Rethinking “Architecture for Sustainability”

Lusi Morhayim

ABSTRACT: Sustainability is a confusing term when it comes to architecture, however the built environment plays a crucial role in sustainable development. At present great effort is spent to achieve environmentally friendly building practices. On the other hand, “sustainable architecture” and “environmental architecture” are used to express the same building qualities, even though these buildings emphasize environmental sustainability while the other factors regarding sustainability are skipped most of the time. Nevertheless, social and economical responsibility in a building is as important as environmental responsibility of a building, in order to obtain qualities for sustainable livelihoods. The aim of this paper is to discuss the above-mentioned issue together with architectural examples.

INTRODUCTION

Today, some 60% of worldwide fish stocks are either over fished or entirely depleted. Every year, some 15 million hectares of forest are destroyed, mainly in the tropics. The WHO assumes that about one quarter of all preventable diseases are environment-related. 40% of the world’s population has no access to adequate sanitary facilities, 850 million people can not read or write, 70% of the rural population of Africa has no access to electricity, One in six children does not go to school –i.e. over 110 million children of primary school age [1]. Indicators of environmental degradation and instability in social and economical fields are accelerated at an alarming rate. Today's problems have led world to take action towards a better quality of life for all. Architecture is one of the means to create a better life for people in terms of environmental sustainability along with social and economical sustainability.

2. VERNACULAR ARCHITECTURE VS SUSTAINABLE ARCHITECTURE

“Since antiquity, man has reacted to his environment, using his faculties to develop techniques and technologies, whether to bake bread or make brick, in such internal psychological balance with nature that humanity historically lived attuned to the environment. Man's creations were natural when built of the materials offered by the landscape... Yet it is this population that has an intimate knowledge of how to live in harmony with the local environment. Thousands of years of accumulated expertise has led to the development of economic building methods using locally available materials, climatisation using energy derived from the local natural environment, and an arrangement of living and working spaces in consonance with their social requirements. This has been accomplished within the context of an architecture that has reached a very high degree of artistic expression”[2].

Vernacular architecture establishes an association with local characteristics, such as climate, topography, natural materials, and culture. Therefore, it represents the locality and culture of the society. Such buildings that benefit from sun and from natural ventilation do not require additional heating or cooling loads and were recognized as the first ecological buildings in history. These kind of structures are also built using natural materials from the region and consequently do not require a large capital expenditure.

However, simultaneously with the development in technology and mechanics, mere architectural principles had been forgotten. Mechanical air-conditioning offered many opportunities to architectural design; but such technologies also screened the cultural and ecological memory that vernacular and local buildings held. Architects started to design buildings that are independent from local climate and other local characteristics. In consequence, buildings became a burden on environment. Moreover, buildings turned into so called “iced-tea buildings”, as they collect the heat from the sun and later on require mechanical cooling to set comfort levels [3]. After all, realization of environmental degradation, mainly the energy crisis of 70's, drove “new” principles on stage regarded as sustainable architecture.

3. SUSTAINABLE DEVELOPMENT ON THE INTERNATIONAL AGENDA

The UN Conference on the Human Environment held in Stockholm in 1972, was the first meeting that
the relationship between economic development and environmental degradation was placed on the international agenda. By 1983, when the UN set up the World Commission on Environment and Development (WCED), environmental degradation was understood to be a matter of survival for developing nations. Led by Gro Harlem Brundtland of Norway, the Commission put forward the following concept of sustainable development in 1987: "Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

After considering the Brundtland report, the UN General Assembly called for the "UN Conference on Environment and Development" (UNCED), in 1992, also known as "The Earth Summit". More than 100 heads of state met in Rio de Janeiro, Brazil for the first international Earth Summit convened to address urgent problems of environmental protection and socio-economic development (with the principal themes of Environment and Sustainable development). The primary goals of the summit were to come to an understanding of "development" that would support socio-economic development and prevent the continued deterioration of the environment. One of the significant outcomes of the Earth Summit was the action plan titled Agenda 21 (A21). A21 addressed pressing problems and aimed to prepare the world for the challenges of the next century. It contains detailed proposals for action in social and economic areas and for conserving and managing the natural resources that are the basis for life. In 2002 the World Summit on Sustainable Development was held in Johannesburg, South Africa in order to follow up the process.

