Development Program the total population of the Arab region is estimated to grow from 317 million inhabitants in 2007 to about 395 million inhabitants in 2015 (UNDP, 2009). In an area of shrinking water resources and arable land, this growth is expected to increase pressure on the region's *ecological carrying capacity* and affect its sustainability.

Climate change is expected to cause changes in temperature, precipitation, wind patterns, cloudiness, and humidity, coupled with a rise of sea level (Williams, et al., 2010). CO_2 is one of the main gases contributing to the greenhouse effect.

Greenhouse gases affect the temperature of the earth, through a process of absorption and emitting radiation within the thermal infrared range (*ibid*).

Common to hot dry zones, as in North Africa and the Middle East, that the average evaporation is higher than the average annual rate of precipitation; temperatures between day and night vary greatly; and they receive high degree of solar energy radiation (Golany, 1982). The UNDP report expects that the phenomenon of climate change would cause an increase in the severity of the current challenges facing the Arab World (Figure 3.6) including increased desertification, scarcity of fresh water and poor land capacity (UNDP, 2009). The phenomenon of desertification - the expansion of desert-like conditions and landscape, occurs as a result of human activities such as overgrazing and pollution; meteorological factors such as harsh climate and draught; and ecological factors such as loss of green cover and lack of biodiversity (Geist, 2005).

Figure 3. 6: The Arab World

(Note: South of Sudan became an independent country; which is not Arab)
Source: http://www.arabicinterpreter.com/culture.html; accessed 08.2011

It is expected that North Africa would be among the worst affected regions by climate change, where the increase in temperature and rise of sea levels could bring about shortages in freshwater, thereby affecting agriculture productivity and causing economic crises. This would be in addition to the displacement of large numbers of the urban population (Gordon, 1998). The Arab region is hot and dry, where water has historically been a deterministic aspect for human activities, security and guiding

the allocation and growth of human settlements far more than in any other region. Access to water, groundwater management, water pollution and demand management are among the most important issues which have key socio-economic implications in several Arab countries (Arab-Water-Council, 2009).

Renewable water resources are limited and are expected to be insufficient to meet future demand in the Arab region. Whereas in 1950 the average annual share of available renewable water resources (ARWR) was above 4,000 m³ per capita per year, this share had fallen in 1995 to about 1,312 m³ per capita, and is projected to further decrease to about 547 m³ per capita per year by the year 2050. This is mainly due to fast population growth and a drain of resources (UNDP 2008 in: (Arab-Water-Council, 2009). Agriculture consumes annually about 83% of water available in the region, while only 10% goes to domestic uses. Overuse of water resources, partly as a result of fast urbanisation, has caused problems such as the deterioration of water-quality, salinisation and has led to a reduction in levels of underground resources (*ibid*).

To compensate for the shortages in the water supply, most nations in the region focus on investment in non-conventional resources - i.e., desalination plants and reuse of wastewater and agriculture drainage - in addition to the non-renewable aquifers. Desalinated water makes up 56% of domestic water consumption in the Arabian-peninsula countries, and it is central to long-term water strategies for many countries in the region (World Bank, 2007 in: (Arab-Water-Council, 2009)).

Photo3. 2: Traditional Irrigation System; Town of Lathron

In the area of Green Mountains traditional systems of water canals and reservoirs are used to collect to distrbute rainwater.
Source: own photo, 2008

Nevertheless, the daily consumption of freshwater per capita in some countries in the region is far below the recommended level of 170 litres per capita per day set by the World Health Organisation (WHO). In Jordan for example the average water supply

is only 90 litres per capita per day (Arab-Water-Council, 2009). As policies are focused towards the satisfaction of people's direct needs for drinking water, rather than food security, the current tendency in the region is to prioritise the demand of urban functions over that of the agriculture sector; this is in addition to calling for the prudent use of water (*ibid*).

This issue has a direct implication on the type of urban development, so that unlike the case in Europe where spatial openness to the surrounding environment is appreciated, in the arid environment open land is not green by nature and the planning for large green areas can be unsustainable in terms of water consumption and energy use (Box 3.1). In the Arab region urban development has traditionally prioritised preserving limited resources of water and soil and the protection from harsh climate.

Box3. 1: Switching to Water Smart Landscape; Queen Palm Oasis

The urban use of water in 2008 was 254 GPCD (galon per capita per day)- i.e. about 756 LPCD (liters per capita per day). Two-thirds of the domestic use of fresh water was in the outdoors due to the desert climate (Southern Nevada water authority, 2008). However, this figure is higher than the national USA figure of 575 LPCD and much higher than that of the UK- 149 LPCD (Data 360, 2002).

Source: Water Smart Landscapes before & after Gallery: Queen Palm Oasis; Southern Nevada water authority 2008; - http://www.snwa.com/html/cons_waterfacts.html- accessed in 2.2012; and Data 360; http://www.data360.org/dsg.aspx?Data_Set_Group_Id=757 ; accessed in 04.2013

At the urban level, due to the concentration of people and their activities, consequences of climate change are expected to be very significant indeed. Changes in external air temperature, while influence air movement, solar radiation and humidity, which in turn determine human thermal comfort; they also lead to more

energy consumption, and increase the greenhouse gases and the heat-island effect (De-Schiller, et al., 2006), (Grandjean & Gilgen, 1976).

Urban heat-island effect happens when urban mass store heat during the day and release that heat during the night. Issues such as the heat-island effect and the deterioration of air quality would lead to a harsher microclimates and affect the quality of urban environment, especially the residential areas, where people spend most of their time (Williams, et al., 2010). The harsh climate affects buildings, which may become overheated and rely more on air-conditioning to maintain satisfactory levels of indoor comfort and this in turn contributes more heat to the outdoor environments. Scattered urban forms expose people to unprotected open space and traffic and expose buildings to heat (De-Schiller, et al., 2006).

A relationship between building type and the exposure to climate conditions is presented in Figure 3.7 which shows a positive relationship between building form and heat loss. On the other hand, public green spaces and parks can deteriorate due to the dry weather, especially in a region where fresh water is a scarce commodity, while large impermeable spaces, especially asphalted surfaces, do increase the percentage of reflected radiation. As a result, outdoor spaces may become extremely hot and discourage people from walking outside their homes and deter the people from participating in public life. Additionally, vulnerable people may suffer heat stress; and air-conditioning may become unaffordable to many people (Williams, et al., 2010), (Farr, 2008).

The urban environment, as an area of concentration of people and their activities, is indeed an important intermediate towards the realisation of objectives of sustainable development. Sustainable urban development can be a means to help reduce the ecological footprint of human activities and improve the quality of people's life. The following sections will focus on the issue of urban sprawl and the role of urban form achieving the objectives of sustainable development.

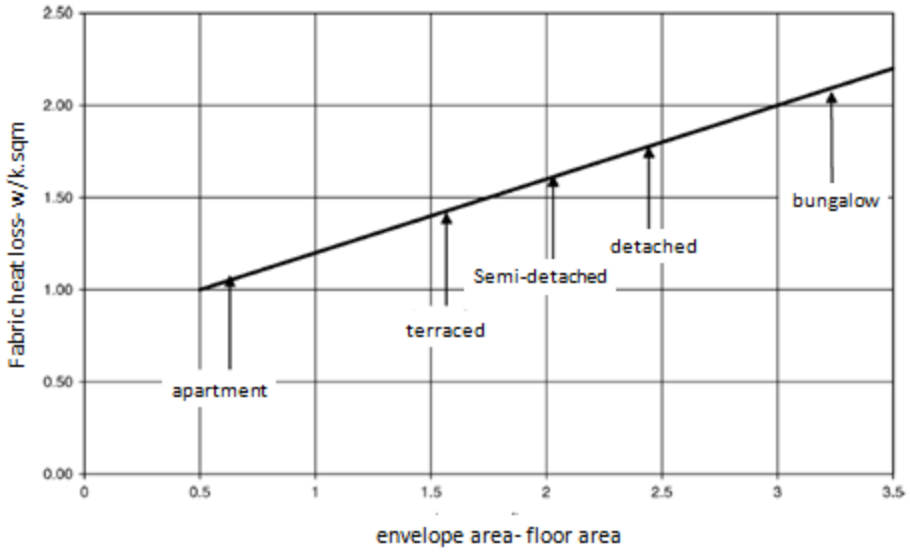


Figure 3. 7: A Relationship between Building Form and Heat Loss.

In European Union, building energy use accounts for about 41% of the total energy consumed and an equivalent proportion of pollution generated
Source: Energy and the city: density, buildings and transport; Steemers (2003).

3.4. The Urban Sprawl

The built environment is viewed as an extremely important field to serve the qualitative aspects for the sustainable development (UN-Habitat, 1980). Due to the influence of the urban environment on the quality of people's life, its improvement has been perceived as a prerequisite towards the satisfaction of basic human needs. It is the provider of the appropriate physical context within which sustainability objectives can be realised and also the area of consistency and contribution in the global objectives of social equity and economic development (UN-Habitat, 1980).

Historically, cities lived within the capacity of their hinterland and were constrained by the availability of resources. Many cities collapsed as a result of the exploitation of their hinterland (Frey & Yaneske, 2007). The 13th century Arab philosopher, Ibn Khaldun argued that the collapse of cities and the frequency of such occurrences can be a result of social struggle (Hoyland, et al., 2010). His explanation was that the city starts strong, then with time it loses its social cohesion and becomes economically weaker to the point it collapses, where it can be taken over by new comers (*ibid*).

Nowadays, cities which experience urban sprawl and a decline of their centres face demographic, economic and spatial transitions. However, instead of dealing with the causes of shrinkage and devising strategies to overcome them, Zingale and Riemann suggest that the focus should be placed on giving the shrinking city a new image, which may play a role in its revival (Zingale & Riemann, 2013).

Sustainable urbanism describes a type of development, urban management and lifestyle that enhances the efficient use of land and other resources and the maintenance of the natural environment, while targeting a high quality of life (UN-Habitat, 1980). According to the United Nations Conference on Environment and Development - UNCED 1992 - in Rio de Janeiro, policies of sustainable development are essentially about a way of living, working and ordering society that encourages a reduction of pollution, re-use of resources, and promotes biodiversity. Measures may include economic initiatives, responsible production and consumption, technological innovations, lifestyle adjustable to sustainability requirements and more sustainable patterns of urban development (UN, 1992).

In the field of urban planning, objectives of sustainability would include a healthy environment, social cohesion, economic efficiency and regional sustainability, specifically targeting the efficient use of land and other resources, reduction of wastes and air pollution, protection of biodiversity, local distinctiveness and urban beauty, and access to skills, amenities and equal opportunities (Eurofound, 1997). However, priorities and the way to achieve sustainability objectives do vary and depend on both the local context and issues under investigation (Williams, et al., 2000).

Local practices and technology need to be appreciated as important elements in this process. They are essential to achieve a balance between opposing demands such as the conflict on land between food production and housing development, or whether to plan for more intensification or urban greening. The next sections of this part will discuss the main characteristics of urban sprawl and methods of measurement.

3.4.1. Scattered Development

Globalisation has fostered urbanisation (Hamm & Muttagi, 2001). Urban expansion is a neutral description that depicts the increases of cities in size and surface into the surrounding land areas (Inostroza, et al., 2013). However, it is common that contemporary urban development, especially in the South, to be fragmented and spread out at low density and to absorb small towns (Lloyd-Jones, 2000).

The *urban form* represents the spatial configuration of certain urban elements and the urban type, whether a market town, historic centre or suburb. However, any urban form is distinguished by its size, layout, land uses, and the distribution of open spaces, in additional to features such as transport and urban design (Dempsey, et al., 2010). Based on his study of British towns, Conzen has defined types of morphological processes that include: (1) outward growth of nucleus town mainly residential; (2) urban fringe-belt of more loosely structure; and (3) internal development including building repletion and urban infill, building replacement, change of the pattern of land plots, and large scale redevelopments of urban centres (Conzen, 2004). A combination of these processes can result in an even more diversified urban form.

Urban sprawl is a common phenomenon confronting many contemporary cities worldwide. The result of demographic and economic changes such as the increase of car-ownership and demand for more living space per capita have influenced urban growth in many regions and have created urban sprawl (Gillham, 2002). However, main reasons for informal development, which represents additional cause of urban sprawl mainly in the developing countries, may include lack of affordable options in the legal market, poverty, fast population growth and unattainable standards and regulations concerning urban development (Payne, 1997).

In some cases, this is coupled with push factors to outskirts such as high land value and the lack of social services and transport, which in turn can reduce differences between planned and informal areas in terms of quality (University of Garyounis, 2007). For instance, in the USA, although household size shrank during the period 1970-2000 from 3.14 to 2.62 persons, the average size of new houses has increased

by 54% from 128.67 m² to 198.81 m² (National Association of Home Builders In: (Farr, 2008, p. 21)).

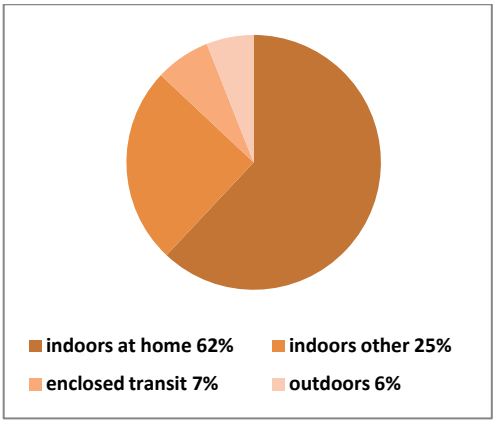
In some societies the car is used for practically all journeys and it is the major consumer of fuel. Car dependency makes people unaware of the proximity between areas of living, working and shopping. The result is the growing need for highways and parking provisions and the encroachment of virgin land by urban sprawl. Comfort living and car use have together changed people's way of life. Nowadays, people spend most of their time indoors, walk less and use cars to move from one building to another (Farr, 2008).

Duany et al mentioned that in the USA suburbia often contain sparse hierarchy systems, where separated areas are connected by collector roads which offer the only way to connect even those physically close destinations; this contrasts with the traditional neighbourhoods organised as a web of densely interconnected systems, which lead to the dispersal of movement trips while the traffic on most streets remains light (Duany, et al., 2000).

Many health problems, such as obesity and psychological stress and even the predicted decrease in life expectancy in the US do have a link with the fact that people do little exercise and spend most of their time indoors; they walk on average about four minutes a day (T. Keith Lawton in: (Farr, 2008, p. 19)) - see Figure 3.8. It is argued that people are fatter now compared with twenty years ago, mainly because they walk and exercise less (Roberts, 2010). It is believed that a dramatic change in life would be achievable if car traffic was taken away from streets (Roberts, 2010).

Figure 3. 8: Time People Spend Indoors

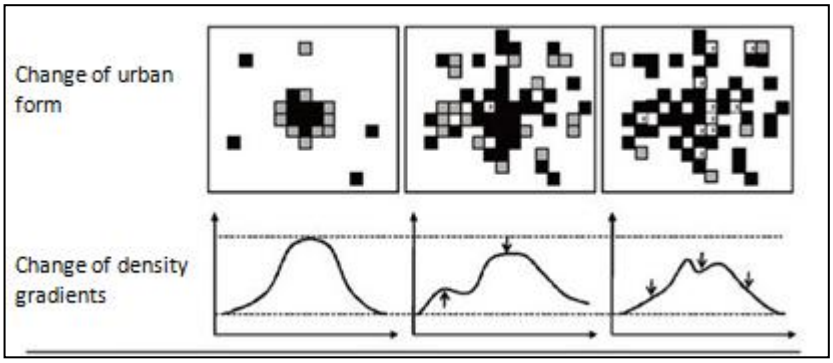
Source: Indoor Air Pollution in California, page2, California Air Resources Board, July 2005 In: Farr (2008, p. 22)



The urban sprawl, as a physical form whether urban or suburban, describes a case of car-oriented low density development consisting of separated land uses and low percentage of public open space (Gillham, 2002), (Galster, et al., 2001). Although this definition is based mainly on an observation of post-WWII development in North America, to a large extent, describes the urban sprawl in many developing countries including Libya. Arguably however, in most developing countries the informal development is part and parcel of this process (UN-Habitat, 2012) - A comparison of the compact form, growth sprawl and shrinking sprawl is presented in Figure 3.9 and Table 3.1.

Figure 3. 9: Compact Form, Growth Sprawl and Shrinking Sprawl Compared
Table 3. 1: Compact Form, Growth Sprawl and Shrinking Sprawl Compared

Source: http://www.cairn.info/resume.php?ID_ARTICLE=FLUX_079_0090; accessed in 15.03. 2013



Key issues	Compact City	Growth Sprawl	Shrinking Sprawl
Development stage	Until 1960	1960- 2000	From 2000
Population growth	High	High to moderate	Negative
Urban form	Compact	Dispersed	Highly dispersed
Urban density	High	Moderate to low	Low
Centrality	Mono-centric	Poly-centric to dispersed	None
Infrastructure efficiency	High	Moderate to low	Very low

Duany et al define five independent components of sprawl to describe the phenomenon within the American context: (1) housing subdivisions consist of only residential use, (2) shopping centres exclusively for trade, (3) office parks for work, (4) civic institutions for public buildings, and (5) the roadways that are necessary to connect the other four segregated elements (Duany, et al., 2000). However, patterns

of urban sprawl at the metropolitan level can be leapfrog, urban strip or single-use horizontal expansion at low-density in the urban edge or the countryside (Barnes, et al., 2012).

The leapfrog type of sprawl describes independent sites of development, scattered over the natural landscape and agriculture land - see Figure 3.10. It occurs frequently in and around small villages and towns adjacent to main urban centres. Over time, land between urban sites may be occupied by different uses, and in advanced stages, urban sites can be integrated into the structure of their cities and towns (Kelbaugh, 2007).

Figure 3. 10: Separate Patches for Urban Development, Sede-Khalifah

A private land subdivision about 20km north of Benghazi city
Source: Google Earth, 01. 2012

On the other hand, an urban strip features linear development that spreads out from an urban centre parallel to main highways and arterial roads. The urban strip may contain a mix of functions, but is quite often dominated by highway services, and grows as a separate development at low density, mostly inconvenient to the pedestrian. In extreme examples urban strips continue alongside radial roads of the main city to the nearby settlements and regional attractions to create regional urban strips (Barnes, et al., 2001) - see Figure 3.11.

Figure 3. 11: Linear Growth; West Alexandria, Egypt.

Developments of gated residential clusters continue alongside the coastal road from Alexandria towards the Libyan boarders (about one Kilometer wide & more than 100 kilometers long)
Source: Google map, 01/2012

The third type of sprawling is the horizontal low-density expansion of existing towns and cities; it is a continuous low-density low-rise type of urbanism, dominated by single-family detached housing (Kelbaugh, 2007). Historically, this is the most common type of urban growth in Libya, which is different from modern high-rise free standing blocks or older mixed use quarters, and it is certainly not like a small town with its comfortably arranged houses and stores – see Photo 3..3.

Photo3. 3: Continual Growth, Tripoli

Subdivision of farm lands in the urban peripheries
Source: Own photo, 2009

Whereas the previous paragraphs describe the phenomenon of urban sprawl at the metropolitan level as a low-density continuous or scattered growth, urban sprawl at the local level can be observed within a wide range of urban types, identical to the features mentioned above which differentiate urban sprawl from any other type of urbanism. Mono-functional land use is one recognizable feature for urban sprawl. However, urban planning can also be a cause of urban sprawl at local level through the way it sets urban layouts and typologies (Duany, et al., 2000).

In general, urban sprawl can be anywhere even in the urban centre, as long as the area is low density, fragmented and car-dependent. Planning contribute to urban sprawl through zoning of separated land uses, unaffordable minimum standards and spatial separation (Talen, 2013). In parallel to the planning system there are many other factors such as housing projects, improved road networks and the practice of self-built homes that drive the building of more urban sprawl. However, this low density growth is also a response to people's demand for cheap land, large plots and single-family homes (see Chapter 5). Undefined, vacant and underused areas are the result of urban fragmentation; their characteristics and impact on the urban environment are discussed in the next sub-section.

3.4.2. Urban Fragmentation

The design of urban space is an output of modern planning and has significant impact on the environment (Symes, 2005). The presence of unused pockets of land is a common problem for modern cities (Ben-Hamouche, 2013). The undefined, vacant and underused land do match what Trancik describes as “lost space” (Trancik, 1986, p. 3), a space which is ill-defined with no clear boundaries and in effect disrupt the connectivity of the urban fabric. Urban land is scarce and absorbs large amount of investments. Land vacancy reflects low efficacy in addition to the negative impact on the quality of urban environment. Indeed, reclaiming “lost space” can be seen as an opportunity to optimise the use of urban investment, improve the quality of urban areas, and while at the same time contain urban growth, which in turn is a measure to protect agricultural land and the natural environment.

The spatial imbalance and decay of many urban areas in the developing countries derives in part from the low level of investments in shelter, infrastructure, services, and other needs of the rapid urbanisation (UN-Habitat, 1980). Building codes, standards and regulations might be some of the most significant variables determining the appropriateness of urban environment, because they set guidelines and controls that define the quality of the urban form (UN-Habitat, 1980).

Based on his experience in the Arab Gulf, Ben-Hamouche noted that the reasons for wasteland can include a generous planning for public open spaces; physical constraints such as topography; and a lack of maintenance of open spaces due to harsh climate and poor quality soil (Ben-Hamouche, 2013). Indeed, such large unmaintained green spaces can be negative urban element and deserted, while any attempt at greenery can lead to unsustainable consequences due to the use of energy and water.

Photo3. 4: A Neglected Public Space, Benghazi

The negative impact of large empty land which act as a spatial separation
Source: Own photo, 2010

Functionalism, the basic concept of modern planning, has been a major cause for land vacancy and low density growth (Trancik, 1986). The attitude of starting from a clean plan in order to produce formality, right-angle subdivisions and free-standing buildings in unbounded flowing space and separated land uses, has created a new type of urban form that is car-oriented, with no spatial or historical reference and contains vast open spaces (Anderson, 1978). Indeed, it is the desire for order and mobility that undermines the diversity and richness of urban life (Trancik, 1986). However, while seemingly the advantage of suburbanisation is that it is much easier to be analysed statistically, and separated traffic that channelled follow a predominated paths is predictable (Duany, et al., 2000), traditional urbanism provides wider choices and offers opportunities for different lifestyles, from living in quiet edge areas to central locations.

It is evident that contemporary development based on urbanism ideals is in stark contrast to the traditional type of human scale urbanism. The traditional Arab city represents a good example of sustainable development, where the indoor and outdoor spaces are well connected and leftover spaces are seized through a process of urban intensification (Ben-Hamouche, 2008), whereby direct negotiations between stakeholders reflect a real practice of community engagement in the development process.

On the other hand, the impact of transport on the urban form was tremendous (Watson, 2009). Local and regional highways have been drivers for more scattered urban expansion, diverting important investments to the outskirts, whereas urban

spaces have been increasingly taken by movement and communication facilities. Cars are not like any other non-motorised mode for personal transport; they are different in capacity, speed and isolation. Cars are accepted because of the convenience, but at the local scale may not able to compete with other modes if they are treated in the same way (Colville-Andersen, 2012). It is observed that when highways cut through cities, they create large unstructured edges and empty areas, which in effect separate urban districts and neighbourhoods (Gillham, 2002). In some cities such as Los-Angeles and Detroit, car-space takes up as much as 75 to 80 percent of the urban area (Trancik, 1986).

It is evident that when car traffic penetrates urban areas, it effectively divides the urban structure; it seizes pedestrian space and streets become no longer a multipurpose space. On the other hand, practices of urban renewal, slum clearance and re-zoning when linked with such measures as the separation of land uses, low densities and stand alone building type, have accidentally produced various types of negative spaces including residual spaces and vacant land, and have brought slums and informal land uses, which violate urban form and degrade the quality of the urban environment (Gillham, 2002), (Inostroza, et al., 2013).

Nowadays, sustainable solutions to urban problems have been sought in the cities themselves and not by moving the urban development to the outskirts. In the UK, policies of urban renaissance were introduced as tools to upgrade dysfunctional areas and to reduce land consumption while meeting future growth requirement. It is believed that the most sustainable way to do so is by redevelop deteriorated urban areas and turning them into liveable neighbourhoods (DETR, 1999), (Punter, 2011).

3.5. Measuring Urban Form

To mitigate the drawbacks of urban sprawl it is important to define clearly the meaning of this concept and how it can be measured and compared across a reasonable number of communities (Galster, et al., 2001). The assessment of any city form would cover aspects such as environmental quality, spatial characteristics and other socio-economic, historical and natural aspects (Cortes, 2005). Research on

urban sprawl has examined the sustainability performance of the urban environment through the evaluation of its characteristics at different scales. This section reviews measurements for various aspects of urban form at scales from the region to the urban block.

The study of urban sprawl at the regional level has often focused on landscape patterns in non-urbanised areas, where the interest is mainly directed towards environmental protection and resource conservation (Clifton, et al., 2008). This field of study perceives urban development as a homogenous land cover with various potential effects on the surrounding environment. One definition of the urbanised area, as presented by the Sprawl City Project, is "all lands contiguous to a central core and has a minimum density of 1000 persons per square mile" – In: (Talen, 2003). However, sprawl has been considered also in a space-time context as a rate of increase relative to population growth. At a metropolitan scale, sprawl may be said to occur if the rate at which natural landscape is converted to non-natural uses exceeds the rate of population growth (the Environmental Protection Agency, USA in (Barnes, et al., 2012).

Based on the aggregate approach, urban sprawl can be defined as the amount of increase of urbanised areas versus the amount of loss of rural land. The most commonly used protection policy in this regard is the containment of urban development (Clifton, et al., 2008). However, it is argued that this kind of aggregate measure treats the urban area, regardless of its plan, as one physical type. Also this measure may represent the same physical phenomenon in different ways, which can produce different types of conflict (Talen, 2003). The influence of urban sprawl on agriculture uses can be measured using a metric based on aerial images. Measuring the permeability of urban surfaces could also be useful for evaluating the sustainability of certain urban typologies (Clifton, et al., 2008).

At the metropolitan level, studies of economic efficiency indicate an advantage in the spatial concentration of economic activities - "agglomeration economies". Yet congestion and rises in land value can lead to the emergence of new sub-centres. Nevertheless, it is evident that diverse urban centres are more stable than the mono-functional ones (Duranton & Puga, 2000). Measures of total population and

metropolitan area show that urban sprawl is simply a decline in population density (Newman & Kenworthy, 1999). It is the mono-centric model which assumes that a fall in urban densities follows an increase in income, and a fall in both transportation costs and agriculture rents (Clifton, et al., 2008). Accordingly, urban sprawl simply reflects a flattening of the rent-gradient.

At this level, representing urban form by aggregate figures based on certain spatial units – such as census data based on census geographical maps - would enable the establishment of a generalised model of the urban system capable of predicting future patterns (Talen, 2003). Thus as urban form can be measured on the basis of zone categories, the emphasis will be more on continuous rather than discrete measurements.

On the other hand, transport studies at the city level that are based on units of transport-zones, normally measure network configuration, connectivity, density, trip distance, land use and accessibility. Parameters such as density and diversity of urban areas can have a direct influence on trip generation, distribution and mode choice; thus a high density is normally associated with a larger concentration of trip origins or destinations, while more diversity means fewer trips by car. (Clifton, et al., 2008). Based on the relationship between travel behaviour and both socio-economic characteristics and the built environment, it is suggested that more dense, diverse and compact urban forms would be an important strategy for reducing car travel - one of the main causes of air pollution in urban areas (Cervero & Kockelman, 1997).

At the local level, studies of spatial patterns make use of different information about natural features and existing and planned land uses. They measure the urban capacity required for land use planning, development patterns that potentially influence social and economic activities, and the degree of proximity and diversity of urban functions (Clifton, et al., 2008). In the area of urban planning, physical form is normally analysed by using two aggregate sources; land use maps and spatial data, with the assumption that there is uniformity within each planning zone, while ignoring the physical complexities among different urban areas (Talen, 2003).

Spatial measures of urban form are valuable in studies such as *accessibility analysis*, where the urban form can be divided into discrete units of observation containing different urban qualities. An example is the study of spatial variation of city form by Galster et al (2001), where they defined eight parameters of the built environment: density, continuity, concentration, compactness, centrality, nuclearity, diversity, and proximity, in addition to the use of housing and employment data. Another example is the evaluation of good urban form by Talen (2003), who has used a combination of spatial indicators- enclosure, lost space, suitability, public space, proximity, mixed uses, together with centres and edges to measure urban quality. However, areas of different forms can produce very similar results (Neuman, 2005).

Table 3. 2: Selected Indicators for the Quality of the Urban Form

Emily Talen; 2003	Physical indicators: enclosure, lost space, public space, spatial sustainability, proximity, mix, centres and edges, and divisions
Clifton & et al; 2008	Indicators at community level: transport behaviour, property value, density and internal connectivity, smart growth index
Ghost and Vale; 2009	Descriptive indicators at different scales: population, density, covered areas, building type, and infrastructure
Bramley and Power; 2009	Measures urban form and its impact on people's welfare and access to services. Indicators: interactions, participation, social stability, security, pride
Jabareen; 2006	Indicators: compact, transport, density, mix, diversity, passive solar, greening
Calster et al; 2001	Indicators: density, mixed uses, proximity, continuity, concentration, clustering, centrality, nuclearity, combined with statistical method to compare different areas

Urban sprawl at building block and street level can also be described by the prevalence of fragmented and incoherent public space. Field observations and interviews are widely used to evaluate social interactions, residential satisfaction and transport behaviour (Clifton, et al., 2008). High level physical representation focuses on the form, components and patterns of the built environment and is suitable for research on sustainable development; this is in spite of its limitations, including the focus on small number of elements at local scale (Talen, 2003).

Morphological studies, which deal with buildings and their parcels and streets and surrounding space, are normally used to analyse the urban form at different levels and with a strong emphasis on local context, including studies of residential areas of different typologies and development processes (Moudon, 1994). *Morphology* refers

to the spatial configuration and linkages between the different components of a city, both between each other and within themselves (Arribas-Bel, et al., 2011). An example of the use of this approach is travel behaviour studies, which assess walkable versus car-dependent urban forms (Cervero & Kockelman, 1997).

This review shows that some indicators – such as: density, diversity and connectivity - can be measured at more than one level, although they may operate differently at different scales. However, it would be more meaningful to investigate the sustainability performance of any urban area at different urban levels. Conducting morphological studies at local level would help to test the direct impact of planning codes and layouts on the urban environment, while at the metropolitan level wider socio-economic and spatial data can help in the understanding of the urban phenomenon within its regional context (Cortes, 2005). Furthermore, measurements of the spatial characteristics for different urban forms need to be related to their ability to accommodate certain sustainability features such as urban intensification, flexibility in design to support privacy and thermal comfort, and adequate green space.

Generally, in the context of this study, which focuses on the impact of urban fragmentation on the quality and sustainability of the living environment, the morphological analysis provides a suitable tool to investigate the forms, components and patterns of local areas and evaluate the spatial parameters at different levels. The examination of existing urban forms, made by different planning tools and post-occupancy changes in response to local needs, can help define sustainable features and indicators relevant to the local context and assist in the setting of targets and thresholds to guide future developments – see Table 3.3.

Table 3. 3: Urban Sprawl at Different Levels – Main Characteristics
Source: Clifton and et al. (2008); Rodenburg and Nijkamp (2004); Galster and et al. (2001); and Talen (2003)

Focus	Concerns	Impacts of urban sprawl	Sustainability targets/ Indicators
Landscape patterns	containment	Disrupting biodiversity	Minimum urban footprint and a network of ecological corridors
Economic concentration	efficiency	Low economic feasibility	Higher densities
Travel behaviour	Proximity	Car-dependence	Density and diverse land uses
Growth capacity	Accessibility	Separation	Compact, diverse and highly connected urban form
Urban quality	Liveability	Lack of social cohesion	Protected and high quality outdoors to encourage urban activities and socialization

3.6. Conclusion

Today, the majority of the world's population is living in urban areas (UN-Habitat, 2010). Sustainability is a necessity to urban development, not only to protect the natural environment, but also because resources such as land, water and energy are limited, issues which could impact on the quality of people's lives (Roseland, 2000). The relationship between man and his environment is unstable; both human needs and the carrying capacity of the ecosystem to support human activities are changing. Thus, while on the one hand, people demanding more from nature to satisfy their increasing needs created by population growth, economic activities and change of lifestyle, on the other hand, natural resources and the capacity of nature to absorb pollutants are limited and expected to deteriorate.

The concept of Sustainable Development represents *a normative theory*, which according to Cordon is "about what is right and wrong, desirable or undesirable, just or unjust in society" (Gordon, 1998). The sustainable development involves a social reform that targets a delicate balance between people and their natural environment (Hamm & Muttagi, 1998); a call for a development strategy based on environmental ethics that balances the satisfaction of human needs with the stability of the natural

environment, while the fair distribution of benefits and costs of development are a central value (Rees, 1998). However, the concept is judgment-based about what sustainable development ought to be, but does not specify how to achieve these goals.

Cordy explains that "every planning decision has a resource use implication of some kind, the more resource efficient the outcome can be, the better chance we have of achieving long-term sustainability" (Cordy, 2002, p. vii). Although it is possible to judge the level of environmental damage - by measuring the ecological footprint, it is, however, usually unclear what the point of balance is or who is responsible for that damage. Given the comprehensiveness and lasting effect of global trends, a precautionary approach that advocates measures such as reduction of air pollution and protection of natural habitat is highly relevant and justifiable (Frey & Yaneske, 2007).

Many sprawling cities around the world suffer from traffic congestion, racial tensions, economic stagnation and a deteriorated urban infrastructure (Grant, 2006). However, it is argued that in many cases planning theory and practice were partly responsible for urban sprawl, in parallel with other factors such as lifestyle, declining of industrial sector and free land market (Grant, 2006).

Urban sprawl is a case of spatial pattern, which can affect the sustainability of any urban environment. Overall, urban sprawl may be described as a process of urban expansion; as a land use pattern that is low density, separated and lack diversity; as a consequence of independent variables such as poor planning, zoning and lack of control; as cause of externalities such as high car-dependency, social segregation, functional separation and loss of environmental qualities; as aesthetic judgment on development patterns; or a case embody certain characteristics of the urban form (Galster, et al., 2001).

Generally, urban sprawl often describes a type of outward growth at low levels of density, diversity, spatial connectivity and physical intensity, characterised by a typology of single-use zones, detached buildings and undefined open spaces. Also, it can be car-oriented and associated with issues such as the decay of urban centres,

urban encroachment of fertile lands, low quality outdoors and social inequalities. For the purpose of this study, urban sprawl has been defined as low density, scattered and fragmented development, which can be incomplete and less-controlled.

Urban sprawl can be measured on different scales and assessed by criteria such as land cover, functional efficiency, spatial connectivity, development capacity and the quality and cohesiveness of urban space. At the local scale, the characteristics of urban typology help understanding the urban sprawl. They represent a combination of physical patterns and qualities and offer important material for evaluating the performance of the urban form within its local context and to investigate the influence of certain factors such as planning codes and local conditions, essential information to assess the success of any scheme and for pursuing comparisons between different urban areas.

The review of the patterns for urban sprawl and their impact on people and the surrounding environment has elucidated the fact that a compact urban form can be a suitable alternative for urban sustainability, even though there are evidences remained unproven such as the link between high density and urban liveability. The next part of this chapter reviews theory and practical experiences regarding the concept of *compact urbanism* and its relevance to the issues under investigation.

Part Two: Compact Urban Development

3.7. Introduction

This study looks at areas of consensus across theories regarding the idea of a sustainable city. It focuses on certain urban models as sources of information, which would help collect evidence on the links between certain features of the urban environment and their sustainability performance. However, development priorities, urban approaches and different urban solutions are context-specific.

This part of the literature review covers ideas about sustainable urban development with a focus on the compact urban form. The first section discusses characteristics of certain types of urban development, their performance in regard to environmental and social sustainability and their relevance to the situations in Benghazi and the Arab region. The second section reviews different approaches to urban planning and design and discusses their appropriateness to sustainability objectives, followed by a conclusion. That conclusion is drawn from all the relevant information studied in the literature review and sets the conceptual framework for the study. The notion *model* refers to "a schematic description of a system, theory, or phenomenon that accounts for its known or inferred properties and may be used for further study of its characteristics" (The-Free-Dictionary, 2013).

3.8. Different Types of Compact Urbanism

Urban sustainability is a balance between seeing the city through deficiencies and perceiving it as part of the solution (Grandjean & Gilgen, 1976). In spite of the potential negative impacts of urban concentration, such as air pollution, high costs, overcrowding, crimes and social segregation, cities can solve problems more than they create and improve the quality of people's life. There is a body of opinion holds that urban areas can be labelled sustainable as long as they support social justice,

optimize the use of urban investments and create high quality urbanism, while posing minimal harm to the natural environment (WCED, 1987), (Williams & Dair, 2007).

The argument that there is a relationship between the form and structure of the city and its sustainability has raised debate on how this link can be used to improve the urban environment (Williams, et al., 2000). In general, the debate about the sustainable development in the area of urban planning and design in the West mainly focuses on air pollution by transport which is seen as a major threat to global sustainability; it is formulated around the idea of the compact city (Frey, 1999). However, the causal link between urban density and some sustainability aspects remains an open issue (Jenks, et al., 1996).

It is argued that an urban form that is characterised by moderate levels of density, spatial connectivity, diversity and physical intensity can be an advantage for the city, enabling it to restore social cohesiveness and improve levels of service, while enhancing the regional sustainability (Grandjean & Gilgen, 1976), (Whitehead, 2003). However, urban sustainability requires embedding not only the city in nature, but also nature into the city (Cuthbert, 2006).

The compact city, as it is introduced by the green paper on the urban environment (CEC, 1990), represents a model of a traditional European city. It is the idea of liveable and human scale city that emerged in the 1960's (Jacobs, 1993), which is reproduced within the context of urban sustainability in order to help reduce the air pollution and greenhouse gas emissions responsible for global warming. Indeed, features such as high urban density and functional diversity are considered by the European Union as a precondition for more efficient public transport, less energy use due to a significant reduction in transport demand, and a better quality urban environment (the European Conference on Sustainable Cities & Towns, 1994).

Furthermore, the sustainable city as a multifunctional model, which maintains a balanced diversity of land uses and builds on its unique character and aesthetic values, is expected to be efficient, safe and socially diverse. Also, to have a network of good quality public spaces, encourages social activities and supports social interactions, socialisation, public learning and dialogue (Salzano, 1997).

On the other hand, very high density and high-rise development could have negative impact on urban areas; thus while urban density above certain levels could lead to poor living conditions, traffic congestion, air pollution and dysfunctional urban systems; the high-rise buildings and large blocks can be criticised on the grounds that they are expensive, contain large parking and undefined spaces, and lack local reference. This is in addition to their links to health and social problems (see (Alexander, et al., 1977)).

The "*Contemporary City*" for Le Corbusier has been planned to be densely populated and built vertically in order to increase proximity and access to green space (Guiton, 1981). However, Lang argues that the range of functions defined by the modernism theory are narrow, based on a simple view of function purity which focus on the efficiency of buildings and transport, while the quality of the urban environment has been perceived as a by-product (Lang, 2007).

Generally, while human scale models of new urbanism based on historical examples of the Western city have been frequently described as liveable, accessible by all means of transport, containing minimum but positive open spaces and expected to provide for human needs at low ecological footprint (Robbins, 2008), the traditional Islamic-Arab city represents a model of compact development that responded for quite different considerations from those in the developed countries; in particular cultural needs and climatic protection.

The Arab-Islamic city is characterised by low-rise, fine-grain and intense physical form and is made up of a large number of centres for individual courtyard buildings so as to create a "multi-focal" cellular structure, which counter-balances the limited public space of narrow streets and plazas (Bianca, 2000). This is in addition to the diversity of functions and building types, the use of local material and technology and the process of gradual development, which are important means for affordable development.

The old city of Tunis, which was added to the World Heritage List in 1979 and has been protected and, to a large extent, has not lost the intrinsic value of its functional and structural authenticity (UNESCO, 2010), provides a living example of the old

Arab city with its unique treatment of the public space and piecemeal development. This old city is approximately 632 meters wide by 1496 meters long. Although around 90% of its buildings are one or two storeys, it has reached a density of 193 persons per hectare, while having almost 72% of its open spaces as courtyards and private gardens (Hakim, 1986) – see Photo 3.5.

Similar traditional rules that defined rights and allowed owners and craftsmen to act responsibly within their capacity, which have influenced the form of old Arab-Islamic city, although may be labelled informal, are still commonly used in many poor neighbourhoods in the region, facilitated by a mainstream urbanism that defines a fragmented but dense urban form and morphology of small size plots and low to medium-rise buildings (Lloyd-Jones, 2006). Nowadays, urban intensification in the developing countries which is mostly informal has been appreciated as an affordable way to accommodate fast population growth and as a mean to improve the quality of life through the provision of more living space and access to basic services, while help to contain urban expansion (De-Roo & Miller, 2000).

Photo3. 5: Street View; Al-Zaytuna Mosque, Old Town Tunis.

Source: Own photo, 2008

The various types of compact urbanism reviewed above, though having different characteristics and serving different objectives such as urban liveability, affordability and efficiency (see Table 3.4), can only be considered sustainable, as long as they respond in an equal manner to both people's quality of life and regional sustainability (Neuman, 2005).

Table3. 4: Types of Urban Development

Sources: De-Roo and Miller (2000), Bianca (2000), Robbins (2008), Guiton (1981, p. 96).

Model	Main features		Main drivers
Modernism	Unstructured- sprawling	Fixed end-state	Functionality (narrow)
New urbanism	Human scale- diverse		Liveability
Historical Arab-Islamic city	Multi focal- compact	Incremental	Privacy- rights in space
Main stream urbanism in the South	Spontaneous- dense		Affordability

3.9. Relevance of Compact Form for Urban Sustainability

The idea of compact development has been frequently promoted as an alternative to low density urban sprawl (Neuman, 2005). The argument is that urban sprawl is environmentally unsustainable: it is more car-dependent; consumes more land, energy and other scarce resources and produces more pollutants than any other type of compact urbanism. On the other hand, there is a counter view which states that urban concentration and the resultant higher densities would bring unfavourable conditions such as shortages of building land, traffic problems, and increases in both air pollution and social stress caused by the effect of heat-islands (Frey, 1999), (Williams, et al., 2010). However, quite often claims for the benefits or disadvantages of different urban forms are based on advocacy rather than research evidence (Jenks & Jones, 2010).

A major justification for the call to adopt the concept of the compact city as a model for future urbanisation was based on concerns about the use of energy (Roberts & Lioyd-Jones, 2001). According to Dave, although the evidence for this argument is based mainly on studies of cities in the developed world and focuses on limited issues of sustainability (Dave, 2010), it can be argued that historical examples prove that in spite of the differences between cities of the developed and developing countries, compact urbanism can indeed bring about a wide range of benefits for the cities in the South as well, where issues such as affordability and the mitigation of a harsh climate are priorities on the local agendas for many developing countries (UNDP, 2009).

It is understandable that in some countries people's acceptance to live in dense areas reflects, in part, their desire to access affordable housing and to run businesses from home (Dave, 2010). However, the undesirable conditions of some fast growing cities in developing countries are not necessarily due to high densities and mixed land uses, but can also be a result of other factors such as administrative failure and lack of public transport and basic services (Dave, 2010).

High density and mixed land uses remain at the centre of the debate on compact urban form and its relation to social, cultural, economic and environmental sustainability. Density may be expressed as the number of buildings, number of people or the amount of floor space on a specific piece of land (DETR, 1998 in: (Dave, 2010)). On the other hand, mixed use development can be a mixture of blocks of different uses or multi-use blocks consist of buildings of comparatively narrow width with different uses configured both vertically and horizontally (Jones, et al., 2007).

Physical density may influence certain sustainability aspects such as the efficient use of land, infrastructure, and energy. Perception of density, however, influences the acceptable level of physical density and it varies depending on cultural preferences and lifestyles in different areas, cities and countries ((Churchman, 1999) in: (Dave, 2010)). Density is a result of factors such as the physical and symbolic aspects of place, the timing and time associated with certain activities and events, the social and cultural attributes and experiences of individuals, groups and settings (Boyko & Cooper, 2010).

Moreover, there are wide variations about how people define low and high density. They depend upon influences such as history, culture and social norms. Therefore appropriate densities have to be locally defined in a context of any particular country. An online-survey in the UK by Boyko and Cooper showed that perceived low, medium and high densities were, on average: 23, 44 and 79 dwellings per hectare respectively (Boyko & Cooper, 2010). However, according to Dixon and Dupuis, who are New Zealanders**,** medium density development can be defined as two to three-storey terraced housing and low-rise apartments up to four storeys high, with a gross-density ranging from 25 to 70 dwellings per hectare in that country (Dixon &

Dupuis, 2003). According to the same UK online survey, the top three choices for the drivers of increasing urban densities have been; (i) Efficient use of land; (ii) Increased profitability/ return on investment; (iii) More use of public transport (Boyko & Cooper, 2010).

Based on the results of a transportation study in Toronto city, where transportation emission per capita in low density areas is about four times higher than in dense areas (Figure 3.12), a WWF International report argued that the role of urban form in reducing greenhouse gas emissions is most obvious in transportation (WWF, 2010). These results are linked to the fact that within this context, areas of higher densities are inherently better for public transport, have fewer parking spaces and more restrictions on the use of cars, while they encourage walking and cycling and provide easy access to public services and transport. In addition, denser housing demands less energy for heating, lighting and cooling (WWF, 2010).

Similar results were concluded by a research conducted by Newman and Kenworthy, where a strong relationship between energy consumption and urban form was found; in particular, at low densities cities appear to consume more energy per capita – see Figure 3.13. They noted that the spatial distribution and separation of functions within large cities would lead to more and longer car-trips. The study recommended that high-density development should be encouraged, with policies to define and support urban centres, to discourage car usage, and to provide better public transport (Newman & Kenworthy, 1999).

While the transportation sector can impact upon regional sustainability due to the consumption of non-renewable energy and emissions of greenhouse gases, it can also cause harm to the urban environment as a result of its noise, air pollution, traffic problems, the separation effect of major roads, and through its taking the valuable buildings and greens for road construction and parking (Naess, 2006), (Grandjean & Gilgen, 1976). A comparative analysis of two projects in Sacramento, California, presented by Allen (1999), showed that the lower density area had more per capita impervious land cover, more miles driven, more water and energy use, more air pollution and more greenhouse gas production (in: (Farr, 2008)).

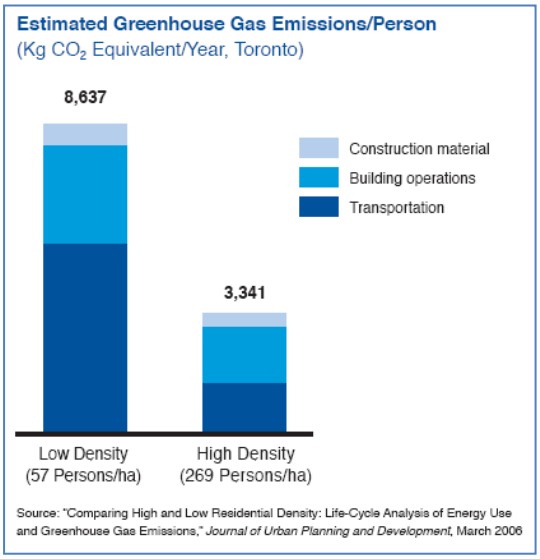


Figure 3. 12: Estimated Greenhouse Gas Emissions Per Person in Low and High Density Areas

Source: Reinventing the City: Three Prerequisites for Greening Urban Infrastructures, WWF (2010)

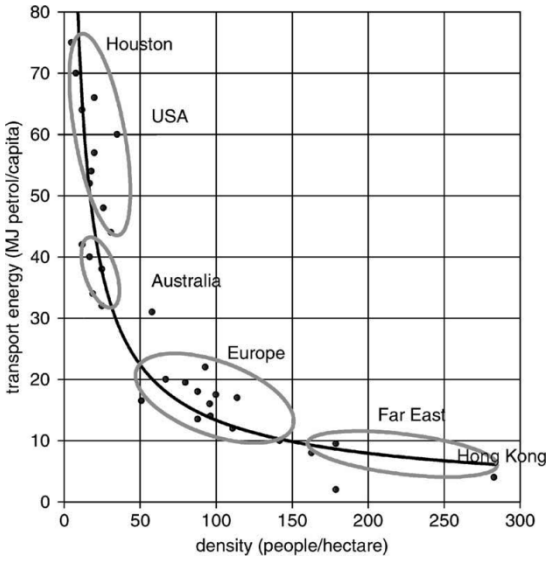


Figure 3. 13: Energy and The City: Density, Buildings and Transport

Source: Energy and the city: density, buildings and transport, Steemers (2003)

Nevertheless, the assumption that higher residential density would necessarily limit the need for car travel has been questioned by Breheny (1992), who noted that the correlation between high density and car trips is weak. Thus, whereas, fewer local trips by cars are expected at higher densities, longer-distance trips seem to be independent of the influence of urban form. Moreover, it is argued that travel demand can be influenced as well by car ownership and lifestyle, where the number of trips is more dependent on people's income and fuel prices rather than population density (Neuman, 2005).

On the other hand, Shammin and et al. have noted that even though sprawl-related factors account for about 83% of average household energy consumption, sprawl is only 17–19% more energy intensive than compact living; depending on how people actually lived (2010). They observed that some of the advantages of reduced direct energy use by people living in high density urban centres are offset by their consumption of other non-energy products; they reached the conclusion that lifestyle choices like house type, number of vehicles, and family size, that could be

independent of location do play a significant role in determining household energy intensity (Shammin, et al., 2010).

Furthermore, Moor and Rees argue that density and walk-ability are not always correlated. There are cases in the developing countries where climate and culture may discourage people from walking and the vehicle is used even for the shortest of trips. Also public transport can be an issue; where in some cities of high density such as Bangkok traffic congestion is very high despite the low levels of car ownership (Moor & Rees, 2000). In Libya, it is observed that in spite of relatively high rates of urbanisation, and where the cost of owning a car is considerably high relative to average household income; most motorised private trips are made using private cars, benefiting from the low prices of fuel and because of the lack of reliable public transport. This scenario suggests that for some people owning a car is a matter of necessity rather than a choice - see Chapter 2.

On the other hand, it is noted that higher densities in the core of some cities appear to have little effect on urban containment (Richarddson, et al., 2000). Whereas cities in the developing countries have higher population densities than their counterparts in the West, their urban structures are not uniformly compact (Dave, 2010). This fact can be observed in the remarkable difference in the pattern of building densities and population densities of Indian cities compared with that in the West (Dave, 2010). However, there is an argument that urban quality can be substituted for personal space and thus make higher density urbanism more acceptable (Talen, 2003). In addition, Biermann argues that capital costs are not a simple inverse function of urban density and compactness, but rather a result of the unique interrelationship between infrastructure thresholds, capacities, location, and density over time and space (Biermann, 2000). The concept of *threshold analysis* is based on the observation that human settlements would face a physical limitation to their spatial growth - the threshold of development - which can only be overcome at a high capital investment ((Kozlowski & Hughes, 1967) in: (Biermann, 2000)).

According to Boyko and Cooper's thorough review of urban density a higher density seems to support public transport and discourage car ownership and use, although it has a link with high accident rates and less walking to leisure destinations. Higher

density is also has a positive correlation with infrastructure efficiency and less use of energy in buildings and traffic. Socially, higher density can create better environment for mixed tenure and equal access to services, but it is poor in regard to privacy and friendliness, whereas in developing countries higher density has been positive to social sustainability (Boyko & Cooper, 2010).

3.10. Quality of the Urban Environment

Urban Liveability - the quality of living environment - describes an aspect that contributes in the overall quality of life for residents living in the city (Mccrea & Walters, 2012). The literature offers different definitions to the concept of "liveability"; reflecting contextual differences and the focus of each study. In the Oxford English Dictionary; Liveability is defined as suitability for habitation or capacity to offer comfortable living (OED; http://www.oed.com; accessed in 28.02.2014). Other definitions include; liveability is a quality that is not an attribute inherent in the environment, but is a behaviour-related function of the interaction between environmental characteristics and personal characteristics (Pacione, 1990); and Veenhoven's definition of liveability as the degree to which its provisions and requirements fit with the needs and capacities of its citizens (1996) in: (Kamp, et al., 2003)).

Generally, liveability as a concept of urban design and planning describes the place-based attributes of the living environment, ranging in scale from dwelling and neighbourhood to a city and its region that contribute to residents' quality of life and well-being (Newton, 2012). However, the debate on the dimensions that should be incorporated to capture the concept of liveability has not yet been settled (Heylen, 2006). A review of liveability indicators reveals that most are local and country specific and are by no means similar, being based on different sets of measures and different weightings (Newton, 2012).

Timmer and Seymoar (2005) have described the liveable city as a delightful and desirable urban space in terms of accessibility, equity and participation that contributes to the well-being and development of all people, where it is essential for

people's quality of life to secure access to needs of urban facilities and services, equal access to these amenities, and their participation in decisions regarding the provision of these needs (Timmer & Seymoar, 2005).

However, according to Shafer and et al (2000) that in spite of the long list of criteria that can be found in the literature describing a good living environment, however, there are problems associated with the criteria used to measure quality of life and the suitability of urban environment, including the lack of a conceptual basis for the selection of these criteria, unclear definition of some attributes, and a lack of secondary data to describe some social qualities (Shafer, et al., 2000).

In order to overcome these problems, and to avoid dealing with a long list of urban qualities regarding the maintenance of sustainability and quality of life, they have suggested a conceptual model that focuses on the basic relationships between the component parts of a place in terms of its physical, social and economic realms, which need to be balanced. The model presents the quality of life as an ongoing interaction between community, environmental and economic qualities. Based on this model, liveability refers to the results from the interaction between the community and its environment (Shafer, et al., 2000).

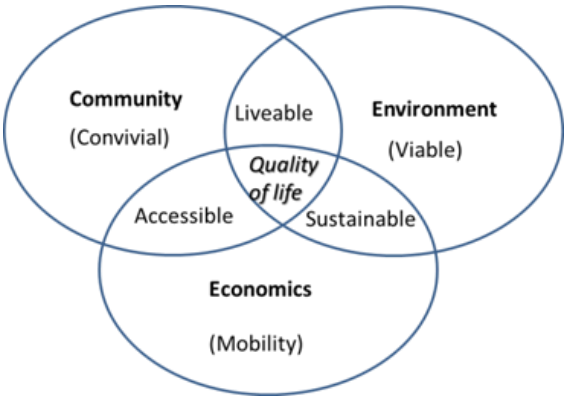


Figure 3. 14: A Conceptual Model – Quality of Life

Factors that contribute to community quality of life from a human, economic and ecological perspectives
Source: Shafer and et al. (2000)

Generally, issues of liveability in a contemporary neighbourhood can be better understood by identifying the attributes deemed to be important in creating a healthy and comfortable living environment (Leby & Hashim, 2010). Also, it is expected that a liveable urban environment would encompass elements contributing to safety, health, convenience, mobility, recreation and economic opportunities ((Jarvis, 2001) in: (Leby & Hashim, 2010); Wheeler (2001) describes the liveability of a human

community in terms of being pleasant, safe, affordable and supportive. An example for the assessment of the living conditions is that arranged by the EIU's Quality of Life rankings, part of the Worldwide Cost of Living Survey, which evaluates over 30 indicators that are grouped in individually weighted categories; including:

- Security
- Environmental comfort
- Cultural facilities and social interactions
- Availability and quality of healthcare and educational services
- Quality of infrastructure and housing (Newton, 2012).

It is argued that urban liveability can be determined by either features of the physical environment, or the residents themselves, where indicators used to measure the liveability might be subjective (survey among residents) or objective (data that is related to the quality of living environment) (van Kamp, et al., 2003). In a study for liveability in Flanders and Netherlands, presented by Helyn, four dimensions of liveability have been used:

- Quality of dwelling/ building; and quality of the physical environment and level of public services;
- Quality of social environment; and safety of the neighbourhood (Heylen, 2006).

Generally, dimensions of the sustainable urban environment provide the content for indicator development by breaking the dimensions down into measurable elements. Since the aim of this research is to understand the impact of urban fragmentation on people's quality of life, urban liveability is perceived as being derived from the urban environment rather than experienced in it. The next subparagraphs review physical arrangements and elements that are useful to improve the quality of urban environment and its environmental sustainability.

3.10.1. Creating Good Living Environment

Moudon in her study of the morphological characteristics of two suburban neighbourhoods attempted to explore their capacity to support transit and non-

motorised traffic; she concluded that higher population density and mix land uses are insufficient to create a pedestrian-friendly environment, mainly because of the car-oriented planning (Moudon, 1998). She mentioned a third factor necessary to support substantial levels of pedestrian activities, namely the provision of safe and interesting urban environment. Figure 3.15 displays a case where the same density can be achieved through different urban typologies of varied qualities.

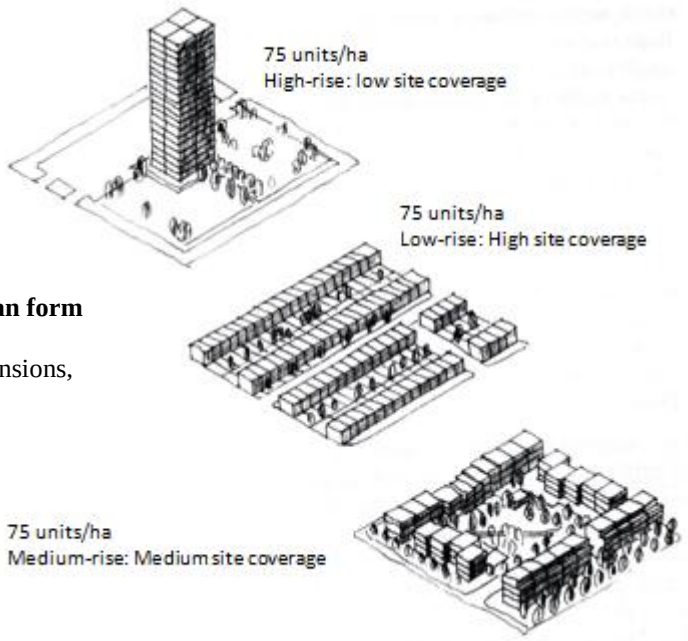


Figure 3. 15: Density and the urban form

Source: Urban Design- Green Dimensions, Moughtin & Shirly (2005, p. 222)

The good neighbourhood place is expected to: promote sociality, by providing space to people to meet each other; diverse to offer various opportunities; are comfortable, safe and attractive for people to enjoy; and are accessible, clear to identify and easy to use (Walljasper, 2007, p. 3). Planning decisions can create life between buildings. Characteristics such as protected outdoors, low movement speeds and clear visual surveys are essential to public spaces in order to create good conditions for intense and diverse outdoor activities and social contacts (Gehl, 2006). However, it is essential to understand the local contexts and how people use the space to create a better urban environment (Lang, 2007).

Indeed, the built environment alone cannot be depended upon to influence people's behaviour or social relationships. This does not mean, however, that the planner should not design for opportunities for social interaction (Green, 1982). Social

activities, which can be passive- such as watching, or real contacts, are spontaneous and depend on the presence of others. Unlike daily *necessary activities*, both *optional* and *social activities* in the outdoor depend on quality of urban environment (Gehl, 2006). Thus spending more time in the outdoors gives more chances for people to meet and establish contacts. Gehl cited several examples where improvements of urban conditions by introducing pedestrian streets and shared streets could led to an increase in the number of pedestrians, the length of average time spent in the outdoors and considerably broaden the spectrum of outdoor activities (2006).

A study of the effect of layouts and design on social interactions in six UK neighbourhoods concluded that social cohesion has a positive relationship with the spatial connectivity of the urban environment more than its density (Raman, 2010); it was observed that the amount of social activity and the nature and structure of social networks in the neighbourhoods have been influenced by location and visibility of the public open space, the spatial linkages between neighbourhoods, the building typology and urban form (Raman, 2010). Reflecting upon the UK policies on mixed schemes, whereby mixing tenures is recommended as a measure for mixing of income groups, Roberts found, through an empirical investigation, that even the projects which are not tenure blind, if have an acceptable level of design qualities, the degree of social interactions between different income groups and levels of people's satisfaction can be high (Roberts, 2007).

3.10.2. The Urban Unit

The urban unit can be defined by aspects of political engagement, spatial accessibility or level of service. It is argued that the sustainable urban unit is that which supports the political role of the local community (Moughtin & Shirly, 2005). At local level people have most knowledge and expertise and need to be empowered. Public participation in decisions regarding urban and natural environments is fundamental to sustainable development. The size of a local community able to act as a cohesive political unit has been suggested by Lynch (Lynch, 1981) to be in the

range from 20,000 to 40,000 people, a size perceived as important for ordinary people to participate in political discussions.

However, other indicators have been suggested in order to respond to different considerations. For example, Plato (Plato, 1975) has mentioned a figure of 5,040 inhabitants as being necessary for person to person contacts, based on Aristotle argument that face-to-face contact is important to democratic society, whereas, Alexander et al (Alexander, et al., 1977) argued that a range from 500 to 2,000 people is suitable for a cohesive community, where communal decisions can be easily reached (In: (Moughtin & Shirly, 2005, pp. 162-190)).

On the other hand, it is suggested that urban nuclei should be located in close proximity to urban thoroughfares in order to benefit from the movement economy (Mehaffy, et al., 2010). Considering accessibility to basic services and amenities an indicator of social equity, Leon Krier has argued that a community size of 12,000 people is relevant, where at a moderate density of street blocks of 4 to 5 storeys the physical size of the urban unit will be about 10 to 15 minutes walk from edge to centre. However, acceptable walking distances of 500 to 700 meters and clear boundaries may need to be negotiated with other aspects such as those of green concept and local conditions such as terrain and climate (Moughtin & Shirly, 2005).

The neighbourhood as a diverse walkable unit is expected to have all local destinations allocated within a 5 minute walk or about 400 meters from all homes - a land area of about 50 hectares (Llewelyn-Davies, 2000). The catchment area of local services overlaps with neighbouring areas, and compatible uses should maximise their synergy and minimise conflicts. Areas of mixed uses that are well-allocated and connected by safe and comfortable routes can offer diverse facilities, convenient walking distances and liveable public space.

It is expected that within the neighbourhood most shops and offices are attracted to the central area, and they support the diversity and liveability of high-streets, while land hungry uses such as schools and green spaces are more localised (Clarke, 2009). Also a mix of housing types and tenure would enhance social diversity, and higher densities would be justified along main streets and in areas close to transport nodes

and other attractions. Mixed housing is expected to offer chances for social integration and mitigate social problems, where homogeneity of people - lifestyle – can be supportive to perception of liveability (van Kamp, et al., 2003). However, the author below asserts that a critical density that would support a bus service would be about 80 persons per hectare (Llewelyn-Davies, 2000). See Figure 3.16 for the vision of a sustainable neighbourhood by Farr, and Table 3.5 on recommended urban indicators summarised by Frey and Bagaeen.

Table 3. 5: Urban Indicators – The UK Context

Source: Adapting the City, Frey and Bagaeen (2010).

Indicator	Thresholds	Targets
Access to amenities at local hubs and neighbourhood	150-250 walk distance (local hub) 400-600 walk distance (neighbourhood)	Primary school, shop, communal park Post, public house, group of shops Features: permeable streets, connectivity to other centres, integrated public transport
Population	7500 inhabitants	
Distance: edge-centre	670 meters	Best 530 meters
Total area	140 hectare (Housing 60%)	Best 88 hectare
Gross density Net density	53.6 persons per hectare (P/H) 89.3 P/H	Best 85 P/H Best 141 P/H

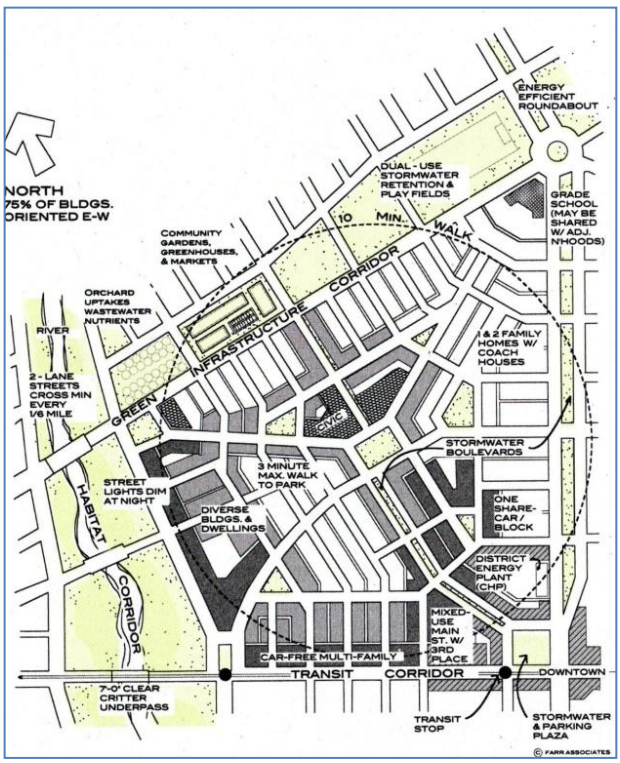


Figure 3. 16: A Vision for A Sustainable Neighbourhood.
Source: Farr (2008, p. 126);

Farr has upgraded the neighbourhood idea by *Perry*, 1926, to include boulevards, green ways and connections with the surrounding and sharing of the school between two or more neighbourhoods. He also has placed an emphasis on urban compactness, mix of uses and a gradient density delimited by 4-story buildings. He also proposed a well defined centre and edges to strengthen the sense of belonging and area control. He argues that these measures can be implemented differently in areas of different conditions, regional customs and climates.

3.10.3. Elements of the Urban Form

The urban unit is shaped by a network of streets, building blocks and open spaces; and influenced by factors such as existing land uses, landform and the location. Fine-grain pattern is perceived to be sustainable and efficient, because it makes more street and other open spaces available to the public for free and safe use (Moughtin & Shirly, 2005). It is suggested that the most efficient urban pattern would be the one that consists of regular or distorted grids with a spacing of about 80 to100 meters, in core areas 50 to 70 meters, which offers choices and good connections for both human and car movements (Llewelyn-Davies, 2000). However, when larger blocks are required, cross-streets can be justified. In this section, the main three elements of the urban form are now introduced and described - the Urban Block; the Public Space and the Public Street with focus on the idea of sharing space.

- **The Urban Block**

The *urban block* defined by public streets is a basic unit of the urban fabric; it can be subdivided into a number of small land plots that form street walls and public open spaces. It is mentioned that small urban blocks can increase permeability, frontages and visibility of corners; this is in addition to their association with medium densities and more choices. This is in contrast with large single use blocks, which can be less-connected, unsafe at night and less walk-able (Moughtin & Shirly, 2005). However, while the rectangular large block could be more relevant to the uses of transition zones such as warehouses, the square shaped block can afford various urban uses and support wider options for interior arrangements such as gardens, car-parks, mews houses or public squares (Llewelyn-Davies, 2000).

