

# **Sustainable cities: an integrated strategy for sustainable urban design**

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## **Abstract**

It has been recognized that urban design has a vital role to play in fostering sustainable cities as urban spatial structure and form have considerable influence on the social, economic and environmental processes in the urban area. Research works have focused on the development of appropriate guidelines and frameworks for making urban design sustainable. However, the studies have not explored the development of a holistic approach to sustainable urban design. This paper seeks to develop an integrated framework, in the local context of Saudi Arabia, for promoting sustainable urban design. The paper discusses the role of urban design in promoting sustainable cities and examines the sustainable development principles that should guide urban design. The paper also discusses issues pertaining to sustainable urban design in Saudi Arabia. It concluded that sustainable urban design could only be achieved if the procedural, substantive, institutional, policy and methodological aspects of urban design are interlinked and guided by sustainability principles.

*Keywords: sustainable cities, sustainable urban design, sustainability principles, urban management, land use planning, Saudi Arabia.*

## **1 Introduction**

In recent times, the major challenges to urban management and development are the spate of rapid urbanization and the subsequent impacts of increasing human activities. The myriad of factors that influence urban development have made the task of taming urban problems enormous if not unachievable. The complexity of factors to be integrated by urban planners and designers in managing urban areas is compounded by globalization. Urban development is no longer mainly



directed by local forces but by global factors. Liddell and Mackie [1] noted that city form is now driven by organizations that are not local and which have imperatives that are not derived from local area. Consequent upon the influences of local and international economic forces, urban spatial structures and patterns are principally directed by economic imperatives leading to high social and environmental impacts. The negative impacts of development activities pose a great challenge to human living as close to half of the world's population lives in the city. The number of mega cities (cities with populations of over 10 million people) is expected to increase from 19 (with population of about 266.7million) in 2000 to about 27 (with population of about 374.8 million) in 2015 UNFPA [2]. That is, the environmental and social failures of the cities affect the high proportion of the world living within them.

Cities are not entirely problematic because they drive economies and it is within them that innovation occurs. Urban problems do not develop due to inherent characteristics of the cities but due to lack of effective governance and management Jenks and Burgess [3]. Land use planning and urban design have been recognized as having a major role to play in the management of urban development. Planning and urban design influence urban structure and form which eventually generate land use activities within the city. Good practice of city management requires that all the relevant dimensions (social, economic and environmental) to urban development be considered at the planning and design level. Traditionally, all these dimensions are considered in development planning during the planning process. The emergence of the concept of sustainable development has boosted the incorporation of the all the dimensions (social, economic and environmental) in the planning process. The principles of sustainable development require a balance consideration of social, economic and environmental implications of development activities. Quite a number of authors have expounded on the frameworks of integrating sustainability principles into urban design, Frey [4], Williams *et al* [5], Atkinson and Ting [6] and Carmona [7], but the frameworks have mainly explored the substantive and procedural aspects of urban design. There is the need to elaborate on the other dimensions of urban design.

In Saudi Arabia, there have been tremendous changes in urban spatial organization due to rapid urbanization and the transformation of the traditional built environment. The Kingdom has experienced a high rate of development and modernization through its petroleum-driven economy. Western urban models have been adopted to direct the development of the built environment. The western models are greatly in contrast with the traditional urban form and consequently the emerging modern urban spatial structures have generated some problems. The challenge lies in developing the built environment in a way that will be at pace with modern trend and harmonious with socio-cultural values. The integration of sustainability principles into urban design and development could open a window of opportunities for rescuing the situation. This paper seeks to develop an integrated framework, in the local context of Saudi Arabia, for promoting sustainable urban design. The paper discusses the role of urban design in promoting sustainable cities and examines the sustainable development



principles that should guide urban design. The paper also discusses issues pertaining to sustainable urban design in Saudi Arabia. It concluded that sustainable urban design could only be achieved if the procedural, substantive, institutional, policy and methodological aspects of urban design are interlinked and guided by sustainability principles.

## 2 Urban design and sustainable development

The concept of sustainable development originated from the World Commission on the Environment and Development in 1987 and it has become the goal of every society. The broad goal of sustainable development is inter- and intra-generational equity. The principle of sustainable development advocates that social, economic and environmental issues should be given balance consideration in development activities. The objectives of sustainable development are laudable but they are seemingly elusive in practice. In order to bridge the gap between the principle and practice of sustainable development, a global action plan "Agenda 21" was formulated at the Earth Summit held in Rio de Janeiro in 1992. Agenda 21 elaborated on the need for indicators and local initiatives to promote sustainability [8]. The basis of the Local Agenda 21 initiative is that local communities need to become involved in making their neighborhoods sustainable which should, in turn, have a knock-on effect in achieving global sustainability [9]. Due to the importance of the cities, the implementation of Local Agenda 21 at the city is recognized as a vital approach to sustainability. The participation of the local authorities especially at the city level is crucial to achieving global sustainable development.

