Towards a localized form-based code for Abu Dhabi urban neighborhoods

Arwa Khalid Sabri

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TOWARDS A LOCALIZED FORM-BASED CODE FOR ABU DHABI URBAN NEIGHBORHOODS

Arwa Khalid Sabri

This thesis is submitted in partial fulfilment of the requirements for the degree of Master of Science in Architectural Engineering

Under the Supervision of Dr. Khaled Galal Ahmed

May 2016
Declaration of Original Work

I, Arwa Khalid Sabri, the undersigned, a graduate student at the United Arab Emirates University (UAEU), and the author of this thesis entitled “Towards a Localized Form-Based Code for Abu Dhabi Urban Neighborhoods”, hereby, solemnly declare that this thesis is my own original research work that has been done and prepared by me under the supervision of Dr. Khaled Galal Ahmed, in the College of Engineering at UAEU. This work has not previously been presented or published, or formed the basis for the award of any academic degree, diploma or a similar title at this or any other university. Any materials borrowed from other sources (whether published or unpublished) and relied upon or included in my thesis have been properly cited and acknowledged in accordance with appropriate academic conventions. I further declare that there is no potential conflict of interest with respect to the research, data collection, authorship, presentation and/or publication of this thesis.

Student’s Signature: ___________________________  Date: ___________________
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Abstract

Form-Based Code (FBC) is a sustainable planning tool that helps realize sustainable urban form and sustainable communities from different perspectives, including mixing of land uses, diversifying housing types, achieving walkability and cycling as well as permitting community involvement in decision making and design processes. It is therefore considered as a comprehensive tool that regulates different planning scales from master plan to individual buildings. Locally, Abu Dhabi Emirate lacks a FBC that could help achieve its sustainability-orientated 2030 vision and thus promote its envisaged sustainable urban identity. This research aims at studying to what extent the present form-related standards and guidelines for developing Abu Dhabi new urban neighborhoods coincide with the common components and process of FBC as a universal practice. This was achieved through a comprehensive review of the local form-related standards and guidelines and then comparing them to FBC. It has been found that these form-related standards and guidelines in are fragmented and lack some essential components of FBC applications. On the other hand, and in terms of the process of developing form-related regulations in Abu Dhabi new urban neighborhoods FBC, it has been found that the community involvement is fairly limited. Based on these results, the research has proposed some additions and modifications for what might be claimed as a localized version of FBC for Abu Dhabi new urban neighborhoods. Consequently, interviews were conducted with different stakeholders involved in the urban planning process, including central and local authority representatives, planners and community members in order to identify the opportunities and obstacles that may face the adoption of the proposed and additions and modifications.

The conducted interviews evidently revealed that there is a need for some actions to overcome the obstacles and seize the opportunities in front of the implementation of the proposed localized FBC to be eventually able to respond to the local urban character and identity of Abu Dhabi neighborhoods.

Keywords: Abu Dhabi, Form-Based Code, sustainability, urban form, housing, local character.
عنوان البحث الرئيسي: أبوظبي، كود التشكيل العمراني، الاستدامة، التشكيل الحضري، الإسكان، الطابع المحلي.
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My thanks are extended to the library staff in the University for providing me with the relevant reference material and to all people who contributed in the development of this thesis.

Additionally, I would like to thank all engineers from Abu Dhabi Urban Planning Council, Abu Dhabi Municipality and the planners who shared their precious time during the process of interviewing. I would like to thank the Emirati residents who were interviewed for their cooperation and time.

Finally, special thanks go to my parents and all my family who encouraged me along the way. My thanks are extended to all my friends and fellow graduate students for their assistance and friendship.
Dedication

To my beloved parents and brothers Walid, Ahmed and Ziyad
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<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AAM</td>
<td>Al Ain Municipality</td>
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<tr>
<td>ADACH</td>
<td>Abu Dhabi Authority for Culture and Heritage</td>
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<tr>
<td>ADCD</td>
<td>Abu Dhabi Civil Defense</td>
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<tr>
<td>ADEC</td>
<td>Abu Dhabi Education Council</td>
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<tr>
<td>ADIC</td>
<td>Abu Dhabi Systems and Information Centre</td>
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<td>ADM</td>
<td>Abu Dhabi Municipality</td>
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<tr>
<td>ADNOC</td>
<td>Abu Dhabi National Oil Company</td>
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<td>ADP</td>
<td>Abu Dhabi Police</td>
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<td>ADSC</td>
<td>Abu Dhabi Sports Council</td>
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<tr>
<td>ADTCA</td>
<td>Abu Dhabi Tourism and Culture Authority</td>
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<td>ADUPC</td>
<td>Abu Dhabi Urban Planning Council</td>
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<td>ANGT</td>
<td>L'Agence Nationale des Grands Travaux</td>
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<td>CFPS</td>
<td>Community Facility Planning Standards</td>
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<tr>
<td>CNU</td>
<td>Congress for the New Urbanism</td>
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<tr>
<td>CRC</td>
<td>Consolidated Review Committee</td>
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<tr>
<td>CSR</td>
<td>Commercial Signage Regulations</td>
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<tr>
<td>DED</td>
<td>Department of Economic Development</td>
</tr>
<tr>
<td>DMA</td>
<td>Department of Municipal Affairs</td>
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<tr>
<td>DOT</td>
<td>Department Of Transportation</td>
</tr>
<tr>
<td>DPZ</td>
<td>Duany Plater-Zyberk</td>
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<tr>
<td>EbD</td>
<td>Enquiry by Design</td>
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<tr>
<td>FBC</td>
<td>Form-Based Code</td>
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<td>FDF</td>
<td>Family Development Foundation</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>GDADP</td>
<td>General Directorate of Abu Dhabi Police</td>
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<td>HAAD</td>
<td>Health Authority Abu Dhabi</td>
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<tr>
<td>HASC</td>
<td>Health Authority and Statistics Centre</td>
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<tr>
<td>HUD</td>
<td>Housing and Urban Development</td>
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<tr>
<td>PCRS</td>
<td>Pearl Community Rating System</td>
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<td>PRDM</td>
<td>Public Realm Design Manual</td>
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<td>PVRS</td>
<td>Pearl Villa Rating System</td>
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<td>RAM</td>
<td>Roadside Advertising Manual</td>
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<td>Road Lighting Manual</td>
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<td>ROW</td>
<td>Right of Way</td>
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<td>SSCI</td>
<td>Scottish Sustainable Communities Initiative</td>
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<td>TDIC</td>
<td>Tourism Development and Investment Company</td>
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<tr>
<td>TND</td>
<td>Traditional Neighborhood Development</td>
</tr>
<tr>
<td>UCDM</td>
<td>Utility Corridors Design Manual</td>
</tr>
<tr>
<td>USDM</td>
<td>Urban Street Design Manual</td>
</tr>
<tr>
<td>WRM</td>
<td>Western Region Municipality</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction

1.1 Sustainable Urban Development

The concept of sustainable development has been perceived as a critical solution to all environmental, social and health problems associated with the current issues, including increasing resource consumption and rapid population growth as well as the dependence on cars (Rifaat, 2015). The research about sustainable urban development includes the integration of sustainability concepts with the construction industry as well as the city’s physical form and structure (Junnila and Ristimäki, 2012; Frey, 2005). Accordingly, sustainable development is considered an integral part of urban neighborhoods that aim to achieve environmental protection, social quality of life and economic performance (Karatas and El-Rayes, 2014). Numerous research describes the basic characteristics of the sustainable neighborhood. It encourages walkability and cycling, diversity of housing types in compact and well-connected streets, as well as community involvement in the design. Mixing uses is also an important strategy for sustainable urban development with the objectives of economic vitality, social equity, and environmental quality (Grant, 2002).

1.2 Sustainable Urban Form as a Means for Achieving Sustainable Urban Development

Sustainable urban form is considered an indicator for realizing sustainable urban development in all its perspectives. Accordingly, sustainable urban form is about ‘how to build urban environments without compromising the possibilities of future generations’ (Kärholm, 2011; 107). Literature, addressed various criteria of sustainable urban form, including compactness, high density, mixing of land uses, diversification of housing types, interconnected street layouts, efficient public
transport networks, walkability and cycling, greening urban areas, achieving security, environmental control and high standards of urban management (Rifaat, 2015; Williams, Burton, Jenks and Williams, 2000; Frey, 2005; Jenks, 2010; Mobaraki, Mohammadi and Zarabi, 2012). In addition, community involvement in the decision making and design process is considered an essential concept for achieving sustainable urban development and sustainable communities (Chen, Jia and Lau, 2008; Darchen and Huston, 2014; Douay, 2010; Jabareen, 2006,). As a way of application, urban codes play an important role in defining the urban form of a place due to its direct impact on the urban form (Marshall, 2011). Form-Based Code (FBC) is a representation of a code-driven tool for realizing sustainable urban form.

1.3 Form-Based Code (FBC) as a Tool for Achieving Sustainable Urban Form

Form-Based Code (FBC) is a comprehensive planning tool that helps realize sustainable urban form. It has the ability to ‘control the form and layout of urban development’ utilizing various components, including building typologies, public space standards and control of architectural elements. FBC is generally concerned with controlling the development process of the urban fabric (Marshall, 2011).

1.3.1 Definition of FBC

FBC is considered as a comprehensive zoning tool (Cisneros, Chamberlain and Hickie, 2012). It is defined as:

‘Allocating land uses based primarily on the control of or influence over the physical form, intensity, and arrangement of buildings, landscapes, and public spaces that enable land or building functions to adapt to economic, environmental, energy, and social changes over time’ (Coyle, 2011:11).

Thus, the main objective of the FBC is to regulate the urban elements and
spaces, including buildings, façades, surrounding streets and open spaces for predictable built results and more attractive, high quality built environment with respect to human-scale and the provision of meaningful senses of place (Rangwala, 2012; Form-Based Codes Institute, 2014; Elliott, Goebel and Meadows, 2012). Accordingly, FBC gives the priority to building form rather than its use. This is because a building’s function as forming the public realm such as street, plaza, or square is comparatively constant, but its uses tend to change over time (Elliott, et al., 2012; Dolan, 2012).

On the other hand, FBC is considered as an integrated code that is categorized by significant enforceability, aiming to prescribe the public realm (Talen, 2009). Its function is based on creating a certain vision for an area by putting up codes which will be strictly followed to ensure the achievement of that vision (Paulsen, 2012).

1.3.2 FBC Vs. Conventional Zoning

Unlike the conventional zoning, which controls the land uses where buildings are disconnected from each other and from the street, the FBC’s main objective is to orchestrate individual buildings (Talen, 2009; Cisneros, et al., 2012), adjust and connect their form with the elements of the built environment, like building types, streets and frontage (Katz, 2004). As a result, they produce a safe, comfortable, and interesting street space (Cisneros, et al., 2012).

Basically, the FBC depends on graphics, illustrations and perspectives for the main concepts and requirements of the code that help the community recognize the rationale and tangible benefits of it (Coyle, 2011). This makes it easy to revitalize and revive any place by planners and architects (Katz, 2004) and rewrite the code in different ways (Hansen, 2014). On the other hand, conventional zoning is a text-based
presentation of rules (SACOG, 2008) and an opaque approach that does not provide any envisioning about how these rules could be converted to a physical built environment (Talen, 2012). Moreover, FBC typically promotes pedestrian-oriented and compact development (Cisneros, et al., 2012) while conventional zoning usually permits sprawl of cities with its serious negative impacts, including depletion of environmental resources, single-use, inaccessible development, poorly conceived public realm and the massive use of cars as a result of isolating the commercial services from residential areas (Talen, 2012; Talen, 2013; Cisneros, et al., 2012). Figure 1.1 shows an example of a pedestrian-friendly and mixed use development project created based on FBC and comprised of multifamily units and retail shops on the street level (Walters and Read, 2014). While Figure 1.2 is an example of an area that is developed based on conventional zoning and segregation between residential and commercial uses. In addition, FBC is usually developed for a specific area while conventional zoning is normally applied universally throughout a jurisdiction. The potential of predictability in FBC is based on allowing the community to build their vision and objectives in planning. On the other hand, the role of conventional zoning is limited to focusing on preventing bad things from happening (SACOG, 2008). Finally, Table 1.1 concludes the main differences between conventional zoning and FBC.
Table 1.1: A comparison between the convectional zoning and FBC (Source: SACOG, 2008)

<table>
<thead>
<tr>
<th>FBC</th>
<th>Conventional zoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usually created for a specific planning area</td>
<td>Often applied universally throughout a jurisdiction</td>
</tr>
<tr>
<td>Purposeful, “pro-active” and focused on implementation of community planning goals and objectives</td>
<td>Reactive, focusing on preventing bad things from happening</td>
</tr>
<tr>
<td>Connects urban form and land use</td>
<td>Focus is on land use</td>
</tr>
<tr>
<td>Primary focus is on achieving compact, mixed-use, and pedestrian-friendly development</td>
<td>Development standards inadvertently or intentionally discourage compact, mixed-use, and pedestrian-friendly development</td>
</tr>
<tr>
<td>Liberal use of graphics to define key concepts and requirements</td>
<td>Text-based presentation</td>
</tr>
</tbody>
</table>

1.3.3 FBC and Sustainable Communities

FBC was known since 1980s when a group of planners and architects worked on defining and enhancing walkable, mixed-use, sustainable communities through the principles of Smart Growth and the Charter of the New Urbanism. In 1981, the Seaside, Florida witnessed the first application of FBC (Parolek, et al., 2008). It was formatted by Duany Plater-Zyberk and specified building height, setback, permitted encroachments, and parking (Talen, 2012). In 2003, Duany Plater-Zyberk firm issued the first version of the SmartCode, a model form-based zoning code that can be tailored to address everything from rural areas and open spaces to very dense urban areas.
For decades now, the adoption of FBC is highly accelerated all over the world as spotted by the codes study undertaken by Borys and Talen in 2015. This codes study comprised various examples not only from the USA but also from other countries, including Canada, Scotland, Romania, Equador, Brazil, Australia and Kingdom of Saudi Arabia.

Throughout literature, FBC is viewed as a ‘legal’ tool for the application of sustainable community principles with the participation of urban designers, urban planners and all members of the community to create smart physical places (Walters, 2011). From an environmental perspective, FBC recommends high density, mixed use and walkable development and increases street tree planting which would slow down climate change, reduce energy consumption and travel distances (Elliott, et al., 2012). FBC determines smaller dimensions for lots in more urban zones and identify strict standards related to the amount and location of parking spaces. Also, it promotes enclosure and compact development by reinstating building lines, thus prohibiting blank walls and by requiring permeability, narrower street widths, shorter turn radii and regulating public and private frontage (Talen, 2013).

As sprawling cities is one of the most prominent obstacles that face the process of achieving sustainability, FBC mitigates separation and encourage connectivity through determining the priorities and the rules for landscape buffering and pavements in both natural and the built environment areas, limiting maximum block size, limiting parking requirements and providing bike routes and pedestrian crossings (Talen, 2013; Elliott, et al., 2012; Talen, 2012). As an evidence for the relationship between FBC and sustainability, and after defining the urban design qualities which are related to walkability (imageability, complexity, human scale, enclosure and transparency) and the codes that are related to FBC, it has been found that the walkable streets are
affected in a direct proportion by the number of urban design qualities that are achieved in FBC. Types of features such as street furniture, courtyards and signs are found to be important elements in creating walkable street and they are usually included in the relevant FBC (Hansen, 2014).

Socially, the most remarkable point in developing FBC is the public participation. It encourages the intervention of residents and creates communities that people want to live in (SACOG, 2008). As successful FBC should put community vision as a priority; this will provide a sense of place and belonging among community members (Caves and Cullingworth, 2014; Berke, 2006). The benefits of FBC extend to enhance public health (Elliott, et al., 2012). It has been found that people, who are living in places where FBC is implemented, are more physically active and healthy. This is due the FBC’s main function of creating safe, attractive and high quality built environment (Rangwala, 2012).

Some researches addressed the relationship between FBC and demographic issues including elderly people. As FBC encourages compactness, mixing the uses and creating high quality public realm that are more socially, viable and walkable, this would help aging population to live independently where they meet their basic needs and interact with others without traveling long distances (Elliott, et al., 2012; Cisneros, et al., 2012).

Furthermore, FBC could help in acquiring affordable housing goals in the way of providing various types of houses that meet the requirements of the community (SACOG, 2008). For example, allowing the construction of attached and multi-family housing with low density offers diversification in building types in urban areas (Elliott, et al., 2012).

In addition, FBC tends to control the building types and architectural details
thus limiting the unsuitable buildings designs and locations and their relations to streets in historic districts to preserve historic site elements, cultural landscapes and community aesthetics and character (Elliott, et al., 2012). It is claimed also that the benefits of FBC extend to promote social sustainability through crime prevention. Paulsen (2012) defined three main elements in FBC that affect crime prevention practices directly: frontage type standards, block standards and building type standards. Firstly, frontage type standards can prevent crime through promoting surveillance, ownership and the use of efficient lighting in areas with limited access. Secondly, block standards are relatively correlated to connectivity issues. The location of allowed cul-de-sacs in zones with specific physical limitations should be clearly identified. Finally, the diversification of residential building types including mansion apartments, town houses, duplexes, triplexes and fourplexes with single-family housing offers variety of housing options that encourage people to live in one community during their whole life.

From an economic point of view, FBC benefits real estate developers through offering diverse project sizes and uses with different allowable civic, commercial and residential spaces, thus, the private sector will be able to manage any sudden change in the market with minimum cost and predict any possible problems during the process. This will lead to time saving for developers and less risk exposure (Walters and Read, 2014).

1.4 Urban Neighborhoods and the Sustainability Issue in Abu Dhabi

Sustainability is a key element in Abu Dhabi Vision 2030, which is considered one of the leading programs in the region. Abu Dhabi Urban Planning Council (ADUPC) and Abu Dhabi Municipality (ADM) worked with several authorities to
develop an integrated vision that covers all development sectors including social housing. Social housing in UAE has actually received a great attention from the government with the aim of providing comfortable housing and a decent life for all local families. The ADUPC, that was established in 2007 has put up a comprehensive approach willing to develop an integrated urban community, thus achieving major concepts related to Abu Dhabi Vision 2030 including: sustainability, infrastructure, community planning and quality of life for all settlements (ADUPC, 2007). Plan Abu Dhabi 2030 is a conceptual document that displays different themes and directions related to Abu Dhabi Vision 2030. It steers the development of Abu Dhabi towards various concepts, including sustainability, excellence, livability and connectivity (ADUPC, 2007). Most of the standards and guidelines that regulate the developments in Emirate of Abu Dhabi are issued based on the concepts within this plan.

However, Abu Dhabi Emirati neighborhoods are usually limited to low density developments in a form of single family housing represented in the villas surrounded by solid fences. They are commonly supported by mixed use buildings for commercial and services.

In literature, sustainable urban neighborhoods in Abu Dhabi have been studied from different angles. For example, some studies focused on “the thermal optimization of windows glass in relation to orientation in a representative governmental housing project” in Abu Dhabi (Abuimara and Tabet Aoul, 2013). Another study introduced a comprehensive approach to design a sustainable house in the desert of Abu Dhabi to reduce greenhouse gas emissions (Al-Sallal, Al-Rais and Dalmouk, 2013). But more importantly, one study examined the social aspect of sustainability in local neighborhoods. It concludes that social sustainability was poorly achieved in local neighborhoods which face different problems including: lack of pedestrian pathways,
cycling facilities and housing diversity (Galal Ahmed, 2012). Figure 1.3 shows examples of Emirati neighborhoods walkways in Abu Dhabi that are disconnected and the cycle tracks were not considered.

![Figure 1.3](image)

Figure 1.3 (a, b): a is Watani neighborhood and b is Yas community (Source: the author)

Additionally, as Abu Dhabi is considered a fast growing city in terms of economy, population and wealth, a recent research indicated that the ownership of cars is ‘growing at an annual rate of 24%’ with high dependency on cars for most journeys. The reasons behind that are represented in the urban sprawl, the cultural habits and the climatic constraints in the region (Ochieng and Jama, 2015). From another perspective, ADM holds several public meetings for Emirati communities to find out the residents’ needs of facilities and suggestions. At one of the meetings held for Yas Emirati community, the residents requested several health and education services and facilities. A survey of this area before the meeting concluded that most of the residents requested commercial shops and centers as there are no supermarkets near the residential villas in addition to entertainment places and parks (Emarat Alyoum, 2015). Figure 1.4 shows a google map and pictures for Yas community in Abu Dhabi.
Accordingly, it could be claimed that the Emirati urban neighborhoods in Abu Dhabi suffer from critical form-related issues that prevent achieving sustainability, including: limited housing options, no services near the neighborhoods and the absence of cycle tracks. Meanwhile, there is a research gap in studying the application of sustainable planning tools to overcome the recent problems and if the existing form-related regulations of Abu Dhabi new urban neighborhoods are responsible for that. There are only some scattered urban form-related regulations and guidelines. Among different sustainable planning tools, this research introduces FBC as one of the sustainable planning tools that would achieve a more sustainable urban form in Abu Dhabi urban neighborhoods.

1.5 Research Objectives

As FBC cannot be generalized or transferred due to the different social and urban contexts in the different local communities around the world, a localized FBC is needed in which urban planners and designers have the chance to develop proposals based on the local community’s vision and agendas that aim to realize smart and sustainable communities (Hansen, 2014, Walters, 2011). Therefore, this research has three main objectives the first of which is the identification of the role of FBC in realizing sustainable new neighborhoods through exploring its main components and
development process. The second objective is studying the form-related regulations for developing new urban neighborhoods in Abu Dhabi and their relevance to FBC components/process. The third objective is investigating the opportunities and barriers that may face the adoption of a proposed localized FBC for Abu Dhabi new urban neighborhoods.

1.6 Research Questions

The research poses the following questions:

1. How does FBC regulate the built environment and help realizing sustainable neighborhoods?

2. To what extent do the current form-related standards and guidelines for developing new urban neighborhoods in Abu Dhabi align with FBC components and process?

3. What are the opportunities and obstacles of adopting a comprehensive and customized FBC for Abu Dhabi new urban neighborhoods?

1.7 Research Methodology

To achieve its objectives and to answer its main questions, the research utilized several methods with their associated tools. The research is essentially qualitative as it is about ‘describing methods or approaches that deal with non-numeric data’ (Hammond and Wellington, 2013: 173). The qualitative method helps provide a holistic overview of the context under study (Miles, Huberman and Saldaña, 2013).

Firstly, the research relies on literature review to answer the first research question through exploring the components of FBC and studying various international case studies to derive the main steps followed for the process of developing and adopting FBC for new urban communities and neighborhoods. To answer the second
question, the research studied the form-related regulations for Abu Dhabi new urban communities and neighborhoods and compared them with the components and the process of development of FBC. The case studies represents both community and neighborhood scales. Neighborhood is ‘is defined as a residential or mixed use area around which people can conveniently walk. Its scale is geared to pedestrian access and it is essentially a spatial construct, a place’. While the community is usually divided into neighborhoods (Barton, 2001: 5, City of Winnipeg, 2006). Locally, both terms are used community and neighborhood where the community usually consists of several neighborhoods. Abu Dhabi was selected for easy access to the researcher. Comparative analysis is used at this stage to find out the similarity and variance (Mills, 2006). Next, interviews were conducted with the central authority, local authority, planners and the local community to find out the obstacles and opportunities that may face the development and application of the proposed Abu Dhabi’s localized FBC. The interview method is clarified more in Chapter Five. Finally, based on the opinion of stakeholders, a road map will be developed for more sustainable urban communities for Abu Dhabi.

1.8 Research Limitations

This research has some limitations that must be considered when dealing with the research findings. As the main objective of this research is to study the applicability of developing and applying FBC for new Emirati urban neighborhoods in Abu Dhabi, the research is limited by its scope. Accordingly, the international case studies presented in Chapter Three were selected for their comprehensive information related to the FBC development process for newly developed neighborhoods from developed and developing countries. However, there was a lack of complete case studies from
developing countries.

Additionally, the research was limited by time. Findings of qualitative research like this one require a lot of time for data collection, analysis and the interviews conduction as well as response interpretation. Also the research is limited by resources available for an individual researcher. Furthermore, getting access to related information and to persons was difficult during this research.

1.9 Research Structure

This research consists of seven chapters. Chapter One introduces FBC and its role in realizing sustainable urban communities. In addition, this Chapter explored the urban neighborhoods and sustainability issues in Abu Dhabi. Chapter Two explores the main components of FBC that are represented in the regulating plan, public space standards, block standards, building type standards, building form standards, frontage type standards, architectural standards and the glossary. Chapter Three sheds light on the typical stages for FBC development through reviewing various case studies that adopted FBC for newly developed neighborhoods. Chapter Four explores the form-related regulations of Abu Dhabi new urban neighborhoods and their relevance to FBC in terms of components and process. Chapter Five investigates the opportunities and obstacles of developing a locally customized FBC taking into consideration stakeholders’ point of view. It started with a clarification for the interview method that was utilized for local investigation. Based on that, Chapter Six analyzes the results and determines a road map for developing a unified FBC tailored for Abu Dhabi new urban neighborhood. The conclusion and future research are presented in the last chapter. Figure 1.4 shows a summary of the research structure.
Figure 1.5: Research outline (Source: the author)
Chapter 2: Defining the Main Components of FBC

This chapter explores the main components of FBC in various relevant literature. As detailed below, FBC is usually comprised of eight major components: regulating plan as the framework for other FBC components, public space standards, block standards, building types standards, building form standards, frontages type standards, architectural standards and glossary. In addition to these components, other optional ones like green building standards could be included within the code based on the community requirements. By the end of this chapter, the determination of the main components of FBC and their regulations will help in the investigation of the form-related regulations of Abu Dhabi urban neighborhoods as explained in Chapter Four.

2.1 Regulating Plan

The regulating plan is a detailed plan that usually illustrates the following items: the lots, blocks, building types for a specific area, the layout of the surrounding elements and public realm elements including streets and public open spaces (Elliott, et al., 2012; Goldstein, Gowder and Slone, 2008). Regulating plan plays three main roles. First, there is an administrative role which represents the scope of development or land use for a specific area and is considered as an initial depiction before going into the code document to identify the design requirements. Second, there is a direct regulation role when it shows the actual development requirements such as street frontages especially where ground-floor retail use is required. Third, there is a planning role where the regulating plan identifies the zones in a project-by-project and a lot-by-lot format. It also identifies the development standards and defines the differences in the form and character of development in each zone in addition to the configuration of
the public realm (Parolek, et al., 2008).

There are three organizing patterns for the regulating plan. First, the building type-based regulating codes regulate zones depending on the building types. The plan of a specific zone shows mixed building types and uses (Figure 2.1) (Goldstein, et al., 2008). It is more applicable in a small community that combines multiple neighborhoods (Parolek, et al., 2008). Second, there are the street-based regulating codes in which the regulating plan determines private realm development standards by street type and elements within the public realm (e.g. sidewalks, travel lanes, on-street parking, street trees, street furniture). Practically, street-based regulating codes are more effective where streets have not yet been platted (Charley and Greene, 2008) (Figure 2.2). Third, there are the frontage-based regulating codes in which the regulating plan shows different colors on the streets rather than lots in addition to other several elements, such as building height, street façade and side lot setbacks (Parolek, et al., 2008) (Figure 2.3).

Figure 2.1: Regulating plan indicates zones of varying intensities and types of development, Whittier Specific Plan (Source: Moule and Polyzoides, Architects and Urbanists, 2014)
Figure 2.2: The Central Hercules Plan code, as an example of a street-Based FBC
(Source: Parolek, et al., 2008)

Figure 2.3: Heart of Peoria. Regulating plan depends on frontage-based FBC
(Source: DeCoursey, 2014)
On the other hand, there are different methods for adjusting and presenting the type, scale, form and intensity of allowable development (Parolek, et al., 2008). The Transect-based code is a geographical cross-section of a region used to reveal a sequence of environments and determines the gradual differences from rural-to-urban transition in terms of scale and intensity of urban character and the physical built environment (Duany and Talen, 2002). For example, the SmartCode, a comprehensive template of a generic FBC, is developed based on a rural-to-urban Transect developed by Duany firm (Ellin, 2006). Figure 2.4 illustrates the six zones and one Special District.

![Rural-Urban Transition Zones](image)

**Figure 2.4: Rural-urban transition zones (Source: Duany Plater-Zyberk and Company, 2003)**

These zones are based on rural-urban Transects that can be clarified as follows:

The Natural zone (T1) represents natural lands that are not suitable for people settlements while the Rural zone (T2) represents land in open or cultivated state or sparsely settled; these include woodland, agricultural lands, green lands and irrigable deserts. The Sub-urban zone (T3) expresses low density suburban residential areas, plants grow naturally in this zone and the roads irregular to meet the natural conditions. The General urban zone (T4) consists of a mixed-use but primarily residential urban fabric with variety of building types such as single, side-yard and row-houses, and
different setbacks and landscaping, Urban center zone (T5) consists of higher density mixed-use building types that accommodate retail offices, row houses and apartments. It has a tight network of streets with wide sidewalks, steady street tree planting and buildings set close to the frontage, Urban core zone (T6) represents the highest density with greatest variety of uses and civic buildings of regional importance. It may have larger blocks; streets have steady street tree planting and buildings set close to the frontages (Parolek, et al., 2008). Finally, Special Districts consist of airports, stadiums and other hard-to-generalize areas deserving separate treatment not primarily based on intensity or form (Elliott, et al., 2012).