It is argued that the perimeter block has many characteristics essential for urban sustainability (Clarke, 2009), (Llewelyn-Davies, 2000) and that it is an effective method to allocate the urban space (Moughtin & Shirly, 2005). The perimeter block has often been associated with qualities such as moderate density, low to medium heights, private or communal rear-gardens and continuing street-frontage; it can also be physically and visually permeable and contain a balanced mix of land uses. It is

suggested that the use of perimeter blocks and positioning buildings close to the street-line help future intensification (Clarke, 2009), where the density pyramid can be negotiated with building type and dwelling size.

Nevertheless, the inability of a zoning-based plan to provide much of these qualities is to an extent because the plan fixes boundaries for different land uses before they take shape; local areas are often subdivided by a network of roads designed to channel traffic to main arterials away from traditional high-streets, while main traffic generators are located in the peripheries (Llewelyn-Davies, 2000). Provisions of narrow blocks of minimum frontage and rear gardens, in addition to minimum road standards and a type of grid pattern that helps improve interconnections and balance the distribution of traffic, can be an affordable solution that meets local preferences for building type and provides easy access to services and open spaces (Biddulph, 2007). It is also expected to encourage higher percentages of finished public works and better quality development.

Based on the experience in the UK, perimeter blocks 70×70 to 100×100 metres with front access and rear private or communal courtyard has been adequate to accommodate most urban functions at moderate densities (Llewelyn-Davies, 2000). However, it was evident that there is a relationship between block size and its courtyard, where in many cases the size of the courtyard is equivalent to a one -car space per unit, either for two storey terraced houses with private gardens or four storey apartments (Moughtin & Shirly, 2005). Indeed, the perimeter block of 2 to 4 storeys of a size from 0.5 to one hectare - a basic urban unit of the European compact city - has been advocated for requiring minimum technology and can create a scenery street wall (Moughtin & Shirly, 2005).

- **The Open Space**

Sustainable development accepts not only that the city needs to be embedded in nature, but also that nature should become part of the city (Cuthbert, 2006). However, in this regard urban sprawl represents a case where home spaces cannot be differentiated from the other uses, and there are no clear ends to residential areas; it

is unclear where individual dwellings belongs (Gillham, 2002). A hierarchy of open spaces, defined by privacy levels from home and home garden to neighbourhood and city square, with flowing and gentle transitions is an important factor for urban form that is visually and functionally successful (Gehl, 2006).

The integration of activities and functions around public spaces can stimulate human interactions and inspire people. Closely placed buildings are an advantage, as they facilitate gaining critical mass and wider human contacts. Compact public spaces and short sensory experiences create the urban form that helps to assemble people and activities; they create intensity and diversity of activities and influence traffic speeds. When people and activities are assembled, it becomes possible for individual events to stimulate participation and participants in one event would have the opportunity to experience and participate in others.

An attraction analysis based on the observation of where pedestrians stop and what they look at concluded that people and activities are the centre of attention and interest for pedestrians more than spaces and buildings (Gehl, 2006). On the other hand, examples from the UK show that improving security at night has encouraged everyday day-time activities such as convenience shopping and going to the gym, to be gradually extended further into the evening (Roberts & Eldridge, 2009). Also, this study observed that within the Libyan context the heat inside buildings due to harsh climate represents an additional factor that encourages evening and night outdoor activities.

In addition, at street level trees can play the role as an intermediary between human scale and high buildings (Le-Corbusier, 1973). Trees as an urban element can bring with many benefits, which may include;

The inclusion of trees and other streetscape features in the roadside environment help reduce accidents as a result of slow traffic, where research shows that speeds can be from 3 to 15 miles per hour slower on a stretch of road with trees than they do on one without;

Trees attract people to the street and hence improve security and business;

They offer important buffer to walkers as a result of slower traffic and also provide visual and literal barrier from traffic;

A line of mature trees can shield passers-by and road material from unpleasant climatic conditions. Findings from California show that asphalt lasts 40 to 60% longer when it is shielded by foliage;

Trees can act as air-conditioning, where a shaded house can reduce warm-weather energy consumption by 15-35% (Walljasper, 2007, p. 120).

A questionnaire survey in Copenhagen, investigated the quality of residential estates asked a population sample what they thought were the more important features of a residential areas. The results of the survey showed that a house with a private garden was the most selected feature among the respondents (Naess, 2006). At the building scale, the terraced buildings with front and rear gardens, though lower in density compared with other row-buildings attracted more activities around themselves. This is partly due to the semi-private transitional open spaces, which encourage inhabitants to spend more time in the outdoor and to participate in public life (Naess, 2006).

- **The Public Street**

Both speed of movement and the urban mass influence the sense of place and connectivity of the urban environment. The street is the place where public life takes place. It is also a channel for transport and can be source of nuisance to local residences. There are conflicts between living and access; between residences and strangers; and between street life and threats to people's safety and health (Appleyard, 1981).

Indeed, in many cases traffic is perceived as a much more widespread problem than crime. Opinion surveys conducted in different cities in the western countries showed that traffic hazard is the most commonly reported by local people as a cause of dissatisfaction. The US housing survey of 1973 showed that a high percentage (45.8%) of the interviewees reported street noise as an undesirable characteristic of their neighbourhoods, while 29% reported the heavy traffic (Appleyard, 1981, p. 5); Another survey for three streets in the city of San Francisco confirmed the suggestion that heavy traffic can be dangerous, noisy, and negative to human contacts and

people's sense of place –this is also often associated with low quality building facades (Appleyard, 1981).

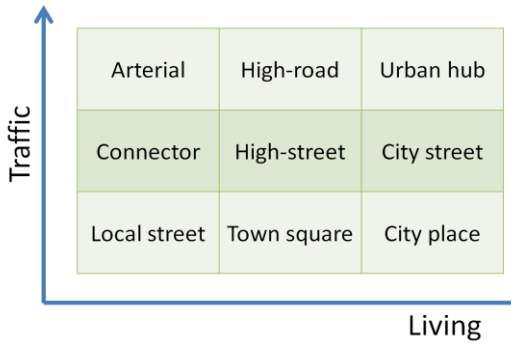
Well-connected and permeable urban layout provides better routes and access to different places, and in turn gains higher quality and attractiveness. Also, streets are more used when better connected to multiple destinations (Dempsey, et al., 2010). Outside main town centres, the mixed use streets which cross residential areas often become district centres, where low speed roads with volumes less than 500 vehicles per hour can be easily crossed by pedestrians (Jones, et al., 2007).

It is argued that highway standards can be conceived as a barrier to place-making (UK-GOV, 2007). However, public roads may better be categorised by character rather than capacity (Llewelyn-Davies, 2000). In addition to their connectivity and traffic-volumes, public roads are physical elements and an important component of the urban fabric that need to be designed in order to integrate with the local context, provide widened movement choices and help to solve traffic and parking problems - see Box 3.2.

Box 3. 2: Living-movement Matrix

As an alternative to the current link-matrix that justifies functional categories for urban roads, the living-movement matrix is suggested as a basis for road classification. A matrix of nine cells, the vertical line for traffic type - local, city or regional level; and horizontal row describes the intensity of human activities- liveability, described by urban hierarchy. However, different segments of the same road can be clssified differently.

Source: Movement/Living Theory - Introducing the concept (presentation) – Mike Keegan, TfL; Hard Working Streets Seminar- Understanding the Role of the Street; 18th April 2013; Urban Design London.



It is evident that higher quality streets attract more people. A survey that recorded all activities occurring in the centre of Copenhagen in 1986, showed that as the number of high quality pedestrian streets is tripled, the number of people standing and sitting in the area increased at the same rate (Gehl, 2006, p. 37).

Low vehicle speeds increase chances for human contacts. It is found that change of speeds from 60 to 6 km per hour can lead to an increase of people on the street by about tenfold (Gehl, 2006). This is because each person will be within visual range for ten times longer. Indeed, the concentration of activities and hence richness of any urban area can be influenced by an acceptable walking distance and visual distance to other people and activities. According to Gehl, these properties can be met by a distance of between 400 to 500 meters each trip for the former, and 20 to 100 meters for the latter (Gehl, 2006). The example of Fawood Park shows that added value can be gained as a result of applying some of the urban design principles discussed above – see Box 3.3 and Figures 3.17 and 3.18.

Box 3. 3: Example- Fawood Park
A site plan with typical floor arrangements, Watson (2009)

The example shows a site of 0.81 hectare occupied by 122 dwellings. The scheme consists of a perimeter arrangement of two linear blocks with fine-grained network of streets and communal garden 20 meters wide (as required by UK codes). Attributes of the mass (plan, section, building depth and the corner) represent a response to local context.

- To alleviate the sense of division of the "defensible space," associated with this type of arrangements, pedestrian and visual axes were opened through the communal garden with the aim of creating a permeable and inviting environment.
- The block has been oriented towards north-south in order to optimise access of east-west sunlight and daylight into the dwellings.
- The southern building is designed to have shallow depth in order to negotiate the noise on the high street by optimising the use of the inner northern side and allowing for cross-ventilation. Lower heights on the high street were compensated for by better sunlight on the back garden and the back block (at 25 degrees, relevant to sun slop in northern countries).

It can be argued that if it is not a one-project design, it would be difficult to gain such properties even with a detailed binding plan. However, measures such as opening up routes through the perimeter block and creating visual connections are relevant to the Libyan context, where case-studies from Benghazi showed that oversized communal gardens and lack of permeability can create negative spaces.

Figure 3. 17: Fawood Park; Ground Floor Plan
Figure 3. 18: Fawood Park; Street Prospective.

Source: Stonebridge- Negotiating between Traditional and Modernist Models of City Housing, Watson (2009)

- **The idea of sharing street space**

On conventional streets, vehicles are given priority and larger cars do have more rights for space on a street. However, it is argued that the democratic space is a shared space (Agyeman, 2013). Shared space is an essential measure in order to improve the quality and coherence of the public realm. Reduction in the speed of traffic is the single most important measure to permit the multiple uses of streets and public spaces (Hamilton-Baillie, 2008). The design of street as a shared space has been accepted due to the expectation that it would preserve the viability of high streets through the control of vehicle-traffic, instead of diverting traffic away from local areas (Clarke, 2009).

To make streets and other public spaces safer, modern planning has introduced measures such as cul-de-sacs, residential squares and the concept of neighbourhood, with its safe pedestrian zones and measures to free buildings from the street line, in addition to the separation of residential areas from other land uses (Appleyard, 1981). However, it was evident that these responses to existing problems are the ingredients for low density urban sprawl. Many urbanists have called for returning

life to streets, with Jacobs arguing that liveable streets of core areas are the safest places in the city (Jacobs, 1993). Here she was concerned more with crime than traffic-accidents.

The liveable-street is a social space; a place for human contacts and learning that enhances the feeling of belonging. However, it is argued that to fulfil these functions the street should connect several local zones and carry a certain level of traffic (Appleyard, 1981). Understandably, allowing certain level of vehicle-traffic is also vital to the life of residential areas. The idea of a neighbourhood unit is concerned with protecting the local environment; it discourages through traffic and limit peak-hour flows to a range from between 100 to 300 vehicles. In a neighbourhood unit, streets can act as a shared space that enhances the sense of locality (Appleyard, 1981). According to Appleyard, the protected zones should meet the following criteria:

- Slow speeds to improve safety on the street, which based on different experiences, can be defined as between 15mph to 20 mph - the lower figure is recommended for school areas in the USA while the second is considered relevant to protected areas within the UK context;
- Acceptable traffic volumes, limited to 2000 vehicles per day;
- A design that helps prioritise pedestrian over vehicle-traffic, reduces accidents and keeps noise levels under 45dBA;
- Acceptable parking provision and open space, in addition to acceptable levels of maintenance and appearance
- Flexibility that allows spontaneous grassroots' interventions (Appleyard, 1981, p. 251).

While the shared street is an approach that seeks to minimise demarcations between vehicle traffic and pedestrians; it focuses mainly on pedestrians' safety by altering the street profile; the home-zone stands as more than a calm-traffic street; it is a residential street in which the living environment clearly predominates over any provision for traffic. Home-zone prioritises people over vehicles and changes the function of street (Biddulph, 2001).

The idea behind a home-zone is to control but not restrict vehicle-traffic. It is expected that when speeds comes down to less than 15 km/h, more diverse activities would appear on the street (Biddulph, 2001). A home-zone may be defined by entrances that narrow the carriageway and change terrain - see Figure 3.19.

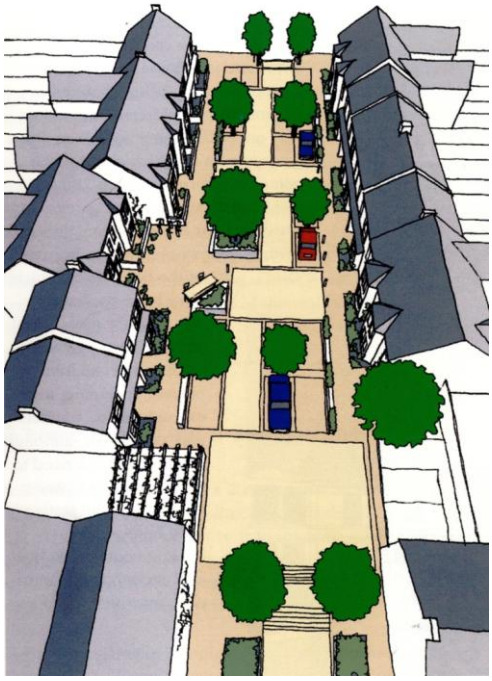


Figure 3. 19: Residential Street as A Home Zone

Source: Home Zones; a planning & design handbook, Biddulph (2001, p. 5)

Evidences show that traffic calming not only reduces speeds but can actually decrease traffic in general. Similarly, narrower streets fund to be less dangerous for motorists, as a study in the city of Longmont, Colorado examined 20,000 accidents on local streets over an eight-year period found that – "as street width widens, accidents per mile per year increase exponentially" (Walljasper, 2007, p. 56). Traffic calm compasses a whole set of common sense street designs that can help increasing safety and satisfaction for people in the neighbourhood (Walljasper, 2007). Measures could include; indirect routes chicane by parking, shared surface and road humps, landscaping by the planting of more trees and shrubs to work with front gardens, space is shared with no separations and street furniture designed to attract social activities including seating places, special lighting and the like (Biddulph, 2001).

The main sustainability concerns and related measures recommended in this section are summarised in the Table 3.6. This summary highlights the advantages of certain urban measures and the relevant urban elements, which will be a matter of further investigation through the exercise of design interventions in Chapter 7.

Table 3. 6: Main Urban Issues and Selected Measures for Improvement

Sustainability concerns and related strategies	Planning and design measures at local level
Regional dimension: The phenomenon of Urban Sprawl and the consequent increase of water and energy used can affect the natural environment and agriculture, and in the same time increase the vulnerability of the urban areas to the harsh climate. ➢ Strategies of urban containment and urban intensification are expected to resist urban sprawl. However, a connected network of green spaces is also important to sustain the biodiversity and improve urban environment.	➢ Clear boundaries and physical intensity to enhance enclosure and urban containment. ➢ Zoning based on the idea of Transect that links the urban density with urban typology and distance from the centre. However, a net-density of 80 to 100 inhabitants per hectare has been set as a minimum for a viable transit service. ➢ A hierarchy of green spaces and rows of are important to bring natural landscape into the city. Such a measure can alleviate harsh climate, soften urban scene, sustain biodiversity and provide space for recycling and renewal energy.
Social dimension: Urban sprawl is associated with spatial remoteness and limited choices – influences in particular transport and social contacts. ➢ A compact urban form is expected to create a critical mass for local services and human contacts	➢ A residential cluster of 7500 people at moderate density is expected to support public services that are viable and accessible on foot- within a distance of about 500 meters from centre to edge. ➢ A grid pattern of 80×80 to 100×100 can create small blocks and direct-short routes, with good physical and visual permeability. Also it is often associated with more dense and efficient types of developments.
Economic dimension: Low density requires higher investments per dwelling and can be unaffordable to many people. ➢ Urban intensification helps to enhance the use of available capacity and encourage investments. ➢ Urban diversity and spatial connectivity are essential for a vibrant economy	➢ Small and Narrow blocks – with minimum rear gardens - are efficient and can help to meet preferences for private outdoors, good orientation and privacy. Perimeter blocks are flexible and associated with continual street-line, mix of building type, diversity of functions and affordance to future intensification. ➢ Minimum road profiles are useful to balance the distribution of traffic and promote interconnections. While design of shared streets promotes flexibility, diversity and spontaneous interventions
Urban dimension: Incomplete and dispersal urban areas are vulnerable to harsh climate and inefficient mainly in terms of energy use. Such type of development can create uncomfortable and deserted outdoors. ➢ A liveable public space should be diverse and spatially connected to meet needs such as privacy, climatic protection and visual quality.	➢ Clear pattern of streets, land marks and boundaries support character and help way-finding. However, privacy needs to be balanced with surveillance. ➢ Human scale and shared public spaces are more liveable. They should be bounded by continual street-wall and contain critical mass in order to stimulate activities ➢ The use of orientation, smooth sky-line and suitable green cover can help protecting localities from hot and dusty winds.

3.11. New Urban Models: *Characteristics of a Sustainable Urban Form*

Undoubtedly, renewed interest in the compact urban form reflects mainly a reaction against urban sprawl, which is widely perceived unsustainable (Calthorpe & Fulton, 2001). However, challenges to contemporary cities are varied, complex and may hinder new urban solutions from making any difference (Frey, 1999). The sustainable city, which is functional, liveable and environmentally sustainable, is expected to be multifocal, human scale of short distances, and fully covered by public transport (Greed, 1998), (Cervero, 1998). That is in order to help achieve higher levels of accessibility and even distribution of work places, services and leisure areas, which in turn generate less traffic, while arrangements around local nodes are expected to enhance the engagement in public life and enrich local democracy and accountability (Greed, 1998).

The vision and principles of compact urban form as applied in different regions do contain many commonalities and also regional differences. These ideas have been promoted by several urban approaches; including *Neo-traditional planning*, *Transit-oriented planning* and *Urban village*, and are embedded in many planning policies such as compact city policies of the urban renaissance in the UK in the 1990's and the smart growth in the USA (Robbins, 2008). However, in spite of the popularity and acceptance of the approaches of new urbanism, that reflect the universality of many urban concepts, dealing with local issues may influence priorities and the relevant treatments.

New urban approaches that inspired by good historical examples, do promote an urban form which is compact, low rise, relatively dense and self-contained, characterised by mixed land uses and fine-grain patterns. Common to these approaches is that they are anti-sprawl, local and target regional sustainability (Vreeker, et al., 2004). Some of these approaches advocate principles that include grid patterns, mix of housing types, attractive and pedestrian-friendly streetscape, clear centres and edges, affordable transport options, traditional designs, permeable blocks and networks of open spaces (Neuman, 2005). However, some models value beauty and traditional architecture over affordability and environmental responsibility, so they place different emphasis on various urban aspects. For

instance, while Neo-traditionalists consider the urban pattern as more meaningful than location or amount of growth to deal with sprawl, the transit-oriented approach focuses mainly on location (Grant, 2006).

Generally speaking, some urban features are common for all new urbanism approaches and can be considered as universal; such features include: physical intensity; moderate density; mix of land uses and housing types; clear boundaries; walk-ability; and transport options, whereas other principles such as architectural style and street patterns are context relevant (Williams, et al., 2000). Thus in Asia and Europe, New Urbanism proponents focus more on urban form, such as high density and diversity, rather than on traditional design which is the case in North America (Grant, 2006).

However, even on the North American side, academics explain that good physical design should not be perceived as deterministic, but rather as a creator of the context for positive social environment - "environmental affordance" (Talen, 2010). Although, examples of new urbanism in the developing countries are few, in the western world built examples have been perceived by many as beautiful and walk-able but not necessarily up to the expectation of or to make a real difference to environmental sustainability. There is even a claim that new urbanism projects have indeed justified urban sprawl (Grant, 2006).

New Urbanism, as a movement, emerged at first in the USA to promote an alternative way of urban development – one which rejected the prevailing patterns of low-density car-dependent urbanism and targeted to help restore and modernise the decayed core areas (Ellis, 2002). This movement, which is a merger of both Neo-traditional and Transit-oriented approaches (Walters, 2007), ratified, at its annual congress in 1993, the charter of New Urbanism which outlined its principles for good urbanism at different urban levels (Congress for the New Urbanism, 2011).

This Charter is in contrast to the Athens charter of 1942 which codified the modernists' view of urbanity. The charter of New Urbanism is an attempt to address the negative impacts of contemporary urban development in different regions including the decay of inner cities and loss of urban heritage; urban sprawl and

placeless urbanism; social inequalities; deterioration of urban environment; and the impact of urban development on agriculture and biodiversity (Ellis, 2002).

The concept of New Urbanism promotes the idea of diverse neighbourhoods; the design that reproduces traditional patterns of narrow streets and plazas targeting to create high quality urbanism that celebrates history, the environment and local character, high accessibility to social services and amenities, and invites all modes of transport. The neighbourhood is envisioned to have an adequate size, be compact with an appropriate urban density; provides suitable mix of uses, a range of facilities, access to transit service, tenure alternatives and a pedestrian-friendly environment (Neal, 2003), (Congress for the New Urbanism, 2011). The main principles and measures promoted by the Charter of New Urbanism are shown in Box 3.4.

Box 3. 4: Main Principles and Measures Promoted by the Charter of New Urbanism
Source: Congress for the New Urbanism (2011)

- A well-structured regional pattern with clear centres and edges;
- Urban compactness that allows for the protection of agriculture and natural environment, and infill development strategies to revitalise decayed inner cities;
- Fine-grain and interconnected streets to improve accessibility and walk-ability;
- Mix of land uses and building types with functional diversity;
- Transit oriented development to reduce car use, energy consumption and air pollution;
- Design of urban space and buildings to provide for higher quality and attractive urban environment of local character with less car appearance;
- A coherent human scale urban form with fitted typologies and streets to encourage social contacts;
- Designs of parks and green spaces as networks for more connected urban fabric.

Without the sustainable dimension, which gives the idea a functional legitimacy, the concept of New Urbanism would not be more than another type of aesthetics (Moughtin & Shirly, 2005). However, the concept has been criticised at different levels. In practice, projects of new urbanism are rarely complete (Robbins, 2004); homogeneity is obvious in style and housing values and they are usually exclusionary to some land uses like industry, whereas social and functional diversity is very limited. However, due to requirements of high quality, it seems difficult to ensure the affordability without public fund. New urbanism is even facilitating suburbanisation by making growth more attractive and legitimate and for providing less affordable housing (Ellis, 2002), (Grant, 2006), (Robbins, 2004). In the USA, it

was found that New Urbanism projects are unaffordable for almost 50% of the population (Robbins, 2008).

Moreover, in spite of the language of collaborative planning, initiatives of New Urbanism lack the overall diversity and spontaneity of real-life development, while claims for the universality of the concept are in contrast to its promotion of the diverse neighbourhood and the inherited uniqueness of each site (Ellis, 2002), (Robbins, 2008). Order is impeded in the outlines of New Urbanism; articles like Krier and Porphyrios (1984) and Duany and et al (2000) do express a dislike for the visual disorder of the contemporary city and argue for design guidelines as a tool for coherent urban development.

Codes based on typological zoning of the transect idea (Figure 3.20), promoted by the New Urbanism, may forbid urban farming that is common in the developing countries (Robbins, 2008). However, this commitment for certainty and refusal of unexpected results can only be described as a denial of real-life circumstances and the needs for fast growth and ever changing demands (Till, 2009).

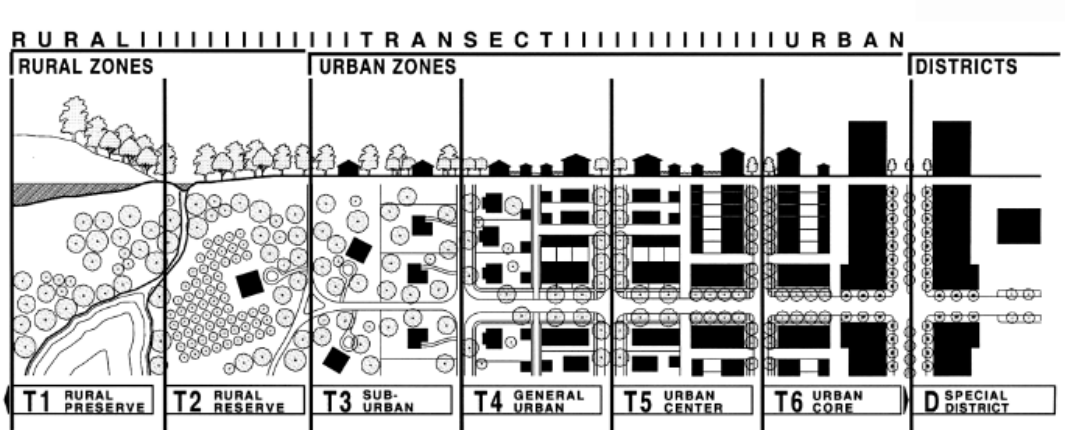


Figure 3. 20: The Transect Model
Source: Neighborhood Design in Practice Duany (2003, p. 95)

Moore argues that approaches of new urbanism are in fact a matter of local interpretative work rather than the intentional or conscious adoption of universal goals or proved claims (Moore, 2013). This argument was put forward to counter the claim that several examples of new urbanism had been unable to meet their core goals of reversing sprawl and achieving social equality. Moreover, the ideals of new urbanism seem to contrast with the view of landscape ecology that insists on the

retention of natural landscape even within urban boundaries – Calthorpe and Poticha (1993) claim that nature needs to be protected and separated, while Duany and et al. (2000) suggest that the city should avoid including inappropriate natural elements, while urban greens may be treated formally not like wild plants. Lastly, in spite of the argument that the traditional style is contextual and appears to be "wishful thinking" in the future rather than based on a real evaluation of aspects of urban development, traditional elements of the New Urbanism reflect the need to security, image and identity in the contemporary urban environment.

Sustainable Urban Form

According to Walters, design can be conceptualised as an act of creating city spaces as sites and containers for human activities (Walters, 2007). The compact city is not necessarily a homogeneous phenomenon; it can be a mono-centric or polycentric city, either compact from the centre to the edge or consist of several compact zones connected by public transport (Frey, 1999). Moreover, there is no single type of sustainable urban form, but it depends on the case under investigation. A compact urban form may refer to the city as a whole or part of it - i.e. a district or neighbourhood - as long as it characterised by relatively high density, a mix of land uses and intensified use of urban space served by good public transport (Frey, 1999).

Indeed, features such as urban density and intensity of activities would be only meaningful when related to the physical form and linked to concrete targets and thresholds (Frey, 1999). It is suggested that because people experience the built environment mainly at the local scale, therefore a polycentric model consisting of compact neighbourhoods would be more appropriate to investigate the social benefits (Dempsey & Jenks, 2010).

The debate on urban sustainability reviewed in this chapter supports the argument that the polycentric city form can be a suitable solution (Frey, 1999). It consists of a network of compact urban units - i.e. neighbourhoods and districts – that are distinct but not overlapping, arranged around transport corridors and nodes. Each urban unit focuses on its own centre with a catchment area equals to a 10 to 15 minute walking distance (Clarke, 2009). However, according to the concept of Transect, mentioned

above, the increase of distance from city centre is normally associated with typological change and a gradual decrease in densities.

The same debate on sustainable development has also promoted the Eco-city model, which accepts lower densities and longer distances in return for features such as spacious private gardens, more landscaping, recycling and waste treatment. Also, the concept advocates a star-shaped structure, where fingers of development radiate from the centre along public transport corridors and wedges of green extend to the centre; however, it has messy edges (Moughtin & Shirly, 2005). This green system may extend to and incorporates the green-belt and contains areas for habitat life. It can help improve the microclimate; alleviate air pollution and strengthen local character and sense of place (Llewelyn-Davies, 2000).

Nonetheless, because of weak evidence of the link between urban sustainability and residential density, some researchers have downgraded the importance of density in the definition of compact city (Neuman, 2005). Indeed, the compact city as a sustainable concept is more than a dense urban form. The Sustainable Urban Form suggested by Newman (Box 3.5), though refers to the three main elements of a sustainable urbanism – compact form, green elements and participatory process of development – it is in many respects similar to concepts presented in the Character of New Urbanism. However, it fails to refer to environmental aspects such as ecological corridors and open green spaces, which are important to water management and solar energy. Also, the presumption that public transport is a key factor to any sustainable solution may not be compatible with the capacities of many cities in the developing countries.

Box 3. 5: Main haracteristics of the Sustainable Urban Form
(As suggested by Newman)
Source: Neuman, The Compact City Fallacy (2005)

- A fine grain compact urban form presents high degree of street connectivity and relatively small size of land parcels
- A mix of land uses at high residential and activity densities
- A low ratio of open-space as a result of a high percentage of impervious surface coverage
- A contained urban development demarcated by clear edges
- Good coverage of civic infrastructure subsidised by the public sector
- A high degree of local and regional accessibility; served by a multimodal transport system
- Liveable outdoors of high degree of social and economic interactions
- A participatory process of planning, design and land development.

In comparison with the historical examples, the traditional Arab city has been perceived as sustainable not only due to its compact physical form and typology, but also because of aspects such as the use of local materials and technologies, urban agriculture, and the flexibility that allows for gradual intensification based on accumulation of local decisions (Bianca, 2000). However, today large part of contemporary development in many cities in the Arab region shows elements of "everyday urbanism" (Kelbaugh, 2007), although termed informal, demonstrates an intensification process that helps to absorb residual areas and maximise the use of the urbanised land.

What everyday urbanism means here is more than just temporary grass-root intervention (Kelbaugh, 2007), but a local process of development that is exposed to less-control from central institutions. Everyday urbanism is a flexible process that responds to changing real-life circumstances and allows optimisation of development opportunities (see examples (UNHabitat, 1980). However, in spite of the embedded features of compact model and green technologies, a contemporary compact city like Masdar in the UAE, cannot be easily termed sustainable. Here Foster and Partners tried to re-create the traditional form of the Arab city in an inappropriate way, because they focused on the output rather than the process.

Abu-lughod argues that the old Islamic-Arab city is a result of an urban process that is influenced by three elements: the distinction between the citizens and outsiders, the segregation by gender, and the decentralisation of planning and government regulations, which today are of lesser importance due to the rise of global trends such as social cohesion and gender equality, in addition to the central systems for the provision of services and the planning tools including zoning and other regulations (Abu-lughod, 2013).

The master plan of Masdar city brought together concepts of the traditional compact form; characterised by density, mixed use buildings, and designs for shading and natural ventilation (Photo 3.6). Its square shape is rotated 52 degrees against the cardinal grid, and contained green corridors to capture wind breezes; the area is walled and surrounded by supporting land uses, as a measure against urban sprawl (Bullivant, 2012). However, some people described Masdar city as an experimental

work of composite solutions rather than an integrated whole (Bullivant, 2012). The city is built as a grand project in a short period of time, used imported materials and technologies and is designed to communicate visitors' preferences rather than the needs of the local community (Cugurullo, 2013).

Photo 3. 6: A Virtual View for the Pedestrian Street; Masdar City

Source: Foster & partners; http://www.fosterandpartners.com/projects/masdar-development/; accessed 03.04.2013

On the other hand, there have been valuable attempts to bring together a preference for suburban environment and sustainability considerations. A study by MJP has presented an example of the increase of urban density within the UK context, while meeting the preferences for a suburban environment and taking climate change into consideration. It concluded that it is possible to design a neighbourhood at gross density above 50 dwellings per hectare, while achieving the following qualities:

- A desirable environment of family houses with private gardens and open spaces;
- Gaining high densities appropriate for a high quality walk-able environment, place for public life, efficient public transport and accessibility to basic services;
- Environmental objectives of a high quality landscape, biodiversity, rainwater management and water quality, renewable energy and recycling, openness, greening and urban farming (MJP, 2010), (Sennett, 2010).

The study has demonstrated the relationship between area layout and housing-type with the urban density, and shows the possibility of negotiating area capacity through applying a mix of housing types. The case study was designed to contain a mix of house types including detached houses of 2 to 3 stories at a density of 35 to 55 dwellings per hectare, row houses of 3 to 4 stories at a density of 85 dwellings per hectare, and apartment buildings of 5 stories at a density of 180 dwellings per hectare (Sennett, 2010) - see Figure 3.21.

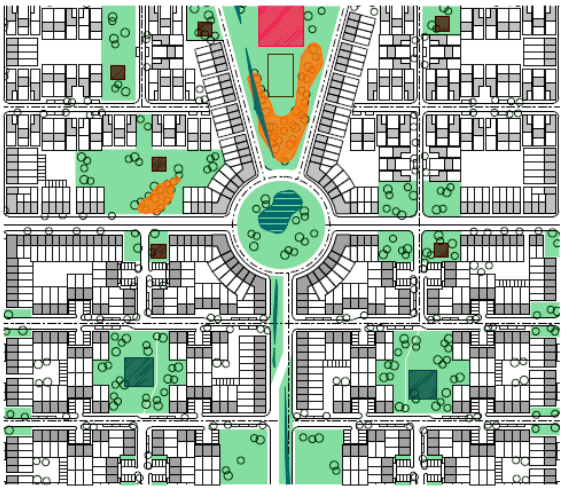


Figure 3. 21: Sustainable Suburbia, Sea-Side Flordia

A Walk-able Garden Suburb
Source: Sustainable Suburbia: A Walk-able Garden Suburb; Van Kamp ans et al. (2003)

Other features included private gardens as front and back yards; play-on-street "home zones"; parking in courtyards with trees and garages; minimum car space by mixing car ways with pedestrian areas; staggering of houses by moving buildings to gain privacy and green; surface rainwater systems, and narrower and taller buildings with frontages of 6 to 7.5 metres wide (MJP, 2010).

Generally, although objectives of urban sustainability range from high quality public realm and the reduction of energy use to the production of more affordable and protected urban development, it is widely believed that any sustainable urban form ought to be compact; it should be made up of a relatively high density, mix of land uses and diverse activities, which is inherently walk-able and promotes public transport. Greening, the use of renewable energy and reuse of wastes are also essential features (Roseland, 2000), (Robbins, 2008), (Neuman, 2005), (Jenks, et al., 1996), (Western Economic Diversification Canada 2010), (Jabareen, 2006).

The expectations are that this type of development, which should be a result of a participatory process that engages local stakeholders and is responsive to change, would help to reduce energy use, wastes and air pollution. It should also protect the

natural environment, better capitalise on urban land and civic investments, and would lead to less use of the private cars, improve urban environment and encourage social interactions. However, indicators of urban form like physical intensity, density, diversity and development capacity can be varied, influenced as they are by the local context, and they therefore need to be assessed against sustainability objectives in each local area.

It is evident that there is no fixed model for sustainable urbanism and that both the objectives and urban principles depend on local conditions and the capacity of the case under investigation, accepting that the planning approach is as important as the final product. The next section provides a discussion on alternative planning approaches and their relevance to sustainability ideals.

3.12. Urban Approaches

The built form is the physical aspect of the human settlement that can be shaped by design. Understanding the characteristics of urban form is essential for any successful design (Lozano, 1990). The design process to urban form is not necessary like the design of object form. While it is important to define building boundaries, community forms are usually characterised by loose ends and transitional areas, often defined by their nucleus and design considerations extend beyond their legal boundaries. Also, instead of comprehensive design, community forms are shaped primarily by disjointed actions guided by controls and incentives, and throughout the shaping process they are normally subject to design interventions (Lozano, 1990).

Available tools to manipulate the physical environment are limited to policy, design and management. The design of an urban environment concerns itself with objects, activities and the process of development. In the process of urban design models are used basically to create new places and improve existing situations. The urban model can be “a picture of how the environment ought to be made, a descriptive of a form or a process which is a prototype to follow.” (Lynch, 1981, p. 277). However, the quality of any urban product depends, in the first place, on the objectives and principles used to achieve its final form (Punter, 1999).

Urban regulations are crucial to the development of cities and towns. Urban guidelines and codes are used to deal with aspects of city layout, typology and townscape. However, their influence on the built environment is under-researched (Imrie & Street, 2011). Urban typologies are based on concrete examples; they afford multiple meanings and contain different qualities and tested solutions (Llewelyn-Davies, 2000). Understandably, without a typological language it would be difficult to design urban areas in a coherent, predictable and collaborative manner (Kelbaugh, 2007).

The example of Charles II's 1667 Act for the rebuilding of the city of London after the great fire of 1666, which defined typologies of streets and buildings and sets of development rules, showed the effectiveness of such tools in facilitating development independently from any Master-plan (Carmona, et al., 2006). On the other hand, the irregular shape of the old Arab-Islamic city has been the result of a flexible approach that responds to change overtime, based on a combination of rules, defined rights in urban space, and traditional design elements. However, in spite of the spontaneity and seemingly unpredictable forms and types of buildings and urban spaces, there is a high degree of similarity that unites the urban fabric (Ben Hamouche, 2009).

Although the first example, Charles II's Act, is based on Cartesian geometry that seeks order and certainty, and the second is a result of a negotiation over private and common rights in the built environment in a search for collective solutions, they have produced a compact and human scale urbanism. However, it is noted that in such cases where institutional planning relies on abstraction and promotes principles such as formality, linear blocks, right-angle subdivisions and unbounded flowing space, an urban sprawl is quite often created, characterised by an urban form, which is less-efficient, car-oriented and has no spatial or historical references (Trancik, 1986).

A main issue with many contemporary planning approaches is that they are detached from local context, advocate unaffordable high quality urbanism, and are not necessarily relevant to local circumstances and people's expectation. It is evident that participation in urban design and planning has not always been understood in the way that makes people own the project. It is not sufficient just consult people about decisions that would impact their lives, they should be engaged in the whole

planning process (DETR-CABE, 2000). Resnik argues that *a deliberative democracy*, an approach for resolving controversial questions on public-policy with an emphasis on open, deliberative debate among the affected parties as an alternative to voting, can provide a fair and effective way to resolve issues of urban planning (Resnik, 2010).

There are different methods of participation, which their relevance depends on the planning task and local context. Participation methods may include: (1) active participation such as community design, self-building and community control, (2) public meetings and political campaigns for urban matters, (3) administrative procedures such as planning appeals and public inquires, (4) informative techniques such as exhibitions, press notice and other media, and (5) social studies- like cultural data, user studies and planning surveys (Moughtin, et al., 2003). The use of the right type of participation and technique in each stage is crucial to the success of the planning process.

Wates (2000) has suggested a participation matrix that illustrates a link between each stage of the urban project and the appropriate level of people's participation. The shaded areas in the table down here show the most appropriate level of participation for community planning. However, any party may initiate action but the crucial ingredient is joint planning and design, shown in the dark square, where people, experts and public officers need to work together to balance between actual needs, and what is possible technically and financially. Implementation and maintenance will either be carried out jointly or by the authority after consulting the community (Wates, 2000) – see Table 3.7.

Table 3. 7: Participation Matrix

Source: The community planning hand book, Wates (2000, p. 10)

		Project stages			
		Initiate	Plan	Implement	Maintain
Level of community involvement	Self Help Community control	Community initiates action alone	Community plans alone	Community implements alone	Community maintains alone
	Partnership Shared working and decision-making	Authorities and community jointly initiate action	Authorities and community jointly plan and design	Authorities and community jointly implement	Authorities and community jointly maintain
	Consultation Authorities ask community for opinions	Authorities initiate action after consulting community	Authorities plan after consulting community	Authorities implement with community consultation	Authorities maintain with community consultation
	Information One way flow of information Public relations	Authorities initiate action	Authorities plan and design alone	Authorities implement alone	Authorities maintain alone

- Most community planning operates in the shaded areas, the dark square shows the crucial element of participation

Codes and planning shift

Urban planning and design create the framework within which others can do design (Greed, 1998); where urban guidelines and codes are important tools in this process. *Urban guidelines* are non-mandatory statements on measures to achieve certain objectives and principles in a specific area. They can be either descriptive of the end product regards urban form indicators and layout, which are easy to measure; or performance based - qualities or activities, which are more difficult to assess (Punter, 1999).

On the other hand, *urban codes* provide the legal framework for the implementation of the accepted physical principles. (Walters, 2011). They describe urban elements and their relationships, but not necessarily the whole urban form (Carmona, et al., 2006). They are independent of a fixed master-plan and can facilitate development with speed and harmony. However, unlike main-land Europe, urban codes in the UK can be mandated only if they are proposed as part of the Master-plan for a specific project area (GOV.UK, 2006), (CABE, 2005).

The contents of Urban Code may cover: (1) land uses: layouts, types and uses of buildings and open spaces, (2) streets: types and dimensions of streets, location of car-parks and street furniture, (3) blocks: arrangements and subdivisions, (4) land plots: position of buildings, gardens and treatment of boundaries, and (5) buildings: types, masses and heights of buildings and detail designs (Carmona, et al., 2006).

Zoning is an instrument of urban development to regulate and control land uses and the physical form. Within this context urban codes can be an instrument for rational planning, which advocates abstraction, plans on clean-sheet and standardised building forms. Therefore urban codes are sometimes described as destructive, as they can become detached and disconnected with local context, and a factor leading to a low quality urban environment (Punter, 1999). Evidence shows that urban codes can be inflexible, exclusive and characterless (Punter, 1999). They can also be unaffordable and inconsistent with real-life circumstances. It is noted that in the UK, the urban guidance introduced following the end of WW II has been a tool for suburban development that led to a waste of resources and lack of character (Walters, 2007).

Recently, *design codes*, which are essentially different from the "conventional" urban codes, have become of increasing interest as they are perceived to be an effective way to deliver liveable and sustainable urbanism (Punter, 1999). Design codes provide the basis for the design-led approach to planning based as they are on understanding the existing urban environment and using of this experience to develop rules and create variety.

Design codes are often introduced as site-specific, context relevant and promote principles of traditional urbanism (Carmona, et al., 2006). It is argued that though they are more regulatory than other forms of guidance commonly used in the UK, overall they have helped to speed up development, improve quality and deliver more certainty for all parties (CABE, 2005).

Design codes main purpose is to help deliver the vision expressed in the master-plan or elsewhere. They can be style free and contain some standards regarding aspects such as accessibility, street hierarchy, parking, open spaces, buildings' envelope and

design elements. At lower urban scale, design codes focus on the delivery of good quality and well designed places and the improvement of the urban sustainability (CABE, 2005). Understandably, urban design needs to deal with a principal set of elements which have a significant influence on the form, structure or use of the city. Other detailed configurations which would not influence the overall urban pattern should be left to the stage of site design (Erickson, 2001).

Both the design-lead approach and form-based codes - i.e. design codes in the UK - are the corner stone of the concept of New Urbanism (Walters, 2011). The form-based codes have been an early attempt to interpret the American traditional town and to use this experience to recreate a diverse neighbourhood with high quality environment. The form-based codes developed by Duany and Plater-Zyberk (1991) have been different from the conventional zoning regulations, which fix and restrict uses; instead they fixe the form attributes of different urban clusters and allows varying uses to emerge (Franck, 1994), (Duany, et al., 2010).

To these ends, the form-based codes for each development have been a tool to address the urban design qualities in the area; they define some urban elements and set the parameters to other details (Walters, 2007) – see Box 3.6. However, the Transect concept is adopted to relate coded urban characteristics to the location of every development along the hypothetical urban-rural cross-section (Carmona, et al., 2006).

Box 3. 6: Main Characteristics of Form-based Codes - as Summarised by Walters

Source: Designing community: charrettes, master plans and form-based codes (Walters, 2007, pp. 245-246);

- Focus on form but not the use, and style neutral,
- They are tied to measurable purposes and outcomes, also clear and easy to read,
- Produced through a process of public participation focusing on urban form and land use issues,
- Organised around spatially defined districts, neighbourhoods and corridors that manifest particular urban characteristics, which recognise the importance of well-defined and well-designed public spaces, and promote compact neighbourhoods- pedestrian friendly, contain mixed uses and a range of housing types to improve housing choices and accessibility to different amenities.

On the other hand, design codes have also been used in the "Sustainable Communities Plan" for England in 2003, with the aim of speeding up the delivery of new housing, while creating attractive places characterised by high quality designs and mixed land uses through a process that involves all stakeholders (Carmona, et

al., 2006). Within this context and in order to respond to the design-led renaissance, the planning regulations and building codes have been reviewed to incorporate sustainability themes such as green buildings and urban liveability (Imrie & Street, 2011). Although currently the use of design codes in the UK is not mandatory, successful codes, such as the example at Upton in Northampton, have been useful tools in raising the standard of urban development by specifying clear design principles and development requirements (Walters, 2011).

The Upton site is a residential expansion of 44 hectares on the outskirts of Northampton town assigned for about 1220 dwellings and their social services. With the aim of developing a sustainable neighbourhood, a "working group" consisting of main stakeholders was established in 2001 to drive the process. However, "inquire by design" workshops as a tool for participatory planning were used to engage the community into the review of the development plan and to develop the design brief, the result was the Upton Framework Plan 2002 (Imrie & Street, 2011) – see Figure 3.22.

Figure 3. 22: Upton- layout plan

Source: Creating a sustainable urban extension- a case study of Upton, Northampton: http://www.northamptonshireobservatory.org.uk accessed 07. 2011

A design code has been produced to detail the guidance on principles of the plan. It defines the hierarchy of street types including courtyards and mews, streetscape and the treatment of boundaries between public and private spaces for each street type. The neighbourhood is subdivided into four "character zones": (1) urban boulevard, (2) neighbourhood spine, (3) neighbourhood general and (4) neighbourhood edge,

which have different codes on building type, density, height and layout, and land use characteristics (Imrie & Street, 2011).

To avoid claims of inefficiency and undesirability linked to conventional regulations and to serve objectives of sustainability, the design codes have focused on the public realm and included sustainability measures such as water conservation and the use of recycled materials (Imrie & Street, 2011). Moreover, in spite of the claims that design codes could limit creativity and create uniform style, people, who become involved in this project, have argued that it was possible to design diversity within the parameters of the design code, which target the production of urban environment of high quality and coherent appearance (Imrie & Street, 2011).

This example shows that the shift in the scope of urban regulations to cover sustainability themes such as climate change and social coherence was commonly accepted by designers, developers and the society. This is in addition to the role of urban regulations in the design process and their support to participation in planning – see Figure 3.23, a comparison for building codes.

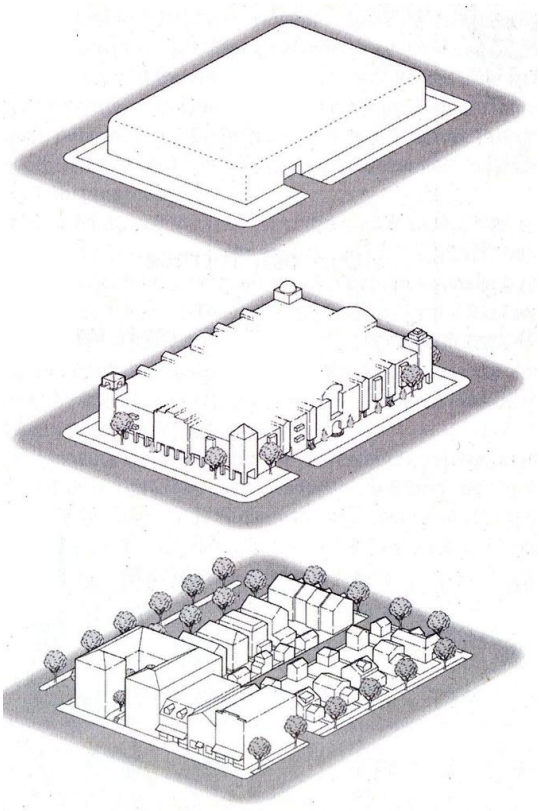


Figure 3. 23: Three Types of Development Regulations
A conventional zoning, design guidelines, and form-based codes, which their focus is on mass, mass & aesthetics, or urban typology respectively.

Source: In: Sustainable Urbanism: Urban Design with Nature, Farr (2008, p. 33).

While some commentators on new urban initiatives based their conclusions on successful examples, presenting design codes as a potential means to facilitate a fast, certain and inclusive process of urban design, which integrates the aspiration of all stakeholders and results in a higher quality urban environment, others claim that many real-life examples demonstrated that design codes can be, to an extent, pro-sprawl, exclusionary and less participatory than anticipated (Frey & Yaneske, 2007). Moreover critics, especially in the developing countries, have even questioned the idea of coding *per se*, and advocated deregulation as an alternative procedure which provides a more context relevant and affordable alternative, asserting that it promote spontaneous development guided by market forces and negotiation between the different stakeholders (Till, 2009).

Deregulation: spontaneous or negotiating the plan

Because human needs are context-related and depend on the level of already satisfied needs (Sharif & Jabaji, 1982), the sustainable urban environment is arguably not necessarily the tighter and cleaner one. Thus, while abstraction may help to create a controlled and perfect development, if design is detached from real-life circumstances and people's aspirations, would be unexpected to be sustainable (Till, 2009).

It is recognised that general building codes and regulations in the developing countries have been unaffordable to many local communities and led to dual formal and informal sectors in many contemporary cities (UNHabitat, 1980). In order to avoid conflicts and better help people to build for themselves, codes and regulations need to be incremental in order to adapt to the needs of the poor, and they should also be adaptable to local socio-economic and natural conditions and linked to traditions.

Spontaneity in urban development has been advocated throughout the 1940's and 1950's by Pevsner as a means to create irregular and picturesque urban form (Hughes, 2000). However, "The idea that some cities have grown naturally is misleading" (Taylor, 1998, p. 165); Piecemeal, incremental or organic growth of cities can always be linked to one planning style or another. Indeed, having no plan

can be messy and problematic. It may encourage urban sprawl, disorder and land speculation. Additionally, other agencies may take over planning tasks and influence development in varied ways (Greed, 2000).

Deregulated urbanism as a counter to state planning was introduced by Richard Sennett in "the uses of disorder". He argued for the building of a community as an "everybody's business", which should be realised by beneficiaries through negotiation and spontaneous actions (Sennett, 2008). However, it is argued that the idea of planning against no-plan does not necessarily mean order or disorder, but rather a matter of power by state or grassroots (Kofman & Lebas, 2000) - i.e. participatory planning.

The variety of forms and types of houses in the traditional Arab city, although seems random and unpredictable, reflects a process of problem solving to development and the influence of early site conditions on the overall urban form. It is argued that these traditional forms are shaped by a hidden order comprised of two systems: (1) the linear system of public actions and (2) the non-linear system of private and collective actions – these generate mixed geometries mainly Euclidean for the first and fractal for the second (Ben-Hamouche, 2009).

Ben-Hamouche has explained this complexity and dynamic urban form using *Chaos Theory*, where the self-generating process, once set up, would function and develop without the need for intervention. It is quite different from the procedural approach to contemporary planning. Therefore, irregularity should be analysed as the result of a set of rules that govern the successive physical events and gave shape to the city (Ben-Hamouche, 2009).

Minimum regulations have been perceived as particularly important in the developing countries to deliver affordable development and respond to the practice of self-built. It is a rationalisation of the regulations to improve their efficiency while maintaining an acceptable level of urban quality. The example of the new town of Gourna in Egypt (Fathy, 1973), which was designed to resettle villagers of the old town, shows how a process of negotiating design possibilities has been used to enhance social pattern through the spatial arrangements, and engage the planner,

builders and local people in the development process. In 2007 UNESCO launched a safeguarding project at the village of New Gourna, which is an initiative to rehabilitate this important architectural heritage, as well as to valuate these ideas and revive their relevance to contemporary sustainable architecture (UNESCO, 2010).

A recent example for urban regulations in Arab Gulf countries, called *corners law*, permit the residents, under certain conditions, to appropriate leftover spaces that are adjacent to their homes. The objective of these regulations is to reduce costs of maintenance, to rectify planning mistakes, and to encourage the participation of people in the improvement of built environment (Ben-Hamouche, 2013).

A similar strategy is the "unfinished" urbanism - not necessarily physically incomplete, which allows for unpredicted interventions by users to take place. It has been perceived as an opportunity for "everyday urbanism" to take place. It is flexible, affordable and can sustain a liveable urban space through the engagement of stakeholders from the early stages (Lerup, 1977).

Indeed, such an approach of unfinished housing has been pursued in many developing countries as a mean of offering affordable housing to local communities during stages of fast growth. The sites and services project in Dakar, Senegal, that took place between 1972 and 1981, to provide 14,000 land plots on an area of about 400 hectares, has been a good example of this type of development (The-World-Bank, 1983). The project, which was initiated by the World Bank and the national government as a pilot project, targeted the provision of affordable and acceptable levels of basic services, at the same time as demonstrating the viability of the sites and services project's approach to the fast growth in developing nations (The-World-Bank, 1983).

3.13. Conclusion and Conceptual Framework

After WWII, and as a result of fast urbanisation and the need to upgrade deteriorated urban centres, many countries across the globe have adopted rational planning – this is an approach based on Modernism ideals that implicitly excludes design from the urban-project (Taylor, 1998). However, this type of planning has been an important factor in the creation of urban sprawl. Based on the literature, urban sprawl in the developing countries has been frequently described as if it were two separate, yet contiguous, types of development, the planned expansion of low density patterns and uncontrolled growth. However, the common features of both are that they are often scattered, fragmented, low density and incomplete.

A sustainable urban development is expected to find a balance between humanistic and environmental considerations; to bring together objectives for urban quality and environmental sustainability. Current debate on urban sustainability quite often focuses on mitigating the impact of modern lifestyles on the regional and global scale, calling for behaviour change such as the use of public transport and recycling. However, the role of urban form on environmental degradation and how the resulting impact can be curbed has attracted less discussion (Frey, 1999). Thus, while compact development has been promoted by planning policies, through urban containment and the improvement of urban quality, as an alternative to outward sprawl, at the local level acceptable urban patterns and spatial characteristics are varied, depends on the local context in each city or town. However, for many developing countries, targets to manage sustainable urban development are not well defined theoretically or practically (Dave, 2010).

To conclude, both models of horizontal very high density and modernist large scale blocks for high-rise buildings and undefined open space may not be a suitable option for sustainable urbanism, particularly in the Arab region. Thus a high density above certain levels could lead to poor living conditions, traffic congestion, air pollution and crumpling urban systems, especially in the case of poor civic infrastructure and poor public transport. On the other hand, high-rise buildings and large scale blocks have been criticised on the grounds that they are expensive, contain large parking

and undefined areas and lack local references. This is in addition to their link to social problems and unhealthy urban conditions.

Nevertheless, international debate on the sustainable urban form has been focused mainly on the idea of human scale fine-grain city form as a model for more sustainable urban development – one that gives urbanity advantage over suburbanisation. Although general patterns for this type of development are similar to the traditional development and even to the main stream urbanism in many areas of the Arab World, targets and thresholds can be different, influenced by local issues and capacity in each region and city.

Characteristics of the traditional urban form, such as self-containment, fine-grain pattern of streets, low to medium-rise buildings and minimum open spaces, in addition to relatively moderate densities and mixed functions and building types, present a model that is appropriate for the efficient use of civic investments, reliable public transport and minimum consumption of natural resources, while at the same time offering a liveable urban environment of good levels of spatial connectivity and diversity. However, it is expected that in spite of the minimum open space, sustainability initiatives such as green infrastructure and renewal energy can be achievable by the use of local technology and engagement of the local community.

This type of traditional urbanism has been the core idea behind new urbanism approaches that aim to reduce air pollution caused by transport and to create liveable public realm. It is expected that measures of urban containment such as clear centres and edges and higher densities would help to reduce the need to travel and encourage the use of public transport and walking. This in turn would reduce greenhouse-gases, while appropriate levels of density, intensity and functional diversity would enhance the liveability of the urban environment. However, in practice, New Urbanism projects have been criticised as they are rarely complete, are unaffordable and homogenous. In addition, there are claims that they lack the diversity and spontaneity of real-life urbanism, and may encourage urban sprawl.

Although, the two concepts of *new urbanism* and *everyday urbanism* advocate the traditional urban form of fine-grain and human scale development as sustainably

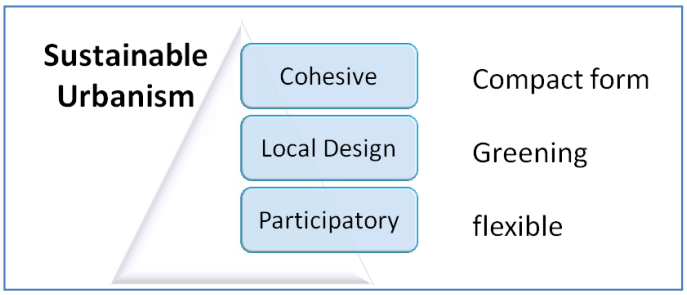
responsible, inherently liveable, and a more local type of development, they do adopt different approaches to achieve these ends. Everyday urbanism is unconscious type of development capable of producing spontaneous and liveable urban realities which reflect real-life circumstances more than any other planning intervention.

However, minimum regulations are essential to facilitate a flexible and affordable development that responds to local practices and conditions, while the unfinished development can be an opportunity for gradual intensification and changes that respond to individuals' needs and local capacities. Moreover, deregulation has been more frequently understood as community planning, where limited rules and regulations are adopted to support negotiations, with the aim of preserving the rights of different stakeholders, responding to the local market, and promoting a compact type of urbanism.

A good urban environment is normally represented through a vision, which is expected to fulfil certain qualities and principles (e.g. connection, character, liveability and mobility) and through a list of physical criteria. However, the development of a conceptual framework would allow developing tools and adopting theory-based indicators necessary to evaluate the sustainability of urban environment and assess the implications of urban planning decisions on people's quality of life (Kamp, et al., 2003).

Based on the discussion above and describing sustainable urbanism as a compact, green and participatory development it is recognised that the sustainable urban development can take different forms based on the scale and context under study. However, for the purpose of this research, qualities of urban accessibility, liveability and environmental responsibility will be the focus of studying the sustainable urbanism within this context. The main attributes of the urban form that would be used to meet these considerations are presented under the headings: physical compactness, green solutions and flexible process of development.

Figure 3. 24: Main attributes of sustainable urban development



- *Urban compactness* – as an indicator it describes a ratio of total floor space to the available public open space. A human scale urban form of suitable levels of compactness and density that consists of a fine-grain pattern of narrow streets and low- to medium-rise buildings is expected to be cohesive and more responsive to local issues such as harsh climate and affordability. Characteristics such as permeable blocks and mixed land uses and building types are important to improve the efficiency of urban investments and public transport and create more social activities in the public space.

- *Green solutions* - the minimum open space created through the development of compact patterns should be arranged and designed through the use of local material and local design. Dense greening and more trees should be used to save water and reduce car-space. A balance between net-density and gross-density can help sustain a network of green areas necessary to serve both biodiversity and leisure activities. Urban agriculture is common in Libya and can be used as a measure to retain rainwater, protect the microclimate and act as soft edges. This is in addition to other sustainability initiatives like shared streets, surface rainwater channels, and green infrastructure.

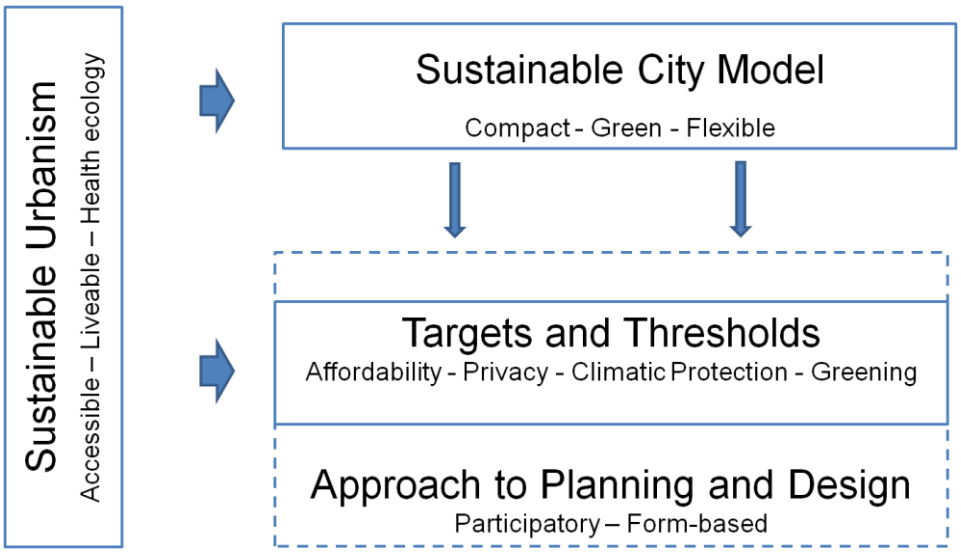
- *Flexible development* – an important measure to adopt to change and facilitate the reuse of residual spaces, and to enhance urban resilience to the unexpected circumstances. Minimum regulations are relevant to build on local experiences, respond to people's preferences and avoid future conflicts. On the basis of this review, it is evident that a design-lead approach, based on minimum regulations and a participatory process for decision making, is more suitable than the abstract modern

approach of rational planning. The design-lead approach values qualitative measures and is expected to be more responsive to local demands and preferences; it also helps to facilitate negotiation, to mobilise local people, and let them own the project.

Generally, these multi-theoretical accounts help to define the concept, approach and physical characteristics of a sustainable urban form and contribute to the development of a conceptual framework for the study, which is designed to examine the research question- *whether compact urban form is a sustainable model to guide urban development within this specific context of fragmented urbanism* - and to assess how this type of development can be delivered through the planning system in Libya.

The following chapter will set the method of research that examines the relevance of these normative considerations to the local urban environments through the study of different residential areas in Benghazi, and examines the influence of such measures on the performance of urban forms through an exercise of design interventions based on the gained experience and the recognition of local conditions and capacity for development. The analysis of results is expected to help define targets and thresholds of the sustainable urbanism suitable to the city, and inform future developments within the wider Libyan context.

Figure 3. 25: Sustainable Urbanism: Objectives – Concept – Qualities – Approach



Chapter Four

Research Methodology

4.1. Introduction

Following the identification of main research objectives and questions, and the setting of the conceptual framework, the purpose of this chapter is to explain how data has been collected and analysed in order to thoroughly understand and tackle the problem of urban fragmentation within this context. This includes the study of spatial characteristics of different urban forms in the city, their qualities and to examine to what extent the performance of different local areas has been influenced by planning theory and practice.

Research is "systematic inquiry directed towards the creation of knowledge" (Groat & Wang, 2002). Generally, any research task is an attempt to describe a phenomenon or a process that has previously been inaccessible or vaguely understood, using a logical and simplified abstraction of complex reality, which represents some aspects of the problem in question (McQueen & Knussen, 2002). The principal characteristic of systematic inquiry, as opposed to *intuitive* inquiry, is the use of rationally grounded procedures to extend knowledge that a community of scholars regards as reliable and valid (Rudestam & Newton, 2001).

Continuing research and practice in the field of urban planning and design have enriched the debate on urban sustainability and added clarity to the concept. The "sustainable city" has been widely described as a compact, green and participatory type of urbanism, characterised by contained, dense and well-connected urban form with a mix of land uses and buildings. It is a type of anti-sprawl development that is expected to support environmental, social and economic sustainability (see for instance (Roseland, 2000), (Haas, 2008), (Neuman, 2005)). However, models such as the Compact City and Eco-city that have been developed in the rich western countries as an alternative to urban sprawl are not necessarily relevant in the context of

developing countries, unless they are revisited in order to respond to urban issues, local conditions and people's expectations in these nations (Jenks, et al., 2000).

The concept of sustainable urban form, like any "Normative Theory" (Lynch, 1981), describes a favoured end-state urban environment, which is expected to have a positive impact on people's lives and their surroundings. Generally, research has examined the sustainability of different types of urban forms, at different scales, through the investigation of their physical characteristics and qualities. However, indicators, such as density, diversity and connectivity for the same area, may be measured at more than one level, where they can operate differently (Talen, 2003).

Building on the assumptions above, this research brings to the fore the question: to what extent the concept of compact urban form can contribute to the improvement of the quality and environmental sustainability of different neighbourhoods in the city of Benghazi. To this end, the study has pursued two lines of inquiry. At the city level it has investigated the phenomenon of fragmentation within the wider context of the urbanisation process and examined the role of planning system in the creation of dispersed patterns of development and vacant spaces. At the block and neighbourhood levels, different urban typologies have been investigated in order to define relations between their physical characteristics and levels of both living quality and sustainability. The results have been used to reflect on the existing urban areas in Benghazi and their suitability to meet people's needs and expectations; and also to inform the development of new measures with the target to refit local areas and develop more sustainable communities.

In response to the research objectives and the type of research question, the study has pursued qualitative research that aims to gain more understanding of the phenomenon of urban fragmentation within this context and its impact on the sustainability of different local environments through the use of a case study strategy. The difference between *quantitative* inquiry and *qualitative* inquiry is that while the former is based on the idea that the material world can be described according to some kind of statistical framework, the latter tries to explore, explain and predict by the use of different techniques concerned with context rather than statistical precision. Indeed, qualitative research is often the choice when the work requires interpretive and

critical methods. It values a comprehensive perspective, applies logic in practice, and allows for following a nonlinear research path (Rudestam & Newton, 2001).

In this respect, the idea of "typo-morphology" (Moudon, 1998) has been found to be a suitable tool to examine the ordinary, non-monumental urban forms and to stress the role of urban process and structure over any given urban state or object. It provides a suitable basis for studying the city within the context of urban sustainability, which requires an examination of the form, structure and functions of various urban areas in order to understand their qualities and capacity for improvement.

Nonetheless, within the context of this study and the changing local conditions throughout the time period for the fieldwork; it became clear that subjective research (i.e. interviewing members of the public) would not be a suitable option. This is an additional factor alongside the educational system and the remarkably low public awareness on issues such as environmental sustainability. Crises can restrict carrying out face-to-face interviews with strangers and are normally linked with uncertainty, which obscures the vision of the future. People in crises are more concerned about temporary problems such as lack of security and frequent power cuts, which may influence their responses to become more random and statistically insignificant.

This chapter outlines the research strategy and methods used to collect and analyse data. The next sections present a summary of the research design. These cover the classification of urban types, the selection of case studies, and the multi-method approach used for data collection and analysis. The fieldwork programme set for summer 2010 was interrupted by a period of political unrest in the city, but resumed in summer 2012. During the two visits, it was possible to complete the planned work. However, as discussed above, the political situation not only had an influence on the process of data collection but also the methods used.

4.2. Urban Type in A City Context

Benghazi city has been chosen in this research to represent all Libyan cities and towns in regard to the study of urban fragmentation. It is the second largest city but has much in common with most other cities and towns in the country. Most urban centres in Libya have passed through similar processes of development that were facilitated by its central planning and regulatory system. The city contains a wide range of urban typologies and sustainability issues that are common in the country. Furthermore, Benghazi is the place where the author lived and gained most his experience in urban planning.

It is evident that the current city plan (Doxiadis-Associates, 1984), together with planning standards and regulations, which define the urban structure, land uses and spatial parameters, are too general, outdated and to an extent not properly implemented. They overlook existing conditions and try to meet demands based on assumptions, but do not necessarily reflect the actual needs and aspirations of the local people.

Previous observations suggest that urban sprawl in the city, which is largely a by-product of institutional planning, can be described as scattered development and a type of fragmented urban form that is associated with issues such as informal development, the shift of development to the outskirts, decay of urban centres and unfinished and deteriorating housing estates. Within the context of urban sustainability, this study covers the phenomenon of urban fragmentation in the city with a focus on the neighbourhood and block levels. Urban fragmentation is a common problem in most Arab cities and presents a real challenge to urban sustainability, as it represents low levels of urban diversity and connectivity and is associated with different forms of "lost space".