Urban design and planning offer the opportunity to guide city development towards sustainability as noted by Miller [10] that most urban areas use planning to determine present and future use of each parcel of land in the area. One of the ways in which local authorities can deliver sustainability is through making their land use planning process sustainable [11]. As planning has a vital role in achieving sustainable urban development; the planning process and the outcome of planning should be guided by the principles of sustainable development. Thus, urban design conceptualizations should include sustainable dimension in the design guidelines which hitherto make reference to morphological, functional, social and visual dimensions.

There is a tendency to weigh economic considerations more than social and environmental factors and even assume that cities are mainly shaped by economic forces. Despite the influence of market forces on the spatial organization of cities, urban design can play an important role in protecting the cities from market failures. The effects of city form and structure on sustainability cannot be disregarded because the configuration of the city influences the function and quality of the city. Frey [4] rightly observed that cities with physical structures that are strictly the products of a market economy rather than being planned become sterile, functionally suboptimal, and unsustainable. Such cities fail to maintain identity, sustainability, amenity, and diversity. Urban development should not be solely driven by market forces but



by an integration of all the relevant factors. Thus, cities need to be designed and planned to foster sustainable urban development. It is the task of urban planning and design to enable and enhance the city's advantages and to minimize, if not eliminate, the city's disadvantages [4]. This poses a challenge for sustainable urban design to identify guidelines that improve environmental quality while leading to social and economic development of the city [1].

### **3 Towards sustainable urban design**

Having recognized the crucial role that could be played by urban design in fostering livable and sustainable cities, different governments and urban administrators have tried to reestablish urban design in the arena of urban development. In Britain, urban design has started taking root in government planning guidance since 1992 and the process has culminated into the development of urban design guidance [12]. Similar initiatives have been taken by cities in the United States such as the Sustainable Seattle initiated by the city of Seattle [13]. The emerging urban initiatives make reference to good urban design based on the premise that urban design can help promote sustainability and reduce if not eliminate present urban problems. However, it has been noted especially in the United Kingdom that more drastic steps must be taken to really succeed in fostering sustainability through urban design [14]. Carmona [14] highlighted the need for design policy and guidance based on primary concern for urban design, policy mechanism based on fully conceptualized urban design framework and hierarchical approach to design policy and guidance in order to improve on the current practice in the United Kingdom.

Apart from the government institutions, urban researchers have also contributed to the debate on promoting livable cities through good design. Even different urban design and planning movements have emerged to advocate for better quality of life in the cities. The notable groups among these movements are the New Urbanism and the Smart Growth. New Urbanism is an urban design movement that is committed to the restoration of urban centers through participatory planning and design while the Smart Growth advocates for reformation of state growth management regulations to foster livable cities [15]. Most of the commentators on the issues concerning sustainable design tend to focus on the substantive and the procedural aspects (as shown by the terms of reference of the movements). It is imperative to develop a holistic approach to the issues bordering on sustainable urban design.

### **4 Challenges of sustainable urban design in Saudi Arabia**

Prior to the 1950s, urban development in Saudi Arabia was mainly influenced by traditional Islamic urbanism. However, since the 1950s, the physical arrangement of Saudi cities has changed due to the adoption of the gridiron pattern streets and villa housing. The change has led to socio-cultural contradictions [16] including issues of privacy and security. Efforts have been directed at promoting good city design through the adoption of the New



Urbanism concepts [17]. The efforts could achieve better results if the challenges to sustainable urban design in the Kingdom are addressed in an integrated framework. The task is to highlight the challenges to sustainable urban design and then develop the framework to address these challenges. Different social, economic and environmental factors pose challenges to sustainable urban design in the Kingdom. These include:

- institutional framework – the kingdom has a centralized institutional arrangement and limited autonomy is granted to the municipalities;
- the climate factor – special design capability is needed to protect the populace from the desert climate and at the same time reduce energy consumption;
- pattern of living – the populace relies on automobile for travel and it may be socially difficult to change to public transportation;
- low level of public awareness – environmental awareness among the populace is still low;
- political will - the political will is not so strong.

The factors listed above hinder the achievement of sustainable urban design in Saudi Arabia. Some of these factors are general while some are specific to the Kingdom.