2.2 Public Spaces Standards

Public spaces standards are one of the major components of the FBC that affect the quality of urban places in which they provide specifications for each element within the public realm in terms of design and location (Elliott, et al., 2012). They are distributed among two main groups of standards: Thoroughfares and Civic Spaces. A thoroughfare is a road used by vehicular and pedestrian traffic and provides access to lots and open spaces (Duany Plater-Zyberk and Company, 2010). Table 2.1 summarizes the main considerations for a desired thoroughfare. Thoroughfare design rules in many communities are unfortunately anti-pedestrian standards, resulting in uncomfortable and insecure pedestrian environment (Parolek, et al., 2008). Figure 2.5 shows an example of the main components and standards of a thoroughfare.

Civic space types are either open space or public areas including parks, squares, plazas, pocket parks, playgrounds, and playing fields (CMAP, 2013). Table 2.2 shows the typical civic spaces standards and Table 2.3 summarizes an example of the characteristics of the civic space based on its Transect location from the SmartCode.
Table 2.1: Thoroughfare standards in FBC (Source: the author based on Parolek, *et al.*, 2008)

<table>
<thead>
<tr>
<th>Regulatory element</th>
<th>Definition</th>
<th>Design Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement type</td>
<td>The kind of traffic flow the thoroughfare is designed to accommodate and foster</td>
<td>- It helps create a good pedestrian-oriented community</td>
</tr>
</tbody>
</table>
| Design speed       | The highest vehicle speed the thoroughfare is designed to accommodate and foster | - It has an impact on the safety and comfort of pedestrians  
- Faster speeds can be accommodated in pedestrian areas where necessary by using a boulevard which has faster lanes in the center separated by a planting strip from slower access lanes along the edges near pedestrians |
| Pedestrian crossing time | The typical length of time required for a person to walk across the thoroughfare  
- Crossing time is most important on thoroughfare with higher vehicle speeds |
| Right-of-Way (R.O.W.) | The measurement across a thoroughfare of the area the municipality controls or owns | - It includes pavement area, planting strips, sidewalks, setback, and frontage type. They should be considered together and regulated accordingly to prescribing the desired place |
| Curb face to curb face width | The distance across a thoroughfare between the vertical faces of the curbs, typically intended for vehicles, including any on-street parking and intermediary planting strips | - It affects the speed of vehicular travel and the comfort and safety of vehicles and pedestrians |
| Curb type          | The kind of transition at the edge of the pavement  
- Helps in reinforcing the desired character of place  
- Create an edge for the vehicular area and affect the width of thoroughfare |
| Curb radius        | The dimension required to establish the curve of the curb at a corner | - Smaller corner radii help lower the speed of vehicles  
- Reduces the crossing distances for pedestrians |
| Traffic lanes      | Number and width of vehicles travel areas, not including bicycle lanes | - The narrower the width of each lane, the slower vehicles will travel thus creating safer and comfort environment for pedestrians  
- Affects the width of the public space thus affects the urban form |
| Bicycle lanes      | Number and width of bicycle lanes demarcated by solid white stripes on the pavement | - Design lanes for bicyclists ensure their safety and comfort |
| Parking lanes      | The number and width of areas designated for on-street parking | - It slows down traffic by narrowing the perceived width of the thoroughfare  
- Better access to homes and work  
- Creates a barrier between pedestrians and moving traffic |
| Planter type       | The kind and width of landscaping accommodation at the edge of the thoroughfare pavement | - It should be calibrated by Transect zone where the thoroughfare is located  
- Plants create separation between vehicles and pedestrians |
| Landscape type     | The kind and spacing of trees and other landscaping | - Affects the character of the streetscapes and the proportion of the public space  
- Affect the pedestrians comfort and walkability |
| Walkway type       | The type and width of space allotted for pedestrians | - Sidewalks provide safe spaces and good surfaces for pedestrians to walk |
| Lighting           | The type and spacing of illumination for vehicles and pedestrians | - Important element for both vehicles and pedestrians ensures comfort and safety of pedestrians at night |
| Distances between intersections | The dimension between two adjacent thoroughfare crossings | - Shorter distances increases the connectivity of thoroughfares, thus promote walkable neighborhoods |
Table 2.2: Civic space standards (Source: the author based on Parolek, *et al.*, 2008)

<table>
<thead>
<tr>
<th>Public Spaces Standards</th>
<th>Civic Spaces Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acreage</td>
<td>The minimum acreage of land required to be allocated for civic space</td>
</tr>
<tr>
<td>Location</td>
<td>Requirements for the placement of civic spaces</td>
</tr>
<tr>
<td>Size</td>
<td>The minimum or maximum dimensions to ensure that civic space is scaled appropriately for the area and the type of space.</td>
</tr>
<tr>
<td>Activity Type</td>
<td>Type of recreation the civic space is intended to facilitate</td>
</tr>
<tr>
<td>General Character</td>
<td>Regulations that determines the look and feel of the space</td>
</tr>
</tbody>
</table>

Figure 2.5: An example of a thoroughfare standards and components (Source: Parolek, *et al.*, 2008)
The inclusion of block standards within FBC is due to their important role in promoting walkability within the urban pattern which meets the main concern of FBC in creating pedestrian-friendly building orientation and design through defining the maximum dimensions of blocks and the streets pattern (Elliott, et al., 2012). Those standards are applicable on the project site that is two acres (1 acre= 4046.856 m²) or larger. They usually include maximum block length (122 m- 274) and maximum block perimeter (487 m- 732 m). Figure 2.6 shows an example of block and subdivision standards for four elements: streets, alleys, lots and building types while lots may not be required in urban areas (Parolek, et al., 2008).
Building type standards are concerned with defining specific building types and how they should be arranged in relation to the surrounding development (SACOG, 2008). Table 2.4 explores the main elements regulated by building types standards. Figures 2.7 and 2.8 show typical building types and an example of applying building type standards.

Table 2.4: Building type standards (Source: the author based on Parolek, et al., 2008)

<table>
<thead>
<tr>
<th>Regulatory elements</th>
<th>Definition</th>
<th>Secondary element</th>
</tr>
</thead>
<tbody>
<tr>
<td>General description</td>
<td>Describes the primary characteristics of the building type</td>
<td></td>
</tr>
<tr>
<td>Required lot size</td>
<td>The minimum lot width and depth for the building type</td>
<td></td>
</tr>
<tr>
<td>Pedestrian access</td>
<td>Where and how pedestrians enter and exit the building affect the perceived level of activity at street level</td>
<td>- Main entrance location</td>
</tr>
<tr>
<td>Frontages</td>
<td>The specific way that a building type addresses the street defines the transition between public to private realms</td>
<td>- Allowed Frontages</td>
</tr>
<tr>
<td>Vehicle access and parking</td>
<td>The types of parking and how it is accessed from programmed spaces</td>
<td>- Access to parking</td>
</tr>
<tr>
<td>Service</td>
<td>The access to, and location of, utilities and aboveground equipment</td>
<td>- Location of services</td>
</tr>
</tbody>
</table>
Regulating the size and location of open spaces that certain building type may require its own open space standards, especially in T6 (Urban core zone) and T4 (General urban zone) zones where there is less public and private open space.

<table>
<thead>
<tr>
<th>Landscape</th>
<th>Certain elements need to be regulated by building types</th>
<th>- Minimum required landscape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building size and massing</td>
<td>Specific building form requirements for each building type that are in addition to the building form standards</td>
<td>- Composition: the way the height and massing of a building is assembled</td>
</tr>
</tbody>
</table>

Figure 2.7: The diverse buildings types across the Transect in Miami 21 Code (Source: Khoury, 2008)

Figure 2.8: Building types diagram in relation to street (Source: Moule and Polyzoides, 2010)
2.5 Building Form Standards

Building form standards includes all standards related to building form dimensions and location in addition to parking amount and location regulations, usually using three-dimensional illustrations with explanatory text (Lawlor, 2011). Building form standards are mainly regulated by zone and consist of: building placement, building form, land use and parking standards (Parolek, et al., 2008). Table 2.5 clarifies these standards (Figure 2.9).

Table 2.5: Building form standards (Source: the author based on Parolek, et al., 2008)

<table>
<thead>
<tr>
<th>Building form standards</th>
<th>Regulatory element</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building placement</strong></td>
<td>Built-to Line (BTL): A parallel line to the property line where the façade of the building is required to be located</td>
</tr>
<tr>
<td></td>
<td>Setback: the distance by which a building must be separated from the property line a or Right-of-Way (R.O.W.), typically defined and regulated as a minimum</td>
</tr>
<tr>
<td></td>
<td>Maximum Lot Width: the largest allowed distance between lot corners along the R.O.W.</td>
</tr>
<tr>
<td></td>
<td>Minimum Lot Width: the minimum allowed distance between lot corners along front R.O.W.</td>
</tr>
<tr>
<td><strong>Building form</strong></td>
<td>Minimum Building Height: the shortest allowed vertical distance between the sidewalk and the top point of references for a building façade along the front ROW</td>
</tr>
<tr>
<td></td>
<td>Maximum Building Height: the largest allowed vertical distance between the sidewalk and the top point of the building façade</td>
</tr>
<tr>
<td></td>
<td>Ground-Floor Finished Level Height: The vertical distances allowed between the sidewalk and the top of the finished floor on the ground level, regulated as a minimum or a maximum. It helps in ensuring as appropriate relationship between the public and private realm</td>
</tr>
<tr>
<td></td>
<td>Minimum Ground-floor Ceiling Height: The smallest allowed vertical distances between the finished floor and ceiling on the ground floor of a building</td>
</tr>
<tr>
<td></td>
<td>Minimum Upper-Floor(s) Ceiling Height: The smallest allowed vertical distance between the finished floor and ceiling on all of the floors of a building above the ground floor of a building</td>
</tr>
<tr>
<td></td>
<td>Maximum Building Depth: The largest allowed distances between a building’s front façade and rear elevation</td>
</tr>
<tr>
<td></td>
<td>Maximum Ancillary Building Size: The largest allowed size of a secondary building, regulated as a maximum depth along with a maximum footprint square footage.</td>
</tr>
<tr>
<td></td>
<td>Signage: Define the allowable signage for each building type</td>
</tr>
<tr>
<td><strong>Land uses</strong></td>
<td>Identify the location and type of the allowed land uses in each zones or districts</td>
</tr>
<tr>
<td><strong>Parking</strong></td>
<td>Required Spaces: The mandatory number of off-street parking spaces, typically regulated by use type and size</td>
</tr>
<tr>
<td></td>
<td>Location: The area on the lot in which parking is allowed</td>
</tr>
</tbody>
</table>
Frontage type standards focus on the buildings and their relation to the streets through providing standards for sidewalk layouts, tree lawns, stoops, porches, arcades, building height, street façade, side lot setbacks. Depth, width and height are the typical regulations for frontage types as well as considering shading when the frontage is facing a walkway (Elliott, et al., 2012; Parolek, et al., 2008). Table 2.6 shows the eight frontage types mentioned in the SmartCode. Figure 2.10 illustrates a typical building.
frontage and public R.O.W in an urban neighborhood street.

Table 2.6: Frontage types from the SmartCode (Source: Duany Plater-Zyberk and Company, 2010)

<table>
<thead>
<tr>
<th>Plan</th>
<th>Section</th>
<th>Frontage type and description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Plan 1" /></td>
<td><img src="image2" alt="Section 1" /></td>
<td><strong>Common Yard</strong>: a planted frontage wherein the facade is set back substantially from the Frontage Line. The front yard created remains unfenced and is visually continuous with adjacent yards, supporting a common landscape. The deep setback provides a buffer from the higher speed thoroughfares.</td>
</tr>
<tr>
<td><img src="image3" alt="Plan 2" /></td>
<td><img src="image4" alt="Section 2" /></td>
<td><strong>Porch &amp; Fence</strong>: a planted frontage wherein the facade is set back from the Frontage Line with an attached porch permitted to encroach. A fence at the Frontage Line maintains street spatial definition. Porches shall be no less than 2.4 m deep.</td>
</tr>
<tr>
<td><img src="image5" alt="Plan 3" /></td>
<td><img src="image6" alt="Section 3" /></td>
<td><strong>Terrace or Lightwell</strong>: a frontage wherein the facade is set back from the Frontage Line by an elevated terrace or a sunken Lightwell. This type buffers Residential use from urban sidewalks and removes the private yard from public encroachment. Terraces are suitable for conversion to outdoor cafes.</td>
</tr>
<tr>
<td><img src="image7" alt="Plan 4" /></td>
<td><img src="image8" alt="Section 4" /></td>
<td><strong>Forecourt</strong>: a frontage wherein a portion of the facade is close to the Frontage Line and the central portion is set back. The forecourt created is suitable for vehicular drop-offs. This type should be allocated in conjunction with other frontage types. Large trees within the forecourts may overhang the sidewalks.</td>
</tr>
<tr>
<td><img src="image9" alt="Plan 5" /></td>
<td><img src="image10" alt="Section 5" /></td>
<td><strong>Stoop</strong>: a frontage wherein the facade is aligned close to the Frontage Line with the first story elevated from the sidewalk sufficiently to secure privacy for the windows. The entrance is usually an exterior stair and landing. This type is recommended for ground-floor Residential use.</td>
</tr>
<tr>
<td><img src="image11" alt="Plan 6" /></td>
<td><img src="image12" alt="Section 6" /></td>
<td><strong>Shopfront</strong>: a frontage wherein the facade is aligned close to the Frontage Line with the building entrance at Sidewalk grade. This type is conventional for Retail use. It has a substantial glazing on the Sidewalk level and an awning that may overlap the Sidewalk to within 0.6 m of the curb. Syn: Retail Frontage.</td>
</tr>
<tr>
<td><img src="image13" alt="Plan 7" /></td>
<td><img src="image14" alt="Section 7" /></td>
<td><strong>Gallery</strong>: a frontage wherein the facade is aligned close to the Frontage line with an attached cantilevered shed or a lightweight colonnade overlapping the Sidewalk. This type is conventional for Retail use. The gallery shall be no less than 10 feet wide and should overlap the sidewalk to within 0.6 m of the curb.</td>
</tr>
<tr>
<td><img src="image15" alt="Plan 8" /></td>
<td><img src="image16" alt="Section 8" /></td>
<td><strong>Arcade</strong>: a colonnade supporting habitable space that overlaps the sidewalk, while the facade at sidewalk level remains at or behind the frontage line. This type is conventional for Retail use. The arcade shall be no less than 3.6 m wide and should overlap the sidewalk to within 0.6 m of the curb.</td>
</tr>
</tbody>
</table>

Figure 2.10: Example of building frontage and dimensional standards design in urban neighborhood, Manchester, CT (Source: Dodson and Flinker, 2011)
2.7 Architectural Standards

Architectural standards would promote the success of the code and enhance the quality of the development. They vary from one community to another depending on the architectural style in the areas. Basically, architectural standards regulate the massing, façade combination, windows and doors, details, color palette and combinations of materials. Also they tend to regulate the external architectural materials, composition, and quality (Coyle, 2011) (Figure 2.11). Table 2.7 shows the typical architectural standards.

![Example of architectural style detailing for Uptown Whittier specific plan, Victorian style](Source: Moule and Polyzoides, Architects and Urbanists, 2014)

Table 2.7: Architectural standards (Source: the author based on Parolek, et al., 2008)

<table>
<thead>
<tr>
<th>Regulatory element</th>
<th>Definition</th>
<th>Secondary element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massing</td>
<td>The main architectural element that regulates the building depending on its type</td>
<td>- Primary forms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Roof forms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Massing elements</td>
</tr>
<tr>
<td>Façade combination</td>
<td>Regulates the building width, the rhythm of windows and doors and other elements of the façade</td>
<td>- Rhythm of windows and doors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Distances between windows and corners</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Locations of doorways</td>
</tr>
<tr>
<td>Windows and doors</td>
<td>The selection of appropriate and well-detailed windows and doors is important on all building scales. The depth of the windows effects the shadow and the visual interest to a building’s composition</td>
<td>- Individual window types and how they are grouped</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Proportions and typical sizes (height and width)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Division patterns and profile of muntins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Minimum depth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Surround details</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sill detail</td>
</tr>
<tr>
<td>Details</td>
<td>Architectural elements that are specific for each community</td>
<td>- Details for buildings corner, cornice, balcony, bay windows</td>
</tr>
<tr>
<td>Materials</td>
<td>Develop a list of materials and show how they are typically applied and used together</td>
<td></td>
</tr>
</tbody>
</table>
2.8 Glossary

In the glossary, all terms used in FBC are defined and included with the code (SACOG, 2008).

Conclusion

This chapter briefly identified the main components of FBC: regulating plan, public space standards, block standards, building type standards, building form standards, frontage type standards, architectural standards and glossary. The identification of these components largely depends on the project’s specific needs. Also, based on the above exploration, it has been found that the components of FBC are considerably interrelated. For example, the allowed frontage types are included in building type standards and they should be considered in the public space standards to depict the relationship between the buildings and the street. Finally, Table 2.8 summarizes the main components of FBC which will be used later in Chapter Four to compare with the form-related standards and guidelines of new urban neighborhoods in Abu Dhabi.

<table>
<thead>
<tr>
<th>FBC main components</th>
<th>Regulatory elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulating plan</td>
<td>Administrative role (land use), Direct role (street frontage), Planning role</td>
</tr>
</tbody>
</table>
| Public space standards    | **Thoroughfare:** Movement type, Design speed, Pedestrian crossing time, Traffic lanes, Bicycle lanes, Planter type, Distances between intersections, Right-of-Way width, Curb face to curb face width, Parking lanes, Curb type, Landscape Type, Walkway Type, Lighting, Curb radius.  
**Civic spaces:** General character, Activity type, Acreage, Location, Size |
| Block standards           | Maximum block length and perimeter, Streets, Alleys, Building types                 |
| Building type standards   | General description, Required lot size, Pedestrian access, Frontages, Vehicle access and parking, Service, Open space, Landscape, Building size and massing |
| Building form standards   | **Building placement:** Built-to line, Setback, Maximum lot width, Minimum lot width  
**Building form:** Minimum building height, Maximum building height, Ground-floor finished level height, Minimum ground-floor ceiling height, Minimum upper-floor(s) ceiling height, Maximum building width, Maximum building depth, Maximum ancillary building size, Signage  
**Parking:** Required spaces and location |
| Frontage type standards   | Minimum depth, height, width                                                        |
| Architectural standards   | Massing, Façade combination, Windows and doors, Elements and details, Materials     |
| Glossary                  | Definitions for all terms used in FBC                                               |
Chapter 3: Investigating the Various Processes for Initiating FBCs for New Urban Neighborhoods

After reviewing the main components of FBC in chapter two, this chapter will contribute in achieving the second research objective through presenting a review of a range of international and regional case studies on the initiation and development processes of the adopted FBCs that mainly aimed to create more walkable, mixed-use and sustainable localized communities. The chapter is divided into three sections; the first section provides a theoretical background about the process of developing FBC to clarify the key related themes. The five case studies in the second section are selected as examples of the most comprehensive cases for new urban neighborhoods in the developed and developing countries. The first two case studies were selected from USA, the origin of FBC. City of Cincinnati is an example that depends on developing FBC for all new urban neighborhoods in one city. The Hampstead case study represents an example for developing a new urban neighborhood based on the adoption of the SmartCode. Grandhome in Scotland is an example from Europe which developed a new urban neighborhood based on the calibration of the design code.

On the other hand, the developing countries and the Middle East region have a limited experience in developing and adopting FBC. One of the most comprehensive case studies is from Gabon. It represents the adoption of a customized SmartCode to suit the urban context of Gabon. Secondly, Kingdom of Saudi Arabia represents an example from the region which depends on the calibration of the SmartCode. Finally, based on the explored case studies, the chapter identifies the basic conceptual stages for developing a localized FBC for a new urban neighborhood to help in comparing it with the local experience in Abu Dhabi.
3.1 Background About the Process of Developing FBC

The processes of developing FBC differ from other planning processes in that FBC usually depends on the participation and interventions by different parties from the community, which is considered an important step in the process of writing the code. One of the famous methods for involving stakeholders in developing FBC is the charrette process. The charrette process is defined as ‘a multi-day planning process during which an interdisciplinary professional design team creates a complete and buildable plan that reflects the input of all stakeholders who are involved by engaging them in a series of feedback loops’. It includes interviews, workshops and presentations conducted with the participation of local residents, developers and agencies (Talen, 2009; Flagstaff, 2007: 10).

However, as mentioned by Congress for the New Urbanism (CNU) Michigan (2010), in some communities the charrette process is not applicable for different reasons including for example: the community may not be ready for this kind of meetings in which stakeholders or some of them cannot participate, there may be political issues that hinder charrette meetings, or the available budget might not be enough to support the charrette process. In this case, two strategies are usually suggested. First, a Visual Preference Survey is conducted in which the community selects the preferable styles and forms among different pictures. Second, a focus group of people attends a meeting controlled by a moderator to discuss various planning issues related to community and helps in depicting a clear image of residents’ behaviors and feelings. On another front, some development procedures could adopt FBC standards ‘by-right’ without public hearing to accelerate and achieve a specific
form of development (Elliott, Goebel and Meadows, 2012). Figure 3.1 illustrates the two different processes of FBC.

3.2 Case Studies for the Process of Developing FBC

3.2.1 Case Studies from Developed Countries

3.2.1.1 City of Cincinnati FBC, Ohio, USA

Cincinnati is one of the largest cities in Ohio. It has been claimed that most of the planning standards of Cincinnati do not reflect or maintain the ‘physical characteristics and uniqueness of Cincinnati’s urban neighborhoods’. Over the past 33 years, Plan Cincinnati, completed in 2012, has been the first comprehensive updated plan that aimed for “thriving re-urbanization” through the adoption of FBC to help achieve walkable, sustainable and self-efficient urban neighborhoods (City of Cincinnati, 2013). City of Cincinnati FBC has been adopted for all new urban neighborhoods.

The CNU (2014) claims that the City of Cincinnati FBC is considered ‘A Landmark in Form-Based Coding’. The Vice Mayor and the Planning Director were behind the development of the FBC of the city that was funded by the Community Development process of FBC.
Challenge Planning Grant from The Housing and Urban Development (HUD). The FBC document of the city comprises a preamble that defines the code and the rural to urban Transect with an overview of the process of developing the FBC, to be explored in the following section. The document also includes a chapter of Overview and Guide to the Cincinnati FBC aimed at explaining the structure of the FBC and how to use it. In addition, it includes Transect zones with building types, frontage types, supplemental to Transect zones, creating a walkable neighborhood, thoroughfares, administration and procedures and glossary (City of Cincinnati, 2013).

A) The Process of Developing the City’s FBC

The development of the FBC of Cincinnati went through four main processes: Scoping, Pre-charrette, Charrette and Post-charrette. The following is a detailed explanation of each process.

I. Scoping Stage

The FBC working group was established including and included staff from various departments: of City Planning and Buildings, City Planning Commission, Transportation and Engineering, Community Development, Economic Development, Law, Metropolitan Sewer District, Fire, and Police. Also, the steering committee was established including to include neighborhood leaders interested in implementing FBC, in addition to representatives from organizations and associations with interest in the design, development, and function of the built environment. Moreover, the Vice-mayor organized and hosted training sessions and meetings on FBC for interested neighborhood stakeholders, developers, city council members and city staff. These sessions took the form of presentations, workshops, webinar series and trainings (Opticos Design, 2012). The City Planning department led a team consisted of the above mentioned working group, steering committee and consultant team to develop
the FBC study in which the team was responsible for analyzing the existing regulations, reviewing the best practices and case studies that implement FBC, reviewing options for implementation including process of developing FBC and integrating them into the current zoning code and selecting the preferred implementation strategy. As a result, the adopted phases for developing the FBC of urban neighborhoods in the City of Cincinnati included: pre-charrette, charrette, and post-charrette in which all the zoning texts and maps were produced by the consultant team (Staff report, 2010).

II. Pre-Charrette Stage

In this stage the Vice-mayor led five delegations of neighborhood leaders, City staff and developers and visited Nashville, Tennessee which is considered a successful example for FBC implementation. They met the planning staff and site developers to explore the opportunities for developing FBC in Cincinnati (Opticos Design, 2012) (Figure 3.2).

Following the recommendations of the FBC Study, in the pre-charrette process the consultation team worked with City staff and FBC working group in order to raise public awareness of the charrette through different ways including: well-located banners in public locations, entitled “Help Design Our Great Neighborhood”, for

Figure 3.2 (a, b): Photos from the tour of Nashville, Tennessee's FBC application areas (Source: Opticus Design, 2012)
inviting people, holding events to discuss and share ideas related to FBC, distributing over 5000 postcards and posters citywide, extensive social media campaign in addition to the coverage of the local media of the citywide FBC charrette. This process also included conducting pre-charrette interviews sessions with different stakeholders including real-estate development professionals, land use attorneys, design professionals, leadership and residents. These interviews, conducted by the consultant of Cincinnati FBC, significantly helped in building a better understanding of what Cincinnati’s future neighborhoods should emulate and what are the places that participants liked to visit (Opticos Design, 2012). Meanwhile, the leader of the consultant team performed an extensive analysis of fourteen neighborhoods within Cincinnati using Google Earth, mapping analysis, aerial photographs, street network maps, figure-ground and topography diagrams as well as assessing existing zoning code and the social and economic compositions. This helped in deriving the large-scale elements affecting neighborhoods' forms and how each neighborhood differ from the others in terms of settlement patterns, street connectivity, block patterns, landscape, building densities and building types (Figures 3.3 and 3.4). Further, it contributed to documenting what has been called the ‘DNA’ of Cincinnati’s neighborhoods thus protecting the local character of the city and led to creating ‘an initial calibration of Cincinnati’s Urban-to-Rural Transect’ (Opticos Design, 2012).
III. Charrette Stage

The following stage was the five-day citywide charrette which allowed the residents to participate in the process of developing FBC and to ensure the predictability of the result. It started with two kick off opening presentations in which the Planning Director introduced to the participants an overview of the work that the consultant team and the City staff have done leading up to the charrette and also an
outline of the work that would be done during the week (Figure 3.5). The design studio was open for the first three days to the public to communicate with the consulting team. This process also included several presentations and discussions about the charrette, FBC and in-progress work to get comments and feedback that ended up with a closing presentation where the completed work was presented and discussed (Opticos, Design, 2012) (Figure 3.6).

Figures 3.7 and 3.8 show two illustrations from the Cincinnati Transect as part of the results from the charrette. The Figures depict examples of T4 and T5 Neighborhood.

Figure 3.5: The Planning Director at the opening presentation (Source: Opticus Design, 2012)

Figure 3.6: Presentation of initial concepts (Source: Opticus Design, 2012)

Figure 3.7: An illustration of T4 Neighborhood with variety of housing types and medium-density (Source: Opticos Design, 2012)
IV. Post-Charrette Stage

In the post-charrette stage the consultant team with FBC working group and city staff worked on developing and submitting the Charrette Summary Report and the Public Review Draft of the city’s FBC. A special public meeting was held to present the document and to clarify its importance to the city. Finally, the City Council approved the Cincinnati FBC in 2013 (City of Cincinnati, 2013). Figure 3.9 summarizes the process followed to develop the City of Cincinnati FBC for urban neighborhoods through the contribution of different actors.

Figure 3.8: An illustration of T5 neighborhood with diverse range of residential units and higher density (Source: Opticos Design, 2012)
Figure 3.9: The main phases for developing the City of Cincinnati FBC for new urban neighborhoods (Source: the author)
3.2.1.2 Hampstead, Montgomery, USA

Hampstead, a 1,679,445 m² new community, is located in Montgomery’s fastest-growing area. It was the first Traditional Neighborhood Development (TND) project submitted under the Montgomery’s SmartCode that was approved in 2006 and permitted the construction of Hampstead (Parolek, et al., 2008).

Hampstead’s master plan consisted of three interconnected neighborhoods that are integrated with the agricultural nature of the place. Meanwhile, each neighborhood has its own character with various housing types, open spaces, live-work units, plazas, playgrounds restaurants, shops and offices (Figure 3.10) (DPZ, 2007).

![Figure 3.10: Transect zone allocation (Source: DPZ, 2006)](image)

A) The Development Process of the FBC

The development of Hampstead, Montgomery FBC went through five main processes: Scoping, Documenting, Planning charrette, Assembling and Architectural charrette. The following is a more detailed explanation of each process.
I. Scoping Stage

Before the adoption of SmartCode in 2006, the planning director in Montgomery started to educate community members. He worked on raising awareness and educating the community members and elected officials from city council and Planning Commission about Smart Growth. After that, a local builder adopted developing a Greenfield site based on TND concept that depends on the adoption of the SmartCode. With the support of the mayor and after meeting with Andres Duany, the city council adopted SmartCode with minor modifications to its template for Greenfield sites in 2006 which encourages mixed-use projects within the city and allows TND developments (Parolek, et al., 2008).

Hampstead is the first TND Greenfield project approved under the adoption of Montgomery’s SmartCode in 2006 (Parolek, et al., 2008). The chairman of the development company aimed to build up neighborhoods that are walkable where residents are encouraged to walk to school, work and shops. The company hired Duany Plater-Zyberk and Company who was responsible for conducting charrette, developing a local SmartCode and designing the master plan for Hampstead and then designing a detailed neighborhood 1 plan. The developer commissioned architects from the whole country for designing home and commercial building plans (RSVP, 2013; better cities, 2011).

II. Documenting Stage

Before starting the charrette stage, the DPZ team visited the site and proposed the appropriate locations for common destinations (RSVP, 2013).

III. Planning Charrettes

The planning charrettes in which the planners and developers worked on designing the overall master plan for Hampstead with the participation of municipal
and community leaders, city officials, public utilities neighbors and potential residents included public meetings and listening sessions (RSVP, 2013). Figure 3.11 shows the charrette illustrative plan for Hampstead.

Figure 3.11: Charrette illustrative Master Plan for Hampstead (Source: DPZ, 2006)

**IV. Assembling Stage**

At the end of the first charrette, DPZ prepared and submitted the Hampstead Consolidated Review Committee (CRC) submittal in 2006 to the City Council. The submittal included the requirements needed to be linked to the Montgomery’s SmartCode: charrette illustrative master plan, Transect zone allocation, standards for maximum block size, thoroughfare standards and civic function allocation (DPZ, 2006).