Decisions on the allocation of resources and the design of urban space influence urban sustainability and people's quality of life. An investigation of the quality of urban environment at the neighbourhood level helps to learn about people's everyday life and avoid overgeneralization for their needs. There are various ways to define the quality of living environment; this study relies on empirical observations to

understand how people interact with particular places; coupled with other information about issues such as traffic, pollution and housing suitability.

4.2.1. Understanding the Urban Form

In order to understand the urban form of any city or town it is important to know how it was built and one way to do this is by identifying the accumulated layers of development that were created, modified or adapted throughout its various stages of development. The systematic interpretation of the urban form helps to understand its development rules and principles and relating them to the objectives of sustainability (Kristjánsdóttir, 2005). It is expected that different urban areas can gain different levels of development potentials and qualities from factors such as land use characteristics, site layouts, urban design, zoning and human activities (Ghosh & Vale, 2009).

Generally, any distinctive urban area can be identified by three fundamental attributes that together form a complete case for urban analysis: (1) a system of interactions, (2) a spatial form, and (3) change over time. Three systematic approaches - functional, morphological and historical - are normally used to promote a balanced progress of knowledge about the urban environment (Conzen, 2004). Urban morphology offers the tools to study the physical characteristics of the urban environment, where the city can be described and explained by its physical elements – street, plot and building and the urban tissue. Caniggia has made efforts in his analysis of traditional urban quarters to isolate the fundamental principles of city making, in order to identify elements and rules that mark the genesis and then the transformation of the urban fabric (Moudon, 1998).

Urban morphology is the field that studies the process of urban development and its products. It deals with the generative cells of the townscape, being buildings or open spaces; the discrete pieces of land for single use or ownership; and the characteristics of groups and sums of these cells which constitute the urban tissue. However, a basic principle that underpins this approach is that the urban area can only be understood as being a temporal phenomenon (Moudon, 1998).

It was suggested that in order to consolidate the urban form, inner and outer zones should be considered as "an urban organism" of structural phases and matrixes for future expansion, where the newer zones are regarded as a continuation of local typologies (Corsini, 2004). While Canggia made a distinction between the spatial correlation of built objects - co-presence; and temporal correlation – the typological process or mutation, he has explained that the urban environment is made of built objects which are related to each other and can be identified at four different scales: the building; the group of buildings - tissue; the city; and the region (Kristjánsdóttir, 2005) – see Figure 4.1.

The urban phenomenon is a result of individual properties of constituents and complex interaction patterns among these constituents. By building the artefact from the bottom up, from components to compound aggregates to whole system, the synthetic science can study the properties of a whole system and how these properties depend on the interrelationships and behaviours of the system's components (Bisig & Pfeifer, 2008).

Figure 4. 1: Hierarchical Components of the Built Environment.

A demonstration of Caniggia's investigation of the built environment based on a hierarchy of components including; elements, a structure of elements, a system of structures and an organism of systems (Kristjánsdóttir, 2005)

Generally, grouping certain concepts or observations is an important step in reducing the number of units and categories, which can in turn improve the potential to explain and predict (Strauss & Corbin, 1998). The typology reflects a classification of the component parts of any problem or situation under investigation, and can be used as a tool in the problem-solving process (Cuthbert, 2006). Types describe material places which are created, observed and experienced in the world (Franck, 1994). The type,

as a web, refers to interconnections between form, use and meaning, and the mutable nature of this relationship. The web is open and imposes no fixed boundaries; it creates a frame for various choices, additions, subtractions and modifications to be made (Franck, 1994). This possibility for choice and change invites more diversity and service in response to the multiple realities.

The level of specificity describes the similarities among certain amount of buildings, which is important to collect them according to specific concept of house, by choosing interpretation parameters in the more appropriate way. The wider their range, the deeper will be the investigation. The maximum level of specificity will therefore be reached hypothetically individualizing just one building with the used parameters (Marzot, 2001).

According to Caniggia, the “leading-building type” presents a picture for a house everybody in that area has in mind and the ideal to which everyone refers to. However, this image can be substituted following a social change, where the existing leading-building type may be changed through a process of urban intensification, or a new one may arise in a new expansion area (Kristjansdottir, 2005). On the other hand, the urban type combines the mass of buildings with their related open space. The urban type is a formative concept that is tested on the ground; it is place-bound and time-bound through responding and adapting to changing social, economic and technological circumstances. Indeed, the inclusion of land and its subdivisions as a constituent element of the type makes land the link that spans across scales from the building to the city (Moudon, 1994).

According to this understanding, the typological process describes a global succession of types in the same cultural area or in several cultural areas in the same space of time, coordinated by reciprocal development; here the building represents the historical - spatial and temporal - individuation of typological process (Caniggia & Maffei, 2001). Moudon argues that the idea of “typo-morphology" can be suitable for a research that is based on an understanding of typical places and structures, where the urban typology combines characteristics of the physical form with its related open spaces, and both of them are associated with the land plot; a basic cell of the urban fabric (Moudon, 1994).

The study of urban morphology offers a way to map different urban areas based on a systematic examination of their components, through the investigation of a degree of coincidence between three elements of the city; namely - the layout, built form and land uses (Conzen, 2004). However, there is some criticism of the use of urban morphology in urban planning; including:

- The original focus of morphological studies on historical centres and on conservation;
- The non-qualitative bias which may limit its potential use for predictive purposes; and
- The claim that morphological analysis of contemporary cities is not only difficult, but not even informative, based as it is on the fact that the relationship between individual elements of the urban fabric has been changed from one of dependence on the city as a whole to one of autonomy and dissociation. Thus individual buildings in historic and traditional cities exist in relation to one another, while many buildings in contemporary cities stand alone and only share a street with their neighbours (Moudon, 1998).

Nonetheless, the approach provides a useful tool to examine the extent of the influence of common practices of urban planning on actual urban development, and brings with it a form-based classification for the urban environment to substitute the modernists' focus on function. This interest in urban form instead of land use has also been a reaction to current challenges in transportation planning such as traffic congestion and lack of funds, which demand a reduction in private car-use and the increase of transit and non-motorised transportation (Moudon, 1998).

In reality, urban forms are usually characterised by loose ends and transitional areas, often defined by their nucleus, while design considerations extend beyond their legal boundaries. However, instead of comprehensive functional design, urban forms are shaped primarily by disjointed actions guided by controls and incentives, while throughout the shaping process they are subject to different design interventions (Lozano, 1990). Kärrholm argues that research should allow experimental studies of how certain architectural types can be manipulated and altered to produce new types. Additionally, an important aspect of the study of architectural type can be influenced

by spontaneous interventions of the residents - that characterises the practice of everyday urbanism (Kärrholm, 2013). Such process of change in the house can be a result of interventions such as extending in private open space, vertical additions in row houses, or negotiating the street space to extend in the front open space.

Based on the understanding that the urban fabric is not a fixed entity but a constantly evolving and adaptable system (Jones, et al., 2007), it is argued that urban design should be more adaptive and responsive to changing circumstances and people's interventions. This logic responds to the idea of "emergence" as a morphological process, where form is determined by actions instead of actions being chosen to create a form (Groat & Wang, 2002).

This study recognises that the idea of typo-morphology, which describes urban form based on understanding of the urban type, is a suitable tool to investigate the characteristics of urban forms in Benghazi and examine how different rules and principles have influenced their quality and sustainability performance. It is an interpretative approach that helps to examine urban environments through understanding their formation and mutation processes (Caniggia & Maffei, 2001). Two inherited characteristics of the typo-morphological approach are important to this study;

- Mutated type- that helps to investigate the process of urban intensification. It responds to questions about historical development of urban form and how proposals might be formulated about future forms; and
- Multi-scale/ the relationship between part and whole that is highly relevant for the study of urban sustainability (Caniggia & Maffei, 2001).

Furthermore, the tools and methods of representation used in this approach are common in the practice of urban planning, which enhances the applicability of the results. The concept of urban tissue associated with this idea offers an effective framework for identifying and describing, in a hierarchical terms, the main elements of urban form, and therefore, it is able to bridge the gap between studies of urban form and the zoning system employed in planning (Kropf, 1996).

The focus in this study has been on the neighbourhood and block level, which are considered relevant for the purpose of studying the impact of urban fragmentation on the quality and sustainability performance of urban environment. Residential areas are the dominant land uses across the city landscape and contain diverse local architectural types reflecting not only the role of planning, but also the influence of spontaneous interventions by residents and their experiences of everyday life. Residential areas are the places where people spend most of their time and influence their quality of life more than any other area.

Different neighbourhoods can be identified by their layouts, public streets, location of existing or planned public services, urban density and the dominant building type. Most local areas in the city are based on official land subdivisions, but do not always meet the requirements of planning regulations or are well served by public infrastructure. The location, physical form and development capacity of different local areas can influence their sustainability performance.

4.3. Research Strategy and Methods

Urban fragmentation and its impact on the quality and sustainability of urban environments represent a complex theme and still form the subject for much debate. It is a multi-scale phenomenon that can be a result of factors including urban planning, socio-economic and historical changes. It is evident that to avoid such problems, future urban design should be adaptive, responding to the empirical evidence on changing conditions of the urban environment, rather than accepting the traditional way of building cities – the self-reported rules of design as advocated by the New Urbanists, and also, rejecting the interventions of the International Modernism, which may provoke imbalances between people and place (Caniggia & Maffei, 2001).

Generally, the method for data collection and analysis depends on the type of research question, the degree of control on events, and whether the focus is on the contemporary or the historical (Yin, 2009). This research employs techniques of

direct-observation and map analysis, in addition to secondary sources of document survey.

The justification of the multi-method approach is that merging two or more methods in the same study would help overcome the limitations of a single method research; limitations such as insufficient data sources and low reliability. The multiple method approach involves an interaction between ideas and evidence and stresses contextual and subjective accuracy over generality. It helps to facilitate a comparative analysis and overcome any scarcity of data. Whereas, the single method approach can lead to bias and can be unable to produce the same results if repeated. Moreover, the use of the single method may allow the hypothesis to influence the accuracy of conclusions, and there is the danger of not seeing small differences even if they are important and articulated (Bulmer & Warwick, 1993).

It can be argued that the case study strategy applied here has been suitable to investigate the phenomenon of urban fragmentation in Benghazi, with the intention of formulating the introduction of a new concept and practice for urban development. A case study can be a container for multi-methods research. It is suitable in urban design as a strategy for studying the urban environment; as a tool to compare different forms; and as a thematic example. However, while it is a challenge to combine methods in an effective and coherent way, the combined research strategy in urban design does represent an enormous opportunity.

The case study approach allows the investigation of a particular setting or circumstance holistically and can use a variety of data collection and analysis techniques. Groat and Wang argue that the primary characteristics of a case study approach would include:

- a focus on either single or multiple cases, studied in real-life contexts
- the capacity to explain causal links
- the importance of theory development in the research design phase
- a reliance on multiple sources of evidence, with data needing to converge in a triangulating fashion
- The power to generalise to theory (Groat & Wang, 2002, p. 346).

The case study as a method is an in-depth study which attempts to gather information on an individual subject from as many sources as possible (McQueen & Knussen, 2002). With the case study method, it is appropriate to define research topics broadly, cover contextual or complex multivariate conditions and it relies on multiple sources of evidence (Yin, 2003). The advantages of the case-study method include the ability to present a holistic view and meaningful characteristics of real-life events; and its suitability for all purposes of research. In addition, it is applicable to real-life circumstances and accessible to the general public through written reports (Yin, 2009).

In general, a qualitative inquiry is often associated with the use of the cases and context; it places an emphasis on conducting a detailed examination of case studies, and usually tries to present authentic interpretations that are sensitive to a specific context (Rudestam & Newton, 2001). Qualitative research implies an emphasis on process and meaning over statistical measures of quantity, intensity and frequency. It is an inductive approach that produces theory rather than a deductive one (Yin, 2009).

Qualitative methods free research from the artificiality and narrowness of experimental studies that control the observations; they promote more spontaneous and flexible research to explain the phenomenon in its environment, and focus on description and discovery (Rudestam & Newton, 2001). On the other hand, quantitative measurements can be useful to facilitate cross-case comparisons; where comparison between scores is easy and can produce immediate results, while multiple indicators give more confidence in the validity of the measure and limit possibilities for bias in the interpretation (Yin, 2003).

In response to research objectives the study has conducted the following tasks;

- A city level study of the phenomenon of urban fragmentation was carried out to gain a holistic understanding of the problem within this context, based on surveys of existing situations, discussions and secondary sources. The main tasks included a review of the role of planning in urban fragmentation, an analysis of the city plan and the investigation of five examples representing different reasons for fragmented urban development,

- At the local level, a multi-case method has been pursued in an attempt to uncover correlations between the physical characteristics and the quality of local urban environments; using techniques of direct observation and map-analysis, in addition to on-site conversations and secondary sources, and
- As part of a reflection process on the results achieved in the previous stages, an exercise of design intervention has been applied to examine the extent to which measures of urban design concluded from the study can support strategies of physical intensification and thereby tackle the impact of urban fragmentation in the city.

A base-map for the city was produced to help define the study area, guide discussions, identify locations and as a source of spatial data. It is based on rectified images (Blue-bird satellite images; El Emara Office; 2006) and defines the urban boundaries in accord to Doxiadis' master plan 2000, which includes Benghazi city and the nearby towns of El-Kuifia to the north, Bu-Atni to the east and El-Guarsha to the south (see Figures 1.2 and 4.10).

The decision to study the planned zones within the 5th Ring road area was taken in order to help the research focus on urban fragmentation and its relation with modern planning, which is difficult to capture in areas outside the 5th Ring road with their more scattered and informal developments, often containing an inconvenient mix of building types. The city structure of well-defined neighbourhoods bounded by arterial and collector roads has been an advantage in that it facilitated the classification of urban types and selection of local case studies.

4.3.1. Surveys at the City Level

At this stage, the research has been designed to focus on the phenomenon of urban fragmentation at city level and explain its relation with the planning system and other socio-economic and historic factors. Methods of direct-observation and map-analysis provided the main sources of data, in addition to secondary sources including public documents and planning studies. However, a number of professionals, who were

contacted at different stages of the study, helped to find relevant sources of information and focus on certain issues. The main results include:

- Urban zones defined by type and density, which represent the influence of urban planning and help to predict change and capacity for intensification
- Vacant and informal land uses defined by type and causes
- Categories of urban types based on building leading type, layout and urban density.

The initial stage of the research covered an analysis of aerial and satellite images, national census and other public documents and reports. The review of the planning system, land use regulations and the process of land development, in addition to the analysis of city plan, gave a broad picture of the role that planning system in the creation of urban fragmentation. Mapping data is an essential tool to visualise and categorise main urban issues. Classified data from the national census of 2006 was used in conjunction with other surveys to visualise the distribution of urban densities and types throughout the city.

Based on these information and the recommendations made by the interviewed professionals, five examples for different urban themes were selected for site visits. The examples represent different urban issues associated with the problem of urban fragmentation. While site visits proved useful to observe the impact of such patterns and for listening to people, the available public plans and reports provided a great deal of information on the causes of those problems. Four types of vacant land were identified: vacant plots, residual areas, unused urban zones and underused urban sites. The investigation relied on direct observations and contextual comparisons rather than precise measurements to identify the impact of vacant land on local quality and sustainability, which can be direct such as causing poor microclimate, or indirect such as the encouragement of informal development.

Conversations, which seek information through open discussions, are considered complementary to site-observations and to be acceptable as long as they provide a logical explanation to the phenomenon under study. Unlike direct questions, which may not get deeply into the problem, answers are often just timely and modulated to

the context, while people's aspirations can be neutralised or altered by a questionnaire, a user-focus method suggests that working with stakeholders would enable the researcher to gain first-hand experience and understanding, while staying neutral to the theme under study (Burgess, 1991).

It is important to mention that social reactions to voice recordings or taking photos have been harder than would be in any other liberal democratic society. This is in part a result of the former political regime and the following civil war. However, notes have proved an important tool to record the tone and content of conversations. Unstructured interviewing is normally used as a type of "conversation with purpose" that incorporates elements of everyday life into the conduct of field work, supports the activities of the research and helps in keeping the informant relating relevant experiences and attitudes to the research problem and encourages the informant to discuss these experiences naturally and freely (Burgess, 1991).

Box 4. 1: Unstructured Interviewing

Discussions with professionals working in the field of urban planning, though informal, five of them were more focused and covered interesting themes.

1. Mr. Isaifan, the head of planning agency branch in Benghazi - central decisions on planning; that even routine planning reviews need to be approved by the Agency's headquarter in Tripoli.
2. Mr. El-Mahdiu, the manager of Benghazi planning project – differences between real-life development and public plans, and seemingly lack of planning control
3. Dr. Taylan, principle planner in Benghazi planning project – comments on local streets as being unexpected and exciting for someone who has experienced the city through its main streets and monumental forms.
4. Mr. Shakmak, the coordinator of Benghazi planning project – comments on the pressure made by different public agency on land, and how that influence planning decisions.
5. Prof. El-babour, consultant for the Benghazi planning project – in spite of the unique balance of the distribution of human settlements in Benghazi region, the growth of main cities has had a negative impact on other small settlements and increases the effect of spatial remoteness.

A general classification of urban typologies in the city was identified at this stage to facilitate the selection of case studies in next stage and the generalisation of results. The results were influenced by the available data on urban densities, building type and cases of informal interventions and vacant land. The idea of "leading-building type" came to be an important element to define a form-based categorisation for

different urban types, where the leading-building type in each period and location is different from all the others, explaining the change of urban patterns spatially and temporally.

As a result of this process, four main urban types in Benghazi have been identified; defined by their leading-building type, urban patterns and densities, including: the two dense types of courtyard and terraced buildings which are concentrated in the inner zones bounded by the 3rd ring road; the third group of lower density developments consisting mainly of detached buildings that dominates the area from the 3rd to 5th ring roads; and super-blocks of apartment buildings that are spread out over different locations in the city.

The first category consists of compact grid patterns and court-yard buildings. It is concentrated mainly within the second ring road area and represents different stages of development, including the historical quarters - the most interconnected type dominated by solids over voids. However, the main characteristics of these urban forms are back-to-back buildings, narrow and rectangular urban blocks, relatively narrow streets, and limited public open spaces (Figures 4.2 and 4.3).

The second category is the less-compact urban forms for terraced buildings of moderate density, which dominate the newer areas between the second and third ring roads. This typology is different from the previous one as it has regular blocks, moderate sized land plots and more spacious public spaces. Also of interest is the fact that in some cases the arrangement of private front- and back-gardens, as a result of the layout plans, has created continuous strips of green areas, which can be appreciated for improving the environmental quality (Figures 4.4 and 4.5).

The third category is the low-density urban areas of detached buildings, which are less apparent within the older zones, but their share increases in the outer zones between the 3rd and 5th ring roads. The detached buildings have more open spaces than all the other types of single-family buildings. However, the old villa areas in the southern and eastern zones of the city are more regular and have relatively less public open spaces than those of the newer sites on the northern side. Most of the new sites

have wider streets and contain more spacious public open spaces as a result of back-streets and common-gardens (Figures 4.6 and 4.7).

The last category comprises the project areas of superblocks and apartment buildings. These are scattered throughout the city, and were developed to contain parking spaces and common green areas. However, while the land cover of these zones is lower than that in any single housing area, some sites have net-densities as low as those for row single-family buildings (Figures 4.8 and 4.9).

Figure 4. 2 (right): Courtyard Buildings - Distorted Grid, Burniq area
Figure 4. 3 (left): Courtyard Buildings - Commercial Subdivisions; Dawod area

Source: Quick-bird satellite Image, El-Emara Office 2006

Figure 4. 4 (Right): Terraced Buildings – Front & Back Side-distances, New-Benghazi
Figure 4. 5 (left): Terraced Buildings - Front &Lateral Side-distances; El-Salmani

Source: Quick-bird satellite Image, El-Emara Office 2006

Figure 4. 6 (right): Detached Buildings - Economic Subdivisions; El-Ansar area
Figure 4. 7 (left): Detached Buildings - Superblocks; El-Mukhtar area

Source: Quick-bird image, El-Emara Office 2006

Figure 4. 8 (right): Low-rise Apartment Buildings – Super-blocks, Ali Ben-Talb area
Figure 4. 9 (left): Medium-rise Apartment buildings – Sparse-blocks, El-Salmani area

Source: Quick-bird image, El-Emara Office 2006

4.3.2. Investigating the Eleven Case Studies

In order to gain a thorough understanding of the characteristics and qualities of existing urban forms, which are important to the study of urban fragmentation at neighbourhood level, eleven residential sites were selected and investigated. This selection of case studies was informed by data gained from the previous stage (Figure 4.10).

Case studies were suitable for the study of urban fragmentation. They can be used to replicate observations or extend theory, or may be selected to fill in certain theoretical categories and provide examples for main types (Eisenhardt, 1989). The use of multi-cases can serve a qualitative research study targeting in-depth knowledge (Audet & d'Amboise, 2001); involving the observation and analysis of several sites and allowing the use of techniques of cross-case comparisons and explanation building.

Because qualitative research does not rely on statistical generalisation, it is argued that the selection of samples should be dictated by replication logic rather than statistical justification (Yin, 2009). A process that builds for analytical generalisation, assumes that what is valid for these cases should be valid for all or many others in the city. However, deciding on the number of case-studies depends on the power of

generalizability that comes from the concept of replication, rather than the concept of sampling. According to Robert Yin “every case should serve a special purpose within the overall scope of inquiry.” Multiple cases are considered, to follow “replication” logic, which is different from the multiple subjects within an experiment that follows a “sampling” logic (Yin, 2009).

Although, there is no straightforward tool for making the choice between single- and multiple-case strategies, or about the number of cases necessary for a multiple-case study; these choices are influenced by two principles: the nature of the research question and the role of replication in testing or confirming the study’s outcomes (Groat & Wang, 2002). The single case-study strategy is usually selected, when the study investigates multiple and complex factors and cover different scales. It makes more sense for the research to uncover the very complex dynamics of one setting of interest than to look less deeply at more settings. However, if the research question is narrower in scope, and by which factors of importance may vary from one case to another; multiple case studies are therefore justified.

The procedure in this study has been selective. The criteria for case study selection have involved building type, density and the formal land use plan. Also, the selection process has taken into account zoning, current regulations and other aspects which may influence the quality of local areas such as vacant land, informal interventions, and the implementation of public works. However, the selection process has also been influenced by the availability of materials, and limited to sites within the current urban boundaries.

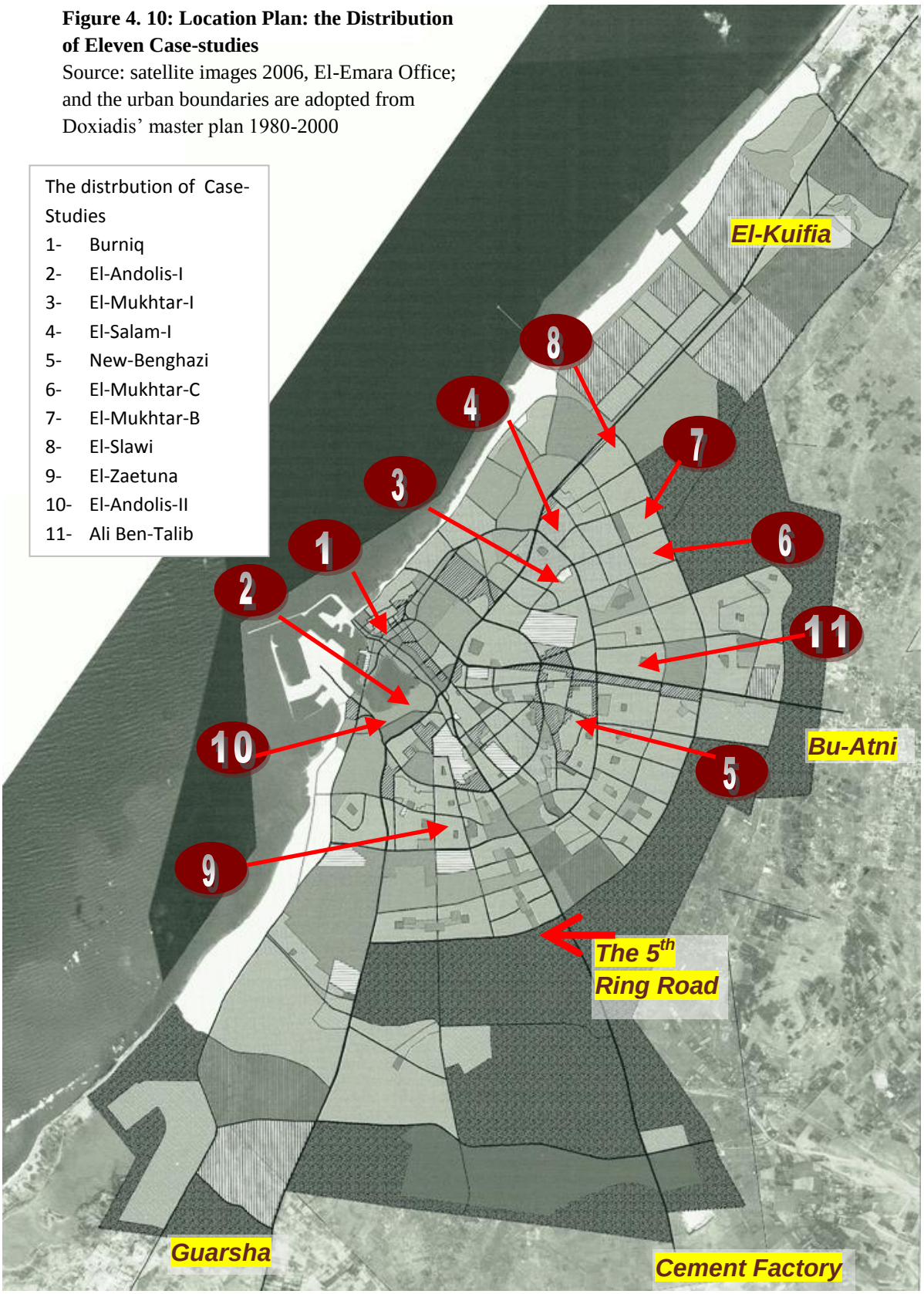
An effort has been made to select representative cases, not the extremes, where it is expected that similar sites would produce identical results - “*internal replication*”, and different sites are going to produce different results - “*theoretical replication*” (Audet & d'Amboise, 2001). The heterogeneity of the case-studies is expected to help examine some theoretical assumptions that attribute urban sustainability to certain physical characteristics. The process started with large number of possible case studies, which then reduced to a manageable size. Two or more cases for each category of the urban typologies have been chosen to cover existing variations and increase the reliability through internal and external replications.

For practical reasons, a size of eleven sites was considered manageable and within the means of this study. Each case study consists of two or more residential blocks arranged around public space. The study relies on replication logic among these locations to facilitate the analysis of urban qualities and describe the relationships between the characteristics and use of different local areas and their quality and sustainability performance (see Table 4.1 and Figure 4.10).

Table 4. 1: Eleven Case-Studies - Main Features

Case study	Architectural type	Building features	Urban features
1- Burniq	Court-yard	- Back-to-back courtyard buildings - Building-line on street-kerbs - Heights range from 1 to 4 for single-family buildings & up to 8 floors apartment building	Distorted blocks, narrow streets & limited open spaces
2- El-Andolis-I			Rectangular blocks, moderate street widths
3- El-Mukhtar-I			Rectangular blocks, wide streets & relatively large parcels
4- El-Salam-I	Terraced	- Row buildings blocks - One, two or three side-distances - Single-family building type of 1 to 3 floors	Small groups of houses with back & front streets
5- New-Benghazi			Rectangular blocks with back & front private gardens
6- El-Mukhtar-III	Detached	- Detached buildings - commonly, gardens bounded with high walls - Single-family building type of 1 to 3 floors	Rectangular blocks with wide streets up to 24m
7- El-Mukhtar-II			Perimeter Blocks of common gardens & wide streets
8- El-Slawi			Front & back streets with cul-de-sacs
9- El-Zaetuna			Rectangular blocks of various land parcels
10- El-Andolis-II	Project apartment	- Two-sided apartment blocks. - Heights are low-rise (3 floors) & medium-rise (8 floors)	Superblocks with common green areas and parking streets
11- Ali Ben-Talib			

Figure 4. 10: Location Plan: the Distribution of Eleven Case-studies
Source: satellite images 2006, El-Emara Office; and the urban boundaries are adopted from Doxiadis' master plan 1980-2000



At this level, case-by-case investigations have been conducted to cover two types of information: (1) the physical characteristics of each case study; including the layout plan, urban type and indicators such as compactness, density and spatial connectivity; (2) the correlations between the urban quality and human activities in the public space of four case studies. Data for each case study has been collected and presented in accordance to a similar procedure that defines type of data, measurements and process. This routine is useful to facilitate the process; enhance the quality and reliability of data; and compare the results.

Collected materials on each case study include: brief information about the site; aerial images for the neighbourhood; the layout plan for the case-study based on municipality plans 1978 updated by new aerial images and site-surveys; and street cross-sections. This is in addition to measurements such as density, footprint, number of buildings and total floor area. Also, in some case examples architectural floor plans have been included.

To create better places, it is important to understand how people use spaces and the surrounding environment (Lang, 2007). It was anticipated that positive open spaces near buildings are those that create good conditions for outdoor activities and walking; the quality of the street surface may influence not only traffic speed and air quality in terms of heat and dust, but also can encourage spontaneous interventions in public space.

In order to evaluate the quality of different local environments, a survey of human activities in the outdoor and the streetscape for four case studies has been conducted to include counting the number of people and cars on streets, and a visual observation of different types of activities and uses of public space, in addition to a survey of the quality of streetscape. The selection of the four case studies - namely El-Slawi, Burniq, Ali Ben-Talb and El-Mukhtar-II - was based on a matrix representing different typologies, densities and urban qualities (Figure 4.2).

Table4. 2: Criterion-based selection for the Four Case Studies

Site	Architectural Type	Density	Street condition
El-Anduls	Courtyard	70	Metalled
El-Ansar	Terraced	38	Temporary pavement
El-Mukhtare	Detached	14	unpaved
Ben-Talb	Apartment	28	Damaged pavement

Counting was conducted twice for each case study: in the morning (from 10.00 am to 12.00 noon) and late after-noon (from 16.00 to 19.00 pm) where each lasted for about ten minutes. The survey was conducted at off-peak times to limit the impact of commuting traffic; and it covered the number of people, the type of activities and the total number of cars parked on or passing through the street. This data offered the numerical base important for cross-case comparisons.

In a similar manner to the first stage of the survey, both unstructured interviewing and public documents have been a complementary source of data. Information about aspects such as planning regulations and local plans were collected from secondary sources, but were mainly provided by the Agency of Urban Planning. Within this context, the observations have been perceived as a type of engagement that helped the researcher to experience the urban environment and focus on relevant data.

Despite the importance of capturing the perceptions of inhabitants towards their local environments, the local situation in Benghazi was unsuitable for carrying out formal surveys. Political instability, in addition to factors such as unfinished projects and a lack of public awareness regarding sustainability issues would have influenced people's responses and led to weak results. As part of the observations, spontaneous on-site conversations with local people were helpful in carrying out the surveys and to get explanations. For instance, when residents were asked questions such as: where do children normally play, why little gardens on the street are fenced, or why the front garden is converted into a garage; they revealed information about important issues such as their needs as regards indoor and outdoor space, how noise affects their privacy and their perceived lack of public infrastructure and parking.

Images were used in this research to help check field notes and add other forms of data. The descriptions in the captions also link with field conversations held with

local people and professionals. Images are not only about contents and settings, but they also contain information about location and time, and they require information on how they should be read (Banks, 2001). Reading an image requires consideration of both the content and context. For example while the content is a matter of information such as someone looking through a window at some objects beyond, the context and interpretation of that image explains why it has been taken. However, it is argued that with regard to techniques such as photographic recognition and comparison, and geometric analysis, notwithstanding of their usefulness in the comparative analysis of townscape, no single technique is either comprehensive or generally accepted (Reeve, et al., 2007).

Generally speaking, activities, urban quality and spontaneous interventions may reflect an inherited capacity and flexibility of the local urban area, or can be a sign of dissatisfaction. Initially the results suggested that existing physical forms are different from their original plans; however, the same forces which have created these realities can be a valuable basis for the improvement of the local environment.

Box 4. 2: Spontaneous Conversations and Inferences – Examples

For instance; the use of roof-space for children's play and a lack of car parking places on streets have been seen in this research as indicators of congested public space and insufficient private space in some case studies, including those that have less than 50 sq m of public open space per dwelling.

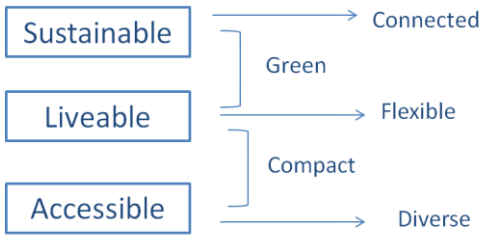
In most areas of courtyard buildings, when the people are asked about the most convenient place for children to play, they frequently mentioned the roof-space; in spite of it being noisy and creating conflicts with other uses. However, the alternative is to play on the streets, while another is to go to other playgrounds some distance apart from their residential street. This latter is not an option for many, by reason of the local culture, as the mother's movement is restricted and therefore they would be unable to watch over their children.

A person who does not have a private garage justifies that by the small plot size and insufficient floor space. However, he mentioned that sometimes he has arguments with his neighbours concerning parking places, especially at the night when everybody wants to park their car close to their front door for security reasons.

Another elderly person; when asked how often he meets neighbours, mentioned the people that meet in the local mosque. While he sees that children play in public space. He regards this as not a good idea and he does not mention traffic problems, but bad behaviour. However, a young boy on the same street was able to tell the names of most residents in the street and describe other children as friends, which shows that the reason for some adults discouraging playing on streets, such as noise or to protect private cars, can be regarded as unjustified.

4.4. Evaluation of Case Study Evidence

The conceptual model was set to link physical attributes with sustainability objectives and how they can be achieved. The characteristics of compact urban form and the qualities of the urban environment that can contribute to the improvement of people's quality of life and regional sustainability have been described through attributes that meet criteria of: accessibility, liveability and health urban ecology. Instead of using formal questionnaire surveys, the attributes of the urban environment are defined, narrowed and measured based on direct observations and the experience gained from the theoretical review and local studies and reports. However, the attributes identified are those that can be manipulated by planning and urban design.



It is expected that the way people use or change the physical environment can offer rich information on their actual needs and preferences. For instance the use of high fences to separate private gardens from the street can be an indication for feeling unsafe and the need for a high level of home privacy. A combination of objective and subjective measures is normally preferred. Subjective measures allow the researcher to learn about people's wellbeing and expectations, and contribute to residents' involvement. On the other hand, objective measures are useful to evaluate the spatial environment and enable the validation of other subjective measures (Mccrea & Walters, 2012). However, it is argued that while many studies on urban quality focus on people's perception of and satisfaction with their living environments, the attributes and parameters for these local environments are rarely investigated (Leby & Hashim, 2010).

A combination of methods provides appropriate checks against the weak points in each, while simultaneously enabling the benefits to complement each other. Triangulation is normally used to address issues of research validity and/or objectivity (Groat & Wang, 2002). However, there are two types of replication; literal and theoretical. The literal replication is a result of a case study or studies that

test the same outcomes, principles, or predictions established by the initial case study, while the theoretical replication can be achieved through a case study that produces contrasting results but for predictable reasons.

Anne Lusk in her study, where she chose to closely examine best practice in order to develop guidelines for new greenways or upgrading existing ones, decided to combine a literal and theoretical replication design. Thus for each one of the three greenway types recognised in the initial investigation, she selected the most two highly regarded exemplars. In this way, three literal replications pairs were achieved, in addition to the test of outcomes of each replication pair against two pairs of theoretical replications (Groat & Wang, 2002, p. 357).

In this study, a mixed method strategy has been a suitable tool to obtain a holistic understanding of urban development, with a focus on factors that cause the fragmentation of urban patterns in the city. In addition to direct observation and map analysis, the research has drawn on evidences derived from archival sources and conversations with different stakeholders. However, it is undeniable that the author's experience in the city comes into play. It is understandable that a pure objectivity is impossible (Groat & Wang, 2002).

The researcher's engagement and long-time observation can be supportive to the qualitative analysis and enhance a thorough and deeper understanding of the issues under investigation. Jane Jacobs argues that in order to understand life in city there is a need to - "look closely, and with as little expectation as is possible, at the most ordinary scenes and events, and attempt to see what they mean and whether any threads or principle emerge among them" (Jacobs, 1993) in: (Groat & Wang, 2002, p. 341).

Here, it may be relevant to give an example from Herbert Gans' work, where in order to pursue his study on life in Levittown, New Jersey, which focused on how much of town plan was affected by builders and how much affected by residents, and whether or not suburban life was bad, he moved to the area and as a member of the community acted as participant-observer (Groat & Wang, 2002).

Whatever the methodology, generated data when clustered around a topic, would provide either *separate* information on sub-areas with little or no overlap, or information with *convergent* overlap, which is consistent and has findings different enough to enrich analysis and when become close to congruent it increases confidence; *divergent* overlap where findings are inconsistent, which may help the analysis as well but sometimes require collection of more data; or *inconclusive* overlap where findings show differences between intensive and extensive data, which require further data collection (Bulmer & Warwick, 1993). However, though the observation generally does not enable the researcher to demonstrate causal relationships among variables, conclusions regarding causality can be inferred from the underlying theory rather than from the results (Rudestam & Newton, 2001).

The analytical strategy in this research is designed to help test the theoretical proposition that compact development, as an anti-sprawl measure, can contribute to the quality and sustainability of urban environments in Benghazi. Two types of analytical techniques have been used. Firstly, comparative research has been employed to examine the existing relationships between the characteristics of different urban types and their performance in terms of sustainability and to provide explanations that describe local environments. The second type of analysis is a cross-case evaluation of various typologies, which has been undertaken by comparing and contrasting different types of urban forms in order to help explore similarities and differences among the case studies and help establish generalised conclusions and reflect on the theoretical framework. It was expected that urban characteristics unique to high performance areas are those shared by all high performing cases and would not be found in any of the low performing ones. However, urban compactness can also be linked to the distance from the centre, the type of development or the implementation of public works.

The case-by-case analysis has followed a procedure of sifting data and selecting what is relevant, measuring the variables for comparison. The procedure has followed similar steps and applied a similar format for each case-study in order to facilitate the comparison. The summary of characteristics and indicators for all cases studies gives a clear picture of the range of differences and similarities. In addition to the summary

table, a figure-plan technique is employed here to visualise percentages of land cover and compare the case-studies.

Figure-ground plans are two-dimensional and consist of solids for built-up areas and voids for open spaces. They are used to examine local patterns and compare their degree of compactness, where areas of more voids are expected to contain more residual and vacant land. The theory relates the amount of "solid" to the amount of "void" and approaches urban design as a manipulation of that relationship, as well as a manipulation of the geometrical shapes (Trancik, 1986).

Table 4. 3: Tests and Tactics for Case Study Design
Source: Adopted from (Audet & d'Amboise, 2001)

Phase of research	Tests	Case study tactics
Research design	External validity	by use of replication logic in multiple case studies
Data collection	constructs validity	through multiple sources of evidence
	reliability	by using protocol, have a database
Data analysis	Internal validity	by pattern matching, explanation building, time series analysis and logic model

4.4.1. An Exercise of Design Interventions

Learning how urban areas are produced and shaped supports the development of theory on urban planning and design within the context of urban sustainability. Two morphological features are relevant to the study of urban sustainability: multi-scale consideration and characterising the urban form as a dynamic and continuously changing entity in a dialectic relationship with its producers and inhabitants (Moudon, 1994).

The morphological elements (natural elements, networks, blocks, land parcels and buildings) form the basic material of parts and wholes from which the built environment is formed. Good urban design should keep the emergent form of the whole in mind as it deals with particular elements; and use principles for guidance rather than directing rules. It is expected that this approach would support urban quality and enhance characteristics to maximise choices, link with traditions, enhance social inclusiveness and environmental responsiveness (Watson & Bentley, 2007).

As part of the reflection on the results, an exercise of design interventions was incorporated into this study, using four of the case studies. The main objective of this process was to examine the potential for combining strategies of compact development and sustainable urban design with the target of retrofitting the case studies to create good future urbanism. Also, through the use of design as means of investigation, new information can be generated by-making; rather than observing or interviewing (Burdick, 2003). It is argued that in parallel to strategic measures, a better urban design can be a tool to rectify the negative social impacts of high density (Raman, 2010).

Design in general is an engagement in creative exploration, however, design that serves as research addresses both a particular design brief and a larger set of questions at the same time. Understanding by design is like building a model, where it is expected that at least some natural phenomena can best be understood by demonstrating a physical form that embody a selected set of the original properties. The process of building the physical form and its subsequent exposure to experimentation results in a tangible form of conceptualization and testable hypothesis (Bisig & Pfeifer, 2008). According to Bisig and Pfeifer that the methodology of understanding by design combines two types of ideas:

- The synthetic approach – that introduces engineering practice into scientific reach, where particular phenomena are approached from an implementation perspective;
- Design for emergence – that tries to minimize designer bias and the pre-definition of the artefact's results properties (Bisig & Pfeifer, 2008).

Within a context of continuous change, where urban zones are at different stages of development, influenced by both formal and informal interventions, design interventions have been mobilised to demonstrate how urban principles arrived at previously in this study can work together with strategies of urban intensification to improve the quality and sustainability of local urban environments.

The four case studies selected in the last stage of street level surveys were subjected to four different strategies of urban intensification The evaluation of changes in urban forms and the associated qualities created by the design intervention in each

case study showed interesting results in respect to the improvement of urban quality and the overall sustainability performance of the local areas. The results helped in verifying the relevance of urban principles and they are expected to provide an important contribution to a new planning approach targeting at retrofitting and developing more sustainable urban environments in the city and its wider context.

4.5. Conclusion

This chapter has reviewed the research strategy and methods of data collection and analysis that helped to respond to the objectives of the study. The main focus of this thesis is the problem of urban fragmentation in Benghazi and its impact on the sustainability of the urban environment. The study was also an attempt to reflect upon the concept of compact urban form as a sustainable alternative to fragmented development, based on research results which explain the causal relationships for different urban forms and functions in the city with their real-life qualities. The criteria – liveability, accessibility and ecological sustainability - and the spatial attributes identified in previous chapters helped to examine to what extent that such a concept of compact, human scale development is relevant to demands of the contemporary society in Benghazi and its wider region.

The study is based on qualitative research investigations in order to facilitate the understanding of the urban environment and its sustainability performance through the case study strategy. Qualitative research offers a holistic explanation to the problem under investigation and adopts the logical interpretation of the results. It is particularly relevant in conditions of crisis and scarcity of information. The case study strategy is used as a tool for categorisation, as a container for multi-methods and as separate examples represent certain issues associated with the problem of urban fragmentation.

Additionally, the typo-morphological approach adopted in this study, which is based on understanding of typical places and structure, was suitable for an investigation of the sustainability of local urban form. It helped to understand the urban environment through its temporal landscape (mutation) and spatial relations. The idea of typo-

morphology helped to describe and explain the physical characteristics of the case studies, their performance in terms of sustainability, and how they are changed over time as a result of urban planning and unconscious interventions made by different stakeholders.

The research has followed two lines of inquiry. While five sites were chosen to investigate issues associated with the problem of urban fragmentation at the city level, at the neighbourhood level eleven case studies were selected to investigate main urban typologies in Benghazi and their performance in terms of sustainability. The selection of the case studies was informed by the general categorisation of four urban typologies and the initial surveys of urban issues in the city, and was limited to a manageable size within the framework of the study.

The research employed methods of direct observation, site-surveys and map-analysis. This is in addition to random conversations and secondary data sources attained from public agencies including reports, official maps and national census. Indeed, multi-methods help to overcome limitations, interact between ideas and evidences, and enhance the focus on accuracy rather than generalisation.

Direct observation has been a useful tool, as it helped the engagement of the researcher and hence gaining better understanding of local issues and unspoken demands. The method of direct observation is flexible and in particular suitable to Benghazi; where.

- There is no trace for previous formal surveys at this level in the city;
- The political and social context was unhelpful for conducting formal surveys; and
- Through engagement, it is also a strategy to help raise people's awareness about sustainability issues; and a fast and reliable method that can be used in planning during times of instability and fast growth.

The use of techniques such as figure-ground plan and counts of people and vehicles on the streets, in addition to the notes and photos attained during the surveys supported the observations and added value to the results. The collected data in the form of - notes, physical measurements and photographs – describe physical

elements, actual uses, and qualities as observed, expressed by people or expected by the observer based on logical inference and comparisons across the case studies.

Moreover, the exercise of design interventions for four of the case studies was an advanced step that attempted to test the combined effect of compactness strategies and urban design solutions in order to propose solutions to address the problems of urban fragmentation and to plan for better models of urbanism in Benghazi. This exercise was undertaken to provide more evidence, to elaborate the results and reflect on the theory and practice of urban planning and design.

Urban design is normally formed by disconnected actions rather than comprehensive design and it is subject to interventions from different parties. The local scale investigation for the urban form, location and capacity allows the examination of everyday urbanism and its impact on sustainability. Physical characteristics, urban elements and the capacity for future intensification represent a real-life state for different local forms that is suitable to facilitate wider comparisons and to examine planning policy and regulations in Benghazi.

While Benghazi city has been a good example to study urban fragmentation in Libya and the Arab World and to reflect on the concept of compact urbanism, however, this work faced many limitations imposed by a period of uncertainty, in addition to other social and administrative constraints, which has in turn influenced the selection of methods of data collection and analysis. It is important to conduct further research in other cities and apply formal surveys whenever the conditions are suitable to verify the results achieved here. The following chapters will present the findings of the empirical study which focuses on the phenomenon of urban fragmentation, based on the investigation of different urban typologies in the city.

Chapter Five

Benghazi - Planning and Development

5.1. General

In general terms, urban sustainability is essentially about pursuing patterns of development, urban management and lifestyle that do not undermine the carrying capacity of the natural environment (WCED, 1987); targeting the building of more green, equal and efficient cities (UN-Habitat, 1980). It is expected that these qualities are more achievable through compact rather than sprawling development. Urban sprawl, which is arguably in part a result of rational planning, is widely perceived as unsustainable; it has relatively high footprint reflecting higher levels of consumption and pollution, and is associated with issues such as poor urban quality, traffic problems and inefficient use of land and other resources (Gillham, 2002), (Farr, 2008).

Previous studies show that urban sprawl in Benghazi, which is characterised by informal expansions, low density and incomplete and fragmented urban patterns, is mainly driven by fast urbanisation and the search for affordable housing, more than preferences for features such as private gardens and spacious living space (University of Garyounis, 2007). Common urban issues in Libya such as poor infrastructure and low quality development have indeed deepened the drawbacks of the urban sprawl.

While official documents and studies acknowledge that many urban areas are fragmented, incomplete and have poor quality (UPA, 2006), the public authorities have responded by adopting anti-sprawl policies, which consider the problem as essentially an issue of urban management whose solution should be sought at the regional level, failing to recognise the fact that these features are also associated with the type and components of urban development, which need to be addressed at a lower urban scale.

In order to grasp the causes and characteristics of urban sprawl in Benghazi and examine the argument that a relatively more compact and denser type of urban

development is more sustainable within this context and within the Arab region in general, a multi-method survey strategy has been employed to obtain data on different urban patterns and typologies and their quality, and role of planning tools together with local responses. It is believed that the multi-method model, which involves the interaction between ideas and evidence and stresses contextual and subjective accuracy over generality, would help overcome the scarcity of data and allow the comparison and evaluation of different urban forms and parameters.

The investigation of urban typologies focuses on local residential areas. Residential areas cover about 60% of the urban land in the city and are the places where people spend most of their time. Also, they contain the type of development which is more local in character and more responsive to everyday life. It is expected that the knowledge gained from this work would be useful to facilitate the setting of urban rules and indicators that targeting the improvement of existing urban forms and the development of more sustainable areas.

The field work was conducted in summers of 2010 and 2012. The main tasks of the field work are:

- The study of the city structure and the planning system, with focus on issues related to urban fragmentation and land vacancy.
- The investigation of different urban typologies and their qualities through the survey of eleven case studies, followed by the observation of outdoor activities in selected streets of four case studies.

Contents and main findings of the first stage of the study are summarised in the two parts of this chapter, while the local case studies surveys are presented in Chapter 6.

Photo 5. 1: General View; Benghazi City
Source: Own photo; 2009

Part One: Theory and Practice of Urban Planning

5.2. Introduction

This part starts with a brief review of planning theory and practice in Libya. Institutional planning in Libya has moved through phases of incremental planning and land subdivisions, then sector-based planning in the 1960s that focused on development programmes, and since the mid 1970s comprehensive planning. Although, urban problems in Libya such as informal expansions and poor urban quality have often been linked to fast urbanisation and changes of lifestyle, it can be argued that there are good reasons to accept that the theory and practice of urban planning are indeed important factors for these problems.

Libya is the most urbanised country in Africa (Elbabour, 2011). It was evident in this study that to advance the discussion on urban sustainability which aims to improve urban quality and minimise the burden on the surrounding environment, the debate on urban sprawl in Libya should be widened to address not only the issues of informal development and urban encroachment over agricultural land, but also other aspects of the phenomenon of urban sprawl within this context, including the fragmented urban form, low urban density and negative spaces in urban and suburban areas.

A review is now presented of the progress in urban planning in Libya, defines elements of the current planning system and draws observations on land use regulations and the constraints that face the design and implementation of urban projects. It concludes that for decades, and due to different reasons, the planning system has been an obstacle to sustainable development in Libya. Factors such as central planning, lack of local participation and out-dated planning tools have hindered the implementation of such policies which respond to local capacities, natural conditions and people's aspirations.

5.3. Progress in Planning

Urban planning as a formal task was first applied in Libya during the Italian occupation (1911-1944) and used mainly in the two regional cities of Tripoli and Benghazi. These early plans laid out new subdivisions and road extensions based on survey maps produced in 1918 (Amoura, 1998). Soon after independence in 1951, the country witnessed fast urban growth, which then accelerated in the 1960s due to the flourishing of the petroleum industry.

In order to meet the growing demand over urban land many cities and towns managed to gain new areas through road extensions and land subdivisions on their outskirts. Also, a number of new settlements emerged for different political and economic reasons. This includes the redevelopment of the town of El-Marg after the earthquake of 1963 on a nearby site to accommodate 40,000 inhabitants, the re-planning of the market city of Al-Bayda for 50,000 inhabitants as a federal capital and the planning of five petroleum port cities- Al-Brage, Al-Sedra, Ras-Lanuf, Al-Heraga and Al-Zuytena which took place over the period from 1961 to 1968 (Amoura, 1998).

Baric's Law of the independent Emirate of Cyrenaica in 1949 provided the early legislative base in the area of urban planning, with its emphasis on the importance of city planning and management. This was followed after the unification of Libya by the Municipalities' Law of 1953 regarding local responsibilities and also the building codes for the two cities of Tripoli and Benghazi (Amoura, 1998). However, it is argued that issues such as lack of administrative, technical and financial capacity to cope with fast growth in main urban centres, together with other socio-economic challenges, have been essential factors in low housing standards, low urban quality and increased informal development (Helime, 1992).

A new nation-wide planning based on the national housing study of 1963 by Doxiadis Associates was initiated to facilitate the tasks of: urban planning; design of residential projects and public buildings; development programmes for civic infrastructure and road networks, and the regulation of planning, development and management activities (Amoura, 1998). Planning studies for 166 settlements, coupled with planning regulations, approved in 1970-71, were set up to define

concepts and guidance for urban development, determine the needs for different social and technical infrastructure, identify development priorities and manage growth (Helime, 1992). The Law No. 5 on planning, issued in 1969, provided the legislative base for this phase of planning. However, in spite of significant improvements, planning activities in this period can be criticised for their focus on separate sectoral plans and the large scale clearance of traditional quarters, at the expense of comprehensive view to planning or considerations such as the protection of local character and enhancing the sustainability of urban development.

The second phase of the nation-wide planning programme started in 1977. It was designed to review previous planning works and conduct three levels of planning studies: *National, Regional and Local planning*. Essentially, the Regional and Local Plans of 1980-2000 were based on three primary studies: the Human Settlements Survey by *Ital Consultants*, the Regional and Local Planning Standards 1977, and the National Physical Plan 1980-2000. Final works covered the National Physical Plan 1980-2000. Four regional plans (Tripoli, Benghazi, Sabha and Al-khaleeg), 13 sub-regional plans, and 213 urban plans, made up of 37 master plans for the main cities and towns and 176 layout plans for small towns. This is in addition to 23 layout plans and 4 master plans prepared separately (Helime, 1992).

Delay and lack of implementation is quite a common problem in most urban areas across the country. One of the main influential issues is the unstable administrative structure of local authorities. Municipalities were changed in number from 24 to 13, 12 and 7 municipalities and by the 1990s there were 46 administrative zones. This was followed by a restructuring that set up 32 districts, which were, in turn, reduced to 22 districts in 2007 (see Figure 5.1). Recently, and as a result of the revolution of 17th February 2011, the constitution has been suspended, and the administrative system is still unsettled.

Planning studies predict that population growth will be about 2% a year for the whole planning period 2006-2030 (UPA, 2006). In order to protect agriculture and the natural environment, the National Spatial Plan 2006-2030 proposes a development strategy promoting what is called *second-line settlements*. These describe a new corridor of urban development parallel to and independent from main

urban agglomerations on the coastline, together with the intensification of existing urban areas through measures such as defining urban boundaries, and infill and redevelopment programmes (UPA, 2006). However, urban planning is still top-down and inflexible. Clearly, there is no real effort to implement these policies, and most metropolitan areas continue to expand on the green-fields and attract low density, large scale projects.

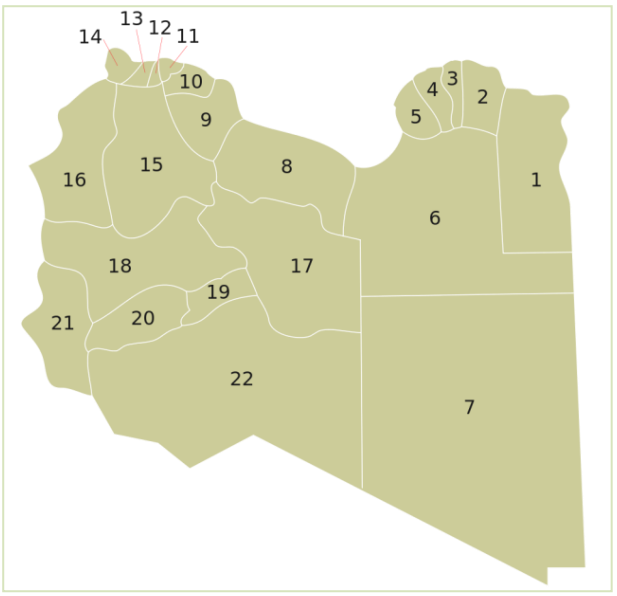


Figure 5. 1: Adminstrative Map, Libya

22 adminstrative districts as set in 2007
Source: Districts of Libya; Wikipedia; http://en.wikipedia.org, accessed in 17.03.2013

5.4. Planning Levels and Process

The Agency of Urban Planning is one of the institutions of the Ministry of General Planning (Libyan-GOV, 2001). The stated objectives of the Agency are to ensure the best use of resources; protect agricultural land and natural environment; preserve cultural and natural heritage; coordinate developments at different planning levels; manage population distribution by influencing rural-urban migration, support socio-economic balance and ensure even distribution of resources; respond to the demand for housing and social and technical infrastructure, and control informal development (§2 (Libyan-GOV, 2001)).

According to the urban planning Law No.3 and Act No.19, the planning activities are divided into four main levels: National, Regional, Local and Urban (Table 5.1). National Planning (policies and strategies for future spatial and socio-economic development), and Regional Planning (development strategies for each region

including hierarchy of human settlements and population distribution) are delegated to the Agency of Urban Planning to do the studies under the supervision of the Consulting Committee, which would review and approve the plans before the final approval by the General Planning Board. However, the regional plans need also to be recommended before the final approval by the Local Planning Boards in each Municipality (Libyan-GOV, 2001).

The Local and Urban Plans, based on demographic forecasts and availability of resources, are delegated also to the Agency of Urban Planning which is empowered to conduct these tasks in house or by calling upon other consultants. These tasks should be followed up and supervised by the Consulting Committees of Local and Urban Planning. The final plans have to be presented before the Local Planning Boards in each district for recommendation in order to be approved by the General People's Committee of the District - now: the Ministry of Local Government (Libyan-GOV, 2001), (Libyan-GOV, 2002).

Table 5. 1: Planning Levels - scope, preparation and approval process.
Source: adapted from Urban Planning Law No.3 in 2001; and its action Plan, 2002

Planning level	Prepared by	Supervision, Revision & Proven by	Presented to & Recommended by	Approval
National Planning *§5 & 11, Law No.3, §3 & 8 Action plan*	The UPA *§9, Action plan*	Consulting Committee for Planning Review *§26, Law No.3,* *§10 & 75, Action plan*		The General Planning Board *§11, Action plan*
Regional Planning *§6 & 12, Law No.3, §4, Action plan*	The UPA *§13, Action plan*	Consulting Committee for Planning Review *§26, Law No.3,* *§14, Action plan*	Local Planning Board in the district *§15, Action plan*	The General Planning Board *§15, Action plan*
Local Planning *§7 & 13, Law No.3, §5, Action plan*	The UPA *§18, Action plan*	Consulting Committee for Local & Urban Planning Review *§26, law No.3,* *§19 & 76, Action plan*	Local Planning Board in the district *§19, Action plan*	The Ministry of Local Government *§20, Action plan*
Urban Planning *§8 & 14, Law No.3, §6, Action plan*	The UPA or Subcontractor *§23, Action plan*	Consulting Committee for Local & Urban Planning Review *§26, law No.3,* *§19 & 76, Action plan*	Local Planning Boards & Local Offices in the district *§25, Action plan*	The Ministry of Local Government *§25, Action plan*

- Abbreviations: *UPA*: the Agency of Urban Planning; *Law No.3*: the law number 3 in 2001 concerns the restructure of the Agency of Urban Planning; *Action Plan*: the Action Plan of the Law No.3 in 2002.

It was evident that central planning can be unaware of the urgency of local issues and so a cause of delays and more informal development. Moreover, it seems that there was a misinterpretation of the idea of people participation in urban planning, as defined by Law No.3 (Libya-UPA, 2006), where it is perceived as no more than the expression of people's needs and views as presented through the mechanism of local and national People's Congresses (which are now dissolved); assuming that planners would do their best to meet these demands. However, ironically, there was no obligation on the Agency to even display new plans to the public, let alone listen to local people. In addition, the same law limited the participation of public bodies in the planning process to the provision of information, whereas planning decisions were conceived as technical tasks that should be undertaken by professionals (§10 and §14 (Libyan-GOV, 2002)).

On the other hand, the detailed plans (Regulatory Plans and Infrastructure Designs) that play an important part in the implementation phase (§30 (Libyan-GOV, 2002)), remained far from satisfactory. Regulatory Plans were quite often limited to land subdivisions and specifications of streets layouts. Such detailed plans based on clear concepts of urban design were not common, and this encouraged people to breach the public plans. Furthermore, practically the absence of quality control within the planning process has been another reason for the production of low-quality plans, which, arguably, have weakened the enforcement of urban plans.

The National Physical Plan 2006-2030 (UPA, 2006) has recommended design guidelines for urban centres that target urban cohesiveness, protection of local character, preservation of architectural and natural assets and creation of liveable urban environments, and the encouragement of people's involvement in the design process and the implementation (see Box 5.1).

The guidelines promote a liveable urban environment characterised by fine grain patterns and compact forms of high quality open spaces. In practice, there is no such arrangement that would ensure the realisation of these objectives. It is evident that these general objectives and principles replicate the Western models for New Urbanism but with little evidence on challenge and transformation. They over-generalise human needs and may well contain flaws similar to those for the projects

of New Urbanism, which denies spontaneity, and in many cases have been unaffordable and even a cause of urban sprawl (see Chapter 3).

Box 5. 1: Urban Design Guidelines - Summary,

Source: the Agency of Urban Planning (UPA, 2006)

- ✓ Development of compact clusters to enhance urban cohesiveness, through typologies of continued street-wall and flexible heights for vertical densities, in addition to other actions and incentives that support strategies for urban-infill.
- ✓ Provision of positive open spaces and a suitable level of enclosure as a measure to enhance the urban character and quality. For these ends a special care needs to be take for the visual experience to pedestrian and drivers, and careful designs of facades, scale, height lines and materials.
- ✓ Landscaping that help improve the quality and utility of urban environment through hard-landscaping to enhance urban character, soft-landscaping to mitigate the impact of harsh climate.
- ✓ For liveable urban environments recommends planning of pedestrian routes to improve their safety, provision of efficient transit and parking facilities, and design of a comfortable urban environment through the use of shading elements and water, and the right orientation of urban blocks to balance between solar gains and need to shading.
- ✓ Enhancing urban diversity through mixed land uses, small narrow shops close to street line, and using the ground floors for windows and more active functions; this is in addition to the provision of mid-block streets for higher permeability.
- ✓ Developing measures to identify protect and maintain buildings and areas of architectural importance.
- ✓ Support people's participation through engagement in design consultations and implementation.

5.5. The Institution of Urban Planning

The Urban Planning Agency consists of a Headquarters in Tripoli, and ten Branches, with between 2 to 6 Offices in each Branch (Libyan-GOV, 2003). The Agency's main tasks are to implement the national policies in the area of urban planning and development, pursue development programmes and follow up the implementation of different national projects. The main aims include: the efficient use of land and other resources; the protection of agriculture and other environmental qualities; dealing with informal developments; provision of balanced regional development; the provision of housing, social services and technical infrastructure, and the protection of cultural assets (§2 (Libyan-GOV, 2001)).

The agency's Headquarters consists of four offices: the national and regional planning office; the urban planning and design office; the survey and implementation office; and the office of administration, finance and legal affairs. This is in addition to the Consulting Committee which reviews and supervises planning tasks, and the Urban Planning Committee that deals with working policies and strategies. However, Urban Planning Branches and their local offices are structured to support the implementation of planning policies at local level. The ten Branches are located in the main urban areas, namely: alJabel alAkhdar, Benghazi, alWahat, Sirt, alSahl, alBitnan, Tripoli, alNegat alGhamis, alJabel alGarbi, Sabha (Libyan-GOV, 2003).

The Urban Planning Branch of Benghazi consists of: the Office of Regional Studies; the Office of Urban Planning and Design; the Office of Enforcement and Follow-up; the Office of Information and documentation; the Office of Interior Audit, Administration and Financial Affairs, and lastly the Department of Legal Affairs. This is in addition to six local offices (Figure 5.2). The main tasks of the two offices of regional studies and planning and design are as follows:

The Office of Urban Planning and Design: (1) works with the survey teams to update urban plans, and sets urban concepts and programmes, (2) follows up the implementation of planning standards and regulations, (3) reviews infrastructure plans and urban designs, (4) updates plans and proposed expansions to urban areas, and (5) provides feedback on other related issues such as the updating of planning regulations (Libyan-GOV, 2003).

The Office of Regional Planning: (1) participates in the preparation of the National Physical Plan, (2) follows up the preparation of regional and local plans, (3) participates in regional studies such as demographic forecasts, development strategies and urban extensions, (4) follows up planning implementation and proposes the updating and upgrading of strategic plans (Libyan-GOV, 2003).

Although, the Agency and its branches are required to undertake all planning tasks, in practice, due to lack of capacity, the Agency depends mainly on the input of outside consultants. Other observations on the performance of the planning agency can be summarised in three points: Firstly, the lack of citizen's and public participation in the planning process. However, in this transition period after the

revolution of 17th February 2011, public demonstrations have become the way for people to voice out views. Secondly, as the work with public stakeholders, like the agencies of agriculture and public works, is limited to an exchange of information (§10 and §14 (Libyan-GOV, 2002)), this leads to lack of coordination and problems such as the encroachment on agriculture lands and land vacancy. Lastly, as the agency has missed any kind of quality control over planning products or feedback, planning documents which were quite often low in quality and omitted vital information, can be unclear and weak in respect of planning enforcement.

The political change raised questions regarding the future of the administrative structure for the country and hence the prospect for the decentralisation of power and the degree and form of participation in urban planning. The previous political system in Libya consisted of the executive institutions- Local Committees and the General People's Committee (council of ministers); and the legislative institutions- Local Congresses and the General People's Congress (parliament) (Libyan GOV, 1977, In: ICL). However, it was always known in Libya that the whole system was corrupt and did not respond to peoples' demands and aspirations. Within this context the system of urban planning was a top-down, where people's participation in planning was limited to the expression of their needs through the political committees (GOV., 2001- Law No 3).

People's participation in decision making is essential in any democratic society. Despite the available examples of many types and methods of participation that developed in different societies, to facilitate planning at different levels and for different purposes, participation tools should not be applied on the Libyan case before being thoroughly investigated and adjusted to fit the local context. People's participation can be understood and applied differently in each society, depending on the flow of information; people's understanding for their needs and their freedom to make decisions and implement them; political system; people's mobilisation and how they organise themselves, and the existing institutions relevant to this purpose.

Figure-5. 2: The Structure of the Urban Planning Branch of Benghazi
Source: the act No. 639 of the Deputy Secretary of Service Affaires, 2004

5.6. Observations - Land Use Regulations

Planning regulations - i.e. planning standards, land-use regulations and building codes - which are set to inform the preparation and review of layout plans, regulatory plans and the detailed plans for streets, public spaces, and various urban projects, were based on rational view to planning and have been in place for quite some time – they were introduced mainly in the 1970s and the early 1980s with limited updates in the 1990s.

The planning standards (1982), which define land use requirements, in addition to other measures, have adopted the concept of the *neighbourhood* as a basic urban unit. The recommended size has been defined to serve a walking distance from edge to centre of about 500 metres - about 78.5 hectares (Figure 5.3). At a density of 120 persons per hectare, as recommended by the National Physical Plan, the total number of people in a neighbourhood can be estimated at about 10,500 inhabitants or about 2,100 households (5.0 persons per household).

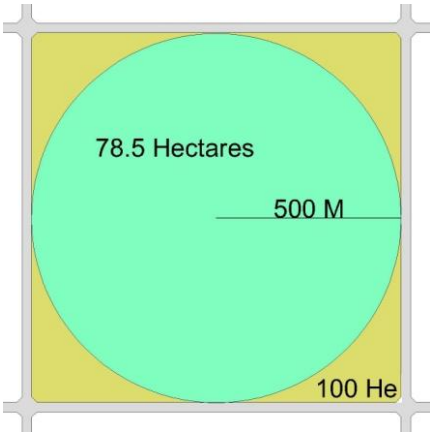


Figure-5. 3: A Schematic Representation for the Walking Distance

Indeed, while a mix of building types and variations of block densities can help not only in achieving the set density but also providing a high quality urban environment; practically, different urban areas are laid-out to demonstrate a direct application of zoning-related specification regarding density, building type and street standards. A close examination of some real-life cases shows that this practice can lead to unsustainable results. For example, in the case of the low density detached type (R1) some provisions have contained large open spaces for roads and green areas which created wide deserted and negative spaces, while on the other hand, in the case of a moderate density courtyard type (R5), under specified conditions of plot size and density, the open space have been far below the minimum requirements - see Table 5.2 and the theoretical representations of land subdivisions in Box 5.2.

