# Greening Eco-Logical Passive Solar Based Compact City Planning

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Abstract- The problems of passive solar designing and greening ecological design has been recognized. Compact city planning has become crucial in terms of transferring the cultural identity for further generations. Where compact city planning can no longer function with its original use, proposing a new function is inevitable to preserve the significance of the compact city planning. The compact city – a way to improve the urban ecological and passive solar designing performance of the urban system. The analysis identifies seven design concepts related to sustainable urban forms: compactness, sustainable transport, density, mixed land uses, diversity, passive solar design, and greening. Moreover, it identifies four types of sustainable urban forms: the neotraditional development, the urban containment, the compact city, and the eco-city. The emergence of "sustainable development".

This approach overlooks a fundamental fact and matters for the ecological and passive solar outcomes of cities. This research aims to develop a comprehensive conceptual framework for urban greening of Beijing Province based on ecological principles and passive solar designing of Ghadames province to evaluate the housing settlements in Ghadames where the vernacular, urban and architectural patterns provide useful hints for designing more sustainable environments.

*Keywords*- passive solar designing; urban greening ecological design; sustainable development; compact city; eco-city; neotraditional development; transportation; urban form; urban containment; vernacular; ecological planning.

## I. INTRODUCTION

One of the most basic and fundamental questions in urban forms and planning with designing regulation is either, it is sustainable or not and how it is securing the common planning and designing access to sun, light and natural ventilation. With the urbanizing problem of urban sprawl these has been recognized as the need for "sustainable development".

This sustainable urban form come to known as environmental problems and emergence of sustainable development. Identification of sustainable urban forms and their design concepts. In addition, it addresses the question of whether certain urban forms contribute more than others to sustainability. The body of sustainable development and environmental planning seven design concepts related to sustainable urban forms: compactness, sustainable transport, density, mixed land uses, diversity, passive solar design, and greening. Moreover, it identifies four types of sustainable urban forms: the neotraditional development, the urban containment, the compact city, and the eco-city. With the urbanism for centuries this occurs is massive migration to metropolitan areas and decentralization within metropolises. This concept of sustainable development revives about urban form development with existing and future development. Further this enhances them with environmental rationalization-more precisely, with principles of sustainable development and ecological design. This study identifies four sustainable urban forms that have many overlaps among them in their ideas and concepts. The problems of urban sprawl have long been recognized. The classic response to sprawl has been compact settlements of one form or another. These sprawling turns out in modern origins stem from responses to overcrowded. affected compact city, smart growth, healthy community, and new urbanist efforts. This reviews data of whether compact cities are sustainable.

Then, after reviewing current debates on sprawl and the compact city, it outlines the intellectual origins of sustainability and analyzes whether its theory supports the compact city hypothesis: compact is more sustainable than sprawl. It concludes that conceiving the city in terms of forming either necessary nor enough to achieve the global change to compact city. Instead of conceiving the city in terms of process this attains the global sustainable city. Identification of seven design concept related to sustainable urban forms of compact city it defines assessing of design elements are highly sustainable or not. So, far comparing these design concepts and their ways in which compact city design can be positively assessed on the basis of passive solar design and greening eco –logical design. As compact city planning forms the short distance city of sky scrapper, how this affects the orientations of buildings and block the natural ventilation of another buildings. As passive solar design and greening ecological design also plays important facts of compact city planning which helps in terms of orientation, layout, and landscaping can make the optimum use of solar gain and microclimatic conditions to minimize the need for space heating or cooling of buildings by conventional energy sourc

# **TYPOLOGY: -**

Follows descriptive research to identify the major purpose of describing the state affairs as it exists or not, this includes new frequency of development strategies towards the counted and studied issues and facts finding enquiries on passive solar design and greening ecological design concepts regarding compact city planning. With Review of planning, design, and other multidisciplinary literature that is related to sustainable development. The aim is to deconstruct ("take apart") a multidisciplinary text related to urban sustainable form. The outcomes of this process are numerous themes, "design concepts" in this case, that are related to urban form.