**V. Architectural Charrette Stage**

The following two years witnessed two architectural charrettes led by DPZ with the participation of the local residents. They ended up with developing CRC submittal for building configuration and architectural standards based on their location on the Transect zones (Figure 3.12).
VI. Assembling Stage

At the end of the first charrette, DPZ prepared and submitted the Hampstead CRC submittal phase 1 that includes the Hampstead Building Plan Submittal (DPZ, 2008).

Finally, Figure 3.13 presents a summary of the steps followed for the development of Hampstead based on the adoption of the SmartCode with the participation of different stakeholders.
Figure 3.13: The process and actors for the adoption of the SmartCode and the development of Hampstead (Source: the author)
3.2.1.3 Grandhome, Scotland, UK

In the UK, the increasing demand for housing prompted the government to put up a long-term vision for creating sustainable communities and developing design codes to regulate the scale (height and massing) and the public realm (DETR, 2000). Accordingly, the Scottish Government launched the Sustainable Communities Initiative aimed at developing high-quality life, built environment and sustainable communities. It presents various projects of different types and scales depicting the main stages for realizing sustainable development with the involvement of general public (Scottish Government, 2010).

Grandhome is a greenfield site and one of the projects under this initiative. It is 3,504,577 m² for a new community that contains 7,000 dwellings. The main goal of the master plan is to create seven pedestrian-oriented neighborhoods based on the calibration of the Transect system. It is supported by shops and services, three primary schools, a community campus, including an academy, library and sports center, a health center, a network of open spaces as well as sports pitches and neighborhood parks. In addition, Grandhome is designed with various housing types to accommodate people of different ages and incomes. (Aberdeen City Council, 2013; DPZ, 2010; Scottish Government, 2010). Other regulating documents including: ‘the Design Code and Pattern Book will then use the Transect system to ensure that housing types and densities, as well as street types are allocated appropriately throughout the site’.

A) The Development Process of the Design Code

Almost similarly to previous studies, the development of Grandhome and based on the calibration of the Transect went through five main stages: scoping, documenting, pre-charrette, charrette and post-charrette. The following is a detailed explanation for each stage.
I. Scoping Stage

As part of the Scottish government initiative, Grandhome was selected to represent the development of new sustainable neighborhoods based on identifying the appropriate Transect zone for the site reflecting the traditional character of the region. The vision behind Grandhome is the essential principles of strong sense of place, walkable neighborhoods, a well-balanced mixed community, green spaces and well-connected streets (Aberdeen City Council, 2013).

II. Documenting Stage

In this stage the design team analyzed the city to ‘calibrate the code to Aberdeen’ through developing a synoptic survey and transforming the data into a code. This was as follows, first, visual inspection of the best existing urban areas was carried out to derive the data for the Transect and the code. Second, the ‘urban dissect’ of the public and private realms was studied through photographing, drawing and measuring different elements within the realm, including vehicular lanes and footpaths, and ‘urban quadrat’ through identifying the proportions of the paved and planted areas, plot coverage and related elements. Also, the design team studied density, frontage design and dwelling types as well as materials palette (Figure 3.14 and Figure 3.15).

Additionally, the design team visited several sites for identical and best practice developments as well as Grandhome. They studied the natural contours and characteristics of the Grandhome to design a masterplan that emerges naturally from the site, through combining historic trees, stone walls, and land contours (Scottish Government, 2010; Aberdeen City Council, 2013).
III. Pre-Charrette Stage (Initial Consultation)

Before conducting the design charrette, Grandhome Trust held initial visioning public meetings, events and exhibitions for key agencies and local community separately to clarify the concept of charrette and encourage residents to participate. This helped getting a clear vision about their initial opinions, issues and ideas related to the development of Grandhome (Aberdeen City Council, 2013).

IV. Design Charrette Stage

Eight days of design charrette has followed the initial consultation which included three major public meetings and five specialized meetings. Various parties were involved in the development process including local residents and community groups, Aberdeen City Council officers with its various departments, local Councillors, local architects, local universities, students and lecturers of two universities, Scottish national agencies, Architecture + Design Scotland, The Scottish Government via the SSCI program and Aberdeen Civic Society. The community participation was undertaken through intensive, interactive sessions which allowed for local people and organizations to have their say in the early stages of planning and designing the new communities. In tandem, the design team worked on the
development of the master plan and created the first detailed plans for the street network and residential block structure with respect to the initial key principles. This was followed by a stakeholders meeting with the design team to review the plans and to get feedback to finalize the master plan. The design team finalized the master plan that included: a town center, six residential neighborhoods, mixed-use cores, a major high street within the town center, surrounded by mixed-use buildings with car parks shielded within the blocks, a green network as well as a well-connected thoroughfare network with a linking road designed for a main bus loop (Scottish Government, 2010; Aberdeen City Council, 2013). Figure 3.16 presents the Transect zones within Grandhome.

![Transper plan for Grandhome](image)

Figure 3.16: Regulating plan for Grandhome (Source: The Grandhome Trust, 2013)

V. Post-Charrette Stage

The design team held several internal workshops to revise and work on developing the masterplan based on the issues raised in the charrette. Additionally, further supportive studies were commissioned in this stage, including: topographical and arboricultural surveys, as well as technical studies relating to transport and
landscape in addition to other fields. Several follow-up public exhibitions were held by the design team with the participation of City Council and local community to present the updated plans. Also, the exhibition introduced the Grandhome Development Framework by Aberdeen City Council which presented several topics including the process of development, the detailed regulating elements according to the Transect as well as the architectural strategy for materials and forms (Figure 3.17) (Aberdeen City Council, 2013).

Finally, Figure 3.18 presents a summary of the followed steps for the development of Grandhome based on the calibration of the Transect with the participation of different stakeholders.
Figure 3.18: The development process of Grandhome and calibration of the Design code (Source: the author)
3.2.2 Case Studies from Developing Countries

3.2.2.1 Angondje Phase II, Gabon

Angondje phase II is a new community development located in the north of Libreville, the capital of Gabon. It is surrounded by a buffer zone that separates the city from Parc National d’Akanda and covers about 54,000 hectares (The Prince’s Foundation, 2012).

Angondje phase II is developed based on the adoption of a calibrated SmartCode that represents the tropical climate of Gabon. Angondje Phase II Masterplan, Vision and SmartCode development is the name of the report that the Prince’s Foundation released in December 2012. It comprises several sections that ensure the development of a localized SmartCode. The SmartCode Development section included: a Community unit type photo overview, a Community unit type overview, the Gabon initial Transect calibration overview, a Transect zones photo overview, a Frontage type photo overview, Tropical urban building type precedents, General tropical urbanism characteristics, Tropical building type studies, an Affordable housing strategy and, finally, Block type studies and architecture notes. The report also had several sections including Transport, Natural resource area strategies, Landscape, Public and civic amenities plan, Infrastructure strategies, Energy strategies, Communication strategies, Climate adaptation, Implementation strategies, Social capacity building, Monitoring strategies and Recommendations (The Prince’s Foundation, 2012).

A) The Development Process of the Customized SmartCode

The development of the customized SmartCode of Angondje went through four main stages: Scoping, Documenting, Design charrette and Assembling. The following sections provide more detailed description for each process.
I. Scoping Stage

The Bechtel International Gabon team that was commissioned by the Government of Gabon, hired the Prince’s Foundation for developing both the master plan and Angondje Phase II. This new community is developed based on the adoption of Gabon SmartCode which was calibrated based on best practice, tropical design and local cultural and environmental challenges. The Prince’s Foundation commissioned stakeholders and experts in the fields of urban design, sustainability, SmartCode specialist, In-Country Project, Transport Specialists and Tropical Building Specialist (The Prince’s Foundation, 2012).

II. Documenting Stage

The Prince’s Foundation team held a five-day intensive workshop in 2012 to explore the constraints, opportunities and strategies for sustainable development on the site. This workshop was attended by ministries, local government officials, other government agencies, relevant companies, not-for-profit agencies and technical experts from and outside of L’Agence Nationale des Grands Travaux (The National Agency for Major Works (ANGT)). Moreover, the workshop was followed by several investigations and meetings consulting various disciplines including social and cultural aspects, natural resources and environmental context, financial feasibility and economic development options, current and future housing demands, construction and building materials, and technical expertise for baseline data.

The design professionals were responsible for the calibration process of developing a locally-initiated SmartCode. The initial calibration was through different steps including community unit type calibration, defining general characteristics of tropical urbanism, Transect zone calibration, frontage type calibration and building disposition/building type characteristics for the SmartCode. In addition, they
developed a palette of appropriate tropical building types, developed strategies related to Affordable Housing as well as illustrated drawings for different types of urban centers (Opticos Design-1, 2013). Figure 3.19 shows the main community types which are: Hameau, Village, Neighborhood I and II, Secondary Centre and Primary Centre. For example, Quartiers (Neighborhoods) I and II type are located in urbanized areas and made up of clusters of neighborhoods that support a larger mixed-use environment. The mixed-use environment can be located at the intersection of multiple neighborhoods or along a corridor between multiple neighborhoods. While the Secondary Centre is located in urbanized areas and is made up of clusters of neighborhoods or villages that support a larger more complex mixed-use environment. Buildings within the Centre are attached and may be up to four stories tall. The Centre Secondaires are important centers of the county (The Prince’s Foundation, 2012).

Figure 3.19: Community types illustrations and photos (Source: The Prince’s Foundation, 2012)
Furthermore, a housing questionnaire was distributed to all Gabonese nationals who work in ANGT offices. The questions were related to the preferred housing size and willingness to pay for variety of housing types that may be constructed in Phase II. The various types were provided with respect to the different family size or single status and the ability to rank preferences. Finally, individual in-depth interviews were conducted both formally and informally for better understanding of the local preferences and current and future housing demand (The Prince’s Foundation, 2012).

III. Design/ Planning Charrette (EbD)

The above mentioned interviews led to Enquiry by Design (EbD) stage that is a stakeholder engagement and design/ planning charrette, held by the Prince’s Foundation team for five days in November 2012 with the engagement of multiple stakeholder groups including national and local government officials, government agencies, relevant companies and not-for-profit agencies, local residents from around Libreville and Angondje besides professionals and technical experts from diverse disciplines. This stage has gained great attention and support from the community. Moreover, two formal meetings and feedback sessions were held for internal and external stakeholders within the workshop. The design session during the EbD was open for all people to give their feedback and comments on the work (Figure 3.20) (The Prince’s Foundation, 2012). Figure 3.21 shows the master plan for Angondje and Figure 3.22 shows examples of tropical building types developed by the end of the charrette.
IV. Assembling Stage

In this documentation stage, the Prince’s Foundation prepared a detailed report that included the whole process of employing the new vision of Gabon in developing the masterplan of Angondje Phase II and a localized SmartCode as well as the findings of studies and investigations ending up with recommended implementation strategies.
Finally, Figure 3.23 presents a summary of the steps followed for the development of Angondje Phase II based on the development of this localized SmartCode with the participation of different stakeholders.

Figure 3.22: Some of Tropical Building Types (Source: The Prince’s Foundation, 2012)
Figure 3.23: The process and actors for the development of Angondje Phase II based on the SmartCode (Source: the author)
3.2.2.2. Dahiyah Al Muntazah, the SmartCode of the Holy Makkah, Kingdom of Saudi Arabia

The master plan for Dahiyah Al Muntazah (3.5 sq.km) is a sustainable community within a larger new development Al Dahiyah Al Garbiyah in Makkah. It is an example that represents the experience of region in adopting a calibrated SmartCode for the Holy Makkah and new community development. It is a community that achieve compactness, walkability and human-scale developments responding to the natural context, local climate and heritage; it will accommodate 600,000 people. Dahiyah Al Muntazah is located within Al Dahiyah al Garbiyah in Bawabat Makkah (Gateway into Makkah). Accordingly, the development of this new sustainable community is based on the adoption of a calibrated SmartCode.

A) Development Process of the Customized SmartCode

The development of Makkah SmartCode went through four main processes: Scoping, Pre-SmartCode workshop, SmartCode workshop, public workshop and assembling. The following is a more detailed explanation for each stage.

I. Scoping Stage

The Holy Makkah Municipality set the goals of producing projects with advanced development and a global vision that suits a holy city like Makkah. This was through introducing the SmartCode as a modern and alternative tool in the sustainable development field. The aim of adopting the SmartCode is to redefine the urban development in Makkah to solve the problems associated with urban sprawl. Additionally, DPZ was assigned to provide the Makkah Municipality with tools for better new development and successful implementation and ‘to provide developers with the design strategies and guidelines with which to build in a walkable, livable settlement’ (SPA, 2012; Al Zahrani, 2012; DPZ, 2014).
II. Pre-SmartCode Workshop

The Holy Makkah Municipality decided to train the engineers on the SmartCode; the Umm Al-Qura University was responsible for preparing for the SmartCode workshop through determining the technical teams from the Holy Makkah Municipality, Jeddah, Taif and Al-Madinah Regional Municipalities (Al Zahrani, 2012).

III. SmartCode Workshop

In September, 2012 the SmartCode workshop was held in Jeddah and lasted two days. During the workshop, several topics were explored including the contribution of conventional zoning in the urban sprawl and the different concepts and the components of SmartCode. By the end of the first day, all attendees participated in envisaging what SmartCode can provide for a holy city like Makkah. On the second day, DPZ discussed the various housing types and their applications in Makkah. Moreover, DPZ introduced SmartCode model for Makkah (Figure 3.24) (Al Zahrani, 2012).

Figure 3.24: SmartCode workshop for the Holy Makkah (Source: DPZ, 2012)
After accepting the SmartCode for the Holy Makkah by the Holy Makkah Municipality, a public workshop was held in Istanbul during 7-11, 2013 with the participation of DPZ, the Holy Makkah Municipality, Al Balad Al Ameen and the Bawabat Makkah Company. Through the workshop six main fabric types with different densities and a regulating plan of the new community Dhahiat Al Muntazah (Figures 3.25 and 3.26) (DPZ, 2014). This case presents the by-right type of development which did not depend on the public hearing and the participation of community members. However, the involvement was limited in the Municipalities and the developers.

Figure 3.25: Six fabric types for Al Dhaiyaht Al Gharbyah (Source: DPZ, 2014)
IV. Assembling

DPZ Company developed the detailed masterplan for the new neighborhood in Makkah (DPZ, 2014). Finally, Figure 3.27 summarizes the process followed to develop the SmartCode and the new community of Dahiyaht Al Muntazah through the contribution of limited actors.
There are two main results in this Chapter. Firstly, from all the cases above, it has been found that implementation approaches followed two categories: community wide FBC or FBC for specific area. Table 3.1 shows the two basic approaches of developing FBC and new neighborhoods based on the case studies in this Chapter. The City of Cincinnati developed and adopted the Transect-Based FBC for all new urban neighborhoods. The case of Hampstead represents an example of developing a new neighborhood based on the adoption of SmartCode with minor modifications. On the other hand, the Angondje Phase II, Gabon and Makkah, Kingdom of Saudi Arabia represent the second implementation approach that is the development of masterplan and SmartCode for new neighborhoods.
Table 3.1: The different implementation approaches of the five case studies (Source: the author)

<table>
<thead>
<tr>
<th>Case study</th>
<th>Implementation approach</th>
<th>Date of adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Cincinnati</td>
<td>Transect for all new neighborhoods</td>
<td>2013</td>
</tr>
<tr>
<td>Montgomery, USA</td>
<td>New community based on the adoption of SmartCode</td>
<td>2006</td>
</tr>
<tr>
<td>- Hampstead</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Scottish Sustainable Communities Initiative</td>
<td>New community based on the Transect</td>
<td>2010</td>
</tr>
<tr>
<td>- Grandhome, Scotland</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Angondje Phase II, Gabon</td>
<td>-</td>
<td>2012</td>
</tr>
<tr>
<td>- Makkah, Kingdom of Saudi Arabia</td>
<td>-</td>
<td>2013</td>
</tr>
<tr>
<td>- SmartCode for a new neighborhood</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Secondly, the development of FBC and new urban neighborhoods in most of the case studies included five main common stages: scoping, documenting, initial-consultation, design charrette, architectural charrette as well as post-charrette stages. In addition, the involvement of community was strongly present in all case studies. However, in Makkah the involvement was limited in the Municipalities and the developers.

Conclusion

In conclusion, this chapter reviewed various case studies in order to identify the main common stages that are usually followed to develop FBC and newly developed urban neighborhoods and determine the implementation approaches. In the case of City of Cincinnati, the calibrated Transect was developed and adopted for all new neighborhoods. The development process went through four stages: scoping, pre-charrette, charrette and post-charrette. The second example from the USA is about developing Hampstead as a new neighborhood based on the adopting of the SmartCode. The same process of the City of Cincinnati FBC was followed, but the
architectural standards took a separate stage for more detailed homes and commercial buildings. The Grandhome, is an example from Scotland presented the experience from Europe and adopted a calibration of the Transect for this new neighborhood. There are significant similarities between the experience in USA and UK case studies. However, in UK case an initial consultation stage was held before the charrette. This would raise community awareness about the charrette and introduce the goal from the development. Gabon represents the experience from the developing countries. It adopted a calibrated SmartCode for new urban neighborhood. In this example the questionnaires took part in the consultation process. Finally, the SmartCode and the new neighborhood in Makkah represents an example of by-right development in the region. However, the community involvement was limited.

Although they were located in different contexts, all cases studies and codes ensure the reflection of the local context of the development. Also most of the case studies included the five common stages: scoping, documenting, pre-charrette, design charrette, architectural charrette as well as post-charrette stages. Some of the cases held a separate architectural charrette while other cases merged the architectural standards within the design charrette. Although the community involvement was an essential step, it was limited in the participation of technical teams and engineers from several Municipalities in the case of Makkah, Kingdom of Saudi Arabia during two workshops.

The following chapter will investigate to what extent the form-related regulations of Abu Dhabi new urban neighborhoods are aligned with FBC in terms of components and process of development.
Chapter 4: Form-Related Standards and Guidelines for Abu Dhabi New Urban Neighborhoods: Status-Quo

This chapter reviews the form-related standards and guidelines that regulate and/or guide Abu Dhabi new urban neighborhoods. The aim is to study the extent to which these regulations/guidelines can be considered a localized FBC in terms of components and process of development. Finally, based on the results of this investigation, a proposed additions and modifications for a localized FBC will be developed including additions and/or modifications to the current Abu Dhabi form-related regulations/guidelines. In the following chapter, the applicability of this proposed additions and modifications for a localized FBC will be investigated with the stakeholders.

4.1 Overview of Form-Related Regulations and Guidelines for New Urban Neighborhood in Abu Dhabi

As presented in Chapter One, the ADUPC is the central authority that is responsible for putting regulations/guidelines for all new urban development projects within Emirate of Abu Dhabi. Besides ADUPC, there are other authorities which issued the form-related regulations and guidelines such as ADM and Department of Transport (DoT).

The Urban Structure Framework Plan is a conceptual document that displays different urban development themes and directions related to Abu Dhabi Vision 2030. It steers the urban development of Abu Dhabi towards various concepts including sustainability, excellence, livability and connectivity (ADUPC, 2007).

After the approval for the concept of the master plan in terms of land use, densities, building mass and site layout, the Master Plan Detailed Submission Requirements ensure the translation of the concept master plan for the same
components in more detail (ADUPC-2, 2013).

Following the new trends of Abu Dhabi, Abu Dhabi Urban Street Design Manual (USDM) regulates several elements of Abu Dhabi streets including crossing areas, bicycle, pedestrian and travel lanes to ensure safety and flexibility of movement for all users (ADUPC-1, 2012). The Executive Regulations for Law No. (18) 2009 are issued by DoT (2010) and responsible for organizing vehicles parking in Emirate of Abu Dhabi through identifying the technical requirements for parking for residential and commercial buildings as well as other regulations. Also in 2014, DoT issued Standards and Specifications for Parking Design which illustrate the minimum requirements for different parking types. The ‘Guidelines for the approval of entrances for residential plots and villas’ regulate the vehicles’ entrances and parking in terms of dimensions and location (ADM-1, 2014). Road Lighting Manual (RLM) provides standards and guidelines for the planning, designing and installation of road lighting in Abu Dhabi. Additionally, it provides illumination standards depending on different factors including the type of roadway, land use, footpaths and cycle-ways (DoT -2, 2013).

Abu Dhabi Public Realm Design Manual (PRDM) works on directing the design of public realm elements to meet the sustainable trends of new Abu Dhabi’s vision. PRDM provides standards and guidelines distributed among different categories including: parks, streetscape, waterfronts and public spaces (ADUPC-1, 2010).

The Unified Executive Regulations for Law No. (4) 1983 for Organizing the Construction Work in Emirate of Abu Dhabi include the administrative, architectural and technical regulations and standards. Neighborhood Planning (NP) was developed by ADUPC putting up a depiction for a traditional neighborhood design represented
Pearl Community Rating System (PCRS) includes design guidelines and credits to evaluate new communities in terms of design and construction (ADUPC-3, 2010). In addition, Pearl Villa Rating System (PVRS) provides guidelines and credits to evaluate villas in terms of design and construction (ADUPC-4, 2010). A Pearl Villa Guide for consultants is developed by ADUPC to help in directing the design team to achieve the required credits of PVRS (ADUPC-5, 2010).

Commercial Signage Regulations (CSR) are responsible for determining type, size and position of commercial signs on all buildings in Abu Dhabi. The standards include permitted signage typologies, signage specifications and dimensions and signage location and position on a building (ADUPC 2, 2012). Roadside Advertising Manual (RAM) provides standards and guidelines for official control and management policy of roadside advertising in Emirate of Abu Dhabi. The manual regulates seven categories of roadside advertising in terms of: size, spacing, lighting, and maintenance access (DOT-1, 2013).

Volumes one and two of the Abu Dhabi Mosque Development Regulations provide standards and guidelines for planning and designing mosques within Emirate of Abu Dhabi (ADUPC, 2013; ADUPC-1, 2013). Abu Dhabi Utility Corridors Design Manual (UCDM) includes standards and guidelines that regulates the location and width of diverse utilities within new streets of urban developments in Abu Dhabi (ADUPC-2, 2014). Abu Dhabi Community Facility Planning Standards (CFPS) is published by the ADUPC to set up standards and guidelines that regulate several community facilities including community center, clinic and nursery within development proposals. These standards shall be followed when planning new communities with 2,000 residents or more (ADUPC-1, 2014).
Table 4.1 summarizes the form-related standards and guidelines for Abu Dhabi new urban neighborhood presenting the authority and issue date and the following is an overview of each manual.

Table 4.1: Form-related regulations for Abu Dhabi new urban neighborhood (Source: the author)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of standards and guidelines</th>
<th>Issuing government</th>
<th>Legislation type</th>
<th>Issue date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Master Plan Detailed Submission Requirements</td>
<td>ADUPC</td>
<td>Standards</td>
<td>2013</td>
</tr>
<tr>
<td>3</td>
<td>Executive Regulations for Law No. (18) 2009 for Organizing Vehicles Parking in Emirate of Abu Dhabi</td>
<td>DoT</td>
<td>Standards</td>
<td>2010</td>
</tr>
<tr>
<td>4</td>
<td>Abu Dhabi Public Realm Design Manual (PRDM)</td>
<td>ADUPC</td>
<td>Standards, guidelines</td>
<td>2010</td>
</tr>
<tr>
<td>5</td>
<td>Neighborhood Planning</td>
<td>ADUPC</td>
<td>Guidelines</td>
<td>2010</td>
</tr>
<tr>
<td>6</td>
<td>Pearl Community Rating System (PCRS)</td>
<td>ADUPC</td>
<td>Standards</td>
<td>2010</td>
</tr>
<tr>
<td>7</td>
<td>Pearl Villa Rating System (PVRS)</td>
<td>ADUPC</td>
<td>Standards</td>
<td>2010</td>
</tr>
<tr>
<td>8</td>
<td>1 Pearl Villa- Guide for consultants</td>
<td>ADUPC</td>
<td>Standards, guidelines</td>
<td>2010</td>
</tr>
<tr>
<td>9</td>
<td>Abu Dhabi Urban Street Design Manual (USDM)</td>
<td>ADUPC</td>
<td>Standards, guidelines</td>
<td>2012</td>
</tr>
<tr>
<td>10</td>
<td>Commercial Signage Regulations (CSR)</td>
<td>ADUPC</td>
<td>Standards, guidelines</td>
<td>2012</td>
</tr>
<tr>
<td>11</td>
<td>Abu Dhabi Capital Development Code (DC)</td>
<td>ADUPC</td>
<td>Standards, guidelines</td>
<td>2013</td>
</tr>
<tr>
<td>12</td>
<td>Road Lighting Manual (RLM)</td>
<td>DoT</td>
<td>Standards, guidelines</td>
<td>2013</td>
</tr>
<tr>
<td>14</td>
<td>Abu Dhabi Mosque Development Regulations</td>
<td>ADUPC</td>
<td>Standards, guidelines</td>
<td>2013</td>
</tr>
<tr>
<td>15</td>
<td>Abu Dhabi Community Facility Planning Standards (CFPS)</td>
<td>ADUPC</td>
<td>Standards, guidelines</td>
<td>2014</td>
</tr>
<tr>
<td>17</td>
<td>Guidelines for approval of entrances for residential plots and villas</td>
<td>ADM</td>
<td>Standards</td>
<td>2014</td>
</tr>
<tr>
<td>18</td>
<td>The Unified Executive Regulation for Law No. (4) 1983 for Organizing the Construction Work in Emirate of Abu Dhabi</td>
<td>ADM</td>
<td>Standards</td>
<td>2014</td>
</tr>
<tr>
<td>19</td>
<td>Standards And Specifications For Parking Design</td>
<td>DoT</td>
<td>Standards</td>
<td>2014</td>
</tr>
</tbody>
</table>
4.2 Form-Related Regulations for Abu Dhabi New Urban Neighborhoods Vs. FBC Components

In this section the existing form-related standards and guidelines are compared to the generic components as previously defined in Chapter Two. The comparison is based on the following indicators: existing components, partially missing components and missing components.

The aim here is to investigate if the current form-related regulations/guidelines are sufficient to formulate a localized FBC for Abu Dhabi new urban neighborhoods or not. This section does not aim to assemble the current form-related regulations in terms of numbers. Rather it hopes to investigate their presence of either fully, partially or not existing in comparison to the generic components of FBC.

4.2.1 Regulating Plan

Basically, ADUPC set several requirements that must be followed for master plan submission. The master plan of some of the Emirati neighborhoods have been developed by ADUPC using the ADUPC issued manuals including CFPS, USDM and PRDM. Generally, the detailed review manual of the Master Plans illustrates several elements such as site details, development design, land use and development summary, development delivery, development control regulations, public realm, community facilities and transportation and utilities (ADUPC-3, 2013). Table 4.2 shows these requirements. Figure 4.1 is an example of a land use master plan for Al Falah community developed by ADUPC. The above requirements are mainly concerned with land use, densities, building mass, and site layout. In contrast, the regulating plan in
FBC plays an important role in providing a depiction for building types and forms as well as their relation to the public realm in addition to the permitted uses in each area. The planning role is partially achieved because the master plan for Abu Dhabi new urban neighborhood is developed based on conventional zoning which depends mainly on uses which led to segregating them with ignoring the frontage of street (Table 4.3).

Table 4.2: Detailed submission requirements by ADUPC (Source: the author based on ADUPC-2, 2013)

<table>
<thead>
<tr>
<th>Required item</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| Site details                  | **Context plan**: Development site within the context of the local/neighborhood/district/regional area and master plan, surrounding land uses, major transport, public realm elements (parks, pedestrian connections etc.) identifying the proposed linkages and integration between the site and the surrounding area.  
**Site plan**: Plan which shows in greater detail the development including streets, building footprints, parks and open spaces, grade level changes within the master plan area and the surrounding area. |
| Development design            | **Grade/street level land use plan**: Indicate in greater detail proposed activities at the pedestrian level including access by travel mode, and site landscaping.  
**Height and massing plan**: Site plan showing building location, footprints and heights. |
| Land use and development summary | **Land use plan**: Plot-specific plan showing permitted land uses.  
**Building typology plan**: Illustrations showing building types (villas, townhouses) by location.  
**Plan**: Layout showing the precinct, district, center, block, special character area and plot location.  
**Plot and ground floor controls**: Plan showing the required build-to-line, setbacks, pedestrian access, vehicular access, etc.  
**Building controls**: Plan showing building footprint, placement and massing. |
| Public realm                  | **Landscape site plan(s)**: Plan(s) showing hard and softscape palettes and planting proposed within and immediately surrounding the site.  
**Universal access plan**: Plan(s) with supporting illustrations demonstrating how universal access (including ramps, disabled access foot paths, elevators and access points) will be incorporated within and immediately surrounding the site. |
| Community facilities          | **Community facilities users plan**: Plan with supporting narrative explaining the types of access to all community facilities within and immediately surrounding the site using the following categories: free facilities, user pay, limited/controlled access, including mosque. |
Table 4.3: Regulating Plan of FBC Vs. form-related regulations/guidelines (Source: the author)

<table>
<thead>
<tr>
<th>FBC components</th>
<th>Form-related standards and guidelines in Abu Dhabi</th>
<th>Regulation item</th>
<th>Source</th>
<th>Legislation type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative role (land use)</td>
<td>Submission requirements-master plan</td>
<td>ADUPC-2 (2013)</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Direct role (street frontage)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Planning role</td>
<td>Submission requirements-master plan</td>
<td>ADUPC-2 (2013)</td>
<td>S</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
S: Standards
G: Guideline
ADUPC: Abu Dhabi Urban Planning Council

4.2.2 Public Space Standards

4.2.2.1 Thoroughfare Standards

In Abu Dhabi, the USDM and PRDM are the main manuals that regulate public spaces elements. According to USDM, the standards and guidelines are distributed among three main categories: street design, junction design and streetscape design. First, the street design section regulate pedestrian realm zones, transit users, cyclists...
and motor vehicles (ADUPC-1, 2012). Figure 4.2 illustrates the main zones within the pedestrian realm: frontage, through, furnishings, cycle track and edge.