Based on real-life observations, the approximate percentage of private open space to land area by building type is for Courtyard buildings (R5, R6 &R7) = 15%, Terraced buildings (R4) = 30%, and Detached buildings (R1, R2 and R3) = 50%. It is worth noting that, traditional buildings with a central courtyard can contain up to 50% private open space. However, the increase of the total floor area due to vertical intensification has influenced the use of private open space and in some cases is compensated for by using the roof space and public space for some domestic activities – see Chapter 6.

Table 5. 2: Zoning Categories and Building Types

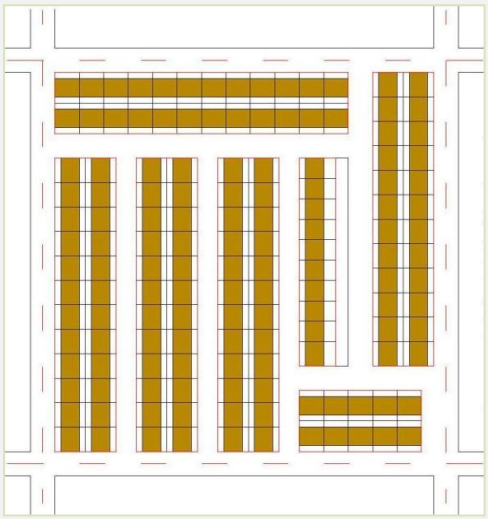
Source: Summarized from planning standards 1982 and land use regulation 1996 - (Act No. 189 in 1996; the Secretary of the General People's Committee (Ministry) for Housing and Utilities; regarding the use and classification of urban land- selected paragraphs)

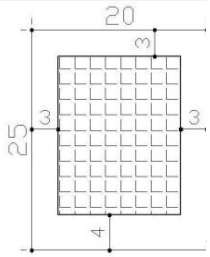
Use	Area density-units	Type	Height	Size	FAR- floor area ratio
R1- single-family	10-14	Detached	Two	≤ 500 m²	0.50
R2- single-family	15-20			≥ 450 m²	0.80
R3- multi-family	21-26		Four	≥ 700 m²	0.75
R6- multi-family	70-100			≥ 500 m²	1.50
R4- single-family	27-40	Terraced and semi-detached	Three	≥ 300 m²	0.65
R5- single-family	40-80	Courtyard	Two	≥ 180 m²	0.85
R7- multi-family	≥ 100		Eight	≥ 300 m²	4.00

However, informal intensification and changes in buildings' elements are common practice in the Libyan cities and need to be tackled within the context of urban sustainability. In the 1990s, the local authorities in Tripoli reported that more than 70% of buildings in the city were informal - referring to breaches of the building code (El-Najah, 1998). Indeed, this judgment reflects the official perception that non compliance to planning regulations is illegal, yet this ignores the fact that informal interventions can be more responsive to people's needs and reflect a local rejection for such static rules.

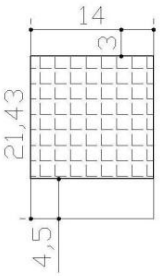
Box 5. 2: Building Types

Current practice based on simple land subdivisions quite often applies only to one building type, and therefore at some points seems difficult to meet density and other requirements. The theoretical representation of a subdivision of courtyard building type (R5) shows that under certain conditions required by the land use regulations (size of land plots, floor-area-ratio, and public space) targets such as gross-density are unachievable.

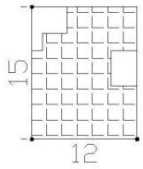




R1:
Land area: 450 - 500 m²
Min. land width: 20 metres
Four setbacks, lead to 252 m² buildable area
Max. floor area ratio: 0.50



R4:
Land area: 300 – 500 m²
Min. Land width: 14 metres
One, two or three setbacks,
Buildable space: 195 m²
Max. floor area ratio: 0.65



R5:
Land area: 180 – 500 m²
Min. Land width: 12 metres
Courtyards
Buildable area: 153 m²
Max. floor area ratio: 0.85

Block model: R5with strrets 10m wide
Total area (mid streets): 3,9204 m²
Number of land plots: 140
Size of the land plot: 180 m²
Achieved density: 35.7 land plot/ hectare
Buildable area: 59.7%
Open space (mainely roads): 1,4004 or 35.7%

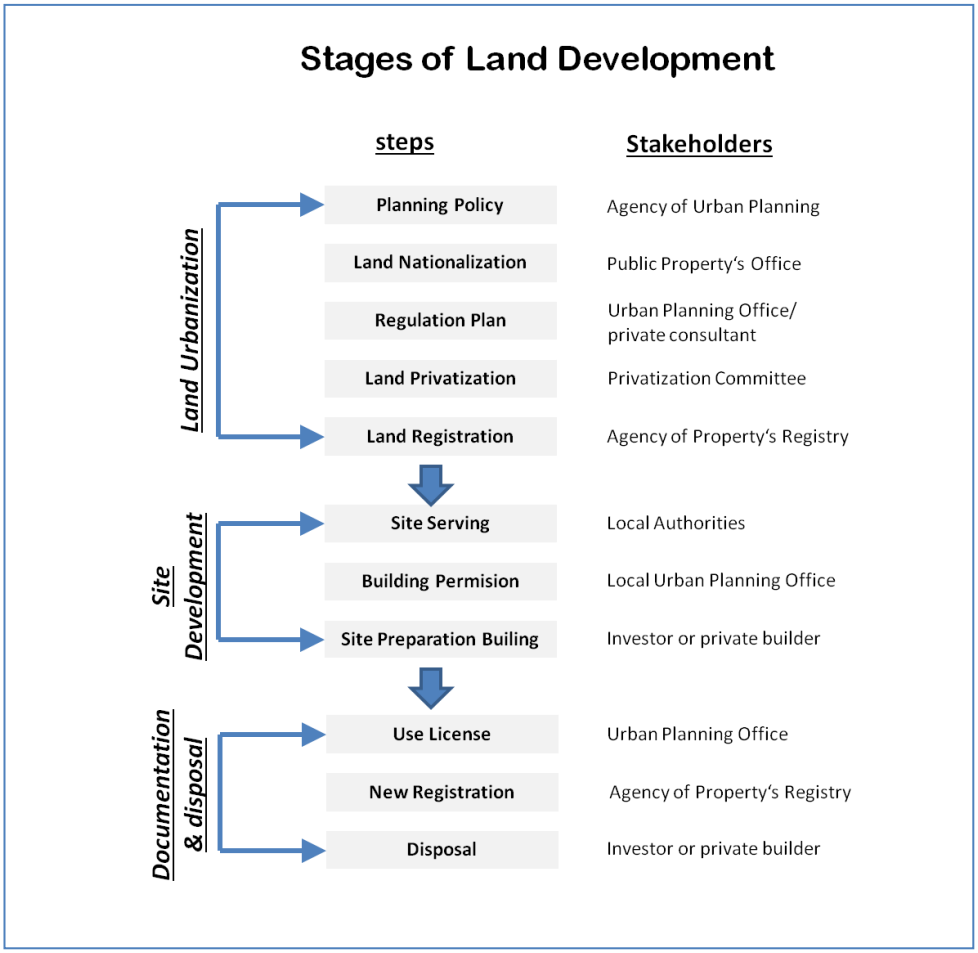
5.7. Observations - Stages of Land Development

Steps of land development can be broken-down into three main stages:

- land urbanisation;
- site development; *and*
- the documentation and disposal (Figure 5.4).

The first stage of land urbanisation includes the steps of (1) Planning policy where decisions on land uses are taken by the planning agency; (2) Land nationalisation by the Office of Public Property against a compensation determined by the land valuation Law No. 116, 1972; (3) Detailed plans and land subdivisions which come under the responsibility of the Local Planning Offices; (4) Land privatisation to different public bodies or individuals through the Privatisation Committee of the Municipality, and finally (5) Land register in the Public registry.

Figure 5. 4: Stages of Land Development



Generally, both the land valorisation system which is based on outdated figures unrelated to the real market value and the high 10% transaction tax (Law No.16, 1998), together affect the whole process of land development. Low valuation and high land tax leads to disputes, corruption and unfair land distribution, and also encourage land speculation and informal transactions. In addition issues such as a lack of citizens' participation and a lack of administrative and technical capacity in the different agencies causes delays and more disputes over land. This could only deepen problems of land speculation and the scarcity of affordable housing. According to Cohen, affordability has been widely perceived as 15 - 20% of the disposal household income that can be used to pay for housing and urban infrastructure costs (Cohen, 2007).

The second stage of land development includes (1) the implementation of social and technical infrastructure by the government; (2) issuing development permissions by the Local Planning Office, and (3) preparation and construction of individual sites by the developer or self builder. The most striking issue at this stage is that development permissions are issued for new sites with no pre-request for the existence of civic infrastructure. This practice affects developments in many ways; most importantly it increases investment costs, encourages informal connections to existing networks and thereby increases loads on those networks.

Box 5. 3: Taxes on Properties and Restrictions on the Size of Land Plot

The Act No.919, the General People's Committee, 1990; *Determines the standardized size (upper limit) of building lands, residential units, shops and workshops*, regarding the law No.11, 1988, concerns the agency of Property's register and Documentations:

Upper limits on the size of residential lands and total floor area per household:
Land size: 500 m²
Total floor area by household size:
- For 1 to 3 members =150 m²
- For 4 to 7 members =270 m²
- For 8 to 10 members =320 m²
- Over 10 members =500 m²

Law No.28, IN: the public newspaper No.12, pp.327-328, (1993); modifies some terms of Law No.2, 1986 concerning *tax on properties*:

The annual tax on urban land plots and total floor area of residential properties are:
- 0.5 LD fine on each one m² beyond the permitted floor area (see Act No. 919)
- 1.0 LD fine on each one m² beyond thepermitted land area (see Act No. 919)

(LD denotes Libyan Dinar- the currency of Libya)

The third stage of land documentation and disposal consists of three steps: (1) issue of a use-license issued by the Planning Offices for any building that meets the

conditions for development; (2) re-registration of the property in the Agency of Property Registry, where property tax is imposed (Box 5.3); (3) the investor/owner can then only use or sell the property, since letting was prohibited – until recently - by law, but with some exceptions (Law No. 5, 2001).

As explained above, the stages of land development, from the early step of taking decisions on land uses to the final step of marketing, are confronted with real constraints that affect the whole development process and lead to deep urban problems. Indeed, in spite of the recent political change in the country, thus there have been no real changes on the ground, especially in the field of land development. At this point, it is evident that not only is the lifestyle to blame for the deteriorating urban environments, but the lack of public works, the scarcity of buildable land and more importantly the central planning decisions are also to blame.

Photo 5. 2: Temporary Infrastructure, Al-Salam area, Benghazi

Many residential areas continue to be unfinished for long time. it is common to see overhead electricity lines and unmetalled street, which are often associated with temporary water lines and no sewage system.
Source: Own Photo, 2011

However, the informal market seems to have benefited from this gap and even compete with the formal one. It is acknowledged that in many developing countries the sequence of informal development – occupation, building, servicing then planning – is match the priorities of urban poor (Devas & Rakodi, 1993). According to Payne although the informal subdivisions have become the largest single tenure category in many cities and are perceived as a mean for urban densification, it is accepted that they cannot guarantee secure land ownership and hence houses are often of low standards (Payne, 1997).

Photo 5. 3: Scattered Development, the Village of El-Kuafia

Random intensification for little towns and rural areas just outside the city
Source; own photo; 07-2010

The steps of informal land development consist of land subdivision and marketing by the owner, and site preparation and building by the beneficiary. These short and cheap steps, guided by the market, bring with them savings in time and costs for the low- and middle-income people who are in need of affordable alternatives. However, in the long run, the informal sites can be more difficult and expensive to serve and upgrade than any other development. Issues on land rights are crucially important in the area of urban sustainability and a primary consideration in times of change (Payne, 1997). The system of land ownership in the city has been an essential issue for urban development and a cause of planning delays. In this respect, the study of land-rights should become part of any sustainable solution. The research on land-rights is expected to start with the recognition of existing rights on land and understanding the current systems for land-ownership, both formal and informal.

5.8. Conclusion: *Planning Failure*

The discussion above shows that up the 1960s, institutional planning, which promotes rational concepts and a top-down approach to planning, has been, in part, responsible for low density urban sprawl and for fragmented, incomplete and informal development. Central planning has been less aware of real-life issues and local demands. Indeed, when plans were issued, approved and applied by the same group; i.e. the planning agency, it was very unlikely to produce genuine solutions that satisfy all parties. It is evident that existing planning tools are not appropriate to make buildable land available in pace with rapid urbanisation and provide no real incentives to recycle urban land over time.

Insufficient land supply, shortages of affordable housing and a lack of public services are deep problems and have made their impact felt on urban sustainability and the quality of life. Moreover, in spite of the recent assurance made by the constitutional proclamation of October 2011 concerning the protection of private ownership, there seems to be little awareness of the role of planning tools in any such review for land legislations; a matter which could have negative implications on urban development in the future.

Generally, it can be argued that many targets regarding sustainability set for urban development have not been formulated into a vision that fuses together the type of physical environment, and development processes and tools suitable to achieve the objectives. In order to reform the mainstream development, the Libyan planning system needs to be upgraded to incorporate more relevant concepts and principles, which can then widen planning considerations in a way that prioritise sustainability objectives by seeking an appropriate balance between human needs and environmental maintenance.

Part Two: City Structure And Reasons Of Urban Fragmentation

5.9. Introduction

This part reviews important information about the city of Benghazi including its urban structure, urban densities, vacant lands and the phenomenon of informal development; with an aim to gain better understand the urban situations in the city. This would then inform the next stage of this work, which is an attempt to explore and explain the causal relationships that exist between various urban forms and their performance in terms of sustainability.

The contents of this section cover important facts on the development of the city master plan, together with observations about vacant lands and informal developments within the city. This review concludes that the drivers of low density expansions, land vacancy and fragmented development have mainly been the planning decisions and regulations, in addition to having arisen as a result of factors include lifestyle, disputes on rights over land, delay of public works due to lack of public fund, and the limited capacity for people to achieve their needs, which need to be addressed in any future solution. These early observations and notes on the phenomenon of urban sprawl in Benghazi were necessary to plan the survey for local residential areas.

5.10. The Urban Structure

Benghazi is an old city located on the Mediterranean Sea in the eastern region of Libya- Cyrenaica. Originally, it was founded in the 6th century BC as a market town, when it was named Euseperides, thereafter it had its name changed to Barneek, then Biolias and finally, in the 15th century, Ben-Ghazi (Doxiadis-Associates, 1984).

The old town was built at first on a narrow plain limited by Salmani Sabkha and the interior anchorage from the sea side, which broadens thereafter to form a strip of land

between the coast and the Sabkhas of about 800 metres wide and 8.0 km long (Doxiadis, 1984). "Sabkha" is a North African geological feature, which describes flat plain with high salt sediments which becomes a shallow lake in the winter (Figure 5.5).

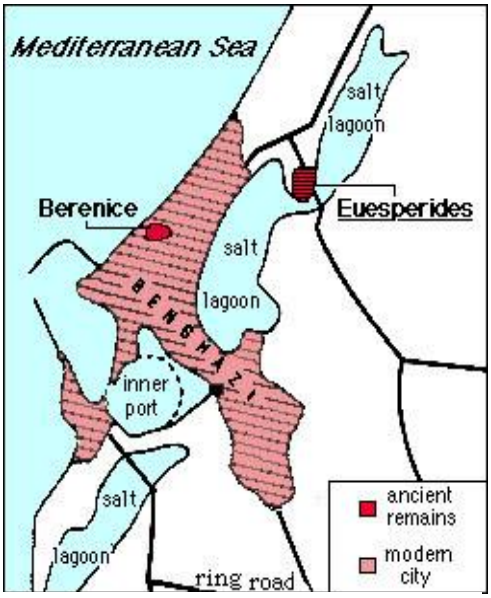


Figure-5. 5: Location Map, the Old City of Benghazi

Source: http://ancienthistory.about.com; accessed in 15.11.2010

Topography has defined the form, size and growth directions of the city. During the Turkish period, a high route across Salmani Sabkha was built to connect the town with the village of Berca to the south. This was done in order to have access to better lands for development and to be closer to the agricultural areas. However, because there are no other real natural constraints beside the sabkhas, the city has expanded in all directions and in the process has grown through many piecemeal additions, and the absorption of a number of nearby villages.

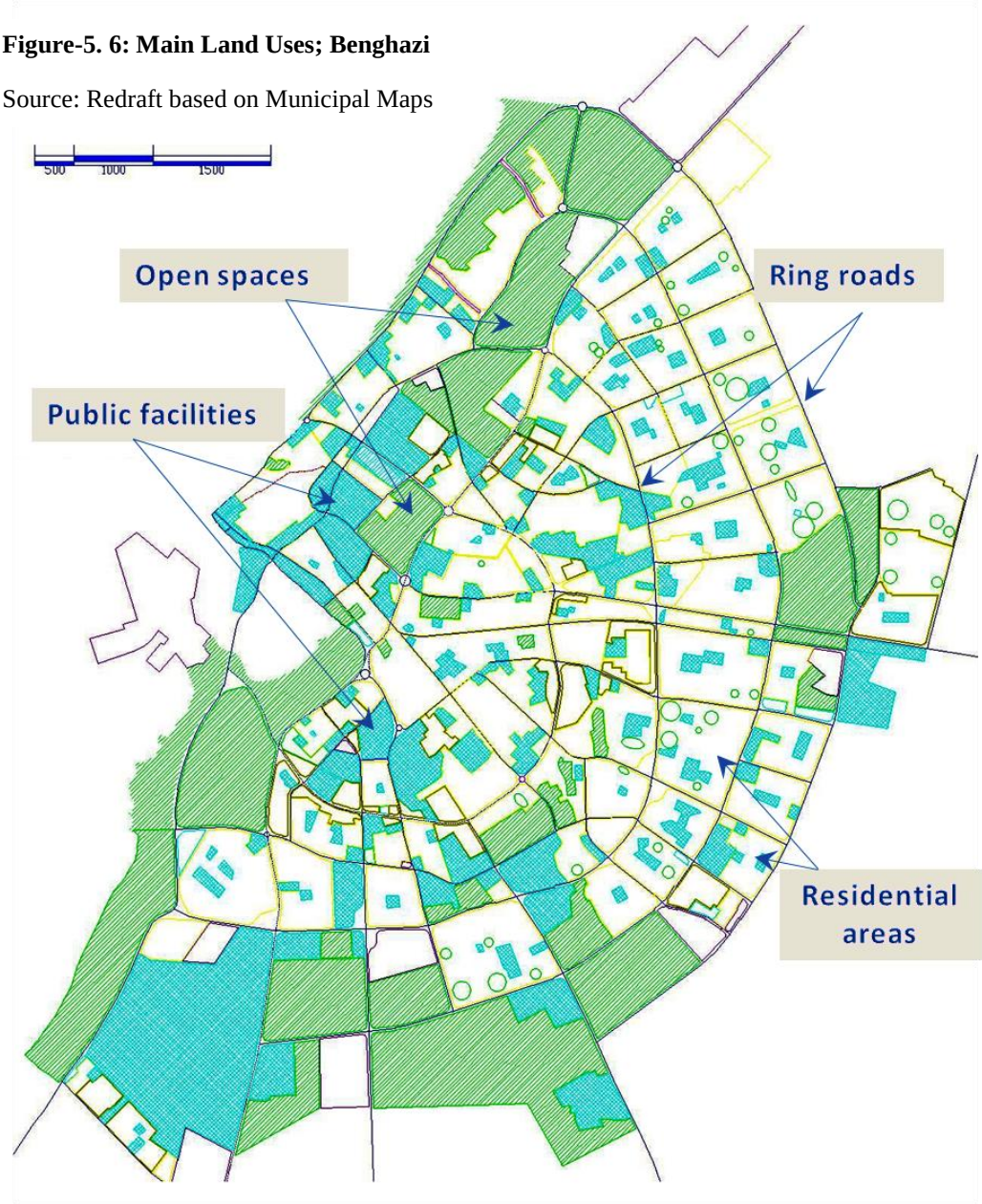
The official layout plan for Benghazi in the 1930s preserved the sabkhas' structure and placed an emphasis on growth directed mainly towards the southwest. However, the plan actually divided the city into two parts: the Arabic one consisting of the old core and some scattered residential clusters, and the modern part, which had been built to accommodate the Italian public servants and military forces. After independence in the 1950s the city attracted a wide range of developments and grew rapidly. In order to meet demand on building land, the local authorities expanded the city plan by laying out new grids of streets thus making for quick and easy land subdivisions within the city and beyond its edges (Amoura, 1998).

By the 1960s as the city became larger and its rate of growth faster a balanced road network became a necessity to improve accessibility and manage urban growth and densities. The city plan of 1966 by Waeting International was based on a concentric

model, where the old city core made the centre of a semi-circular structure served by a system of three radial roads and six circular roads. This has, to an extent, succeeded in containing and balancing growth around the existing city centre, in addition to containing functions of higher levels that support the city's regional and national role (Doxiadis-Associates, 1984). The semi-circular form of the city with circumferential and arterial roads has resulted in areas closer to the core becoming gradually more dense and diverse due to higher levels of accessibility, proximity and the scarcity of building land (see Figure 5.6).

Figure-5. 6: Main Land Uses; Benghazi

Source: Redraft based on Municipal Maps

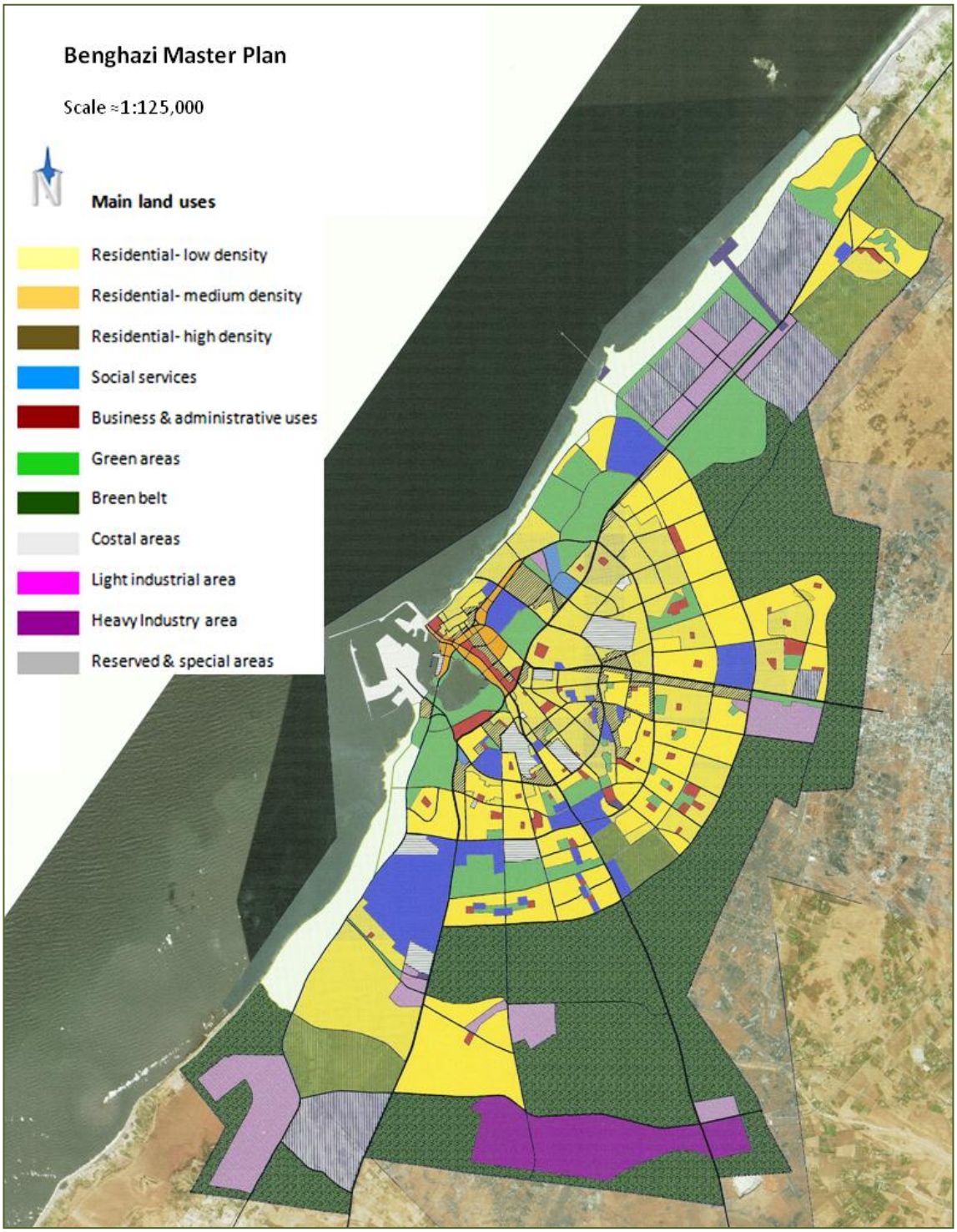


The subsequent Master Plan of 1980-2000 by Doxiades Associates was a comprehensive one. Socio-economic predictions and planning standards were produced to estimate future demands on land and services. Based on the comparison of land requirements with available land for growth, the proposed plan has maintained an overall residential density of 100 persons per hectare, while reducing the percentage of residential area compared with other land uses through a strategy of urban intensification (Doxiadis-Associates, 1989). The final plan based on a multi-nodal model, has proposed restructuring the road network to open two wings of growth parallel to the costal line and the inclusion of the two nearby towns of Kuifia and Guarisha. The master plan covers 24,000 hectares, of which 16,000 hectares are for urban uses, including 7,900 hectares of residential land which is planned to accommodate about 800,000 people at a density of about 100 persons per hectare (Doxiadis-Associates, 1989)- see Table 5.3 and Figure 5.7.

Until recently, urban development remained by far within the fifth ring road area, but with limited informal expansions alongside main arterial roads. Currently, there are several large-scale projects underway in different locations outside the current boundaries of the build up area bounded by the fifth ring road, including housing, industry and other regional functions (see Figure 5.8). However, in spite of a lack of information, the overall picture suggests that these developments are mostly at low density and scattered at different distances from the city centre.

Figure 5. 7: Benghazi- Master Plan 1980-2000 by Doxiades Associates

Source: Redrafted in the report of Benghazi Region 2006-2030 (El-Emara, 2008)



Land use type	Area in Hectares	%
Residential land uses including local services	7,895	49.5
City centre - Central business district - Administrative centre	329 (205) (124)	1.3
Main social facilities	1,005	6.3
Green areas, recreation and sport	2,853	17.9
Industry	2,144	13.4
Main transport system	1,724	10.8
Sub-total	15,950	100.0
Special areas Reserved areas Green belt Areas reserved for future extensions	656 224 6,158 1,033	
Total	24,021	

Table 5. 3: Main Land-uses of the Master Plan, Benghazi

Source: Doxiadis Associates Int., Benghazi Master Plan- final report, *1989*

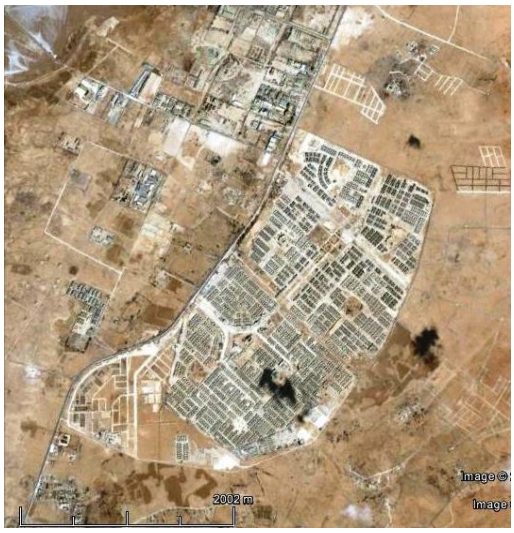


Figure 5. 8: New Residential Site, Outskirts of Benghazi

Source: Google-earth, accessed in 5.12.2011

The last census 2006 shows that the average net-density for the build up area in Benghazi of about 128 persons per hectare contains wide variations (Libyan-GOV, 2008). Urban density ranges from above 300 persons per hectare in the city centre dominated by multifamily buildings to the very low densities of the peripheries dominated by a mix of informal developments, where the average net-density drops to below 60 persons per hectare. Areas within the 2nd ring road which are mainly courtyard buildings, averaged from between 200 to 250 persons per hectare, while newer zones between the 2nd and 5th ring roads, which are dominated by detached buildings, have net-densities that range from 92 to 145 persons per hectare (see Table 5.4). The map below (Figure 5.8) shows the net-densities for different urban zones, which are grouped into three main categories: (1) low density - less than 65 persons per hectare, (2) medium density - from 65 to 200 persons per hectare, and (3) high density - above 200 persons per hectare.

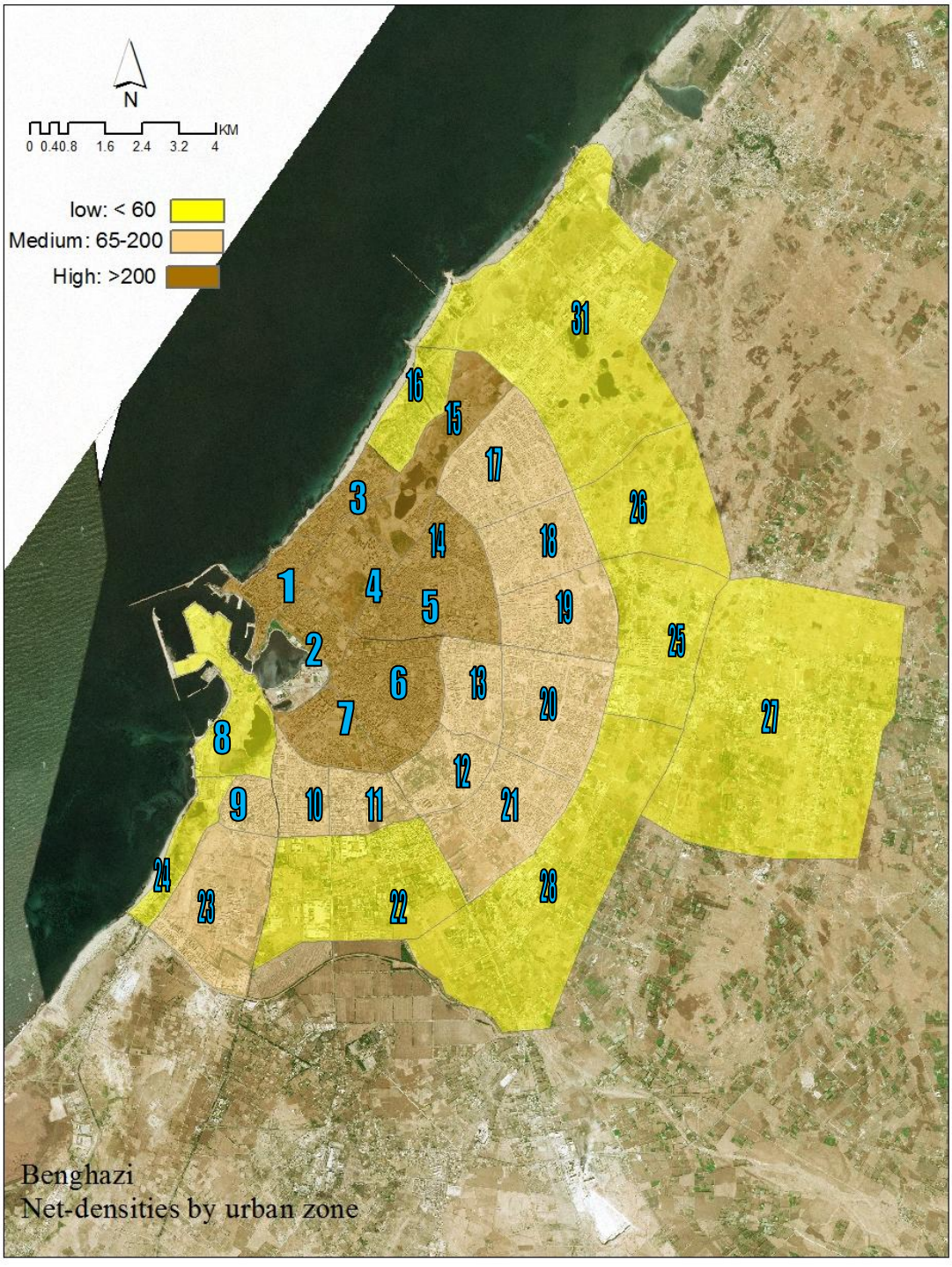
Table 5. 4: Urban Densities by Zone, Benghazi
Source: Benghazi Region 2006-2030 (El-Emara, 2008)

Zone	Total Area - H	Net-Residential area - H	Net-density P/H	Gross-density P/H		Zone	Total Area - H	Net-Residential area - H	Net-density P/H	Gross-desnity P/H
1	226	95.5	324	137		16	303	39.7	60	8
2	150	53.8	370	133		17	512	393.2	121	93
3	198	98.4	301	149		18	359	229.1	145	93
4	281	54	221	149		19	413	255.6	92	57
5	146	101	239	166		20	540	319.9	133	79
6	498	336.2	219	148		21	545	195	142	51
7	252	96.2	214	82		22	925	141.1	49	8
8	575	8	41	1		23	627	54.2	183	16
9	135	83.9	93	58		24	227	5.2	64	1
10	207	127.4	120	74		25	691	266.8	36	14
11	211	111	96	50		26	665	93.3	29	4
12	272	118.1	115	50		27	2545	581	22	5
13	270	179.7	130	86		28	1548	77.5	40	2
14	452	284.6	203	128		31	2585	247	28	3
15	459	20.1	258	11						
Total	**16817**	**4666.5**	**128**	**40**						

- A density of 128 people per hectares is about 21 dwellings per hectare for a household size 6.1.

Figure 5. 9: Net-densities by Zone, Benghazi

Source: Net-densities by zone; Benghazi Region 2006-2030 (El-Emara, 2008)



This brief review suggests that throughout the successive stages of development, the semi-circular structure and land-use policies of the city have played an important role in the formation of urban forms and the distribution of densities and building types. However, whereas the overall gross-density of 40 people per hectare may reflect a high amount of vacant lands within the urban boundaries, on the other hand, net-densities are mainly a result of planning decisions and regulations as they influence urban layouts and building type, this is in addition to the multiple informal interventions in the built environment, and as such they need to be addressed as part of the study of urban fragmentation.

The general picture obtained for the metropolis confirms the assumption that urban densities tend to decrease outward in a relationship with their distance from the city centre. However, it should be noted that while gradual development has its positive side in that it help absorb vacant land, on the down side, it can lead to unbalanced intensification of unsustainable results.

Although lacking systematic research on the preference of suburban living in Libya, national policies such as those calling for the right of every household to own a private home and mode of transport, contain in the background an image of what people really want, which is a single-house, private car and access to a private garden and a parking place or garage. Throughout the last three decades, where investment in real-estate has been limited to the public bodies, which in turn have lacked fund and incentives, urban growth in Benghazi and almost everywhere in Libya has been dominated by subdivisions of single housing plots and a practice of self-build.

A previous study of urban sprawl in the periphery of Benghazi concluded that urban sprawl, which can be formal or informal, and developed by either the private or public sector, is mainly low density and poses a challenge to the capacity of the city in terms of civic services and transport (University of Garyounis, 2007). It is evident that quite often these areas consist of groups of single-family housing served by wide streets and lacking sufficient public places; they are widely scattered, divided by vacant land and incomplete or look so.

5.11. Vacant Land

An observer in any Libyan city or town would notice the impact of urban sprawl on the quality and sustainability of urban areas, which is characterised by low density, fragmented, incomplete, and contains different types of residual and vacant land. It was evident that in addition to the lasting effects on the natural environment and agriculture, urban sprawl is also a main factor in spatial separation, segregation, increase of development costs and the deterioration of urban quality.

Types of vacant and underused land – negative space - have been identified as: (1) *space-left-over-after-planning*, (2) large residual and undefined areas alongside main roads and between urban zones, (3) vacant land plots and abandoned facility sites and buildings, and (4) large ill-planned car park and less-used parks.

Leftover and vacant areas could encourage different informal developments such as building extensions, new buildings or informal subdivisions of land (see Photos 5.4, 5.5 and 5.6), which are associated with negative consequences. However, in some cases spontaneous developments can be a healthy intervention and a facilitator of balanced urban intensification; a traditional practice that is widely accepted in many cities in the developing countries and which is appreciated for improve efficiency and meeting local needs.

Photo 5. 4: Informal Development - Building expansion on the public space

Source: own photo; 07-2010

Photo 5. 5: Informal Development – Private building in a buffer zone

Source: own photo; 07-2010

Photo 5. 6: Informal Development – Public building in a buffer zone

Unnecessarily wide buffer zone is also shows lack of coordination between public agencies.
Source: own photo; 07-2010

The presence of unused pockets of land is a common problem for modern cities (Ben-Hamouche, 2013). Vacant and residual lands do exist in Benghazi for various reasons (see Box 5.4). The observation suggests that the most distinctive reasons for urban land being left unused or under-used include: (i) disputes over land; (ii) unsuitable soil conditions for construction; (iii) bureaucracy and the delay of planning permissions, (iv) scarcity of funding for infrastructure programmes and mortgages; and (v) the informal market.

This is in addition to the effect of low density urban development and outward expansion, which are mostly unnecessary and informal, leading to draining the city from its people and resources. The complex effect of these factors has fostered the consumption of green-fields driven by the demand for affordable building land and housing, and at the same time led to the inefficient use of existing urban resources; factors which can be negative for all aspects of sustainability. The following examples present some of the reasons for informal uses and vacant land in the city. These examples have been put together using information gathered by direct observations of real-life situations and are supported by public documents and unstructured interviews with some professionals in a form of open discussions.

Box 5. 4: Surveys Regarding Housing Demand

An opinion survey, in the Human Development Report-Libya, 1999, found that about 91% of the participants believed that lack of infrastructure and limited public funding were the main causes of the shortage of affordable housing, whereas a land inventory by CEOU in 2001 concluded that the unused residential areas within the planning boundaries of Benghazi city were large enough to accommodate around 30,000 dwellings at a density of 100 persons per hectare; arguably, close to the deficit in buildable land at that time.

5.11.1. Land Disputes

The question of land rights is widely controversial in Libya and for decades it has been a subject of several legislations. Until recently, by law, land is "communal property," where people can only hold usage-rights. However, in spite of the move towards a free-market economy and recent political changes, thus far legislative reforms concerning land rights are scarcely debated. Furthermore although the country is currently in transition, past experience has shown that as soon as land is urbanised all private-rights become subject to nationalisation against, quite often, unsatisfactory compensation.

It was evident that fixed valuation indexes such as the one attached to Act No 305 are outdated and lower than real market values (Act No.305 of the General People's Committee, 1999 - regarding the action plan of the law No.21. 1998). Landlords not only reject these measures, but complain as well about the payment process,

protesting that local authorities often use revenues of land sales to cover their own expenditures, instead of paying the appropriate compensation. This is in addition to the unequal treatment of different landlords with respect to law enforcement and the advantage granted to some to negotiate with special committees the terms of compensation.

To avoid actions of land nationalisation, some landlords register their properties as farms, in order to be protected under the "Law No.15" for the year 1992 on the protection of agricultural land (see Figure 5.10), or subdivide and sell their land in the informal market. Indeed, these actions do bring about a new structure of rights over land and informal investments, which could hinder any official plan from being implemented and create a type of development that is expensive to upgrade.

Figure 5. 10: Private Farms, Benghazi

some urban farms are walled, which in effect isolate some buildable lands and hinder them to be connected with public networks
Source: Google earth, accessed in 12.07.2010

Photo 5. 7: Informal Subdivisions, Ali Ben-Talb Area

The paved road encourage the informal development and connect it with the nearby site of multi-family housing project.
Source: Own photo, 07-2010

Box 5. 5: Example One: Informal Subdivisions, Ali Abe-Talb Area

The site is located in the district of Ali Ben-Talb between two sites of prefabricated multi-family housing and is bounded by a military camp on the east and on the west by the 5th ring road. It is approximately 5km away from the city centre and covers an area of about 75.0 hectares. The area is classified by the Master Plan as a district centre of a medium density development.

Currently, the land has been informally subdivided by the landlords and is occupied by a mix of housing, shops, workshops and warehouses, of different footprints and at most unfinished (see Photo 5.7 and Figure 5.11). However, informal land subdivisions are preferred by both land owners to escape nationalisation actions and those in need of affordable land, while the dely of regulation plans has gave more room to these activties.

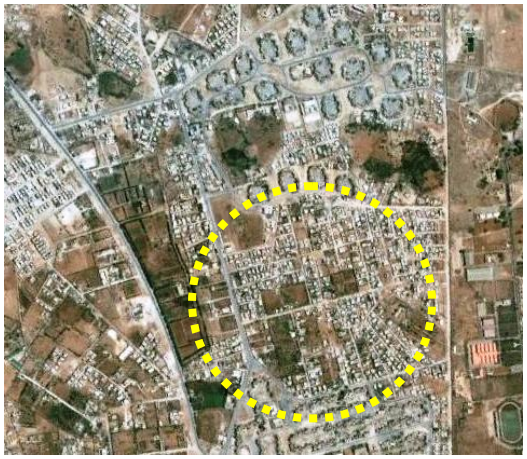


Figure 5. 11: Informal Residential Subdivisions, Ali Abe-Talb Area

Source: Google Earth, accessed in 15.02.2011

Box 5. 6: Example Two: Urban Farm, El-Slaui Area

An urban farm of about 1.5 hectares, fenced and partially cultivated. The farm is located in the Al-Slaoui area, street number 67 close to Palestine High Street and bounded by an existing school on the west and local streets and houses on other sides. According to the regulatory plan, the site is a residential area; subdivided into 42 land plots of 180 m² each (Figures 5.12 and 5.13).

Notwithstanding that it is actually used as a small holding; the farm has been registered an agricultural land and its registration document can be used to challenge any action of the nationalisation. However, the farm became a physical obstacle hindering several services such as roads and a sewage network and even prevent some other land plots outside the property from being developed.

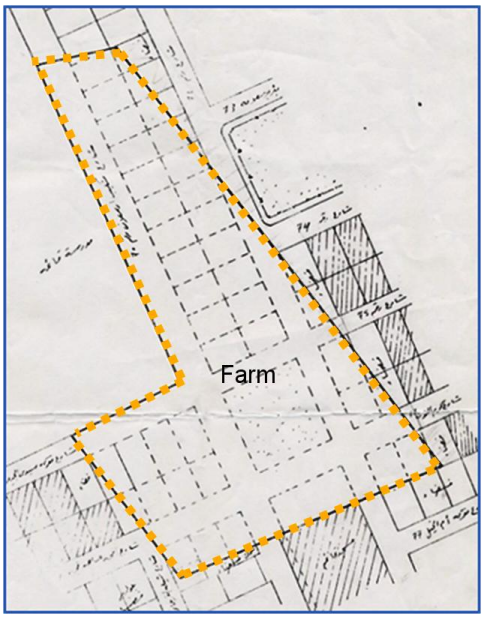


Figure-5. 12: Municipal Subdivision of Farm Land, El-Slaui Area

Source: Own survey, 2010 and Municipality land subdivisions 1995

Figure-5. 13: Private Farm, El-Slaui Area

A walled farm blocks residential streets and infrastructure
Source: Google-earth; accessed in 5.7. 2012

5.11.2. Poor Land Conditions

The issue of land suitability for construction has been one of the main reasons for land vacancy in the city. It is a fact that the development of areas such as *sabkhas* - i.e. seasonal lakes with high salt sediments - and old stone quarries require more investment in foundations, salt resistant materials, and filling up work than any other site. Developing sites with poor land condition is an expensive investment and can be unjustified especially for residential projects at low and medium densities (see Photo 5.8).

Photo 5. 8: Sabkhah, El Thama

A marsh land is assigned for urban uses
Source: own photo, 07-2010

Box 5. 7: Example Three: Poor Land Conditions, El-Thama

The northern side of the industrial area of El-Thama - Site B - covers an area of about 37 hectares, mainly sabkhas. The site is bounded from the south-east by existing industraly area - workshops, sabkhahs from the north-east, the extension of Ahmid El-Muhedui Street from the north-west, and the 5th ring road on the south-west (Figure 5.14 and Photo 5.9). The site is classified by the layout plan as light industry - workshops, where it is subdivided into 248 land plots, of 600 m² each with streets ranging from 20 to 40 metres wide.

Land plots are available for lease since the early 1990's for 0.6 LD per m² a year - a convenient rent based on the fixed rent index for public properties. However, filling up the site by the use of waste is a costly and time consuming task. Clearly, provision of an infrastructure will be more expensive than any normal project and therefore the future rental returns could only cover a fraction of these costs. Moreover, future investments in the area are expected to face problems such as high construction costs, high levels of corrosion and lack of public services as is the case in the existing area - part A. Nevertheless, there is currently a planning proposal to move the whole industrial area to a new greenfield site about 15 km to the north-east of the city.

Figure-5. 14: Marsh Land, the industrial Area of Al-Thama

Source: Google earth, 02.2011

Photo 5. 9: Marsh Land, Al-Thama Area

The filling up works with use rubbish
Source: Own photo, 07-2010

5.11.3. A Fragile Economy

An unstable national economy since the 1980s has led to a widespread public debt, which in 1997 accounted for 65% of the GDP, while the exchange rate of LD sank against the US$ from 0.29LD /1US$ in 1990, to 0.52LD /1US$ in 2000 (Alzeni, 2000). Currently, the fixed exchange rate is 1.25LD/1US$.

Most activities of the public sector were deeply affected by the lack of funding. According to the Planning Department of the local authority in Benghazi (Fyath, 2003), until 2002 almost all phases of the technical infrastructure had been delayed by about 42.5%, mainly due to shortages of financial resources (see Photo 5.10). Currently, many infrastructure projects are struggling to survive due to lack of payment, and also political instability. Moreover, the construction industry has been impacted as well by a lack of funding. While the costs of labour and materials have increased sharply over the previous two decades, mortgages remained until recently unchanged, and fixed at an upper ceiling level of 60,000LD (Libyan National Bank), a figure which is even below the subsidised value of about 80,000LD per dwelling provided by the national housing scheme in partnership with the private sector.

Photo 5. 10: Unfinished Streets, El-Salmani Area

Source: own photo; 07-2010

The property market has not fared any better. In addition to the limited purchasing capacity for people, investors in the housing sector are also challenged by legislative and administrative constraints including an unregulated rental market and a high transaction tax which reach 10% of the exchange value (Law 16, in: public news paper No. 2, pp.50-64, 1998, that modified some terms of the law No. 65, 1973,

concerning Stamp Tax). Indeed, these obstacles took their toll on many investors, who in many cases either do suspended or cancelled their projects. In an inflationary economy savings in land become a worthwhile business; however, keeping land out of the market can even deepen the problems of shortage of building lands and limit the use of already extant services and utility networks.

A study by the Planning Department of Local Authority in 2003 shows that about 80% of vacant land is inaccessible for development due to different factors, including the above mentioned issues of disputes over land rights, poor land conditions and land speculations which top the list (Fyath, 2003). As they try to overcome these difficulties, public authorities have, in many cases, taken decisions for re-zoning and the acquisition of green fields, which in turn leads to more fragmented development within the city and on its outskirts. In addition, opening new developments in areas of unfinished or no civic infrastructure can only bring about low quality environment.

5.11.4. Acquisition of New Land

In order to overcome constraints such as land disputes, unsuitable land conditions or even to avoid long administrative procedures, both private and public sectors, have frequently followed the easiest route of investing in land outside urban boundaries in the greenbelt zone and the countryside. However, formal or informal development on the outskirts, in addition to its direct impact on natural environment and agriculture, also drains the city of its people and resources.

Figure-5. 15: **New Residential District, Jerdiena**
A public housing project is currently under construction located 20km south-east of the urban edge of Benghazi.
Source: google Earth, 12. 01. 2013

Box 5. 8: Example Four: A Greenfield Development - The housing project of El-Rehaba

El-Rahbah site is a housing project built on the greenbelt zone and covers 75.0 hectares. The site is a previous military camp located adjacent to the junction of Al-Auroba and the 5th ring roads; the ground is levelled and consists of brittle lime rocks, close to sensitive areas of ground cavities and natural lakes (Figure 5.16 and Photo 5.11).

The decision, which was taken in the mid 1990's to build this housing project on the greenbelt zone, was a response to the unsatisfied demand for building land for the national housing scheme in spite of the vast undeveloped land within the urban area, most of it being inaccessible for development.

Figure-5. 16: A Greenfield Development - housing project of El-Rehaba allocated in the green-belt zone

Source: Google earth; accessed in 7.02. 2011

Photo 5. 11: A Residential Project in the Green-belt; Al-Rehbah

The multi-family housing project built on a previous military camp in the green-belt zone
Source: own photo; 07-2010

5.11.5. Informal Land Market

Informal development by the private sector accounts for about 10% of the housing stock in the whole metropolitan area of Benghazi (University of Garyounis, 2007). Informal buildings occupy the empty urban zones and spread outside the city's boundaries in scattered locations of existing villages or alongside main roads such as the airport road to the east and the coastal roads to the north and south of the city (see Photo 5.12). Although informal development has been perceived as a violation of planning regulations, it does, to a certain extent, provide an affordable alternative for many people, as it helps people to overcome problems such as the scarcity of building land, delays of housing and infrastructure projects and high transaction costs.

Generally, informal development within this context refers to unauthorised construction regardless of ownership or physical condition, and includes private subdivisions of different sizes and sometimes unpleasant mix of uses. in many cases informal sites do have either formal or informal access to basic services such as water, electricity and social facilities, and are served with dirt roads but lack sewage connections. However, it is clear that informal sites have become attractive alternatives for poor and rich alike.

On the one hand, high income people may become interested in buying a parcel of land not less than half a hectare just outside the planned area, which can then be registered as farmland and apply for permission for a farm house, fence, and public service connections. The resulting registration documents offer a level of security, which may be used to construct a modern "villa type" building with large floor space. On the other hand, for lower income people, there is always an opportunity of owning building land in informal subdivisions of an average of 500 sq m at a low price but with informal documents, which can then be built upon gradually and used for both living and private business.

Photo 5. 12: Informal Developments Alongside the Airport Road; Bu-Atnie area

Source: Own Photo; 07-2010

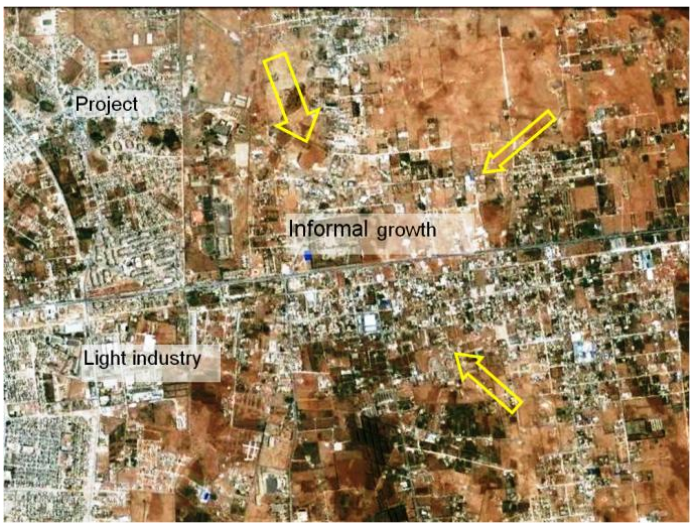
Box 5. 9: Example Five: Linear Expansion Alongside Arterial Roads, Bu Atnie Area

The development is informal on agricultral land. It extends parallel to both sides of the airport road to the east of the city. The main food industry in the formal part of the area has attracted different land uses including labourer's accommodation, private housing, small factories and warehouses. Informal developments occupy areas of the master plan classified as light industry and greenbelt and continue to cover large areas of the countryside (see Figure 5.17).

It is noted that, lack of collaboration between planning and agriculture agencies to enforce the law, in addition to the provision of basic services such as roads, water, electricity and social services by other authorities have played a part in the increase of urban sprawl. The resulting informal areas are characterised by an unbalanced mix of uses, and scattered low density development, which consume agricultural land and is expensive to upgrade.

Figure-5. 17: Urban Expansions Alongside the Airport Road, Bu-Atnie Area

Source: Google earth; accessed in 5.02.2011



5.12. Conclusion: *Urban Fragmentation*

The early development of the city and its overall structure has been, in part, a result of unique natural characteristics and historical events. Indeed, while it can be argued that the balanced semi-circular form of the city is a success story, at the local level, the formation of residential areas made up of various typologies and densities has been to an extent accidental, which in many cases were incomplete and fragmented.

The official definition of urban sprawl, as nothing more than a result of outward informal development and a lack of management is incomplete in that it only describes part of the reality and omits any reference to the crucial role of planning theory and practice. However, in line with the objectives of sustainable development, this study places emphasis on a definition for urban sprawl that is not limited to informal and outward expansion, but also covers different patterns of low density and fragmented developments at various urban levels from neighbourhood to the urban region.

The general observations show that urban sprawl within and outside the urban boundaries of Benghazi, whether a continual low density growth, scattered nodes of development or ribbons of urban growth alongside main roads, do represent a fragmented, incomplete and disconnected type of development that can contain a wide range of undefined and vacant land. Also, it can be characterised by a scarcity of positive public spaces, the separation of functions, and an unpleasant mix of land uses. Factors that affect the development of urban areas and have played a part in the emergence of urban fragmentation may include outdated planning regulations and the practice of land subdivisions. This is in addition to the lack of collaboration between different projects, lack of information about local conditions, disputes over land rights and delays in infrastructure and plan implementation.

From the practical point of view, urban sprawl affects both natural and built environments. It creates isolated communities; it is expensive to run and is served mainly by private cars. Urban sprawl consumes virgin lands and damages natural ecology and the agriculture. In a region of harsh climate, low quality built

environments can cause health problems, discourage outdoor activities and social contacts and increase energy use for both buildings and transport.

Vacant and residual land, in the city, range in size from small undefined corner plots, empty land parcels and less-used car park to large leftover land and undeveloped urban zones. They are quite often neglected and occupied by informal uses. However, they can be seen as a spare capacity for future intensification and hence a chance for improvement. Real-life investigation demonstrated that the urban plans were poor in design terms. The layout plans were, to an extent, a direct application of abstract zoning criteria, while the case studies of urban intensification illustrate that the process was unplanned and the results were accidental.

The next chapter of field work will build on this experience of urban sprawl in Benghazi by examining the sustainability of different local areas in the city, evaluating the quality of public space, and identifying and highlighting the causal relationships between the characteristics of different urban types and their sustainability performance; essential information in order to improve the practice of urban planning and design. Urban planning should go beyond the space provision approach, and addresses the concerns of environmental and social sustainability in relation to urban design based on local practice, capacity and needs.

Chapter Six

Case Studies and Main Findings

6.1. Introduction

Based on the results of the last chapter and definition of the phenomenon of urban fragmentation in Benghazi and its wider context, this chapter covers the second stage of field works that investigates the causal relationships between the quality of different urban typologies and their sustainability performance. A multi-method survey strategy has been employed to obtain data on different urban patterns and their quality that involves techniques of direct-observation and map analysis, in addition to secondary sources.

This chapter presents the case studies and main findings. It is divided into two parts: the first part investigates the physical characteristics of eleven case studies and examines their performance in terms of sustainability and urban quality, while the second part focuses on the influence of urban environment on human activities in the public space in four case studies.

Photo 6. 1: Bird's-eye View, Benghazi
Urban expansion in a fragile landscape
Source: Own photo, 2007

Part One: Understanding the Urban Form

6.2. Introduction

The general classification of urban typologies in the metropolitan area, based on the leading building type, has identified four main categories of urban forms: the two dense types of courtyard and terraced buildings which are concentrated in the inner zones bounded by the third ring road; the third group of lower density developments consisting mainly of detached buildings that dominates the outer zones of the city; and super-blocks of multi-family buildings that are spread out over different locations in the city. However, most developments outside the fifth ring road are informal, scattered and contain various types of buildings – see Photo 6.1.

Based on this classification and an understanding of other issues uncovered through the initial survey, eleven case studies have been selected for further investigation (see Table 4.1). This part of the current chapter presents the results of the case by-case surveys. The investigation of the eleven case studies offers valuable information about the spatial characteristics of each type of development and its qualities. Comparison of case studies will be a useful tool to reflect on the proposition that compact urbanism is a more sustainable type of development in Benghazi and its wider region.

6.3. The Case Studies

The survey of eleven residential case studies has offered valuable data for an in-depth study. Data has been gathered to cover urban layout, physical form and the capability of each case study to meet future needs. Neighbourhoods are defined by their urban patterns; main streets; location of existing or planned public services; residential density and leading-building type. However, they can be influenced by their location in relation to the central area, main road network and the size of reserved and vacant land.

Site surveys included the observation of urban characteristics and qualities, and measurements of street profiles, housing density and building heights, while information on physical parameters have been collected through map analysis. Other complementary sources of data included unstructured interviews, public documents and other publications. Basic information and analysis of data for each case study have been presented in this section in order to draw a general picture of the *status quo* and facilitate the evaluation of the sustainability of local environments.

- **Site One: Burniq**

Burniq is the historic quarter of Benghazi city, distinctive for its compact irregular form of a distorted grid of narrow streets extending from the north-west to south-east to attract sea breezes (see Figure 6.1). Factors such as changes in lifestyle and progress in construction and transport technology have influenced the area, which has long been subject to a continual process of piecemeal redevelopment.

At the level of individual buildings, demand for more living space and climatically protected indoors have been crucial factors for the change in building design. For instance, when a central courtyard is replaced by a lateral courtyard or light-well, for the purpose of targeting better indoor air-control and an opportunity for vertical intensification, the courtyard loses its importance as a family space. However, at the community level, lack of public open-spaces in core areas quite often poses a challenge to their upgrade, whereas the scattered pieces of land gained for car parking and green spaces are below the requirements of planning standards and are far from sufficient for social activities (see: the planning standards for residential areas in (UPA, 1982)).

The surveyed housing site of 2.18 hectares (Figure 6.2) consists of irregular narrow blocks served by narrow streets ranging from 4.0 to 7.0 metres wide. Approximately 64% of the site area is occupied by 76 courtyard buildings of varying size and height. Buildings are single and multi-family; many of them have secondary uses, especially on the ground floor – these secondary uses include garages, shops and offices. In general, net-residential density can be estimated at 140 dwellings per hectare - i.e.

about four dwellings per building, based on the observation that in the core area on average, buildings on inner streets are three storeys high, whereas those on main streets range from four to eight storeys.

The process of redevelopment has been a direct response to changes of human needs, in addition to different investment opportunities and the benefits gained from advances in construction technology such as the use of reinforced concrete. This has resulted in the rearrangement of land parcels through subdividing or merging them and the vertical intensification of the area. However, the core area has lost much of its inherited characteristics due to interventions such as changes in building types, the widening of some narrow streets and the provision of car parks (see Photos 6.2, 6.3 and 6.4).

Nevertheless, in spite of the process of reconstruction and intensification, which has brought about a mix of building types and relatively more crowded public spaces, the historical area can be credited for its liveable public space; characterised by deep envelopes which protect people by providing shadow and attracting sea breezes (see Figure 6.3 and also Figure 2.3 regarding sun elevation in Benghazi).

Figure 6. 1: Satellite Image for Site One- Burniq

Compact form of distorted grid and courtyard buildings
Source: The Urban Planning Agency, 2006

Figure 6. 2: Layout Plan, Site One - Burniq

Source: Based on the Municipality map 1978; updated through site visits

Photo 6. 2: Redevelopment, Site One- Burniq

Urban clearance and redevelopment programs were a main cause of changes in land uses and urban scale
Source: Own Photo, 2012

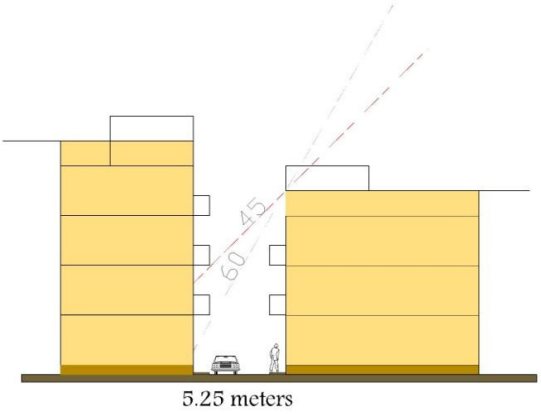


Figure 6. 3: Street Cross-section, Site One- Burniq

Photo 6. 3: Narrow Street, Site One - Burniq

Mix of building types and qualities
Source: Own photo, 2010

Photo 6. 4: Street Elements, Site One - Burniq

A semi-private space is created on the street. which may also be positive to walking. That, when cars park close to the walls, people may need to negotiate the traffic in middle of the street
Source: Own Photo, 2012

The attached floor plan (Figure 6.4 and Photo 6.5) is an example of contemporary courtyard building on an area of 67 m² of land and a total floor area about 232.6 m²; or a floor area ratio "FAR" of about 3.5. This four-storey building consists of a shop on the ground floor and three one-bedroom flats on the upper floors. Although, buildings of the core area are exempted from some requirements of the building code such as minimum size of land parcel, they often fall short of meeting other codes such as the minimum floor space per dwelling of 60 m² in areas classified as high density "R7" and the maximum building height, which should not exceed a ratio of 1.5 relative to the street width - i.e. a slope of 60° (see: the Land Use Regulation (Libya-GOV, 1996) and Building Code (Libya-GOV, 1971)).

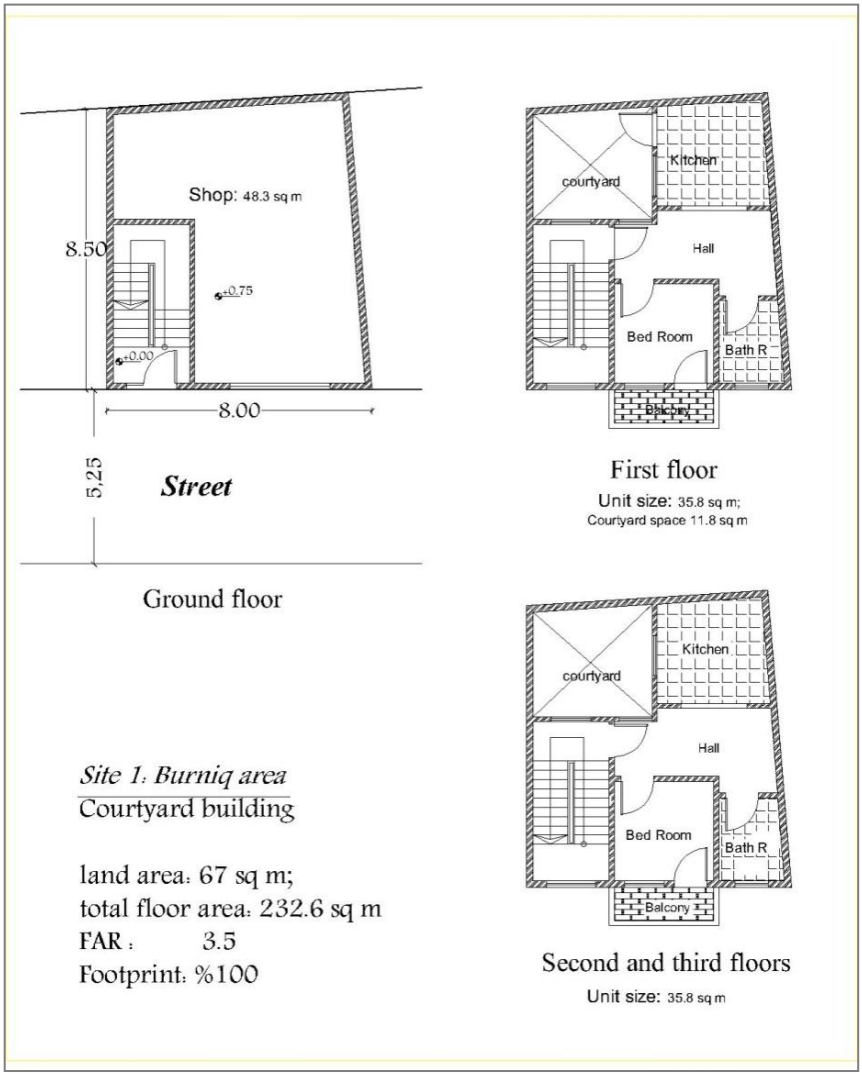


Figure 6. 4: Floor Plans, Site One - Burniq

Four-storeys courtyard building
Source: adapted from as-built plans, UPA, 2010

Photo 6. 5: Local Street, Site One - Burniq

A tree on the narrow street creates a visual divide and defines public realm.
Source: Own Photo, 2012

- **Site Two: El-Andolis-I**

This neighbourhood was originally laid-out in the late 1950s with the aim of offering affordable buildable land to local workers, especially those working for the textile factory located on the northern side of the area (Figure 6.5 and Photo 6.6). The subdivision consists of narrow rectangular blocks and small land parcels of about 100 m² each, served by streets of widths that range from 6.0 to 10.0 metres together with a few small green spaces. The courtyard buildings on this site were built as either one or two storey high. In some cases, two or more land parcels were merged together, in order to be built as two or more independent dwellings at different storeys.

The figure of a net-density for this site of 71 dwellings per hectare, based on an estimated rate of 1.5 dwellings per land parcel, and a ratio of land cover – private to public land use – of approximately 71%. Although they look reasonable when compared with some international indicators, in practice, the resulting amount of public open space of 41.0 m² per dwelling is not enough to provide the needed space for people and their cars. At some times during the day streets become cramped with parked cars, leaving little space for pedestrians and social activities (see Figures 6.6 and 6.7 and Photo 6.7).

On the other hand, when residents complain about the noise on local streets, they refer to it more or less as a lack of privacy, since having windows that open directly onto the street makes them more vulnerable to be watched or heard by strangers. However, building roofs are used as an alternative outdoor space for many households. It is quite common for the roof space to be protected by walls, tiled and used, especially in the summer, as a living space, storage area or for a laundry (Photos 6.8, and 6.9).

The attached example for a courtyard building (Figure 6.7) consists of two separate dwellings built on a combined unit of two small land parcels. It should be noted that the floor area ratio about 1.65 and land parcel with more than one dwelling are very common, although violating planning permissions (see: the Land Use Regulations; (Libya-GOV, 1996)).