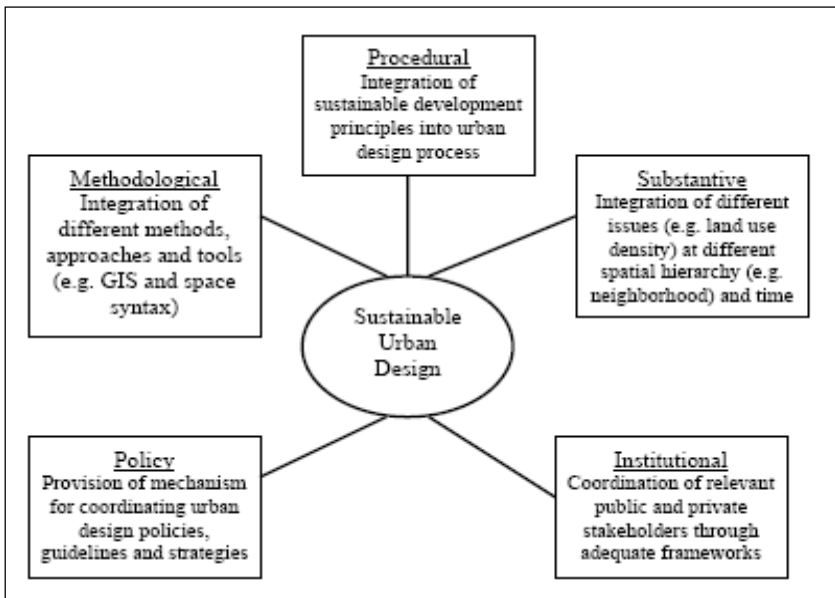


Figure 1: The concept of integrated sustainable urban design.

## 5 Integrated strategy for sustainable urban design

The integrated strategy highlighted in this section is adapted from Eggenberger and Partidario [18]. The different aspects of sustainable urban design

(procedural, substantive, methodological, institutional and policy), as shown in figure 1, should be integrated in a synergetic form to foster sustainable cities through urban design. The substantive aspect involves the integration of different issues relevant to sustainable design such as land use density, environmental performance, mixed-use and pedestrianization. The procedural aspect involves the urban design process. Sustainability principles should be incorporated with the urban design process. Methodological aspect involves the different tools for supporting urban design while institutional and policy aspect borders around good urban governance, integration of design policies and coordination of relevant stakeholders.

**5.1 Procedural aspect**

As shown in figure 2, sustainability issues and process can be integrated into the urban design process by introducing sustainability steps into the design process. The urban design process consists of about four stages: Analysis, Synthesis, Evaluation and Implementation. Each stage of the process is amenable to sustainable urban design process. Overall, the process should be proactive, flexible, allow top-down and bottom-up interactions and encourage citizen participation [19].

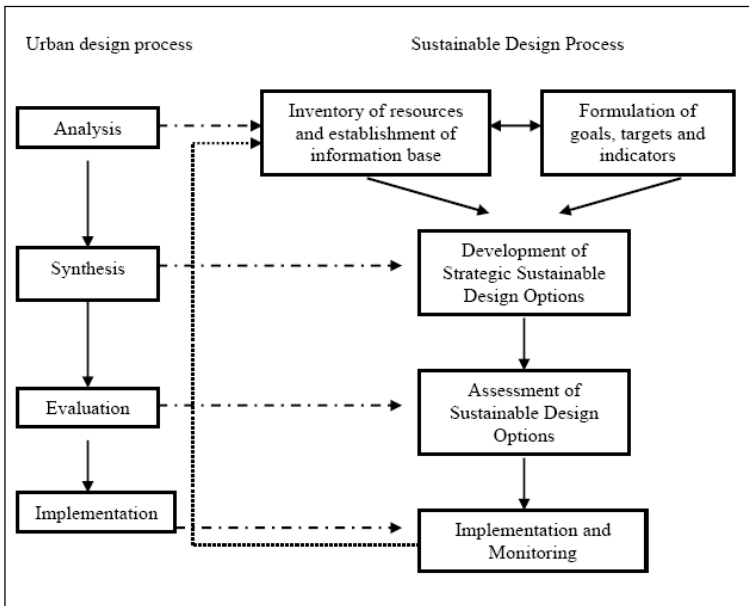


Figure 2: Integration of sustainability into urban design process.

