

The Role of Sustainable Architecture in Urban Sustainable Development: A Case Study in Hong Kong Bank

Shokooh Neshani Fam^{1,2*}, Reza Haghgoshaei³

¹Department of Architectural Management, East Azerbaijan Science and Research Branch, Islamic Azad University, Tabriz, Iran; ²Department of Architectural Management, East Azerbaijan Branch, Islamic Azad University, Tabriz, Iran; ³Department of Architectural Management, East Azerbaijan Branch, Islamic Azad University, Heris, Iran

*E-mail: Shokooh.neshanifam@yahoo.com

Abstract

Quick urban development in the recent decades has affected the human life in different social, cultural, economic, political, and environmental aspects. Introduction of sustainable development as the main theme of the third millennium is due to the impacts of cities on the range of the biosphere and human various aspects. Undoubtedly, the discussion of sustainability and sustainable development without considering the cities and urban areas would be meaningless. Cities are considered as the main factors causing inconsistency in the world and in fact, urban and global sustainability are both the same concepts. And urban space as one of the elements of spatial construction of the city can be shaped and transformed along with the history of a nation occurs at different times. Therefore urban sustainable development means change in urban land use and density to meet the human's basic needs in the field of housing, transport, leisure, etc. So that environmentally the city becomes habitable and economically viable. This article studies the principles of urban sustainable development and the role of sustainable architecture and its effect on stabilizing the environment. Today utilizing only natural materials instead of artificial ones is not enough, but a viable product in addition to be recyclable must have intrinsic aesthetic attractions that its sample was run on a bank in Hong Kong. This article studies the role of sustainable architecture on urban sustainable development and the case study of a bank in Hong Kong.

Keywords: global sustainability, sustainable city, cultural development, urban spaces, green architecture.

Introduction

Population growth, especially in technology and its mismatch with the environment and variation in the level of human civilization and culture especially in the last century and in brief lack of proper relations between human needs and environment resulted in extensive changes and disruption of the natural environment and ecosystems (forest, pasture, land, sea) in many parts of the world. Adverse effects of modern technology on the environment present people a new awareness about environmental issues and most of all, it was felt for the first time in history that the resources of the earth are limited and belong to all. It seems that the term "sustainable development" is one of the most obvious concepts which states what is in the mind and thoughts of many people. For this reason the term is widespread and has been widely applied. Achieving such development requires massive positive fundamental changes in the world economy, rational utilization of natural resources, fundamental changes in human attitudes to nature and a serious revision in production and consumption patterns (Saremi, 1994). In this global movement, architecture consistent with other scientists also tries to find new solutions to provide ideal human life. Obviously, life, work, leisure and.... all are activities carried out in spaces designed by architects. Since the strengths and

weaknesses of the building have a direct impact on ecosystems in the world, architects are assigned a very critical task in this regard (Armaghan, 2009).

Sustainability

The literal meaning of the term sustainability

According to Dehkhoda the term sustainability means durable, and lasting. The current meaning of the term sustainability is considered in this debate is “What can continue in the future”. Sustainability is an adjective that describes something providing calmness and nourishment and life support and leads to prolonging the life and its continuation (Mahmoodi, 2004). The fact is that the sustainability in new age has become the norms. If once the development was merely meant production oriented and economic growth, today this concept has undergone substantial change. Therefore, it is said development is an inclusive and multi-dimensional issue which is applicable not only in the field of economy but also considers the extension of the quality of human life, the environment and changing people’s cultural understanding. Development in the 21st century obtains desired results if it goes beyond the quantitative levels and causes the profound changes in the social organizations and people’s intellectual insight. If these changes are to be institutionalized, many aspects of public participation in the planning system will be guaranteed. Sustainable architecture and green roof systems are also defined in line with the fundamental objectives of sustainable development and while involving the roots of sustainable development they follow its components (Dizji, 2010).

Sustainable architecture

In the past, cities have manifested the best examples of sustainability in themselves. Considering the ecological constraints such as water, appropriate development compatible with the environment, saving resources, using indigenous materials, creating effective and appropriate ways to survive such as aqueducts and wind catcher, artistic use of wind and water in order to refresh the air and to create pleasant landscapes, gardens, in the yards, and public spaces and cities around, all are examples of factors influencing the sustainability. Today’s urban development by following the classic pattern and the stereotyped patterns of urban development -which disregards the local characteristics- created not only unstable situation in cities but also resulted in the instability of the surrounding areas (Keshtkar Ghalati, 1997).