Figure 6. 5: Satellite Image, Site Two- El-Anduls-I

A compact form of regular blocks and courtyard buildings
Source: The Urban Planning Agency, 2006

Photo 6. 6: General View, Site Two - El-Andolis-I

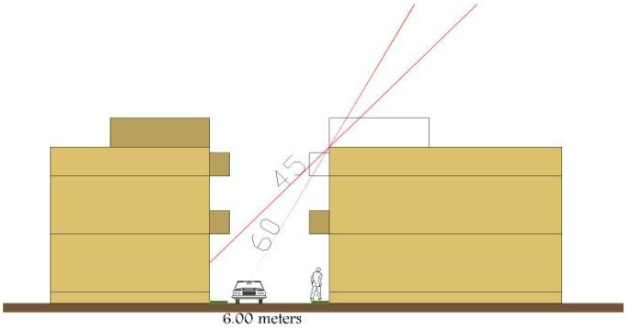
A south-west view for the area shows little variation in building heights.
Source: Own photo, 2010

Photo 6. 7: Public Space, Site Two-El Andolis-I

A parking place is percieved as public space
Source: Own photo; 2012

Figure 6. 6: Cross-section in Narrow Street, Site Two - El-Andolis-I

A ratio 1:1.5 for street width to building height can be described as being balanced, where it creates shadow on the street, but does not hinder sunshine to access buildings



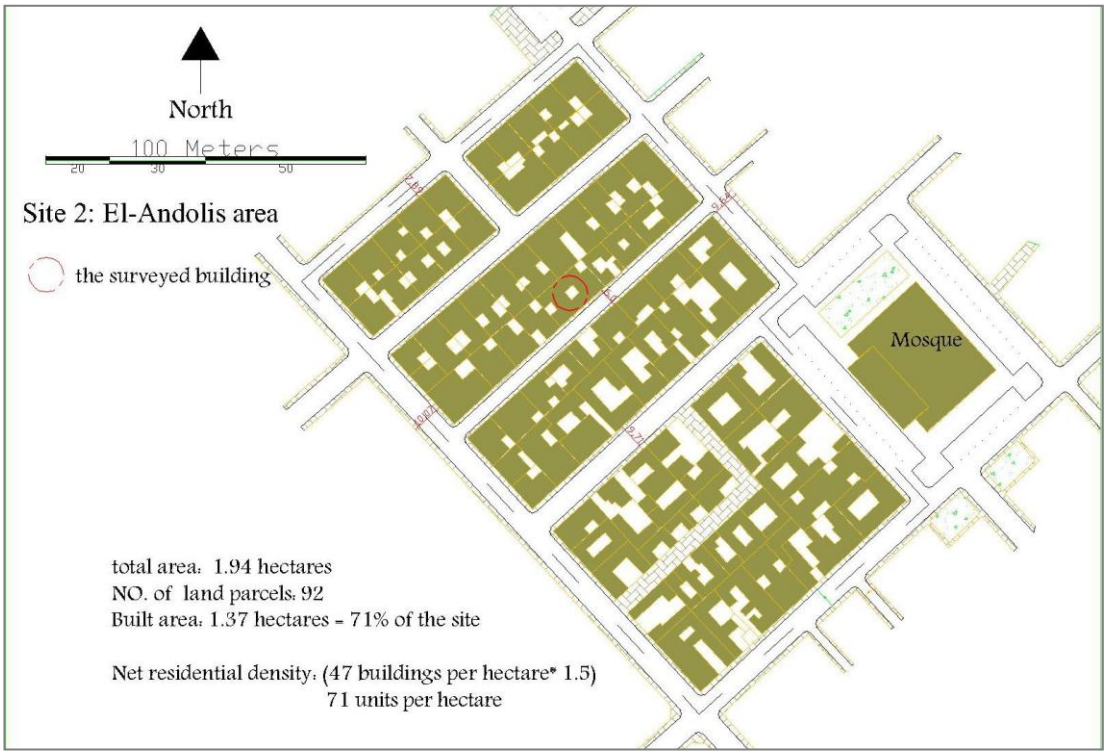


Figure 6. 7: Layout Plan, Site Two - El-Andolis-I

The older part in the southern side of this site contains buildings with central courtyards, which offer larger and more protected private open space than the modern buildings
Source: Based on the Municipality map 1978; updated through site-visits

Photo 6. 8: Local Street, Site Two - El-Andolis-I

Trees and lighting columns takeover on the sidewalk, while people are pushed to walk in middle of the street
Source: Own photo, 2012

Figure 6. 8: Floor Plans, Site Two - El-Andolis-I

The two storey courtyard building consists of two separate dwellings established on two merged land plots
Source: adapted from as-built documents, UPA, 2010

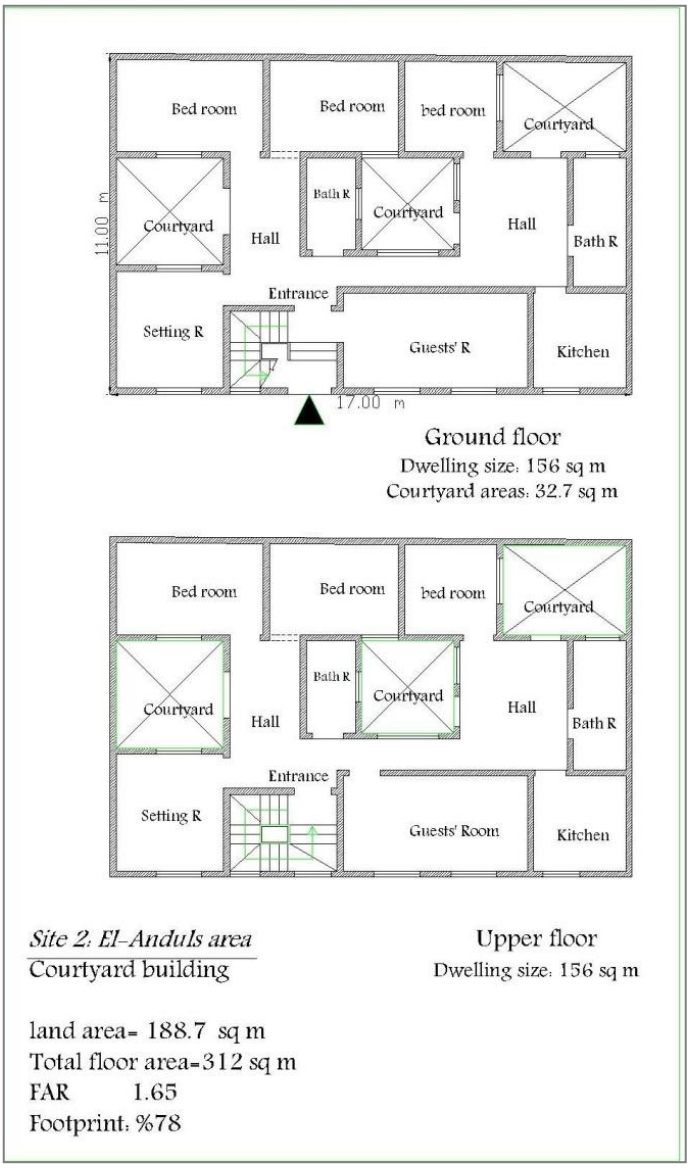


Photo 6. 9: Street View - Site Two- El-Andolis-I

Narrow street with 60cm side walk
Source: Own photo, 2010

➢ Site Three: El-Mukhtar-I

This site, which was assigned in the early 1970s for courtyard buildings, consists of rectangular blocks with a size, on average, of 40 × 144 metres subdivided into land parcels with an area of about 240 m² each and served by local streets about 15.0 metres wide (Figure 6.9). Indeed, this example demonstrates, to an extent, the start of a new period of planning in the country, where the focus was on the provision of spacious streets and larger land parcels with the purpose of improving the quality of the urban environment. The observational study found that, whereas approximately 59% of the site has been assigned to land parcels, the site density was found to be just 25 dwellings per hectare. However, considering that about 50% of buildings consist of at least two dwellings – i.e. in average 1.5 dwelling per land parcel, it can be safely estimated that the net-density is about 38 dwellings per hectare (Figure 6.10 and Photo 6.10).

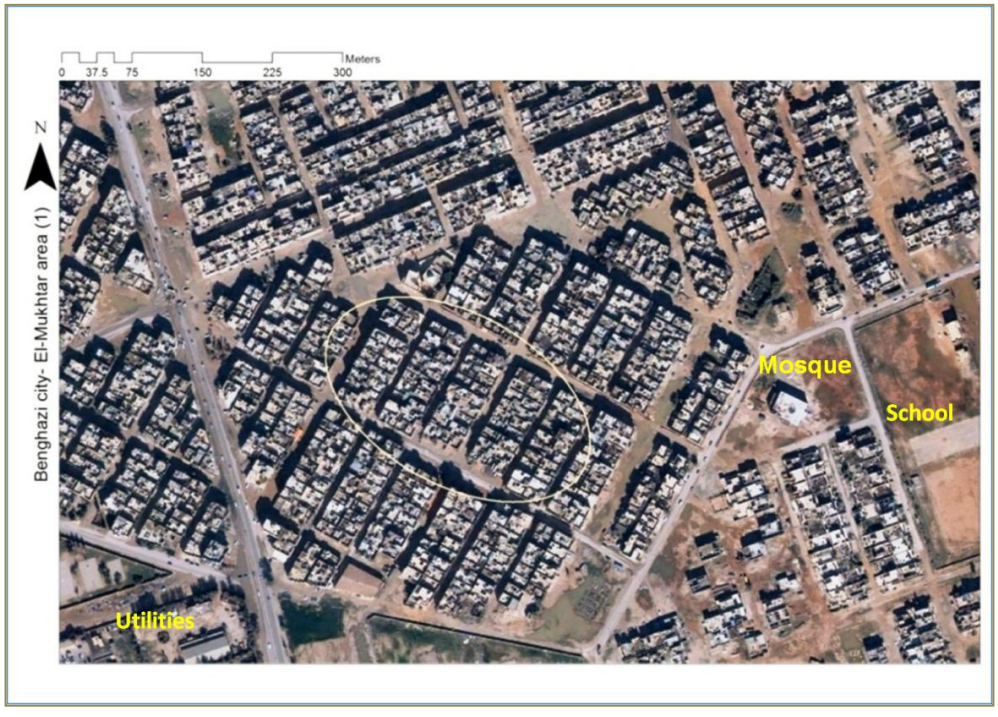


Figure 6. 9: Satellite Image, Site Three - El-Mukhtar-I

Compact form of grid pattern and courtyard buildings
Source: The Urban Planning Agency, 2006

Photo 6. 10: Street and Building Type, Site Three - El-Mukhtar-I

Source: Own photo, 2010

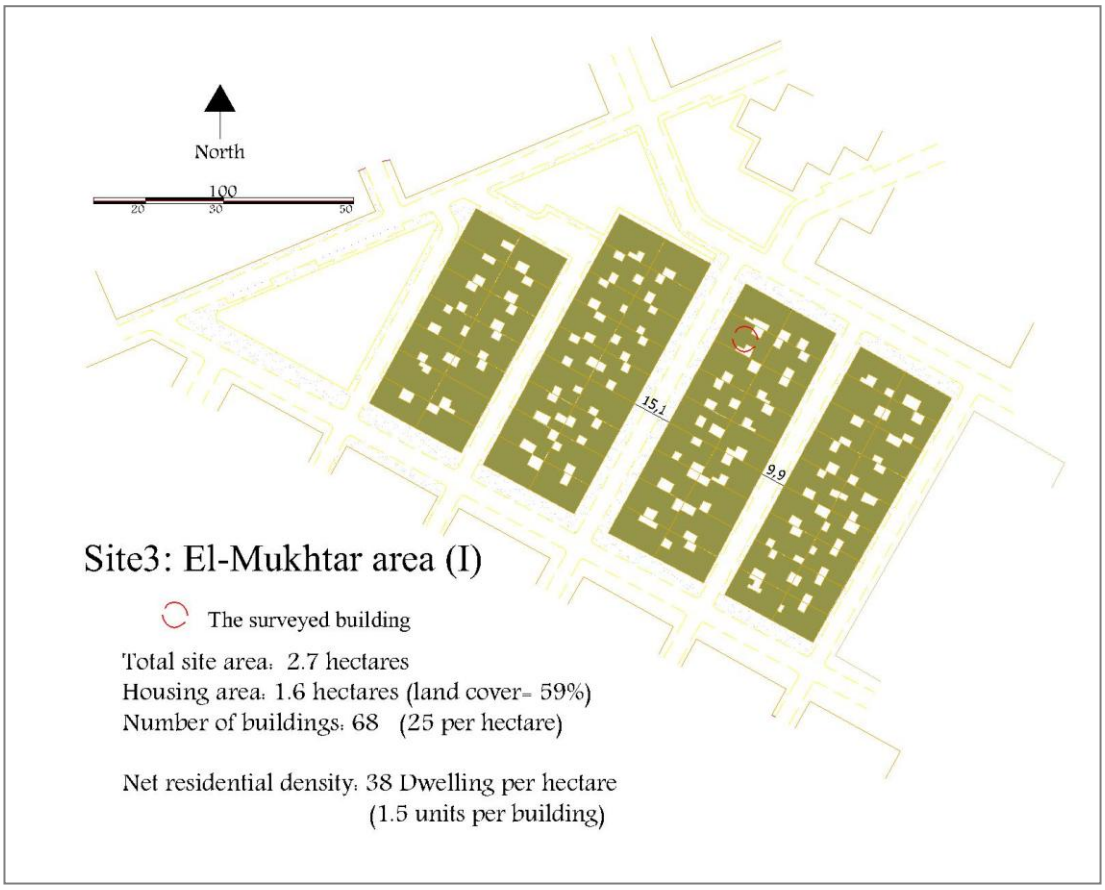


Figure 6. 10: Layout Plan, Site Three - El-Mukhtar-I

Source: Based on the Municipality map 1978; updated through site-visits

The floor-plans (Figure 6.11) show a three-storey courtyard building designed with one-dwelling per floor. However, the floor area ratio for the example is about 1.80, which is more than double the threshold ratio of 0.85 in this R5 zone. Clearly, the floor area ratio overreaches the limits set by the by-laws (the Land Use Regulations (Libya-GOV, 1996)). However, this is but one of the many violations, which can be observed in this and other similar sites (Photo 6.11 and 6.12).

It seems common, especially in the case of courtyard buildings, which might be for social and economic reasons, that buildings are designed, approved and built as one-floor single family dwelling units and only later are more floors added. Generally, in residential areas most buildings on inner streets are one or two storeys, while on the main streets, where there are more investment opportunities, it is quite common for buildings to be up to four storeys in height. Though this is possible from the structural point of view, it can be an issue with regard to health and safety and the design capacity of the civic infrastructure (see Figure 6.12 - the street envelope).

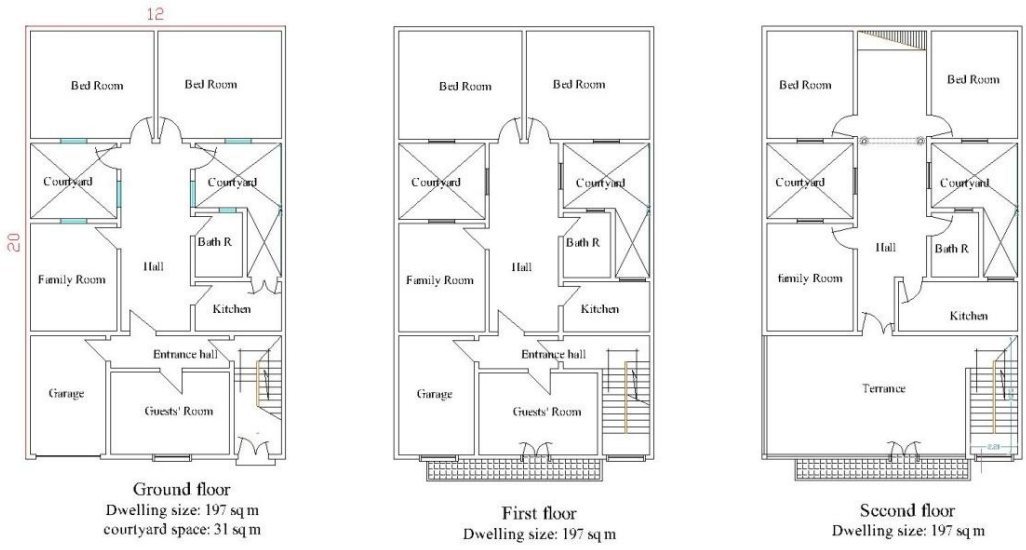


Figure 6. 11: Architectural Floor Plans, Site Three - El-Mukhtar-I

A three storeys courtyard building
Source: adapted from as-built documents, UPA, 2010

Photo 6. 11: Street View, Site Three- El-Mukhtar-I

Unfinshed streets
Source: Own photo, 2010

Photo 6. 12: building type; site three- El-Mukhtar-I

Source: Own photo, 2010

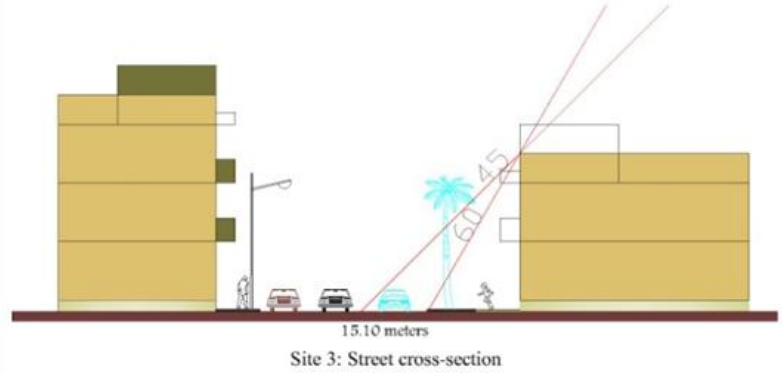


Figure 6. 12: Street Cross-section, Site Three - El-Mukhtar-I

➢ Site Four: El-Salam-I

The site covers about 2.68 hectares and contains 54 duplex-unit buildings that were established in the mid 1970s as part of a social housing project (Figure 6.13). The site plan shows an arrangement of small blocks with front and back streets with a width of about 12 metres each (Figure 6.14). These data values result in a net-density of about 40 dwellings per hectare. Yet 70% of the site area remains as public open space which relates to about 348 m² per building or 174 m² per dwelling. However,

although a large part of the open space looks as though it is green on the plan, many of the open spaces are in reality neglected and have been left vacant for a long time so becoming places for rubbish and source of hazard to the locality. In addition, some people claim that buildings in this site lack an acceptable level of privacy if compared with other locations protected by walled private side-distances, especially if there is more than one facade (Photos 6.13, 6.14, 6.15 and 6.16).

The building presented below consists of two dwellings, each of size 125 m². Each dwelling unit contains two bedrooms, a salon "guestroom", a family-place, a bathroom and kitchen, in addition to courtyard space on the ground floor or a balcony on the upper floor, together with a shared roof space (Figure 6.15). Although the floor area ratio of this design is about 1.88 which is above the value of 0.85 set for this zone of terraced building (the Land Use Regulations (Libya-GOV, 1996)), the design contains the basic elements of a Libyan dwelling, and provides a floor area of 125 m² which is very close to the threshold of 100 m² per dwelling set by the planning authorities (see: the planning standards for residential areas, (UPA, 1982)).

Figure 6. 13: Satellite Image, Site Four - El-Salam-I

Low density area of front and back streets and courtyard buildings
Source: The Urban Planning Agency, 2006

Photo 6. 13: Residential Street, Site Four - El-Salam-I

Dirt-street and the use of outdoor space
Source: Own photo, 2010

Figure 6. 14: Layout Plan, Site Four- El-Salam-I

Source: Based on the Municipality map 1978; updated through site-visits

Photo 6. 14: Back - Common Space, Site Four - El-Salam-I

Source: Own photo, 2010

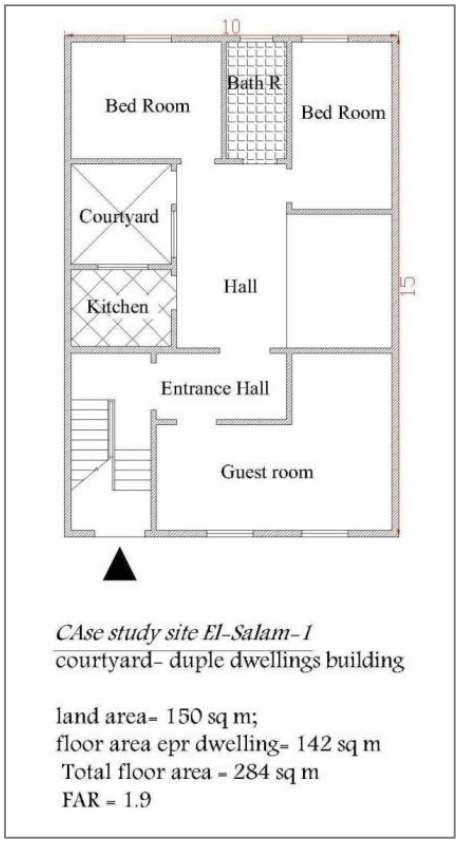


Figure 6. 15: Floor Plan, Site Four - El-Salam-I

Two-sided courtyard building
Source: adapted from as-built documents, UPA, 2010

Photo 6. 15: Building Type, Site Four - El-Salam-I
Vertical intensification
Source: Own photo, 2010

Photo 6. 16: Street View, Site Four - El-Salam-I

Source: Own photo, 2010

- **Site Five: New-Benghazi**

This neighbourhood was initiated through semi-public housing cooperatives in the late 1970s. Although such a mechanism of land subsidy was achieved through a process of land nationalisation, subdivision and then the privatisation of land parcels to individuals or cooperatives, and helped to provide more space for streets and public services. However, the provision and maintenance of public space has been, in itself, a continual challenge mainly due to lack of finance (Figure 6.16 and Photo 6.17).

The housing group covered in this survey is bounded by an arterial road in the north and primary school in the south. It has a total area of about 2.25 hectares and consists of two rectangular blocks divided into 58 land parcels and is served by local streets which are, on average 12 metres wide (Figure 6.17). Applying the same rate used in the previous case study of 1.5 dwellings per building, it can be estimated that the net residential density is about 38 dwellings per hectare. However, whereas almost 56% of the site has been taken up by land parcels, which make the amount of public open space per dwelling approximately 115 m², public green areas are small and seemingly arranged to beautify the layout lines but not for any real social use (Figure 6.18 and Photo 6.18). Nevertheless, private back-gardens together have drawn continual green strips within the blocks, which are interesting and surely make a positive addition to the local environment.

Generally, buildings are of the terraced type with a size of 216 m² each, with front and back gardens. The floor plan shown below (Figure 6.19) is an example for a duplex house with a total floor area of 242 m² and a floor area ratio of 1.12. What makes this example different from the previous ones is that the front and back gardens keep the floor area ratio slightly closer to the permitted level of 0.85. For the street scale and changes in front gardens - see Photos 6.19, 6.20 and 6.21.

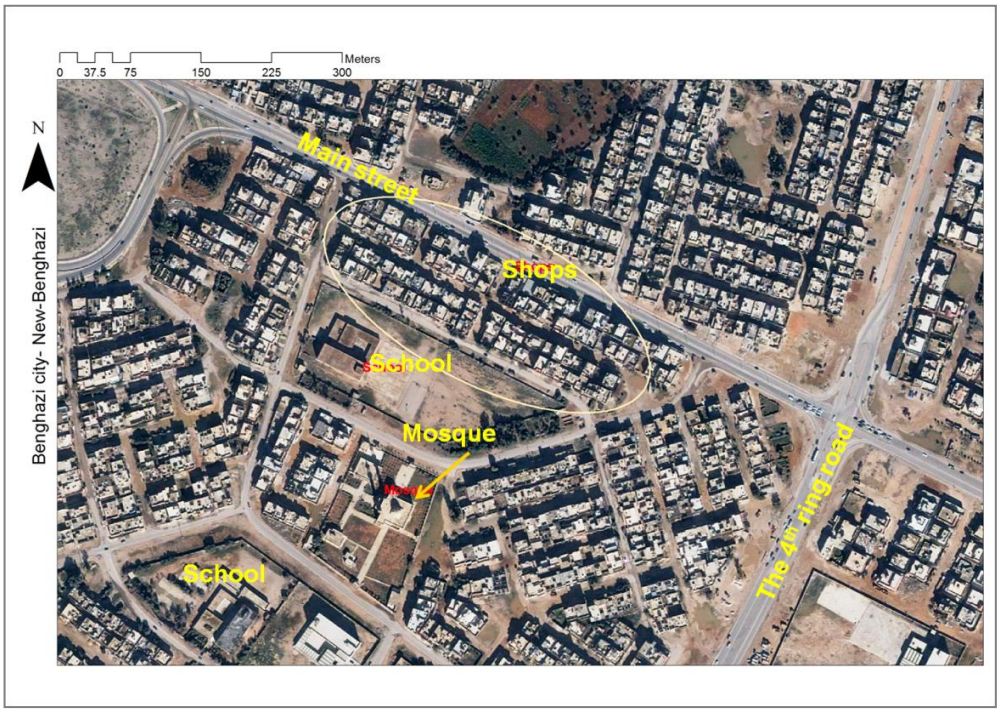


Figure 6. 16: Satellite Image, Site Five - New-Benghazi Area

Moderate density site for Terraced buildings of front and back gardens
Source: The Urban Planning Agency, 2006

Photo 6. 17: General View, Site Five - El- New-Benghazi area

Source: Own photo, 2010

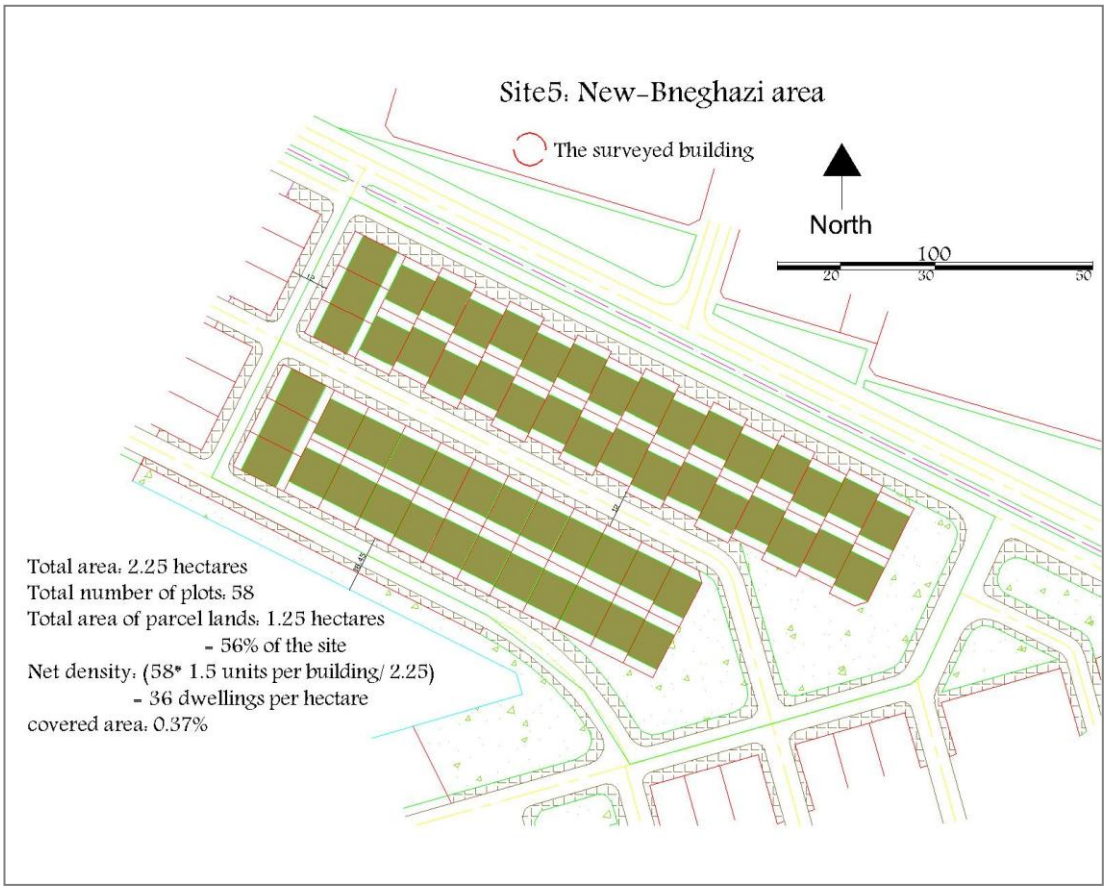


Figure 6. 17: Layout Plan, Site Five - New-Benghazi Area

Source: adopted from Municipality map 1978 & updated through site-visits

Photo 6. 18: Street View, Site Five - New-Benghazi Area

Front gardens are frequently taken-over by informal extensions of the buildings
Source: Own Photo, 2010

Photo 6. 19: High Street, Site Five - El- New-Benghazi Area

Mainly two-storey shops built on the front gardens
Source: Own photo, 2010

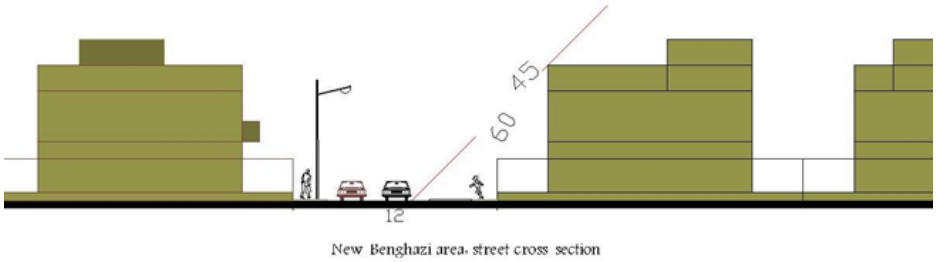


Figure 6. 18: Street Cross-section, Site Five - New-Benghazi Area

Photo 6. 20: Street View, Site Five - El-New-Benghazi Area

Source: Own photo, 2010

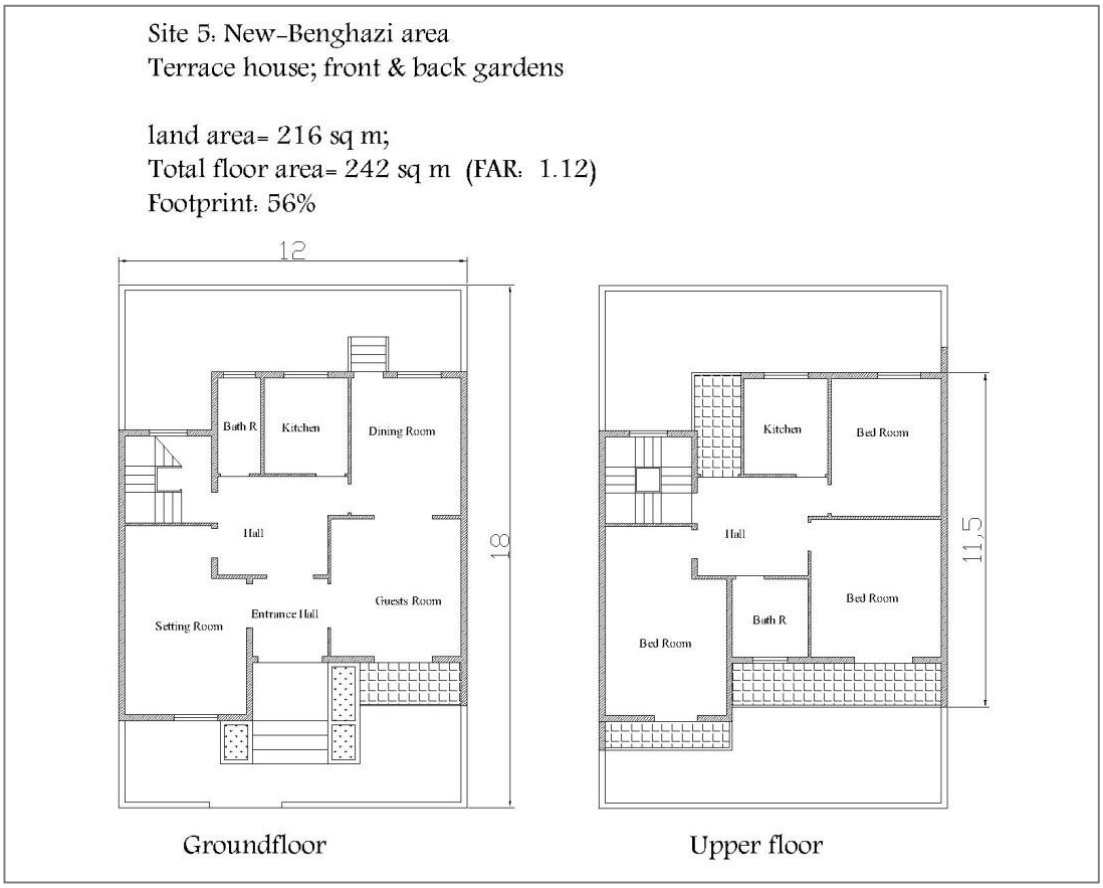


Figure 6. 19: Floor Plans, Site Five - New-Benghazi Area

Source: adapted from as-built documents, UPA, 2010

➢ Site Six: El-Mukhtar-C

Development of this neighbourhood was started in the beginning of the 1990s. The area, which is about 85.5 hectares in size, is bounded by the fourth and fifth ring-roads on the east and west sides and by the extensions of two arterial roads on the other two sides (Figure 6.20). Farm-lands within the area, which were ignored during the planning stage, became a real obstacle during the stage of the plan's implementation. Currently, about 27.7 hectares of the area is inaccessible for development, as they are preserved under law (Law No 15 in 1992 regarding the protection of agriculture land). The remaining area of 57.82 hectares is arranged to contain about 6.1 hectares of public services, comprising a primary school, mosque, utilities and a reserved area of land for future public uses, and residential land plots that range from 500 to 700 m² in area. Although private properties on the eastern side

are almost fully built, the public services are only partially complete and most utility networks are non-existent. One outcome of this has been the installation of private sub-standard connections, but these are costly and unsustainable – see Photo 6.21.

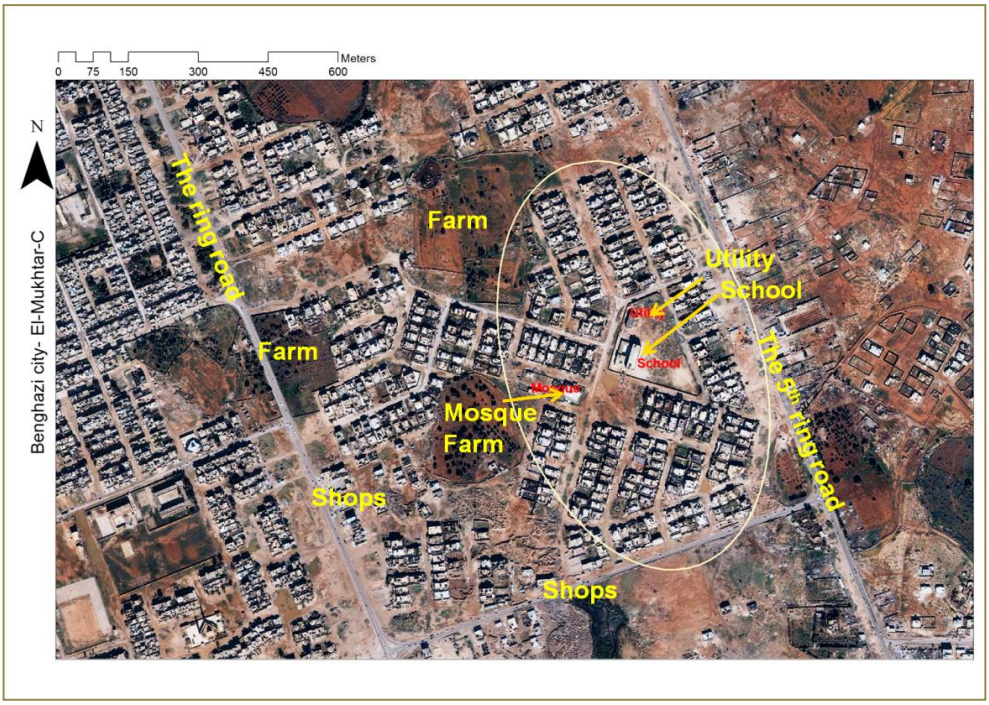


Figure 6. 20: Satellite Image, Site Six - El-Mukhtar-C Area,

Rectangular blocks of detached buildings
Source:, The Urban Planning Agency; 2006

Photo 6. 21: Street View, Site Six - El-Mukhtar-C Area

Wide street and wide facades create large open space per dwelling
Source: Own photo, 2010

The layout plan below (Figure 6.21) shows the eastern part of this neighbourhood, which has a size of about 28.7 hectares, and is subdivided into rectangular blocks with wide streets with an average width of 24 metres and 261 land parcels, with an average size of 700 m², assigned for detached buildings. Although private parcels cover about 64% of the land area, the net-density remains at just 9.1 parcels per hectare or about 15 dwellings per hectare – this is based on the same assumption of 1.5 units per building, which is within the range recommended by planning standards of 12-15 units per hectare for an R1 low density area. However, because most buildings are two storeys high and large in size, they are clearly breaching the maximum permitted floor area which is 50%, set by the land use regulations (see: the Land Use Regulations (Libya-GOV, 1996)) - see Photo 6.22.

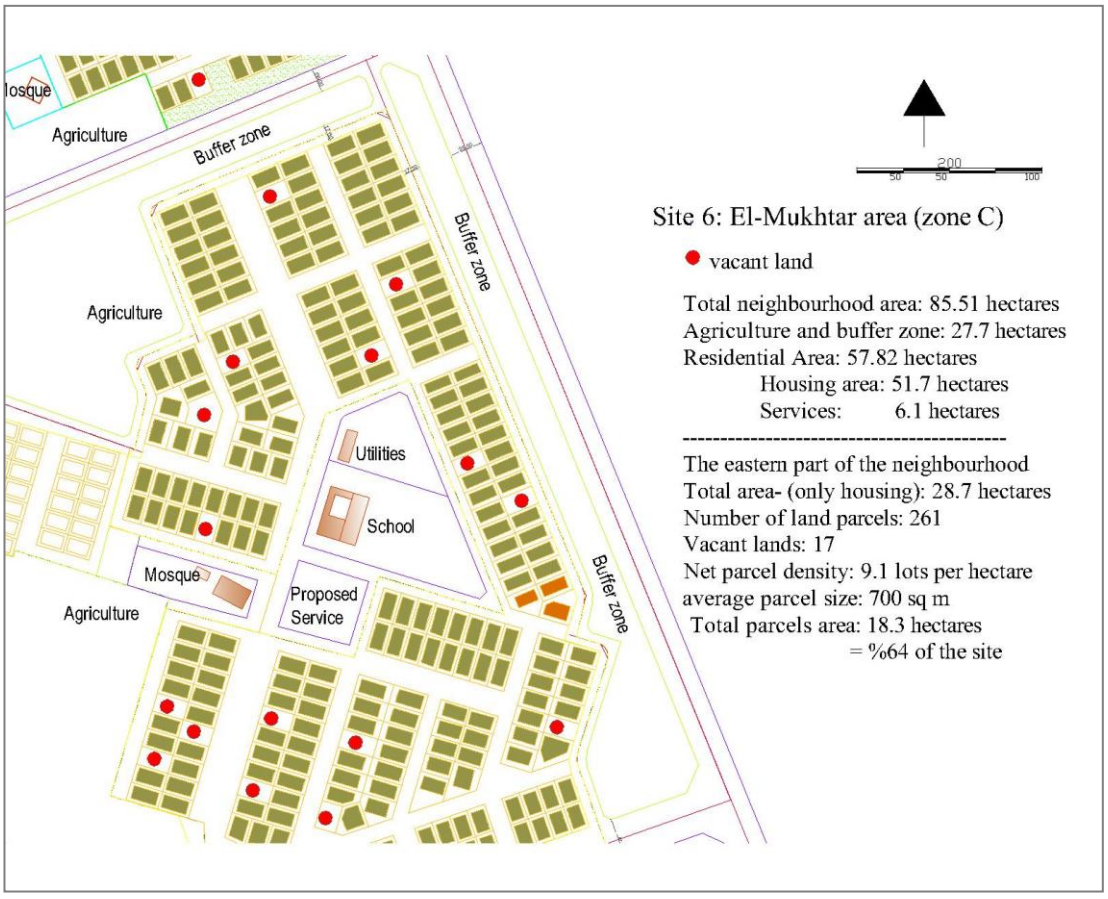


Figure 6. 21: Layout Plan, Site Six - El-Mukhtar-C Area

Source: adopted from Municipality map 1978 & updated through site-visits

Photo 6. 22: General Street View Site Six - El-Mukhtar-C Area

Intensification and un-metalled streets
Source: Own photo, 2010

- **Site Seven: El-Mukhtar-B**

The site is about 11.6 hectares and consists of perimeter blocks with wide streets and a total number of 103 land parcels with an average size of 600 m² (Figures 6.22 and 6.23). However, in spite of the savings in the size of land parcels compared with the previous example, the type of layout plan with common rear-gardens kept the net-density at about 9.0 parcels per hectare or about 14 dwellings per hectare, with parcel coverage of about 53%. The common rear-gardens were left unimplemented and hidden from public view, and turned to be a source of nuisance to residents.

The architectural plans below (Figure 6.24) show that when the land size is above 500 m², it would be easier to build within the limits of floor area ratio, heights and side-distances as set by the planning regulations. However, interestingly, the inclusion of a separate staircase in the example does reflect a desire for future additions, which arguably rooted in people's perception of private ownership and their unawareness of planning regulations – see Photos 6.23 and 6.24.

Figure 6. 22: Satellite Image, Site Seven - El-Mukhtar-B Area,

Perimeter blocks of detached buildings
Source: The Urban Planning Agency

Photo 6. 23: Street View, Site Seven - El-Mukhtar-B Area

Source: Own photo, 2010

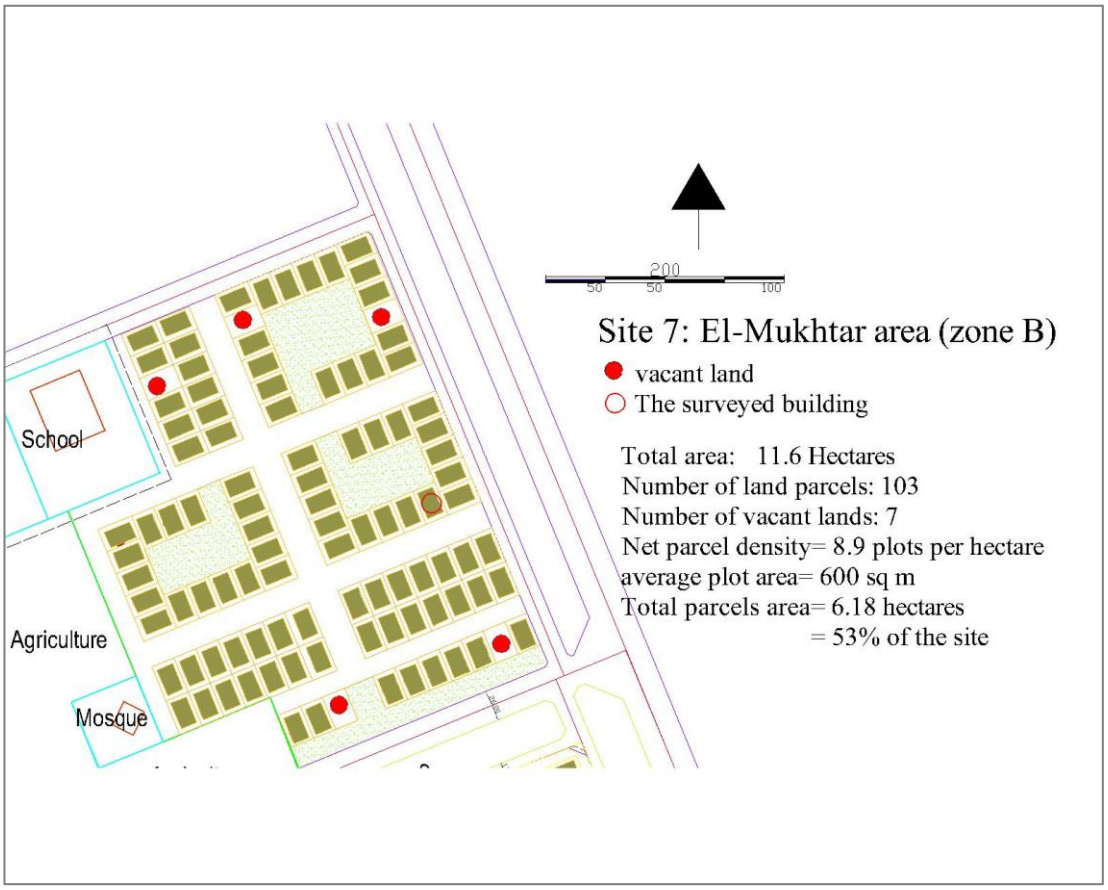


Figure 6. 23: Layout Plan, Site Seven - El Mukhtar-B Area

Source: adopted from Municipality map 1978 & updated through site-visits

Photo 6. 24: Detached Building, Site Seven - El-Mukhtar-B Area

Source: Own photo, 2010

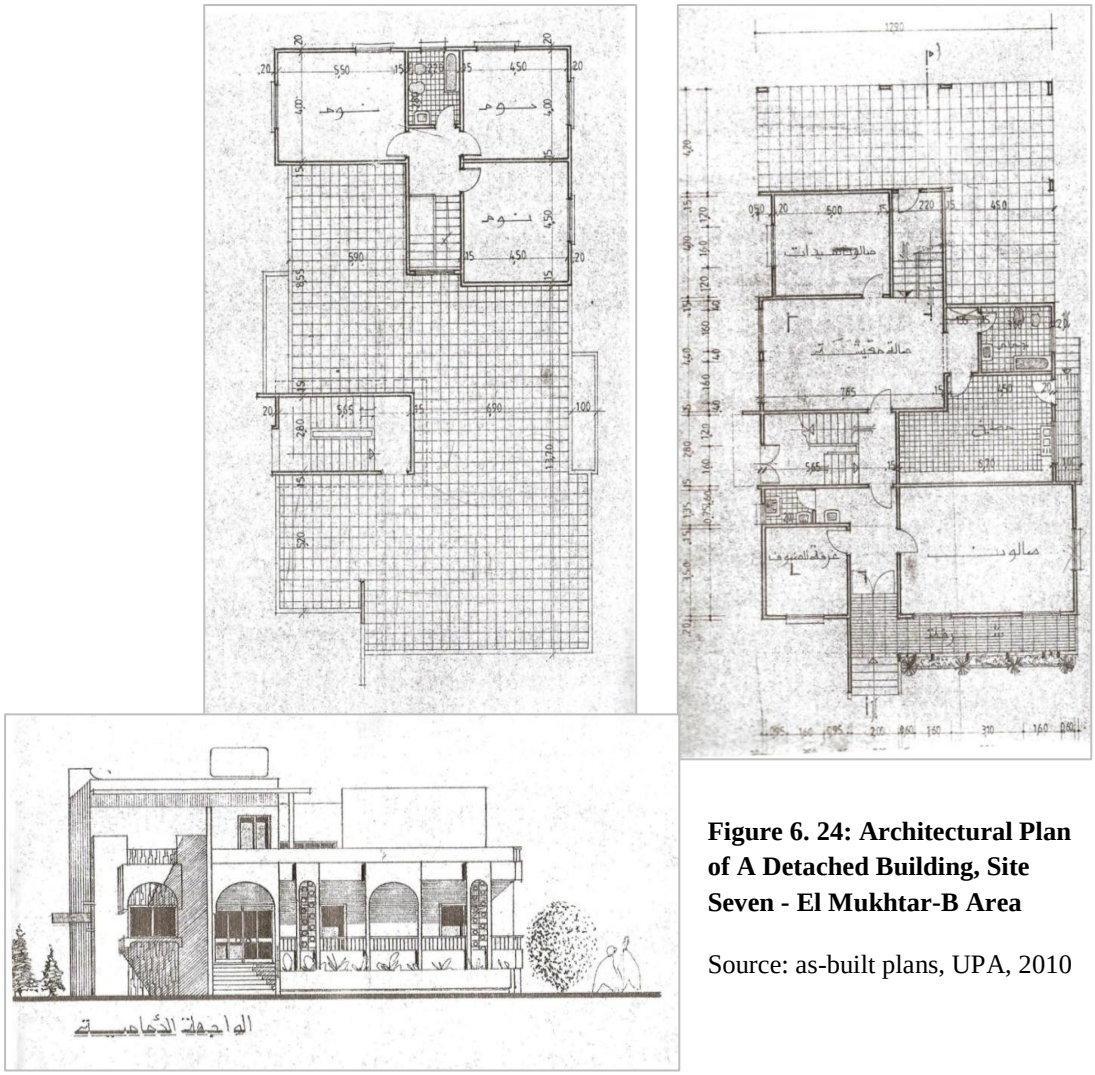


Figure 6. 24: Architectural Plan of A Detached Building, Site Seven - El Mukhtar-B Area

Source: as-built plans, UPA, 2010

- **Site Eight: El-Slawi**

The northern part of the El-Slawi neighbourhood is located at the northern entrance of the city and is bounded by the fifth-ring road from the north-east and by the coastal highway from the north-west. It covers about 31.7 hectares, of which 2.5 hectares is farm-land and 2.1 hectares is public services, made up of a primary school, mosque, shops and utilities (Figure 6.25).

The surveyed housing group (Figure 6.26) has a total area of about 5.9 hectares and consists of 59 land parcels with an average size of 450 m², which are arranged with front and back streets. The density of 10 land parcels per hectare is below the

minimum of 12 set by the planning standards for the low residential zone R2. However, the number of dwellings can be estimated as 15 units per hectare, i.e. 1.5 units per building. Clearly, once again, the layout plan can be considered as the main reason for low density, where the arrangement of cul-de-sacs and back streets results in a parcels' coverage of about 45%, which is less than corresponding values in the two last case studies. However, the proposed green back streets, similar to the back-common gardens of the El-Mukhtar-B area, remain largely undeveloped, unmaintained and continue to pose a nuisance to the surrounding properties – see Photos 6.25, 6.26 and 6.27.

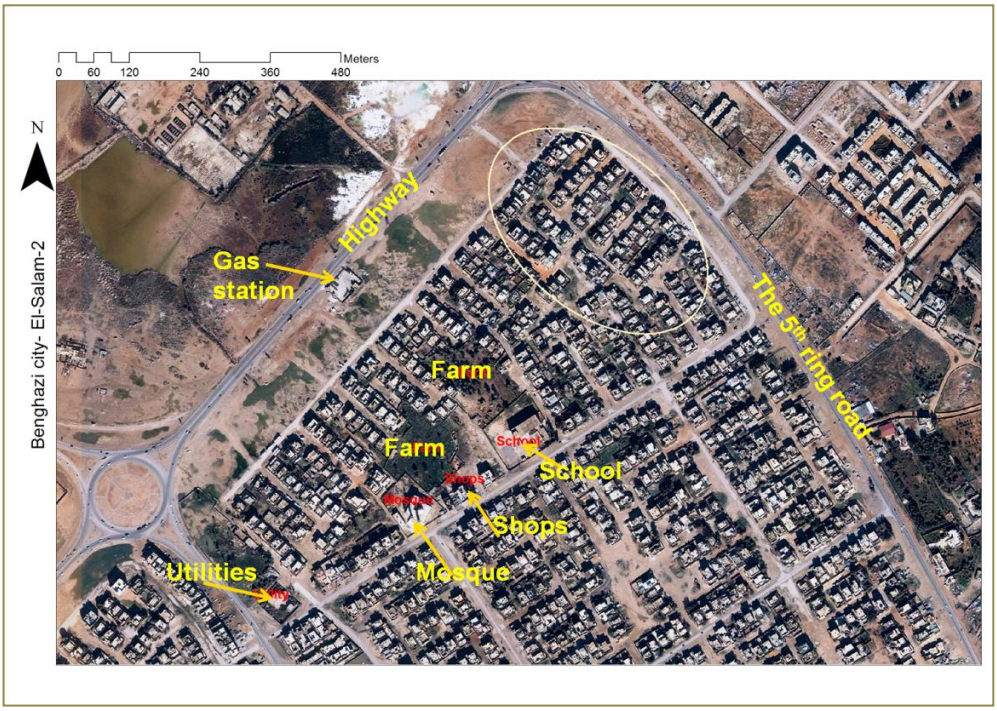


Figure 6. 25: Satellite Image, Site Eight - El-Slaw Area

Low desnity area for detached buildings of front and back streets
Source: the Urban Planning Agency, 2006

Photo 6. 25: Residential-Street, Site Eight - El-Slawi Area

Source: own photo, 2010

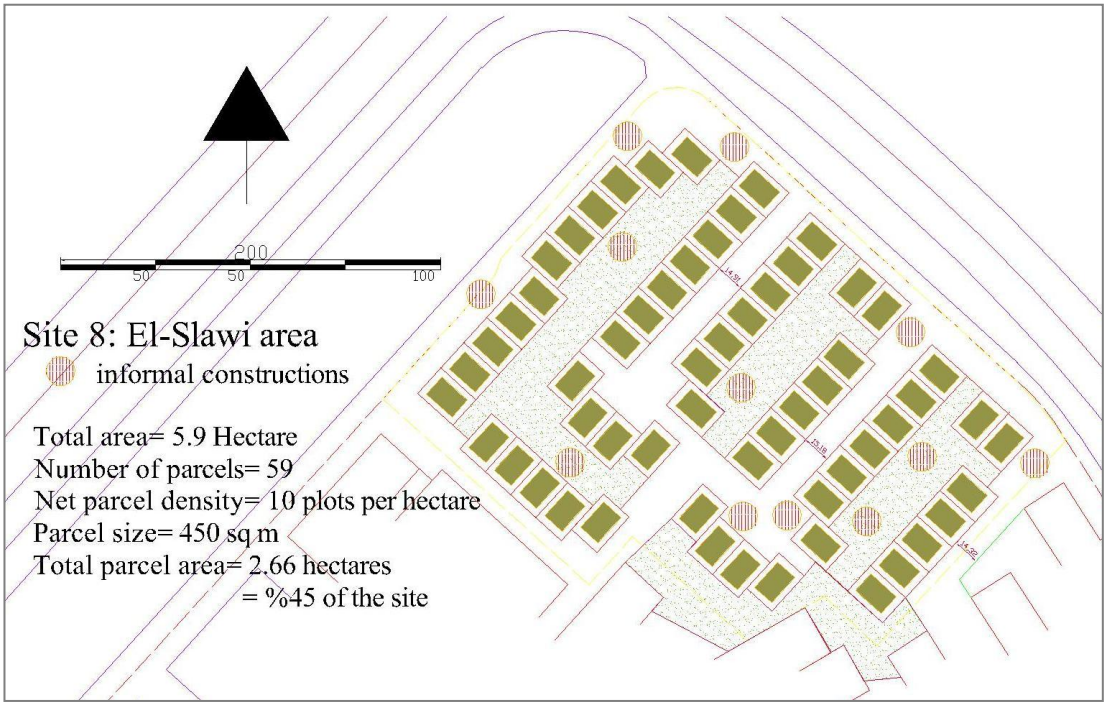


Figure 6. 26: Layout Plan, Site Eight- El- Slawi Area

Source: adopted from Municipality's map 1978 & updated through site-visits

Photo 6. 26: Back Street, Site Eight - El-Slawi Area

Neglected space
Source: own photo, 2010

Photo 6. 27: Detached Building, Site Eight - El-Slawi Area

The newer building extents on the front garden
Source: own photo, 2010

➢ Site Nine: El-Zaetuna

Al-Zaetuna neighbourhood, which is located on the southern side of the city, was first laid-out in the early 1960s to provide rectangular blocks, subdivided into land parcels, for detached buildings ranging from 500 to 1200 m² in area (Figure 6.28). The diagram (Figure 6.27) shows that the perimeter of the surveyed block is about 317 meters, relatively good level of connectivity. Indeed, most zones of the city are based on

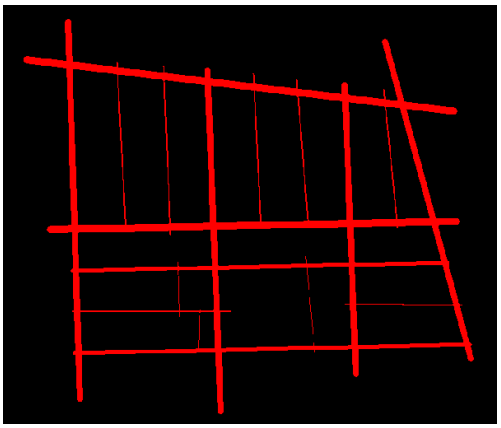


Figure 6. 27: Axes Diagram, Site Nine - El Zaetuna Area

grid pattern, which is historically one of the characteristics of North African cities (Loumi, 1988).

The site is served with metalled roads and sewage; the two utilities that are hardly found in other newer locations. In fact the existence of public services in any neighbourhood depends principally on the implementation programmes planned by local authorities, which were in Benghazi city, designed to follow the ring-roads, with inner areas being served first. With that knowledge, all technical and social infrastructures are funded by the public treasury, with the natural conclusion that it is always the government, which is to blame for the delay of implementation works.

The surveyed site was of two residential blocks that cover about 5.67 hectares, of which 4.17 hectares - i.e. 74% of the site - is private land; subdivided into 41 land parcels, or about seven parcels per hectare (Figure 6.29). By applying the same ratio of 1.5 dwellings per building suggested previously, the net residential density can be estimated as 11 dwellings per hectare, which is lower than all the preceding case studies. In this case, it is clearly not the layout but the size of the land parcels that is responsible for the low density. However, it is observed that quite often empty parcels and those subject to redevelopment were subdivided into land parcels ranging in size from 450 to 700 m², whereas many existing large buildings are occupied by extended families – see Photos 6.28 and 6.29.

The detached duplex-building plan presented below (Figure 6.30), does to some extent, demonstrate a typical design. However, it was the size of the land parcel which helped to bring the floor area ratio of this building to a level below the 50% required by the planning regulations. Also, within this context, the additional constructions detached from the main building quite often consumed large parts of the garden and in some cases even violated the idea of a stand-alone building.

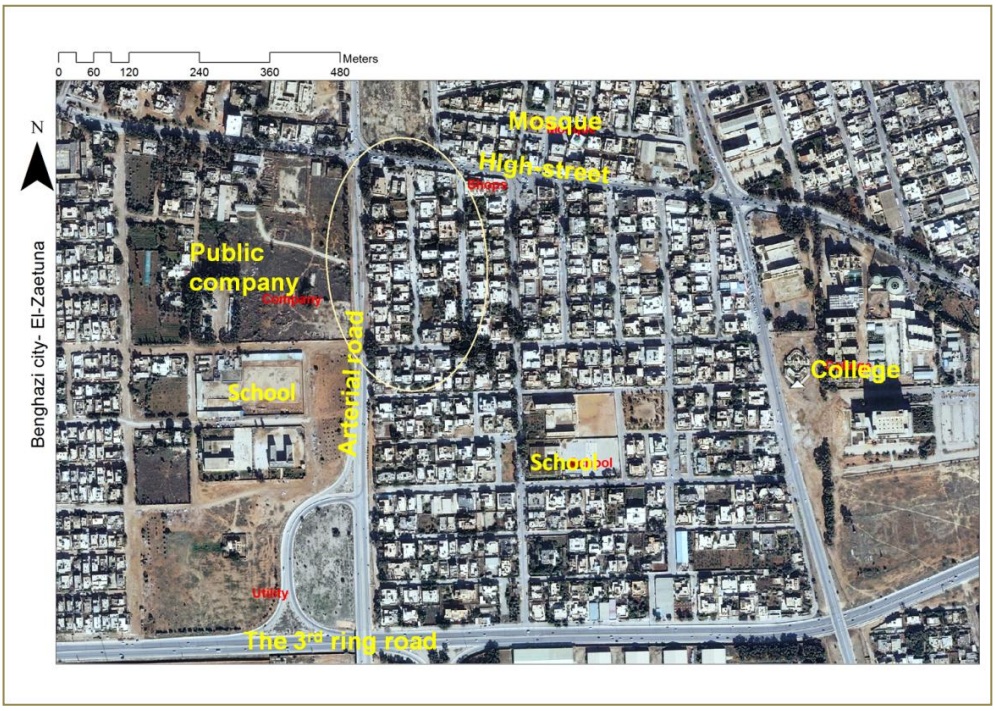


Figure 6. 28: Satellite Image, Site Nine - El Zaetuna Area

Low density arrangements of rectangular blocks and detached buildings
Source: The Urban Planning Agency, 2006

Photo 6. 28: Local Street, Site Nine – El-Zaetuna Area

Large asphalt surface, apparently because of availability of space, not traffic requirements
Source: own photo, 2010

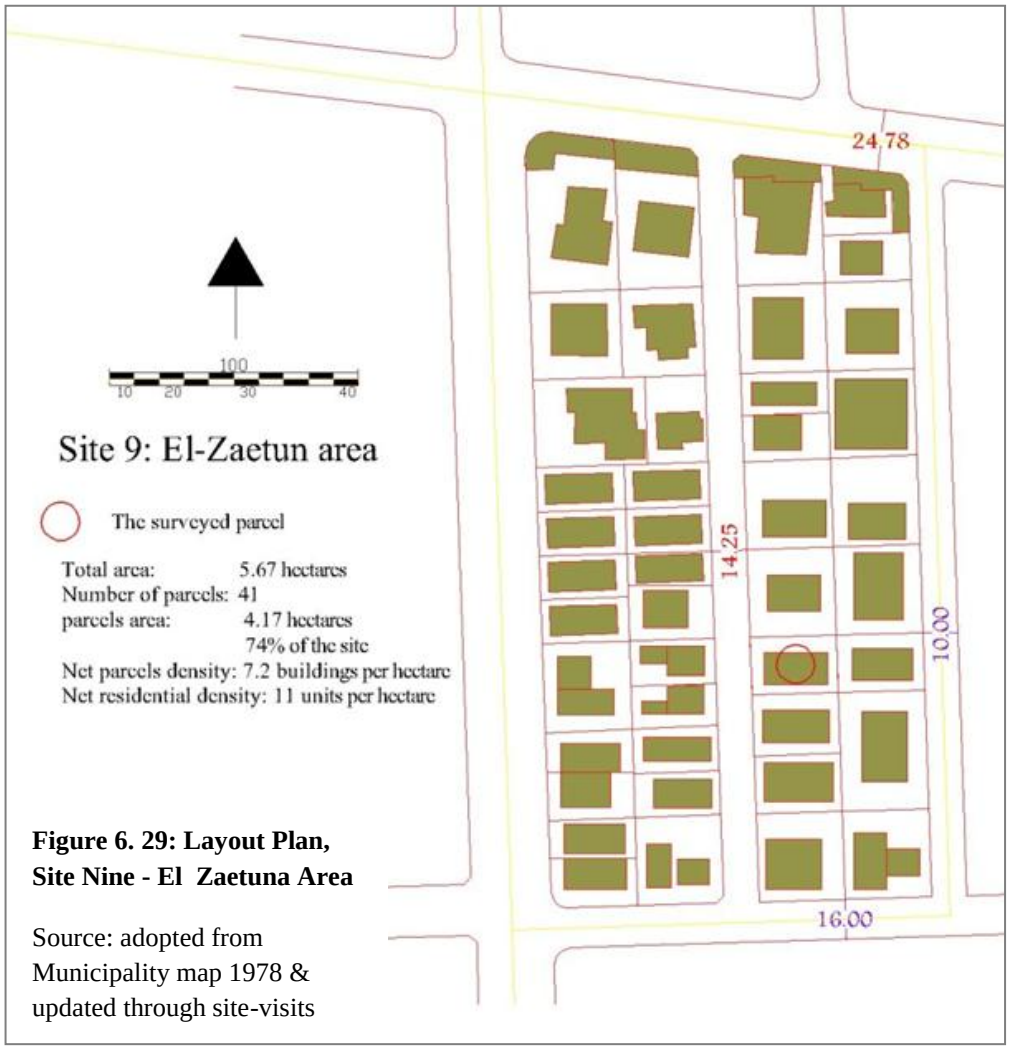


Figure 6. 29: Layout Plan, Site Nine - El Zaetuna Area

Source: adopted from Municipality map 1978 & updated through site-visits

Photo 6. 29: Shopping Street, Site Nine – El-Zaetuna Area

Source: own photo, 2010

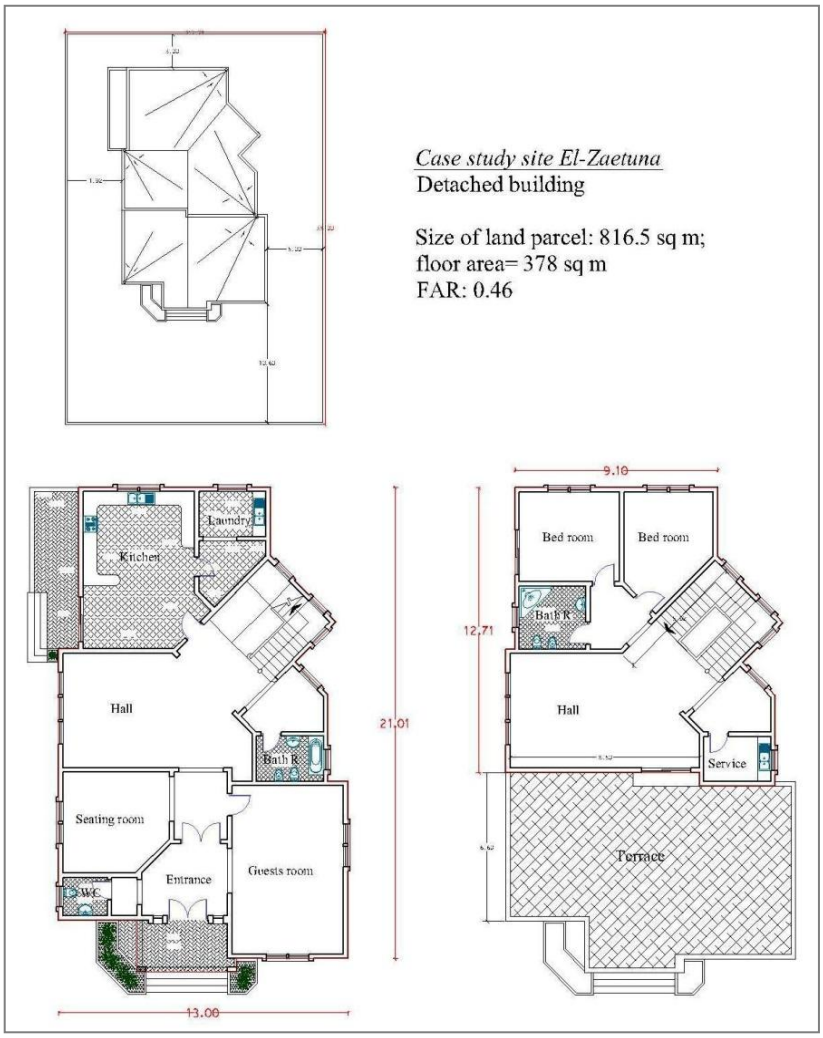


Figure 6. 30: Architectural Plans, Site Nine - El Zaetun Area

Large part of the garden space is taken over by additions including garage, storage rooms and shop.
Source: as-built plans, UPA, 2010

- **Site Ten: El Andolis-II, and Site Eleven: Ali Ben Talib**

Both sites of multi-family buildings can be described as sparse urban grids of low- and medium-rise buildings, where the buildings are arranged to keep large parts of the land un-built and allow for parking streets distinctive from other open spaces.