Recognition of sustainable development in the international agenda found its reflection in architectural community as well. In 1993, the UIA/AIA World Congress of Architects, recognized the significant holistic nature of sustainability thinking, and in its Declaration of Interdependence for a Sustainable Future stated: "We are ecologically interdependent with the whole natural environment. We are socially, culturally, and economically interdependent with all of humanity. Sustainability, in the context of this interdependence, requires partnership, equity, and balance among all parties". [4] Following this, in 1995 the Architects Council of Europe stated that: "Architecture strongly influences the natural and built environment, the quality of life, natural resources, and the cultural identity of our society, where activities are matters of considerable public concern. This requires that the architect acquires the capability to take social, ecological, technical, and economic responsibility for areas covered by his/her work" [4].

4. ARCHITECTURE FOR SUSTAINABLE DEVELOPMENT

Every designed system has an impact on the environment, which is identified as an "ecological footprint". In terms of building, as Yeang (1999) states, "the mere physical existence of the building, as we have seen, causes some spatial displacement (it takes up space) of the ecosystem". To be accurate; almost 50% of the global resource consumption is building related. Furthermore, buildings are the cause of 20% of global waste production and 50% of global CO2 emissions [5]. These numbers precisely define the importance of the ecological footprint of buildings. Undoubtedly, ecological building practice is a vital point for environmental of sustainability, considering architecture’s role in sustainable development.

The guiding principle of sustainable development is built upon the realization that economic and social development and ecosystem conservation are interlinked. Sustainable development seeks lasting change in patterns of production and consumption, efficiency improvements in resource use and culturally appropriate ways of shaping the development process [1].

According to Mockbee, "Sustainable architecture involves a combination of values: aesthetic, environmental, social, political, and moral. It's about using one's imagination and technical knowledge to engage in a central aspect of the practice -- designing and building in harmony with our environment. The smart architect thinks rationally about a combination of issues including sustainability, durability, longevity, appropriate materials, and sense of place. The challenge is finding the balance between environmental considerations and economic constraints. Consideration must be given to the needs of our communities and the ecosystem that supports them." [6]

Raising the quality of living standards in human settlements - rural areas or cities - should be one of the main principles of design for sustainability. Where ecological design provides healthier indoor environments and minimizes the negative impact on ecology, the architecture itself has an impact and social and economical life of the people. Sustainable design must take into consideration the wide range of cultures, races, religions, and habits of the people who are going to be using and inhabiting the built environment and this requires sensitivity and empathy on the needs of the people and the community [7].
Mutual Relationship between A21 Issues and Architecture:

Sustainable development requires concentration on economical and social aspects as well as ecological ones. This should be identical for architecture since it affects the natural environment and creates the setting in which people live. Many of the sustainable architecture examples that are publicized are mere ecological or energy efficient practices, where as these examples do not refer to any social and economic benefits of the society which they are built for. Architecture’s contribution to sustainable development depends on understanding the needs of sustainability. The action plan generated in the Earth Summit, A21, is a useful tool to discover the interaction between architecture and sustainable development.

Figure 2: Architecture is one of the means of achieving sustainable development.

Agenda 21 consists of 41 issues on different fields regarding sustainability. Architecture is one of the fields that can take a positive role in sustainable development by means of appropriate design strategies. Therefore understanding the mutual relationship between A21 issues and architecture requires great consideration. While some of those issues influence architecture, architecture has an influence on the rest [Figure 3].

Promoting education on environmental issues would increase awareness of the client and help to change customers’ demand through ecological practices. Even though it is more expensive, increasing awareness would help producers to take into account sustainable production methods for architectural materials. On the other hand a building itself can be an educational tool, via demonstrating ecological building techniques that are applied, or as a gallery to give information about environmental responsibility. International laws, in this case building codes or guidelines, encourage people to build energy efficient buildings. Trade and environment agreements in the architectural field may subsidize buying and selling ecological building materials. International cooperation concentrating on ecological practices would also be of a great value. Technology and science helps to find new ways to build sustainable buildings. Charles Corea, who works especially in poverty areas, 2 m. width pedestrian roads for homeless people to sleep at night is one of the many other examples of architect’s and architecture’s role on poverty and human settlements. Direct influence of a low-energy building on financial capital and on ecology is an indisputable relation. Minimizing environmental impact of built environment would protect ecosystems and help to control resource consumption and waste production.

Figure 3: Mutual Relationship between A21 Issues and Architecture.

Considering the examples above, in order to clarify the characteristics of sustainable architecture, intersections of sustainability and architecture are provided below:

- Health, amenity and working conditions of both users and construction workers,
- Preservation of historical and cultural heritage of a city; vernacular and ecological building techniques, hand crafts etc.,
- Economic aspects of the building itself -both contributions and drawbacks- from a local and global perspective,
- Environmental impact; on flora, fauna and habitats
- Consumption of energy and resource of a building (and waste) as both economic and ecologic matter are some of the common questions of both fields.