# AIM

To identify the ways in which compact city design can be positively assessed based on passive solar design and greening eco-logical design.

## **OBJECTIVES**

- To look at the typologies, methods, and concepts of designing urban forms.
- To identify the typologies that maintain urban form and sustainable development.
- To study techniques that can be used for conserving the sustainable development.
- To analyze the effectiveness of sustainable development with respect to compact city.
- To analyze the rating of designing elements.
- To gather a mutual understanding between urban design forms and its elements with pros and cons.

# SCOPE

- Study of sustainable urban forms and design elements.
- Study of passive solar and greening ecological design concepts.

## LIMITATIONS

- Impact of human activities on the natural environment and their implications and how this harms them.
- Based on case studies and application of techniques .

# **II. LITERATURE STUDY**

The sustainable urban form which come into the realizing as a source of environmental problems and sustainable development. With the identification of sustainable urban forms and their design concepts, it addresses the question of whether compact city urban forms are sustainable or not from the other sustainable forms. With the spreading development of cities or urbanism with different planning techniques the urban form directly affects habitat, ecosystems, endangered species and water quality, land consumption and replacement of natural cover with impervious surfaces. In addition, urban form affects travel behavior which defines air quality, premature loss of farmland, wetlands and open space soil pollution and contamination; global climate. With the growing statistics from around the world indicates that owing to our excessive use of fossil fuels, especially in affluent countries, greenhouse gas concentrations has been gradually gathered in mass at an alarming rate to the ecosystem with these impact Urgent changes are needed not only in our behavior but also in the design of the built form. This urgent changes and emergence derived as "sustainable development" as a popular concept. This identifies seven design concepts related to sustainable urban forms: compactness, sustainable transport, density, mixed land uses, diversity, passive solar design, and greening. With the identification of seven design concepts it identifies four types of sustainable urban forms: the neotraditional development, the urban containment, the compact city, and the eco-city.

These approaches have been addressed on different spatial levels: (1) the regional and metropolitan levels, Bio-Region approach, the city level, the community level and the building. With Conceptualizing this finds theoretical relationships among the identified concepts and urban forms.

#### SUSTAINABLE URBAN FORMS

**2.1.1-The eco-city**—emphasizes urban greening, ecological and cultural diversity, and passive solar design. In addition, the approaches of the eco-city emphasize environmental management and other key environmentally sound policies. These propose a wide range of environmental, social, and institutional policies that are directly co-related to urban spaces to achieve sustainability. With the recognition of concept of eco-city, it emphasizes the concept of passive solar design and greening eco-logical design which makes it more highly rated with all design considerations. Some approaches

of passive solar design emphasize the concept of Ecovillage, Solar Village, Cohousing and Sustainable Housing. There are others that emphasize the concepts of greening and passive energy design, among them the Environmental City, Green City, Sustainable City, Eco-City, Ecological City, Sustainable Urban Living, Sustainable Community Paul, Sustainable Neighborhood and Living Machines. passive solar design affects the form of the built environment through, for example, the orientation of buildings and urban densities..

Neotraditional development—emphasizes sustainable transportation, diversity (e.g., of housing types), compactness, mixed land uses, and greening. In addition, neotraditional development has much to do with style and design coding. The new urbanism is the best known among the neotraditional approaches to planning. New urbanism advocates designbased strategies based on traditional urban forms to help arrest suburban sprawl and inner-city decline and to build and rebuild neighborhoods andcities. Neotraditional development emphasizes concepts of sustainable transportation this suggests pedestrian orientation and walkable villages. In density, it promotes higher residential densities than typical suburbs. In mixed land uses, it suggests a mix of residential, commercial, and civic uses. Accordingly, the ideal neotraditional town would be self-contained, tightly clustered, walkable. It would have mixed land uses, as well as higher densities; street patterns that allow drivers and pedestrians with encouraging people to walk from place to place.