Figure 4.2: A cross section for the pedestrian realm zone (Source: ADUPC-1, 2012)

In the USDM, the urban streets within a residential context are categorized into first, boulevard, which is a high vehicle capacity street; second, avenue, which is a medium vehicle capacity street; third, street, which is a low vehicle capacity; and fourthly, access lane, which is a very low vehicle capacity street (ADUPC-1, 2012). Table 4.4 shows the street typology in the USDM with a relative number of lanes and vehicle speeds.

Table 4.4: Street typology within residential context and their transport capacity and vehicle speed in the USDM (Source: ADUPC-1, 2012)

<table>
<thead>
<tr>
<th>Street family</th>
<th>Transport capacity (Maximum travel lanes)</th>
<th>Vehicle speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulevard</td>
<td>3+3</td>
<td>40-60 Km/h</td>
</tr>
<tr>
<td>Avenue</td>
<td>2+2</td>
<td>40-50 Km/h</td>
</tr>
<tr>
<td>Street</td>
<td>1+1</td>
<td>30 Km/h</td>
</tr>
<tr>
<td>Access lane</td>
<td>1+1 - 1 shared</td>
<td>20 Km/h</td>
</tr>
</tbody>
</table>
Additionally, the standards of the Right-of-Way (R.O.W.) are distributed among three areas: pedestrian realm, frontage lane, and traveled way standards as shown in Table 4.5. Figure 4.3 illustrates typical Emirati neighborhood streets types.

On the other hand, there are special street types that could be used including *mushtarak* (shared street) and *sikka* (narrow passage). *Mushtarak* is a space shared by pedestrian and vehicles, while *sikka* is a pedestrian passageway between houses where cyclists may share this space. *Sikka* should be used only when it helps in increasing walkability and connectivity through the neighborhood to facilitate access to community facilities (ADUPC-1, 2012).

Table 4.5: Standard dimensions for residential streets (Source: ADUPC-1, 2012)

<table>
<thead>
<tr>
<th>Street Family</th>
<th>Pedestrian Realm</th>
<th>Frontage Lane</th>
<th>Travelled Way</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Through</td>
<td>Furnishings</td>
<td>Cycle Track</td>
</tr>
<tr>
<td>Boulevard</td>
<td>0.8</td>
<td>3.1</td>
<td>2.0</td>
</tr>
<tr>
<td>with Frontage Lane</td>
<td>0.8</td>
<td>3.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Avenue ^3</td>
<td>0.5</td>
<td>2.7</td>
<td>1.0</td>
</tr>
<tr>
<td>with Frontage Lane ^3</td>
<td>0.5</td>
<td>2.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Street</td>
<td>n/a</td>
<td>3.0</td>
<td>n/a</td>
</tr>
<tr>
<td>Access Lane</td>
<td>n/a</td>
<td>2.25</td>
<td>n/a</td>
</tr>
</tbody>
</table>

1 Parking along pedestrian realm
2 Consult with the DoT. Streets and Access Lanes may have cycle lanes or cycles may share the curb lane. Ensure Edge zone does not act as a barrier between parking areas and pedestrian realm.
3 Use 3.5 m if buses use curb lane as part of a regular transit route.
4 Median dimensions include 3.0 m left turn lane.
5 When a cycle track is provided on Avenues without frontage lanes, the Furnishings zone should be 1.5 m minimum.
6 On Avenues with a frontage lane, provide either a cycle lane or a shared lane (in the frontage lane).
7 On-street parking on Access Lanes on one side only.
The junction design section defines junction types, design considerations, spacing and layout as well as signs. According to the USDM, the spacing of urban junctions shall be as compact as possible and should consider the needs and accessibility of all transit modes (ADUPC-1, 2012). Table 4.6 provides minimum and maximum spacing for the streets types within the residential context. The pedestrian crossing time at junctions is estimated 1.0 m per second walking speed. Also, the junctions' regulations take visibility and sight requirements, curb ramps into consideration. Moreover, selecting the curb type and extensions depends on the pedestrian movement and street type (ADUPC-1, 2012). Figure 4.4 shows a curb extension at pedestrian crossing and a typical raised crosswalk in urban areas. In low

Figure 4.3 (a, b, c): Typical Emirati neighborhood street types, a) Boulevard/Avenue: 25 m R.O.W., b) Street: 20 m R.O.W., c) Access lane: 16 m R.O.W. (Source: ADUPC-1, 2012)
density residential areas, the maximum corner radius allowed at junctions is 5.0 m. While in some cases the corner radius may reach 7.5 m for large vehicles such as buses (ADUPC-1, 2012).

Table 4.6: The minimum and maximum spacing of junctions within residential context (Source: ADUPC-1, 2012)

<table>
<thead>
<tr>
<th>Context</th>
<th>Boulevard</th>
<th>Avenue</th>
<th>Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Minimum</td>
<td>1000</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>1500</td>
<td>750</td>
</tr>
</tbody>
</table>

Figure 4.4 (a, b): a) Typical curb extension at pedestrian crossing. b) Typical raised crosswalk, the preferred approach in urban environments (Source: ADUPC-1, 2012)

The streetscape design section includes different standards and guidelines that regulate shading, landscaping, materials, furnishing and lighting. Materials and finishes for pedestrian’s lanes should be firm, smooth, stable and slip resistant. Street furniture are located in transit stops and edge zones as well as in junctions depending on the needs. Figure 4.5 shows typical street furnishing. Providing lighting is an essential element that must be considered when designing streetscape.
Based on the USDM, lighting should be located along the motor vehicle traveled way, sidewalks and cycle ways in addition to other places that need additional lighting including junction crosswalks and mid-block crossings, stairs and ramps, transit stops, building entrances, plazas and public spaces, entrances to parking garages, under awnings and arcades. According to RLM, short lighting poles are used in narrower residential roads (ADUPC-1, 2012; DoT-2, 2013).

Shading is an essential strategy especially in hot climate like UAE. According to the manual, any new street should be designed with respect to orientation and size to get the advantage of shading from adjacent buildings where possible. If shade could not be provided by the buildings within a development, different architectural options including freestanding structures, canopies and arcades in adjacent buildings, should be incorporated. However, this is optional (ADUPC-1, 2012) (Figure 4.6). The landscaping proposed in the Manual is only limited in plants and stones, while the PRDM identifies plants list that contains the suitable trees, shrubs and groundcover for streetscapes in the Emirate (ADUPC-1, 2010). Figure 4.7 shows the appropriate placement for the tree.

Figure 4.5: Typical palette of common streetscape furnishing in the USDM (Source: ADUPC-1, 2012)
On the other hand, the USDM provides general standards and guidelines for designing signage and advertisements including that no signs or advertising structures shall be placed within 10.0 m of junctions and that they will not obstruct pedestrian and cyclists (ADUPC-1, 2012). Meanwhile, the RAM provides detailed standards that regulate signs in terms of spacing and placement, device size and character height depending on roadway speed and land use. For example, the freestanding or wall are the permitted types of signs in a residential context, the area of the sign shall not exceed 0.75 m² and the maximum height of the sign above grade is 2.0 m (DOT-1, 2013).

### 4.2.2.2 Civic Space Standards

According to the PRDM the main civic spaces are categorized into three groups: parks, streetscapes and public spaces (Table 4.7). The universal target standard for the provision of open spaces is 20% of total developed areas. Parks category includes various types of spaces that suit the residential development: art park, baraha (small semi-private space located in a fareej), community garden, linear park and meyadeen (small semi-public central meeting areas within a fareej). Streetscapes category includes five spaces: mushtarak (shared street), parking area, pedestrian first
corridor, pedestrian crossing and *sikka* (narrow passage). Public spaces include two main civic spaces: mosque and plaza (ADUPC-1, 2010) (Table 4.8). All these spaces are regulated in terms of different design guidelines where applicable including parking, shading, softscape, hardscape and services/infrastructure.
Table 4.7: Public spaces categories (Source: ADUPC-1, 2010)

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Service Radius</th>
<th>Service population</th>
<th>Level of service (ha/1,000 population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park</td>
<td>- Integrated with daily lifestyles and activities</td>
<td>0.35 km</td>
<td>150-1,000</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>- Provide neighborhood users with a variety of play gathering areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Features designed areas design for outdoor children’s play</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Equipped playgrounds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Smaller sport pitches/courts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Abundant seating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Abundant shade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Active and passive use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streetscapes</td>
<td>- Streetscapes intended for use by residents within walking distance</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>- Integrated with daily lifestyles and activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Designed primarily for pedestrian/shared use and have limited to no vehicular access</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Activities are accommodated by paved pedestrian access between residences and community facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Abundant seating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Abundant shade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Spaces</td>
<td>- Integrated with daily lifestyles and activities</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>- Provide neighborhood users with a variety of play areas and gathering areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Public places that accommodate daily neighborhood interests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Gathering spaces between residents and mosques</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Abundant seating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Abundant shade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Locations are within a maximum of 350 m of residents</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N/A = Not Applicable
Table 4.8: Types of urban civic spaces within a community (Source: the author based on ADUPC-1, 2010)

<table>
<thead>
<tr>
<th>Type of Space</th>
<th>Explanation</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baraha</td>
<td>Spaces between homes that are located in a small number of key positions throughout the fareej. There are usually a small number of baraha to create focal points for residents to come and interact with one another, ensure maximum use and provide a focus for a larger number of people. In urban areas these could also be referred to as pocket parks.</td>
<td>![Baraha Illustration]</td>
</tr>
<tr>
<td>Community garden</td>
<td>It supports and encourages local food security and production in local communities. They contribute to community awareness, positive social interaction and ecological biodiversity in urban areas.</td>
<td>![Community Garden Illustration]</td>
</tr>
<tr>
<td>Linear park</td>
<td>A corridor for passive and active recreation. It is located along natural corridors, utility easements and other linear open spaces. They are located throughout the community.</td>
<td>![Linear Park Illustration]</td>
</tr>
<tr>
<td>Meyadeen</td>
<td>The larger neighborhood level gathering spaces that tie together various community uses and are programmed primarily as central meeting areas. They are located as focal points in a traditional neighborhood system or fareej.</td>
<td>![Meyadeen Illustration]</td>
</tr>
<tr>
<td><strong>Streetscapes</strong></td>
<td><strong>Explanation</strong></td>
<td><strong>Illustration</strong></td>
</tr>
<tr>
<td>Mushtarak</td>
<td>Shared-use streets that are programmed to accommodate vehicular and pedestrian activity within the same space. Vehicle speeds are controlled to allow pedestrians and cyclists to safety share the street.</td>
<td>![Mushtarak Illustration]</td>
</tr>
<tr>
<td>Pedestrian first corridor</td>
<td>Corridor that is programmed primarily to accommodate pedestrian circulation. It has important pedestrian-oriented functions and/or connections to pedestrian destinations.</td>
<td>![Pedestrian First Corridor Illustration]</td>
</tr>
<tr>
<td>Pedestrian crossing</td>
<td>It provide a clear indication of a safe route for pedestrians to cross. Street-level Pedestrian Crossing also provides a traffic calming measure. Frequent crosswalks promote slower traffic speeds and cautious driving</td>
<td>![Pedestrian Crossing Illustration]</td>
</tr>
<tr>
<td><strong>Public spaces</strong></td>
<td><strong>Explanation</strong></td>
<td><strong>Illustration</strong></td>
</tr>
<tr>
<td>Plaza</td>
<td>Public space in front of a building available for civic purposes and commercial activities. Plazas are usually located at the intersection of important streets or other significant locations. Plazas can be linear, following the path of the built environment.</td>
<td>![Plaza Illustration]</td>
</tr>
</tbody>
</table>

Based on the above analysis, it is notable that the generic thoroughfare and civic space standards within FBC are mostly covered by Abu Dhabi form-related standards and guidelines as summarized in Table 4.9. However, it is revealed that not all of the regulations are ‘mandatory’. For example, allocating lanes for cycling within
the new residential context is ‘optional’. In addition, although shading is an essential component which helps in promoting walkability and cycling, the Manuals do not depict a clear set of regulations that promote neighborhoods’ walkability. The concept of R.O.W. width in form-related regulations of Abu Dhabi is limited to determining the dimensions for the pedestrian realm, frontage lane and travel way. While the R.O.W. in the generic FBC components usually comprises other elements including ‘frontage type’. This would increase the predictability of creating desired places.

Table 4.9: Public space standards of FBC Vs. form-related regulations for Abu Dhabi new urban neighborhood (Source: the author)

<table>
<thead>
<tr>
<th>FBC components</th>
<th>Form-related standards and guidelines in Abu Dhabi</th>
<th>Regulation item</th>
<th>Source</th>
<th>Legislation type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Movement type</td>
<td>Movement type</td>
<td>Street typology</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Design speed</td>
<td>Design speed</td>
<td>Vehicles speed</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Pedestrian crossing time</td>
<td>Pedestrian crossing time</td>
<td>Pedestrian crossing time</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Bicycle lanes</td>
<td>Bicycle lanes</td>
<td>Cycle track</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Planter type</td>
<td>Planter type</td>
<td>Plant selection</td>
<td>ADUPC-1 (2010)</td>
<td>S</td>
</tr>
<tr>
<td>Distances between</td>
<td>Distances between intersections</td>
<td>Junction design: spacing</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>intersections</td>
<td></td>
<td>and layout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curb face to curb face width</td>
<td>Curb face to curb face width</td>
<td>Traveled way</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Curb type</td>
<td>Curb type</td>
<td>Curb design</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Landscape type</td>
<td>Landscape type</td>
<td>Landscaping and water</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Walkway type</td>
<td>Walkway type</td>
<td>Pedestrian realm</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Walkway type</td>
<td>Pedestrian type</td>
<td>Pedestrian realm</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Curb radius</td>
<td>Curb radius</td>
<td>Corner radius</td>
<td>ADUPC-1 (2012)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Activity type</td>
<td>Features/Activities</td>
<td>ADUPC-1 (2010)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Acreage</td>
<td>Level of service</td>
<td>ADUPC-1 (2010)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Location</td>
<td>Location</td>
<td>ADUPC-1 (2010)</td>
<td>S</td>
</tr>
</tbody>
</table>

Legend:
S: Standards
G: Guideline
ADUPC: Abu Dhabi Urban Planning Council
DOT: Department Of Transportation

Existing component
Partially missing component
Missing component
4.2.3 Block Standards

Basically, a block is the smallest area of a neighborhood that is surrounded by streets (ADUPC-1, 2012). Plan Abu Dhabi 2030 puts forward a vision for the Emirati neighborhood which is formed by several residential blocks named as fareej. The proposed dimension of each block is 240 m x 240 m. Accordingly, Neighborhood Planning introduces a typical Emirati neighborhood that comprises of fareej (residential block), courtyard houses, baraha and sikka (ADUPC, 2007; ADUPC-2, 2010) (Table 4.10).

Table 4.10: The main elements in a neighborhood (Source: ADUPC-2, 2010)

<table>
<thead>
<tr>
<th>Neighborhood element</th>
<th>Definition</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fareej</td>
<td>A traditional neighborhood system. The key elements of a fareej are the courtyard house, sikka and baraha.</td>
<td><img src="image1" alt="Illustration" /></td>
</tr>
<tr>
<td>Courtyard housing</td>
<td>Homes that have a courtyard located within them. It can be a central courtyard house, L-shaped courtyard house, shared or multiple courtyard house style</td>
<td><img src="image2" alt="Illustration" /></td>
</tr>
<tr>
<td>Baraha</td>
<td>Barahaat (plural of baraha) are spaces between homes that are located in a small number of key positions throughout the Fareej.</td>
<td><img src="image3" alt="Illustration" /></td>
</tr>
<tr>
<td>Sikka</td>
<td>The smallest elements of public space, sikkak (plural of sikka) are narrow streets that link the neighborhood together. More specifically, they link each home both to neighbors and to community facilities</td>
<td><img src="image4" alt="Illustration" /></td>
</tr>
</tbody>
</table>
The adoption of *sikka* is considered an effective strategy for increasing walkability and street connectivity in which they provide direct access for all residents to different community facilities including transit stops, retail centers, mosques and schools (ADUPC-1, 2012). Practically, the *fareej* style was adopted in designing some of the Emirati housing developments in Abu Dhabi including Yas Island (phase 1) (ADUPC, 2011; ADUPC-2, 2010).

However, the proposed dimension of a block was not identified as a maximum and this is one of the standards in FBC that helps promote walkability and respect the human scale (Table 4.11).

Table 4.11: Block standards of FBC Vs. form-related regulations for Abu Dhabi new urban neighborhoods (Source: the author)

<table>
<thead>
<tr>
<th>FBCs components</th>
<th>Form-related standards and guidelines in Abu Dhabi</th>
<th>Regulation item</th>
<th>Source</th>
<th>Legislation type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block standards</td>
<td>Maximum face length and</td>
<td>240 m x 240 m</td>
<td>ADUPC (2007)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Maximum perimeter length</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
S: Standards
G: Guideline
ADUPC: Abu Dhabi Urban Planning Council

4.2.4 Building Type Standards

Emirati neighborhood is defined by ADUPC as ‘*a sub-set of the residential context, primarily designed for the very low density Emirati neighborhoods comprising only villas*’ (ADUPC-1, 2012; 51). The new Emirati urban neighborhood includes different types of buildings, but the single family house is the only housing type. The villa is identified as the private residential unit attached or detached and contains the main residential villa and its ancillary and is built on a plot allocated for one family. Also, it is not allowed to divide its interior to residential flats to increase
CFPS identified several regulations for each type. When the population of a community is between 2,000 and 6,000 residents, community facilities are calculated using per capita approach. For communities with more than 6,000 residents, the neighborhood center must include various facilities including community center, clinic, early learning center/nursery, community police point as well as KG + primary school and/or K12 schools (private) (ADUPC-1, 2014). Also the Unified Executive Regulations for Law No. (4) 1983 for Organizing the Construction Work in Emirate of Abu Dhabi identifies the commercial buildings that are built on plots allocated for commercial use based on the general detailed plan, for example, residential buildings, offices and shops. Also it identifies the general services buildings including mosques, educational buildings, health services buildings and community facilities. According to ADM (2014), the minimum residential lot size is 625 m² inside Abu Dhabi island and 900 m² outside Abu Dhabi island. According to the Unified Executive Regulation for Law No. (4) 1983 for Organizing the Construction Work in Emirate of Abu Dhabi, its allowed to add projections or balconies on commercial buildings elevations. So, 1.5 m can be added to the elevation that faces the main road and adding 1.5 m projections and balcony for side elevations is allowed when the distance between adjacent plots is no less than 12.0 m (ADM, 2014). Figure 4.8 shows example of villa types in Al Falah community.

According to CFPS, neighborhood centers are considered the most suitable locations for neighborhood facilities and services including commercial, cultural, religious, educational and recreational. These building types are regulated in terms of the minimum site size that is required to deliver the community facility, the type of community facility and the maximum plot coverage. The aboveground services are
regulated through the UCDM including the location of solid waste collection bin (ADUPC-1, 2014; ADUPC-2, 2014).

In terms of entrances, two maximum entrances for pedestrian are permitted. Also, an additional entrance for the majlis (council) is permitted if it is located on the fence that faces a street. It is allowed to build one maximum entrance on each side or rear boundary walls if it faces are facing a street. The width of all people entrances shall not exceed 2.0 m (ADM, 2014). The standards for vehicles entrances includes a maximum of two vehicles’ entrances allowed for each residential plot when the minimum distance between them is 15 m. Opening a vehicle’s entrance on a main road is not allowed and if the plot has one elevation on a main road; in this case, opening an entrance must be through a service road. Still, if the plots are located on a corner and overlooking two streets, the vehicles’ entrances should be located 15 m away from the curve (ADM-1, 2014). Figure 4.9 illustrates the different situations of vehicles’ entrances.
The provision of mosques which are considered essential elements in building types within Abu Dhabi neighborhoods, requires several regulating elements, including lot size, maximum plot coverage, minimum area for open space and parking (ADUPC, 2013; ADUPC-1, 2013). However, in practice in the new urban Emirati neighborhood the housing types are limited to single family housing surrounded by solid fences (Figure 4.10).

Figure 4.9: The dimensions and locations of vehicle’s entrance for different situations (Source: ADM-1, 2014)

Figure 4.10: Villas within Watani community surrounded by fences (Source: Al Dar, 2013)
As mentioned above, the form-related regulations for all building types in neighborhoods identify the lot size, parking, entrances as well as open space. The provision of housing is restricted to single family houses represented in villas with various styles and number of bedrooms. Furthermore, in spite of its importance in creating more inviting and walkable neighborhoods as well as identifying how the building interacts with the public realm, the frontage type is missing in the form-related regulations for Abu Dhabi. This reflects a gap in frontage type definition if compared to FBC. For public buildings in the neighborhood, the standards and guidelines do not consider specific treatment regarding the higher floors to respect the human scale which is positively reflected on the pedestrian movement. Finally, Table 4.12 shows clearly the fragmentation of the above mentioned standards and guidelines related to building type standards if compared with FBC.

Table 4.12: Building type standards of FBC Vs. form-related regulations for Abu Dhabi new urban neighborhood (Source: the author)

<table>
<thead>
<tr>
<th>Building types standards</th>
<th>FBC’s components</th>
<th>Regulation item</th>
<th>Source</th>
<th>Legislation type</th>
</tr>
</thead>
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<tr>
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<td>Facility type</td>
<td>ADUPC-1 (2014)</td>
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<td>Lot size</td>
<td>ADM (2014)</td>
<td>S</td>
<td></td>
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<tr>
<td></td>
<td>Site size for community facilities</td>
<td>ADUPC-1 (2014)</td>
<td>S</td>
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<td></td>
<td>Mosque</td>
<td>ADUPC (2013)</td>
<td>S - G</td>
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<td></td>
<td></td>
<td>ADUPC-1 (2013)</td>
<td></td>
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<tr>
<td>Pedestrian access</td>
<td>Pedestrian access to the plot</td>
<td>ADM (2014)</td>
<td>S</td>
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<tr>
<td>Frontages</td>
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<tr>
<td>Vehicle access and parking</td>
<td>Vehicle access and parking</td>
<td>ADM (2014)</td>
<td>S</td>
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<tr>
<td></td>
<td></td>
<td>ADUPC (2013)</td>
<td></td>
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<tr>
<td>Service</td>
<td>Service</td>
<td>ADUPC-2 (2014)</td>
<td>S</td>
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</tr>
<tr>
<td>Open space</td>
<td>Open space</td>
<td>ADM (2014)</td>
<td>S</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>ADUPC (2013)</td>
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<tr>
<td></td>
<td></td>
<td>ADUPC-1 (2014)</td>
<td></td>
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<tr>
<td>Landscape</td>
<td>Landscape</td>
<td>ADM (2014)</td>
<td>S</td>
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<tr>
<td>Building size and massing</td>
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<td></td>
</tr>
</tbody>
</table>

Legend:
S: Standards
G: Guideline
ADM: Abu Dhabi Municipality
ADUPC: Abu Dhabi Urban Planning council

Existing component
Partially missing component
Missing component
4.2.5 Building Form Standards

According to the building type, the Executive Regulation for organizing the Construction Work includes several regulations regarding different building types. Built-to line element is included only for the ancillary buildings for villas. The construction of majlis, additional services, guard rooms and electricity rooms on fences that are facing main or secondary roads is allowed and matching with the fence in design and the construction must not exceed 30% of the length of the fence (ADM, 2014). There were no considerations or any special treatment for building elements including corners.

The minimum setbacks are identified within Abu Dhabi form-related regulations. For the main residential unit it is 2.0 m in two cases; first, if the building line is facing the main or secondary road side, or if there is a joint plot line between two lots with the openings. The minimum setbacks for the building and the projections is 1.5 m when the plot line is facing sikka with 3.0 m width and without openings or when there is a joint plot line without openings. It is allowed to build without setbacks if, first, building (main unit and ancillary) on a plot line that face sikka with minimum width 3.0 m, second, building the majlis or other ancillary on the plot line that faces streets (main or secondary) where the height of the building does not exceed 6.0 m, or third, building the services on the plot line that faces the neighbors’ plots and does not exceed 4.0 m in height. The elevation of the roof floor in the main unit must be built with 2.0 m setback from the main elevations of the building. In addition, ADM (2014) determined the length of buildings’ elevations that face the street. For example, within Abu Dhabi Island the length must be minimum 20 m and outside the island it must be minimum 25 m.
The standards related to the height of buildings are identified within form-related regulations for Abu Dhabi. They include the maximum height, the height of architectural elements for villas and commercial buildings, the height of the majlis and ancillary, the finished level and the height of the ground floor, the maximum height of the ground floor in commercial buildings (with or without mezzanine floor) and the minimum and the maximum height of the repeated floors. For example, residential villa shall not exceed 15 m (ground, first and roof floors). It is allowed to exceed this height if building a dome or barjeel (Wind Tower) in which the highest point shall not exceed 2.0 m from the highest point of the roof. Moreover, the finished level of the ground floor for residential unit is 1.5 m from the road level that faces the main entrance. The number of floors and uses for commercial buildings is determined based on the general detailed plan issued by the administrative authority for urban planning.

For commercial buildings, the maximum height of the ground floor is 5.5 m and the minimum is 4.5 m if the building does not include mezzanine floor. When the mezzanine floor is included, the height of the ground floor and the mezzanine floor is 7.0 m and measured from the zero level to the ceiling of the mezzanine floor. The minimum height of the repeated floors is 3.0 m and the maximum height is 3.6 m. It is allowed to exceed this height if the building is allocated for offices but it shall not exceed the general height of the building.

The commercial signs are regulated based on permitted typologies, location and position on a building as well as specifications and dimensions. There were several general regulations including no sign or portion of a sign shall cover any major architectural element of a building or obstruct views into and out of the business premises (excluding glass fascias). All signs within a signage zone on a building must be consistent in height and position and designed to complement the building in order
to convey a positive image. CSR provides different types of signs categorized into two groups: primary signs and secondary signs (Table 4.13).

Table 4.13: Examples for commercial sign types (Source: ADUPC-2, 2012)

<table>
<thead>
<tr>
<th>Sign type</th>
<th>Description</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stencil cut</td>
<td>Letters (minimum 0.5 cm in depth) cut into a background or a stencil cut plate layered onto a background.</td>
<td>![Stencil cut Illustration]</td>
</tr>
<tr>
<td>3D with background</td>
<td>3D letters mounted on a background.</td>
<td>![3D with background Illustration]</td>
</tr>
<tr>
<td>Internal window sign</td>
<td>3D internally lit letters mounted in a window</td>
<td>![Internal window sign Illustration]</td>
</tr>
<tr>
<td>Banner</td>
<td>A sign that is displayed perpendicular to the building.</td>
<td>![Banner Illustration]</td>
</tr>
</tbody>
</table>

According to ADM (2014), the allowable land uses are identified within Abu Dhabi form-related regulations. Additionally, according to the DoT (2014), Figure 4.11 shows examples of different parking designs and the minimum design standards for a plot size of 1,000 m² or above. It also provides minimum design standards for a plot size or the basement extension coverage less than 1,000 m² as well as for public parking. Additionally, DoT determines the amount of parking space based on the uses and activities within a building. For example, in commercial buildings, each shop requires 3.6 parking rate for area/100 m². For a Jumaa’ mosque (Friday mosque) 6.26 parking rate for area/ 100 m² (DoT, 2009). For residential units two car parking lots should be provided for each residential unit as a minimum within the plot with minimum dimensions of 2.7 m x 5.5 m (ADM-1, 2014).
Based on the above mentioned analysis, most of the regulating elements in Building Form Standards are found to be covered by the form-related regulations in Abu Dhabi. However, those regulations are fragmented. The regulations for parking are separate from the ones for buildings. Additionally, the built-to-line is not identified well for buildings and it is restricted for services and ancillary that are built within villa units. Consequently, this does not ensure the variation of the visual character of streets and corners (Table 4.14).

Figure 4.11: Minimum parking standards for a plot coverage of 1,000 m² or above (Source: DoT, 2014)
Table 4.14: Building form standards of FBC Vs. form-related regulations for Abu Dhabi new urban neighborhoods (Source: the author)

<table>
<thead>
<tr>
<th>FBC components</th>
<th>Form-related standards and guidelines in Abu Dhabi</th>
<th>Regulation item</th>
<th>Source</th>
<th>Legislation type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building placement</td>
<td>Built-to line</td>
<td>Ancillary building for villas</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Setback</td>
<td>Setbacks</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Maximum lot width</td>
<td>Maximum lot width</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Minimum lot width</td>
<td>Minimum lot width</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Maximum building height</td>
<td>Maximum building height</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Ground-floor finished level height</td>
<td>Maximum ground floor finished level</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Minimum ground-floor ceiling height</td>
<td>Minimum ground floor height</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Minimum upper-floor(s) ceiling height</td>
<td>Minimum first floor height</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Maximum ancillary building size</td>
<td>Majlis</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Signage</td>
<td>Signage regulations</td>
<td>ADUPC-2 (2012)</td>
<td>S</td>
</tr>
<tr>
<td>Land use</td>
<td>Allowed land use</td>
<td>Land use</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td>Parking regulations</td>
<td>Required spaces and location</td>
<td>Parking regulation</td>
<td>ADM (2014)</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DoT (2009)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>DoT (2014)</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
S: Standards
G: Guideline
ADM: Abu Dhabi Municipality
ADUPC: Abu Dhabi Urban Planning Council
DoT: Department of Transportation

4.2.6 Frontage Type Standards

The frontage type standards help in creating active frontages, attracting pedestrians as well as ensuring the proper transition between the public and private realm. As presented previously, the residential unit of the Emirati neighborhood is usually surrounded by solid fences. ADM (2014) provides regulations for fences, including the maximum height of the fence to be 4.0 m and the minimum height to be 0.9 m. If the side fence is facing a walkway between two plots it is allowed to exceed the maximum height and to be 6.0 m for the privacy issue or for the design need.
However, in this case the solid part from the fence must not exceed 4.0 m and complements the rest with aesthetics light materials that do not affect the integrity and balance of the fence as well as addressing a gradual decorative structure to the convergence point between the side and the front fence. Also, the fence style should match the frontages of the villa.