Applying the sustainability concepts in architecture has opened new issue called "sustainability architecture" with “ecological architecture” or green architecture” or “ecological architecture” which all of these have the same concepts and refers to architecture compatible with the environment. Nowadays, matching the quantity and quality of architecture has become architects’ first concern, whereas previously only educational institutions and government agencies stressed to build buildings based on the environmental factors. Private businesses have already been interested in such buildings. In Canada in 2000, 45 buildings with a total built-up area of 3 million square meters joined a voluntary certification system called Leadership in Energy and Environmental Design founded by Green Construction Council. This number has already reached to 171 commercial buildings and 1800 other buildings have also applied for this license. There are almost 3000 Canadian engineers with Leadership in Energy and Environmental Design license (Kanter, 2005). Natural resources must be considered as assets and it is needed to consider the resources and benefits not produced with the great value. This means that we use our creativity more than natural products in the cycles of nature. The truth is that we need the world surrounding us to survive. Disciplines and human’s welfare resources are created by our architecture. Sustainable architecture is characterized by the fact that things that we need can be created by accessing the natural resources. The resources are foundation of our world. There are some resources used to

create things. Finally, the new architecture is based on sustainability. The truth that the energy resources are mortal and consequences of degradation and the loss of our natural environment have clearly a huge impact on the life and character of our culture. The logical conclusion is that we need to apply the concepts of sustainability in architecture. A long-term view rather than a short-term physical satisfaction is needed, economic and artistic points of view both play significant roles in the development of sustainable architecture.

Longstanding and close contact to the nature have proposed solutions such as those can be seen in the villages located in the deserted areas of Varamin. Here the houses in the village are mixed together so that less surface to be exposed to the burning sun. The proximity of residential units creates a sense of shelter and support caused by congestion. The thick walls reduce the intensity differences between day and night temperatures. The yards are shadow catcher and create cooling cavities and make introversion residential units created which turned from the hostile environment to the inside (Ghiyasvand, 2003). The term sustainable development was first formally proposed in 1987 by Brandt Land. This term in its broad concept includes a proper and efficient management and utilization of basic resources, natural resources, financial resources and manpower to achieve optimal consumption patterns associated with the use of appropriate technical and organizational structures to meet the needs of present and future generations (Maknoon, 1996). Principles of sustainable development policies are divided into the following four categories (Hardoy 1992):

- To minimize the use of nonrenewable natural resources (such as fossil fuels and sufficient resources);
- To make the use of renewable natural resources sustainable (eg, groundwater, soil and plants);
- To keep the production of waste and pollution in the local and global absorption capacity (such as greenhouse gases, ozone destructive chemicals and toxic waste);
- To provide basic human and social needs (such as access to the means of subsistence, having the right to choose participation in social self-determination and access to the healthy environment and basic services).
- Sustainable development has profound implications in three dimensions:
 - Environmental sustainability;
 - Economic sustainability;
 - Social sustainability.

Environmental sustainability is very important in relation to architecture to achieve the goals of sustainable development and Environmental issues endangering human future have made the architects had to think seriously (Mahmoodi, 2004). It seems that the concept of sustainable development is well consistent with the goals and objectives of the new urbanization, and could be utilized as an effective means to meet the sustainability goals by urbanization (Salman, 1995).

Sustainable Development and Architecture

Sustainable urban development theory has been derived from environmentalists' debate on environmental issues, particularly the urban environment presented after sustainable development concept to support the environmental resources (Ziyari, 1998). In this theory, the conservation of current and future resources through optimal use of land and entering the least waste to the nonrenewable resources are indicated (Belaverz, 1994). Urban sustainable development needs the recognition of the limitations for human activities in relation to the cities and matching design methods in these limitations (Redin, 1995). Urban sustainable development means change in urban land use and density to meet the human's basic needs in the field of housing, transport, leisure, etc.

So that environmentally the city becomes habitable and economically viable, and socially equal so that technological and industrial changes of cities match job creation, affordable housing and preserving the environmental conditions. Successful policies to move towards urban sustainable development require an understanding of ecological, economic, social and administrative issues. Applying these issues is a guide to achieve basic and fundamental urban sustainability (Maleki, 2003).

Sustainable city

Sustainable city is a city which could provide the needs of citizens in terms of urban economic growth and development, income, and employment and environmentally focuses on health status and does not have any problems like urban air pollution, water and sanitation and green spaces and leisure time. On the other hand, sustainable city is a city considering the physical aspects and also the future optimal development of the city, especially in the housing sector, and it should act with coordination in terms of urban applications and should have citizens' involvement in solving the urban problems. In other words, sustainable development has a direction of bottom-up in planning and urban management in the neighborhood and urban areas and urbanization and urban culture (production, distribution and consumption) is clearly visible in the city and eventually it should be a city for all citizens (Terner, 1997).