Fig 2.1.2 NEOTRADITIONAL DEVELOPMENT

**2.1.4 Compact city** — The distinctive concepts of the compact city are high density and compactness. It proposes mixed land uses like the approaches of new urbanism or neotraditional development. Compactness is the crucial typology to be implemented to achieve sustainability. For example, that a sustainable city should be compact, dense, diverse, and highly integrated. They ask for an urban form that is easily walkable, small enough to eliminate even the desire for a private automobile, yet large enough to provide the

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variety of opportunities and services that constitute a rich urban life. (Dumreicher, 2000) . Sustainability for them "is a local, informed, participatory, balance-seeking process, operating within a Sustainable Area Budget (SAB), exporting no imbalances beyond its territory or into the future, expanding the spaces for possibilities to flourish" (p. 360). Compactness goes hand in hand with the goal of livability and works to prevent commuting, one of the most wasteful and frustrating aspects of city living today. As this shows there are many ways of dealing with sustainable urban forms. Different scales of concepts as well as emphasizing some concepts over others. In practice, many local governments, planning consultants, landscape architects and so on are engaged more specific aspects of sustainable urban form through a variety of planning and design approaches and policies. The question is, which form is the most sustainable and environmentally sound? This outlines a distinctive set of concepts by which settlements can be classified in terms of their "environmental burden" and develops a sustainable urban form matrix that can aid and contribute to our evaluation of the sustainability of a given form. Apparently, neither academics nor real-world cities have yet developed convincing models of sustainable form and have not yet gotten specific enough in terms of the components of such form. forms, where each form emphasizes different concepts. However, all should be forms that environmentally contribute beneficially to the planet for the present and future generations. The ideal sustainable urban form according to the design concepts of sustainable urban form is that which has a high density and adequate diversity, compact with mixed land uses, and its design is based on sustainable transportation, greening, and passive solar energy.

# III. AFFECTS OF SEVEN DESIGN CONCEPT ON COMPACT CITY

**DENSITY:** Refer to the number of people inhabiting a given urbanized area. As such it is to be distinguished from other measures of population density. Urban density is considered an important factor in understanding how cities function. Research related to urban density occurs across diverse areas, including economics, health, innovation, psychology and geography as well as sustainability. It is commonly asserted that higher density cities are more sustainable than low density cities. Much urban planning theory particularly in North America, the UK, Australia and New Zealand, China has been developed premised on raising urban densities such as New Urbanism - transit-oriented development - and smart growth. The link between urban density and aspects of sustainability planning with compact city designing this remains a contested area of planning theory. This constraint on the city produced several progressive, unconventional, locally unique, and innovative spatial compositions and functional combinations

during this period, and precipitated innovations at the material and urban scales. By approaching space in cities as a resource, urban conditions that may be otherwise be perceived as handicaps and/or difficulties force and enable people to approach these spaces with resourcefulness, creativity, and innovation. Urban density is a very specific measurement of the population of an urbanized area excluding non-urban landuses. Non-urban uses include regional open space, agriculture and water-bodies.

There are a variety of other ways of measuring the density of urban areas:

- 1. Floor area ratio the total floor area of buildings divided by land area of the lot upon which the buildings are built.
- 2. Residential density the number of dwelling units in any given area
- 3. Population density the number of human persons in any given area
- 4. Employment density the number of jobs in any given area
- 5. Gross density any density figure for a given area of land that includes uses not necessarily directly relevant to the figure (usually roads and other transport infrastructure)
- 6. Net density a density figure for a given area of land that excludes land not directly related to the figure.
- 7. Weighted density a density metric which measures the density at which the average citizen lives. It is determined by calculating the standard density of each census tract, assigning each a weight equal to its share of the total population, and then adding the segments.