5. REFLECTIONS

As discussed in the previous section (4), A21 issues (considering mutual interdependencies) relate to different building types in architecture; human settlements, educational facilities, sustainable tourism facilities, and museums, to name only a few. The examples below give an idea of architecture’s and the architect’s contribution towards a sustainable development.
5.1 Affordable Housing

Portland Place and Jackson Street Village and Single Family Affordable Housing Frogtown are some of the affordable housing examples in Minneapolis that are collaborative projects between NGO’s dealing with human habitats, teams of architects, sustainable designers, academics, funding partners and health associations. Houses have 2-4 bedrooms, a bathroom and living areas, some are two level town houses and some are detached single-family houses with garages. Houses are designed to residence to both ethnically and economically diverse population. Economic well-being and the health conditions of the families and their integration to the society are other intentions of the projects. Estimated cost of construction, not including land acquisition and preparation is around US$10/m². The houses try to demonstrate that high performance and healthy features can be constructed while still maintaining affordability for low-income families. While these affordable housings aim to allow low-income families to own a house and live a better quality of life, this example has other distinct qualities, for instance:

- Jackson Street Village is a supportive housing community for families who have experienced problems with chemical dependency or homelessness and serves to a very low-income group. The project is also designed to American Lung Association Health House program. Houses are commissioned only in the circumstance that families accept to quit smoking and built-in monitoring equipment keeps tabs on air quality (and energy use) during the occupational phase of the building. Data is gathered by Xcel Energy and the American Lung Association Health House program and medical surveys are part of this program.

- The Pilot House Demonstration Project in Frogtown is a design collaboration between architects, different foundations, the City of St. Pauls and experts in cold climate housing from University of Minnesota. This project’s main purpose is to demonstrate that high performance and healthy features can be constructed while still maintaining affordability for low-income families.

5.2 Educational Buildings

A High School for Environmental Studies is a boarding school for grades 9-12 with students coming from all over Israel. The school is located the middle of a desert area in Israel at an altitude of about 500 meters above sea level [9]. This high school is a concrete example of a building type, an educational building, contributing to sustainable development. Besides the general requirements of a high school, these students take extra classes to learn about the special desert ecosystem that surrounds them. Theoretical classes on sustainable development and environmental protection are part of the education system in this school, as well as field trips and outdoor activities in the desert.

The educational activity at the Midreshet Ben Gurion educational institute is dependent on cooperation with the two university research institutes in the region. This makes it a highly important scientific and educational center, contributing to the quality of education, environment and life in Israel [9].

Another example, Istanbul Bilgi University is located in less developed areas of the city as a criterion since its foundation. The University aims to rehabilitate the surrounding and to contribute to social development. University encourages students to be involved in NGO activities regarding personal and social development. Computer, language and sport courses for people in the neighborhood; exhibitions and cinemas, jazz education and sport activities for children are some of the contributions of the university to its neighborhood.

‘The slick and the hairy’, a special house in North London was constructed with straw bales and covered with polycarbonate rain screen. Natural and often ignored highly insulative material was used for the project, with a special effort taken to make the use of these materials visible to the public. The other side of the building is amplified by a sandbag wall (again clearly visible), which provides acoustic mass against the nearby railroad. The building is functioning not just as a house but also as an exhibition itself for ecological architecture, and as a tool for increasing awareness on environmental issues. Davey (2002) explains that, “…the house has many environmental lessons to teach” [10].
5.3 Sustainable Tourism & Tourism Building

The demands of tourism can contribute to the destruction of the natural and cultural environment upon which it depends [8]. On the other hand, according to UNEP [11], traveling brings people into contact with each other and, as tourism has an educational element, it can foster understanding between peoples and cultures and provide cultural exchange between hosts and guests. The jobs created by tourism can act as a vital incentive to reduce emigration from rural areas. The main positive economic impacts of tourism relate to foreign exchange earnings and generation of employment and business opportunities. Tourism can generate jobs directly through hotels, restaurants, nightclubs, taxis, and souvenir sales, and indirectly through the supply of goods and services needed by tourism-related businesses. According to the WTO, tourism supports some 7% of the world's workers.

Kandalama Hotel [12] is the first environmental project in Sri Lanka, at the crossroads of different ecological zones incorporating a spectrum of wildlife in the center of the Cultural Triangle. Initially, the development met with public debate, as the region was opposed to any tourism development because of its historical and ecological importance. However, the developers decided to embrace local communities concerns instead of fighting them. Since its opening in 1995, the Kandalama's presence in the domestic and international marketplace has influenced 3 other hotels in the country to become Green Globe 21 certified and two other companies to join the Green Globe 21 program.