The first project site, which was under construction during the initial survey and only just occupied during the second visit in 2012, is a public investment on an area of about 4.17 hectares. The project consists of 22 front and back-street apartment

buildings arranged around three open spaces and covered about 18.5% of the land area. The main concept of the layout plan is to provide all buildings with an access to common green spaces separated from car traffic through the provision of circumferential roads (Figures 6.31 and 6.32).

All of the 22 buildings are 7 storeys high with two flats at each level. This makes for a total number of 308 flats. The site, with a net-density of 74 dwellings per hectare, offers about 111 m² of open space to each flat - see Photos 6.30, 6.31 and 6.32. The floor plans below show the model design of ground and upper floors, with a floor area per level of about 336 m² , while the size of each flat is 140 m² (Photo 6.33 and Figure 6.34). Apparently, the dwelling size ranges from 120 to 160 m² is widely acceptable within the Libyan context (see Chapter 2 – the Project of 7000 Housing Dwellings).

Figure 6. 31: Satellite Image, Site Ten - El Andolis-II Area

A superblock for medium-rise apartment buildings
Source: UPA, 2006

Photo 6. 30: Bird's- eye View, Site Ten - El Andolis-II Area

Source: Owen photo 2012

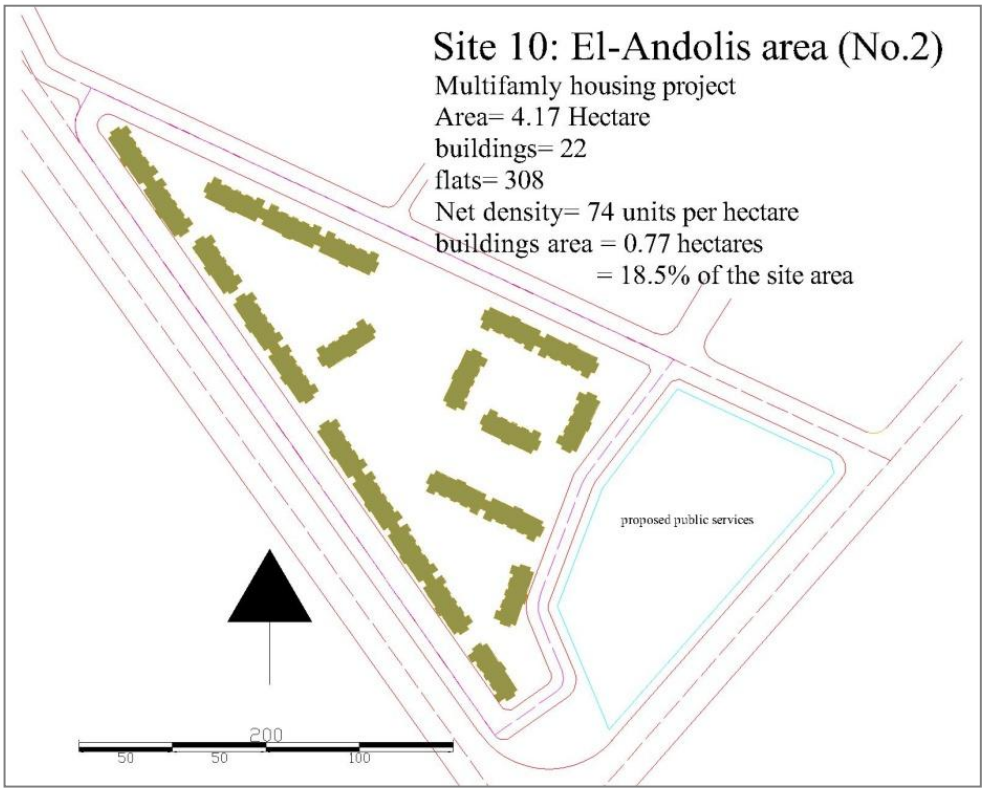


Figure 6. 32: Layout Plan, Site Ten – El-Andolis-II Area

Source: project documents (the investment and real state bank 2001)

Photo 6. 31: Street View, Site Ten - El Andolis-II Area

Source: Owen photo 2012

Photo 6. 32: View in the Common Space, Site Ten – El-Andolis-II Area

Un-finish public infrastructure
Source: Owen photo 2012

Photo 6. 33: Parking Place, Site Ten – El-Andolis-II Area

Source: Owen photo 2012

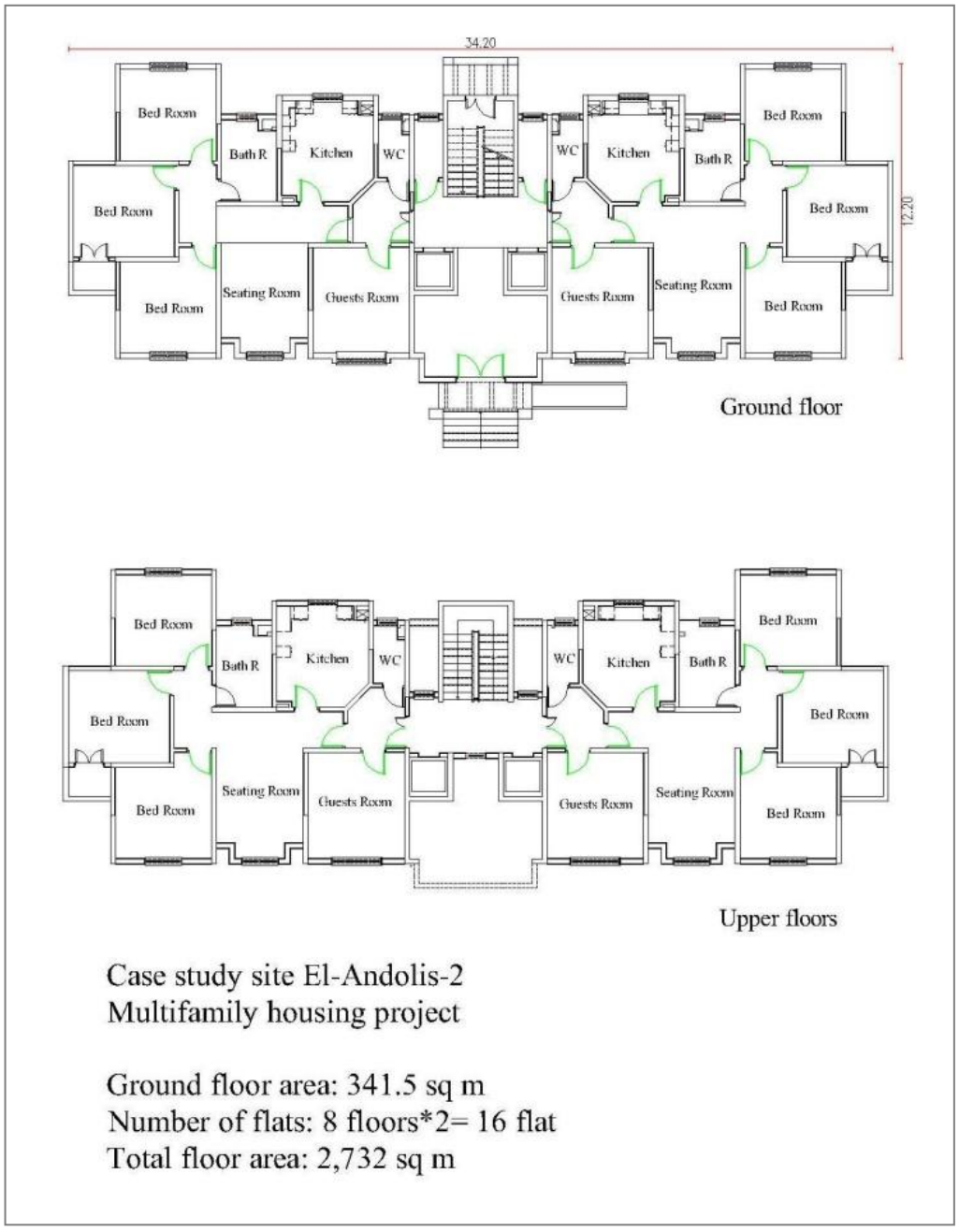


Figure 6. 33: Architectural Plans, Site Ten - El Andolis-II Area

Source: project documents (the investment and real state bank 2001)

The second site is a social housing project built in the early 1970s. The buildings are also a two-side multi-family type but are only three storeys high. They were arranged according to the same concept as the previous site, yet with relatively much larger common open spaces (Figure 6.34 and Photo 6.34). The surveyed site contains 32 buildings, each of three storeys and a total of 192 flats, which were built on an area of

around 6.9 hectare - this provides a relatively low net-density of 28 flats per hectare and a building cover close to 12.5% of the site area, which provides about 315 m² of open space for each flat - see Figure 6.35 and Photos 6.35 and 36.

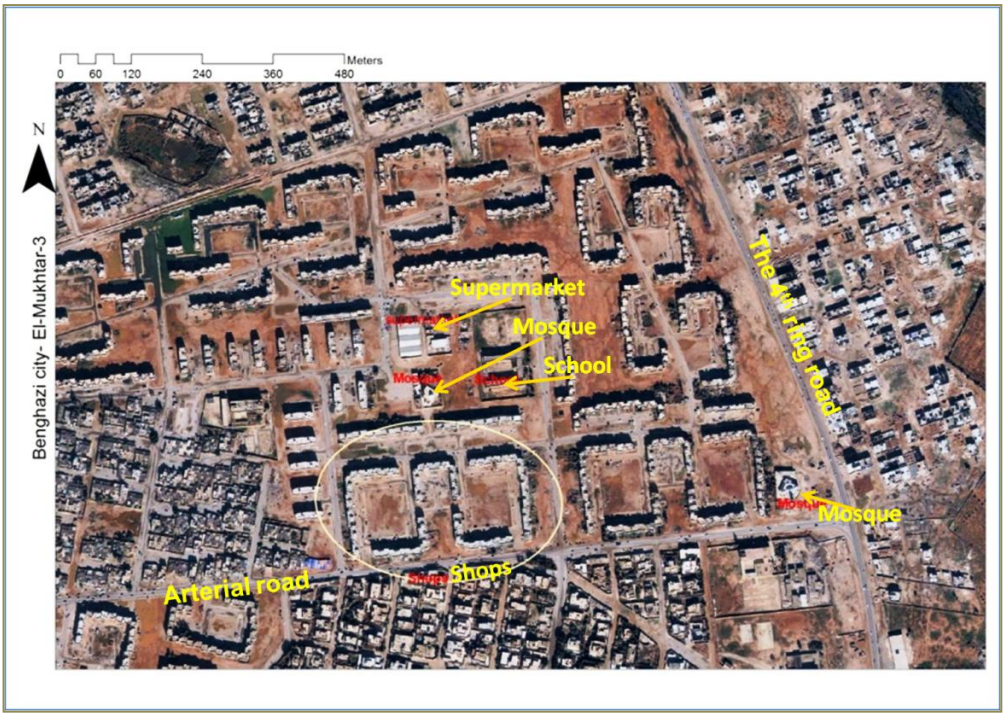


Figure 6. 34: Satellite Image, Site Eleven - Ali BenTalb

Superblock for Low-rise apartment buildings
Source: UPA, 2006

Photo 6. 34: Back Common Parking, Site Eleven - Ali BenTalb Area

Source: Own photo 2010

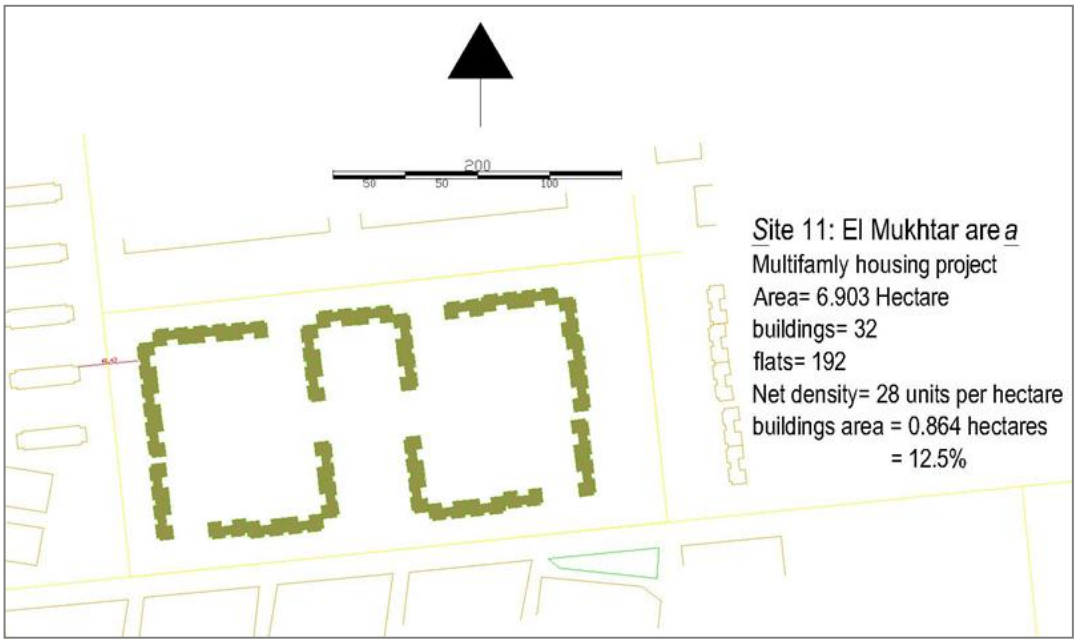


Figure 6. 35: Layout Plan, Site Eleven - Ali BenTalb;

Source: adapted from Municipality's map 1978 & reviewed through site-visits

Photo 6. 35: General View, Site Eleven - Ali BenTalb Area

Large less-used space
Source: Owen photo 2012

Photo 6. 36: Private Gardens in the Common Space, Site Eleven - Ali BenTalb Area

Source: Owen photo 2012

The investigation of these two case studies show that the first one, with built-land cover 18.5% and floor area to total site area of 1.12, is well managed and meets the requirements of land use regulations (Libya-GOV, 1996), whereas the second one is relatively low density. In fact, a large extra amount of open space cannot always be regarded as positive, and it can be even damaging to the quality of the urban area. Open spaces, as shown in the photographs above, remain largely unmaintained and apparently less-used; even the existing roads are partially covered by soil as a result of neglect and lack of maintenance. However, in some cases, spaces adjacent to buildings are taken for private uses such as a garden or car shed.

6.4. Summary: *Urban Typologies*

The classification of urban forms in Benghazi into four categories based on the leading building type has been an important step towards the study of characteristics of the different urban forms at the neighbourhood level. However, even residential clusters of the same category can contain varied differences due to factors such as existing conditions, planning decisions and other historical and local circumstances. It is noted that at the neighbourhood level, all the case studies do have good level of accessibility to schools and mosques, whereas other services such as health care-units, public offices and parks are indeed limited. However, it is evident that planned local centres, when located in the middle of a neighbourhood, can lose trade and business due to the competition provided by the commercial strips which often created spontaneously on the edges. The information gained from this investigation of the eleven case studies and their characteristics is summarised in Table 6.1 and Figure 6.36.

Case studies One, Two and Three have been of courtyard buildings made up of rectangular narrow blocks with very limited public space and green areas. The courtyard buildings have been single-family low-rise and multifamily low to medium-rise back-to-back buildings, identical to those defined by planning regulations R5 and R7 respectively.

Differences between courtyard buildings can be traced back to three periods of urban development: (1) the pre-1960s, a period of incremental growth dominated by irregular and uneven land subdivisions with narrow streets and traditional central-courtyard buildings; (2) the 1960s, a period dominated by commercial subdivisions of regular blocks, streets of moderate size and moderate dwellings frequently designed with lateral-courtyards; (3) the third period since the early 1970s, which has witnessed changes in land law and planning regulations and practice; leading to quite different urban realities characterised by relatively wider streets and larger land parcels.

Case studies of courtyard buildings have revealed that changes in the size of land parcels and street profile have significantly influenced residential densities, which range from 140 down to under 40 dwellings per hectare, and led to variations in public open spaces from about 25 m^2 to 110 m^2 per dwelling. However, in all cases dwellings were found to have floor area ratios larger than the 0.80 threshold value that is permitted by the land use regulations. This may be due to the fact that the average footprint of courtyard building remained around 85% in all cases, which means that buildings could comply with planning regulations regarding floor area ratio only if they were one floor high.

Moreover, the lateral-courtyard buildings are widely perceived as having lower privacy and higher noise levels than the central-courtyard and other types of single-family buildings, due to the direct contact between indoor and street space, especially on the ground floor. However, the lack of private gardens has been compensated by the use of the roof as family space, especially in summer time. On the other hand, the lateral-courtyard does have advantage over the central courtyard building, for reasons include the possibility for vertical intensification and the capability to better control indoor air quality.

Case studies Four and Five have moderate density and compactness, consisting of rectangular blocks of terraced buildings, defined by the planning code as category R4, which refers to single-family dwelling of one to two storeys high. They are designed as low-rise, two-sided buildings with front and back streets or private gardens on one or two of the front, back or lateral sides. The surveyed sites contain moderate street

widths that range from 10 to 15 metres and land plots with areas from 216 to 240 m², which is below the minimum limit required by the regulations. However, with an average footprint per land plot of about 70%, most buildings exceeded the 65% floor area ratio specified under category R4. While net density measurements were at levels close to the maximum of 40 dwellings per hectare specified for this zone, the resulting public open space ranges from 115 to 170 m² per dwelling.

The two values of density and public space sound acceptable for following good reasons: the net-density is that necessary to serve public transport as it lies within the range 35-50 dwellings per hectare recommended for single-family areas - see (Rogers, 1999). The amount of public open space about 25 m² per person for an average family size of five to six persons, a figure which in practice offers enough public space for different users, while still maintaining a suitable level of enclosure to protect the microclimate. Front and back gardens were perceived as positive features for home privacy and outdoor activities. However, private gardens are normally walled to provide protection from street nuisances and have, in some cases, been taken by garages and stores.

Case Study Six to Case Study Nine inclusive are low-density of detached buildings - the "Villa type." They contain land parcels ranging from 450 to 1200 m² and street widths of between 10 and 24 metres, arranged in different layouts to include simple grids for rectangular blocks, perimeter blocks with common back gardens or cul-de-sacs with back strips of open space. Although residential densities of between 11 and 15 dwellings per hectare are in line with those set by the planning regulations for categories R1 and R2, the public open space has reached levels that range from 245 to 365 m² per dwelling, a space equivalent to a parking place for ten cars. Meanwhile, the average area for both private and public open spaces accounted in some cases for 500 m² per dwelling. In reality, large portion of public open spaces, especially those hidden in back-streets and common gardens, are leftover and are in effect, perceived as negative space.

Furthermore, while buildings are mostly two storeys high, clearly added-structures such as carports, storerooms and sometimes shops do increase the total floor area above the threshold ratio of 50% and 80% for categories R1 and R2 respectively, and

even blur the whole idea of detached buildings. Additionally, as a related issue to low density development, the use of water and energy in these areas, though lacking real data, is believed to be well above the average, due to the use of irrigation and the illumination of outdoor space.

The last two case studies - Ten and Eleven - examined superblocks of apartment buildings which are low- and medium-rise two-sided buildings. Their heights are three and eight storeys and have densities from less than 30 to about 80 dwellings per hectare. The amount of open space per dwelling in the low-density one is about 300 m^2, while the higher density case study provides 110 m^2 of open space per dwelling. However, it is found that larger open space per dwelling, similar to the previous case studies, has added nothing but nuisance to the urban environment.

Generally, while levels of service and consideration of health and safety do influence decisions on urban density, public open spaces have often been considered as a by-product, even though they are important to urban quality and overall sustainability. It should be noted that although the same amount of public open space per land parcel or dwelling may be sufficient for detached buildings, it can be unsatisfactory for areas of courtyard and terraced buildings due to the fact that they already contain less private open space, and they are more likely to contain mix of uses and future intensification than the detached building type.

The figure-ground plans (Figure 6.36) show clear differences in the footprint of the different case studies. Often dwellings, which contain less private open space due to their relatively small land size, are also more likely to lack access to sufficient public open space. However, the comparison of different typologies (Table 6.1) shows that those case studies of terraced building of relatively moderate plot size and density have been positive at different levels. While they can be judged positive in respect of moderate density and permeability suitable for walk-ability, they are also associated with a sufficient level of privacy and comfort in the public space, provisions for private gardens, continual street-wall and moderate but sufficient streets space.

Furthermore, it is observed that local interventions such as using balconies as storage space or just for decoration, hiding the front gardens behind high walls of up to 3.0

metres tall, gardening on the public residual space and the use of roof space for different domestic activities, do reflect cultural and social needs that should be considered in design.

The next section will focus on the relationship between the quality of urban environment and the actual use of the public open space.

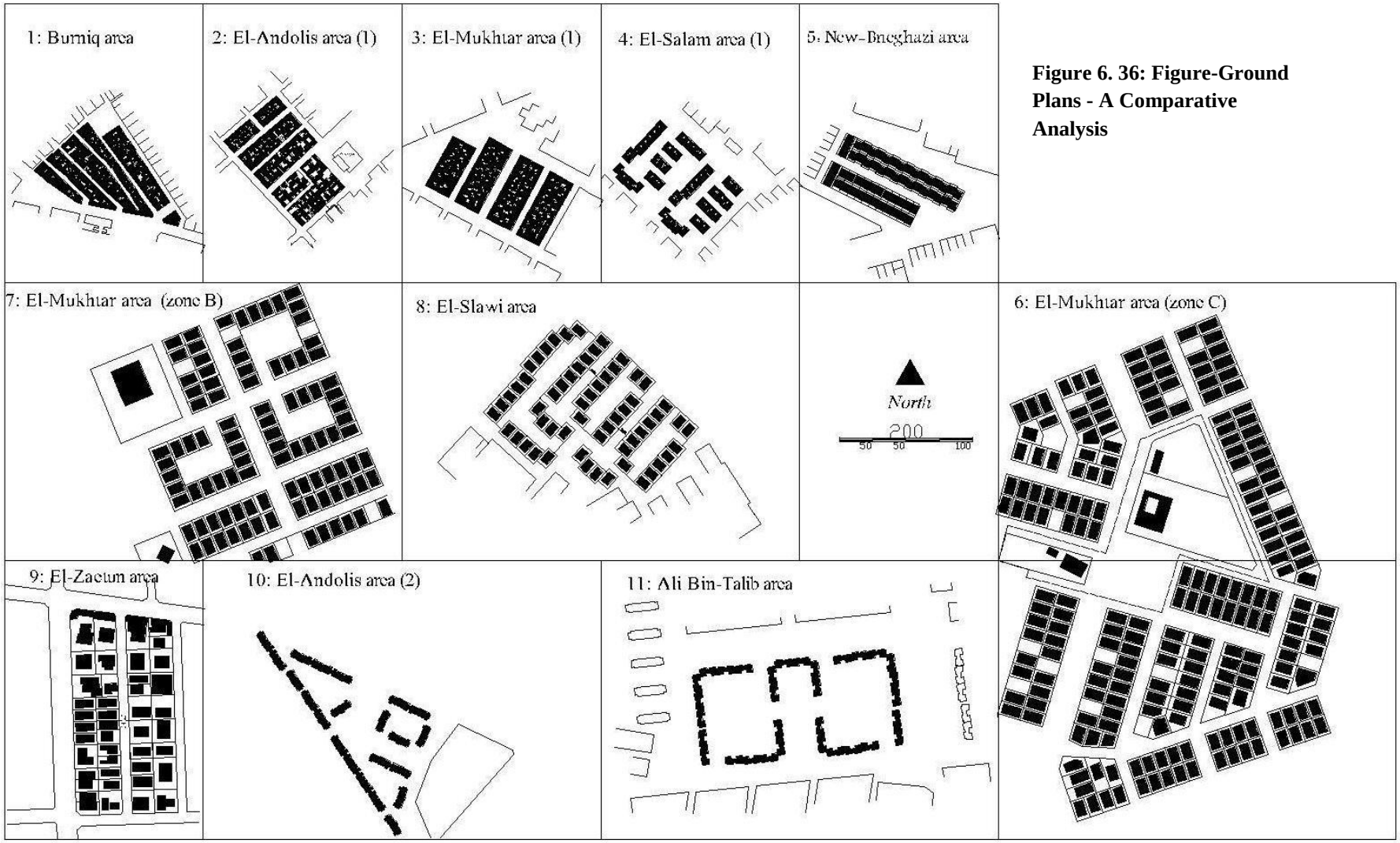


Figure 6. 36: Figure-Ground Plans - A Comparative Analysis

Table 6. 1: Physical Characteristics - Eleven Case Studies Compared

Case study	Archite-ctural type	Net-density Per hectare - Parcel -Dwelling*	Land parcel cover (%)	Public space per dwelling (m^2)	Floor area ratio	compact #	Urban features	Building type
1- Burniq	**Court-yard houses**	P. 25- 47 D. 38- 140	59- 71	26	3.5	6.15	Rectangular-irregular urban blocks, narrow streets, limited open space and buildings of varied sizes and mixed uses	- Lateral-courtyards (traditional central-courtyards are rare) - Can be single (1-4 floors) or multifamily building (up to 8 floors) - Street-frontages are close to each other (building-line on kerbs)
2- El-Andolis-I				41	1.65	4.00	Rectangular blocks and moderate streets	
3- El-Mukhtar-I				108	2.6	3.78	Rectangular blocks, wide streets and relatively large parcels	
4- El-Salam-I	**Terrace -houses**	P. 20- 24 D. 36- 40	30- 52	173	1.9	0.82	Small groups of houses with back and front streets	- One to three side-distances - Can be single (one floor or duplex) or more dwellings and up to 3 floors
5- New-Benghazi				115	1.12	1.40	Rectangular blocks with back and front private gardens	
6- El-Mukhtar-III	**Detached houses**	P. 7 -10 D. 11-15	45- 74	267	(0.60)×	1.06	Rectangular blocks and wide streets up to 24m	- Can be single (one floor or duplex) or two dwellings up to three floors - Walled-gardens - walls of 2 to 3 meters high mainly for privacy reasons
7- El-Mukhtar-II				350	(0.60)×	0.68	Perimeter Blocks with Common gardens and wide streets	
8- El-Slawi				364	(0.60)×	0.49	Front and back streets with cul-de-sacs	
9- El-Zaetuna				242	0.45	1.25	Rectangular blocks of different sizes of land plots and moderate streets - 10 to 15 meters	
10- El-Andolis-II	**Project-buildings**	D. 28 - 81	13- 18	111	(8.0)×	1.58	Superblocks with common green areas and parking streets	- Two-sided multi-family buildings- 3 to 7 floors - very few of 8-12 floors
11- Ali Ben-Talib				315	(3.0)×	0.43		

Notes:

(*) An estimated number of dwellings based on site observation of four units per land plot for the first case study and 1.5 units for other single housing case-studies;

(#) Urban Compactness is the ratio of total floor area to public open space;

( )× estimated values

Part Two: Quality and Use of the Public Space

6.5. Introduction

Urban quality; associated with the placement, height and mass of buildings and the relationships among them, influences how people use public space (Cook 1980). Positive open spaces near buildings create good conditions for outdoor activities and walking (Gehl, 2006). Higher quality public spaces attract human activities and invite people to stay longer in the outdoors and engage in the public life. Human activities help people to improve and maintain their contacts and develop new relations. Social contacts are essential elements for psychological needs, and hence urban sustainability (Schaefer, 1992).

The focus on urban sustainability has justified adopting the concept of urban liveability as being derived from the urban environment rather than experienced in it, where spatial indicators can be attained by breaking the urban form down into measurable elements. At this stage, the survey has concentrated on investigating the extent to which different urban forms in Benghazi have influenced human activities in the outdoors and urban sustainability in general. To evaluate this relationship, the study has examined the link between the intensity of use of public open space in different sites and their physical characteristics, with a focus on the parameters of physical compactness and elements of sustainable design.

The observation of human activities in public open space, the subject of this part of the study, was conducted during a second visit to the city in 2012, after an important political change in the country and when life was returning to normality. The events included the battle over places of everyday life, where the “Killing of Urbanity” (Coward, 2009) was a strategy used by the overthrown dictatorship. Although Benghazi city and most of the eastern part of the country, “Cyrenaica province”, was among the least affected by the events, the region was influenced by the influx of war immigrants and the halting of most public works. It is important to mention that the meaning and value of public space can be influenced by such socio-political

events. It is noted by Elbabour that there has been a change in citizen's perception of different urban places following the so called Arab spring, where new landmarks has formed new mental images of many cities in the Arab region (Elbabour, 2011). At the local level, the uncompleted public works have affected many residential streets, leading to unbalanced distribution of traffic, while other streets are barricaded due to the increased sense of insecurity. They are unusual conditions that have limited the extent of this research and the methods of investigation.

6.6. Investigating Outdoor Activities

To create better places, designers need to understand how people use spaces and the surrounding environment (Lang, 2007). Based on existing knowledge of the physical characteristics and parameters of the eleven case studies analysed in the previous stage of the field work, four sites of different typologies and street qualities have been chosen at this stage for further investigation. The use of outdoor space has been observed on residential streets and public space on these sites. The sites are: (i) El-Anduls – which consists of courtyard buildings; (ii) El-Ansar – which consists of terraced buildings; (iii) El-Mukhtare – which consists of detached buildings; and (iv) Ben-Talb – which is a super block of multi-family buildings.

Also, the chosen examples represent different outdoor qualities, which are defined here on the basis of the type of streets finishing, namely: streets of metalled surface, temporarily asphalted streets, and unpaved streets or streets with damaged pavements; see Table 6.2. It is anticipated that the quality of street surface may influence not only traffic speed and air quality in terms of heat and dust, but also it can encourage spontaneous interventions on the public space including temporary structures, gardening and reserving car places.

Table 6. 2: Main Characteristics of the Selected Streets

Site	Building Type	Density – D / H	Public open space (sq m) per Dwelling	Compactness*	Street Condition
El-Anduls	Courtyard	70	41	4.0	Metalled
El-Ansar	Terraced	38	115	1.22	Temporary pavement
El-Mukhtare	Detached	14	350	0.68	unpaved
Ben-Talb	Apartment	28	315	0.43	Damaged pavement

*- the ratio of total floor space to avaliable public open space within a designated areas

The field work was carried out in the residential streets of the four chosen case studies, where real life data was gathered through the use of direct observation of human activities and the streetscape; counts of people and vehicles present in the public space, and finally site measurements.

The counting of people and vehicles in the outdoors was conducted twice for each case study: in the morning (from 10.00 am to 12.00 noon) and late after-noon (from 16.00 to 19.00 pm) – the counts lasting for about ten minute each. They covered the number of people, the type of activities and the total number of cars parked on or passing through the street. This data offered a numerical base, which is important for cross-case comparisons. In addition, direct observations with photographic surveys and taking notes, also site measurements were conducted in order to collect more detailed data on human activities and local conditions. The data included: the carriageway profile and parking places together with hard and soft elements of the streetscape such as green places, trees, street bumps, lighting elements and sitting places.

Interestingly, the surveys do not show evidences of significant variations between the case studies with respect to the number of people and cars per dwelling on the street, in spite of the differences in qualities and spatial parameters. However, based on the collected data and discussions with local people, two main factors were identified that stand out more than others to explain these results. The first is the apparent similarity of social-mix in most urban areas due to the national land policy and the practice of redistribution of building land, which offers similar opportunities for people of different incomes and backgrounds to access building land and housing.

Secondly, the same socio-cultural conditions offer no class barriers and this is manifested in the use of local streets as a playground and meeting place for *all* people - young and adults alike; which is interestingly quite distinct from even the neighbouring Egyptian culture where adults use corner-cafes more often as gathering places.

Details of the findings for each of the four sites: (i), (ii), (iii) and (iv) identified above are now presented.

(i) Street Number 90 - El-Andolis-I

The observed street is located in an area of courtyard buildings at an estimated density of 70 dwellings per hectare. This area is characterised by narrow blocks, small land plots, and metalled streets of widths ranging from 6.0 to 10.0 metres (Figure 6.37). The redevelopment process, which has encouraged the combining of land plots and construction of two and three storeys, has brought with it a variety to the streetscape and more social opportunities. However, the increase of floor area ratio for buildings has further raised levels of physical compactness in the site to about 4.0 which brings the public open space per dwelling down to about 41.0 m^2 which, within this context, signals an insufficient amount of open space to support local demands and has led to conflicts between different activities in the public realm. As a substitute, roof-space is used widely in these areas as an alternative private open space, particularly during the summer in late after-noon and at night.

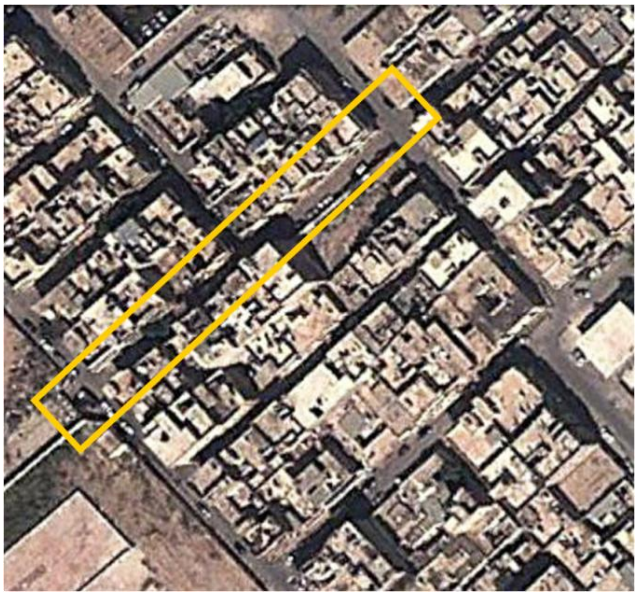


Figure 6. 37: Satellite Image, Street No 90 - El-Andolis-I

Source: Google Earth, accessed in 12.2012

The observed street of 7 × 103 metres represents almost all the public open space available to the residents. The 5.20 metres carriageway occupies almost 80% of the street, with less than 0.90 of a metre for sidewalks on each side and almost no green areas save for some trees which lay out over the street from within private properties or takeover part of the pedestrian paths (Photo 6.38). People often walk in the middle of the street to avoid affecting the privacy of individual houses and also because sidewalks are sometimes obstructed by such activities as people sitting on front doorsteps and other domestic uses, and the available space in this street is even lower due to obstacles such as lighting columns, parked cars and entrance steps (Figure 6.38).

Photo 6. 37: street view; street No 90 - El-Andolis-I

Narrow sidewalks and partly occupied by cars.
Source: Own photo; 07.2012

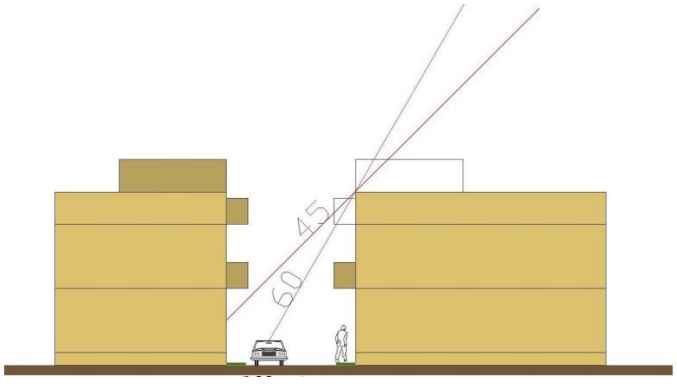


Figure 6. 38: Street Cross-section, street No 90 - El-Andolis-I.

A climatically convenient ratio for street width to building height need to be balanced with the demand on public space

Observation of human activities on this street showed that in the morning time (≈10 am), as expected in any residential area, there were very few parked cars and few people present on the street. However during the late after-noon (≈5.30 pm), the

presence of both cars and people was larger and at times conflicted with each other. Cars and humans were competing for the very limited public space and this was clearly an uncomfortable experience to all users and provided a source of nuisance. Although, less than the night-time peak, the number of parked cars and those passing through in the after-noon period reached 12.0 vehicles in ten minutes observation, which equates to 1.55 cars per 100 m² of street. Passing cars were included in the count because they occupied part of the street for some time and influenced other activities.

Human activities observed on the street included walking, playing, sitting and various outdoor activities. The number of people on the street in the peak after-noon period amount to about 15 persons (or about 1.94 people per 100 m² of the public space) most of them were children, but some adults did congregate near the corner of the street - see Table 6.3 and Photo 6.39.

Photo 6. 38: Street View, Street No 90 - El-Andolis-I

Children play on the street – car traffic on narrow streets even at low speed can be an issue of safety and inconvenience. One resident told about a child who was hit by a car in spite of the slow-travel speed. It seems that the driver was unable to react quickly enough when the child ran from between the parked cars
Source: Own photo; 07.2012

(ii) Street Number 84 - New-Benghazi

This street is located in an area of terraced buildings with an estimated density of about 38 dwellings per hectare. The area consists of narrow plots longer than those of the previous example with front and back gardens, and streets that range from 12.0 to 15.0 metres in width (Figure 6.39). There are various building designs, most of which breach the limits of floor area ratio set out in the planning regulations and occupy parts of the set-backs. They have also made a street wall of building facades and high walls and have some trees that provide shade for the outdoors.

Figure 6. 39: Satellite Image, Street No 84 - New Benghazi-I

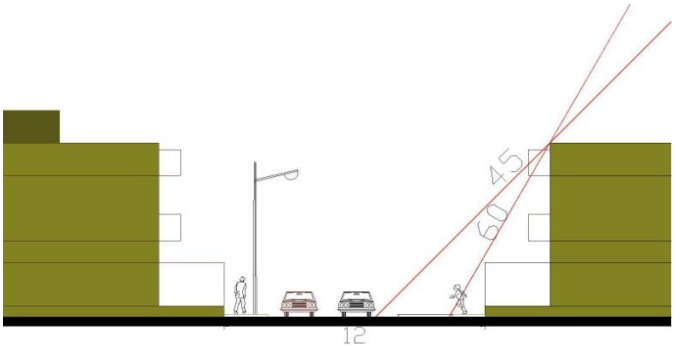
Source: Google Earth, accessed in 2012

The available public space - street space and other residual areas of about 115 m² per dwelling, together with a compactness level of around 1.22 has been apparently sufficient for local activities. The observations noted limited or no conflicts between different activities. Furthermore, it appears that other uses of the public space have been encouraged such as the fencing of little green areas, sitting places and the reservation of private car parking spaces.

The observed street segment - the eastern part of Street Number 84 - is about 12 by 210 metres, and there are additionally small green areas which were created at the end of the block as a beautification measure. The carriageway of 6.0 metres is metalled but considered temporary with no paved sidewalks or kerbs. This level of finish reflects a type of temporary infrastructure in the city which contains no sewage system and has only temporary connections for water and electricity. However, the carriageway takes up only half of the street space and leaves the rest for pedestrians,

green areas and surface drainage and other local uses. It was evident that a balance of asphalted car-lanes for slow traffic and less dust, with unpaved sidewalks provides a suitable compromise and encourages spontaneity of use.

Figure 6. 40: Street Cross-section, Street No 84 - New Benghazi-I



Counting both cars and people present in the street, it was found that within the peak late afternoon period there were approximately 19 cars and only 11 persons performing different activities in the outdoors. It was observed that both people and cars were going about comfortably with rates of 0.75 cars and 1.35 people per 100 m² of the public space (table 6.3). People also benefited from the protection of privacy afforded by front gardens and moderate street width. It was also observed that private open spaces offered areas such as family space and garages.

Photo 6. 39: Public Space, street No 84 - New Benghazi-I

Source: Own photo, 2012

Photo 6. 40: Street view, street No 84 - New Benghazi-I

Many things are going on the wide street - freely walking and playing, an extension for a workshop, and little gardens and trees next to front doors.
Source: Own photo, 2012

(iii) Street Number 76 - El-Mukhtar-B

The street under investigation exists in an area of detached buildings at an estimated density of about 14 dwellings per hectare. The subdivision consists of perimeter blocks, wide streets and relatively large land plots; it contains about 351 m² public open space per dwelling.

Figure 6. 41: Satellite Image, Street No 76 - El-Mukhtar-B

Source: Google Earth, accessed in 2012

The public open space can be described as less-used and has a negative impact on the local community. The street and back gardens are unfinished and continue to have unadjusted surfaces. As vehicles negotiate their ways through the street, they raise dust which impacts on those people outdoors. In addition, low levels of urban compactness - about 0.68 - and large impermeable blocks are other factors that separate people from each other and encourage them to stay longer inside their private domains. Fewer eyes on the street affect security and leads to deserted streets during the night.

The observed street of 23.30 × 323.50 metres, which is unpaved has been used more than the back-gardens for different human activities, but that usage is still relatively low when compared with the previous examples. Car-traffic, pedestrians and people engaged in other activities present all in the same space with no traffic signs or priorities. In this example, claims on the street space by local people are similar in type to the previous example, where positive features such as the planting of trees and sitting places were quite often observed.

Photo 6. 41: Streetscape, Street No 76 - El-Mukhtar-B

The street is a play ground and social space
Source: Own photo, 2012

The late afternoon observation of outdoor activities showed that although there was a relatively moderate ratio of cars per dwelling of 0.65, the number of cars per 100 m² of public open space was found to be just 0.19. Different human activities on the street such as play, staying and doing private things in addition to the movement of people and vehicles were still going on and led to the presence of people though at a moderate but non negligible level. The late after-noon count of people in the street recorded was 17 persons or about 0.23 people per 100 m² of open spaces.

Photo 6. 42: Street View, Street No 76 - El-Mukhtar-B

Dust created by car traffic. Despite of the similarity of figures regarding cars and people per dwelling; it is evident that the density of users on the street is low in such areas that have large open space per dwelling.
Source: Own photo, 2012

(iv) Common Garden - Area of Ali Ben-Talib

The observed area of large perimeter blocks consists of multi-family buildings with their courtyards designated for both green and parking space. The site has widely deteriorated, with street pavement and car parks damaged. Other open spaces are mostly unmaintained; however, there are scattered trees and green spaces managed as private gardens. Indeed, the low level of compactness of around 0.43 is a strong indicator explains the low usage of public open spaces, where the unnecessarily large public open space per-dwelling proved useless and unaffordable to maintain.

Figure 6. 42: Satellite Image, common space - Ali Ben-Talib

Source: Google Earth, 2012 accessed in 2012

The observed site shows that there have been many changes on the ground floors, as many flats have attached a garage or shop on the public land. Although both asphalt and paved sidewalk are damaged, the kerbstones are still present and provide direction to traffic and pedestrians. The observation of human activities shows that the outer-streets are used more for through-traffic rather than local activities, while the block courtyard has been sufficiently permeable and contains large open space and car parks for the residents.

The presence of people and cars in the observed courtyard showed that during the late afternoon peak the intensity of use had been moderate to low. The number of cars reached about 0.30 vehicles per dwelling or about 0.10 cars per 100 m² of the public open space. Different human activities (such as walking, playing, staying and doing something that takes place outdoors) attracted a number of people, which in the after-noon period reached about 0.82 persons per dwelling or 0.19 per 100 m² of the public open space.

Photo 6. 44: Undefined Space, common space - Ali Ben-Talib

Source: Own photo, 2012

Photo 6. 43: Public Space, Common Space - Ali Ben-Talb

Less used space as a spatial divide
Source: Own photo, 2012

6.7. People and the Streetscape – Examples from the City

It was evident from previous research in Libya that the unfinished infrastructure, and a desire for domestic privacy and a comfortable climate represent urgent needs within this context, such that their satisfaction can be a higher priority on the scale of human needs than, for instance, visual quality. However, it can be argued that in Benghazi level of accessibility to basic services and amenities is satisfactory in regard to schools, mosques and shops; other services are less accessible and have not been considered as so important by local people. The ideal living environment, as expressed by different people and even tacitly represented by public policies, is a single-family house with private garden and private car place. A park, however, is not always perceived as an advantage, as experience has shown parks often become degraded and a source of nuisance.

In this section a selection of examples for different locations in the city is presented to reflect on and draw lessons from the quality and common uses of the public space. This review of the streetscape and actual uses for different types of streets and public spaces can enrich the discussion on urban liveability in the city and help find solutions to some issues at the neighbourhood scale. The photographs show in addition to different human activities and intensity of use, different constraints and issues in the public space that need to be dealt with in the next stage of the design exercise.

Photo 6. 45: A Vibrant Pedestrian Street; the Core Area

The scale, enclosure and the mix of functions that encourage walking through the streets of the old quarter
Source: Own photo, 2010

Photo 6. 46: Parking Space as a central space, the Core Area

The rearrangement of the shopping area to face large open space instead of a roofed pedestrian street has led to negative results and lost viability.
Source: Own photo, 2010

Photo 6. 47: High Street - Made for Cars

A street for one-way traffic and minimum sidewalks attracts more through-traffic and separates activities on the two sides of street.
Source: Own photo, 2010

Photo 6. 48: Busy Street; Meeting at the Front Door

In spite of the busy traffic that causes noise and dust, front doors still a place of gathering and chat
Source: Own photo, 2010

Photo 6. 49: Walking on the Unmetalled Street

This un-metalled street is shared by people and vehicles – while young men walk freely on the middle of street, the moving car on the opposite direction takes the side not the middle.
Source: Own photo, 2010

Photo 6. 50: Obstacales in Public Space

Women try to negotiate their way; obstructed by some vehicles
Source: Own photo, 2010

Photo 6. 51: Who Walking on Middle of the Street

While strangers walk on the middle of the street, a local woman walks on the side walk. Walking in the middle of the street is common as people to avoid affecting the privacy of houses.

Photo 6. 52: Quiet Residential Street

Temporary pavements with soil on both sides allows various uses such as planting trees, car places and little gardens, but can also act as a place for dumping waste.
Source: Own photo, 2010

Photo 6. 53: Various types of Trees

Trees are used on the streets to create different places, protect home privacy and provide shade. The unpaved street allows more flexibility to arrange space and for planting
Source: Own photo, 2010

Photo 6. 54: Sunny Street Corner

A child enjoys the sun – however, crowded areas are often poor quality with regard to playgrounds and green spaces.
Source: Own photo, 2010

Photo 6. 55: A Semi-private Space

Fixed or mobile chairs and trees are used to create a sitting place on the front door.
Source: Own photo, 2010

Photo 6. 56: Narrow Streets are more Active Places

Shade encourages walking and outdoor activties. However, people frequently raise the issue of privacy, both noise and visual. It is evident that unmanaged urban intensification can led to higher densities and negative impacts on the quality of public space
Source: Own photo, 2010

6.8. Summary: *Quality of Public Open Space*

It was observed that local streets contain activities conducted by different groups of residents, whereas by-passers are few and often target local destinations. On the other hand, children under 12 year old; who make up about 20% of population or about child per household (Libyan-GOV, 2008), are the group that has a strong presence on local streets, while women are few, which reflects cultural influence in that they often meet and partake of social activities indoors.

In addition, features such as the density of doors - the number of entrances to the length of the street; and the types of façade - whether they are mainly solid walls of front gardens, shop-windows or simply the outer wall for a living space, have been influential on outdoor activities. Narrow frontages seem to push pedestrian to the middle of street, as a result of semi-private zones created at step-doors, whereas front gardens enhance privacy, provide shadow and improve the visual quality of the street.

Furthermore, different neighbourhoods, while seemingly divided by a network of arterial roads, still have high levels of internal connectivity, not least because of the grid pattern, low speeds, and visual connections, which support the use of streets as multi-purpose spaces. It is clear that traffic in residential areas is local and calm, where average speeds on local streets are generally under 30 km/h, mainly due to physical constraints rather than measures of traffic control.

Both a human scale urban form and moderate densities have been positive factors that encourage the presence of people in the outdoors. Factors such as the size of household, car-ownership and a cultural predisposition to privacy influence acceptable levels of compactness and hence how people use public space. Social and optional activities are the main reason for the late after-noon and night peaks. Indeed, in Benghazi, going out at night has social and climatic motivations, and has been associated with positive experiences, which is different from that in some Western societies where nightlife in the city has become associated with crime, disorder and anti-social behaviour (Roberts & Eldridge, 2009).

In order to examine the assumption that there is a causal relationship between urban characteristics and the intensity of human activities in the outdoors, the scope of the survey was widened to cover aspects and measurements of the presence of people and cars on streets, the types of human activities in the public space and corresponding detailed data on the characteristics and quality of the pertinent surrounding environments.

Counting the people and cars in the public space in the four different locations and the comparison of these observations presents some interesting results. That, whereas the numbers of people and cars per dwelling present marginal variations, the liveability of the public space showed evidence of a correlation with the building type and the quality of streetscape. Important differences in intensities of human activities in the public space can be observed when measured relative to a fixed area – 100 m² in this case - of public space (see Table 6.3),

Table 6. 3: Survey of Outdoor Activities

Site	Denisty D/ H	Street dimensions	Cars per 100 m² of open space	Cars per dwelling	People per 100 m² open space	People per dwelling
El-Andolis- I	70	7.50 × 103.0	1.55	0.63	1.94	0.79
New-Benghazi	38	12.0 × 210.0	0.75	0.50	1.35	0.9
El-Mukhtare	14	23.30 × 323.5	0.19	0.65	0.23	0.77
Ben-Talb	28	Urban block	0.10	0.30	0.19	0.82

To gain more understanding of these results, the study has further examined the relationship between the intensity of use of the public space and the characteristics of the urban environment, focusing on the level of urban compactness - measures of the ratio of total floor area to public open space; and the quality of the street surface - metalled, temporary pavement, damaged pavement or unpaved.

It is clear that the first case study of courtyard buildings has a relatively higher level of activities per 100 m² in the outdoors compared with the other examples, which may reflect the relatively lower quantity of public open space and the scarcity of private outdoor spaces, in addition to the urban quality. The first case study is

compact and has a metalled street, a finished infrastructure and is credited for the shadow and enclosure as a result of a narrow urban envelope. However, narrow streets and scarcity of green space have been a cause of differing conflicts, particularly between people and car traffic. At a compactness level of 4.0, human activities on the street appear to contain more conflict than is the case in the other sites. It is clear that at ratios of about 1.55 cars and 1.94 persons per 100 m² of public space, the residential street becomes inconvenient to passers-by and residents alike; and less safe for children, in spite of low traffic speeds.

At some times through the day parked and moving vehicles take up an important part of the street, while the sidewalks, by and large, have been taken for uses such as street furniture or parked cars. Through the observation and talking with people, it was possible to identify other problems that have arisen as a result of the scarcity of public space. These include lack of verbal and visual privacy at home, difficulty of finding a place to park, children playing between cars and the pedestrians' need to negotiate their way through the street.

On the other hand, case studies Three and Four with their low densities and levels of compactness under 0.75 reveal that human activities have been scattered and limited, which may discourage people from staying longer in the outdoors. Intensities of 0.10 to 0.19 for cars and 0.19 to 0.23 for people per 100 m² of the public space do reflect scattered human activities in relation to space, where the public space acts as dividing factor rather than common place.

The second example of terraced buildings, with its moderate level of compactness at about 1.22, represents a balance between demand on public space and spatial closeness and enclosure. This site at 0.9 persons per dwelling has a higher rate of people in the outdoors relative to available public open space than other examples, and does reflect a relatively more acceptable outdoor environment. It is observed that the figures of 0.75 cars and 1.35 people for each 100 m² of the street space were associated with convenient mix of activities.

In contrast to the perception that urban completeness is a pre-condition for urban quality, it is observed that spontaneity brings with it a variety and richness to public

space. The second example with its temporary finishing, where the street has a reasonably narrow kerb-less carriageway, and unpaved side-distances, acquired interesting properties such as the surface-drainage of rain water, random and frequent planting of trees, and spontaneous uses such as the marking of private parking places, sitting places and play grounds. Also, this level of finish may well be an affordable solution that copes with rapid urbanisation and offers a measure of environment sustainability due to its reduced use of asphalt and the permeability of street surface.

To conclude, this survey supports the suggestion that there is a relationship between urban liveability and the characteristics of urban form and confirms the argument that in parallel with the compactness of the urban form and green elements, certain aspects of the urban design such as spontaneity and protection of privacy and microclimate are essential to urban sustainability in Benghazi and its wider region.

6.9. General Conclusion

It is common that most residential areas in the city are incomplete or look so, and contain a wide range of vacant and underused land, while positive public spaces are limited. Many local streets are unfinished and in practice, if metalled, are made for car traffic. Indeed, in spite of the fact that congestion and overcrowding can be inconvenient, there are good reasons for the preferences of street walls to be closer to each other, not the least of which are the enhancement of privacy, improving microclimate and minimizing impact on the surrounding environment. However, the lack of public transport and basic infrastructure in many parts of the city have been determinant factors in the acceptable levels of public open space and hence of net-density within this context.

In addition to natural and historic factors, planning theory and practice have been essential drivers in the formation of urban sprawl in Benghazi. However, practically, many developments failed to comply with planning codes. Parameters such as building height and floor space were quite often determined by decisions taken by the owners, looking to optimise the value of their properties and respond to the perceived building capacity, rather than adhere to regulatory requirements. For

instance, within local areas, single-family buildings are more likely to be two to three storeys high, whereas on main streets and in district centres they tend to be up to four storeys high with mixed uses on ground floor. In turn, the actual floor space ratio and hence residential density are often different from what was originally planned.

In hot-humid environments experience shows that straight streets, minimum public squares and open space ranges from 0.28 to 0.44 of the total area are favoured measures to avoid direct urban heat (Ben-Hamouche, 2008). Other factors can play a role in the quality of local environments. The observed case studies of terraced buildings presented here represent a quite balanced type of development that contains several positive elements and combine good qualities – this balanced type of development is rarely found in courtyard or detached building areas.

Areas of terraced buildings are normally built as two to three storeys and have a medium density in the range of 40 dwellings per hectare with a street space of 115 to 175 m² per dwelling. They contain private gardens and garages, and incorporate several favoured parameters and urban attributes such as efficient urban grids with a block perimeter less than 500 metres, balance between access to public open space and climate protection; the level of net-density necessary for an affordable transit system; and private outdoor space, highly valued by local people, that does not disrupt the continuity of street frontiers suitable for areas of harsh climate.

Generally, the experience gained from these observations show that urban forms as built and modified can provide valuable knowledge of how to retrofit existing areas and develop new sustainable cities and towns. The next chapter is devoted to a reflection on these results and an evaluation of their suitability for future development, through the use of design intervention approach as a tool to investigate the impact of concepts for sustainable development at urban and block levels; a process which is expected to help establish a basis for new guidelines for urban development in Benghazi.

Chapter Seven

Reflections and Urban Design Interventions

7.1. Introduction

This chapter reflects on the previous review for the theory of urban sustainability and the case studies in Benghazi. It builds on this knowledge to examine the degree to which certain concepts and strategies of compact development are suitable for improving the sustainability performance of the case studies under investigation. This work aims to help improve the current approach and underlying concepts for urban planning and design, which are essential to facilitate the refit and development of urban areas in Benghazi and other Libyan cities.

A better urban design can be a tool to rectify the negative social impacts of high density (Raman, 2010). It is argued that critical reflection is a necessary element of design research (Burdick, 2003). The next section of this chapter reflects on the observations made on the city and residential case studies, and is followed by exercises of experimental designs for four case studies which test different strategies for urban intensification. These apply urban measures that are promoted as being sustainable solutions to different urban problems similar to those under investigation.

While the main focus of this study is the investigation of characteristics of urban forms within the context of sustainability, at this stage, elements of urban design have been applied here to examine the potentials of compact development and its relevance to Benghazi city. The results have been positive, and it is believed that the knowledge gained will be useful to for subsequent programmes to improve the sustainability of existing areas and for future development in Benghazi and its wider context.

7.2. Reflections on the Field Works:

Urban history, current trends in urbanisation and environmental challenges in the Arab region show that compact urban development, an intrinsic characteristic of the traditional city, can be a key strategy for more sustainable cities and towns within this context (UNDP, 2009). Planning measures like urban containment and the upgrading of informal settlements have been frequently adopted by many local authorities in the Arab region with the aim of achieving a better quality of life, efficient use of urban land and investments, and the protection of agriculture and the natural environment (UNDP, 2009).

- *Planning and urban fragmentation*

It is evident that the adopted planning policies for compact development in Libya have very limited impact on the development of fragmented low density urbanism. In practice, concerns with regard to microclimates and urban ecology have had limited influence on planning decisions. The findings show that urban sprawl, within this context, has been driven mainly by decisions on the allocation of new housing and urban investments, informal developments and planning tools that advocates a type of fragmented and low density development (see Chapter 5). Unfortunately, the combined impact of these factors has not yet been addressed thoroughly when dealing with policies on urban sprawl in Libyan cities.

Moreover, the argument that planning theory and practice can through unintended consequences create low density urban sprawl has barely been debated in Libya. Urban sprawl is most often regarded as if it was essentially a result of informal development - blaming the process on plan implementation and related issues such as lack of public funding and delays in land reclamation rather than the planning theory and practice adopted in the country (tacit in the National Spatial Policy (UPA, 2006).

Many contemporary developments in the city are fragmented, incomplete and frequently contain informal interventions; they are characterised by low densities, poor design and car-dependence. Quite often, urban zones are separated by arterial roads and contain considerable areas of vacant land, undefined open spaces and unfinished buildings and public works (see Chapters 5 and 6). It is acknowledged

that such a type of urban sprawl is unsustainable; it destroys agriculture and ecosystems, increases development costs, and creates low quality urban environments (Gillham, 2002).

In 2006, approximately 60% of residential areas in Benghazi were single-family buildings (Libya-GOV, 2008). It is evident that low density development mainly results from planning policies and regulations. While the current system of central planning, due to bureaucracy and lack of actual information on local circumstances and people's demands, has been a cause of delays and bears the responsibility for a large part of the scattered and informal developments in the urban periphery, at the local level, planning tools and practice, which promote abstraction and spacious layouts, have accidentally created a type of development that can be described as widely low density, fragmented and unsustainable.

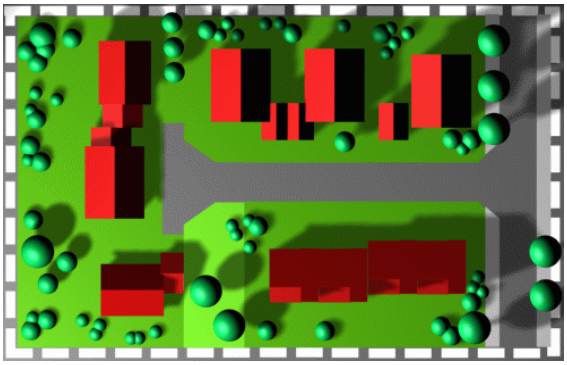
Experience shows that new urban quarters are manly self-built subdivisions (self-built: which within this context refers to the self-management of building construction). They may continue for some period of time unfinished but are under a constant process of intensification. Urban intensification, if uncontrolled, could lead to the breach of planning codes, which are frequently perceived as unsatisfactory or/and unaffordable. However, in advanced stages of intensification, conditions in local areas – as characterised by high levels of physical intensity and congestion - become unacceptable, especially in the case of unfinished public works and services.

The study has identified some conflicts in the planning system that seems to facilitate outward sprawl, urban fragmentation and informal development both in Benghazi and Libya in general. Technically, land use regulations can, under some circumstances, be contradictory and a cause of informal development. For instance, although various planned densities are linked with specific building types, which are defined by size of land parcel, number of dwellings, floor area ratio, side-distances and building height, in certain cases these levels of density are unachievable, and sometimes preclude the provision of appropriate green spaces and other desirable elements.

On the other hand, there is often a mismatch between planning concepts and the real-life practice of urban development, especially in regard to the recognition of how people use urban space, the response to certain urban issues and the acceptable - or affordable - levels of urban compactness (see Chapter 3 - part B). The old town of Ghadamis in the Libyan Desert presents a unique example that responds to local needs, where most public streets and squares are covered; creating a pleasant microclimate and also a parallel system of pedestrian routes over the roofs of private buildings, which additionally serve the desire for gender separation (UNESCO, 1986).

In parallel with planning regulations, the practice of preparing regulatory plans has also been blamed for poor outcomes. Within this context, the regulatory plans were limited to land subdivisions and produced through zooming in - i.e. by simply enlarging - the higher level layout plans which essentially define land uses, urban densities and the main road network. However, as the findings have demonstrated the assumption that planning regulations would automatically bring about beautiful, liveable and efficient urban environments has proven unrealistic; in many cases the outcomes have been unacceptable and unaffordable urban realities with many negative spaces and fragmented urban patterns.

Indeed, this process of urban planning is different from, for instance, the "Bebauungsplan" in Germany, which, though rational, is based on detailed plans that define aspects such as the spatial mass and urban elements that include the building-line; street profile and the townscape (see Figures 7.1, 7.2 and 7.3). However, it has been argued with respect to guidance on design aspects that "the more they are institutionalised, the less their utility" (Llewelyn-Davies, 2000, p. 16).



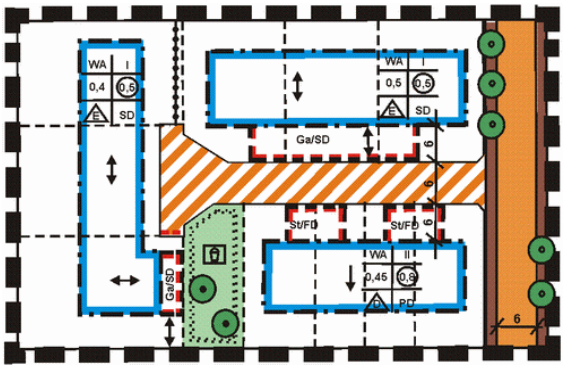


Figure 7. 2: Concept Plan,
Figure 7. 3 Regulatory Plan (Bebauungsplan), Germany

A two steps plan ensure consideration of the urban design aspects
Source: http://www.urban-is.de/e/Binding-land-use-plan.htm, accessed 02.2012

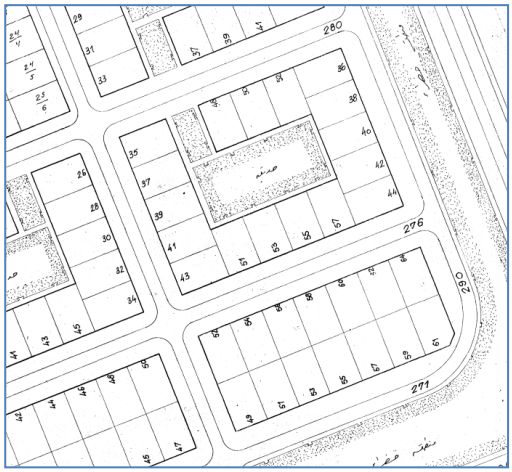


Figure 7. 1: Land Subdivision - Detached Buildings, Benghazi

The layout defined by land uses and codes for building mass, roads and green spaces, but is not based on urban design principles
Source: Regulation plan, Benghazi Municipality, 1988

Box 7. 1: *Bebauungsplan* (regulatory plan) - Main steps

Source: The Planning Department, Frankfurt am Main; Hessische Minsterium fuer Wirtschaft, Verkehr und Landesentwicklung, 2002, p,15.

1) The decision to initiate the plan: Engagement of the different stakeholders
2) Draft plan: Local planning department or contracting with other professionals
3) Discussion of the plan: Engagement of the different stakeholders
4) Design: Local planning department or contracting with other professionals to further elaborate the first proposal
5) Plan disclosure and reflections: Engagement of the different stakeholders
6) Taking decisions and setting statements: Local planning department, based on the evaluation made by the different parties
7) Permission procedure: local authorities, only in the case of the non-existence of a land use plan.
8) Public display and enforcement: Local authorities.

It is also noted that planning tools and practice in Libya seem to assume that public open space is a by-product of the planning scheme, and therefore do not pay attention to its role as an essential element for urban sustainability. Hence, both public open space - whether street, green space or park – is normally laid out as a separate land use; and private open space is defined by building type and health standards – needs for light and ventilation - have both been overlooked as living spaces with an influence on acceptable residential density, potential for future intensification and the quality of the urban environment. However, the quality and use of public and private open spaces can also be affected by factors including land vacancy and informal developments.

In response to the issue of urban sprawl, the planning authorities have adopted measures that include urban infill, the control of urban boundaries and incentives for land development such as subsidized land subdivisions. Only recently, have they recognised the importance of incorporating urban design within the planning process. The urban design guidelines attached to the National Planning Strategy (see Box 5.1) contain general objectives and principles. However, these guidelines are detached from the local context; they advocate high quality urbanism similar to that promoted by the western approaches to New Urbanism, but which is not necessarily relevant to local circumstances and people's expectations. In addition, the reference to people's participation in urban design and implementation has been associated with existing institutions which were vague regarding the issue. However, it can be interpreted differently under the current political context (see Table 3.1).

- *Characteristics of the Urban Form*

The general picture of Benghazi city shows a moderate density slope decreasing gradually from the centre to the peripheries with an average net-density of about 128 persons per hectare, equal to 21 dwellings per hectare. However, at local levels, densities are varied and to an extent are different from those set in the regulatory plans. Urban densities in many cases have been unbalanced and influenced by factors such as unfinished infrastructure and urban intensification.

Many residential areas are fragmented, separated by arterial roads and contain spacious land subdivisions of moderate land plots for single-family buildings. Many buildings are self-built and continue to be unfinished or look so – they are influenced by a lack of basic infrastructure and by surrounding areas of unfinished construction and empty spaces. It is evident that the gradual intensification of buildings and urban space, though violating planning regulations to varying extents, has been perceived as affordable and to an extent associated with acceptable results. It is a type of "everyday urbanism", which is described by Beckley as an "unselfconscious type"; the result of decisions and actions of people who most certainly do not see themselves as designers (Beckley, 1979).

Gradual development absorbs residual spaces and maximises the use of available land and civic infrastructure, and its flexibility also helps in responding to real life changes. This experience shows that sites built under such a less-controlled process contain a mix of housing types and uses even within the same block, and with a minimum, but not necessarily optimal, amount of open space. It is a grassroots process based on negotiation between the different stakeholders – through social organisations. However, the process has neither been purely spontaneous nor well-organised participation. Indeed, random interventions - i.e. do no-plan - though linked to irregular and picturesque urbanism (Hughes, 2000), can lead to urban sprawl and land speculation (Greed, 2000).

The process of urban intensification in Benghazi is quite often informal, and to varying degrees a function of factors such as leading building type, location and the implementation of public works. It is observed that buildings above five storeys tend to be concentrated in central areas - the urban core and main urban corridors - while local centres and main streets have buildings that range from three to five storeys, and on local streets buildings are often less than three storeys. It is evident that the imbalance between the residential density and available public open space has in some cases created congestion and led to certain conflicts in the outdoors, while other areas of large open spaces have been deserted. Also, at some stages of development, urban farms have played a role in compensating for a scarcity of green space, in addition to their intrinsic function for food production.

❖ *Measuring the Urban Compactness*

It is evident that urban forms at certain levels of physical compactness and density have, together with grid pattern and specific urban elements, created urban realities that can be described as sustainable and successful to varying degrees.

