

Urban Space and Vitality of traditional city

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Abstract: Sustainability was the worst banderole assemble in prior events, prowl discussing relationship to different life branches. In our cessation, we presume this reprove is strenuous, and accordingly involved to pliant more round environmental, natural and manmade elements. Accordingly we buttocks worth peasant-like technology okay and attainmentfriendly live with surrounding environment. As a smooth product we destine b apply to pin plant on stretch shrug off dismiss deportment, activate green area, and recycling. Impede commerce we discussing close by, our routine cities ordeal non-native neglecting sustainability on parish presence, causing by Sisyphean covenant for city frankly spaces, and resulting negative characteristic on achieving urban fabric sustainability for these cities. Inspect conclude was by activation guileless crack arrangement in the age-old cities reaching us to set out sustainable these centers and traditional cities, commensurate with explain, our target to succeed assorted strategies be capable execution reaching to reasonable venerable cities centers, function by investing cities sustainability elements, and make it as main tool for revitalization village life. The banderole meagre for this corroborate by formidable to administer strategies, stranger conspectus break down, on accustomed borough center, to reorder urban forthright aperture for reaching to create sustainable city and saving cultural and traditional values.

Keywords: Urban Fabric, Sustainability, Sustainable development.

1. Introduction:

Arab urban architecture in the 20th century was influenced by modern trends in planning and architecture. Modern and unsustainable environments were created due to the mismatch between the urban objectives and the natural reality. The modern technical development and the dynamics of urban growth ignored various environmental and human factors when planning new urban communities. It is natural that this gap will increase when planning cities called smart cities, which rely mainly on ICT in most aspects and activities of life, affecting all elements of the system of urban development. One of the most important criteria for planning sustainable cities is to be environmentally

Compatible and technology and take into account the renewable energy resources, which must be taken into account in the new urban communities in the Arab cities, especially in the desert areas. The urban planning systems were initially concerned with solving the urban problems rather than Improvement of the urban and human environment of humans, planners have recently found that the traditional approach to urban planning must be changed to shift to planning systems for sustainable development. Research in theoretical theory will depend on two axes:

The first axis Urban Sustainability:

2. Urban Concept:

Urban areas are characterized by rapid change both in terms of population movement or change in economic and social systems or change in values, customs, traditions and outlook on life.

3. The Concept of Urban Development:

Urban development is defined as the changes that characterize the city in all its parts such as the changes in the construction of houses in terms of design, shape and green areas. In the second half of the twentieth century, developments have been accompanied by the concept of urban development in accordance with the mechanism of scientific research and various studies that dealt with it so as to expand the concept to deal with problems urban development and the potential constraints that may constrain the development of the city. Therefore, the need to include urban development is an important issue related to the planning process. It establishes means and objectives related to land use patterns and housing projects sites. For the new and prepare a program to train technical staff, which ensures the raising of the standard of living of the population, which is conducive to stability and sustainability of life within the cities [1].

Urban development scientists define it as a set of processes that teach self-reliance and mobilize all potentials, energies and forces and define the aspects of their use strategically and technically in the light of the interaction between the functional energy perspective and development on the one hand and contemporary forces and pressure as well as located in a changing world on the other. It should be noted that there are several elements that lead to urban development and are represented by the following four elements:

- The human community.
- Natural environment.
- Human action in the environment.
- Economic, social and cultural activities.

In addition, urban development and urban growth are the result of scientific progress in many areas of direct contact with the lives of urban residents such as transport, communications and communications, as well as the advancement of technology in roads, services and infrastructure, as well as the specialization and integration between rural and urban areas where cities rely heavily on trade. The population growth that usually accompanies the industrial process is also an important factor in urban development.

4. Urban Development Goals:

Any horizontal expansion of cities reflects the intensity of the activity of the city itself and at the same time reflects the possibility of risking new types of agricultural land for urban use. This should be noticed by planners. The most valuable and most important agricultural lands in daily food finance, the land surrounding any city is an epitome of that city and a recreation area and a natural outlet for its inhabitants. This requires extreme caution from sacrificing any part of the good agricultural lands for the benefit of urban constructions, roads and other facilities. Achieve three goals: [2]

- Housing development and construction.
- Development of public services.
- Develop the city's functional role.