Furthermore, the hotel is designed in an ecologically friendly manner, and there are other design elements that make it distinctive. For instance: the food in the restaurants is locally grown and organic where available; the entire hotel has been non-smoking since 2001 (guests and employees); employees, of whom many originate from the region, are encouraged to develop new environmental ideas and present them to management. Furthermore, an environmental ethic is fostered through the Eco Park, an area near the employee residences that provides an environmental education centre for all employees and guests. An Eco Library for employees, guests and local school children is also included in the park. Initially the project employed over 300 people and generated an income of over US$500,000, which assisted in increased living standards for locals. Kandalama has become an important control mechanism for illegal activities around the hotel site such as poaching, clearing and firewood collection. A total of 26 local species are grown this way and replanted around the hotel site and to a network of regional schools which plant then during school planting days. Kandalama has been central to the rehabilitation of approximately 230 ha of rainforest.

5.4 Museum Buildings

Frank Gehry's, Guggenheim Museum in Bilbao is an excellent example of a building providing a well being to the city where it is located, not surprisingly this phenomenon is now called the 'Bilbao Effect'. Bilbao was formerly an industrial city of 18th century, and it has now became one of the most popular destinations in Europe, attracting almost five million visitors in five year since its opening in 1997. The city became a center of restaurants, nightlife, theatre, and art. According to the Financial Times, in its first three years the museum has helped to generate about $500 million in economic activity and about $100 million in new taxes [13]. An estimated 80% of all visitors to Bilbao are either drawn there by the museum or add an extra day onto business trips in order to see it [13]. Another similar example of a museum boosting the economy of the area and attracting visitors is Jewish Museum in Berlin designed by Daniel Libeskind, which attracted 350,000 visitors in two years before it even had any exhibits [13].

Figure 5: The slick and the hairy' (Davey, 2002)

Figure 6: Frank Gehry's, Guggenheim Museum in Bilbao.
5.5 Architect’s Role in an Urban Scale Example

Not just the buildings themselves contribute to sustainability, but also architects can lead a great transformation in quality of life, as happened in Curitiba, Brazil by Jamie Lerner while he was mayor of the city.

As an architect and urban planner, Jaime Lerner brought unique and local solutions to urban problems such as environmental degradation and social-economic problems by thinking simple, cheap and participatory.

One key aspect of the revitalization of Curitiba has been the voluntary nature under which these changes throughout the city have been implemented [15]. For example, recycling was introduced in Curitiba. Recovering alcoholics and homeless people are actively employed in the recycling program to collect recycled materials from homes. For recycling their garbage participants were awarded with food and transportation vouchers [15].

Lerner got each industry, shop and institution to ‘adopt’ a few street children, providing them with a daily meal and a small wage in exchange for simple maintenance gardening or office chores [16].

In 1970 only 0.4m2 of open space per resident existed. Today there is 52m2 per resident [15]. Children and sheep are used to take care of the parks. Curitiba builders get a tax break if their projects include green areas [16].

Jaime Lerner started a cleaning project for the golf. Even without having a fund the project was started and an agreement was established with the fishermen. According to the agreement the municipality purchased any garbage collected from the sea. As a result the fishermen went fishing, even in weather that was not suitable for fishing because they knew the importance of a clean sea for more fish [17].

Lerner introduced a new transportation system; buses that go in their own traffic lanes, carrying 300 passengers each. They travel as fast as subway cars, but at one-eighth of the construction cost [16].

CONCLUSION

“A large part of designing sustainability is to do with energy conservation, using techniques such as life-cycle assessment to maintain a balance between capital cost and long-term asset value. However, designing sustainably is also about creating spaces that are healthy, economically viable and sensitive to social needs.” (Edwards, 2001).

The extent of the global impacts of architecture on social, economical, and ecological fields needs to be discussed between architectural professionals. Required architectural characteristics, which could contribute to sustainable development, should be defined at least to some extend. Buildings can have either a positive or a negative impact on environment and human beings. Social and economical issues are as important as mere environmental issues, which are all basics of sustainability. In order to live in a socially-economically and environmentally sustainable built environment, designers should consider and be aware of realistic sustainable design principles in architecture.

ACKNOWLEDGEMENT

RESOURCES & REFERENCES

[17] Cumhuriyet Newspaper, may, 16, 2004
[22] Istanbul Bilgi University, http://www.acialumni.net/BEACON2003/Lale.htm
[23] Environmental High School in Sde Boker (Israel), http://tichon.boker.org.il/