The traditional quarters of narrow streets and minimum public open spaces have been perceived as more suitable in harsh climatic conditions than contemporary areas with generous open spaces. The deep street envelope protects public spaces and buildings from direct sunshine and encourages more walking on streets. This is in contrast to typologies like free-standing buildings, which can expose people to unprotected open space and traffic and expose buildings to heat (De-Schiller, et al., 2006) – see Figure No.3.7. However, in spite of possibilities for urban vitality and social activities, change in lifestyles and the demand on urban space have been reasons behind the deterioration of many old quarters.

Photo 7. 1: The Old City, Benghazi

A palm tree in courtyard and the presence of cars in the narrow street
Source: Own photo, 2012

In order to examine the relationship between the amount and ratios of public and private open spaces, on the one hand, and the physical characteristics of the local urban typologies, on the other, and how they together influence the quality of urban environment, the case studies were grouped in accordance with the amount of public open space per dwelling. The observations show that areas containing less than 100 m^2 of public open space per dwelling normally consist of small land plots and narrow streets, less than 10.0 metres wide, made for cars - the asphalt, if it exists, makes up more than 75% of the street surface. Such streets are congested and contain serious conflicts between pedestrians and vehicles. On the other hand, low density areas,

which generally have more than 240 m² of public open space per dwelling, contain relatively large land plots and wide streets – they sometimes even have back streets or rear communal gardens, which are neglected and perceived as negative space.

Photo 7. 2: Street Envelope, El-Salam Area

The minimum height/width ratio 1:1.5 (a shadow slope of 35° recommended by the planning standards - Libya) is achieved in most the planned areas. However, almost all buildings in this photo seems unfinished, and it is expected that future outlook of street profile and the activities can be different
Source: Own photo, 2012

Both areas of moderate density associated with patterns for land plots of medium size and terraced buildings at heights on average of 2 to 3 storeys and streets from 10.0 to 15.0 metres wide, *and* the medium-rise project site for apartment buildings at a density of about 80 dwellings per hectare, have contained suitable amounts of public open space with values ranging from 110 to 170 m² per dwelling. Indeed, these areas have been perceived as reasonably efficient and acceptable. They are associated with mixed activities and minimum conflicts between people and vehicle movement. They also have good permeability due to either the small blocks, characterised by a perimeter of less than 500 metres, or superblocks of well-arranged apartment buildings with cross pedestrian routes. In the cases of terraced buildings, although they contain elements such as private or communal gardens, garages and front

gardens, they still have a reasonably moderate size of land plot which is about half of that normally for the detached building types.

The common ratios of street widths to building heights of – 1:1.5 - have been positive with regard to the closeness of street walls and the protection of pedestrians, while casting minimum shadow on the opposite facades. As observed in the previous chapter, in relatively compact areas comfortable outdoor environments have been associated with a higher presence of people in the street and a variety of outdoor activities. Indeed, it is observed in the medium density case studies that people of all ages claim the street; some people sitting in the corner, others chatting and children playing, which is an evidence of a healthy street life.

Furthermore, there was space for different elements such as trees, car places and other street furniture arranged conveniently with traffic lanes, parking and pedestrian space. Moreover, unpaved and streets with temporary pavement, with their lower speed traffic, are used more than other streets as sharing space, where people claim spaces for little gardens, sitting places, and even mark the places for their private cars. These features show that a level of flexibility in the public space of residential areas is important for people to interact with their surrounding environment. Indeed, due to the harsh climate in Libya, shaded parts of the public space are used more often than others; they do provide a refuge for pedestrians especially around midday in the summer. In Benghazi, buildings are traditionally positioned to avoid uncomfortable summer sun and south winds. Urban blocks are oriented to benefit from the winter sun and the mild breezes of the seaside.

Photo 7. 3: Public Space Reserved for Private Uses; Buenqu

Soure: Own photo, 2012

Although the designs of shared and calmed streets are not common in Libya, people's response to low speed measures is encouraging. It has been observed that

diverse activities and the presence of people in public spaces are quite often at higher intensities on streets of unpaved or temporary paved surfaces – with unpaved sidewalks and kerb less carriageways - and those equipped with speed humps and like features that restrict speeds to acceptable levels. Whilst shared street and home-zone designs can improve safety, security, promote greater use of public space and encourage greening, such qualities can also be observed in streets that are only temporarily finished. In the city of Benghazi, streets with temporary pavements and unpaved carriageways, although causing a nuisance to people because of the dust raised by traffic and the lack of drainage, have advantages not only with respect to safety, diversity and free-walking, but also because they attract people's care and encourage spontaneous uses of the public space.

The preferred type and size of dwellings within the Libyan context are different from those of other regions. Demand for living space in Libya is higher than that observed in Asia and the size of household is more than double that in Europe. There are demands for more space to mitigate harsh the climate and to meet a need for privacy, which can in addition to other factors, justifies levels of physical compactness and density quite different from that recommended for sustainable development in other regions. However, current planning standards in Libya that set the minimum living space to 20.0 m^2 per person and 100 m^2 per dwelling unit (Land Use Regulations (Libya-GOV, 1996)) show no evidence that links these indicators to real demand or sustainability objectives.

Private open spaces - i.e. courtyards, side-distances, private gardens or roof-space are normally hidden behind high walls and arranged to meet different domestic needs such as living, relaxing, laundry and storage. However, side-distances, at different degrees, are less used as living space because they are often narrow and lack visual privacy. The case studies show that on average private open space makes up about 15% of the land plot for courtyard buildings, 30% for terraced buildings and 50% for detached buildings.

While the general expectation is that gardens bring with them food, coolness and visual pleasure, evidence from Benghazi city shows that communal rear-gardens, especially those in areas of low density detached housing, have failed to add value to

local areas; they are left unmaintained and perceived as nobody's land. Arguably, the issue of negative urban spaces within this context can be linked, in part, to the low level of compactness and the lack of design, which undermine local needs and the limited capacity of local authorities to develop and maintain public spaces.

Although, the suitable public open space per dwelling showed a degree of similarity across all the case studies, it was evident that levels of urban compactness are varied; correlated with urban typology and the distance from the civic centre; and they can influence aspects such as accessibility, efficiency of civic investments, viability for public transport and urban enclosure (see figure 7.4). However, some measures can be counteracting and need to be negotiated; for example, whereas protection of the microclimate justifies narrow streets and minimum open space, there is a need for more green and open spaces to alleviate the impact of climate change and facilitate the requirements of a modern lifestyle.

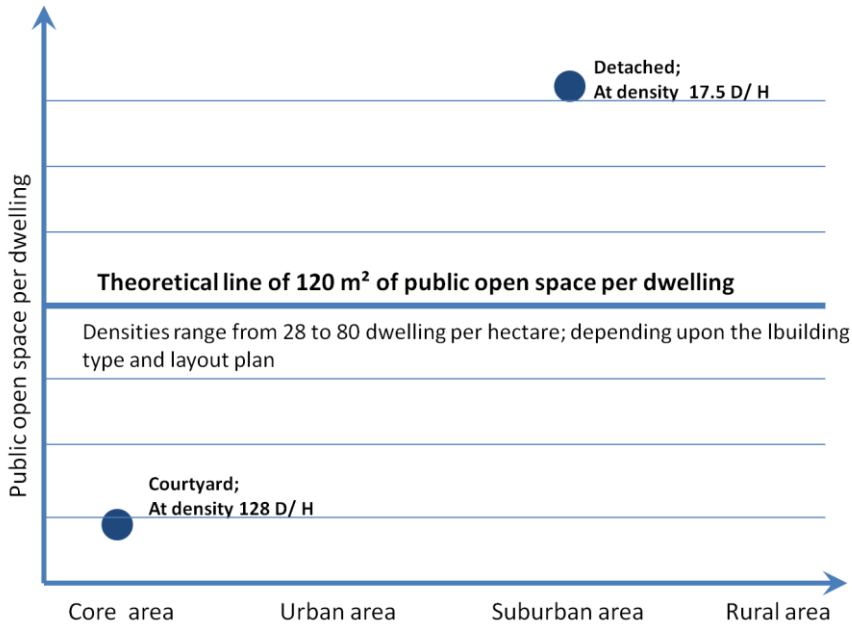


Figure 7. 4: Public Open Space per Dwelling, Compared

The findings show that a range of public open space from 110 to 170 m² per dwelling is associated with positive urban qualities such as urban enclosure, privacy and liveability. However, public open space is a function in the relationship between density, building type, layout plan and distance from the core area

It was noted that a change of street' width from 10.5 – 11 meters to about 6.5 – 8.0 meters lead to an overall reduction of 30% of street space (Southworth & Ben-Joseph, 2003, p. 7). To demonstrate the achievable levels of compactness within the context of zoning regulations in Benghazi, three theoretical land subdivisions have been laid out, including subdivisions of land plots for - courtyard buildings of 180 m², terraced buildings of 300 m², and detached buildings of 500 m² - with street widths of 15.0, 12.0 and 9.0 metres respectively, which maintain around 125 to 140 m² of public open space per land plot; assuming 1.5 dwelling per land plot. The results show compactness levels ranging from 2.12 to 2.98 - see Box 7.2 and Figure 7.5.

Box 7. 2: Theoretical Examples

Total floor area to public space per land plot (from road centreline)

1st scheme (density 32.5 D/H):
(180m² × 1.50) / 127.50m² = 2.12

2nd scheme (density 23.5 D/H):
(300m² × 1.20) / 125.13m² = 2.88

3rd scheme (density 15.8 D/H):
(500m² × 0.80) / 134.25m² = 2.98

In case private open space is added to public space (figure plan) the ratios show different tendencies (0.17, 0.30 & 0.50 are the rate of open space within land plots)

1st scheme: (180m² × 1.50) / (127.50m² + 180m² × 0.17) = 1.71

2nd scheme: (300m² × 1.20) / (125.13m² + 300m² × 0.30) = 1.67

3rd scheme: (500m² × 0.80) / (134.25m² + 500m² × 0.50) = 1.04

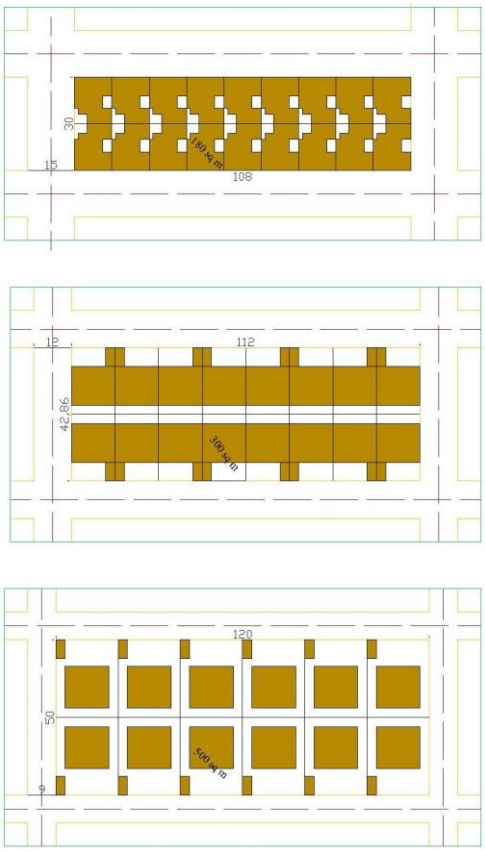


Figure 7. 5: Land Subdivisions – Theortical Schemes

Courtyard land plots with streets 15 meters, terraced buildings with streets 12 meters, and detached buildings with 9 meters streets.

While having a role in coping with challenges such as hot weather, dusty winds and the drying-up of green cover, urban areas, at the same time, do need to minimise their ecological footprint to sustainable levels. Investigating the urban form with a focus on attributes that influence the liveability and sustainability of the urban environment – such as a deep street envelope, street connectivity and diversity of uses - suggests that urban compactness that links physical form with real-life performance can be a useful indicator to assess urban quality and the potential for future intensification. The physical form is a result of complex factors associated with the local context. However, this view is different from that of the research on urban sprawl reviewed in previous chapters, which puts high density and mixed land uses at the centre of the debate on compact urban form.

The next section tests indicators of physical compactness and the relevance of various urban concepts for intervention using four case studies from Benghazi city and evaluates their level of performance within this context. This knowledge will be used to conclude urban principles which are important to facilitate the revision of planning guidelines.

7.3. Design Interventions

Understandably, existing urban forms are, to an extent, a result of planning regulations and practice, which may also obstruct adaptation to urban change. It is evident that in most cases urban intensification has been unplanned, and the results are accidental. Benghazi city was restructured by Doxiadis' Master Plan of 1980-2000 into a semi-circular form, made up of ring roads and arterials, which shape residential zones of low, medium and high densities, associated with certain building types, defined as follows: P1 – for detached and semi-detached buildings with one and two storeys; P2 - for row buildings with one and two storeys and semi-detached buildings up to four storeys; P3 - for row buildings of three and four storeys and medium-rise apartment buildings. However, because the planning process lacked a design dimension, layout plans were, to an extent, a direct application of abstract zoning criteria, so leading to quite accidental and fragmented localities, while urban

interventions in response to local circumstances, either being formal or informal, have often been random.

The study now examines, through an exercise of design interventions, the extent to which certain urban measures can help improve the sustainability performance of case studies of specific typologies. Although the majority of urban zones in the city are at various stages of development and much new urban development has spread outside of the urban boundaries, the task of retrofitting through design may help in verifying the relevance of urban principles and are expected to provide an important contribution to the research on urban sustainability in this particular context.

To this end, four of the eleven case studies, namely El-Slawi, Burniq, Ali Ben-Talb and El-Mukhtar-II, have been selected. These case studies represent different typologies, densities and urban issues. Four different strategies of urban intensification have been applied to the case studies. The evaluation of changes in urban forms and the associated qualities created by the design intervention in each case study show interesting results in respect of the improvement of urban quality and the overall sustainability performance of the local areas.

7.3.1. The Area of El-Slawi: *restructuring a neighbourhood*

- *Existing*: The neighbourhood contains an area of about 71.0 hectares located on the north-eastern side of the city and bounded by highways on three sides and a commercial street on the south-eastern side (see Figures 5.6 and 7.6). The site was criticised for its low levels of density and spatial intensity; it lacks a diversity of buildings and contains a wide range of vacant and underused land, mainly due to a network of cul-de-sacs and back-streets, and leftover spaces on the edges, which affect the quality and overall sustainability of the urban environment – more information on the site survey and the quality of urban environment was given in Chapter 6: Case Study No. 8.

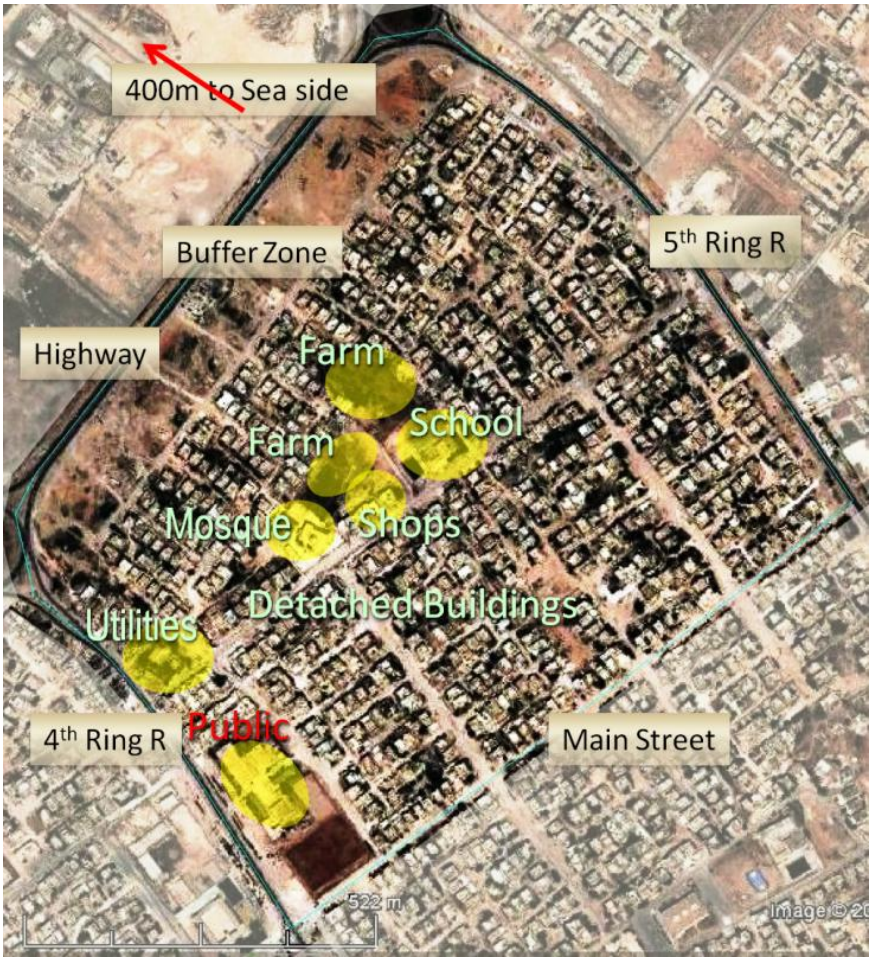


Figure 7. 6: Existing Situations, El-Slawi Area

Source: Google earth, 12. 2012

- *Design Concept*: Within the context of this exercise of design intervention, a redevelopment scheme for this neighbourhood has been laid out, which preserves the existing farms and the old mosque, while incorporating the cross street and surrounding buffer-zone, which were originally designated by the higher level master plan. For the purpose of this study a density of 120 persons per hectare - i.e. 24 dwellings per hectare - has been adopted as a guiding density for the layout plan. This indicator is based on a review of measures including the current average net-density of the city at 128 persons per hectare (Benghazi Regional Plan, UPA, 2008) and is in line with the promoted density in the literature of about 80 to 100 persons per hectare essential for a bus service. This is in response to the neighbourhood's peripheral location.

Based on this figure of density the size of the population is estimated at about 8,500 inhabitants - or 1700 households. According to Libyan planning standards, the required land area for public services is about 10.0 hectares including education, health, culture, trade, public agencies and recreation, in addition to 1.2 hectares for parking facilities. The proposed scheme, which deals with elements of urban form - blocks, streets and the open space, has the objective of influencing spatial intensity and net-density, and is framed to achieve higher levels of diversity and accessibility that would enhance the quality and environmental sustainability of the local area.

The proposed scheme has treated the whole neighbourhood area as two zones: an outer – or foreground - zone that benefits from higher connectivity to the wider city network, and an inner - or background - zone of quieter areas. Accordingly, all land uses and building types have been allocated depending on their specific needs. There is no one centre, but public facilities are distributed alongside main corridors and in different locations depending on their needs for accessibility and land requirements. While services with large footprints have been allocated to the geographical centre and peripheral locations, trade and public functions are placed on the commercial streets and highly accessible locations (Figure 7.7). It is a real-life trend - also observed by Alexander, Ishikawa & Silverstein (1977) - that higher densities tend to be at the edges and on the side of the neighbourhood closer to the main civic centre.

Three categories of local street have been defined that reflect the intensity of movement and the liveability of different public spaces; namely: the main streets, service streets and inner streets. The scheme is served by main streets connecting the neighbourhood with the city network. They are relatively wide and lined by buildings, which on average are four storeys high and contain a mix of uses especially on the ground floor. The main streets serve through-traffic, and offer space for parking, pedestrians and greening which suits relatively dense and mixed activities, enhances the character of the residential area and protect users from unpleasant conditions.

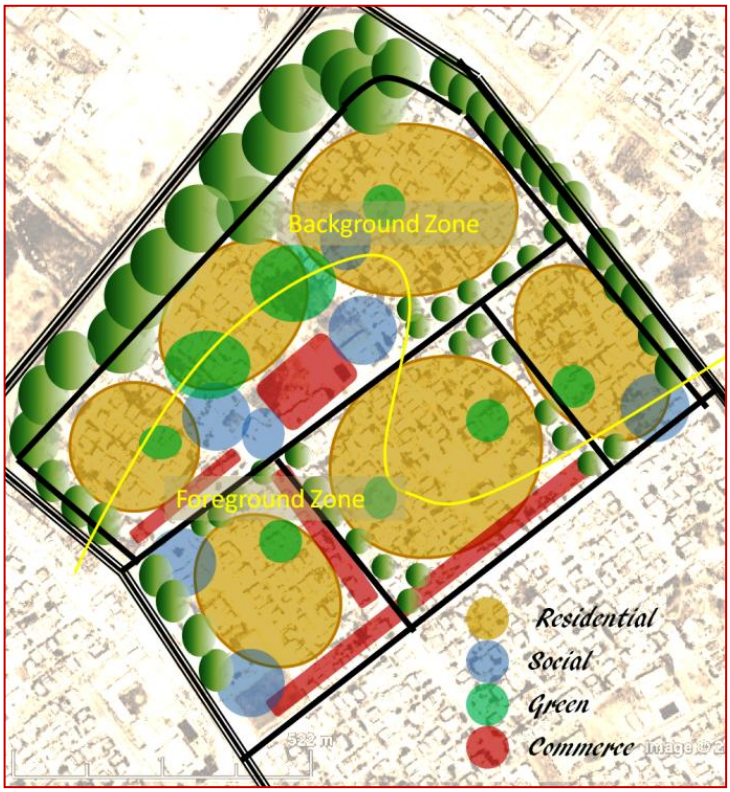


Figure 7. 7: Planning Concept, El-Slawi Area

The service streets connect residential clusters together and link them with the wider urban network. The service streets offer parking to visitors and carry traffic at 20 to 30 km/h. Because of low volumes, streets may have low kerbs, narrow walkways and parking spaces laid on half of the traffic lanes. Also rows of trees are proposed to help reduce speeds, direct traffic and define intersections, while increasing the green cover. In addition, the peripheral service street has been aligned to bind inner residential clusters together and prevent informal developments or any illegal connections to the surrounding highways.

Unlike main and service streets, the inner streets, which are laid orthogonally to each other, are meant to be semi-private, calm and flexible. They are laid out as home zones that restrict through-traffic, and have narrow carriageways of about 5.0 metres width, well-defined entrances, low or no kerbs, and rough paved or unpaved sidewalks. These are in addition to small green spaces, trees and hard landscape that define different places, improve privacy and improve the microclimate. Generally, in order to manage the size of the total open area, streets have been laid out of widths ranging from 8.0 to 10.0 metres in areas of detached buildings, and from 12.0 to 15.0 in other areas of terraced and courtyard buildings.

Building blocks are mainly small - 80 to 120 metres long and 40 to 70 metres wide - with no back communal areas. They are arranged at right angles to minimise public space and are oriented generally towards the north-west to catch the sea breezes. These features are expected to support connectivity, reduce traffic speeds, help place-finding and offer protection from the harsh climate. It is worth mentioning that within residential clusters, green areas as an independent land use have been reduced to the minimum. However, the public open space necessary for movement and other human activities has been treated as one combined space for greening and movement and has been balanced with the building mass.

The scheme adopts a mix of building types – single, duplex and multi-family buildings – that enhances diversity and offer choice. The massing and private open spaces have been arranged to support aspects such as visual links, green corridors and the skyline, in addition to create continuous street walls and gardens. Besides housing, the building blocks also contain some public uses that require a relatively small floor space like commercial and administrative functions. As a part of this task, the standards regarding building type have been reviewed. The suggestions as shown in the table below (7.1) include changes in densities, floor area ratios, plot size and heights based on results from the field survey (Chapter 6) and the abstract analysis of land use regulations (Chapter 3).

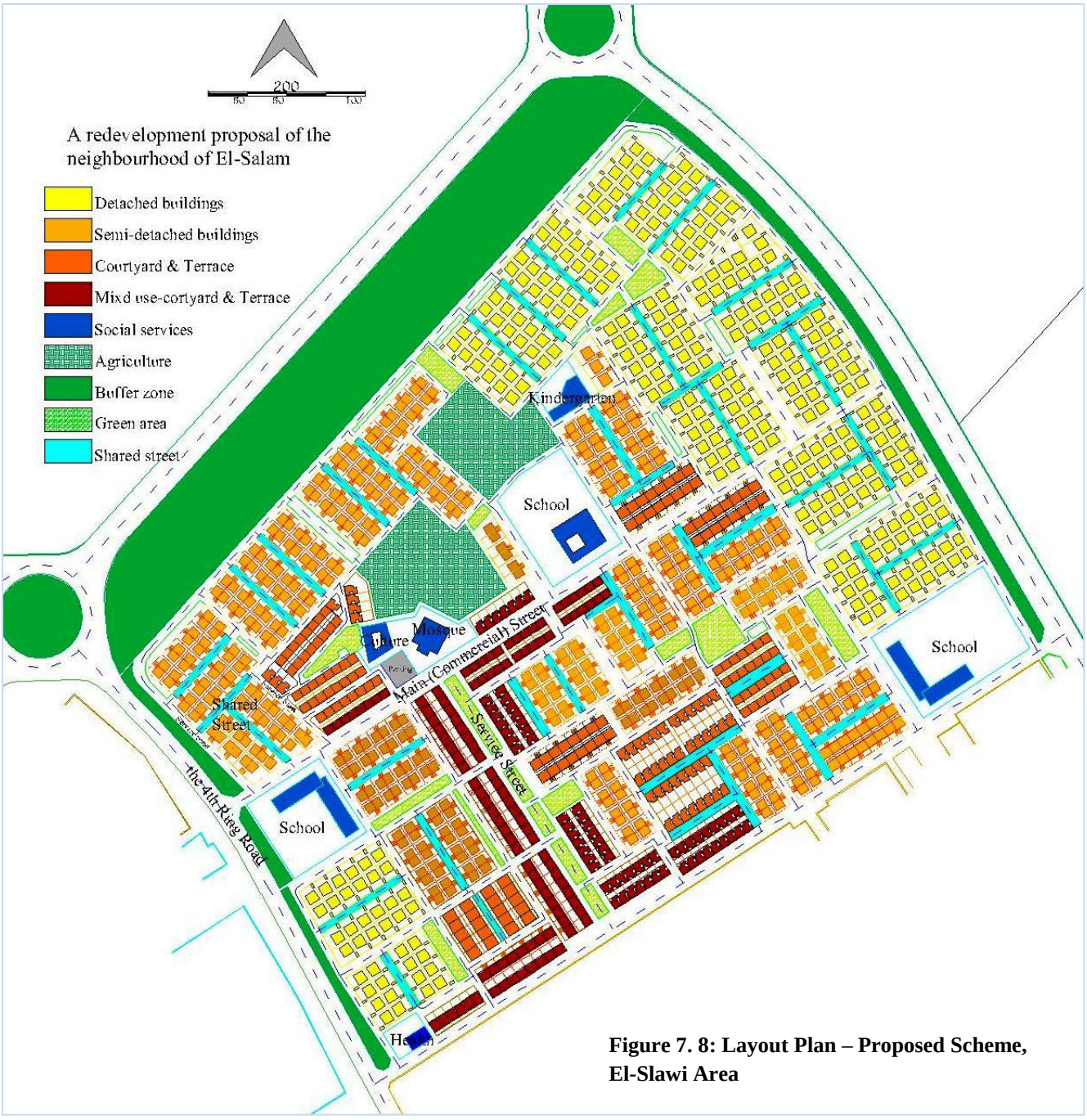


Figure 7. 8: Layout Plan – Proposed Scheme, El-Slawi Area

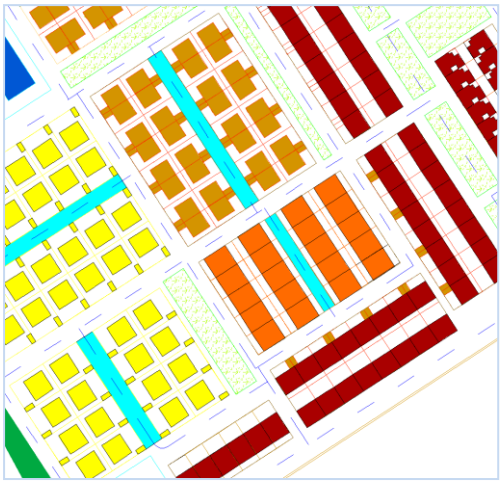


Figure 7. 9: Building Typology – Proposed Scheme, El-Slawi Area

Detached; semi-detached; terraced, and courtyard buildings;
Mixed use courtyard and terraced buildings

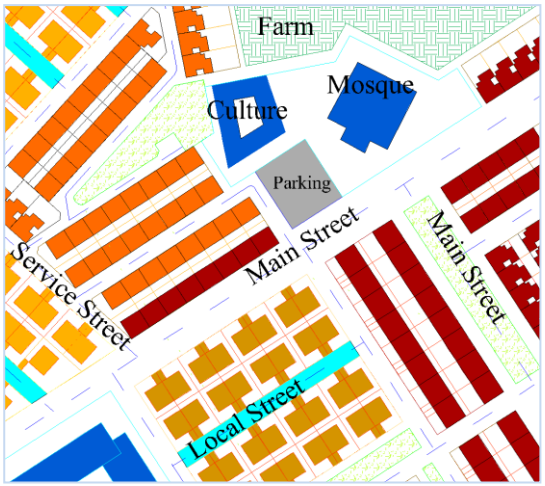


Figure 7. 10: Street Types – Proposed Scheme, El-Slawi Area

Main streets;
Service streets and
Local streets (home zones)

Table 7. 1: Categories of Building Types, Suggested Changes

Source: Based on the planning standards 1982 & land use regulation 1996

Category	Type	Plot size (m²)		Height-max.		FAR- max.		Density (unit/h)	
			New		New		New		New
R1- single-family	Detached	≤ 500	≥ 450	Two		0.50	0.80	10-14	10-20
R2- single-family		≥ 450				0.80		15-20	
R3- twin-building		≥ 700	≥ 500	Four		0.75		21-26	
R6- multi-family		≥ 500				1.50		70-100	
R4- single-family	Terraced & semi-detached	≥ 300	≥ 200	Three		0.65	1.20	27-40	
R5- single-family	Courtyard	≥ 180	≥ 150	Two		0.85		40-80	27-40
R5/1- multi-family			≥ 150		Four		1.50		40-80
R7- multi-family		≥ 300	≥ 200	Eight		4.00		≥ 100	

- While, the size of land plot and the ratio of floor area have been altered in the light of actual subdivisions and to combine similar categories, it was clear that the target density of category R5 is unachievable under the same conditions of single-family two storey buildings. It is

suggested that based on the same experience from field surveys, this category should be split into two, one with a much lower density fits the type of traditional central-courtyard buildings while the second is appropriate for low-rise multi-family buildings.

- *Results:* Generally, the scheme created 1144 land plots, assigned for single, multi-family and mixed use buildings. To estimate the resultant net-density, an indicator of 1.5 dwellings per land plot for single-family buildings that was suggested in Chapter 6 has been used here. The resultant figure was 24 dwellings per hectare – equivalent to 120 people per hectare. However, the housing groups, identified by their dominant building type, have an average public open space, excluding public facilities, of about 195.0 m² per land plot - i.e. about 130 m² per dwelling unit. Further calculations for urban compactness as defined by the ratio of total floor area to public open space (streets, gardens and other vacant land) have been estimated at an average of 1.91. Urban compactness by type is shown below:

(Urban compactness = land size × floor area ratio / average public open space)

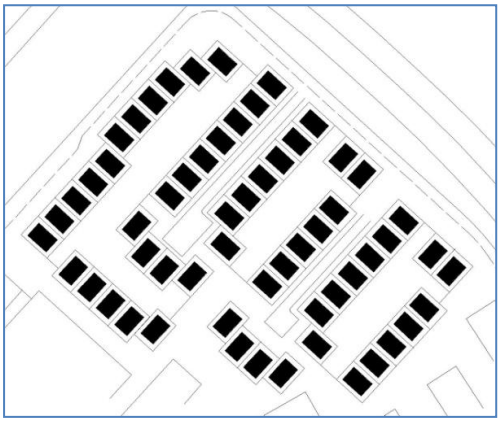
- Multifamily buildings: (250 m² × 1.75) / 230 m² = 1.90
- Courtyard buildings: (180 m² × 1.5) / 200 m² = 1.35
- Terraced & semi-detached buildings: (300 m² × 1.2) / 163.5 m² = 2.20
- Detached buildings: (500 m² × 0.8) / 230 m² = 1.74

(Note: 1.91 is a mean of urban compactness figures by type weighted by the number of land plots for each type).

Small open spaces are more manageable, more affordable and positive in regard to the protection of microclimate and the natural environment; however on the other hand, minimum open space can be negative for green cover and social activities. Based on the results from the field work, the proposed range of urban intensities is expected to offer a balanced urban form within this context, and should provide useful information for future development.

Table 7. 2: Parameters of Existing and Proposed Layouts – Compared, El-Slawi

	Site area - H-	Buildings		Dwelling	Density (unit/h)	Public open space (m/unit)	Compactness	
		No	Land cover				Public	Public& private
Existing	5.9	59	0.45	86	15	364	0.49	
Proposed	71.0 (Net-60.0)	1144	0.64	1716	24 (Net-28.6)	130	1.91	1.18



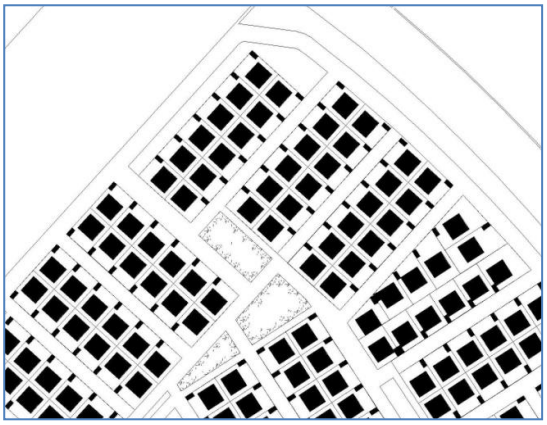


Figure 7. 11: (left) Figure-Ground Plan – Existing, North-eastern Cluster, El-Slawi
Figure 7. 12: (right) Figure-Ground Plan – Proposal, North-eastern Cluster, El-Slawi

A comparison for the existing and proposed schemes shows that the rearrangement for the same type of buildings allows for increasing the level of compactness for detached buildings from 0,7 to 1.74 and overall compactness level for the neighbourhood to about 1.91

To compare these indicators with minimum physical variables of the theoretical land subdivisions (compactness from 2.12 to 2.98 – see Box 7.2), the margin of public open space in this scheme is quite justifiable considering the location, design solutions and land requirement for other uses in parallel to traffic requirements. Based on these results, it can be argued that because real-life developments quite normally breach limits of total floor area, this margin of about 30% of open space in the proposal is expected to offer a convenient level of flexibility and avoid future conflicts. This example shows that urban intensification can be a useful tool to influence the sustainability of urban areas through a balance of the floor area to public open space. However, the compactness of urban form can be influenced by aspects such as zoning, urban typology and urban design.

7.3.2. The Site of Ben-Talb: *reclaiming of Underused spaces*

- *Existing:* The site consists of two-sided three storey apartment buildings, arranged in a superblock to contain large areas of land assigned for car parking and green spaces, and surrounded by public roads and vast leftover spaces. It was evident that a large amount of open space has a negative impact on the local environment. There are large areas of car parking and greenery which are underused, and having deteriorated, they are less secure and act as negative influence with regard to the microclimate; matters which led many people to use their back-doors on the main streets. See figure 7.13; also Chapter 6; Case Study No. 11 for more information on the site survey.

Public open space in this case accounts for more than double the total floor-area of all buildings. Although the project area exists in a medium density zone it contains low level of compactness about 0.43, a value that is associated with a density much lower than that is expected for multi-family housing and is unjustifiably very much lower than the figures that associated with the case studies of preferred qualities. Indeed, the compactness level of any urban area is relative to its typology and centrality. However, low levels of compactness can be positive to the continuity of green space and a healthy urban ecology, but under certain circumstances, as it is in this case, they can only be described as oversized and negative to the environment and peoples' quality of life.

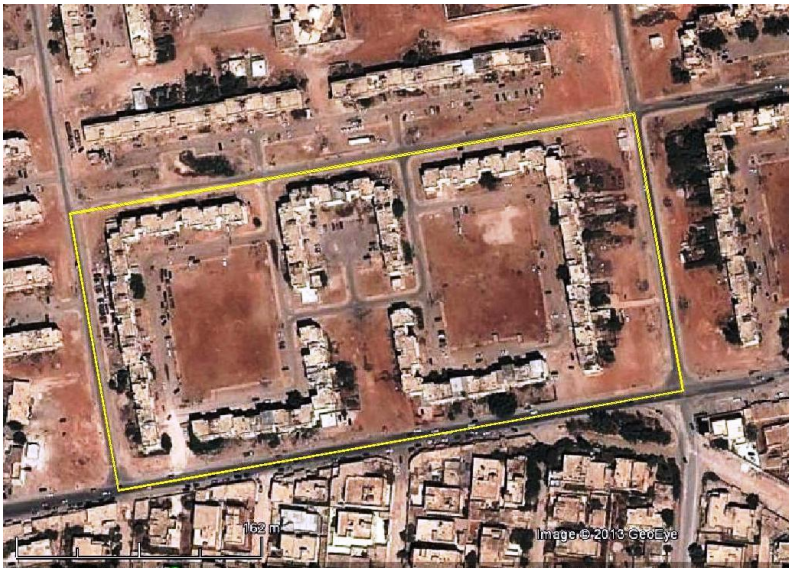


Figure 7. 13: Existing Situations, Ben-Talb Area

Source: Google earth, 12. 2012

- *Design Concept:* Measures of urban intensification proposed in this scheme include adding new buildings in order to increase net-density and hence the efficiency of urban investment, together with other design interventions such as shared streets, private gardens and greening to improve quality and justify an increase in physical intensity. A target density of a minimum of 40 dwellings per hectare has been set to be in line with planning regulations and also to bring the amount of open space per dwelling to more efficient and balanced levels.

To realise these strategies, 23 new four storey buildings have been allocated in the deserted space between existing buildings and in the leftover space at the eastern side of the site. The proposed buildings have a form similar to the existing. This is in addition to the provision of two one-storey service buildings, which can be allocated to use as a community centre, a kindergarten, health care-unit or any other similar service. The provision of private gardens attached to the ground-floor apartments has been introduced as a measure not only to reclaim leftover land surrounding the site, but also to protect privacy, improve the microclimate and promote sustainable practices such as home gardening (Figure 7.14).

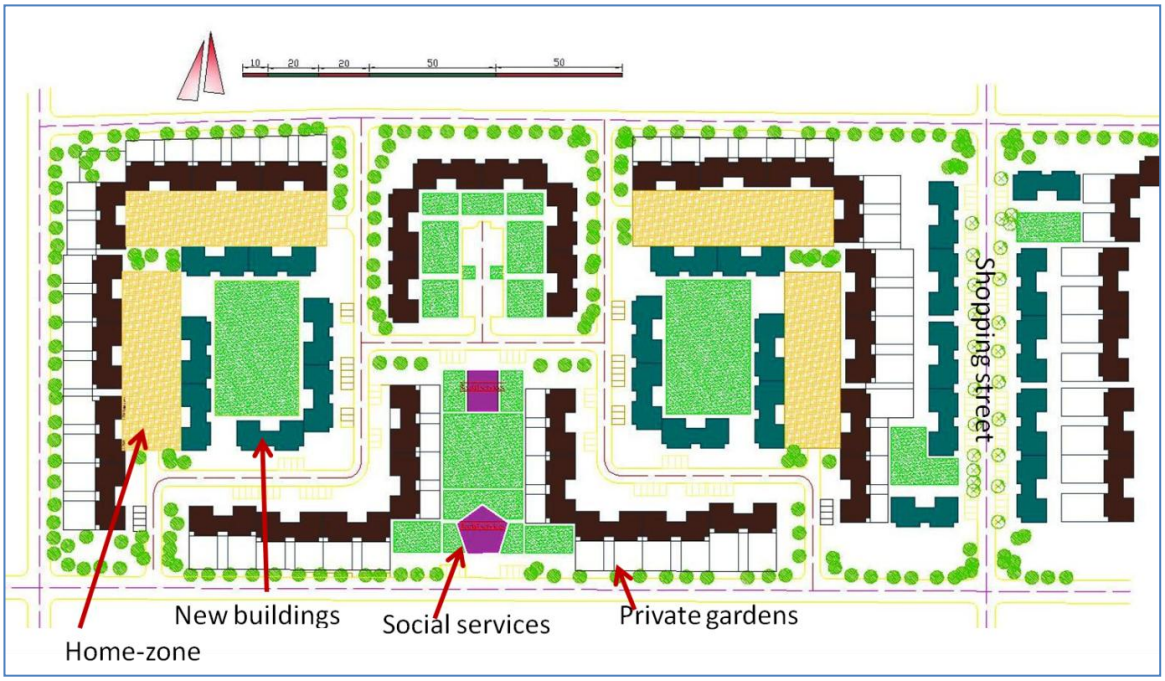


Figure 7. 14: layout Plan – Proposal, Ben-Talb;

Adding new buildings as a strategy to reclaim empty land

Results: These interventions helped increase the building footprint to about 21.5% of the site and the density to 54.5 dwellings per hectare. The amount of public open space per dwelling decreased to 124 m². The total open space including private gardens is 144 m² per unit. This has brought the level of compactness to around 1.10, which is important and close to the target levels. Flats in the upper floors continue to have access to the main street through the back doors and the space between private gardens; also these spaces which are about 6.0 meters wide can be used for other purposes.

Achieving suitable levels of urban quality have been a justification for this level of physical compactness. Space between buildings has been redesigned not as cul-de-sacs and parking spaces, but as a space shared by people and cars; it is a design which prioritises people over cars and invites outdoor activities by converting the current deserted common spaces and underused parking places to a more liveable environment. Also dense greening and rows of trees are used to define spaces and visual axes, while offering refuge and creating a healthy and enjoyable urban environment.

Table 7. 3: Parameters of Existing and Proposed Plan – Compared, Ben-Talb Area

	Site area - H -	Buildings		Dwellings	Net-density (unit/h)	Public open space (m/unit)	Compactness	
		No	Land use				Public	Public & private
Existing	6.9	32	12.5%	192	28	315	0.43	
Proposed		55	21.5%	376	54.5	124	1.10	0.94

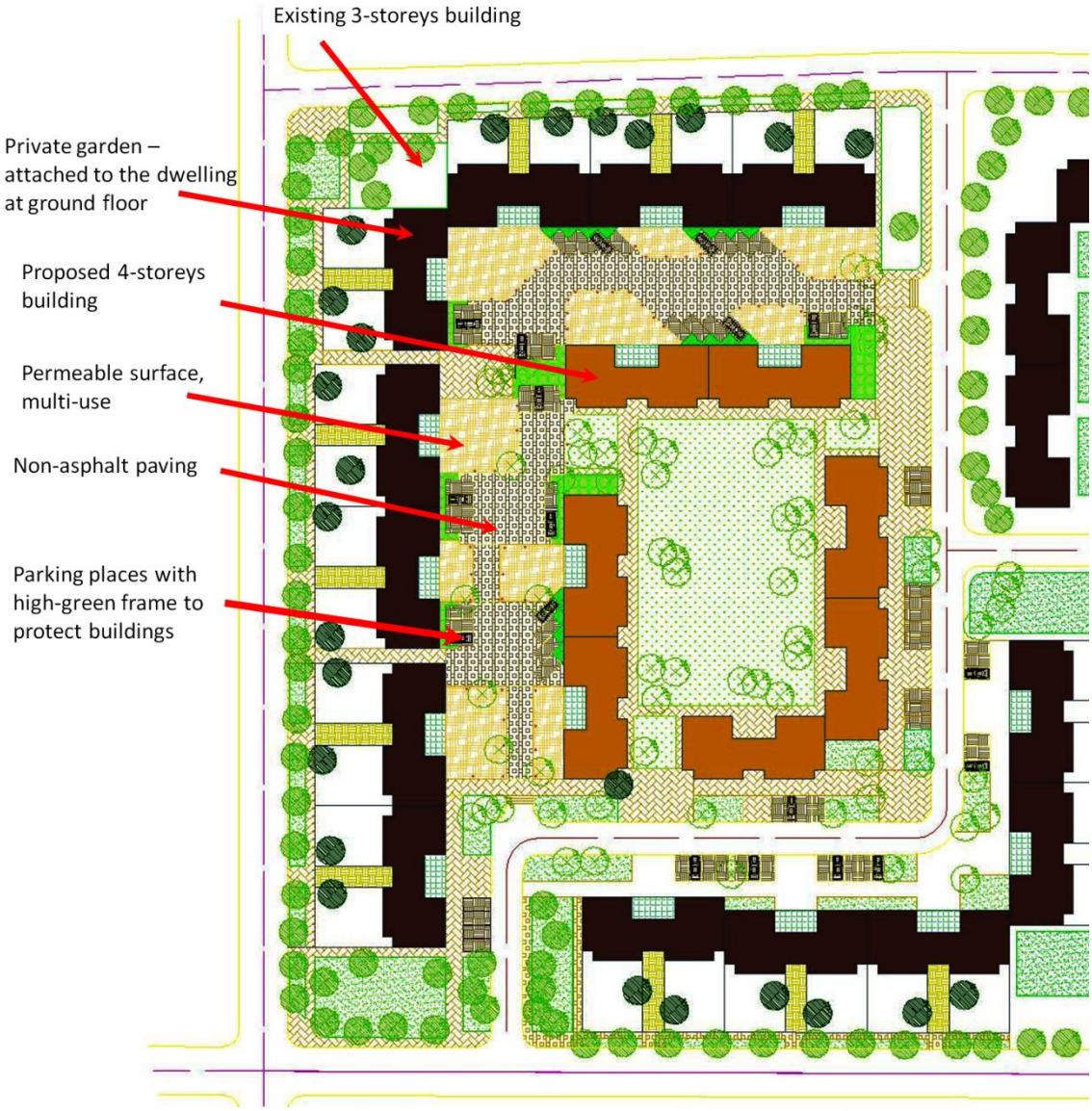


Figure 7. 15: Detailed Plan - Proposed Scheme, Ben-Talb Area

street layout, new buildings and the provision of private gardens

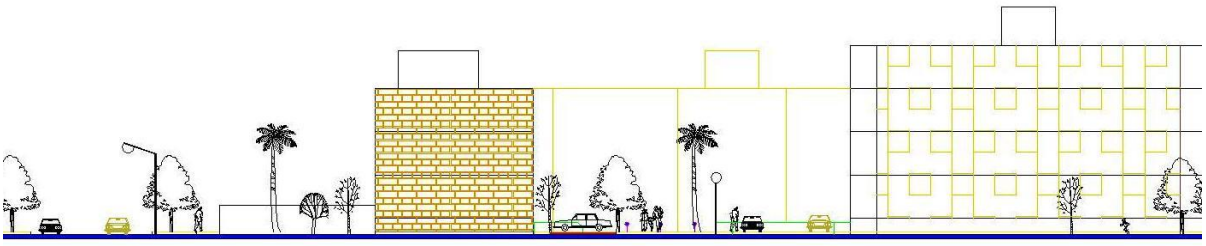


Figure 7. 16: Site Cross-section – Proposed Scheme, Ben-Talb area

Calmed streets are laid out to have entrances that are well-defined by ramps, trees and hard-elements. It is suggested that the street surface should be kerb-less, and sidewalks paved by rough non-asphalt materials with a variation in pavement patterns and partially permeable to improve the sense of place and eliminate car-dominance. The diagonal on-street parking places are located close to walls and controlled by bollards to meet the demand for car parking which has been calculated on the basis of 0.5 cars per apartment, in accordance with the national standards, while planting and sitting benches have been arranged to give more space for people to make use of the whole of the street area.

In a harsh climate large open areas are rarely grassed but trees can be more resilient. The assumption here is that the use of trees alongside main roads and in green areas can open ecological corridors, enhance bio-diversity and connect them with the wider metropolitan green network, while at the same time they help to improve air quality and the overall urban environment. Trees alongside main streets surrounding the site can alleviate the negative impact of vast undefined space and help bring car speeds down; they define movement and visual axes and protect local climate. Features such as permeable-surfaces are expected to allow some grass to grow, invite spontaneity and attract more human activities such as playing, sitting and chatting in the outdoors.

7.3.3. The Site of Burnqe Area: *redevelopment while preserving local character*

Existing: This site of distorted grid pattern contains narrow streets and thin blocks of courtyard buildings. The survey shows that at a density of about 140 dwellings per hectare, public open space has been insufficient to meet local needs and led to many conflicts. This example represents a quite different problem of urban deterioration and lack of open spaces caused by the unbalanced practice of urban intensification. Ongoing redevelopments, as they respond to modern lifestyle, land values and technology, have failed to anticipate different needs in the public space. The mismatch between housing density and public open space has resulted in congested streets, low quality urban space and, in turn, various conflicts and less outdoor social activities (see figure 7.17).

Figure 7. 17: Existing Situations, Burnqe Area

Source: Google earth, 12. 2012

Arguably, these realities have been partly a result of quite contradictory approaches of, on the one hand, the desire to preserve the historic fine-grain pattern of local areas, and on the other, a practice of redevelopment which responds to the demands for modern building type and vertical intensification; this has led to an overall size of private open space less and floor area much more than those of the original buildings.

The impact of intervention activities in the past, such as the widening of streets and urban clearance, are still visible in the current urban fabric. As a result, social activities on streets, which are the justification for the preservation of compact localities, are very much affected. It is a challenging reality, as it reflects the current situation in many Arabic cities, where old quarters have been reduced to back-streets with store houses and accommodation for poor migrants - see the survey results Chapter 6 case study No 1.

- *Design Concept:* In order to negotiate the physical mass with both private and public open spaces, while preserving the existing fine grain pattern characterised by its narrow streets and human scale blocks, the proposed intervention strategy has focused on the demolition and re-development of a mix of three types of row-housing with: lateral-courtyards; common-courtyards and rear-private gardens. This strategy would allow most buildings on the narrow streets to access more light and green on the opposite side, and negotiate vertical density with provisions for private gardens – see Figure 7.19.

Local connectivity has been treated by opening new cross-routes but at the same time restoring the continuity of some streets. Land area assigned for public and private gardens has been compensated by vertical intensification but within the limit of four-storeys, while three-storey courtyard-buildings are arranged to combine courtyard space together in order to improve access to natural light. Although narrow streets are an advantage in the hot climate, indeed buildings on these streets should not have extended balconies over the streets and may need even to retreat at the higher floors to minimise shadowing the elevations opposite.

Shared street treatments are applied to make the best out of the limited public space and to encourage social activities in the outdoors. The treatment includes: paving patterns and material to emphasise a sense of place and priority for pedestrians; entrance ramps and demarcation; kerb-less lanes, and free-standing diagonal car-places pushed closer to walls to gain space but keeping enough distance to protect doors and related movement. Additional treatments include arrangements of trees and greens on streets and rear-gardens to improve the microclimate and create an enjoyable outdoors. However, it is believed that in the narrow streets of the core area, it is not so relevant to promote permeable surfaces and spontaneity, while the restoration of broken street-lines and the cross-streets are valuable measures that improve connectivity and the continuity of street-line.

- *Results:* The proposed layout succeeded in devoting about 50% of the site area to public and private open spaces, and reducing the compactness level to about 5.6 - or 4.3 if private open spaces are included. It is possible within this context to rearrange a traditional fine-grain pattern as three- to four- storey buildings at a density of about 128 dwellings per hectare, where a mix of uses in addition to characteristics such as closeness to public facilities and high levels of connectivity have been helpful to compensate for less open space per dwelling. However, differences between the acceptable levels of compactness in the different zones across the urban rings of Benghazi city can be explained by the concept of *transect* which is based on the suggestion that there is a relationship between the centrality of an urban area and its typology.

Table 7. 4: Parameters of Existing and Proposed Plan – Compared, Burnqe Area

Scheme	Site area - H -	Buildings		Dwellings	Net-density (unit/h)	Public Open space (m/unit)	Compactness:	
		No	Area				Public	Public& private
Existing	2.18	76	64%	304	140	26	6.16	
Proposed		70	61%	280	128	30.6	5.6	4.3

Understandably, such administrative measures are crucially central to the process of redevelopment, mainly the issue of *land readjustment*, which is an inevitable to facilitate such strategies. Essential to the technique of land readjustment is the facility to bring all the land into one "basket", set the new scheme, and then redistribute the outcome based on value or land share. Moreover, in such a compact urban form, it is unfeasible to provide enough on-street parking places to meet local demand, which is expected to be one half of a parking place per dwelling. Hence the assumption here is that most parking demand would be met through the provision of common underground parking which, although unfamiliar in Benghazi and expensive, may be justified as an alternative to private garages or the provision of off-site car parking within reasonable walking distances; practices which are currently in place and cause much of inconveniences.

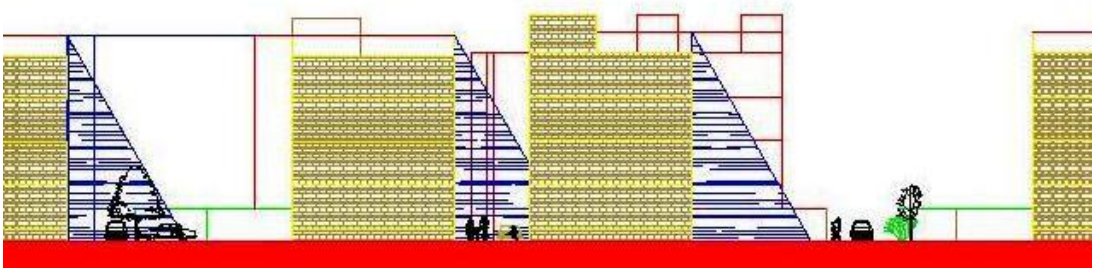
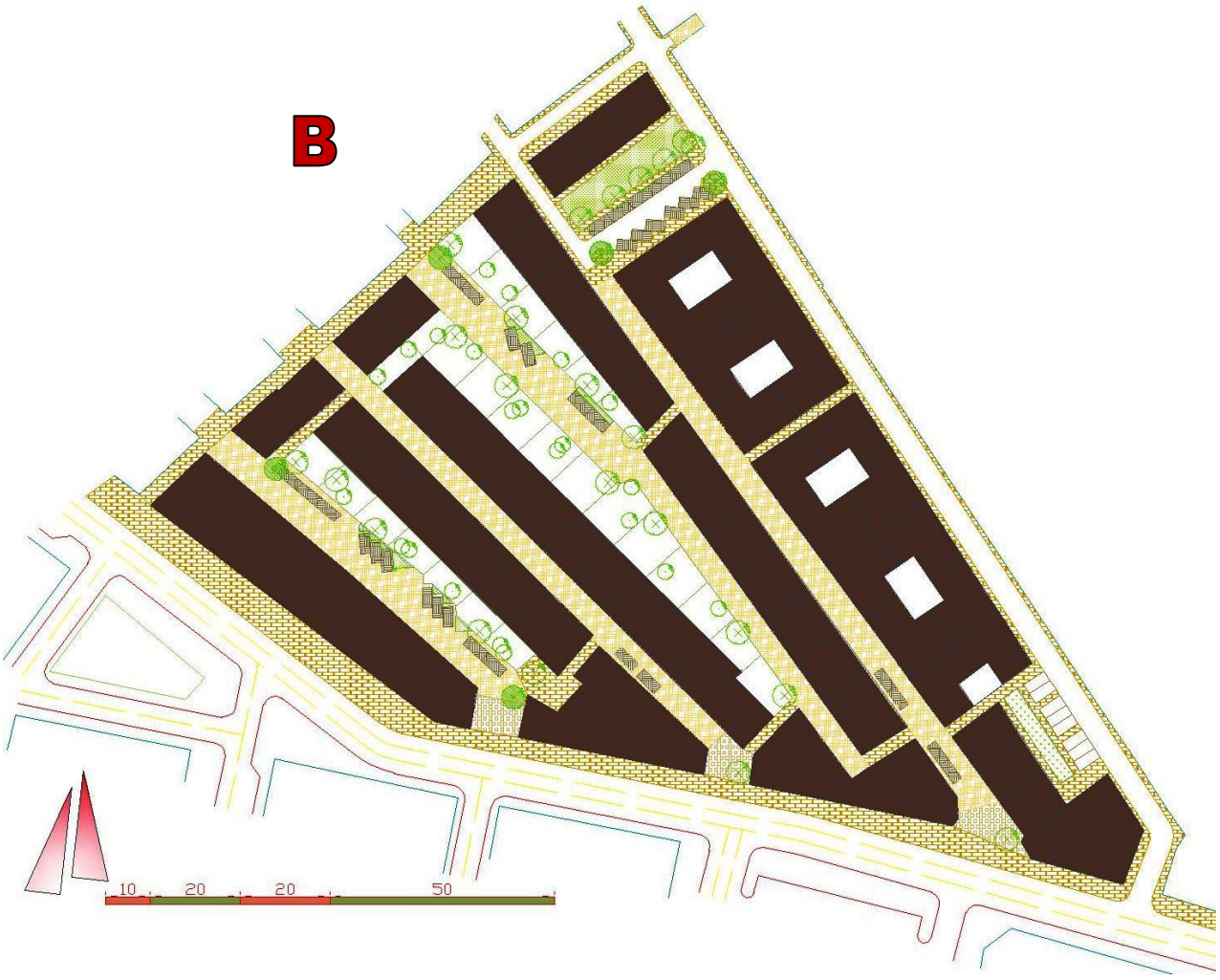


Figure 7. 18: Site Cross-section – Proposed Scheme, Burnqe

a balance of deep envelop and green spaces

Figure 7. 19: Layout Plan, Burnqe
Existing (A)
Proposed (B)

Built area= 1.3231 hectares
Extracted gardens and common courtyards= 1.0752 hectares
Floor area= 47,993 m²
Public open space= 8,569 m²



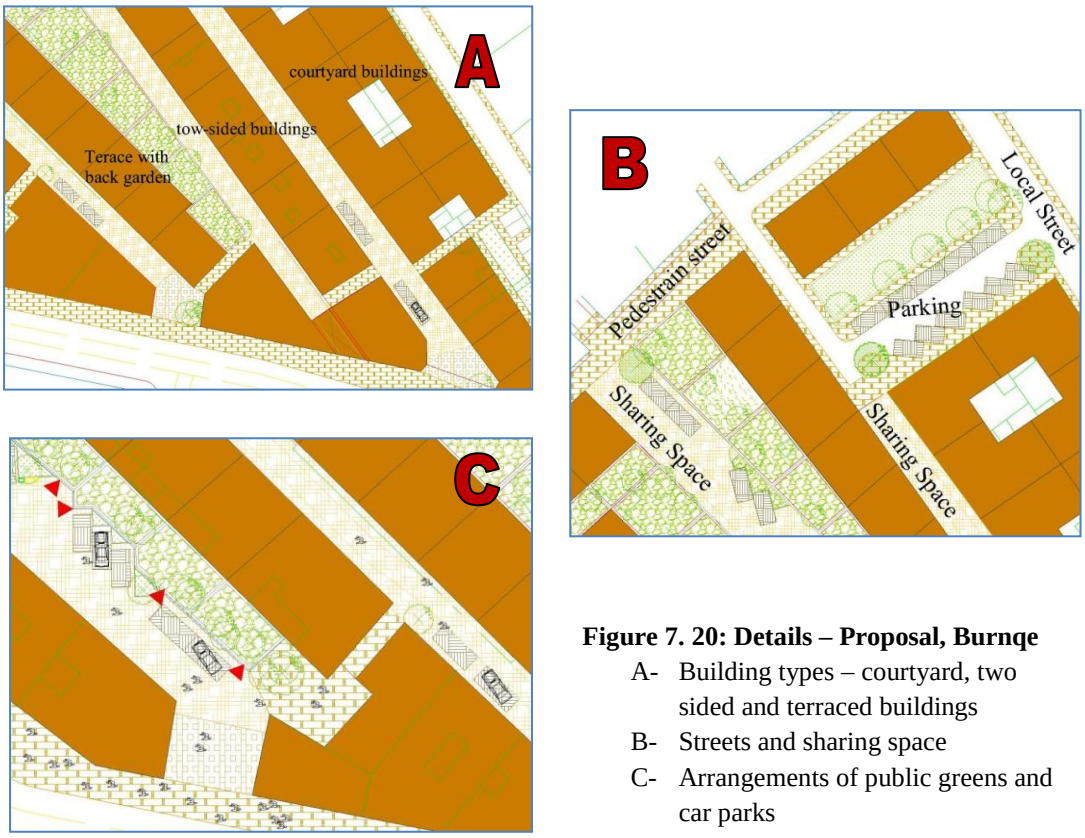


Figure 7. 20: Details – Proposal, Burnqe

A- Building types – courtyard, two sided and terraced buildings
B- Streets and sharing space
C- Arrangements of public greens and car parks

7.3.4. The area of Al-Mukhtar –II*: vertical intensification*

- *Existing:* This case study presents a subdivision of perimeter blocks that contain wide streets and detached buildings. However, features of large land parcels, wide streets and rear communal gardens have indeed been clear factors in the oversized public open space, which is in this case reaches about 351.0 m² for each dwelling. In fact low dwelling density and large land parcels do increase distances to local services, reduce chances for public transport and, in effect, impact on the sustainability of environment (see figure 7.21 and the site survey in Chapter 6; Case No 7).

The observed site shows that although each rear communal garden has only one opening to the public streets and can be accessed directly from the backdoors of most of the surrounding properties, they are far from being positive. Indeed, they are mostly abandoned and have been widely perceived by local residents as insecure and a source of nuisance. Normally, residents prefer to access their homes from the front-

doors, where they can watch and use their cars and the children are more secure on the un-paved streets of very low traffic volumes and speed.

Figure 7. 21: Location Image, El-Mukhtare

Source: Google earth, 12. 2012

- *Design Concept:* The scheme suggested to this site is based on certain intensification measures including increasing the floor area and dwelling density through vertical intensification, and improving the quality of the rear gardens through opening more paths and provision of new uses such as public meeting rooms and playgrounds in order to attract people and improve security, while reclaim part of the open space for public uses (figure 7.23).

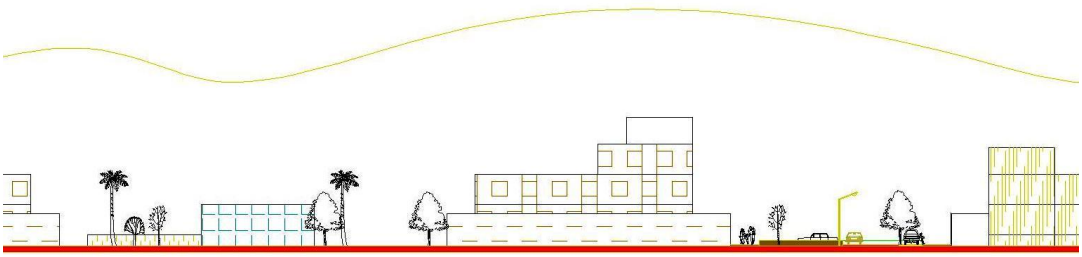


Figure 7. 22: Site Cross-section - Propoased Scheme, El-Muchkat-II

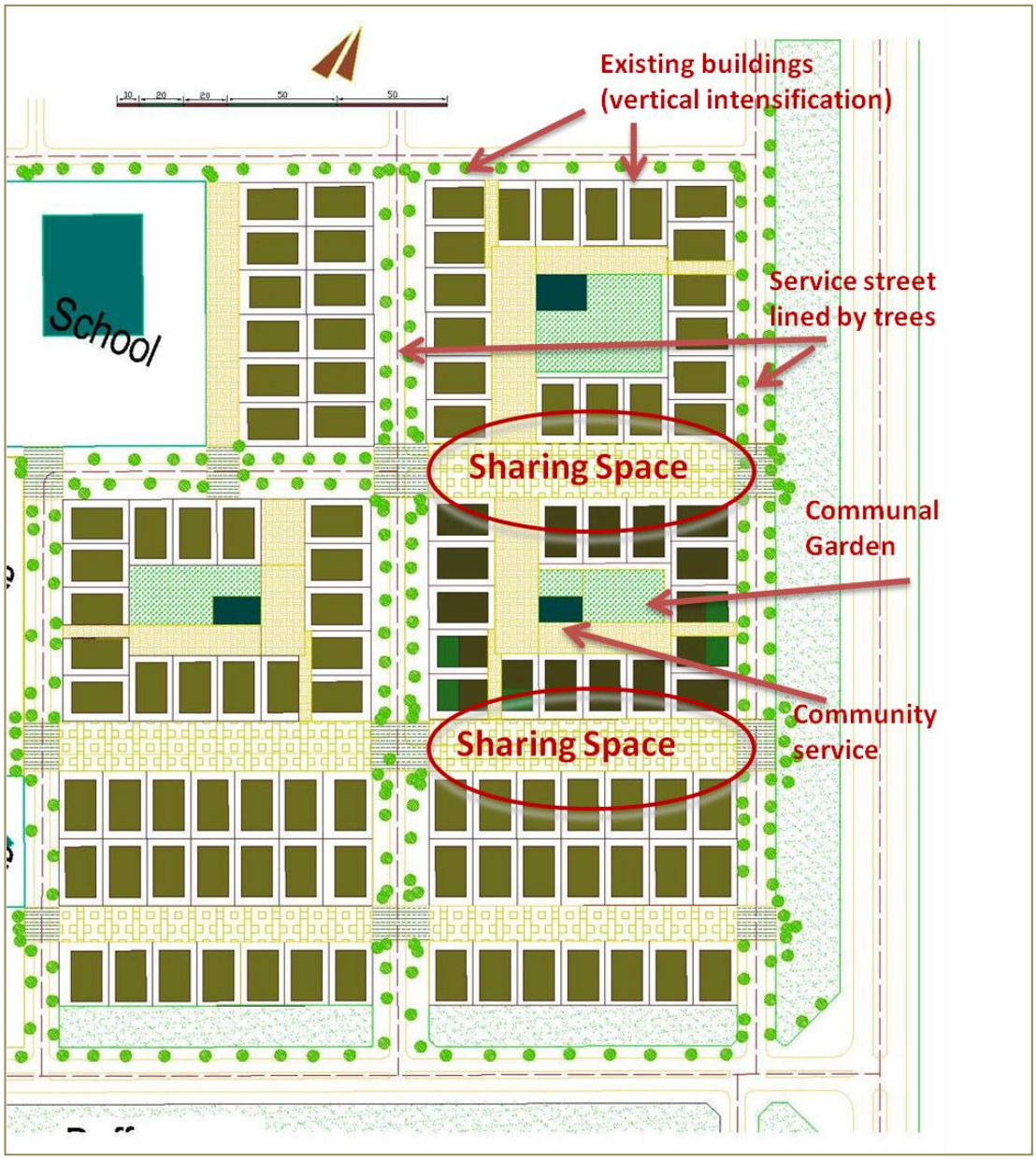


Figure 7. 23: Layout Plan – Proposed Scheme, El-Muchkat-II

The changes include the rearrangement of the common gardens and opening new through-block routes, this in addition to measures of vertical intensification and design of shared streets

The proposed scheme includes the provision of a building for social purposes attached with a garden, in addition to the opening of two through routes to the opposite streets at widths of 3.00 metres - 1.5 metres from each adjacent land plot. Three affected properties are eligible for bonuses of extra floor space of 135 m², while the two others 90 m², which is equivalent to three times the area of the requisitioned land.