5. Sustainability Concept:

Sustainability is defined as a concept that stems from a humanitarian theory that calls for attention to the future of man, and thus preserves the environment that gives continuity to humanity in order to achieve

environmental, social and economic sustainability and thereby enhance life in a way that allows others to meet their needs in the present and future [3]. It is also defined as dealing with natural ecosystems and technological and economic systems with the specificity of the place in creating an urban fabric or building adapted to the environment of the environment [4]. The idea of sustainability is based on maintaining balance and rebalancing. This approach aims at balancing the economic and environmental impacts now and in the future. Sustainability requires a balance between environmental factors and social and economic considerations. This is achieved in many applications that represent architecture.

5-1: Sustainability and Its Dimensions:

Sustainable development involves multiple flows, which are intertwined and can focus on addressing them. There is a significant progress in achieving sustainability goals. Three critical dimensions can be mentioned. [1]

To define these dimensions in the integrative concept of sustainability, the so-called Triple Bottomline (TBL Triple Bottomline) was first introduced, using the term John Elkington for the first time. The economic and social sustainability of the environment, which enables us to crystallize the point of view that affirms that we cannot achieve economic, social or economic sustainability in a separate way. The three dimensions must be taken into consideration at the same time to improve the quality of the environment and economic growth while achieving social justice. [5]

5-2: Sustainability and Its level of Architecture:

There are many levels of sustainability in architecture as well as other development

areas, and studies suggest that the sustainability system in the field of architectural work can be divided into two levels.

- First: Urban level: which deals with its own scale through the physical and physical environment and infrastructure.
- Second: The level of the single building: Little The process of building the environment and investigating the sustainability formulas are directly related to the urban planner and the city plan. The integration of the work between the two levels will result in a designed and integrated environment across the levels ranging from the city scale to the urban unit, to the building and its different spaces. [6]

The current research focuses on sustainability at the urban level. Future projections of population growth rates place the urban challenge at the forefront of the problems faced by developing countries, which must increase their capacity to produce and manage their urban bases from infrastructure, services and housing under difficult conditions as resources decrease relative to needs.

5-3: Urban Sustainability and Sustainable Design:

The functional needs of cities and urban gatherings often change over time as population changes and society evolves, so it is important in any long-term development plan to take into account the problem of changing space use and its associated considerations. The best solution is to deal with the multi-use spaces that Space characteristics and high flexibility that enable them to accommodate such variables to achieve continuous compatibility of changing needs and systems of urbanization with the

requirements of future generations in the face of their needs. The functional aspects of space within the urban system are directly affected by the level of spatial organization of the system in terms of space relations, both locally and comprehensively, and that it is important to implement urban sustainability. The effectiveness of space within the system so that the space acquires a high degree of flexibility, which qualifies him to accept different types of use formulas that accompany the ocean to create a sustainable urban environment. [7]

Increase self-sufficiency.

- Unit design of the neighborhood.
- Meeting human needs and achieving social and environmental goals.
- Urban space design and regulation on energy efficiency and transport network planning and conductors.
- Space regulation of the Sabla network and open spaces.
- Planning (Future Street) as a space where the social representation of the neighborhood.
- Center strategies for the use of energy and materials.

Barton also sets the basis for urban space regulation, which is used in three main elements that affect the installation of any urban fabric:

- Accessibility.
- Convergence.
- Job integration.

In order to achieve spatial regulation at the urban sustainability level, the urban matrix must be studied to meet the local, cultural and social needs identified by [8] as follows:

6. Design and Planning for Sustainable Development:

Sustainable design is simply synonymous with sustainable development, and when creating a clear idea of what sustainable development necessarily produces sound planning foundations, it must be confronted with contemporary needs without compromising the potential of future generations to meet their needs. Sustainable planning is characterized by urban and spatial formations that contribute to urban development. In order to achieve continuous compatibility with changing needs and innovative urbanization systems, previously the plan was to identify urban problems with fixed planning targets from a point of view, taking into account the use of the least possible resources. Net targets is reserved logos applied to the plans both on the level of cities, residential neighborhoods or residential neighborhoods [9]. The designer or planner was concerned only with the planning papers he devised, with attention to the fragmentation of problems so that he could reach solutions and assemble these solutions to reach the status of the plan in isolation from the population, where they had no right to determine their goals themselves. This method has been in place for several decades, where "planning from the office" was done with previous calculations and theories ... but with the technological development and the beginning of the advent of the means of assistance for planning by computer programs (such as the use of geographic information systems GIS) And the land, which enabled him to document the current situation accurately and it was a good start followed by the application of the participatory planning method, which involved the population in the planning process and made them a key part of them, so they determine their own planning goals and develop a perception of development methods that fit them, Tarsal to the urban

setting scheme, which can be called a sustainable scheme, [10] this scheme requires :