(Newman.etal, 1989,33)conclude that some policies can save significant amounts of energy, mainly by "increasing the urban density; strengthening the city center; extending the proportion of a city that has inner-area land use; providing a good transit option; and restraining the provision of automobile infrastructure." They advocate a policy of new mass rail transit systems for the "inefficient" cities. Sustainable development with respect to compact city planning implies a "selfsupport economy" and requires "more land for outbuildings and outdoor activities and a general reduction in net residential densities." Similarly, in favor of a decentralized future is based upon a return to the countryside and a revival of rural values. (Robertson, 1990).

## COMPCATNESS

Intensification, a major strategy for achieving compactness, uses urban land more efficiently by increasing the density of development and activity. The intensification of the built form includes development of previously undeveloped urban land, redevelopment of existing buildings or previously developed sites, subdivisions and conversions, and additions and extensions. Compactness goes hand in hand with the goal of livability and works to prevent commuting, one of the most wasteful and frustrating aspects of city living today. Four major themes are evident in compactness as an important strategy for achieving desirable urban forms the first, probably the longest established and most common, is that a contained and compact city has a corollary of rural protection. The second theme is related to the promotion of quality of life, including social interactions and ready access to services and facilities. The third is the reduction of energy consumption by providing building densities capable of supporting district heating or combined heat and power systems; and the fourth is the reduction of greenhouse gas emissions by minimizing the number and length of trips by modes of transport harmful to the environment.

# PASSIVE SOLAR DESIGN



Passive solar design is central to achieving a sustainable urban form. Generally, the idea of this design is to reduce the demand for energy and to provide the best use of passive energy in sustainable ways through specific design measures. With these design considerations this affects the orientation of buildings and urban densities. It is assumed that design, siting, orientation, layout, and landscaping can make the optimum use of solar gain and microclimatic conditions to minimize the need for space heating or cooling of buildings by conventional energy sources. The urban area, described as the "urban microclimate," has a different climate from the countryside. Compared to open country, built urban sites have larger areas of exposed surfaces per unit area of ground cover. Because of the larger area, potentially more solar radiation can be collected on a built urban site than on a flat, open terrain, especially in winter. In the city, a surface's exposure to the sun at any given time is largely determined by the built form, as well as the street widths and orientation.(yannas, 1998)summarizes some design parameters for improving

urban microclimate and achieving environmentally sustainable cities:

- (1) built form—density and type, to influence airflow, view of sun and sky, and exposed surface area;
- (2) street canyon—width-to-height ratio and orientation, to influence warming and cooling processes, thermal and visual comfort conditions, and pollution dispersal;
- (3) building design—to influence building heat gains and losses, albedo and thermal capacity of external surfaces, and use of transitional spaces;
- (4) urban materials and surfaces finish—to influence absorption, heat storage, and emissivity;
- (5) vegetation and bodies of water—to influence evaporative cooling processes on building surfaces and/or in open spaces; and
- (6) traffic— reduction, diversion, and rerouting to reduce air and noise pollution and heat discharge. Interaction between energy systems and urban structure takes place at all spatial scales from the regional, city, and neighborhood to the individual building.

# 3.8: - ANALYSIS TO ELEMENTS AND DESIGN CONCEPTS

After considerations all the design concept had high, moderate, and low rating to designing elements assessing to sustainable development. Concepts having highly and moderate rated notation are more sustainable urban form with its design elements, while putting some design criteria into low rating shows that they are not more sustainable urban forms. These had concluded that every design concept and seven different elements has their different impact on planning and assessing its limits with the respective planning process. With the changing in design concept and its planning each design concept rates the seven-design concept with respect to its considerations.