Based on the above, the form-related regulations in Abu Dhabi do not identify various frontage types and how the building frontage is interrelated with the public realm. The frontage type standards are limited to fences that surround the residential units (Table 4.15).

Table 4.15: Compatibility of frontage type standards of FBC with form-related regulations for Abu Dhabi new urban neighborhood (Source: the author)

<table>
<thead>
<tr>
<th>FBCs components</th>
<th>Form-related standards and guidelines of Abu Dhabi</th>
<th>Source</th>
<th>Legislation type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontage type standards</td>
<td>Minimum depth, Height and Width</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Legend:
S: Standards
G: Guideline

4.2.7 Architectural Standards

The form-related regulations of Abu Dhabi stipulated that attention must be paid when designing the secondary elevations due to the need for privacy. For example, in Al Falah community ‘windows shall be perpendicular to the boundary by integration into the building setback, in order to maintain privacy between the villas’ (Figure 4.12 and Figure 4.13) (ADUPC-4, 2013; ADM, 2014).
Achieving the compulsory 1 Pearl Villa in Estidama rating system requires meeting various standards and guidelines, including: applying light colors finishes for exterior walls. In addition, to provide shading windows should be located in shaded areas and recessing into walls’ and using mashrabia style shading device (ADUPC-5, 2010; ADUPC-4, 2010). ADM (2014) introduces several regulations for allowing adding projections and balconies, including that the main entrance canopy projection shall not exceed 2.0 m, projections are only allowed on floors above the ground floor inside the residential plot for a maximum length of 1.5 m and projections are not allowed if they face a shared boundary between two plots. Any projections of architecture form or flower bed must not exceed 0.3 m. It is allowed to build projections for flower bed on the ground floor that do not exceed 0.3 m. As mentioned earlier, the use of elements like barjeel (Wind Tower) or dome is allowed where the highest point shall not exceed 2.0 m from in the highest point of the roof.

Figure 4.12: A window perpendicular to the boundary wall (Source: Al Falah community, 2013)

Figure 4.13: Building corner, Watani community (Source: the author)

The goal from architectural standards in FBC is to reflect the local character of an area. Architecturally, despite the previously mentioned regulations, Abu Dhabi still lacks sufficient regulations that are related to Abu Dhabi Architectural heritage. In fact, the form-related regulations of Abu Dhabi are limited to guidelines that regulate the projections and balconies and the architectural forms if they are used in the
buildings and they are optional. Also, there is a lack of regulation that indicates the location of the building if it is on a corner or not (Table 4.16).

Table 4.16: Architectural standards of FBC Vs. form-related regulations for Abu Dhabi new urban neighborhoods (Source: the author)

<table>
<thead>
<tr>
<th>FBCs components</th>
<th>Form-related standards and guidelines in Abu Dhabi</th>
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<th>Legislation type</th>
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<td>G</td>
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<td>Façade combination</td>
<td>Location of entrances</td>
<td>ADM (2014)</td>
<td>S</td>
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<tr>
<td>Windows and doors</td>
<td>Location of windows</td>
<td>ADUPC-5 (2010)</td>
<td>S</td>
</tr>
<tr>
<td>Elements and details</td>
<td>The use of mashrabiya</td>
<td>ADUPC-4 (2010)</td>
<td>G</td>
</tr>
</tbody>
</table>

Legend:
S: Standards
G: Guideline
ADM: Abu Dhabi Municipality
ADUPC: Abu Dhabi Urban Planning Council

4.2.8 Glossary

All manuals are associated with definitions and glossaries for all terms used, including: the USDM, the PRDM and The Unified Executive Regulation for Law number (4) 1983 for Organizing the Construction Work in Emirate of Abu Dhabi. But, there is no unified glossary as form-related standards and guidelines are scattered as shown in Table 4.17.

Table 4.17: Summary of compatibility of FBC components with form-related regulations for Abu Dhabi new urban neighborhoods (Source: the author)

<table>
<thead>
<tr>
<th>FBC components</th>
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<th>Source</th>
<th>Legislation type</th>
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<tr>
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<tr>
<td>Direct role (street frontage)</td>
<td>Submission requirements-master plan</td>
<td>ADUPC-2 (2013)</td>
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<tr>
<td>Planning role</td>
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</tr>
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<td>Pedestrian crossing time</td>
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<td>Bicycle lanes</td>
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<td>Topic</td>
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<td>Planter type</td>
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<td>Distances between intersections</td>
<td>Junction design: spacing and layout</td>
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<td>Curb face to curb face width</td>
<td>Traveled way</td>
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<td>Location</td>
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<td>Size</td>
<td>Universal standard for open space</td>
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<td>Block standards</td>
<td>Maximum block size</td>
<td>240 m, ADUPC-1 (2014), S</td>
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<tr>
<td>General description</td>
<td>Description</td>
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<td>Facility type</td>
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<td>Required lot size</td>
<td>Lot size</td>
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<td>Minimum site size for community facilities</td>
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<td>Mosque</td>
<td>ADUPC (2013), ADUPC-1 (2013), S</td>
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<td>Pedestrian access to the plot</td>
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<td>Vehicle access and parking</td>
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<td>Service</td>
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<td>Open space</td>
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<td>Landscape</td>
<td>ADM (2014), S</td>
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<td>Building size and massing</td>
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<td>Building Form Standards</td>
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<td>Setback</td>
<td>Minimum building setbacks</td>
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<td>Maximum lot width</td>
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<td>Maximum building height</td>
<td>Maximum building height</td>
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<tr>
<td>Ground-floor finished level height</td>
<td>Maximum ground floor finished level</td>
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<td>Minimum ground-floor ceiling height</td>
<td>Minimum ground floor height</td>
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<td>The maximum plot coverage</td>
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<td>Maximum ancillary building size</td>
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<tr>
<td>Signage</td>
<td>Signage regulations</td>
<td>ADUPC-2 (2012), S</td>
<td></td>
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</tbody>
</table>
4.3 The Process of Developing Form-Related Regulations for Abu Dhabi New Urban Neighborhoods Vs. FBC Development Processes

The development of the above standards and guidelines were undertaken mainly by specialized teams from ADM, ADUPC and other hired consultants depending on their specialization. ADUPC was behind the development of Plan Abu Dhabi 2030 through two workshops held in Abu Dhabi in 2007 with the participation of urban planning and community development experts from eight different countries and representatives from Abu Dhabi authorities. Meanwhile, USDM was developed by ADUPC with the contribution of DoT, DMA, ADM, AAM, and Western Region Municipality (WRM), Abu Dhabi Police (ADP) and Abu Dhabi Civil Defense (ADCD), as well as the Health Authority Abu Dhabi (HAAD). In addition, an international consultant team with technical advisors was involved in developing the USDM. CSR was developed by ADUPC in 2012 based on best standards and

The UCDM was developed by ADUPC based on the requirements of stakeholders/utility providers/government agencies within the Emirate of Abu Dhabi in addition to a benchmarking study carried out for international standards and common practices. ‘Guidelines for approval of entrances for residential plots and villas’ was developed by ADM. CFPS was developed by ADUPC and the cooperation with different government agencies and specialized departments including ADCD, ADEC, Abu Dhabi General Services Company (Musanada), Abu Dhabi National Oil Company (ADNOC), Abu Dhabi Sports Council (ADSC), Abu Dhabi Systems and Information Centre (ADIC), Abu Dhabi Tourism and Culture Authority (ADTCA), DMA, ADM, AAM, WRM, Family Development Foundation (FDF), General Directorate of Abu Dhabi Police (GDADP), and Health Authority and Statistics Centre (HASC) (ADUPC 1, 2014).

On the other hand, the community participation was limited to a single document. PRDM was developed by ADUPC through stakeholder meetings and public survey. The stakeholder meetings were conducted with the DMA, ADM, AAM, DoT, Tourism Development and Investment Company (TDIC) and Abu Dhabi Authority for Culture and Heritage (ADACH). In one case community members were surveyed to determine the availability and use of parks, streetscape, waterfronts and public places
related to PRDM. PRDM was developed by ADUPC through stakeholder meetings and public survey. The stakeholder meetings were conducted with the DMA, ADM, AAM, DoT, Tourism Development and Investment Company (TDIC) and Abu Dhabi Authority for Culture and Heritage (ADACH). The public survey was distributed to 10,882 households to determine the availability and use of parks, streetscape, waterfronts and public places. Table 4.18 summarizes the development process of some of the form-related regulations for new urban neighborhoods in Abu Dhabi. For the development of new urban Emirati neighborhoods, ADUPC developed the master plan for most of the new communities in collaboration with Abu Dhabi and Al Ain municipalities.

Table 4.18: The process and participants for developing some of form-related regulations of Abu Dhabi new urban neighborhoods (Source: the author)

<table>
<thead>
<tr>
<th>Abu Dhabi Form-related regulations/ guidelines</th>
<th>The adopted development process</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan Abu Dhabi 2030</td>
<td>- Design workshops</td>
<td>- Urban planning and community development experts</td>
</tr>
<tr>
<td>PRDM</td>
<td>- Stakeholder meetings, public survey was distributed households to determine the availability and use of civic spaces</td>
<td>- ADUPC, DMA, ADM, AAM, DoT, TDIC, ADACH, Community members</td>
</tr>
<tr>
<td>NP</td>
<td>- Based on the awareness of the needs of local communities</td>
<td>- ADUPC</td>
</tr>
<tr>
<td>CSR</td>
<td>- Based on best standards and specifications applicable worldwide</td>
<td>- ADUPC and DED</td>
</tr>
<tr>
<td>RAM</td>
<td>- According to other documents</td>
<td>- DoT, DMA and ADUPC</td>
</tr>
<tr>
<td>UCDM</td>
<td>- Based on the requirements of stakeholders, benchmarking study</td>
<td>- ADUPC</td>
</tr>
</tbody>
</table>

Based on the above exploration, scoping, documenting and assembling stages are considered while developing the form-related regulations and guidelines of Abu Dhabi new urban neighborhoods. They depend on the administrative decisions issued by ADUPC and ADM in addition to the contribution of other relevant authorities in Abu Dhabi. Most of the documents are developed based on the vision of Abu Dhabi
2030. On the other hand, the charrette stage and community involvement in Abu Dhabi is limited to the contribution in a public survey for developing PRDM. Additionally, most of the Abu Dhabi Emirati neighborhoods have their own regulations beside the general regulations, for example: Al Falah and Yas communities.

### 4.4 The Proposed Localized FBC for Abu Dhabi New Urban Neighborhoods

Based on the above exploration, the research proposes several modifications and additions for a localized FBC for Abu Dhabi new urban neighborhoods. They are categorized into two groups: general issues and FBC components. Each element is attached to the target group who will be interviewed later in order to investigate the applicability of the proposed additions and modifications for a localized FBC for Abu Dhabi (Table 4.19 and Table 4.20).

**Table 4.19: The proposed considerations for a localized FBC for Abu Dhabi for new urban neighborhoods: general issues about FBC (Source: author)**

<table>
<thead>
<tr>
<th>FBC- General issues</th>
<th>Form-related regulations/guidelines in Abu Dhabi</th>
<th>To be considered for Abu Dhabi</th>
<th>Target group for applicability interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unified form-related regulations</td>
<td>The form-related regulations are fragmented</td>
<td>Unify all standards in one document</td>
<td>ADUPC, ADM, Planners</td>
</tr>
<tr>
<td>FBC, SmartCode for one or all neighborhoods or for one</td>
<td>There are general and special standards for neighborhoods.</td>
<td>Select an appropriate process type to develop FBC for new neighborhoods</td>
<td>ADUPC, ADM</td>
</tr>
<tr>
<td>Involvement of community in the process of FBC development</td>
<td>The community participation is limited or not significant</td>
<td>Involve community members</td>
<td>ADUPC, ADM, Planners, Local community</td>
</tr>
<tr>
<td>Considering various housing types</td>
<td>The provision of houses is limited to single family houses (villas)</td>
<td>Consider various housing types including multi-story residential buildings</td>
<td>ADUPC, ADM, Planners, Local community</td>
</tr>
</tbody>
</table>
Table 4.20: The proposed additions and modifications in terms of components for a localized FBC for the Abu Dhabi FBC for new urban neighborhoods (Source: author)

<table>
<thead>
<tr>
<th>FBC- Components</th>
<th>Form-related regulations/guidelines in Abu Dhabi</th>
<th>To be added/modified items</th>
<th>Target group for applicability interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulating plan</td>
<td>Depends on conventional zoning</td>
<td>Regulating plans must be developed for new neighborhoods</td>
<td>- ADUPC</td>
</tr>
<tr>
<td>Public space standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle track</td>
<td>Providing cycle track is optional</td>
<td>Convert the provision of cycle track to be mandatory in neighborhoods</td>
<td>- ADUPC - ADM - Planners - Local community</td>
</tr>
<tr>
<td>Right of way</td>
<td>The frontage type for each street type is not identified</td>
<td>Identify the allowable frontage types for each street type</td>
<td>- ADUPC - ADM - Planners - Local community</td>
</tr>
<tr>
<td>Block standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum block length and perimeter</td>
<td>The maximum block size is recommended</td>
<td>Determine maximum dimensions for the block size</td>
<td>- ADUPC - ADM - Planners</td>
</tr>
<tr>
<td>Building types standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frontage type</td>
<td>Frontage types are not identified</td>
<td>Identify different frontage types</td>
<td>- ADUPC - ADM - Planners</td>
</tr>
<tr>
<td>Building size and massing</td>
<td>The relation between height and massing is not identified</td>
<td>Identify the relation between height and massing</td>
<td>- ADUPC - ADM - Planners</td>
</tr>
<tr>
<td>Building form standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Built-to line</td>
<td>The standards do not provide a percentage for the built-to-line standard</td>
<td>Add percentage for the build-to-line standard</td>
<td>- ADUPC - ADM - Planners</td>
</tr>
<tr>
<td>Frontage types standards</td>
<td>Frontage type is limited to solid fences surrounds the villas</td>
<td>Identify different frontage types</td>
<td>- ADUPC - ADM - Planners - Local community</td>
</tr>
<tr>
<td>Architectural standards</td>
<td>The provision of architectural forms is limited</td>
<td>Identify guiding forms that reflect Abu Dhabi character and heritage</td>
<td>- ADUPC - ADM - Planners - Local community</td>
</tr>
</tbody>
</table>

**Conclusion**

This chapter presented the form-related standards and guidelines for Abu Dhabi new urban neighborhood and studied the extent they to which they align with FBC in terms of components and development process. Based on the above exploration, it has been found that the standards and guidelines are distributed among twenty documents; some of them are not mandatory and many of them do not depend on illustrations. Furthermore, not all the components generally found in FBC are covered in these standards and guidelines. It has also been found that the standards and
guidelines discourage the diversification of housing types. Abu Dhabi depends mainly on conventional zoning and does not have a regulating plan for its new urban neighborhoods. Although most of the public space standards are covered by the form-related regulations of Abu Dhabi, they lack the frontage type for the R.O.W. which would help in creating a vision for a place. Providing a cycle track in Abu Dhabi new urban neighborhoods is optional. While identifying frontage types for each building type plays a critical role in achieving livable and invited built environment, they were limited to the fences that surround the residential units in the case of Abu Dhabi. Architectural standards and guiding forms that ensure a localized built environment and reflect Abu Dhabi heritage are not sufficient.

For the development process of the form-related regulations/guidelines for Abu Dhabi new urban neighborhoods and in the comparison to the development process of FBC, scoping, documenting and assembling are followed in Abu Dhabi. However, community involvement and architectural charrette are not considered when developing the form-related regulations for Abu Dhabi new urban neighborhoods.

Finally, this chapter proposed additions and modifications for a localized FBC including additions and/or modifications to the current Abu Dhabi form-related regulations as shown earlier in this chapter in Tables 4.18 and 4.19.

The following chapter will investigate the applicability of the proposed localized FBC of Abu Dhabi new urban neighborhoods among the target groups.
Chapter 5: Investigating Applicability of the Proposed Localized FBC with Stakeholders

In Chapter Four the results revealed which of the components of FBC existed or were found missing in the form-related standards and guidelines for planning and designing Abu Dhabi new urban neighborhoods. This chapter aims to explore the stakeholders’ opinion to find out the opportunities and obstacles of adopting the proposed additions and modifications for a localized FBC for Abu Dhabi. Stakeholders are represented by the central authority (ADUPC), local authority (ADM), planners and local Emirati communities. Before embarking on the investigations, this chapter first introduces the interview method that was utilized in this investigation.

5.1 Investigation Method and Tools

The investigation in this chapter depends on interviewing all involved stakeholders and interviews were adopted to answer the fourth research question. Interviews here can be defined as ‘conversations between the researcher and those being researched, variously termed participants, subjects or simply ‘interviewees’’ (Hammond and Wellington, 2013). The semi-structured interview method, which uses open and closed ended questions with no specific order for the questions (Naoum, 2013), was selected as an investigation tool because it is more manageable and does not require asking many main questions. It provides flexibility in asking subsidiary questions or employing modes of exploration if necessary depending on the interviewee’s responses (Hammond and Wellington, 2013; Gillham, 2005). On the other hand, one of the semi-structured interview strengths lies in its high validity because it allows the interviewee to answer questions and justify in detail and depth with little direction from interviewer (Sociology Central, 2008).
adopted the face-to-face interview style which, while it needs more time, allows for
moving from one topic to the other, and ensures the certainty about who answered
the questions (Muise and Olson, 2007).

Moreover, as recommended by Muise and Olson (2007), enough effort was
exerted to ensure that each question was understood in the same way, the answers were
written in a standardized form and correct information was extracted without bias.
Also, according to Hammond and Wellington (2013), the interviews’ questions were
structured carefully in terms of the use of language and clarity in phrasing. Various
illustrations were attached to questions for more clarification.

The interviewees were selected in the following way. Firstly, the ADUPC
assigned a planning director in Research and Development Feasibility who is aware of
all topics and regulations to answer all queries (10- November-2015). Representatives
from ADM were met as follows: two Chief engineers (12-October and 1-November
2015), one senior engineer in Urban Planning Department (18- October- 2015) and
two Chief engineers in Construction permits department (12- October and 1-
November- 2015). Two planners were selected for their involvement in designing new
urban neighborhoods in Abu Dhabi (19-November and 7-December-2015). Table 5.1
summarizes the detailed information related to interviews.

Table 5.1: Detailed interviews’ information (Source: the author)

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Interviewee</th>
<th>Date of Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADUPC (Central authority)</td>
<td>Planning Director</td>
<td>10- November-2015</td>
</tr>
<tr>
<td>ADM (Local authority)</td>
<td>Urban Planning Department:</td>
<td>12-October and 1-November- 2015</td>
</tr>
<tr>
<td></td>
<td>- Two chief engineers</td>
<td>18- October- 2015</td>
</tr>
<tr>
<td></td>
<td>- One senior engineer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction permits department:</td>
<td>12- October and 1- November- 2015</td>
</tr>
<tr>
<td></td>
<td>- Two Chief engineers</td>
<td></td>
</tr>
<tr>
<td>Planers</td>
<td>Two planners</td>
<td>19-November and 7-December-2015</td>
</tr>
<tr>
<td>Emirati residents</td>
<td>- 24 females and 22 males</td>
<td>Between October- December- 2015</td>
</tr>
</tbody>
</table>
All the community members who were interviewed are Emiratis as the main concern of this research is new urban neighborhoods allocated for Emirati citizens. The selected sampling method for Emiratis is purposive sampling which relies on discovering useful patterns of information about particular groups or subsets of the population (Groat and Wang, 2013); in other the main feature of the samples is that all the interviewees from the local communities are Emiratis for a detailed exploration purposive about the research topic. The sample size is another important dimension in sampling definition. In a single study with individual interviews like this research, the sample size is under 50 (Ritchie and Lewis, 2003). The age of community members who were interviewed is between 20 and 50 and represented in 24 female and 22 male residents. Some of them are married and all of them are educated.

However, it should be admitted here that the results of this research are linked to local context and limited to Abu Dhabi’s new urban neighborhoods, and the results may vary for other contexts.

5.2 The Applicability of the Proposed FBC for Abu Dhabi New Urban Neighborhoods

The following section is an exploration of all stakeholders’ responses regarding the proposed additions and modifications for a localized FBC for Abu Dhabi. The first section is related to three general issues including unifying all the form-related regulations in one FBC document, the appropriate process to develop a FBC for Abu Dhabi as a city or for individual neighborhoods, community member’s involvement and diversifying housing types.
5.2.1 Opinions of Stakeholders About the General Issues of Abu Dhabi Localized FBC

5.2.1.1 Unify the form-related standards and guidelines on one FBC document

Based on the results in the previous Chapter, the form-related standards and guidelines for Abu Dhabi new urban neighborhoods have been found to be fragmented. The interviewed representatives of ADUPC, ADM and planners were asked about unifying all the form-related standards and guidelines in one code. All of them emphasized on the importance and the need for merging all of these form-related standards and guidelines for Abu Dhabi in spite of some major associated difficulties.

In detail, the interviewed representative of ADUPC claimed that although Abu Dhabi has most of FBC elements, the major constraint for a unified code is ‘the maturity of the system’ as well as there are several government stakeholders with various individual regulations. He added that Abu Dhabi lacks a strong legal framework which would help implementing all standards within the manuals that are issued by ADUPC. Additionally, he indicated that when the first version of the Abu Dhabi Development Code was finalized and accepted in 2010, various partners of the ADUPC argued that it would be difficult to implement because of the wide breadth of its scope and it needs to be pared down for easier implementation. Therefore, from the point of view of the ADUPC’s representative, to realize a unified FBC, the willingness of all stakeholders has to change to adapt, to develop a strategic plan as well as to impose strict regulations.

All the interviewed representatives of ADM encouraged unifying the form-related standards and guidelines. All of them explicated that it facilitates the revision of projects thus reduces the time and steps before the approval and issuing the license. One of the interviewed representatives of ADM added that this would positively affect
the international evaluation as the existence of several governmental authorities resulting in difficulties in coordination. Another interviewed representative of the ADM claimed that it would be difficult to combine all the form-related regulations/guidelines in one code because it requires a planning system to put strategic plans to unify all goals and strategies as well as a unified code.

Accordingly, the interviewed planners found that the form-related regulations are fragmented and several government authorities put regulations for the same element but usually with different values. Additionally, for them, developing one source for new urban neighborhoods would facilitate the design process.

As summarized in Table 5.2, the interviewed representatives of ADUPC, the ADM and the planners encourage unifying the form-related standards and guidelines. However, the main problem is the existence of several stakeholders with individual regulations.

Table 5.2: The results of the interviews for each stakeholder concerning unifying all form-related regulations/guidelines in one FBC document (Source: the author)

<table>
<thead>
<tr>
<th>FBC- general issue</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unify all form-related regulations in one FBC document</td>
<td>ADUPC representative</td>
</tr>
<tr>
<td></td>
<td>• Agrees on the importance of a unified form-related regulations</td>
</tr>
<tr>
<td></td>
<td>• There are several government stakeholders with various individual regulations</td>
</tr>
<tr>
<td></td>
<td>• Abu Dhabi lacks a strong legal framework</td>
</tr>
<tr>
<td></td>
<td>• The willingness of all stakeholders has to change to adapt</td>
</tr>
<tr>
<td></td>
<td>• The development of a strategic plans as well as to impose strict regulations</td>
</tr>
<tr>
<td></td>
<td>ADM representatives</td>
</tr>
<tr>
<td></td>
<td>• All of them agree</td>
</tr>
<tr>
<td></td>
<td>• The existence of several governmental authorities resulting in difficulties in coordination</td>
</tr>
<tr>
<td></td>
<td>• It facilitates the revision of projects</td>
</tr>
<tr>
<td></td>
<td>Planners representatives</td>
</tr>
<tr>
<td></td>
<td>• Both of them agree</td>
</tr>
<tr>
<td></td>
<td>• Several government authorities put standards for the same element but usually with different values</td>
</tr>
<tr>
<td></td>
<td>• One source for all form-related regulations would facilitate the design process</td>
</tr>
</tbody>
</table>
5.2.1.2 Investigating the Appropriate Type of FBC for Abu Dhabi

This research clarified that in some cases FBC has been developed for all new urban neighborhoods in a city while in other cases a calibrated SmartCode has been adopted. The interviewed representative of ADUPC and ADM are target groups in this section. Although the interviewed representative of ADUPC does not think that Abu Dhabi is ready for this code at this time, he believes that a standard SmartCode would be considered. Additionally, the interviewed representative of the ADUPC was asked if FBC needs to be firstly adopted by right without public hearing and he clarified that it is needed to maintain the strict level of regulations.

According to the five interviewed representatives of ADM, they all found that general regulations for all Abu Dhabi new urban neighborhoods and additional ones for each new urban neighborhoods are needed. This is according to three out of five interviewed representative of ADM claimed, because each project has a special concept and design and they have their specificity which provides a distinction for each area based on the nature of location of the project. Additionally, the other two of five of the interviewed representative of ADM clarified that each period of time has a specific trend depending on scale and location of the new urban neighborhood.

From the above investigation, having a standard SmartCode with special regulations for Abu Dhabi new urban neighborhoods is the suitable type of FBC. However, a strict level of regulations is needed for Abu Dhabi so that by-right adoption first have to be considered.
Table 5.3: The results of the interviews for each stakeholder concerning the appropriate type of FBC for Abu Dhabi (Source: the author)

<table>
<thead>
<tr>
<th>FBC- general issue</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADUPC representative</td>
</tr>
</tbody>
</table>
| FBC, SmartCode for one or all neighborhoods | • When Abu Dhabi is ready for this code, a standard SmartCode will be adopted with special regulations for each community  
• A strict level of regulations and to be by-right first | • Agree on having a standard SmartCode with special regulations for each community  
• Each period of time has a specific trend depending on scale and location of the new neighborhood  
• Each community may have a special concept |

5.2.1.3 Investigating Stakeholders’ Opinions About Community Involvement in the Development of Abu Dhabi FBC and New Urban Neighborhoods

The opinions varied about community participation in the early stages among decision makers. If FBC will be developed for new urban neighborhoods, the interviewed representative of ADUPC mentioned that community will be involved and there had been community consultation in some projects previously. In his opinion, the participation could be through focus groups that would likely live in the newly developed neighborhoods.

Only two of five of the interviewed representatives of ADM strongly agree with the community involvement in developing FBC and new urban neighborhoods. They highlighted the importance of public hearing and community participation and that people must be asked not only about their functional needs but also their physical needs including the design of the house and how they imagine their community to look like. One of them suggested that community participation can be through building samples first for villas and asking residents about their opinion and if they requested any modifications. Another professional argued that the community first needs to realize the importance of standards for regulating spaces. Three of five interviewed representatives of the ADM do not encourage the participation of community in early stages for two reasons. Firstly, the lack of community awareness about the importance of standards in regulating spaces as the first one of them clarified. Secondly, although
it reduces the effort and time to put additional standards and guidelines for allowable extensions and modifications or other special requirements, the involvement of community requires long time during the process of developing regulations and new neighborhoods. Instead, the second interviewed representative of the ADM who does not encourage the community involvement suggested that people living in previously developed projects could be asked to define the negatives of their communities to avoid them in new projects. The third interviewed representative of the ADM mentioned that first we must increase the awareness of the community about the participation in the development of standards and new neighborhoods and how their participation would benefit the whole community. After assuring that the community is ready, they can participate and be involved from the beginning of the development of standards and new neighborhoods.

Accordingly, the two interviewed representatives of planners refuse the community involvement. They only agree to consulting them on specific issues that they need for their social needs like privacy and facilities. They refer to the lack of community awareness on the importance of standards in regulating spaces.

On the other hand, all Emirati residents who were interviewed expressed their willingness to participate and they will be pleased to play a role in building and designing their homes and neighborhoods. The majority of local residents’ interviewees claimed that their participation will help determine the services in the neighborhoods in terms of type and distances to those services (23 persons). Some of those added that the neighborhoods need to have various facilities and activities to be more distinctive and keep pace with modern life requirements which suits Emirati society. As each family may have different needs, some of the interviewees clarified that the participation in the early stages of developing and designing neighborhoods
could reduce time and money in modifying and additions to houses later on and to have their needs in the neighborhood before moving to it (12 persons). Others found that the participation has the potential to explore new ideas by the residents for the new neighborhoods (7 persons) as well as to find out the new trends of the authorities and clarify some points directly during the meetings (4 persons) (Figure 5.1).

As for the way of participation, 41 person preferred to attend public meetings and participate in the design process with planners and architects. However 37 persons want to have special meetings for women and others for men. While the others found no problems for having mix meetings (4 persons). Only 5 persons preferred the questionnaire as a way of participation due to lack of time (Figure 5.2).