Healthy and ecological city

Mayer says a green city is a live city with identity. In one concept it can be said that green city is a city that completes the rest of the life. He cites, the goal of green city is urban and human planning. It is an amazing fight against the ugliness, disease, destruction and exploitation of the urban centers created by people. This city provides new aspects for civilization future direction (Mayer, 1998). According to Mark Rozland, ecological cities should follow the principals as follow:

- Revising the priorities of land applications to create compact, versatile, green, and healthy societies with vital mixed applications close to group communications and transportation arrangements.
- Revising the priorities of transportation in order to pay attention to walking, cycling, and public transportation instead of private cars and emphasizing close accessibility.
- Restoring damaged urban environments, especially coastline, mountains and swamps.
- Creating decent, cheap, safe and convenient housing and in terms of energy and economy mixed.
- Supporting agriculture and urban green spaces designs and city garden.
- Raising environmental awareness through teaching the activists and training plans which increases public awareness in productivity, ecological sustainability issues.

According to these issues, the ecological city is a sustainable city which can give its residents a meaningful life without destroying ecological site relying on it (Kazemi Mohamadi, 2001).

Hong Kong Bank

Ecosystem degradation has been intensified in the present century and its dangerous aspects can be seen around the towns and villages now. Architecture has been significantly affected in this trend. Architecture can be produce kind of consistency with the surrounding environment. In fact, the architecture has tried to define its production within the ecosystem. In fact, the building is part of the ecosystem and moves to strengthen and improve it. Remarkable, but expensive activities have been done in this way but we are still in the first steps. There is no doubt that with the correct orientation of technology and knowledge in current century, dramatic developments will be seen in this field. To achieve a new interpretations have got into the architecture and environmental issues

from early of twenty-first century including structural biology presented in Germany in 1970s. These words express the design of buildings available with the environmental health.

In biological architecture or sustainable architecture, the relationship between nature and architecture, environmental considerations, environment conservation, environmental psychology, environmental considerations in building, recycling and energy, preventing energy waste, land use planning, and considering the biological, ecological, economic, and social conditions and etc., have been studied (Kasmaei, 2008). Hong Kong Bank is a building is an example of building in which the fundamentals of sustainable development and environmental architecture have been considered.

Hong Kong and Shanghai Banking Corporation

Hong Kong and Shanghai Bank: a bank for the global economy: the project was designed to meet the needs of bank headquarters building so that it could have the ability to perform detailed functional and technical demands of the world's major financial institutions and yet to be also suitable for the next century. Hong Kong and Shanghai Banking Corporation headquarters building is one of the tallest towers with suspension structure in the world. The plan of the bank is about 54 × 70 m divided by four biserial masts tolerating the effects caused by the creation of three continuous protrusions in the east-west direction. The structures of the building are vertically supported by hanging trusses with 6.33 m width in east-west direction and with more than 10.8 m console at the end of each mast.

Hong Kong Coast is particularly lack of suitable ground conditions. The water level is high and lower layers of granite are fully biodegradable which is very difficult to predict their behaviors. For this reason, the basement structures were built within a meter thick environmental wall extending 25 to 35 meters under the stone surface. Special anti-corrosion treatment for steel works have been designed, developed and presented to meet bank building needs for at least the lifetime of 50 years. With the use of a polymer-modified by cement and sand mixture, relatively impermeability, and applying it with stainless steel fibers over 12 mm thick steel works made erosion prevention possible. Detailed information on the behavior of the wind to predict the size and characteristics of each type of wind may be necessary for the future.

Distribution system for all electrical services, telecommunications and air conditioning, as well as prefabricated modular canals involving all vertical distribution services have been designed through the floor. Although there are other buildings with services systems in the floor, but none of them is complete in compare to Hong Kong bank. Seawater is usually used to cool the condensers. This allows the chilled water get pumped to the top of the building which means to the local air handling units embedded in prefabricated modular components of each floor. Fresh air passes through the shutters embedded in exterior walls and is blown into the cooling coils, then the fresh air is distributed by ducts under the floor space. The building was designed with the aims to bring sunlight into the heart of the tower through the bank atrium space and down to the field. This case led to installing one of the more interesting features of the banking system as a series of mirrors called sun scoop system. One of the sun scoop systems is located above the atrium and another is located in south parallel with it sticking to the exterior of the building. Exterior sun scoop follows the sun's movements throughout the year and reflects the sun's light back to the row of mirrors above the employees in the eleventh floor. Interior mirror formed curved membrane along the surface above atrium, reflects the light through the glass under the arch, down to atrium and down into the field of basement. Shelves to put each mirror are equipped with an electric motor and computerized control and allow following the sun's movements (Shalmani, 2010).