**5.2 Substantive aspect**

Carmona [7] and Selman [20] identified the key principles of sustainable development that should be integrated with urban design. These tenets include

intergenerational equity, public trust doctrine (maintaining environmental diversity and carrying capacity), precautionary principle, intra-generational equity, participation and polluter pays principle. The spectrum of the spatial scale of urban design (from local to metropolitan) should be considered in applying the urban design principles. Frey [4] elaborated on the spatial scale of urban design by identifying three levels of strategic urban design interventions: individual spaces or group of spaces, city district and city/conurbation levels. For urban design intervention to achieve success and effectiveness development frameworks should be generated at these levels and in this hierarchical order. The spatial scale aspect can be managed effectively if plans are prepared at each level and the plans are coordinated with each other while maintaining their individualities [15]. Also, issues such as resource efficiency, diversity and choice, human needs, pollution reduction, intensification of land use, identity, biotic support and self-sufficiency are relevant to the substantive aspect.

### 5.3 Institutional aspect

The institutional aspect is very important because it involves the provision of adequate collaborative framework and the political will to promote sustainability principles. Good sustainable urban design initiatives can be frustrated by inadequate institutional framework and impeding political process. Therefore, the institutional aspect should provide frameworks that will achieve the following:

- encourage stakeholder and community collaboration and participation in development decisions,
- enhance the exchange of information and sustainability awareness
- clarify the duties and responsibilities of stakeholders

### 5.4 Policy aspect

The policy aspect involves the integration of principles, regulations and strategies for intervention. The integration of sustainable design policies can help in formulating design goals, indicators and targets. Integrated policy framework can also enhance the resolution of contradictory sustainability policies. For instance, the policy of encouraging high density development can contradict that of ensuring affordable housing as housing prices may shoot up as a result of high-density housing development. Differences in contexts and socio-cultural values should be considered in policy integration. A policy that works in an urban area might produce different result in another city within the same region.

### 5.5 Methodological aspect

The methodological aspect involves the integration of different approaches and tools to enhance the understanding of the complexity and uncertainty involved in urban development decisions. Batty *et al* [21] noted that the opportunities provided by information systems have not been fully utilized in urban design. Figure 3 shows a conceptual framework of integrating GIS and other information



technology tools into the urban design process. The concept envisions the integration of all the tools relevant to urban design analysis.

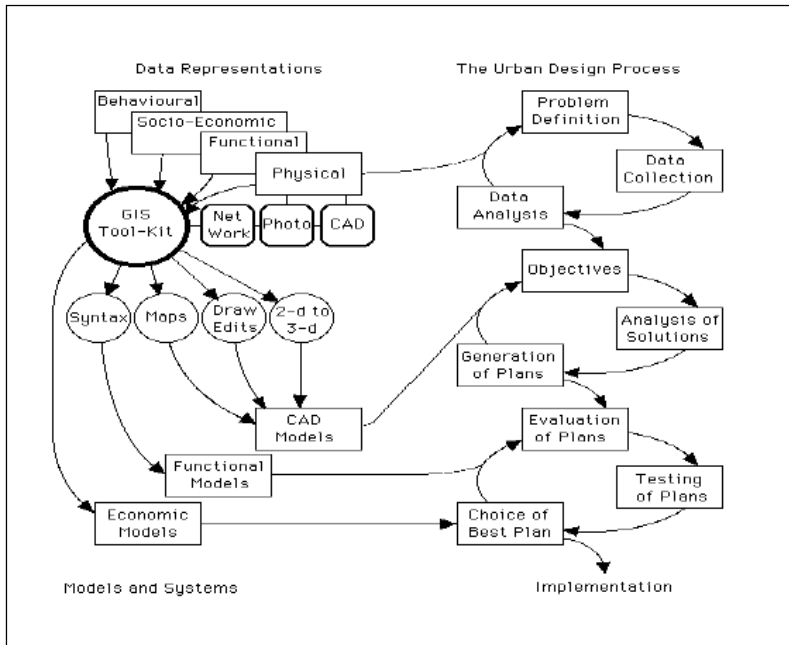


Figure 3: Integration of urban design systems (source: Batty et al [21]).

## 6 Concluding remarks

Urban planning and design could play a vital role in achieving sustainable development as the city structure and form influence effectiveness and quality of the city. For a balance urban development, the principles of sustainable development should be integrated with the urban design and planning process. The sustainable urban design principles could be used to rescue cities from the negative impacts of market-driven spatial organization. As there are no two communities that are the same, the context of application of sustainable design principles will vary from place to place. In this view, the challenges to sustainable urban design in Saudi Arabia are highlighted and a strategy for integrating sustainability into urban design is discussed. There is the need to further investigate into the different aspects of sustainable urban design. For instance, in the substantive aspect, the degree of compactness a city must maintain is still debatable. The application of these principles in empirical cases will go a long way to shed more light on how to use them in achieving sustainable urban development. Also, the contradictions of arising from the implementation of sustainability need to be better understood by planners and urban designers.



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