- Integration of the planning process by experts, residents and resources.
- The plan should be comprehensive for construction, maintenance, repair and continuous development.
- The laws and regulations governing construction should support the trend towards sustainability.
- The plan should be formed according to the expected changes, whether these variables are demographic, economic, social or technological.
- The plan should include not only the architectural and engineering aspects, but also the planning, management, environmental, economic and demographic aspects.
- Attention to the formation of a clear database for everything related to the scheme so that it can be consulted during the planning and then continue to feed the variables after the continuation of the development of the scheme.

7. Sustainable Building Elements:

There are many factors that, if properly observed in the planning and construction of new cities, can contribute to the Arab cities' compatibility with their surrounding environment and produce a better urban environment as follows: (Douglas-p.97-2009)

- Regional Interaction.
- Accessibility.
- Ordering jobs.
- Visual composition.
- Consider the environment.
- The use of modern technology.

In addition to the three elements contribute to the development and sustainability of Arab cities, namely:

-Implementation of green architecture systems in existing cities or, in particular,

in the development of new urban communities, by taking care of waste recycling and reducing pollutants, which will improve the quality of life and reduce thermal emission.

-Attention to building smart cities that use innovation and modern technology by the most efficient means.

-Focus on the use of renewable energy sources in advanced economic ways.

8. Achieving Sustainability in Cities:

The objective of the urban design and site planning strategy is to maximize the use of the natural resources of the site as renewable sources of energy (wind and wind) and location components (geolocation of the site - ecological composition - soil - water - plants) in the design of the building and of the site over the life cycle of the building. As the cities benefit from the planned space organization regularly reduce the need for energy and water to provide a residential environment and urban pollution-free and compatible with nature through:

1. Transportation and public transport: The planning of cities that are compatible with the environment should not be planning on private transportation, but on the principle of public transport and pedestrian paths.

2. Multi-use development: Recent guidance for the sustainable development of city centers calls for a multi-use development that encourages inter-space interaction and functions.

3 - Adoption of the movement of pedestrians: Sustainable design of cities aims to respect the standards of humanity and conservation of the environment in design so it is necessary to adopt the idea of design on the movement of pedestrians first and then modes of transport friendly to the environment and then come public

transport such as buses, The last of my recent visits to sustainable cities that seek to achieve the following principles of high population densities and multi-use spaces [11].

9. Sustainable Development:

Development that meets the current needs without prejudice to the ability of future generations to meet their needs in the sense that sustainable development aims to balance the interactions and changes of mutual relations, which include human potential and different elements of nature and the role of man in the exploitation, sustainable development tries through the planning processes implementation of development policies to improve The quality of life of the population, and the goals of sustainable development that it hopes to achieve in all countries of the world are as follows: (william-p.17-2000)

- Respect for the natural environment.
- Promote awareness of environmental problems.
- Quality of life of the population.
- Use of technology in society.

10. Sustainable Urban Development:

Urban land use is characterized by rapid and continuous change, as well as the extreme diversity and complexity of the structure, which is strongly related to the diversity of urban activities and their rapid change and continuity in the nature of urban society. Sustainable urban development requires field surveys of cities as well as a study of the potential effects of spontaneous urban development in urban areas On the environment of the city, where development policies must focus on ensuring the reduction of the manifestations of pollution within the cities, and study the problems resulting from the manifestations of urbanization rapid as a problem of urban

congestion and resulting in the increase of population density as well as Traffic congestion problems And the problem of disposal of solid waste, which is suffering from many large cities (such as the capital Baghdad) and others. (Canadian-4-2012)

Access to sustainable urban development requires the use of modern technologies and advanced sciences in harmony with the surrounding environment, nature, environment, cultural, social or economic dimension, which seeks to create a society less inclined to materialism. The objectives of sustainable urban development are as follows: (Douglas-p.78-2009)