Figure 5.1: Reasons of participation (Source: the author)

Figure 5.2: The way of participation according to the interviewed Emirati residents (Source: the author)

Table 5.4: The opinions of stakeholders about the community involvement (Source: the author)

<table>
<thead>
<tr>
<th>FBC general issue</th>
<th>ADUPC representative</th>
<th>ADM representatives</th>
<th>Planners representatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community involvement</td>
<td>• Agree on the community involvement</td>
<td>• Two representatives agree on the community involvement • Three representatives disagree because of the lack of community awareness</td>
<td>• Both planners disagree the involvement of community</td>
</tr>
</tbody>
</table>
5.2.1.4 The Provision of Various Housing Types

One of the main elements of FBC is mixing of housing types. Locally, new Emirati urban neighborhoods in Abu Dhabi depend only on single family houses represented in villas. The representatives of ADUPC, ADM, planners as well as Emirati residents were interviewed and asked about this issue.

The interviewed representative of the ADUPC clarified that this issue has been discussed before and at this time. It has been found that there is no enough demand, need or the political will for this. However, the interviewed representative of the ADUPC believes that this will be the only choice for future. In his opinion, giving the people the choice to live in a multi-story residential building at this time is the best way to respond to Emirati community individual needs and changing demographic trends. Additionally, it will be useful to explain to them how this would reduce the time for waiting to get a land or a villa.

Although this trend is not accepted by Emirati community, it is believed by two out of five of the interviewed representatives of ADM that providing multi-story residential building for Emirati families is inevitable in the future to help with saving resources. One of them suggested that the multi-story residential buildings may need to have special design considerations including each flat may consist of two floors with private entrance. In contrast, the other two out of five of the interviewed representatives of ADM disagree with the allocation of multi-story residential building for Emirati communities. They claimed that they can be provided for new emerging or small families and not for long time (for five years). One of them added that incentives must be offered to encourage Emirati families to accept living in multi-story residential buildings. The last interviewed representative of the ADM disagrees with the allocation of multi-story residential buildings. In his opinion the multi-story residential
building does not encourage the formation of social relationships, but it can still be provided for small families and for short time.

According to the two interviewed planners, one of them agrees with the allocation of multi-story residential buildings for Emirati communities but with studying first the special requirements and considerations that must be taken into account to encourage Emirati families to live in multi-story buildings. The second interviewed planner claims that a feasibility study should be conducted because Emirati families mostly prefer to live in a private villa and will not accept to live in multi-story buildings for a long time as well as it is a political issue.

For Emiratis residents who were interviewed, 33 out of 46 persons do not agree with living in multi-story residential buildings. The lack of privacy in those buildings was the common reason. They clarified that they need a private small garden for them and for their children. Some of those added to that they feel restricted in a flat and it is difficult for large families to adapt (8 persons). 13 out of 46 persons of the Emirati residents who were interviewed agree with living in multi-story residential building if their flats are the only flat on the floor, spacious and can accommodate all family members. Some of them clarified that having one flat on each floor will provide privacy for families because they will feel that they own the floor as well as providing a near park is an important attribute (7 persons). The other interviewed Emirati residents added that buildings should not be too high in addition to the availability of a near park (6 persons) (Figures 5.3 and 5.4).

Accordingly, although the interviewed representative of the ADUPC, and most of the interviewed representatives of the ADM believe that the provision and mixing of housing types in Abu Dhabi will be the only option in the future, there is no enough
demand for this (interviewed representative of the ADUPC) and multi-story residential buildings should include several elements to encourage Emirati families to accept living in them (the interviewed representatives ADM, planners and some of the interviewed Emirati residents) (Table 5.5).

Table 5.5: The opinions of stakeholders about the provision of various housing types for Emirati families (Source: the author)

<table>
<thead>
<tr>
<th>FBC general issue</th>
<th>Stakeholders' opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The provision of various housing types</td>
<td>ADUPC representative</td>
</tr>
<tr>
<td></td>
<td>• Encourage this issue but no enough demand for that at this time</td>
</tr>
<tr>
<td></td>
<td>• It is only an option in the future</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.2.2 Opinions of Stakeholders About the Components of Abu Dhabi Localized FBC

The following sections is an exploration of the stakeholders’ responses regarding the proposed additions/modifications for a localized FBC of Abu Dhabi.

5.2.2.1 Regulating Plan

As showed in the previous chapter, Abu Dhabi does not have a regulating plan that shows all regulating principles for an area. It depends on the conventional zoning with concentration on land uses. This issue was investigated with the interviewed representatives of ADUPC and ADM to find out the opportunity of developing a regulating plan for Abu Dhabi new urban neighborhoods. For new areas, the interviewed representative of ADUPC encourages to develop a regulating plan and does not expect any difficulties in Abu Dhabi new urban neighborhoods. On the other hand, in the interviewed representative of ADUPC point of view, it needs time and developing documents that provide regulations for all properties and enforced by the municipality as well as raising stakeholders awareness thus changing their willing about the importance of this component (Table 5.6).

Table 5.6: The opinions of stakeholders about the regulating plan (Source: the author)

<table>
<thead>
<tr>
<th>FBC-Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulating plan</td>
<td>• Agrees on developing regulating plan</td>
</tr>
<tr>
<td></td>
<td>• raising stakeholders awareness</td>
</tr>
<tr>
<td></td>
<td>• Issue documents to provide regulations and enforced by the municipality</td>
</tr>
</tbody>
</table>
5.2.2.2 Public Space Standards

In this section two issues are investigated. Firstly, as shown in Chapter Four, the cycle track in Abu Dhabi new urban neighborhoods is optional and it is proposed to convert it to be mandatory. This was investigated with ADUPC, ADM and planners representatives as well as Emirati residents. Furthermore, the identification of the frontage type for each street type within the Right-of-Way is investigated with ADUPC, ADM and planners representatives.

Firstly, the interviewed representative of the ADUPC claimed that the provision of cycle track in residential areas with low density development like Emirati neighborhoods is not needed. In addition, he found that some areas have streets that are perfectly fine for utilizing a bike on the existing right of way. Additionally, the interviewed representative of the ADUPC encouraged the identification of the frontage type for each street type to be adopted within urban street standards and did not expect any difficulties.

Secondly, the opinions of the interviewed representatives of the ADM varied. Three of five of them encourage converting the provision of cycle track in Abu Dhabi new urban neighborhoods to be mandatory and did not expect any problems. They clarified that providing cycle track will ensure safety for cyclists. One of them added that it will be easier to reach all local places as well as it would improve the community health especially with the prevalence of obesity and physical inactivity among children. The other one added that the cycle track is needed in the neighborhoods because the width of walkways in some of them is not enough for both pedestrians and cyclists. However, two of five of the interviewed representatives of the ADM disagree the provision of cycle track to be mandatory because it is costly to provide cycle track in Abu Dhabi new urban neighborhoods, where riding a bike is not a prevalent culture.
For the second element in public space standards, all the interviewed representative of the ADM believe that this element would have a significant positive effect to the street and add attractiveness through giving a conceptualization about a place as well as give each type of street its own identity and vision.

Thirdly, one of the two interviewed representatives of the planners encourages the provision of cycle track to be mandatory in the neighborhoods for several reasons. Mainly, it supports the sustainable vision of Abu Dhabi through adopting green means of transportation represented in cycling. Additionally, in his opinion, residents will be encouraged to practice cycling when cycle tracks are provided especially nowadays where many Emirati families are moving towards a healthy lifestyle and encouraging their children to be active and practice cycling. He did not expect any difficulties in adopting that. The second interviewed representative of the planners disagrees with the provision of cycle track to be mandatory because cycling is not a prevalent culture in Abu Dhabi among residents. For the second element in public space standards, both planners thought that identifying frontage building type for each street type would help in creating a meaningful place.

On the other hand, all Emiratis who were interviewed found that providing cycle tracks in the neighborhoods is important. They clarified that cycle tracks ensure safety for cyclists from accidents especially for children and avoid disturbing pedestrians (46 persons). As stated by some of them, most of the walkways in the neighborhoods are continuously interrupted by vehicle entrances which makes it dangerous for cycling (4 persons). Some of them added that providing cycle tracks would encourage people to practice cycling (14 persons). Others considered bicycle track as one of the modern life requirements and one that provides entertainment for the neighborhoods (8 persons). Also for some of them bicycle tracks is an additional
service that increases the value of the neighborhood and reflects on the pattern of people lifestyle positively (5 persons) (Figure 5.5). Most of them who do not practice cycling or prevent their children from doing the same in the neighborhoods do that for safety issues assured that if cycle tracks are provided they will allow them to practice cycling (25 persons).

The opinions concerning the provision of cycle track to be mandatory varied as shown in Table 5.7. However, all of them agreed on the importance of identifying the frontage type for street types.

![Figure 5.5: Opinions and number of the interviewed Emirati residents about the provision of cycle track in the neighborhoods (Source: the author)](image)

Table 5.7: The stakeholders’ opinions about the additions/modifications in public space standards (Source: the author)

<table>
<thead>
<tr>
<th>FBC-Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>ADUPC representative</td>
</tr>
<tr>
<td>Cycle track</td>
<td>• In low density development like Emirati neighborhoods it is not needed</td>
</tr>
<tr>
<td>Public space standards</td>
<td></td>
</tr>
<tr>
<td>Frontage type</td>
<td>• Agrees on identifying different frontage type</td>
</tr>
</tbody>
</table>
5.2.2.3 Block Standards

This section will present the findings regarding the identification of the maximum block size for Abu Dhabi new urban neighborhood and if it is walkable or not. In Abu Dhabi new urban neighborhoods the block size recommended in Abu Dhabi Plan 2030 is 240 m x 240 m.

For ADUPC, the interviewed representative considered that this distance is walkable. This is determined mainly depending on providing community facilities within a studied walkable distances ranging between 350- 700 m. These distances inform the maximum that most people would be willing to walk during the heat of summer. ADUPC clarified that some of the community centers are meant to be within a comfortable walking distance.

All the interviewed representatives of the ADM believed that these distances are suitable for walking to reach all daily needs. However, one of the five of the interviewed representative of ADM suggested to ask Emirati residents about these distances. Another interviewed representative of the ADM found that an extensive study for a sustainable urban block is needed in terms of size, orientation and shape.

The interviewed planners found these distances are walkable and it depends on the people and their willing to walk. From Table 5.8, it can be noted that the interviewed representatives of ADUPC, ADM and the planners found the recommended block size is suitable. However, one of the five of the interviewed representatives of the ADM found that a study of a sustainable urban block is needed in terms of size, orientation and shape.
Table 5.8: The opinions of stakeholders about identifying the maximum block size (Source: the author)

<table>
<thead>
<tr>
<th>FBC: Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block standards</td>
<td>ADUPC representative</td>
</tr>
<tr>
<td>Maximum size of the block</td>
<td>• The size is suitable for walking</td>
</tr>
<tr>
<td></td>
<td>• One representative found that a study on the sustainable urban block is needed</td>
</tr>
</tbody>
</table>

On the other hand, the Emirati residents who were interviewed split into two groups. Some of them walk to mosque or for sport. Others do not walk regularly for different reasons. People who practice walking in their neighborhoods (20 persons) justified that they walk because movement is useful for health (15 persons) and walking does not require machines or transportation to go clubs as well as walking in the neighborhood creates a coherent and safe neighborhood where people meet and know each other (5 persons). The other interviewed Emirati residents do not walk because there are no near facilities and services to walk to so they use their cars (26 persons). A few refer to the lack of time as preventing them from walking. Those who are not walking assured that if the walkways are more suitable for walking and facilities are near they will start practice walking (Figure 5.6).

Figure 5.6: The number of the interviewed Emirati residents if they practice walking or not (Source: the author)
5.2.2.4 Building Type Standards

In this section two elements were investigated: identifying different frontage type for building types and building size and massing. The interviewed were representatives of the ADUPC, ADM and planners. As shown before in Chapter Two, FBC identifies the allowable frontage type for each building type. However, Chapter Four clarified that this element is not included within Abu Dhabi form-related regulations. The second element is the building size and massing which is not included in Abu Dhabi form-related regulations as explored in Chapter Four.

According to the interviewed representative of ADUPC, he claimed that the frontage type and building size and massing are identified within Abu Dhabi Development Code that is not issued yet. However, the building size and massing element may face one problem in that owners will require more areas.

However, all the interviewed representatives of the ADM encourage the identification of the various allowable building frontage types. Two out of five of the interviewed representatives of the ADM do not expect any problems with adopting this regulating element. One of them clarified that this would help in avoiding boredom and repetition of buildings as the case is now in Abu Dhabi. The other one agrees that the form-related regulations can control some elements without restricting architects in the design. On the other hand, three of five of the interviewed representatives of the ADM expected some problems that may face the adoption of this element. They believe that economic aspects overwhelm the planning aspects. There were regulations for different frontage types including gallery and arcades, but these spaces were commercially exploited so that they were canceled. In their opinion, this can be overcome through putting regulations with periodical follow-up and inspections. In addition, the responsibility must be determined for these places. All the interviewed
representatives of the ADM agree that there are no way to remove or replace the fences and adopt other frontage types. They believe that this is an important social demand for privacy and it is a key element for Emirati residential units. For the building size and massing, two out of five of the interviewed representatives of the ADM encourage to adopt this element. Although one out of five of the interviewed representatives of the ADM do not encourage the adoption of high rise buildings as they prevent the social interaction, he believes that a study on the ratio of building height to street width is important to be conducted. Two out five of the interviewed representatives of the AMD found that this element is difficult to apply for commercial aspects in which owners will require more areas. One of them added that incentives would encourage to adopt this element. This may include allowing them to increase the number of floors in their building.

Both interviewed planners agree that there should be variety in frontage types for buildings and could be identified but without restricting creativity. One out of two of the interviewed planners clarified that this issue should be studied and implemented for its benefit for ventilation. However, as the commercial factor is dominant in design and planning any project, there should be solutions to face any commercial obstacles may occur. The second interviewed planner indicated that it is a must to study the height of buildings and the scale of the street for the pedestrian comfort and does not expect any obstacles that may face the adoption of this element (Table 5.9).
Table 5.9: The opinions of stakeholders about the additions of building type standards (Source: the author)

<table>
<thead>
<tr>
<th>FBC- Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td><strong>Regulating element</strong></td>
</tr>
<tr>
<td>Building type standards</td>
<td>Identify frontage types</td>
</tr>
<tr>
<td>Building massing</td>
<td>Building massing</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.2.2.5 Building Form Standards

Chapter Four explored that all the regulating elements of the building form standards are covered by Abu Dhabi form-related regulations except the built-to line regulating element. Accordingly, this was investigated with the interviewed representatives of the ADUPC, ADM and planners and they were asked about the applicability of identifying built-to line within Abu Dhabi form-related regulations for all building types. The interviewed representative of the ADUPC claimed that only ancillary buildings can be on the front build to line in villa areas. However, commercial lots are generally sized in which it is the footprint. Usually, it is considered when new areas are being planned.

The interviewed representatives of the ADM discouraged the adoption of this element because it restricts the creativity of architect and the design of buildings. One out of five of the interviewed representatives of ADM added that the commercial lot size in the neighborhoods is not too large which makes it difficult to apply this in neighborhoods, owners want to take all the advantages of the plot and incentives can be offered to the owners.

Accordingly, both interviewed planners do not encourage the adoption of it. They found this element is restrictive to the architect creativity. Table 5.10 summarizes
the responses of the interviewed representatives of the ADUPC, ADM and planners.

Table 5.10: The opinions of stakeholders about the built-to line regulating element
(Source: the author)

<table>
<thead>
<tr>
<th>FBC- Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADUPC representative</td>
</tr>
<tr>
<td>Building form standards</td>
<td>Commercial lots are generally sized in which it is the footprint</td>
</tr>
<tr>
<td>Built-to line</td>
<td>Usually, it is considered when new areas are being planned</td>
</tr>
</tbody>
</table>

5.2.2.6 Frontage Type Standards

As explored earlier in this Chapter in section 5.2.4, the allowable frontage types are not identified for buildings within Abu Dhabi form-related and the fences are the dominance frontage that surround the residential villas in Emirati urban neighborhoods. In this section, more detailed issues are investigated with the interviewed representatives of ADUPC, ADM and planners and Emirati residents as it is considered within frontage type standards in FBC, including shading especially for fences.

Firstly, the interviewed representative of the ADUPC encourages to consider shading standards with each frontage building type if it faces the walkways in the urban neighborhoods especially in hot weather like Abu Dhabi. However, fences cannot be replaced or removed due to the cultural and social requirements for the Emirati families.

Secondly, three out of five of the interviewed representatives of the ADM, claimed that there should be a study that includes treatment for solid fences. One of them suggested that these fences can be joined to architectural shading elements, including arcades. Another one of the interviewed representatives of the ADM claimed that shading must be applied mainly in the areas with more commercial activities in
the neighborhoods. Two of five of the interviewed representative of the ADM said that dissemination and encouragement to walk is needed among community members. One of them added that people have to pressure decision makers and request shading for all neighborhoods walkways.

The interviewed planners found that the fence is an essential element in Emirati communities. Trees and courtyard houses would be examples of the solutions to shading and solid fences. However, the interviewed planners agree that the fences cannot be removed or replaced to adopt other frontage types. They said that this is an important social demand for privacy and they are a key element for Emirati residential units.

Accordingly, the majority of Emirati residents who were interviewed disagree with removing fences and living in different single family houses, including the courtyard houses (40 person). They clarified that privacy and comfort for the families is essential in the Emirati community. Some of them added that it is needed to provide distances between residential plots instead of common fences. In contrast, few Emiratis encourage the diversification of housing types including courtyard houses without fences in order to strengthening social cohesion (6 persons) (Figure 5.7). Table 5.11 summarizes the responses of the interviewed representatives of the ADUPC, ADM and planners.
Table 5.11: The opinions of stakeholders about the frontage standards (Source: the author)

<table>
<thead>
<tr>
<th>FBC Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>ADUPC representative</td>
</tr>
</tbody>
</table>
| Frontage type standards | Shading | • Encourages to adopt this element  
                     |               | • Fences cannot be replaced or removed for social needs  
                     |               | • All of them agree to the importance of this element  
                     |               | • Fences can be joined to architectural shading elements  
                     |               | • Fences cannot be removed or replaced for social need  
                     |               | • Agree to the adoption of this element. Trees can be solution for shading and treatments for fences  
                     |               | • Fences cannot be removed or replaced for social need  |

5.2.2.7 Architectural Standards

This research clarified that Abu Dhabi lacks architectural standards which help to provide directions for the design of buildings to maintain and promote the local character. Representatives of ADUPC, ADM and planners were interviewed and asked about their opinion concerning the identification of various guiding forms that reflect Abu Dhabi character and heritage in new urban neighborhoods. Furthermore, the Emirati residents were interviewed and asked about the design of their villas and new urban neighborhoods.

This research clarified that Abu Dhabi lacks architectural standards which help to provide directions for the design of buildings to maintain and promote the local character. Representatives of ADUPC, ADM and planners were interviewed and asked
about their opinion concerning the identification of various guiding forms that reflect Abu Dhabi character and heritage in new urban neighborhoods. Furthermore, the Emirati residents were interviewed and asked about the design of their villas and new urban neighborhoods.

The interviewed representative of the ADUPC believes in the importance of this issue in Abu Dhabi where architectural standards are not considered. Additionally, the interviewed representative of the ADUPC indicated that this will be addressed via the architectural pattern book that ADUPC is working on. However, he claimed that buildings should not look alike, so ways to encourage better materials and design through simple regulations have to be studied.

Furthermore, all the interviewed representatives of the ADM consider this as an important element and agree that providing guiding forms will help create a unique design for buildings. Two of five of the interviewed representatives of the ADM claimed that the cost plays a critical issue in the variation of designs in commercial and residential buildings. One of them added to that this is helpful for consultants to introduce them to the local character of Abu Dhabi. Additionally, one out of five of the interviewed representatives of the ADM clarified that Abu Dhabi is moving towards becoming a global city which would restrict the determination of special and local character for Abu Dhabi. Furthermore, offering incentives would encourage architects to create and adopt more localized forms. Despite the absence of the architectural standards in Abu Dhabi with floating identity, one of the five interviewed representatives of ADM claimed that Abu Dhabi has an inspiring history. He added that the development of guiding architectural forms cannot be studied without considering the recent issues, including ongoing environmental changes (Estidama) and through analyzing the goal from the heritage elements (for example the courtyard)
and defining the needs and assets of the Emirate of Abu Dhabi in the recent time. According to one of the five interviewed representative of the ADM, Abu Dhabi suffers from repetition and boredom in the designs of buildings without reflecting the local character. Therefore, he added to that if the architectural standards will be developed in Abu Dhabi they have to reflect the social and culture factors. This would help in creating more attractive elevations resulting in distinctive streets and plots. However, after developing any codes, the time factor and quality should be studied.

Although they believe in the need for architectural standards in Abu Dhabi, the interviewed planners found them difficult to be identified. The first interviewed planner claimed that for decades now Abu Dhabi has not adopted a certain architectural style and developed it. So that it needs a huge effort and time to study this issue. Besides that, the other interviewed planner found that this issue must be studied to ensure offering a variety of designs and forms that will not restrict planners and architects.

On the other hand, 18 out of 46 persons of the interviewed Emirati residents prefer the diversification of forms and designs in villas and buildings. However, some of them added to that Abu Dhabi new neighborhoods lack diversity and uniqueness in building designs and attracting and landmark buildings. Also, some of them found the neighborhoods replicated each other. Additionally, 20 out of 46 persons of the interviewed Emirati residents prefer simple designs that are not complicated. Additionally, a few of them indicated that villas can be in different colors based on family desire rather than beige, but at the same time without allowing bright colors. The rest of the interviewed Emirati residents do not have any comment with regard to the design of the buildings and villas; they are satisfied with the design of their villas and neighborhoods and like the simple designs (8 persons). Figure 5.8 illustrates the
opinions of the interviewed Emirati residents.

Table 5.12 summarizes the responses of the interviewed representatives of the ADUPC, ADM and planners about the development of guiding forms setting regulations for architectural standards. All of them believe in the importance of the architectural standards. Some of the ADM representatives indicated that the guiding forms should not be restrictive for the architects and consider the goals of Abu Dhabi vision, including being a global city.

Tables 5.13 and 5.14 summarize the thoughts of interviewed representatives of the ADUPC, ADM and planners regarding the general issues and components of FBC.

Table 5.12: The opinions of stakeholders about the architectural standards (Source: the author)

<table>
<thead>
<tr>
<th>FBC-Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural standards</td>
<td></td>
</tr>
<tr>
<td>ADUPC representative</td>
<td>ADM representatives</td>
</tr>
<tr>
<td>• Encourage the development of architectural guiding forms</td>
<td>• All of them encourage the development of architectural guiding forms and several factors have to be considered</td>
</tr>
</tbody>
</table>

Figure 5.8: The opinions of the interviewed Emirati residents about the design of villas and buildings in neighborhoods (Source: the author)

Table 5.12 summarizes the responses of the interviewed representatives of the ADUPC, ADM and planners about the development of guiding forms setting regulations for architectural standards. All of them believe in the importance of the architectural standards. Some of the ADM representatives indicated that the guiding forms should not be restrictive for the architects and consider the goals of Abu Dhabi vision, including being a global city.

Tables 5.13 and 5.14 summarize the thoughts of interviewed representatives of the ADUPC, ADM and planners regarding the general issues and components of FBC.

Table 5.12: The opinions of stakeholders about the architectural standards (Source: the author)
Table 5.13: The opinions of stakeholders about the general issues of FBC in relation to Abu Dhabi form-related regulations (Source: the author)

<table>
<thead>
<tr>
<th>FBC General issues</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADUPC representative</td>
</tr>
</tbody>
</table>
| Unify all form-related regulations in one FBC document | • Agrees to the importance of a unified form-related regulations  
• There are several government stakeholders with various individual regulations  
• Abu Dhabi lacks a strong legal framework  
• The willingness of all stakeholders has to change to adapt  
• The development of a strategic plan as well as to impose strict regulations | • All of them agree  
• The existence of several governmental authorities resulting in difficulties in coordination  
• It facilitates the revision of projects | • Both of them agree  
• Several government authorities put standards for the same element but usually with different values  
• One source for all form-related regulations would facilitate the design process |

<table>
<thead>
<tr>
<th>FBC, SmartCode for one or all neighborhoods or for one</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADUPC representative</td>
</tr>
</tbody>
</table>
|                   | • When Abu Dhabi is ready for this code, a standard SmartCode will be adopted with special regulations for each community  
• A strict level of regulations and to be by-right first | • Agree on having a standard SmartCode with special regulations for each community  
• Each period of time has a specific trend depending on scale and location of the new neighborhood  
• Each community may have a special concept | |

<table>
<thead>
<tr>
<th>Community involvement</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADUPC representative</td>
</tr>
</tbody>
</table>
|                      | • Agree on the community involvement | • Two representatives agree on the community involvement  
• Three representatives disagree because of the lack of community awareness | • Both planners disagree with the community involvement due to their lack of awareness |

<table>
<thead>
<tr>
<th>The provision of various housing types</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADUPC representative</td>
</tr>
</tbody>
</table>
|                                      | • Encourage this but no enough demand at this time  
• Need to ask Emiratis about this | • Two of five agree which flats must have special considerations  
• Three of five disagree which flats can be provided for new emerging or small families and not for long time  
• The multi-story residential buildings discourage the social interaction | • Planners agree on providing various housing types but with special considerations  
• Conduct a feasibility study |

Table 5.14: The opinions of stakeholders about the additions and modifications for Abu Dhabi form-regulated regulations according to the components of FBC (Source: the author)

<table>
<thead>
<tr>
<th>FBC Components</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Regulating element</td>
<td>ADUPC representative</td>
</tr>
</tbody>
</table>
| Regulating plan | • Agree on developing regulating plan  
• Issue documents restricting what can be done with property | - | - |

<table>
<thead>
<tr>
<th>Public space standards</th>
<th>Stakeholders’ opinions</th>
</tr>
</thead>
</table>
| Cycle track | • Disagree converting the provision of cycle track to be mandatory | • Three of five agree  
• Two of five disagree to be mandatory | • One agrees because it supports Abu Dhabi sustainable vision  
• One disagrees |
| Frontage type | • Agree on identifying various frontage type | • All of them agree on identifying different frontage type | • All of them agree on identifying different frontage type |
Block standards

| Maximum size of block | Agree on that this distance is suitable | All of them agree on that the block size is suitable | A study for sustainable urban block is needed | Both of them found the block size is suitable |

Building type standards

<table>
<thead>
<tr>
<th>Identify frontage types</th>
<th>It will be identified in the Abu Dhabi Development Code</th>
<th>All of them agree on that Periodical follow-up and inspections should be considered</th>
<th>Both of them agree on identifying different frontage type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building massing</td>
<td>It will be identified in the Abu Dhabi Development Code</td>
<td>Encourage the adoption of this element Owners may require more space Offer incentives to owners</td>
<td>Both of them agree on the importance of this element Owners may require more space Study the height of building according to the width of the street</td>
</tr>
</tbody>
</table>

Building form standards

| Built-to line | Commercial lots are generally sized in which it is the footprint Usually, it is considered when new areas are being planned | All of them do not encourage the adoption of this element It is restrictive and not needed Offer incentives to the owners | All of them found this element restrictive to creativity |

Frontage type standards

| Shading | Encourage to adopt this element Fences cannot be replaced or removed for social needs | All of them agree on the importance of this element Fences can be joined to architectural shading elements Fences cannot be removed or replaced for social need | Agree on the adoption of this element. Trees can be solution for shading and treatments for fences Fences cannot be removed or replaced for social need |

Architectural standards

| Encourages the development of architectural guiding forms | All of them encourage the development of architectural guiding forms with respect to Abu Dhabi vision and several considerations | Both encourage the development of architectural guiding forms without restricting creativity |

Conclusion

This chapter explored the opinions of stakeholders about the applicability of FBC in Abu Dhabi new urban neighborhoods based on the proposed additions/modifications from the previous chapter through face-to-face interviews. This helped in identifying the opportunities and obstacles that may face the adopting of FBC in Abu Dhabi. According to the responses of the interviewed representatives of stakeholders, there is a need for a unified FBC for Abu Dhabi new urban neighborhoods but the existence of different authorities is the main obstacle that may face achieving this point. However, the central authority believed that this can be overcome by raising the awareness of stakeholders on the importance of unifying the form-related standards. Although the community involvement is an essential step when developing FBC and new urban neighborhoods, not all stakeholders agree on
that while all interviewed Emirati residents expressed their willing to participate. The application of some of the regulating elements would face obstacles including determining different frontage types. Some of the stakeholders found it restrictive for designers and others mentioned that places like gallery and arcades can be commercially exploited. Therefore, setting these regulations requires periodical inspections of them. Incentives would play an important role in overcoming obstacles for some of other regulations including providing mixing of housing types. Additionally, the interviewed representatives of the ADUPC, ADM and planners agree that Abu Dhabi suffers from the absence of architectural standards where some of them found that identifying architectural forms must not restrict the realization of Abu Dhabi vision towards globalism. The following chapter will discuss the results and clarity the opportunities and solutions to overcome the obstacles that face the proposed additions and modifications for a unified FBC for Abu Dhabi new urban neighborhoods.
Chapter 6: Results and Discussion

This chapter aims at summarizing the results of this research and analyzing the results of the comparison in Chapter Four between the FBC as a universal practice and the form-related regulations/guidelines of Abu Dhabi new urban neighborhoods in terms of components and process. Additionally, this section will analyze the interviews data derived from the previous chapter to point out the major considerations that should be undertaken to develop a unified FBC for Abu Dhabi new urban neighborhoods.