Sustainable urban form matrix: Assessing the sustainability of urban form.				
Design Concepts (Criteria)	Neotraditional Development	Compact City	Urban Containment	Eco-City
Density	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate
	3. High	3. High	3. High	3. High
Diversity	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate
	3. High	3. High	3. High	3. High
Mixed land use	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate
	3. High	3. High	3. High	3. High
Compactness	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate
	3. High	3. High	3. High	3. High
Sustainable	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate
transportation	3. High	3. High	3. High	3. High
Passive solar design	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate
	3. High	3. High	3. High	3. High
Greening	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate	1. Low 2. Moderate
Ecological design	3. High	3. High	3. High	3. High
Total score	15 points	17 points	12 points	16 points

#### 4.4.1. Building materials and Construction system

The primary elements in the construction of the dwellings are the locally available materials. Building

elements of walls and roofs had enough thermal resistance. They consist of heavy, thick walls mud, stone and hay that were composited shaped in blocks and seasoned for over a period of a year. The main material for walls used sun dried brick" which was made from earthy clay mixed with water, formed in a rectangular wooden frame and then dried in the sun. Corresponding to wall thickness, the size of the bricks is measuring (0.60x 0.40) m in the ground floor, (0.50x 0.40) m at first floor and (0.40x 0.40) m at top floor. Walls, arches, and vaults were built by using the clay as a mortar to connect the courses of bricks together. Stone was used as a foundation and sometimes used in the parapet wall fig. (4.4.1). They used the palm trees as the beams for roofing fig. (4.4.2). and to make doors and shelves fig. (4.4.3). Branches of the palm tree were used as a flooring surface which was then covered with palm tree leaves; they also were used as a base for roofing substances, such as clay mixed with sand and small pieces of stone, a surface was then plastered and finished with limestone white wash.





# **IV. CONCLUSION**

Cities are a mark of human civilization and so appropriately shaping urban space as a compact city is a priority. A compact city does not mean a small city but a city with well-designed and well-utilized space for people. A compact city works well when it is not only good for the urban area, but also for the countryside. Intensification of land use allows the use of existing facilities and encourages walking and public transport use. Overall, a sustainably oriented city allows proper development of compactness. One principle of a compact city is that everything should be easily accessible to all residents because the forms of compact cities impact the urban social environment and social quality. Urban form can also affect the ability of cities to provide residents with a good way of life while minimizing impacts on nature and depletion of natural resources. In addition, the concept of a compact city improves urban sustainability. Sprawl has negative effects such as consumption of land, fragmentation of ecosystems, higher cost of public services, social segregation, and increased fuel consumption. It is essential that the compactness of the city not be a state, but a process - creating compactness should be an ongoing goal. Public participation in shaping the city is important because people need to influence urban policy to feel good in their city. A compact city has not only a physical (functional or urban) dimension, but also a very important psychological (or social) one created by its user's perception of space. In terms of social perception, the city Ghadames and Beijing are not generally perceived as highly compact. Even if a city like Beijing and Ghadames the urban point of view and efforts has been made to create a maximum compactness level in the relationship between people and the city. A city is compact when it gives residents a sense of compactness and improves the quality of their lives. Attention should be drawn to conducting a more sustainable urban policy. The idea of the compact city should be part of metropolitan master plans and governance plans because specific aspects of .The compact city can be used to respond to various socioeconomic issues while paying attention to the quality of life. After all these consideration and design considerations planned and executed in city Beijing and Ghadames it says that all design consideration and its elements are more sustainable in their own respective regions. We cannot define the that any sustainable design elements are less or highly applicable or not. In both case studies it has derived that they had their own perspective point to apply and to execute the design elements followed with compact city planning. As in Beijing after compact city development they were facing the problems of decreasing number of green spaces which were causing many health issues and this was lacking with the green urbanism and passive solar design consideration for getting out form this troubles they had come to design the green wedges ,green belts and vertical greening / landscaping designing. As with issues find in Ghadames was because of their climatic condition which was hot arid they were facing the issue of ventilation and extreme heating

during day for getting out from this problem they had planned the changes in streets, openings etc.Hence considering the all these solutions to their problems has emphasizes that region and climatic conditions are matters but calming that any urban forms and their design elements are highly and less applicable is not the main issue.

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