- A. To orient the vertical to accommodate human increases in the urban population.
- B. Direct urban growth towards small cities.
- C. Intensification of the use of cities within cities and their status in terms of quantity and type in an attempt to collect similarities or transfer appropriate to other sites to restore life to the city and to attract the population.
- D. Select the lands that surround the cities as areas for the expansion of the cities if housing or heavy industries or service jobs.
- E. Protect agricultural lands from urban misuse and rural development and create attractive forces in villages.
- F. Development of urban areas such as: modernizing means of transport and communication, repairing and maintaining roads, water and electricity networks within cities and neighborhoods, and encouraging the departure of private cars.
- G. Optimal use of open land or open urban areas within cities and create a balance in the proportion of land uses within urban space.

H. Focus on increasing the cultural awareness of the population of the importance of creating a clean environment suitable for the population.

I. Preserving the cultural heritage of the cities and ensuring that their historical places are not affected.

These goals have become a cornerstone in the study of sustainable urban development in the developed world and the demand in the preparation of development plans in the developing world, where cities are still many shortcomings in the level of services provided to the population. In the form of (4)

11. Sustainability Approaches in Traditional Cities:

Throughout history, architecture has been a true reflection of cultural diversity and a clear expression of the social, economic or cultural transformations that afflict society. Cities were formed and influenced largely by these transformations. Their identity was reflected in their environmental and social characteristics and their artistic and formative components as well as their ideological and religious principles and their spiritual values and collective memory within the framework of a coherent faculty unit. In general, the historical decision of urban development, growth, urbanization, architectural patterns, flourishing activities and living memories makes them a phenomenon many of our local cities are in dire need today for a systematic policy of renewal. The architectural and urban landscape of these cities raises many fundamental and urgent questions about the continuity of architecture and architecture in our societies. As a social cultural phenomenon has its historical extension, and in the context of contemporary variables it is necessary to give a new impetus to this phenomenon to meet the

requirements of the era, we no longer see our traditional cities only the architecture of the past or conflicts between modernity and tradition, or between modernity and modernity. Although adapting to contemporary conditions is required for the continuity and continuity of these traditional environments, a new view of these urban areas needs to emerge so as not to lose its specificity and identity that has been preserved for many generations. In the past, we can ask: is there still a real presence (of the traditional city phenomenon of identity) as it has existed in the past under these challenges Our contemporary society and what are the common features of this phenomenon and then does this phenomenon have an intellectual discourse that qualifies it to develop future visions through which it can contribute to drawing a picture of our future and our city. The best proof that man cannot boast too much of the building and built of buildings of greatness and breadth as long as much of the urban misery still hangs on most parts The busy and overcrowded world in our present area through the previous proposals can provide several axes to implement the idea of sustainability as a way to improve the status of traditional cities show in Fig. (1), including the following:

- Method of communicating with the past without reproducing it.
- The approach of integration between old and new demography and morphology.
- Approach to compatibility with the environment and all ecological considerations.
- The approach of adopting technology as a solution is available and available in the current era.
- A forward-looking approach that provides insights into what will happen after some time in predictive formats.



Fig. (1): show effect urban space on Traditional city

Therefore, the modern directives of sustainable cities call for creating life in the city and its center through the organization of multiple mixed uses and the removal of what is harmful to them and emphasize the importance of public transport and its importance in linking cities and the social, economic and political motives, both near the open urban areas to attract people to this Regions and thus will create a social and environmental link based on this link is based on a clean, calm and sustainable environment is vital day and night to keep abreast of the technological development achieved to reach the cities of vital and sustainable. In this paragraph, the research of the importance of open urban space in the vitality of cities and their social, economic and environmental sustainability and here we will move to know the importance of urban space and its organization in the sustainability of traditional cities and centers to prove the hypothesis of research.