6.1 Results of the Research

The adoption of FBC has spread all over the world as a sustainable planning tool and an alternative to conventional zoning. This research is divided into three parts. Firstly, it depended on reviewing literature to explore the main components of FBC and the main steps followed to develop a localized FBC and new urban neighborhoods. Accordingly, this research identified the main components of FBC: regulating plan, public space standards, block standards, building type standards, building form standards, frontage type standards, architectural standards and glossary (Chapter Two). Additionally, this research reviewed various case studies and determined the main common steps that are usually followed to develop FBC for new urban neighborhoods, including: scoping, documenting, pre-charrette, design charrette, architectural charrette as well as post-charrette stages. By this, the research answered the first research question of how FBC regulates the built environment and helps realizing sustainable neighborhoods and realized its first objective.

Secondly, based on that, Chapter Four discussed the Abu Dhabi form-related regulations/guidelines for new urban neighborhoods and compared them to FBC in
terms of components and process of development. It has been found that the standards and guidelines are fragmented. According to the results, it has been found that there are some missing or partly missing components as shown in Table 4.17 in Chapter Four. Furthermore, for the development process of the form-related regulations for Abu Dhabi new urban neighborhoods and in the comparison to the development process of FBC, it has been found that the community involvement is fairly limited. Thus the research proposed additions/ modifications to the existing Abu Dhabi form-related regulations as shown in Tables 4.19 and 4.20. This answered the second research question and achieved the second research objective.

Thirdly, in order to answer the third research question and realize the third research objective, interviews were conducted with representatives of the ADUPC, ADM, planners as well as Emirati residents to find out the opportunities and difficulties of adopting the proposed additions and modifications as shown in Tables 5.13 and 5.14. The following section will discuss the results of this research.

6.2 Discussion

6.2.1 General Issues

6.2.1.1 Unifying all Form-Related Standards and Guidelines

As explored in Chapter Two, one of the features of FBC is acting as one reference for all form-related regulations for all built environment scales. In contrast, by reviewing the form-related standards and guidelines of Abu Dhabi new urban neighborhoods, Chapter Four showed that those regulations are fragmented. Thus, it is proposed to unify all of them on one FBC and this was investigated through interviewing ADUPC, ADM and planners representatives and this answers the fourth research question.
Although all stakeholders agree on unifying all form-related regulations, the major problem lies in the existence of several parties and authorities who are responsible for devising regulations. Thus, the emergence of problems in coordination between authorities as some of the interviewed representatives of ADM and both planners was clarified in the previous chapter. Accordingly, for a unified FBC for Abu Dhabi, the willingness of all stakeholders has to change to adapt as well as setting a strategic plan based on a strong legal framework that Abu Dhabi does not have based on the interviewed representatives of the ADUPC and ADM. Additionally, one source for all form-related regulations for Abu Dhabi new urban neighborhoods facilitates the revision of projects as stated by the interviewed representatives of the ADM and the design process as the interviewed planners clarified (Figure 6.1).

![Figure 6.1: The difficulties and proposed actions of unifying the form-related regulations of Abu Dhabi in one FBC (the author)](image)

**6.2.1.2 Appropriate Type of FBC for Abu Dhabi**

As revealed in Chapter Three, the development of FBC is either developing the FBC for all new urban neighborhoods, for a specific neighborhood or adopting a calibrated SmartCode. If FBC will be developed for Abu Dhabi new urban neighborhoods, a calibrated SmartCode and special regulations for each neighborhoods will be considered as the interviewed representatives of the ADUPC and ADM stated. This is similar to the Gabon and Kingdom of Saudi Arabia case studies explored in Chapter Three. For example, in the case of Kingdom of Saudi
Arabia the developed masterplan and SmartCode are for a new sustainable community in Makkah.

This is because each period of time has a specific trend depending on scale and location of the new community and each new neighborhood may have a special concept as mentioned by some of the interviewed representatives of ADM. Additionally, as mentioned by the interviewed representative of ADUPC, the wide breadth of its scope was the reason behind the difficulty of implementing the Abu Dhabi Development Code in 2010.

Additionally, as FBC requires the participation of different parties, in the case of Abu Dhabi firstly FBC would adopt by-right. This is because as the interviewed representative of the ADUPC has stated, it is needed to maintain the strict level of regulations. (Figure 6.2).

![Figure 6.2: The difficulties and proposed actions of selecting an appropriate type of FBC for Abu Dhabi new urban neighborhoods (Source: the author)](image)

**6.2.1.3 Community Involvement in Developing Abu Dhabi FBC**

The community involvement in decision making is considered an essential step for developing FBC and new urban neighborhoods. However, the participation of community for developing the form-related standards and guidelines of Abu Dhabi and new urban neighborhoods does not actually exceed the community consultation, if considered from the outset.

Despite the disagreement of community involvement among the majority of the interviewed representatives of ADM and the interviewed planners due to their
claim that Emirati community is not ready for involvement, the opportunity lies in that
two of the interviewed representatives of ADM found that Emirati community can be
educated and raising their awareness. Accordingly, as revealed in Chapter Three in
City of Cincinnati case study, sessions were held for community members educating
and raising the awareness of community members before the design charrettes. Also
in the case of Grandhome, Scotland, initial events were held to clarify the concept of
the Charrette for residents. Additionally, all the interviewed Emirati residents reflect
that they are conscious of the importance of their involvement. Some of them mention
that their participation allows to suggest new ideas to neighborhood designs. In
addition, the participation should respect the social and culture needs for Emirati
society and hold separate charrettes for participators of women. Therefore, in order to
develop FBC for Abu Dhabi new urban neighborhoods and overcome all obstacles, it
is important to raise people awareness to ensure that all of them are well educated
about the idea of participation and when they are ready they can be involved as has
been stated by two of the interviewed representatives of ADM. However, as few of the
interviewed Emirati residents indicated, the nature of work makes them familiar with
mixed gender meetings (Figure 6.3).

Figure 6.3: The difficulties and proposed actions of community involvement in Abu
Dhabi (Source: the author)
6.2.1.4 The Provision of Various Housing Types

One of the main elements of FBC is mixing of housing types. However, Emirati neighborhoods in Abu Dhabi depend only on single family houses represented in villas. Allocating multi-story residential buildings for Emirati families is not acceptable for the majority of the interviewed Emirati residents and most of the interviewed representatives of ADM due to several reasons. Living in multi-story residential building lacks privacy and does not allow for social interaction as one of the interviewed representatives of ADM. Also most of the Emirati families are used to living in villas with private small courtyard which makes difficult to adapt in multi-story buildings according to the most of the interviewed Emirati residents. For the time being, Abu Dhabi can afford the allocation of single family houses for Emiratis as one of the interviewed planner indicated and there is no enough demand for that as the interviewed representative ADUPC indicated.

On the other hand, there is a significant percentage of the interviewed Emiratis who agree to living in multi-story residential buildings but with special requirements. So that if Abu Dhabi will move toward this trend, and to encourage Emirati families to accept living on multi-story residential living several actions should be done. In the beginning, Emiratis should have the choice to live in multi-story residential building. This would help to move on gradually in the adoption of allocating multi-story residential buildings for Emirati families as stated by the interviewed representative of the ADUPC. Additionally, a feasibility study should be done for this issue before adopting it as one of the interviewed planners indicated. Furthermore, Emiratis should be asked about the special requirements that are needed to be considered in those buildings as one of the interviewed representatives of ADM. Additionally, incentives can be offered for Emiratis who accept to live in multi-story residential buildings as
one of the interviewed representatives of ADM indicated. Some of the Emirati residents who were interviewed indicated that buildings should not be too high, provide privacy and offer small outdoor area within the flat. Also, each flat could contain two floors as one of the interviewed representatives of ADM stated. Furthermore, offering incentives would encourage Emirati families to live in multi-story buildings according to one of the interviewed representatives of the ADM (Figure 6.4).

![Figure 6.4: The difficulties and proposed actions of providing various housing types to Emirati families (Source: the author)](image)

6.2.2 Localized FBC for Abu Dhabi New Urban Neighborhoods

6.2.2.1 Regulating Plan

The regulating plan provides an image of the developed areas showing the several regulatory principles. The findings of this research show that for Abu Dhabi, it is not difficult to develop regulating plans for new urban neighborhoods as the interviewed representative of ADUPC stated. However, it requires two major points. Firstly, raising all stakeholders’ awareness regarding the importance of the regulations as mentioned by the interviewed representative of ADUPC. This is relevant to most of the case studies including Makkah, Kingdom of Saudi Arabia, where SmartCode workshops were held to educate the engineers in the municipalities. Secondly, issuing documents that includes regulation principles to control the property that must be
enforced by the municipality as the interviewed representative of ADUPC mentioned (Figure 6.5).

Figure 6.5: The difficulties and proposed actions of developing regulating plans for Abu Dhabi new urban neighborhoods (Source: the author)

### 6.2.2.2 Public Space Standards

As revealed in Chapter Four, the provision of cycle track in Abu Dhabi new urban neighborhoods is optional. Additionally, the frontage type according to the street type is not identified within Abu Dhabi form-related regulations and guidelines. Accordingly, it is proposed to convert the provision of cycle track to be mandatory in Abu Dhabi new urban neighborhoods and to identify the frontage type for each street type.

Based on the responses of some the interviewed representatives of stakeholders and the interviewed Emirati residents, this research shows that providing a cycle track is considered an important element in Abu Dhabi new urban neighborhoods due to several reasons. Firstly, safety of cyclists and avoiding disturbing pedestrian is considered a significant reason as well as improve the community health as some of the interviewed representatives of ADM and one of the interviewed planners in addition to all of the Emirati residents who were interviewed who expressed their need for a special track for cycling. Secondly, cycling plays an important pillar in realizing the Abu Dhabi sustainable 2030 Vision as a sustainable mean of transportation and the ongoing changes of Emirati community lifestyle is notable and should be considered, that is what one of the interviewed planners agrees with. Thirdly, additional service
increases the value of the neighborhood and is considered one of the modern life requirements as an entertainment element and for more attractive neighborhoods as some of the interviewed Emirati residents mentioned. Fourthly, although a few of the interviewed representatives of ADM and one of the interviewed planners do not agree on providing cycle tracks in Abu Dhabi new urban neighborhoods to be mandatory, the provision of cycle track would encourage the residents to practice cycling. That is what the majority of the interviewed representatives of ADM, one of the interviewed planners and most of the interviewed Emirati residents stated.

Meanwhile, a few of the interviewed representatives of ADM and one of the interviewed planners do not agree with the provision of cycle tracks to be mandatory because cycling is not a prevalent culture among Emirati communities. However, as one of the interviewed planners indicated, many Emirati families are changing their lifestyle. Additionally, as one of the researches indicated that the cyclists in the neighborhoods are not only from the residents but also they can be from the Asian laborers who usually use the road or the sidewalks for cycling (Galal Ahmed, 2012).

Defining the R.O.W. should be through regulating elements that are the width and frontage type that faces the walkways. This research shows that the identification of the frontage type for each street type has a high opportunity to be considered within Abu Dhabi FBC and it would affect the built environment positively as all the interviewed stakeholders stated. They agree on that adding this element which would help in creating attractive streets and plots and this will add uniqueness for places. Further, all of them do not expect any difficulties in adopting this element within Abu Dhabi FBC (Figure 6.6).
6.2.2.3 Block Standards

In FBC the maximum block dimensions is determined to help in creating more compact neighborhoods and encourage walkability. In Chapter Four it has been found that the block size is recommended to be 240m x 240m. Although all the interviewed representatives of ADUPC, ADM and planners believed that this distance is suitable for Abu Dhabi new urban neighborhoods and the community facilities are provided within walking distances, some of the Emirati residents who were interviewed indicated that most of the daily needs are not within walking distances so they have to use their cars. Additionally, as one of the interviewed representatives of ADM noted that people need to be asked about these distances if they are suitable for walking, as shown previously in Chapter One, a survey of Yas Emirati community conducted by the ADM concluded that most of the residents requested commercial shops and centers as there are no supermarkets near the residential villas in addition to entertainment places and parks.

However, if FBC will be developed for Abu Dhabi and to determine the maximum block size, an extensive study about sustainable urban block in terms of size, orientation and shape is needed as stated by one of five of the interviewed representatives of ADM (Figure 6.7).

Figure 6.6: The difficulties and proposed actions of the public space standards elements, including the cycle track and frontage type (Source: the author)
6.2.2.4 Building Type Standards

Firstly, in FBC, one of the building type standards is identifying the allowable building frontage type. However, this research clarified this regulating element is not identified by the form-related regulations of Abu Dhabi. Based on the interviews conducted in the previous chapter, the identification of allowable building frontage types is encouraged by the interviewed representatives of ADUPC, ADM and planners. Accordingly, the interviewed representative of the ADUPC claimed that this is element will be included in the Abu Dhabi Development Code. However, this research shows that if this element will be adopted in Abu Dhabi, a periodical follow-up and inspections should be conducted for the spaces including gallery and arcades where it is implemented as those spaces may be exploited commercially. This is what two out of five of the interviewed representatives of ADM stated. Additionally, the identification of the building frontage types should not be restrictive to the architects creativity as the interviewed planners indicated.

Secondly, building massing is included in FBC to ensure that the height of the buildings respects the human scale. This research revealed that this element is not considered in Abu Dhabi. However, it will be included in Abu Dhabi Development Code as the interviewed representative of ADUPC stated. Accordingly, the results of this research show that all the stakeholders ensure the importance of this element to be considered. Additionally, in Abu Dhabi one difficulty may face the adoption of this

Figure 6.7: The difficulties and proposed actions of determining the maximum block size for Abu Dhabi new urban neighborhoods (Source: the author)
element, which is the removal of GFA from the perceived rights of the property owner as the interviewed representative of ADUPC, some of the interviewed representatives and one of the interviewed planners. This can be overcome through offering incentives to the owners, for example allowing them to increase the number of floors in their building as one of the interviewed representatives of ADM and the interviewed planner suggested (Figure 6.8).

![Figure 6.8: The difficulties and proposed actions of the adoption of the frontage building type and building size and massing for Abu Dhabi (Source: the author)](image)

### 6.2.2.5 Building Form Standards

Based on the results in Chapter Four, all the regulating elements in the building form standards are covered in Abu Dhabi form-related regulations except the built-to line element. Built-to line is a line parallel to the property line where the façade of the building is required to be located. It keeps the visual character and continuity of the visual line of the street blocks (buildings).

Although the interviewed representative of ADUPC clarified that the commercial lots are generally sized in which it is the footprint and when the area is being planned it is considered, the results of this research show that in Abu Dhabi there are some potential limitations of the adoption of this element due to the lack of awareness about the importance of this element among some of the interviewed representatives of ADM and the interviewed planners. As all the interviewed representatives of ADM stated, this element is restrictive and the commercial lot size...
in the neighborhoods is not too large which makes is difficult to apply it. Incentives can be offered to the owners as one of the interviewed representatives of ADM suggested.

However, this is relevant to what has been revealed in Chapter Three, in the case of Makkah a workshop held for engineers in the municipalities to identify the problems with the conventional zoning and in the case of Grandhome events were held for the local stakeholders. Thus, if this element will be adopted within Abu Dhabi localized FBC, as the commercial aspect may control this element, offering incentives and raising stakeholders’ awareness about the importance of character and the street line is required (Figure 6.9).

Figure 6.9: The difficulties and proposed actions of the adoption of the built-to line element in Abu Dhabi (Source: the author)

6.2.2.6 Frontage Type Standards

As described before in Chapter Two, the frontage standards explore in detail the regulations of buildings frontage types represented in the depth, width and height. Also if the frontage type of a building is facing a walkway, shading should be considered. The results of this research show that shading is an important element that should be included within Abu Dhabi form-related regulations for its hot climate as stated by the interviewed representative of ADUPC. This element could be considered and adopted without any difficulties as all the interviewed representatives stakeholders stated. In terms of design, the regulations of frontage types should not be restricting the creativity of architects as the interviewed planners and one of the interviewed
representatives of ADM stated.

Additionally, the social aspect plays a critical role in the determination of frontage types for the residential units. Although fences may prevent the social interaction between families as a few of the interviewed Emirati residents mentioned, all the interviewed stakeholders believed that the fence is an indispensable element and a key social demand in Emirati housing which ensures privacy and comfort for Emirati families. This is what prompted some of the Emirati interviewees to claim that they need spaces between residential plots and not even sharing fences with others. Accordingly, there are several treatments to those fences to make them more attractive and get benefits from them to the public including linking them to arcades to provide shading for pedestrian as one of the interviewed representatives of ADM suggested. Additionally, trees would be one of the solutions for both solid fences and shading as the interviewed planners suggested (Figure 6.10).

![Figure 6.10: The difficulties and proposed actions of the adoption of shading regulations within Abu Dhabi form-related regulations (Source: the author)](image)

### 6.2.2.7 Architectural Standards

From Chapters Two and Three, the architectural standards play an important role in maintaining the local character of an area. However, Chapter Four revealed that architectural standards are not considered within Abu Dhabi form-related regulations.

The results of this research show that the architectural standards are needed in Abu Dhabi as all of the interviewed representatives of ADUPC, ADM and the interviewed planners. Accordingly, the absence of architectural standards had resulted
in the loss or floating identity of Abu Dhabi as mentioned by two of the interviewed representatives of ADM. Additionally, some of the interviewed Emirati residents referred to that the new urban neighborhoods lack livability as well as missing attractive and landmark buildings. Thus, the interviewed representative of ADUPC indicated that the architectural standards will be addressed via the architectural pattern book that ADUPC is working on.

However, based on the interviewed stakeholders’ responses in the previous chapter, the identification of various architectural forms within architectural standards in Abu Dhabi is trapped by several restraints that must be considered when developing FBC for Abu Dhabi new urban neighborhoods. Firstly, the regulations must consider the ongoing environmental changes with respect to the rating system ‘Estidama’ as one of the interviewed representatives mentioned. Secondly, the globalism and its relation to the character of a city is a thorny issue. As one of the interviewed representatives of ADM stated, Abu Dhabi strives to be a world-class Emirate so it is needed to find out a balance between realizing globalization and maintaining the local character of Abu Dhabi and a well identification for the assets and goals from these standards. Thus the regulations should be a supporting tool for Abu Dhabi Vision and not hindering the realization of the universality considering the ongoing changes and the needs of Abu Dhabi as one of the interviewed representatives of ADM mentioned. Thirdly, understand the goal of the traditional architectural elements in heritage. This is relevant to most of the case studies explored in Chapter Three. Understanding the local context would lead to meaningful localized codes and architecture for Abu Dhabi. Fourthly, the identification of guiding forms within architectural standards could restrict the architects and limit their creativity; therefore, buildings should not be the same as the interviewed representative of ADUPC and the interviewed planners
stated. Therefore, the architectural standards should include variety forms so that architects will not be restricted as the interviewed planners indicated. Also, offering incentives for architects and owners helps in encouraging them to design and develop diverse communities as one of the interviewed representatives of ADM mentioned. In addition to that, workshops need to be held to raise all community members’ awareness of including practitioners as well as owners as one of the interviewed representatives of ADM indicated. Finally, as one of the interviewed representatives claimed, the commercial aspect affects the urban form of Emirati communities. The architectural standards must consider the cost when identifying the forms for Abu Dhabi new urban neighborhoods. Also, codes must reflect the social and culture aspects of community as one of the interviewed representatives mentioned (Figure 6.11).

From the above analysis and Tables 6.1 and 6.2, it is found that there are some elements that can be adopted without any problems while others need an effort to be considered for a localized FBC for Abu Dhabi. For the first general issue, all form-related regulations of Abu Dhabi can be combined in one FBC and this was encouraged by all stakeholders with some proposed actions, including establish a strategic plan to unify all goals and regulations and change the willingness of all stakeholders.

Additionally, FBC should be adopted by-right firstly as stated by the interviewed representative of ADUPC to maintain the strict level of regulations. A calibrated SmartCode would be adopted in addition to specific regulations for each neighborhood. For the components, for example, the cycle track plays a critical role in the safety for cyclists and pedestrians.
Figure 6.11: The difficulties and proposed actions of identifying architectural guiding forms for a localized FBC for Abu Dhabi (Source: the author)

Table 6.1: The difficulties and opportunities for developing a FBC for Abu Dhabi new urban neighborhoods (Source: the author)

<table>
<thead>
<tr>
<th>FBC-General issue</th>
<th>Challenge</th>
<th>Opportunities</th>
<th>Suggested by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unify all standards in one document</td>
<td>o Fragmented form-related regulations</td>
<td>• All of them agree on unifying all form-related regulations</td>
<td>CAR, LAR, IP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Establish a strategic plan to unify all goals and regulations</td>
<td>CAR, LAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Change the willingness of all stakeholders</td>
<td>CAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unify the form-related regulations will facilitate the design and revision process</td>
<td>LAR, IP</td>
</tr>
<tr>
<td>Appropriate type of FBC</td>
<td>o Appropriate type of FBC for Abu Dhabi</td>
<td>• Adopt a calibrated SmartCode with special regulations for each community</td>
<td>CAR, LAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adopt FBC firstly by-right</td>
<td>CAR</td>
</tr>
<tr>
<td>Involve community members</td>
<td>o Limited community participation</td>
<td>• Some of the stakeholders encourage the community involvement</td>
<td>CAR, LAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If FBC will be developed in Abu Dhabi there will be community involvement through a focus group</td>
<td>CAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Raise awareness of Emirati community</td>
<td>LAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• All express their willingness to participate</td>
<td>ILCM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hold separate meetings for women and men</td>
<td>ILCM</td>
</tr>
<tr>
<td>The provision of various housing types</td>
<td>o Limited to single family houses</td>
<td>• Some of the interviewed stakeholders encourage the provision of various housing types</td>
<td>CAR, LAR, IP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ask residents if they want to live in multi-story buildings</td>
<td>CAR, LAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Offer incentives for Emiratis who accept to live in multi-story residential buildings</td>
<td>LAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Consider privacy and special elements (for example: not too high multi-story buildings, one flat per floor)</td>
<td>LAR, IP, ILCM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct a feasibility study about providing mixing of housing types in Abu Dhabi</td>
<td>IP</td>
</tr>
</tbody>
</table>

Legend: - CAR: Central Authority Representative - IP: Interviewed Planners
- LAR: Local Authority Representative - ILCM: Interviewed Local Community Members
Table 6.2: The difficulties and opportunities for developing a localized FBC for Abu Dhabi new urban neighborhoods in terms of components (Source: the author)

<table>
<thead>
<tr>
<th>FBC-Components</th>
<th>Challenge</th>
<th>Opportunity</th>
<th>Suggested by</th>
</tr>
</thead>
</table>
| Regulating plan | ○ Abu Dhabi depends on the conventional zoning | • Raise all stakeholders awareness  
• Issue documents to provide regulations that must be enforced by the municipality | CAR |
| Public space standards | ○ The provision of cycle track is optional | • The majority of stakeholders found it important to provide cycle track in the neighborhoods  
• Cycle track would ensure safety for pedestrian and cyclists  
• Provide cycle track would encourage community members to practice cycling  
• Consider the ongoing changes of Emirati community lifestyle  
• Cycling supports the Abu Dhabi sustainable 2030 vision | LAR, IP, ILCM |
| ○ Frontage type not considered | • All the interviewed stakeholders agree on identifying various frontage types for each street type | CAR, LAR, IP |
| Block standards | ○ The block size is recommended | • Conduct a study about sustainable urban block in terms of size, orientation and shape  
• Ask residents about the distances to facilities  
• Some of the interviewed Emirati residents found no places in their neighborhoods to walk to | LAR, IP, ILCM |
| Building type standards | ○ Frontage type is not identified | • All the interviewed stakeholders encourage the adoption of this element  
• Identify the allowable building frontage types without restricting creativity  
• Conduct periodic follow-up and inspections for the frontages including gallery and arcades | CAR, LAR, IP |
| ○ Building size and massing | • All stakeholders encourage the adoption of this element  
• Offer incentives for owners, for example: allow owners to increase the number of floors | CAR, LAR, IP |
| Building form standards | ○ Built-to line | • It is usually considered when new areas are being planned | CAR |
| ○ Shading regulations and solid fences | • All the interviewed stakeholders encourage the adoption of the shading standards  
• Consider special treatments for fences | CAR, LAR, IP |
| Frontage type standards | ○ No architectural standards in Abu Dhabi | • All the interviewed stakeholders believe the need for architectural standards in Abu Dhabi of this components  
• Most of the interviewed stakeholders believe that Abu Dhabi new urban neighborhoods need diverse buildings and designs  
• Develop an architectural pattern book  
• Define well the assets and goals of the Emirate  
• Consider ongoing environmental changes (Estidama)  
• Provide various forms to avoid restricting creativity  
• Consider ongoing needs of Abu Dhabi  
• Consider and understand the goal from heritage elements  
• Offer incentives would encourage architects to create and adopt more localized forms | CAR, LAR, IP, ILCM |

Legend:  - CAR: Central Authority Representative  
- LAR: Local Authority Representative  
- IP: Interviewed Planners  
- ILCM: Interviewed Local Community Members
Furthermore, architectural standards have a high significant among all stakeholders. They all agree on the importance of the element where Abu Dhabi lacks standards that reflect its culture and heritage. This can be realized through defining well the assets and goals of the Emirate, defining well the assets and goals of the Emirate, considering the ongoing environmental changes (Estidama), providing various guiding architectural forms to avoid restricting creativity as well as considering and understanding the goal from heritage elements. If the proposed additions and modifications are applied for a localized FBC for Abu Dhabi, it would help realize sustainable urban form in Abu Dhabi new urban neighborhoods.

**Conclusion**

This chapter summarized and analyzed the results of this research to find out the difficulties as well as the opportunities to overcome the obstacles that may face the adoption and the development the proposed additions and modifications for a localized FBC for Abu Dhabi new urban neighborhoods. From the above discussion, according to the general issues, unifying the form-related regulations in Abu Dhabi gains high significance. Also the community involvement in the design process is not accepted by most of the stakeholders while all community members expressed their willingness to participate in designing and planning new neighborhoods. The provision of various housing types in Abu Dhabi is strongly restricted by the social factors. However, residents can be asked about what are the special requirements that flats must have to suit the Emirati community. Finally, there is a need for identifying the architectural standards to create more localized built environment in Abu Dhabi.
Chapter 7: Conclusion and Recommendations

7.1 Conclusion

Sustainable community development has been perceived as a critical solution for all problems associated with urban sprawl and high dependency on cars. This research introduced FBC as a sustainable and an alternative tool to the conventional zoning. It has the potential to realize all the characteristics of sustainable urban form in all its perspectives through achieving compact, mixed-use, and pedestrian-friendly development as well as promoting a sense of place diversification of housing types. Further, FBC is distinguished by its ability to rebalance the linkages between the elements of built environment and public realm through major components depending on the scope and scale of the project. Mainly, the major components of FBC are the regulating plan, public space standards, block standards, building type standards, building form standards, frontage type standards, architectural standards and glossary. The research also reviewed five case studies and identified the main steps for developing FBC for new urban neighborhoods. Two cases were from the USA as the origin of FBC, one from Scotland, one from Gabon and one from Kingdom of Saudi Arabia as examples from developing country. City of Cincinnati depends on developing FBC for all new urban neighborhoods while in Gabon and Kingdom of Saudi Arabia a calibrated SmartCode for new urban neighborhood is adopted. However, there are five common stages for developing a localized FBC: scoping, documenting, pre-charrette, charrette, architectural charrette and post-charrette. With this, the research achieved the first research objective and answered the first question of the research on how FBC regulates the built environment and helps realizing sustainable neighborhoods.
Locally, the research presented the form-related standards and guidelines for Abu Dhabi new urban neighborhoods and studied their compatibility with FBC in terms of components and process. It has found that there are some regulating elements that were included and others not. For example, most of the elements of public spaces standards are included within Abu Dhabi form-related regulations while architectural standards are not included and they were limited to optional guidelines for a few architectural forms and do not assure the creation of built environment that reflects the local character of Abu Dhabi. In terms of process of development, the form-related regulations of Abu Dhabi new urban neighborhoods were issued by several government authorities as well as ADUPC through various processes depending on the scope of the manuals and standards including design workshops and meetings, reviewing best standards and specifications applicable worldwide, benchmarking studies in addition to reviewing previous documents. However, the community involvement is absent in the development process of the form-related regulations and new urban neighborhoods in Abu Dhabi. It is limited to holding meetings in majalis (councils) for residents in the neighborhoods. This achieved the second research objective and answered the second research question on the extent to which form-related standards and guidelines of Abu Dhabi for developing new urban neighborhoods align with FBC components and process.

Accordingly, the research proposed additions and modifications to the existing related regulations for a localized FBC Abu Dhabi new urban neighborhoods as well as determining the target group from the stakeholders based on the latest sustainable planning tool to be utilized in the investigation of its applicability in Abu Dhabi. Based on the responses, there were some general issues and regulating elements that can be adopted without any obstacles while others that face several obstacles.
The results indicated that in order to overcome these obstacles and for a more effective FBC for Abu Dhabi new urban neighborhoods, there is a need for several actions. Developing a strategic plan and maintaining the strict level of the regulations would play an important role in overcoming the obstacles that may face the development and adoption of FBC for Abu Dhabi new urban neighborhoods. Also, raising authorities’ awareness about the importance of having a unified code that is related to the physical built environment is another proposed solution.

Additionally, as the codes must respect the culture and social values of a community, one of the opportunities related to the general concepts of FBC in Abu Dhabi requires gradual change before adopting it including the provision of various housing types which face social obstacles. Therefore, starting to give people the choice for having a flat with special specifications that respects the needs of Emirati family is one of the important steps. In addition, the provision of cycle tracks within new urban neighborhoods would encourage people to practice cycling. Furthermore, the architectural standards are considered important elements that help to reflect the local character so that guiding forms would help in promoting the local identity of Abu Dhabi. Through this, the research achieved the third research objective and answered the third question on what the opportunities and obstacles of adopting comprehensive customized FBC for Abu Dhabi new urban neighborhoods based on the existing form-related regulations are.