Conclusion

It should be admitted that after more than a hundred years from the age of modern urban planning, but major changes have not been done in this area and the citizens of modern cities are not satisfied with living in these cities and theories presented in this respect have not removed urban slums and reduced urban poverty, yet. New strategies in the processes, policies and urban planning has emerged since 1970s that most of them have been in the levels of local and municipal to achieve power and issues such as social welfare, provision of optimal housing, efficient urban transportation, education and adequate health services are involved into urban studies and cause the development of local governments activities in urban areas. With all of these developments, the fundamental work has not been done in order to explain the real urban problems and their solutions (Duhl, 2005). Urban communities have always had the desire to gain utopias and perhaps the reason of such a cycle is their everyday and real lives, which mean utopias, are expressed as a choice against today's cities. Bed preparation to create sustainable architecture in three categories- cultural, social, economic and environmental factors can be studied. In all of these branches considering the characteristics and capabilities of the region and its people, is important (Saremi, 1994).

References

- AhmadShalmani, M.H. (2010). Seven architects, third edition. 185-233.
- Armaghan, M., & Gorjimahlabani, Y. (2009). Iranian local architectural values in relation to sustainable architecture approach. *Architectural Journal of Housing and Rural Environment*, Page 34.
- Bahrayni, H. (1997). Urbanization and Sustainable Development. *Journal of Rahyaft*, Issue 17.
- Banting, D. (2005). Report on the environment benefits and cost of green roof technology for the city of Toronto .Toronto
- Blowers, A. (1994). Planning for sustainable environment. A report by town and country planning Association. London: Earthscam pub.
- Clarck, M. (1992). A sustainable economy. London: Earthscam. pp140-147
- Duhl, L. (2005).The healthy cities, function and future, health promotion.
- Ghiyasvand, J. (2003). Architecture, Environment, and Sustainable Development. *Journal of Civil , Architecture , Urban Planning*, 45 , p.55.
- Hardoy, J. (1992). Sustainable cities, environment and urbanization,vol4,2, 3-10.
- Kanter, R. (2005). Enviromental Almanac: Trees,Green space and human well-being. Toronto.p:47.
- Kazemi Mohamadi, M. (2001). Urban sustainable development, concepts, ideas. *Geographical Research Quarterly*, 62, pp. 101.
- Kasmaei, M. (2007). Environmental designing manual, First Edition. Tehran: Building and Housing Research Center.
- Keshtkar Ghalat, A.R., Ansari, M., & Nazidizji, S. (2010). Development of Green roof system based on the sustainable development criteria in Iran. www.sid.ir
- Mahmoodi, M. (2004). Principles of sustainable designs to meet sustainable development goals. P 2, Iran civil center.
- Maknoon, R., (2006). sustainable development strategy. Sustainable development and environment seminar, Ecologists Association of Iran , Tehran University , page 29.
- Maleki, S. (2003). Sustainable city and urban sustainable development. *Journal of housing and revolution*, 12, p. 34.
- Mayor, R. (1998). Vission joy of green cities in garden. d green cities: ecologically sound approaches to urban space. rlack rose bodcs Montreal Canada,pp38-39.

- Nohi, S.M. (2000). Interactions in arts and architecture, first edition. Tehran: publication of Nashr e No.
- Rydin, Y. (1995). Sustainability development and the role of land use planning report
- Saremi, A.A., & Radmard, T. (1994). Sustainability values in architecture. Tehran: Publication of National Cultural Heritage.
- Selman, P. (1995). local sustainability: can the planning system help get us from here to there? T.r.p.66(3).
- Ternor, T. (1997). City like a view: a perspective beyond the new quotations (post - postmodern) to design and urban planning, Translated by Nouriyan, F. Tehran: Processing and urban planning company.
- Ziyari, K.A. (1999). New urban planning. Tehran: Samt publication.
- Ziyari, K.A. (2001). Sustainable Development and urban planners' responsibility in the twenty-first century. Journal of Tehran University Faculty of Literature and Humanities, p. 375.