- Second axis Space organization:

12. Space Regulation at the City level:

The Islamic city is divided into a group of different spaces, reflecting the means of social expression, and the identity of society and these spaces are a social product and a reflection of many social and environmental phenomena and the daily needs needed by the inhabitants of these cities. The needs of the family require the existence of housing and contain the necessary elements in order to provide psychological comfort to its users and the need for traffic requires the existence of alleys and roads, and the need for a market [12]. This is why we find traditional cities (Islamic) divided Arab tribes in the form of the plans of each tribe in a single plan, and allowed them the freedom to divide the land between them depending on the circumstances and possibilities for reconstruction and construction. Organic space organization represents the model of most traditional cities with sequentially developed and natural growth with the needs of the society in a cumulative manner which is in harmony with most systems in achieving the idea of integration because it possesses the ecological properties and diversity in its components and maintains the total spatial organization of the city by maintaining the open spaces within the regions Urban and green belt around the city. The organic space of the city is characterized by streets and twisted walks, relatively spacious and open jars and pavements, and indoor gardens serving as reservoirs for cool, mild air. The climatic conditions have contributed to the formation of the organic space organization of the city in order to protect the saplings from the heat of the sun and provide the required shade for the use of narrow streets that end with closed ends and horizontal pulses. Thus, the Arab city is considered the best example of the implementation of the concept of sustainability at the level of the city as a whole. Its spatial organization and

traffic pathways are the trend that represents the basic stage of adaptation to the environment show in Fig. (2). to mitigate the effects of harsh climate and mitigate the effects, especially high temperature and solar radiation and dusty and warm winds and thus reduce the total thermal impact on the facades of buildings, especially residential units [13].



Fig. (2): Show space vitality in center

Dealt with traditional architecture with Al-Jira neighborhood is part of the urban fabric of the city as a whole. The spatial organization of the city is organic in form of building blocks and residential complexes, which are interconnected with the streets and the paths of movement in length and width depending on their importance and the area that leads to it and the degree of its privacy whether public spaces or residential units. The surrounding environment starts at the city level depending on the level of privacy of the site and its spaces and the nature of the building.

1- Space regulation at the level of the traditional neighbor unit:

The residential shops consist of a group of residential units with a central courtyard that are grouped together with an interlocking organic space. The streets and the traffic paths that were narrow and winding and surrounded by semi-dark and shaded walls, which were central to the dwelling, function as a thermal regulator for the residential complex. For the city as

a whole, the traditional house was not unique or distinguished [14]. The housing of the rich and the poor within the unit of the neighborhood without the distinction of social class, whether in the division of the housing unit or external treatment excellence between the housing of the rich and the poor by different

- Assembly around miniature urban spaces.
- Achieve the lowest penetration and lowest intersection of motor vehicles with the guarantee of secondary roads for different gatherings.
- Integration of residential units with their social, economic, cultural and educational services and the combination of these services constitute the sustainable neighborhood unit.

2. Adopting planning and urban design for sustainable cities on public transport and pedestrian traffic mainly to reduce environmental pollution through the adoption of environmentally friendly means of transport and reduce dependence on private transport. Adopting an efficient space organization for pedestrian traffic and connecting it to public spaces to ensure a positive social interaction that enhances the sense of belonging. .

Recently, they have been ignoring the importance of finding solutions in sustainability policies to preserve the historical essence of the city. The research will present a number of strategies that form the basis for the development of logical practical application. This is a framework for the design and development of urban sites in ways that are more sustainable and more sympathetic to the preservation and adaptation of the rich cultural heritage of buildings and urban design in the practical

application of the Baghdad Cultural Center.

The research aims at realizing that the integrated spatial regulation of urban areas open to and revitalization of traditional cities enables us to achieve the sustainability and revitalization of traditional cities. This applies to the open urban areas of the Baghdad Cultural Center (Maidan) and how urban life affects urban areas. The vitality of the center and the sustainability of the city in general.

13. The Most Important Strategies Proposed by the Research that lead to Its General Objectives:

In order to reach the goal of research in the development of the city of Baghdad and return vitality through the organization of uses in addition to the impact of the organization of the Center on their development, the consideration of these strategies, including:

- A. Educational policy of the population through increasing public awareness of the importance of heritage areas and develop the optimal uses that achieve economic returns and well-being in living life.
- B. Encourage mixed uses that remain until late hours of the night (commercial, cultural and housing).
- C. Activate the public transportation system and create a regular efficient system.
- D. Work to find architectural designs consistent with the past and the model of the historical area and modernized.
- E. The development of the arena to be the site of the arena dedicated to

pedestrians and the presence of places to sit

F. Expanding green areas, clubs, and parks and sitting areas.

14. Conclusions and Recommendations:

- Sustainability is linked to space organization through its objectives in reducing the distance of access and transition between the system (building or urban assembly), as well as successfully dealing with the spatial relations of space in terms of movement and the inclusion of functions to affect the functional aspects carried by the spaces within any system at the level of space organization, Important applications that combine sustainability with space regulation:

- Successful handling of the spatial relationship of spaces.
- The economy to discover the most important axes within the system.
- The functional aspects of spaces within the spatial organization of the system.