7.2 Recommendations

The recommendations of this research are categorized into four levels: central authority, local authority, planners and community members. Firstly, at the level of the central authority, it is recommended to set a timetable and an action plan for the
development and adoption of FBC, conduct several meetings and charrettes with community members during and after developing the code, increase their awareness about the importance of community involvement in developing FBC and new urban neighborhood in Abu Dhabi, schedule site visits of successful examples and case studies that developed and adopted FBC, develop guiding forms that ensure the creation of an expressive architecture that helps in promoting and preserving the identity of Abu Dhabi, and adopt the incentive system.

Secondly, at the level of the local authority, the research proposes conducting various workshops and training sessions for representatives from the local authorities and practitioners to enhance their knowledge of the importance of sustainable urban form and FBC as a tool with a direct implication on the form of the built environment and public realm and clarifying the way of developing and adopting FBC.

Thirdly, at the level of the planners, the research recommends raising planners’ awareness on the importance of community involvement in the development process of FBC and new urban neighborhoods.

Fourthly, at the level of community members, the effort from community members must entwined with central and local authority as well as planners to realize the desired built environment. This could be achieved through community involvement in regular community events and design charrettes. As a result, community participation would promote the sense of community and would have a positive impact through promoting the responsibility of community members towards their neighborhoods and surrounding as well as raising community members’ awareness on the importance of standards and guidelines in regulating spaces.
7.3 Future Research

Further research can be conducted to examine the applicability of FBC on the existing neighborhoods in Abu Dhabi, or on different scales for more sustainable urban forms in the Emirate of Abu Dhabi.
Bibliography


Appendix 1

Pilot study

Interview form for specialists

The development of sustainable urban communities requires the integration of sustainability concepts with several fields including the urban form. Sustainable urban form is categorized by various criteria including compactness, high density, mixing of land uses, diversification of housing types, achieving walkability and cycling as well as community involvement in decision making and design process. This research aims to shed light on Form-Based Code (FBC) as a sustainable zoning tool that helps realize sustainable urban form and sustainable communities. FBC is usually comprised of eight major components: regulating plan as the base for other FBC components, public spaces standards, block standards, building types standards, building form standards, frontages type standards, architectural standards and glossary. The adoption of FBC is highly accelerated all over the world in developed and developing countries, for example: USA, Canada, Australia, Gabon and Kingdom of Saudi Arabia. The following questions aim to find out the opportunities and barriers that may face the development and adoption of FBC for Abu Dhabi new urban neighborhoods as a tool that help achieve Abu Dhabi vision 2030.

1. By doing review for the currently form-related standards and guidelines for planning and designing Abu Dhabi new urban neighborhoods, it is found that they are related to more than five manuals. Unifying them is needed to help achieve the vision of Abu Dhabi government in realizing sustainable communities. What are the constraints for combining all these in one FBC of Abu Dhabi?

3. How can they be overcome?

4. Developing FBC requires the participation of different parties. Some case studies developed and adopted FBC firstly ‘by-right’ without public hearing. Do you think that the development and adoption of FBC in Abu Dhabi have to be first by-right? Why?

5. Engaging the community members is an essential step in the early stages of developing FBC and new urban neighborhoods. Do you encourage the participation of community members in the early stages of developing FBC and designing new Emirati urban neighborhoods? Why?

6. If you encourage the participation of community members, in your opinion, what is the appropriate way of doing the same (questionnaire, charrette …)?

7. There are different ways to develop FBC. Various approaches are: developing one code for all new urban neighborhoods or for a specific new urban neighborhood,
adopting a calibrated SmartCode for all new urban neighborhoods or for a specific new urban neighborhood. What is the most appropriate approach for Abu Dhabi from your point of view? Why?

(SmartCode: is a model for form-based code that can be tailored and used on all planning scales from regional planning to the building scale).

8. In FBC the regulating plan is: a plan or map of the regulated area designating the locations where several regulatory principles are presented including building forms, street types and building frontage types based on clear community intentions regarding the physical character of the area being coded (Figure 1, Figure 2). In your opinion, what are the difficulties in developing regulating plans for new urban neighborhoods in Abu Dhabi?

9. How they can be overcome?

10. According to Urban Street Design Manual, providing a cycle track within a new urban neighborhood is optional. Why? Do you encourage to convert it to mandatory?

11. In FBC the allowable building frontage type for each street type is identified to prescribe the desired place (Figure 3). In your opinion, what are the difficulties in identifying the allowable frontage type for each street type in Abu Dhabi new urban neighborhoods?

12. How they can be overcome?

13. In the Urban Structure Framework Plan within Plan Abu Dhabi 2030, the proposed block size (fareej) is 240 m x 240 m. Is this the maximum block size for all new urban neighborhoods in Abu Dhabi?

14. Do you think that this is size suitable for walking?

15. One of the characteristics of sustainable urban form is mixing of housing types. Locally, there is a trend adopted by one local housing program towards developing multi-story residential building for Emiratis (Figure 4 and Figure 5). (For example, the residential building in Fujairah- Al Gghurfa developed by Sheikh Zayed Housing Program). Do you agree on mixing of housing types to include multi-story residential buildings? Why?

16. FBC defines the relation between height and massing of the building to help reduce the effect of building height on pedestrian. This is achieved by determining a setback at specific height. What are the difficulties that may occur when developing this element in mixed use buildings in Abu Dhabi new urban neighborhoods?

17. How they can be overcome?
18. In FBC, the allowed frontage type is determined for each building type. It represents the transition space between the public and private realms. What is your opinion about identifying the allowable frontage type for each building type? Why?

19. Built-to line: is a line parallel to the property line where the façade of the building is required to be located. Do you encourage the adoption of this item in Abu Dhabi new urban neighborhoods? Why?

20. The frontage type of the residential lots is limited to solid fences surrounding the residential units. What are the problems of determining different frontage types for more attractive walkways?

21. How they can be overcome?

22. In FBC shading is considered when regulating building frontages that face sidewalks. Do you think that this element can be applied in Abu Dhabi new urban neighborhoods for fences that surround the residential units and mixed-use buildings that serve the neighborhoods? Why?

23. Architectural standards in FBC provide directions for the design of buildings to maintain and promote the local character. What is your opinion about identifying various guiding forms that reflect Abu Dhabi character and heritage in new urban neighborhoods (building style, various windows types, …)? Why?
Interview form for community members

General information:

Gender: □ Male □ Female
□ 20-29 □ 30-39 □ 40-49

Marital status: □ Married □ Single

Job: ______________________

1. If you are asked to participate in meetings to develop a design for a new neighborhood that you will live in, would you like to participate?
□ Yes □ No
Why?

2. If yes, how would you like to participate?
□ Questionnaire □ Public meetings □ Others …. (describe)

3. Do you think that it is important to provide cycle tracks in the neighborhood?
□ Yes □ No
Why?

4. Do you practice walking regularly in your neighborhood?
□ Yes □ No
Why?

5. Do you agree on living in multi-story residential blocks if they considered privacy where each floor has one flat and provision for parking spaces?
□ Yes □ No
Why?

6. Do you agree on living in a different single family housing types that are not surrounded by fences (For example: Courtyard houses)?
□ Yes □ No
Why?

7. Do you have any comments regarding the exterior design of the house?
Appendix 2

The interview forms after modification

Interview form for ADUPC representative

The development of sustainable urban communities requires the integration of sustainability concepts with several fields including the urban form. Sustainable urban form is categorized by various criteria including compactness, high density, mixing of land uses, diversification of housing types, achieving walkability and cycling as well as community involvement in decision making and design process. This research aims to shed light on Form-Based Code (FBC) as a sustainable zoning tool that help realize sustainable urban form and sustainable communities. FBC is usually comprised of eight major components: regulating plan as the base for other FBC components, public spaces standards, block standards, building types standards, building form standards, frontages type standards, architectural standards and glossary. The adoption of FBC is highly accelerated all over the world in developed and developing countries, for example: USA, Canada, Australia, Gabon and Kingdom of Saudi Arabia. The following questions aim to find out the opportunities and barriers that may face the development and adoption of FBC for Abu Dhabi new urban neighborhoods as a tool that help achieve Abu Dhabi vision 2030.

1. By doing review for the currently form-related standards and guidelines for planning and designing Abu Dhabi new urban neighborhoods, it is found that they are related to more than five manuals. Unifying them is needed to help achieve the vision of Abu Dhabi government in realizing sustainable communities. Do you think that Abu Dhabi should have a unified FBC of its own? Why?

2. What are the constraints for combining all these in one FBC of Abu Dhabi?

3. How can they be overcome?

4. Developing FBC requires the participation of different parties. Some case studies developed and adopted FBC firstly ‘by-right’ without public hearing. Do you think that the development and adoption of FBC in Abu Dhabi have to be first by-right? Why?

5. Engaging the community members is an essential step in the early stages of developing FBC and new urban neighborhoods. Do you encourage the participation of community members in the early stages of developing FBC and designing new Emirati urban neighborhoods? Why?

6. If you encourage the participation of community members, in your opinion, what is the appropriate way of doing the same (questionnaire, charrette …)?

7. There are different ways to develop FBC. Various approaches are: developing one code for all new urban neighborhoods or for a specific new urban neighborhood,
adopting a calibrated SmartCode for all new urban neighborhoods or for a specific new urban neighborhood. What is the most appropriate approach for Abu Dhabi from your point of view? Why?

(SmartCode: is a model for form-based code that can be tailored and used on all planning scales from regional planning to the building scale).

8. In FBC the regulating plan is: a plan or map of the regulated area designating the locations where several regulatory principles are presented including building forms, street types and building frontage types based on clear community intentions regarding the physical character of the area being coded (Figure 1, Figure 2). In your opinion, what are the difficulties in developing regulating plans for new urban neighborhoods in Abu Dhabi?

9. How they can be overcome?

10. According to Urban Street Design Manual, providing a cycle track within a new urban neighborhood is optional. Why? Do you encourage to convert it to mandatory?

11. In FBC the allowable building frontage type for each street type is identified to prescribe the desired place (Figure 3). In your opinion, what are the difficulties in identifying the allowable frontage type for each street type in Abu Dhabi new urban neighborhoods?

12. How they can be overcome?
In the Urban Structure Framework Plan within Plan Abu Dhabi 2030, the proposed block size (fareej) is 240 m x 240 m. Is this the maximum block size for all new urban neighborhoods in Abu Dhabi?

Do you think that this is size suitable for walking?

One of the characteristics of sustainable urban form is mixing of housing types. Locally, there is a trend adopted by one local housing program towards developing multi-story residential building for Emiratis (Figure 4 and Figure 5). (For example, the residential building in Fujairah- Al Gghurfa developed by Sheikh Zayed Housing Program). Why new Emirati urban neighborhoods in Abu Dhabi depends only on villas?

Do you agree on mixing of housing types to include multi-story residential buildings? Why?
17. FBC defines the relation between height and massing of the building to help reduce the effect of building height on pedestrian. This is achieved by determining a setback at specific height (Figure 6). What are the difficulties that may occur when developing this element in mixed use buildings in Abu Dhabi new urban neighborhoods?

18. How they can be overcome?

19. In FBC, the allowed frontage type is determined for each building type. It represents the transition space between the public and private realms (Figure 7). What is your opinion about identifying the allowable frontage type for each building type? Why?
20. **Built-to line:** is a line parallel to the property line where the façade of the building is required to be located. It keeps the visual character and continuity of the visual line of the street blocks (buildings) (Figure 8). Do you encourage the adoption of this item in Abu Dhabi new urban neighborhoods? Why?

21. The frontage type of the residential lots is limited to solid fences surrounding the residential units. What are the problems of determining different frontage types for more attractive walkways? How they can be overcome?

22. In FBC shading is considered when regulating building frontages that face sidewalks. (The following are general standards for frontage types). Do you think that this element can be applied in Abu Dhabi new urban neighborhoods for fences that surround the residential units and mixed-use buildings that serve the neighborhoods? Why?

**Example of general standards for frontage type:**

- ‘When regulating buildings at or near the sidewalk edge, allow awnings to encroach 3 m as long as there are no conflicts with the sidewalk depth, street trees and lighting. For comfortable, pedestrian-oriented sidewalks, awnings are necessary to relate the larger buildings to the scale of the pedestrian and provide shade in hotter climates’.

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**Figure 7: Frontage types**

**Figure 8: Example for build-to line element**
- ‘When regulating galleries and arcades, require them to encroach into the public Right of Way over the sidewalk. Similarly to awnings, galleries provide shade’.

23. Architectural standards in FBC provide directions for the design of buildings to maintain and promote the local character. What is your opinion about identifying various guiding forms that reflect Abu Dhabi character and heritage in new urban neighborhoods (building style, various windows types, …)? Why?

24. Would you like to raise any point that has not been raised in this form relevant to Form-Based Code (FBC) or sustainable urban form in general for Abu Dhabi new urban neighborhoods?
Interview form for ADM representatives

The development of sustainable urban communities requires the integration of sustainability concepts with several fields including the urban form. Sustainable urban form is categorized by various criteria including compactness, high density, mixing of land uses, diversification of housing types, achieving walkability and cycling as well as community involvement in decision making and design process. This research aims to shed light on Form-Based Code (FBC) as a sustainable zoning tool that help realize sustainable urban form and sustainable communities. FBC is usually comprised of eight major components: regulating plan as the base for other FBC components, public spaces standards, block standards, building types standards, building form standards, frontages type standards, architectural standards and glossary. The adoption of FBC is highly accelerated all over the world in developed and developing countries, for example: USA, Canada, Australia, Gabon and Kingdom of Saudi Arabia. The following questions aim to find out the opportunities and barriers that may face the development and adoption of FBC for Abu Dhabi new urban neighborhoods as a tool that help achieve Abu Dhabi vision 2030.

1. By doing review for the currently form-related standards and guidelines in Abu Dhabi, it is found that they are scattered and belong to more than eight manuals. Unifying them is needed to help achieve the vision of Abu Dhabi government in realizing urban sustainability. Do you have to check conforming to all form-related standards and guidelines to issue a license for new urban neighborhoods?

2. Do you encourage combining all form-related standards and guidelines? Why?

3. Engaging the community members is an essential step in developing the FBC and new urban neighborhoods. If FBC will be developed for Abu Dhabi’s new urban neighborhood, what is your opinion about the participation of community members? Why?

4. There are different ways to develop FBC. Various approaches are: developing one code from scratch for all new urban neighborhoods or for a specific new urban neighborhood, adopting a calibrated SmartCode for all new urban neighborhoods or a specific new urban neighborhood. What is the most appropriate approach for Abu Dhabi from your point of view? Why? (SmartCode: is a model for form-based code that can be tailored and used on all planning scales from regional planning to the building scale)

5. According to Urban Street Design Manual, providing a cycle track within a new urban neighborhood is optional. Do you encourage to convert it to mandatory? Why?

6. In FBC the allowable building frontage type for each street type is identified to prescribe the desired place (Figure 1). In your opinion what are the difficulties in
identifying the allowable frontage type for each street type in Abu Dhabi new urban neighborhood?

7. How they can be overcome?

8. In the Urban Structure Framework Plan within Plan Abu Dhabi 2030, the proposed block size (fareej) is 240 m x 240 m. Do you think that this is size suitable for walking? Why?

9. There is a trend adopted by one local housing program towards developing apartment building for nationals (Figure 2 and Figure 3). (For example, the residential building in Fujairah- Al Gghurfa developed by Sheikh Zayed Housing Program). Do you agree on mixing of housing types to include multi story apartment buildings for nationals in Abu Dhabi?

Figure 1: Thoroughfare standards

Figure 2: Watani community in Abu Dhabi

Figure 3: The residential building in Fujairah
10. In FBC, the allowed frontage type is determined for each building type. It represents the transition space between the public and private realms (Figure 4). What is your opinion about identifying the allowable frontage type for buildings? Why?

![Figure 4: Frontage types](image)

11. If multi story building is adopted, FBC defines the relation between height and massing of the building to help reduce the effect of building height on pedestrian. This is achieved by determining a setback at specific height (Figure 5). Do you encourage the adoption of this treatment in Abu Dhabi? Why?

![Figure 5: Illustration shows the relation between building height and massing](image)

12. Built-to line: is a line parallel to the property line where the façade of the building is required to be located. It keeps the visual character and continuity of the visual line of the street blocks (buildings) (Figure 6). What are the problems with applying this item in Abu Dhabi new urban neighborhoods?

13. How they can be overcome?
14. According to the Iskan Portal, the proposed lot width in Abu Dhabi is 36 m. Do you think that this width is appropriate for the new urban neighborhoods? Why?

15. The regulations in Abu Dhabi Development Code include the maximum plot coverage for villas to be 70%. Is this enough or the maximum building width should be defined as well? Why?

16. The frontage type of the residential lots is limited to fences surrounding the residential units. What are the problems of determining different frontage types?

17. Providing shading must be considered when frontages are facing walkways (The following are general standards for frontage types). Do you think that this can be applied in Abu Dhabi new urban neighborhoods especially for mixed-use buildings and neighborhood retail?

Example of general standards for frontage type:

- ‘When regulating buildings at or near the sidewalk edge, allow awnings to encroach 3 m as long as there are no conflicts with the sidewalk depth, street trees and lighting. For comfortable, pedestrian-oriented sidewalks, awnings are necessary to relate the larger buildings to the scale of the pedestrian and provide shade in hotter climates’.

- ‘When regulating galleries and arcades, require them to encroach into the public Right of Way over the sidewalk. Similarly to awnings, galleries provide shade’.

18. Architectural standards in FBC provide directions for the design of buildings to maintain and promote the local character. What is your opinion about identifying guiding forms that reflect Abu Dhabi character and heritage (building style, windows, …)? Why?

19. Would you like to add any point about FBC or sustainable urban form in general that is related to Abu Dhabi new urban neighborhoods?
Interview form for planners

The development of sustainable urban communities requires the integration of sustainability concepts with several fields including the urban form. Sustainable urban form is categorized by various criteria including compactness, high density, mixing of land uses, diversification of housing types, achieving walkability and cycling as well as community involvement in decision making and design process. This research aims to shed light on Form-Based Code (FBC) as a sustainable zoning tool that help realize sustainable urban form and sustainable communities. FBC is usually comprised of eight major components: regulating plan as the base for other FBC components, public spaces standards, block standards, building types standards, building form standards, frontages type standards, architectural standards and glossary. The adoption of FBC is highly accelerated all over the world in developed and developing countries, for example: USA, Canada, Australia, Gabon and Kingdom of Saudi Arabia. The following questions aim to find out the opportunities and barriers that may face the development and adoption of FBC for Abu Dhabi new urban neighborhoods as a tool that help achieve Abu Dhabi vision 2030.

1. By doing review for the currently form-related standards and guidelines in Abu Dhabi, it is found that they are scattered and belong to more than eight manuals. Unifying them is needed to help achieve the vision of Abu Dhabi government in realizing urban sustainability. Are the form-related standards and guidelines for new urban neighborhood easy to use?

2. What are the problems you face?

3. Engaging the community members is an essential step in developing the FBC and new urban neighborhoods. Do you think that the participation of community members would help more in designing Abu Dhabi’s new urban neighborhoods? Why?

4. What are the problems that may occur?

5. How they can be overcome?

6. According to Urban Street Design Manual, providing a cycle track within a new urban neighborhood is optional. Do you encourage to convert it to mandatory? Why?

7. In FBC the allowable building frontage type for each street type is identified to prescribe the desired place (Figure 1). In your opinion what are the difficulties in identifying the allowable frontage type for each street type in Abu Dhabi new urban neighborhood?

8. How they can be overcome?
9. In the Urban Structure Framework Plan within Plan Abu Dhabi 2030, the proposed block size (fareej) is 240 m x 240 m. Do you think that this is size suitable for walking? Why?

10. One of the characteristics of sustainable urban form is mixing of housing types. Locally, there is a trend adopted by one local housing program towards developing apartment building for nationals (Figure 2 and Figure 3). (For example, the residential building in Fujairah- Al Gghurfa developed by Sheikh Zayed Housing Program). Do you agree on mixing of housing types to include multi story apartment buildings for nationals in Abu Dhabi?
11. In FBC, the allowed frontage type is determined for each building type. It represents the transition space between the public and private realms (Figure 4). What is your opinion about identifying the allowable frontage type for each building type? Why?

12. What are the problems with identifying the allowable building frontage type?

13. How they can be overcome?

14. If multi story building is adopted, FBC defines the relation between height and massing of the building to help reduce the effect of building height on pedestrian. This is achieved by determining a setback at specific height (Figure 5). Do you encourage the adoption of this treatment in Abu Dhabi? Why?

Figure 4: Illustration shows the relation between building height and massing

P 15. Built-to line: is a line parallel to the property line where the façade of the building is required to be located. It keeps the visual character and continuity of the visual line of the street blocks (buildings) (Figure 5). What is your opinion about the adoption of this item in Abu Dhabi new urban neighborhoods? Why?
16. The maximum subdivision width for residential lots in new urban neighborhoods is 20 m- 25 m. Do you think that this width is an appropriate scale for new urban neighborhood? Why?

17. The frontage type of the residential lots is limited to fences surrounding the residential units. Do you encourage determining different frontage types? Why?

18. Providing shading must be considered when frontages are facing walkways. (The following are general standards for frontage types). Do you think that this can be applied in Abu Dhabi new urban neighborhoods especially for mixed-use buildings and neighborhood retail?

19. Architectural standards in FBC provide directions for the design of buildings to maintain and promote the local character. What is your opinion about identifying guiding forms that reflect Abu Dhabi character and heritage (building style, windows, …)? Why?

20. Would you like to add any point about FBC or sustainable urban form in general that is related to Abu Dhabi new urban neighborhoods?
Interview form for community members after modification

General information:

Gender: Age:
□ Male □ Female □ 20-29 □ 30-39 □ 40-49

Marital status: Job:
□ Married □ Single ______________

1. If you are asked to participate with your family in meetings to develop a design for a new neighborhood that you will live in, would you like to participate?

□ Yes □ No
Why?

2. If yes, how would you like to participate?

□ Questionnaire □ Public meetings □ Others …. (describe)

3. Do you think that it is important to provide cycle tracks in the neighborhood?

□ Yes □ No
Why?

4. Do you practice walking in your neighborhood for sport or going to specific places?

□ Yes □ No
Why?

5. Do you agree on living in multi-story residential blocks if they considered privacy where each floor has one flat and provision for parking spaces?

□ Yes □ No
Why?

6. Do you agree on living in a different single family housing types that are not surrounded by fences (Figure 1)?

□ Yes □ No
Why?

7. Do you have any comments regarding the exterior design of the house?
Figure 1: Example for housing types, a and b courtyard house, c and d common garden
Investigation of Form-related Regulations Vs. Form-Based Code in Abu Dhabi Urban Neighborhoods

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Abstract— Form-Based Code is a sustainable planning tool that helps realize sustainable urban form and sustainable communities from different perspectives, including mixing of land uses, diversifying housing types, achieving walkability and cycling as well as permitting community involvement in design processes. Locally, Abu Dhabi lacks FBC which could help in promoting its sustainable identity. Accordingly, this research aimed at reviewing the form-related regulations for developing Abu Dhabi new urban neighborhoods to investigate to what extent they coincide with the components of FBC as a universal practice. It has been found that the form-related regulations in Abu Dhabi are fragmented and they lack some essential components of FBC applications. There is a need for adding requirements to reflect the urban local identity of Abu Dhabi. The research ended up with developing a proposed FBC model for Abu Dhabi. Further research is planned to investigate the applicability of adopting this model.

Keywords— Abu Dhabi; Form-Based Code; Sustainability; neighborhoods

I. INTRODUCTION

Form-Based Code (FBC) is a sustainable planning tool and defined as: ‘Allocating land uses based primarily on the control of or influence over the physical form, intensity, and arrangement of buildings, landscapes, and public spaces that enable land or building functions to adapt to economic, environmental, energy, and social changes over time’ [1:11]. Thus, the main concern of the FBC is to regulate the elements and spaces in the public realm that includes buildings façades, surrounding streets and open spaces for more attractive and high quality built environment [2], with respect to human-scale [3]. In terms of process, developing FBC depends on the community involvement in decision making and design processes. Additionally, FBC should reflect the culture and local character of a place [4]. For decades now, the adoption of FBC is highly accelerated in both developed and developing countries, including: USA, Gabon and Kingdom of Saudi Arabia [5]. Locally, sustainability is a
key element in Abu Dhabi vision 2030. However, Abu Dhabi lacks FBC for new urban
neighborhoods which could help in achieving its 2030 vision and promoting its
envisaged sustainable identity. Therefore, this research aimed at exploring the major
components of FBC and reviewing the current form-related regulations for planning
and designing Abu Dhabi new urban neighborhoods. Additionally, comparative
analysis is used to find out to what extent the form-related regulations of Abu Dhabi
coincide with the components of FBC. Based on the results, the research will introduce
a proposed FBC model for Abu Dhabi new urban neighborhoods.

II. THE COMPONENTS OF FORM-BASED CODE

FBC is usually comprised of eight major components, for example:
Regulating plan presents zones according to building intensity and form including
type, placement, height, its relation to the public realm and the characteristics of the
public realm [7]. Public space standards is one of the major components of the FBC
that affect the quality of urban places in which they provide specifications for each
element within the public realm in terms of design and location. Block standards
define the maximum dimensions of blocks [3]. Building type standards define
various building types and how they should be arranged in relation to the
surrounding development [6]. Architectural standards regulate the massing and
combinations of materials [1]. Finally, the glossary defines all terms that are used in
FBC [6]. Basically, FBC depends on graphics, illustrations and perspectives for the
main concepts and requirements of the code that helps community recognize the
benefits of FBC [1]. Fig. 1 illustrates a typical building frontage and public Right-of-
Way (R.O.W) in an urban neighborhood street.
III. FORM-RELATED REGULATIONS FOR ABU DHABI NEW URBAN NEIGHBORHOODS

ADUPC, ADM, Department of Transportation (DOT) and other authorities are responsible for issuing form-related regulations/guidelines that regulate planning and designing Abu Dhabi new urban neighborhoods. They are distributed among more than six manuals. For example, Urban Street Design Manual (USDM) that is issued by ADUPC, regulates several elements of Abu Dhabi streets including crossing areas and bicycle lanes. The Executive Regulations for 1983 Law No. 4 concerning the regulating the building works in Abu Dhabi (2014) and issued by ADM. This document includes regulations for different building types. Although diversifying housing types is one of the sustainability indicators, in Abu Dhabi the provision of housing is restricted to villas. Additionally, although architectural standards play an important role in maintaining the local character of places, Abu Dhabi lacks architectural standards.

IV. RESULTS AND DISCUSSION

By reviewing the form-related regulations and guidelines for designing and planning Abu Dhabi new urban neighborhoods, it is found that they are fragmented. Therefore, this research is proposing a unified FBC model for Abu Dhabi new urban neighborhoods that helps realize sustainable communities. In addition, although the public space standards are mostly covered in the Abu Dhabi form-related regulations, providing the cycle track in new urban neighborhoods is optional. It is proposed that providing tracks for cycling in all Abu Dhabi new urban neighborhoods to be
mandatory. Also, the current form-related regulations of Abu Dhabi lacks standards that maintain the local character of Abu Dhabi. Accordingly, the proposed model recommends identifying guiding forms that reflect Abu Dhabi character and heritage. Table 1 shows part of the results and the FBC model for Abu Dhabi new urban neighborhoods.

### TABLE I. EXAMPLE OF THE RESULTS AND THE PROPOSED MODEL [SOURCE: THE AUTHORS]

<table>
<thead>
<tr>
<th>FBC components</th>
<th>Form-related regulations of Abu Dhabi</th>
<th>Proposed model: To be added/ Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public space standards</td>
<td>Bicycle lanes Providing cycle track is optional</td>
<td>Provide cycle track to be mandatory</td>
</tr>
<tr>
<td></td>
<td>Parking Parking*</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Civic spaces Public Realmb</td>
<td>-</td>
</tr>
<tr>
<td>Block standards</td>
<td>Maximum block length and perimeter The block size is recommended</td>
<td>Determine maximum dimensions for the block size</td>
</tr>
<tr>
<td></td>
<td>Building type standards Lot size Lot sizec</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Building size and massing Missing component</td>
<td>Identify the relation between height and massing</td>
</tr>
<tr>
<td></td>
<td>Building form standards Built-to line Considered in residential villasd</td>
<td>Identify built-to line for all building types</td>
</tr>
<tr>
<td></td>
<td>Frontage type standards Height, depth and width Missing component</td>
<td>Identify different frontage types</td>
</tr>
<tr>
<td>Architectural standards</td>
<td>Massing, Elements and materials Missing component</td>
<td>Identify guiding forms that reflect Abu Dhabi character</td>
</tr>
<tr>
<td>Glossary</td>
<td>Definitions for all regulating elements All terms are defined within Abu Dhabi form-related regulations</td>
<td>-</td>
</tr>
</tbody>
</table>

c. Source: Executive Regulations Law No. 4 concerning the regulating the building works (ADM, 2014)

d. Source: Executive Regulations Law No. 4 concerning the regulating the building works (ADM, 2014)

V. CONCLUSION

This research introduced the FBC that is considered a sustainable planning tool. It is characterized by regulating the built environment through rebalancing the linkages between the elements of the built environment and public realm realizing walkable, connected, attractive and sustainable neighborhoods. However, Abu Dhabi lacks a FBC and some essential components that reflect its local character. This research proposed a unified FBC model for Abu Dhabi new urban neighborhoods with several modifications and additions to the current form-related regulations of Abu Dhabi. For example, it is proposed to identify guiding forms that reflect the Abu Dhabi local character in new urban neighborhoods. Further research is planned to investigate the applicability of adopting this model in Abu Dhabi with stakeholders, including ADUPC, ADM, planners and Emirati residents.
References