- *Results:* It should be noted that an alternative concept of gated communal garden has been applied in other places but with limited success, due to lack of legislative basis and people's limited capacity to maintain the common garden. The new openings through the urban blocks have also been a measure for better permeability. This treatment would require compensating the extracted land from private properties, which may grant them the right for more floor space equivalent to three times the taken space (in line with the building code (Libya-GOV, 1971)).

However, with regard to dwelling density, it is suggested that an increase from the observed 1.5 dwellings per land parcel to 2.0 dwellings will result in a density of 17.8 dwellings per hectare or about 90 inhabitants per hectare (5.0 persons per a household - Benghazi plan 2025). This measure would lead to a change in the sky line as heights will change from the current range of one-to-two storeys to mainly two-to-three storeys. These measures for reducing public open space overall, opening new routes and diversifying the use of public space, are expected to create a more comfortable and green outdoors and this, in turn, will attract more social activities in the public space and enhance the sense of responsibility and ownership.

Similar to the previous cases, the treatment of public streets as shared spaces will help provide people with most of the open space they need for outdoor activities and also justify the reallocation of parts of rear-gardens to other uses. The wide streets in this case are arranged to accommodate decent space for various human activities, greening and on-street parking, which in single-family provisions is calculated as one car-place per dwelling with 50% on-street (the Planning Standards- (UPA, 1982)).

Table 7. 5: Parameters of Existing and Proposed Layout, Compared, El-Muchkar-II

Scheme	Site area - H -	Buildings		Dwellings	Net-density (unit/H)	Public Open space (m/unit)	Compactness
		No	Area				
Existing	11.6	103	53%	155	13.5	351	0.68
Proposed		103	53%	206	17.8	244*	1.00

* The reduced area equals the rear-garden space reclaimed for social uses and rental garden, this is in addition to the increase of density.

Figure 7. 24: Detailed Plan - Proposed Scheme, El-Muchkar-II

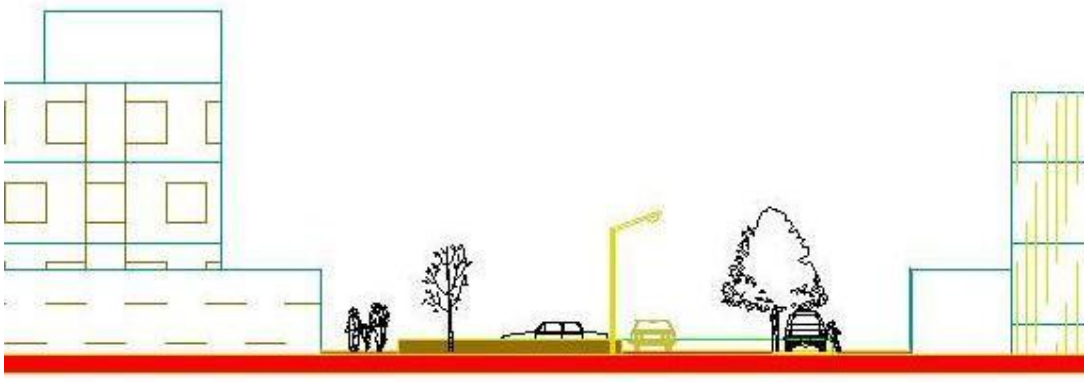


Figure 7. 25: Street Cross-section (Home Zone) – Proposed Scheme, El-Muchkat-II

7.4. Discussion

The configuration of urban form and elements, and the process of plan preparation and implementation can, together, shape a sustainable urban environment, which is expected to be diverse and connected, characterised by suitable levels of physical compactness, density, greening and flexibility. Local design solutions and participatory process are important means towards these ends.

Current planning tools have not yet specified and presented the characteristics of the compact urban form for the neighbourhoods within the planned zones in Benghazi in such a way that can respond to the demands created by modern lifestyle and the sustainability objectives that include a minimum footprint and high quality urban environment. It is evident through this research that an urban form that is human scale and consists of fine grain patterns is appropriate to contemporary development in Benghazi, where privacy, thermal comfort and affordability are needs of higher priority than visual quality.

The observations in Benghazi show that though large parts of residential areas consist of private housing of small blocks and low to medium heights, local areas, in general, contain different building types, densities and levels of compactness, so leading to differences in local qualities and levels of performance in terms of sustainability. Many local areas have been challenged to different degrees by the impact of urban fragmentation, which includes vacant and underused land, incomplete infrastructure and unbalanced levels of intensification. Fragmented urban form has been defined in this study as a type of urban sprawl, which is partially a result of planning theory and practice; characterised by dispersed urban patterns, low density and poor design.

To examine the suitability of compact urbanism for the case of Benghazi city, design intervention has been pursued in this chapter as an approach to alter the form and content for four case studies with different urban characteristics and qualities. Different intensification strategies, associated with the idea of compact urbanism, in addition to relevant urban principles have been applied to these case studies. The

examination has been facilitated by the "before and after" analysis of each case study and the comparison of the differences (Table 7.6).

Table 7. 6: Physical Indicators – Surveyed, Theoretical and as a Result of Design Interventions

Task	Type	strategy	Building area % (change)	Net density (unit/h) (change)	Public open space (m/unit) (change)	Compactness (change)
Selected Surveys	Terraced – grid		52%	30	115	1.40
	Apartment - medium rise		18%	81	111	1.58
Theoretical - minimum standards	Courtyard – grid		58.5%	32.5	127.5	2.12
	Terraced – grid		70.5%	23.5	125.13	2.88
	Detached – grid		79%	15.8	134.25	2.98
Design intervention	1.Mixed – grid	Restructure	64% (+19%)	24 (+9)	130 (-234)	1.91 (+1.42)
	2.Apartments - low rise-superblock	Reclaim land	21.5% (+9%)	54.5 (+26.5)	124 (-191)	1.10 (+0.67)
	3.Courtyard - distorted grid	Redevelopment	61% (-3%)	128 (-12)	30.6 (+4.6)	5.60 (-0.5)
	4.Detached - perimeter block	Vertical Intensification	53%	17.8 (+4.3)	244 (-107)	1.0 (+0.32)

❖ Building area does not cover space that claimed for private gardens or public services

The four case studies chosen at this stage to represent different typologies and common problems in the city have been subject to two layers of intervention. On the one hand, strategies of urban intensification that include: (i) the restructuring of a neighbourhood, (ii) redevelopment of a traditional quarter, (iii) reclamation of underused land, and (iv) vertical intensification, have been applied with a target of balancing the compactness levels of local environments in order to improve diversity and connectivity of local environments, based on the knowledge gained from the previous survey and other sustainability requirements.

On the other hand, design solutions such as - small blocks, private gardens, shared streets and urban greening - have been applied in line with the rearrangement of - green, living and movement urban systems. These have been applied in order to justify and support the strategies of urban intensification, promote affordable

solutions through flexible development and examine their appropriateness in achieving better urban qualities that improve privacy, microclimate and affordability.

The results have confirmed previous conclusions from the field surveys that there are strong relationships between the quality of urban environment and both the amount of public open space and block permeability. An acceptable amount of public open space of about 110 to 170 m² per dwelling has been associated with levels of urban compactness ranges from 1.2 to 1.9. At these levels of physical compactness it was possible to achieve a balance between different sustainability objectives.

Urban compactness - the ratio of built mass to the amount of public open space - has been viewed as an indicator that can help define a balance between two conflicting needs: on the one hand a minimum open space to reduce the development footprint and improve urban climate, while on the other hand, space requirements for green initiatives and human activities.

Based on the investigation of the links between spatial parameters and the sustainability performance in different residential areas, the study has concluded that there is a level of balance for urban compactness, above which signs of congestion and conflicts between human activities and car traffic in the public space start to appear, while below that level, local areas become more associated with sprawl problems, including deserted open spaces, spatial separation and deteriorated urban climate. However, within the range of 1.2 to 1.9, the urban compactness for different case studies has been perceived as balanced and sustainable. It is associated with a suitable amount of public open space for human activities, flexibility and a climatically protected urban mass. This is in addition to elements such as private gardens and flexible streetscapes that protect privacy and improve the quality of local areas – An exception is the core area, where higher levels of compactness are justified due to factors such as the historical layers of development and high percentage of non-residential uses.

The observation shows that within this range of urban compactness, public open spaces can be made more liveable and streets may function as shared space for people and vehicular-traffic. However, although unfinished streetscape and buildings

might not be visually interesting and may encourage informal intervention, the case studies show there is a positive side to *unfinished urbanism*, which is flexible and tolerant of spontaneity, important for future changes and supportive to the engagement of local people. This is in contrast to the case with other contexts, where planning schemes are over designed, leaving no space for changes, additions, or any future interventions.

The treatment of local streets and other open spaces as shared space is expected to help reduce speeds, encourage outdoor activities and minimise impermeable surfaces. The concept introduces measures such as kerb-less carriageways with textured or unpaved sidewalks, humps, narrowing street entrances, more spaces for greening, and moving parking places closer to walls in order to free up more space for other activities. Also front doors, which offer semi-private space; important for engagement in public life, have been protected. This is in addition to other proposals such as rows of trees and dense greening to define spaces and increase green-cover, the strengthening of street-walls and opening of new routes to improve physical and visual permeability, and lastly the provision of private gardens and protected spaces to improve privacy and encourage spontaneous activities. Table 7.7 summarised the important measures that applied in the different case studies, and the expected outcome.

To sum up, this chapter reflects on the features of compact urbanism, which has been widely promoted as supportive for urban sustainability, and examines the relevance of various concepts associated with this theory to situations of fragmented neighbourhoods in Benghazi city. To these ends, an exercise of design intervention has been employed to investigate to what extent certain intensification measures, when applied in line with particular urban design solutions, can help improve the sustainability performance for both existing situations and future development. This exercise should not be considered as an end-product in itself; it is only intended as a means of exploring the possibilities of using knowledge gained from the theoretical review and real-life examples when undertaking a design task. It is intended, in broader terms, to open up a way to explore a larger range of possible urban strategies and to test different urban design solutions that are supportive to urban sustainability.

It is worth mentioning that while acceptable levels of public open space can be influenced by factors such as typology, distance from the centre and access to transport and other facilities, the urban form is changing due to the practice of gradual development. This experience underlines the importance of both the strategies that manage the physical form, and urban design solutions as tools to improve urban sustainability and negotiate development capacity. Both urban elements and physical parameters influence each other and can offer the means to control the extent of urban intensification.

Rather than attempt to define a static model for sustainable urban development in Benghazi based on theoretical conclusions, this work provides an example of identifying urban principles based on their success to improve the sustainability performance of different local areas. These results provide important information for the next stage, which attempts to help define an urban approach based on urban guidelines for more sustainable urbanism in Benghazi and the wider Libyan context. The next chapter will cover discussions on the applicability of these results under different development situations, and suggests revision to the current urban design approach and guidelines in order to facilitate the development of more sustainable urban neighbourhoods within this context of Benghazi city.

Table 7. 7: Main Elements of the Urban Interventions – Summary

Case Studies	**Burnq - distorted grid of narrow blocks** ***"core area"***	**BenTalb - super block** ***"urban area"***	**Al-Mukhtar - perimeter blocks** ***"suburban area"***	**Al-Slawi - rectangular blocks of mixed buildings** ***"suburban area"***
Development strategy	The site is over-developed through the gradual replacement for the traditional buildings. A redevelopment strategy has been adopted for preserving existing fine-grain patterns and for seeking more balanced levels of urban compactness.	The three sites have been fragmented and contain open space much larger than the moderate level of 110 to 170 m² per dwelling that defined in this study as being relevant for sustainable development in Benghazi Intensification strategies that targeting reclaims the negative spaces included vertical intensity, adding new buildings and restructuring the whole site		
Building blocks	A mix of modern buildings of moderate vertical intensity, with some contain private gardens, which targeting to balance between minimising buildings' footprint and improving the access for sunlight and green Shallow depth buildings have been adopted to negotiate lack of sunlight on narrow streets and improve cross-ventilation Crossing-streets - narrow connections – are expected to improve permeability and maintain the continuity of street wall, and hence improve access, visual survey and stimulate social activities.	New buildings are laid to create positive spaces and enhance urban enclosure. Also spaces are defined by trees, fences of private gardens and other street elements. These measures are expected to improve connections, privacy and the microclimate. Private gardens for apartment buildings are proposed to reclaim residual spaces and protect the privacy of ground apartments. They are also expected to help improve environmental quality and encourage sustainability practices like home farming.	Crossing streets have been laid through the perimeter blocks to improve their visual and physical Permeability. This measure is expected to alleviate the sense of division of the "defensible space", and to create inviting outdoors and better connections.	Small blocks (80 to 100 meters long and 45 to 60 meters wide) have been adopted in order to support visual and physical permeability, increase frontage, and accommodate variations in density and building types.
Public street	Shared streets have been laid out to redefine the limited public space as multi-use space, with minimum parking places, aiming to reduce conflicts and add green aspects to improve character, climate and increase green cover.	Designs for Home zones are proposed to encourage green and spontaneous activities in the outdoors and enhance local character. They are designed for low speeds (15km/h) and low traffic volumes. They consist of well-defined entrances, narrow carriageways with low kerbs - or now kerbs - and landscape that protects privacy, protect outdoors from harsh climate and connect green cover with a wider ecological network.		

Greening	Trees and Shrubbery used in specific locations to soften street scene, improve sense of place and define some transition spaces.	Rows of trees have been treated as important elements of the layouts, which are expected to maintain the continuity of the ecological corridors and improve the quality of local environments. Trees alongside main streets help reduce speeds, protect pedestrian and contain rainwater. In addition they are used to alleviate the negative impact of wide streets. Local trees are resilient to dry weather and need minimum maintenance.

Chapter Eight

Results and Recommendations

8.1. Introduction

The review in previous chapters has concluded with a collection of urban concepts and principles suitable for the sustainable development of the city of Benghazi. The results have been arranged under four main headings:

(1) Urban compactness
(2) connected open spaces
(3) dense greening
(4) urban intensification

It was evident that applying these measures requires a planning approach that incorporates urban design and encourages the participation of different stakeholders in the process.

This chapter examines the role of urban planning in the development of residential areas in Benghazi and discusses aspects of planning tools and practice that need to be upgraded in order to help create more accessible, liveable and environmentally sustainable urbanism. The study argues that tools such as action plans and guidelines can provide a flexible framework for urban planning in Benghazi and its wider context, where affordability is more relevant than certainty and formality; and where local interventions, controlled by negotiation of rights, is widely accepted.

The chapter starts with a review of the argument that a compact urban form is suitable for urban sustainability in the city and examines to what extent certain urban principles have been positive in achieving objectives of urban sustainability; this is followed by a reflection on the planning system in Libya and its shortcomings regarding concerns about delivering the expected qualities. Finally, it introduces a

participatory approach to sustainable planning that has been adopted with a suggestion that the four main concepts of: urban compactness; connected open spaces; dense greening; and urban intensification should formulate the core structure of future general form-based guidelines for the city of Benghazi. It is important to note that the proposed principles are not meant to be necessarily a complete checklist; however, they do provide a framework within which the site-specific briefs can be produced for different residential areas in response to history, local conditions, zoning regulations and development practice.

8.2. Relevance of Compact Development To Benghazi

For the sake of regional sustainability and a higher quality urban environment that meet social needs, it is accepted that the physical form should be relatively dense, compact, well-connected and diverse (Frey, 1999). These characteristics are necessary to reduce the need for travel, encourage walking and support reliable public transport. It is also the sort of development that is expected to help to improve the urban quality, economic viability and social interactions, while reducing the damage to the natural environment (Frey, 1999), (Neuman, 2005).

The historic urban areas, which were developed through a process that protects public and private rights in space while allowing local stakeholders to negotiate the details and act responsibly, have been compact of fine-grain grid patters, and have acquired positive qualities including a low footprint per capita, a protected urban environment, affordability and high levels of accessibility (Ben Hamouche, 2009), (Bianca, 2000). However, the findings in Benghazi show that the same type of the historic form has been perceived locally as outdated for reason that both the central courtyard and narrow streets were seen as unfit for modern

Photo 8. 1: The old city of Ghadames

Source: Own photo, 2008

lifestyle and practice of development; mainly in respect of the difficulties facing car-traffic and the demand on vertical intensification - see Chapter 6.

On the other hand, contemporary urbanism, which is in part a result of rational planning based on ideas of transport planning and zoning for single-use and low density development, has been accused of being an essential cause of urban sprawl. The findings show that main urban centres continue to spread out, decrease in density and absorb the nearby towns. Many redevelopments and new residential clusters were separated from each other, fragmented, built at low densities, and contained different types of vacant land and leftover spaces (see Chapters 2 and 5). This type of urbanism, by its very nature, is unsustainable; it consumes relatively more land, energy and other natural resources and produces more waste and air pollution per capita than any other type of compact urbanism. Also, it is often linked to issues such as lack of access to basic services, a deteriorating urban environment, weak social cohesion and car dominance (Gillham, 2002).

Generally, the debate on urban sustainability has led to a common acceptance that the compact type of urbanism can be a more sustainable alternative to low density urban sprawl, where the preview has shown that compact development that affords modern building type and technology is more efficient, accessible and environmentally responsible than any other type of low density urban expansion (Boyko & Cooper, 2010). The sustainable solution is expected to be self-contained; contain moderate densities and mixed land uses; afford suitable green solutions; and to be brought about through a process of participatory planning and design (Neuman, 2005). However, the findings of this study have uncovered some challenges that can hinder urban planning in Benghazi in supporting this type of urbanism. These include inconsistent planning policy, the separation of design from the planning process and the nature of urban plans and practice of planning within this context.

8.2.1. The Planning Policy

Libyan national policies promote urban densification and discourage urban sprawl; aiming to deliver more efficient and integrated urban development. It is expected that

urban concentrations would help reduce the costs of public services; due to shorter networks and economies of scale, and protect agriculture (UPA, 2006). Nevertheless, the case of Benghazi shows that planning policies and practice have been inconsistent in regard to urban sustainability. They have failed to provide proper measures to manage the process of urban intensification and appear unclear about targets and thresholds which are necessary to facilitate the development of more compact urban forms.

At the strategic level, measures of urban containment and upgrading of informal development have been adopted in order to diminish the ecological footprint of the city and create a denser and more connected urban environment. However, urban sprawl as a type of fragmented development continues to be dominant due, in part, to the failure to incorporate concepts of compact urban development into the planning system and due to the central planning approach, which is, to an extent, detached from local circumstances.

Moreover, this study has already argued that the *official* narrow definition of the phenomenon of urban sprawl as resulting exclusively from informal development is incomplete and misleading; it misses the fact that urban sprawl is a type of urbanism whether formal or otherwise, that needs to be evaluated against a wider range of sustainability considerations that cover not only the efficiency of development but also its environmental and social dimensions.

8.2.2. Urban Plans

Shaping the public realm is an important step towards urban sustainability (Trancik, 1986). This study shows that the layout and regulatory plans, based on planning standards and regulations, have been two-dimensional in the sense that they rarely treat the urban form as an identical unit which has its own shape, scale and spatial connections. Furthermore the plans were inflexible and in many cases irrelevant to existing conditions.

Practically, the regulatory plans - or urban plans - have been, in effect, land subdivisions and enlarge for the higher-level city plan based on zoning regulations. They are intended to meet targets such as the number and size of land plots and standards of streets and parking which reflect pre-set densities, land uses and building types as defined by floor area ratio, setbacks and building height. However, it is evident that these plans have failed to draw a vision for the urban form that considers the surrounding environment and existing conditions, while arguably, the outcomes are often accidental.

In contrast to some public projects, where regulatory plans are normally perceived as a framework for further detailed urban design, private buildings, particularly those self-built, are quite often developed with little concern on their local surroundings. The field survey shows that newly built areas are mostly separated by arterial roads and vacant land, contain a wide range of leftover spaces, and are weak in regard to urban liveability and visual qualities.

It is evident that there is a need to upgrade the planning tools in the city in order to achieve better results. Planning regulations and schemes, which promote abstraction and planning on clean-sheet, have been criticised for being inflexible, exclusive; unaffordable and inconsistent with local practices (see Chapter 5 Part A). However, in spite of the importance of residential areas with their direct impact on people's everyday life, their public spaces and civic works have received less attention with respect to design and implementation.

8.2.3. Current Urban Design Guidelines

The planning institution in the country recognises that there is a gap in the planning process - the practice of urban design (UPA, 2006). In an effort to tackle this issue, the National Planning Policy 2006 has suggested the introduction of urban design plans in the planning process, based on general urban design guidelines. This move was meant to restore the gap between the planning framework and implementation and so provide a better response to local needs and aspirations, to help improve the quality of life and maximise the potentials for sustainable development.

The main targets of the guidelines were to develop urban centres of higher urban intensity and enclosure, landscaping, urban diversity, the preservation of valuable urban assets, and the engagement of the general public in the process of planning and implementation - See Box 5.1. However, the guidelines have been ambitious and performance-oriented, and hence difficult to apply or measure.

In practice, urban design has been an exceptional task and applied as part of urban projects independent from the planning process, in a case where performance may be relevant to create scope for a project that designed and implemented by the same party – i.e. the developer or owner. However, in this case, urban design is in parallel with the planning process and not a genuine part of it; therefore these tools are irrelevant to the development of individual buildings and spaces by different parties. Moreover, although highlighting a real issue, these guidelines focus on civic-centres and based on untested principles. At the very least, they could be inefficient in tackling issues associated with residential areas such as affordability, protection of privacy and the capacity for gradual development; let alone the tolerance to spontaneous interventions.

Generally, it can be argued that these guidelines seem to be a reproduction of New Urbanism ideals, in that they promote order, perfection and style, while neglecting local experiences of real-life urbanism, especially the widely appreciated practice of gradual intensification, which has been successful as a regeneration process that responds to local capacity and changing demands. Moreover, these guidelines do clearly promote conventional human-centric principles to urban design, but they are very narrow in respect of environmental sustainability. It is argued that while conventional urban design considerations have been framed in terms of aesthetics, public health, liveability and economic performance, these days environmental sustainability has become central, though not exclusive, to urban design considerations (Hebbert, 2009).

8.3. Alternative Approaches to Urban Development

Characteristics of the Compact Urban Form

The compact city approach as a sustainable solution has been defined as a way to increase population densities, to intensify social, cultural and economic activities, and to manipulate urban size, form and the urban systems (Burgess, 2000). Because the concept focuses on human scale development, it was accepted that the neighbourhood is a relevant scale to investigate.

Tasks of design intervention for a selected number of case studies in Benghazi, the theme of the last Chapter, have examined the effectiveness of certain urban concepts and principles in enhancing local qualities and helping to create more sustainable urban forms. Various planning theories that bring with them opportunities and limitations in relation to urban sustainability have been considered in this process. Hence, rather than adopt a fixed physical model, the tasks of design-intervention have provided a mix of solutions based on concepts promoted by different types of urbanism – concepts that include fine-grain patterns, modern building types, urban greening and sustainable urban systems - as identified by their degree of success in creating cohesive residential clusters of a compact, flexible and environmentally sustainable nature.

The results of the design-interventions have been a bundle of urban principles for residential areas, which are sifted and arranged around four main themes: (i) development strategy, (ii) building block, (iii) public streets and (iv) greening (see Table 7.7). They promote an urban form that consists of fine-grain and intense patterns of narrow streets and low- to medium-rise buildings, in addition to moderate densities, mixed building types and permeable arrangements - qualities which are important to enhance environmental sustainability, increase the efficiency of investment and public transport, and create high quality urban environment.

Several strategies of urban intensification have been tested through the tasks of design intervention, together with measures such as mixed building types and uses, continue street-wall, permeable urban blocks and the redesign of streetscape, which were selected as means to negotiate the preferable levels of urban compactness,

density, diversity and connectivity with the access to public open space and higher urban quality.

As a result of these measures, open spaces have been reduced in all examples, excluding the Burnqe area which is already compact. Dense greening has been a measure to maintain urban quality while intensifying the physical form. It promotes more hard landscape, trees and drought resistant greening, in addition to the potential to integrate other sustainability initiatives such as surface drainage of rainwater and use of passive and green energy. However, in addition to private gardens, existing urban farms have been preserved in the Slawi area in order to improve the microclimate and act as soft edges, while continue their role in local food production. Other sustainability solutions of shared street, and ecological corridors have been applied in the different examples.

It should be borne in mind that anthropocentric and bio-centric design solutions may compete for influence (Hebbert, 2009); hence a measure that optimises solar gain, urban greening and storm water retention, could compete with the call for urban enclosure and a shared public space of intense and diverse activities. The theoretical schemes for subdivisions of residential land (Box 7.2, figure 7.5) do demonstrate the possible outcomes of applying maximum net-densities for different building types based on Land Use Regulations – see also the comparison table 7.6. They show the complex relationships, and test a level of balance, between preferences for narrow street envelopes and cohesive development with a demand for greening and liveable outdoors; measured by the amount of public open space per dwelling.

The treatment of different case studies to increase their levels of compactness through measures such as reclaim the open space around dwellings and vertical intensification has been an effort to meet the demands for open space, while protecting the local environment. Indeed, it is important to mention that, although the theme of landscape is, in a sense, not part of this study, it has emerged in the course of this investigation as being an important factor, and hence has been included as part of the solution.

The Process of Urban Design and Planning

The design of urban environment deals with form, activities and the process of development. However, the quality of any urban development depends on the objectives and principles used to achieve the final product (Punter, 1999). The sustainable form of the city should support the economic, social, cultural and environmental processes. Cities are systems of means (physical) and ends (functional). However, while sustainability is about the "ends", the controls are largely about the "means" (Hillier, 2007). Hence, separating the design of physical form from the planning of functions, or separating the different levels of planning would only lead to a gap between form and function (Hillier, 2007).

The functional dimension of urban design supports viewing it as process (Lang, 2007); and hence an integral part of planning. Indeed, there is a principal set of urban design elements that have significant influence on the urban form, structure or use, which need to be dealt with at the level of urban planning (Erickson, 2001).

Various historical examples of compact fine-grain urbanism were independent from any preset master-plan. Developments that were based on Cartesian geometry which sought order and certainty, and those that were achieved through negotiations between different stakeholders, both reinforced an idea of "*diversity and unity*", where the geometry was not a goal but a tool that enabled the creation of urban realities which were of a human scale, cohesive, liveable and responsive to change (Carmona, et al., 2006), (Ben-Hamouche, 2009). Real-life examples show that although straight lines become broken as a result of gradual development and compromise, yet they still maintain the urban grid which brings the whole system together.

On the other hand, physical planning has been associated with the assumption that necessarily involves the production of master-plans (Taylor, 1998). It is evident that although it is helpful to advocate a physical vision for a better urban future, the master-plan can be inflexible and hence irresponsive to unexpected future circumstances (Taylor, 1998). However, despite the shortcomings associated with

master-plans, physical planning has been the tool for the New Urbanism approach (Walters, 2007).

Giddings and Hopwood argue that there seems to be a number of inconsistencies between the master-planning approach and features of sustainable urbanism; thus while sustainability encourages local actions, enhances the local context and perceives urbanism as a process, master-planning is generally a top-down approach and is often less sensitive to local conditions and promotes the scheme as a product (Giddings & Hopwood, n.d.). In addition, sustainability requires a process of reassessment and adjustment, where strategies rather than plans can be more appropriate.

The current debate on urban sustainability and the call for a development of more compact, fine-grain and mixed urban forms, has driven a new interest in design-led planning (Llewelyn-Davies, 2000). However, perception of urban design as "a second-order" design (George, 1997) has provided a basis for the re-definition of design-led planning within this context; one which should be based on a strategic approach to decision-making, rather than a comprehensive approach that specifies every aspect of the designed object.

Moreover, there is also a call to reassert deregulation as an alternative approach that allows spontaneity, guided as it is by the negotiation between different stakeholders. Proponents argue that it is more democratic and responsive to local conditions, affordability and future change (Till, 2009). However, based on the experience extracted from the case studies, spontaneity, if created by unorganised actions and without the engagement of different stakeholders, can lead either to chaotic and unmanageable conditions of over-development and conflicts, or lead to an outward sprawl of low density and fragmented development that contains various types of leftovers, separations and incomplete areas.

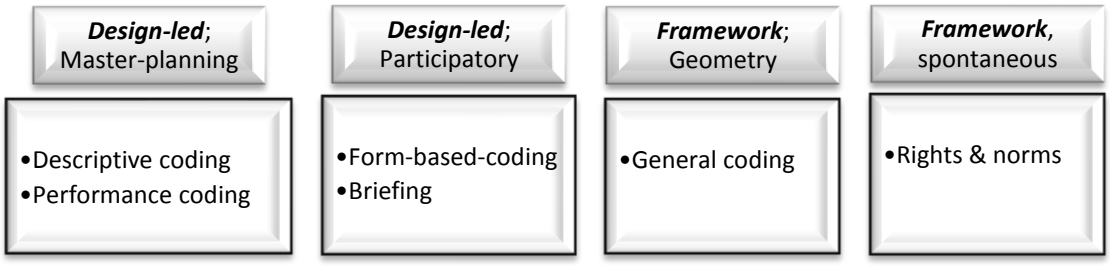
Generally, it was evident that the idea of compact development requires a flexible framework in order to evolve. Gradual development with minimum regulations provides a tool for urban intensification and facilitates local participation, which enhances urban affordability and social stability, and creates opportunities, while

helping to absorb residual spaces and increase diversity and urban accessibility. To integrate these views, urban planning needs to adopt a two-level approach that provide a framework of broad principles and measures, while at the lower level, development briefs that can be set to introduce more detailed and site-specific guidance (Giddings & Hopwood, n.d.).

As with historical urbanism, the urban grid can open up certain potentials for development, while leaving the urban form to evolve and take shape with a minimum level of constraints, rather than imposing a fixed master-plan. A relevant example is the grid pattern of streets laid out in Manhattan, New York in 1811, which has been overlapped by patterns of urban activities that gave an impression as if it was an organic city (Martin, 2007). This is quite different from the design-led model promoted by New Urbanism, even though it is, in theory, site-specific and promotes the principles of traditional urbanism (Carmona, et al., 2006). However, New Urbanism can be pro-sprawl, exclusionary and less participatory than anticipated (Frey & Yaneske, 2007).

The example of Upton town (see Chap. 3) has demonstrated the use of a participatory approach to produce the Upton Framework Plan 2002, where a work group drove workshops of "inquire by design" as a tool to engage stakeholders in the process of plan review and the development of the brief (Imrie & Street, 2011). The design code focused on the public realm and included sustainability measures such as water conservation and use of recycled materials (Imrie & Street, 2011). However, although the UK Planning Policy-1 on delivering sustainable development (UK-Government, 2005) - now superseded by the National Planning Policy Framework - promotes a design-led approach to inform participatory planning, it focuses on policies and results and does not recommend any particular spatial form. The policy promotes the efficient use of energy and land and better air-quality through density, mixed uses, greening, land reuse and infill, and common utilities.

Figure 8. 1: Approaches to Urban Development



8.4. A Sustainable Urban Strategy for Benghazi

Nowadays, urban areas are changing very fast and it is difficult to predict the impact of this change even for the near future. The practice of urban planning and design, while responding to matters such as function, climate, topography and visual quality of the area under study, also deals with other factors of an economic, social, political and legislative nature, which are liable to change significantly over time and may influence the environment of decision making (George, 1997).

Based on the findings of this study, it can be said that affordability, thermal comfort and privacy, which reflect considerations of health, security and accessibility, are more relevant qualities for urban development in Benghazi rather than other conventional qualities like visual aesthetics. The study argues that the compact and dense urban form is suitable to Benghazi. It is expected that it would create a diverse and connected urbanism, important for the improvement of regional sustainability, urban efficiency and overall urban quality.

In addition to manipulating the main characteristics of urban form, the study suggests measures relevant to the local context including: narrow streets and modern buildings, permeable blocks; relatively small size and narrow land parcels; minimal open-space; and elements such as clear edges, urban farming and streetscape with less pavement and lower or now kerbs, which are expected to enhance flexibility and gradual intensification.

In response to the fact that people experience the built environment mainly at the local scale (Dempsey & Jenks, 2010), the focus of this investigation was limited to

the urban form and activities at the neighbourhood and block levels, assuming that compact residential clusters would be the built unit for a more sustainable metropolis. The study has placed an emphasis on three concepts, which are arguably necessary to underpin a sustainable planning approach within this context. These are:

(i) a flexibility that attracts variety and responds to changing circumstances
(ii) participation that engages different stakeholders in order to build on local experiences and respond to people's needs and aspirations - this also helps to facilitate negotiations, mobilise local people and allow them to own the project
(iii) form-based to maintain a framework that reinforces local character and incorporates sustainability initiatives in urban development

To establish a planning approach that is flexible, participatory and form-based, which is capable of improving the performance of the urban form and which creates functional, liveable and green urban environments, it is sought that the planning of urban areas should adopt two levels of planning:

- strategic that sets the framework for the urban form to emerge
- site-specific that focuses on local design solutions.

The first is to be informed by urban guidelines, while the second is subject to planning briefs produced through local consultation.

Participation in planning, although common in many other countries, is unfamiliar in Libya and hence needs to be studied thoroughly within this context. Participation is a suitable planning tool, based on local practices and experiences which help strengthen contacts between different actors. Local people and other stakeholders need to be engaged in all three steps of the action plan namely: (i) initiating the vision, (ii) developing the proposals and (iii) the final approval process. In this way the process would help raise awareness of important issues, encourage local design based on the general guidelines and add legitimacy to the product. The following stage is that of a detailed plan that starts with the setting of the planning brief, defines elements of design and finally the selection of the suitable alternative.

In line with this view, the use of action plans, instead of current regulatory plans, would be an advantage. Action plans are strategic, flexible and suitable for the process of participation. They need to be based on urban guidelines descriptive enough to define the main characteristics of the urban form. The descriptive guidelines are more relevant in this regard than performance-based guidelines - they create unity by defining urban typologies and are easy to measure. Also they are more context-relevant and can promote local design, speed up development and deliver more certainty for all parties.

Furthermore, while urban guidelines can bring about varied outcomes and enrich diversity and quality due to the incorporation of local design solutions, planning briefs - which are expected to be formulated through a participatory process - are useful tools for consulting on urban design and focus on desired outcomes regarding site-specific design and urban elements, while considering local factors such as location, zoning, history and existing conditions.

Urban typology defines the footprint, height and bulk of buildings, and offers a known framework within which creative change can take place, either during the initial design process, during construction or after occupancy. Different urban patterns and types create different levels of access to open space and various solutions to protect privacy and improve climatic comfort. However, urban intensification, which is a response for factors including zoning, history, design solutions and location, if uncontrolled can alter urban capacity, connectivity and the mix of land uses.

Four main guiding concepts have been chosen to inform future general form-based guidelines in Benghazi:

(1) urban compactness
(2) connected public space
(3) dense greening
(4) urban intensification

These concepts incorporate a variety of urban principles and indicators that have been investigated and tested within the local context in benghazi. They represent

objectives, concepts and principles that have been arranged in a way that maintains a degree of clarity and flexibility necessary to adapt to change and the incorporation of new ideas. They provide suitable solutions, in spite of the fact that they are not necessarily complete.

Urban Compactness: a compact urban form has been an expression for anti-sprawl development that can be achieved by a fine-grain and intense urbanism, which is inherently cohesive, relatively dense and contains a mix of building types and functions, and is associated with efficient networks of transport and civic infrastructure and green initiatives. At the local level, it describes residential clusters with clear centres and edges that have net-densities range from 24 to 80 dwellings per hectare depending on the mix of building types and layouts. However, while a level of compactness, which describes a ratio of total floor space to public open space, is site-specific and depends on factors such as urban typology and distance from the centre, however, a public open space with a range from 110 m^2 to 170 m^2 per dwelling is considered suitable to sustainable development in the different residential areas of the city.

The concept of compact urban form also promotes small urban blocks and narrow buildings in order to enhance urban permeability, increase frontages and maintain the potential for future intensification. While types of terraced buildings are preferred because they sustain the street-wall and have minimum external skin and so use less energy than detached buildings. Buildings' setbacks and upper floor setbacks are also tools to consider, with due regard to neighbours rights to sunlight and visual privacy, in addition to the enhancement of visual connections. Moreover, measures such as reclamation of residual space, private gardens and provision of urban elements such as trees are promoted to help protect privacy and improve the urban quality. This is in addition to other design solutions, which balance the containment of growth and benefits of narrow streets with access to green space and sunlight (one example is the use of two-sided buildings to negotiate noise and sunlight and make use of cross-ventilation).

Connected Open Spaces refers to a well-connected network of all public open spaces – they represent more than what Lynch has described as green corridors that

complement street grid and combine the system of off-street movement (Lynch, 1981, p. 441), but rather a network of open spaces around buildings that incorporates all local streets, parks and green areas. It is accepted that local urban areas should not be seen as just a collection of buildings, but as a network of interconnected open spaces created by these buildings. A well connected network of all open spaces, public and private, is expected to sustain connections between ecological zones, and create liveable places which are safe, comfortable and convenient.

Grid patterns, common in the Arab region, are preferred due to their efficiency and because they are easy to manipulate. Preferred streets are multi-use that are classified on the basis of movement type and intensity of use. Main streets may be treated as shared space, through measures such as clear entrances, minimum parking and shared movement surface, while inner residential streets can be arranged as home-zones, with narrow carriage ways, low kerbs and more greening enhanced by measures such as speed limits, social activities, and protected outdoors.

Dense Greening includes treating local trees and shrubberies as elements of urban design, which are resilient to dry weather and require minimal care. Tress can also be used to define places, soften street scenes and to offer a refuge to pedestrians, while groups of trees are useful to define directions and line alongside main streets to reduce pollution and noise, to calm traffic, and contain rainwater. Small green areas, parks, urban farms, private gardens and groups of trees are important urban elements that should be arranged in such a way as to form a continuous and dense greening, which is important to sustain links between different ecological pitches and improve urban quality and overall sustainability.

Lastly, *Urban Intensification* is a process that capitalises on the spare capacity of development, which exists due to low levels of urban compactness or gained because of changes in the density pyramid influenced by changes in the urban structure. Strategies for urban intensification may include vertical intensification; gradual replacement of buildings; reuse of empty land and restructure of urban blocks. Incremental development is a common practice that responds to changes, and enhances diversity and affordability. However, to avoid over-development, it is suggested that future intensification should be predictable and manageable through

monitoring the level of urban compactness, balancing building heights with access for sunlight, privacy protection and response to preferences such as private gardens.

8.5. Conclusion

A sustainable urban form is expected to be human scale of compact and fine grain development, which is flexible and afford green initiatives. The exercise of design interventions showed that urban fragmentation, which has been perceived as lack of diversity and spatial connectivity, can be tackled through altering the urban form and elements in order to manipulate urban density and compactness - measures include minimum public open space, permeable blocks and local design solutions.

By stressing on form instead of function, the future guidelines are expected to create a framework that describe typologies, promote diversity and impose minimum regulations. Such a level of spontaneity is important to encourage creative design and increase potentials for sustainable results. Indeed, achieving unity and flexibility would be positive to actual urban capacity and people's needs, while enhance variety, liveability and sustainability.

The above mentioned concepts and principles are not meant to be inclusive but to provide examples which can be further expanded to respond to specific demands, local conditions and real-life experiences. Thus in spite of the fact that there are always attempts to define typologies, the participatory approach should be flexible enough to deal with new challenges such as those caused by globalisation and modern technologies.

Lastly, it is accepted that the objectives and products of urban development would be more valuable and legitimate if they defined through a genuine engagement of all stakeholders in the process. However, the scope of public participation currently adopted by the planning institution, which is limited to asking people about their needs and expectations, is irrelevant and needs to be revised in order to allow local people to influence the planning and design of their localities. Indeed, new methods of planning require legislative revisions and public awareness, especially on those

matters of public participation and decentralisation of power. Nowadays, there is a real debate about the future of the national physical structure and the distribution of powers in the country, which will inevitably have implications on the planning system and process of development. Moreover, this study, which promotes values and builds on real-life experiences, is expected to provide help in creating the basis for a better planning approach and contribute important knowledge, advice and suggestions for wider considerations.

Chapter Nine

Discussion and Final Conclusions

9.1. Introduction

Current debate on sustainable development, especially in West-European and Anglo-Saxon countries, focuses mainly on the impact of modern lifestyle on environmental sustainability and calls for behavioural change in order to reduce the use of private cars and enhance the use of recycled materials, which would help minimise greenhouse gas emissions and protect the natural environment. However, in many developing countries, issues such as fast urban growth and scarcity of resources have had a direct impact on local communities, since they present a real challenge to the capacity of urban areas and affect people's quality of life.

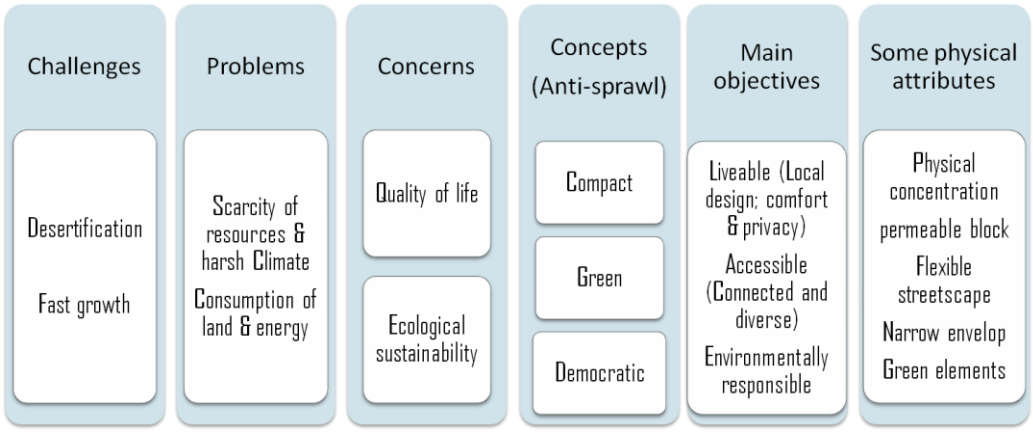
The urban dimension of these issues has justified the scope of investigation and the idea of sustainable urbanism, which promotes a *compact, green* and *democratic* development. Generally, by definition, the city is a concentration of urban functions and human activities. Indeed, within the context of sustainable development; the compact urban form is perceived mainly as an anti-sprawl, self-contained type of development which balances between human needs for space and the protection of natural environment. It is argued that a fine-grain urban form of moderate density and mixed functions can offer a suitable framework for more cohesive, walkable and sustainable urban environment (Neuman, 2005). However, in spite of these substantial benefits, it is unclear whether the benefits outweigh the perceived negative effects of the compact urbanism - such as congestion and air pollution - on individuals' quality of life (Jenks, 2000).

Despite the wide consensus on the relevance of the policies of compact development as a sustainable solution, at the urban level many urban models have been produced,

mainly in the developed countries, representing contextual variations and contain different priorities. However, for many developing countries, the type of urban development that is necessary to manage sustainable growth is not well defined either theoretically or practically (Dave, 2010).

This study has reviewed the general theory on compact development and formulated a new concept suitable for sustainable urbanism in Benghazi. The concept and the adopted principles describe characteristics for a compact urban form and highlight local design solutions important to meet objectives of higher urban quality and environmental sustainability. It is anticipated that adopting a participatory approach to planning would help the delivery of these qualities, as it reinforces flexibility, local responsiveness and robustness of the planning process.

Figure 9. 1: The Research – Concerns, Concepts and Physical Attributes



Despite the fact that the political upheavals have affected the participation in research, this study has applied methods that have enabled it to overcome the constraints of these exceptional situations. The criteria and measures defined in this study while opened new opportunities for the improvement of urban sustainability in the city, in the same time, they represent a contribution in the research on compact urban form within the context of Arab countries and the South in general.

This final chapter summarises the stages of study and reflects on research methods, the transferability of the framework, research process and findings; including the anticipated contribution to knowledge. Also, it presents the constraints that have been encountered during the study together with suggestions for future research.

9.2. Summary Highlighting Contribution to Knowledge

This work has focused mainly on the investigation of urban fragmentation in Benghazi and the examination of planning concepts and tools that are important to improve the quality and sustainability of the urban environment. The study looked at the challenges to and potentials for sustainable development within the Libyan context, addressed issues such as the scarcity of water, harsh climate, fast urban growth and shortages of buildable land and housing. Also, it reviewed the historical development of human settlements in the country in order to understand how traditional urbanism had responded to local circumstances.

The debate on sustainable development, which covered considerations on human needs and ecological sustainability, helped to reflect on the causal relationships between regional issues and the city, where urban sprawl - the low density outward growth and urban fragmentation - has been perceived as an issue of urban sustainability. To serve the objectives of this study, the theoretical part reviewed the idea of compact urbanism and presented it as an alternative for sustainable development. The discussion covered characteristics of the compact urban form, flexible planning and urban design solutions. However, it is acknowledged that the definition of the parameters and features of the sustainable urbanism should reflect the local context for each city and town.

The second stage of this research covered several tasks of data collection and analysis, where the case study approach was applied to generate different types of information at two levels - the city and the neighbourhood. A review of urban planning system in Libya, coupled with discussions on planning standards and the stages of land development in Benghazi, helped to evaluate the appropriateness of current planning tools for achieving the objectives of sustainable development. It was evident that central planning and guidance that seeks efficiency and over-generalise human needs were among the main factors which cause urban sprawl in Benghazi.

At the neighbourhood level, the research covered different features of the urban environment based on the survey of eleven case studies, which represented main categories of urban typologies and various local issues. Multi-methods have been

used to investigate the physical characteristics and quality of the case studies and examine their performance in terms of sustainability, where urban fragmentation has been perceived as a lack of diversity and connectivity. The main considerations in the sustainable city that have been identified within this context included: (i) Urban liveability (health & security) - represented by designs for thermal comfort and sense of privacy; (ii) Accessibility - measured by urban diversity and the degree of spatial connectivity; (iii) Environmental sustainability - judged by ecological footprint of the urban space and relevant green solutions.

An exercise of design interventions has been applied to reflect on the results and test the relevance of different intensification strategies and urban design principles to local areas. The exercise was an effective tool for the examination of the potentials of the strategies and principles mentioned above to mitigate the problem of urban fragmentation in the city and to suggest suitable planning tools. It is evident that spontaneous interventions and a gradual process of development are important factors that need to be considered as part of any future solution. However, there is a danger that uncontrolled urban intensification can be unbalanced and a source of real concerns. The planning approach adopted here is based on a bundle of urban principles that reflect the local context and responds to the objectives of urban sustainability within this context.

Figure 9. 2: Compact or Sprawl Development - the Impact on Urban Sustainability

Generally, the results support the argument that a model of compact city, characterised by a cohesive and dense urban form of suitable levels of diversity and connectivity, can offer a sustainable alternative to the current type of fragmented urban development, in regard to the enhancement of people's quality of life and

ecological sustainability. The next sections reflect on four main aspects of the study – urban fragmentation, research methods, a concept of compact urbanism and the planning approach - and highlight important contributions to knowledge.

- *Urban fragmentation*

An important step towards the solution is to define the problem. Urban areas can contain different physical characteristics and qualities depending on local situations in each region and city. Urban sprawl is context relevant and hence its definition is essential towards the search for a sustainable solution. Based on the findings, urban sprawl in Benghazi, either being formal - though quite often less controlled - or informal, has been defined in this study as low density scattered development and fragmented urban patterns.

While scattered development describes patterns of low density urban expansion, which can be continuous, linear or separate patches of development on the urban edges and in the countryside; the fragmented urban form describes urban or suburban patterns of single use and car-oriented development, which is often: incomplete; contains various types of less-used and vacant lands; separated by arterial roads; and has poor quality, poor connections and poor social services (see Chapters 5 and 6).

This review has helped to overcome a conceptual confusion in the study of urban sustainability as a result of a lack of clarity of the existing description of urban sprawl derived from the literature. Within the Libyan context this has led to a definition of the phenomenon as if it referred solely to scattered expansion and the consequent informal development resulting from ineffective development control, where fragmented urban patterns of more formal and relatively higher density housing at the neighbourhood level have been considered by the extension of the same reasoning, these have been considered to be the result of a lack of implementation of existing planning rules, leaving aside the issue of whether the rules themselves are part of the problem. This framing has adversely affected the

diagnosis of the problems and thereby led to a stalled effort in studying the phenomenon of urban sprawl.

The argument is that urban fragmentation is an under-researched phenomenon and is major contributor to unsustainable development in Benghazi and Libyan cities more generally, resulting from inappropriate modern planning, urban management and development practice. In this study, the definition of urban fragmentation has been put forward in a way that helps sharpen the focus of research into urban sustainability within this context and facilitates the transferability of findings.

Distinguishing between the two dimensions of urban sprawl at the metropolitan and local levels represents an important step in the study of urban sustainability in Benghazi. In order to focus debate on urban sustainability and facilitate investigation of the environmental and social aspects of urban development, this work has focused on urban fragmentation at the neighbourhood level, while urban sprawl at the metropolitan level has not been a central theme for this thesis. Scattered urban expansion at metropolitan level is a result of multiple factors and is normally dealt with through regional strategies such as urban containment and upgrading of informal development, as well as other policies regarding land management, the protection of agricultural land and property taxation.

- *Research methods*

Urban areas can be defined by various indicators and characteristics that describe their physical form, typology, and the use and quality of public space. The study has focused on the physical dimension of the urban environment, where it dealt with the contributions that the urban morphology can make to urban sustainability and people's quality of life. The approach involved the selection of limited set of physical attributes that describe and explain the urban form in morphological terms – i.e. streets, land subdivisions and buildings. The comparison of the urban characteristics for different case studies and their actual uses and change through time have revealed interesting results that link local urban forms with the quality and ecological sustainability of the city.

Morphological study helps in learning how urban areas are produced and shaped in such a way that supports future development of urban design and planning. There are two main features that are relevant to the study of urban sustainability within this context; the consideration of all scales of the built environment, and presenting the urban form as a dynamic and continuously changing entity that is in a dialectic relationship with its producers and residents (Eisinger, 2008). Nonetheless, while morphological analysis is a well-established technique in the global North, it is less established in a Libyan context, where it is common for planning studies in Libya to rely on general unchecked concepts and international examples.

The case study strategy applied in this research has been a container for multiple methods of data collection and analyses. Also they are used as thematic examples and as tools for analysis. The strategy has been flexible and helped to draw a holistic understanding of the issues under investigation. The case study strategy together with the adopted objective methods were successful in conducting the research during a period of political unrest, and in a context of minimum sources of data and lack of cooperation; they were suitable to improve the focus and speed of research, overcome limitations, and enhance an understanding of local capacity and practices.

To facilitate the selection of the case-studies, four categories of urban typologies were identified based on the concept of leading-building types – courtyard, terraced, detached and apartment buildings. This general classification of urban typologies, while it was simple to enhance research flexibility and the analysis, at the same time, provides a tool for further comparative studies for urban fragmentation and planning regulations.

In contrast to surveys of people's perception of their surroundings, the physical attributes of the urban environment are rarely investigated (Leby & Hashim, 2010). The attributes used for the assessment of case studies and cross-comparisons were identified on the basis of their response to qualities of climatic comfort, domestic privacy, affordability and ecological sustainability of the built environment, in addition to the flexibility and capacity of local areas to accommodate different uses, to allow spontaneous interventions and to respond to future needs. They include: (a) suitable levels of physical compactness, urban density and the amount of open space

per dwelling; (b) permeable blocks and narrow street envelopes; (c) local design that covers flexible streetscape and elements such as gardens and trees.

Following, an exercise for design intervention has been used in parallel with cross-case and cross-type comparisons to assess the suitability of various urban principles and indicators for the improvement of local environments and to draw conclusions. The focus of this test was on the influence of a combination of intensification measures and design solutions on the change in urban quality and environmental sustainability in each case study.

This task demonstrated the idea that design should try to keep the emerging form of the whole in mind as decisions at each particular level are made, and also that no set of design principles can ever form a full-proof model for good-design, but principles should be used for guidance rather than directing rules. This view, which has its roots in the traditional practice of urban development, presents a challenge to the previous assumptions about the significance of rational planning in Libya. It is expected that such a design-based approach can better enhance a compact, green and democratic type of urbanism; characterised by local design, flexible development and sustainable solutions.

Generally, the flexibility and robust findings gained as a result of the combination of methods and evidence construction represent a successful strategy in a study of urban sustainability, which is suitable for replication in future research in Libya and its wider region. While it is a challenge to combine methods in an effective and coherent way, the combined research strategy in urban planning and design represents an enormous opportunity for the use of various sources of information and methods and establish a comprehensive understanding to the issues subject of study. However, it is important that the future research includes social surveys in order to add concrete evidence and reflect on the results of this study.

❖ *A concept of compact city*

The idea of sustainable urbanism, which brings together the three qualities of: physical compactness; urban greening; and democratic process of planning, has been a response to objectives of sustainable development that call for a balance between development and maintenance. These qualities underlie three approaches in urban planning and design: the compact city, the ecological city and participatory planning.

The observation of the link between characteristics of the physical form and certain urban qualities and how they influence human activities in the public space has helped to identify the capacity of local areas for urban intensification and to judge their sustainability performance, where unbalanced urban intensification, associated with low- or over-use of public space, demonstrates the deficiencies of existing planning tools in managing the development process.

The normative principles and indicators that have been deduced from the case studies are important elements in addressing the theory of compact urbanism and in adopting concepts with potential for wider application in Libya and the Arab region. The adopted idea of compact urban form presents a framework and vision for a sustainable urbanism, which promotes physical concentration, local design and flexible development. It describes a fine-grain urban form, with moderate levels of physical compactness and density and suitable degrees of connectivity and diversity, which is expected to enhance both regional and urban sustainability.

However, the study challenges the idea that traditional urban forms can in themselves provide a future model for sustainable urbanism in the context of contemporary Arab society. Examples like Ras-lanuf (adopts concepts of residential clusters and networks of open spaces) and Masdar (contains urban elements of the traditional Arab city) showed that partial commitment for the main dimensions of the sustainable city – compact, green and democratic – can be insufficient to achieve the objectives of urban sustainability.

A bundle of urban principles and indicators has been sifted and arranged under four main headings namely: development strategy; building block; public street and green

elements. They promote urban strategies and design solutions suitable for local conditions, which focus on targets include: protection of privacy and microclimate; flexible process that facilitates speed and affordability, spatial connectivity and diversity to enhance accessibility, and green solutions that negotiate minimum open spaces with the need to provide green elements necessary for urban quality and sustainable ecology. However, the urban intensification promoted in this study is meant to be a process of revision and updating through local authorities and social organisations that managed by certain indicators rather than random interventions, while elements of the streetscape has been described to suit different densities and the capacity of each local area, in addition to the affordance of measures such as flexible use of street space and parking alternatives.

The observation showed that the un-metalled and quasi-finished streets (reasonably narrow and kerb-less carriageways) could work rather well in a local neighbourhood context; where they can be considered relevant even in the context of the developed countries; especially compared to the financial burdens and controversies experienced in countries like the UK with more highly engineered street improvement schemes. Such a level of finishing, while enhancing the affordability of development and encouraging spontaneous human activities is important for urban richness and diversity and it can also be positive for green initiatives such as surface-drainage for rain water and permeable street surface as a result of a minimal use of asphalt.

Furthermore, in spite of the appealing findings that link physical parameters for different case studies with the urban quality and sustainability, an attempt that links abstract indicators of physical compactness with variables associated with features such as urban topology, distance from the centre and the stage of development (see Table 7.8) has arrived at a conclusion that such a correlation is insignificant, and cannot be justified as an alternative planning tool to control urban intensification.

Thus while this relationship is useful in understanding links and for judging urban interventions, it was evident that such an abstraction has limited potential to substitute for the conventional practice of decision making in urban planning and design, which contain complex connections and are influenced by several factors

involving design - that control the size of public open space - and the engagement of different groups, which are in turn uncertain and difficult to predict.

- *Planning approach*

The findings highlighted the main reasons for urban fragmentation in Benghazi; these include issues associated with rational planning, urban management and development practice. However, even in the same city, local areas of different typologies and zoning characteristics can respond differently to the factors mentioned above and gain varying qualities and levels of compactness. Real-life investigation demonstrated that the urban plans were poor in design terms. The layout plans were, to an extent, a direct application of abstract zoning criteria, while the case studies of urban intensification illustrate that the process was unplanned and the results were accidental.

The argument is that in addition to central planning and lack of participation in Libya, Doxiadis' ideas of *Ekistics* (Doxiadis, 1968), which promote standards for spacious subdivisions, reserving large open spaces for future expansions, and transport planning, have been a major cause of urban fragmentation and low quality development in Benghazi. Rode argues that comprehensive planning that centred about the idea of Master plan and expected to respond to all problems, represents a deterministic approach that is linked with urban problems (e.g. urban fragmentation) arise from issues including – knowledge gap resulted from incomplete information, delays, and limitations of central systems, this is in addition to an all-encompassing regulation stands which is in opposition to public legitimacy (Rode, 2006).

The observations showed that lack of diversity, spatial separations and presence of various types of vacant land at the neighbourhood and city levels in Benghazi have had a negative impact on people's quality of life and the urban environment. It is acknowledged that urban sprawl - including urban fragmentation associated with spacious arrangements and single land use - is unsustainable. It can cause damage to

fertile land and ecosystems, increase development costs, and affect the quality of urban environments (Gillham, 2002), (Williams, et al., 2000) (Jacobs, 1993).

To refit and develop more sustainable areas in Benghazi, based on the idea of compact urbanism, it is recognised that there is a need for a new planning approach that enhances flexibility and responds to local capacity and experiences. This suggests more generally the need for urban design guidelines and more participatory and adaptive forms of planning practice, rather than forcing top-down planning concepts on people who then have to try to adapt them to their changing needs and circumstances. It is expected that adopting a two-stage planning approach – an action plan together with form-based guidelines that set the framework, and detailed plans with planning briefs for local projects – which in part imitates the practice behind the development of traditional Arab city - can be an advantage for responsive and participatory planning.

The traditional way of city building in the Arab region is based on a grid pattern and the arrangement of main functions; yet, locally, no fixed plan is imposed, but development is guided by common norms and the protection of various rights. The generated urban form, although physically unpredictable, has unity and its parts are intentional (Haas, 2008). However, these qualities are non-existent in projects of New Urbanism, which are accused of being exclusionary, anti-nature, lack diversity and fixed by a master plan (Robbins, 2008). Masdar in the UAE - designed by Foster & Partners - has been criticised in this study in spite of its compact urban form, because it is detached from the local context and is produced as a grand project. Some people have described the city as an experimental work of composite solutions rather than an integrated whole (Bullivant, 2012).

Moreover, as an essential part of this view, it is suggested that future guidelines should be form-based and structured around broad themes instead of being performance-based or specific on design and style, so as to facilitate communication and satisfy a wide range of needs, while at the same time ensuring a suitable level of flexibility. These tools respond to the call for minimum regulations, which are relevant to build on local experiences, respond to people's preferences, avoid future conflicts and enhance urban resilience to the unexpected circumstances.

Urban guidelines are flexible by nature so could be interpreted differently according to the local situations. They can be a suitable tool to facilitate negotiation on urban matters and to improve people's consensus on urban issues. The four main themes set for future general guidelines to the city of Benghazi are:

(i) Compact urban form
(ii) Connected public spaces
(iii) Dense greening *and*
(iv) Urban intensification.

The flexible structure and the principles included under these themes have been arranged to suite refitting existing and developing new urban areas. This is in contrast to New Urbanism's codes, which are subject to normative ideals targeting clean-sheet planning for new neighbourhoods. The suggested general guidelines reinforce the role of design in urban planning and enhance objectives of urban sustainability.

Design has been always part of the practice of urban planning; although its role has been ignored at various points as planning becomes more institutionalised (Talen, 2010). However, in Libya and most Arab countries, institutional planning is based on rational ideals, therefore, the use of urban design as a tool to tackle planning problems - such as urban fragmentation – provides a new dimension to planning practice. Within this context, urban design is viewed as a tool to form the cell-structure of common spaces in the city rather than a site-specific design, where it deals with principal elements that can significantly influence the urban form, structure and land uses. It is expected that form-based guidelines can assimilate variations and provide a framework which is adaptable and can be expanded to respond to different urban situations in the city and its wider Arabic region.

To sum up the contribution to knowledge, it be fair to say it lies in the analysis and redefinition of urban fragmentation as a result of urban planning rules in Benghazi rather than from a lack of regulatory planning; that the fragmentation is not homogenous but can be categorised based on urban types; from a deeper study of these types a different approach to urban planning can be identified for the Libyan

context; and while this new approach draws heavily on features identified in previous studies as supporting sustainable urbanism, the particular combination of features identified in this study is sensitive to the local context of neighbourhoods in Benghazi; this method of investigation and classification is therefore relevant to other urban areas in the region.

9.3. Limitations and Suggestions for Further Research

This study, which has been devoted to the investigation of local urban environments in Benghazi and the examination of their performance in terms of sustainability, has faced limitations at different levels. The lack of theory about urban fragmentation and the idea of compact development in the developing countries, in addition to the scarcity of practical studies on these topics in Libya have been influential factors for cross-context comparisons and the setting of presumptions.

While the compact urban form, as a type of sustainable development, has been a matter of genuine debate in the developed countries for some time, comparatively very few systematic studies on the subject have been undertaken in the majority of developing countries, particularly at the neighbourhood level. Indeed, existing theory on the compact city has been produced in the context of stable democratic countries and legitimate planning processes, in societies where level of satisfaction of human needs is, in general, higher than that in the South. This gap in knowledge has been a reason for many cities in the South to borrow unchecked urban concepts and consequently create new development that is, to an extent, cut off from local context and unsustainable.

On the other hand, in practice, the informal development and lack of implementation for public works in Benghazi have limited the relevance of public plans and regulations as reliable sources of information. These factors, in addition to the exceptional political situation which imposed limitations on the fieldworks and direct communication with professionals and the general public alike, have influenced the extent of the study and the use of the methods of data collection and analysis - which have justified the selection of random aspects of the qualitative approach. However,

direct observation and learning about the local context through engagement have provided suitable tools for the study of urban fragmentation at different urban levels. They are straightforward methods that have been helpful to focus on the issues under investigation, in addition to other benefits include learning about human activities and needs, and understand the planning practice.

This study, while having fulfilled the aim of contributing to the theory and practice of urban planning and design in Benghazi, at a broader context it calls for investigating the similarities and differences between urban patterns and the applicability of this research strategy to other cities in Libya and across the Arab region in order to advance debate and help advance theory suitable to this context.

The study has been conducted in an urban area, so the findings should be interpreted within this context. However, expanding knowledge on urban fragmentation in Benghazi and its wider region requires the investigation of more case studies in the city and other settlements. Replication of this study in the future so as to cover more case studies and include structured surveys would bring in more constructive information and help progress in the theory and practice of urban planning. However, research should not be limited to the review of urban history, as some urban studies have already done, but instead should focus on the analysis of urban form and the process of city building within its current spatial, socio-economic and cultural context.

The mainstream urbanism in Libya, characterised by combining formal rules with spontaneous interventions and the unexpected physical form, is quite often perceived as an exception and an informal deviation from the formal plan, rather than as an alternative type of development. This study has opened an important debate on contemporary development in Benghazi and the Arab region in general and discussed its relevance in the light of certain local issues, actual capacity, and common practices.

It is expected that the planning approach suitable to achieve these ends can be quite different from that of the current institutional planning in Libya. A reform of current planning practice is fundamental and requires an update of the conceptual and

legislative basis of the planning system. However, incorporating such new concepts requires general consensus on issues such as decentralisation and new legislations on matters such as land ownership and the level of participation in planning. Unfortunately, research on these themes is limited in Libya; and hence each one of them would be a subject for further research.

Furthermore, through the course of this study, it has been recognised that in addition to the physical form, both landscaping and social organisations are essential aspects to the idea of sustainable development – a compact, green and democratic urbanism - and hence they are important themes for future research. It is hoped that the new political realities will bring with them an opportunity to revise the current urban planning system in light of the findings of this study.

9.4. Conclusion

This research, which focuses on the phenomenon of urban fragmentation at the neighbourhood level, has investigated different urban typologies in Benghazi in order to examine to what extent compact urban form can help improve urban sustainability within this context; and how this can be achieved. The study has produced interesting results which are expected to enhance the advance of research and practice in the area of urban planning.

In a time of political change and high expectations, it is assumed that reflecting on the performance of existing urban situations in terms of sustainability would be more demanding. The research strategy and methods used to investigate different urban areas were flexible, affordable and have succeeded to produce good results in a context of uncertainty and scarcity of information. The study has identified the characteristics of local areas, including patterns of negative spaces at the neighbourhood level and investigated actual uses, unfinished public works and spontaneous interventions in the public open space.

Based on these observations, it can be argued that the concept of compact urban form is relevant for the city of Benghazi. The study has identified indicators of urban

compactness, densities and public open space per dwelling together with other urban design measures that are associated with good urban qualities and high environmental sustainability. It has also explored how urban intensification can be used to address the issue of urban fragmentation, and arrived at a set of generalisable principles and indicators which enhance strategies for compact development suitable to the city of Benghazi. Also, these results are expected to address the bigger picture of urban sprawl and informal development in the city and its wider Arab region.

It was evident that the rational planning approach and modern lifestyle are among the main factors which have led to urban fragmentation. It is argued that in order to improve the sustainability performance of the urban environment, the city should adopt a type of compact urban form based on a bundle of principles that respond to the local context and can be delivered through a participatory planning, which supports gradual development and is responsive to change.

Urban fragmentation has rarely been researched as an issue of urban sustainability, particularly in Libya, where most planning studies about urban sprawl focus on outward expansion. Through debating this issue, the study opens new opportunities to rethink the theory and practice of urban planning in Libya. It is anticipated that while this review for the urban fragmentation helped in an understanding of the phenomenon within the Libyan context and its impact on urban sustainability, it would facilitate the research and sharing of information on this theme in the wider context of Arab countries and the South in general.

Generally, the intention of this research has been the focus on the quality of life and environmental sustainability as central considerations for future urbanism in Benghazi. However, due to the course of this study and the fact that the theory on urban sustainability is more about the ends rather than the process, the suggestions mentioned above for further research focus mainly on characteristics and qualities of the urban form.

Moreover, the diversity of future research suggested above reflects the richness of the topic as a multidisciplinary and ongoing theme that has many possible areas of investigation. It can be inferred that the urban concepts and principles presented in

this study have the potential to be generalised for other cities and towns in Libya and the Arab region. It is hoped that these measures when applied to individual cities would help to establish a type of sustainable urbanism that is suitable to local conditions, flexible to accept change and resilient enough to face various challenges.

To conclude, this work challenges some ideas on contemporary urbanism in the West when they are applied in Benghazi. The findings have contributed to the understanding of the phenomenon of urban fragmentation and highlighted the relevance of the theory of compact urban form to sustainable development in Benghazi and the South in general.

The next step should be testing the relevance of the concepts suggested in this study for the development of new residential areas in the city and its wider Arabic region.

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Declaration

According to §3 section 14 in the regulations for the Award of the Degrees of Master of Philosophy and Doctor of Philosophy of the University of Westminster, I herewith confirm that I wrote this thesis by my own and that I did not use any other sources, means of support and aid than those mentioned within the text.

Adel Mohamed

London in October 2013