- The residential environment cannot be considered sustainable unless the unit of sustainable living is adopted as a basic basis for modern residential planning theories. It is available from a small society that allows for the exchange of social relations and social interaction. It also achieves a healthy urban environment that is free of pollution and provides economic savings by reducing energy consumption. Which is based on the principles of human design, on which man depends.

- There are many basic principles that have been based on the traditional unit of Jihra, which includes the concept of sustainability and the persistence of modern theories in the achievement of environmental and psychological integrity

to create a sustainable residential environment characterized by intellectual and physical communication and meet the general requirements of human comfort and efficiency and social function of its inhabitants while ensuring the continuity of performance efficiency of the future. To take into account the fit between the spiritual sides. These principles are consistent with the principles of human design. Contemporary architecture faces many challenges in order to prove that it is capable of accommodating the requirements of sustainable development. Therefore, modern architecture has to discover the principles of traditional architecture, choose the appropriate ones for the local environment, and mix these principles with modern technologies and use them in architecture. Contemporary.

- The essence of modern transformations in the urban environment as in the loss of the total space organization resulting from the definition of the local penalty. The adoption of the human design strategies is a practical tool to increase the efficiency of the spatial organization of the sustainable unit by employing it as a mechanism for the conversion of indicators and standards. Pedestrian traffic and public transport) as sustainability factors in the spatial organization of the unit to achieve a sustainable residential environment.

15. References

- [1] Zubaidi, Maha Sabah, Environmental Sustainability in the Formation of Housing Communities in Iraq, PhD thesis, Department of Architecture, Faculty of Engineering, University of Baghdad, 2006.
- [2] Khovza, Omer Hazem, Urban Renewal Policies in Sustainability Curricula - *An Evaluation of Traditional Cities Connected Model*, published in Qadissiya Journal of Engineering Sciences, Vol. 4, 2014.
- [3] Najil, Kamal Abdul Razzaq and Shamweel Mohammed Wajih, *Sustainability of Traditional Cities between Yesterday and Contemporary Today*, Journal of Engineering and Technology, University of Technology, Vol. 26, No. 3, 2012.
- [4] Al-Watar, M. Fatna and M. Wafa, *Planning Features for Achieving the Prospects of Sustainable Development*, published in Proceedings of the Conference on Initiatives and Development Creativity in the Arab City in Amman, Al-Banara, Aqaba, Jordan, Vol. 2, 2008.
- [5] Elkington, J, Triple Bottom Line Revolution: Reporting for the Third Millennium, Australian CPA, Vol.69, pp.75, 1999.
- [6] Canadian, Sajeda Kazem, *The Impact of Sustainability and Space Organization of the Residential Unit in the Residential Environment*, Research published in Journal of the College of Engineering / University of Baghdad, No. 2, 2012.
- [7] Barton, Sustainable Urban Design Quarterly, vol. 57, 1996.
- [8] Williams, Kati, Barton, Elizabeth and JenksMike, "Achieving Sustainable Urban Form" E & FN Span, Vol. 6, 2000.
- [9] Douglas Farr, Urban Design with Nature, uk, Vol. 3, 2009.
- [10] Baker, Nick & Steemers, Koen, Energy and Environment in Architecture: Technical Design Guide, E & N Spon, London, UK, 2000.
- [11] Qenaoui, Abdel Rahim and Issam Abdel Salam, Neighborhood of theoretical-reality, 9th International Engineering Conference, Cairo, 12-14 April 2007.
- [12] Al-Ahbab, Shaima Hamid, Social Sustainability in Local Architecture, PhD, Department of Architecture, Faculty of Engineering, Baghdad University, 2010.
- [13] Fathi, Hassan, *Natural Environments and Traditional Architecture*, Arab Institute for Studies and Publishing, II, UNU, Tokyo, 1988.
- [14] Kim, Jong-Jin & Rigdon, Sustainable Architecture Module: Introduction to Sustainable Design, National Pollution Prevention Center for Higher Education, Michigan.USA, Vol. 3, 2009.