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## **Livable Eco- Architecture; Interaction between Sustainable House and Environment Conditions**

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### **Abstract**

Sustainability creates solutions that solve the economic, social and environmental challenges. It has been studied and managed over many scales of time and space and in many contexts. The paper reviews the definitions of sustainability respecting the ecologic concept as well the need for balanced sustainability within its three pillars on equal way, then it goes through Ecologic Architecture with its core requirements and how it's important to work within the framework of Ecologic Architecture. In the aftermath of climate changes there has been an increase of overall interest in sustainability of Environment material. Sustainable development in living environment is not only a trend. Similarly sustainable development in modern bathroom is not a fad. Contemporary societies are not able to function without water, energy, heat, electricity and fuel. It is obvious that the precious natural resources are not available in unlimited quantities. Therefore is absolutely no alternative to necessity of sustainable development. Man must learn to be more careful with using of natural resources; in this paper describe the Livable eco- architecture that have been explained the interaction between sustainable house and urban conditions in analytical approach.

**Key words:** *Eco- Architecture; Livability; Sustainable House; Environment.*

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1. Environmental issues have raised serious concerns for several decades, yet little improvement has been realized in the building sector, especially in the single-family residential sector. In the US, buildings are responsible for more than 40% of national energy consumption and for about 30% of greenhouse gas emissions. On the one hand, buildings rely on natural resources and have large environmental footprints; on the other hand, they not only impact the environment, but also affect the humans they house. With the residential sector being an important part of building construction in the US, building new homes and retrofitting the old ones in a sustainable way is essential.

## Introduction

Many years ago, a lot of environmental, urban, social and economic challenges are facing Egyptian cities. These challenges have many negative impacts on cities' development efficiency and performance. These challenges emerged as a result of many reasons including, adopting of ineffective and unsustainable policies, systems and technologies in the process of planning and management of Egyptian cities. In the next few years, and with high expectations of population increasing, it is expected that these challenges will be expanded to reach very dangerous degrees on human being. In the age of Global warming, Pollution and running out the Earth of its natural resources, where the future will be governed by the development of clean technologies for sustainable environmental management, highlighting the architects role where it's clear that the building sector is the single largest contributor to increase the phenomena of world climate change. This paper addresses itself to that modified challenge, it attempts to define and clarify eco-Architecture as a framework for a comprehensive understanding, and then it will focus as the first eco city in Arab world. Sustainable development calls for improving the quality of life for all of the world's people without increasing the use of our natural resources beyond the Earth's carrying capacity. While sustainable development may require different actions in every region of the world, the efforts to build a truly sustainable way of life require the integration of action in three key areas:

1. Economic Growth and Equity; Today's interlinked, global economic systems demand an integrated approach in order to foster responsible long-term growth while ensuring that no nation or community is left behind.
2. Conserving Natural Resources and the Environment; to conserve our environmental heritage and natural resources for future generations, economically viable solutions must be developed to reduce resource consumption,

stop pollution and conserve natural habitats.

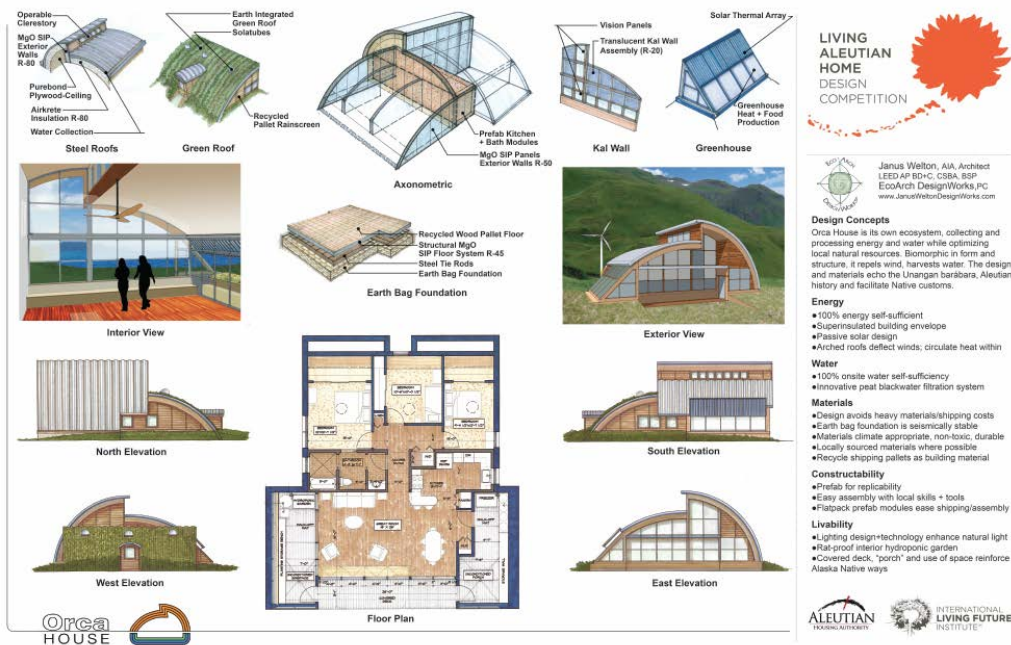
3. Social Development; throughout the world, people require jobs, food, education, energy, health care, water and sanitation.

## Literature Review

### Sustainability

Sustainability means continuing, evolving, and adapting to renewable. Usually, sustainability is emerging as a key issue in economy and society. Now, the challenge of climate change leads us to introduce sustainability in architecture. As we know, architecture is about creating a better living space for human life and development, as well as considering the nature and resources of the planet from a global sustainable perspective. Sustainable architecture must not solely become a question of CO2 emission reducing. It is necessary to consider sustainability from a holistic point of view that considers financial, cultural, and social issues as well as wider ecological and environmental aspirations. As it is production of conventional energy sources that produces carbon dioxide, the first step will be to find ways in which to reduce the energy consumption of the buildings.

This means minimizing the need for everything that requires power, e.g. air conditioning, mechanical ventilation, and artificial light, etc. The second step would be to use sources of renewable energy wherever possible in the planning of the future master plans. Sustainability origins and concept the phrase "Sustainable Development" was emerged and defined by the World Commission on Environment and Development in 1987. They set forth that "sustainable development is improving people's life-enabling habits to meet our needs in the present without compromising the ability of future generations to meet their needs". Natural resources such as water, air, soil, plants, and animals are the basic assets upon which all life, human and otherwise, depend. Therefore, according to this definition it is unwise to use up these supplies, or we will be threatening the security of all people, in the present and future.



▲ Fig 1. Livable eco house; the best work in international competition of eco-city; IFLA competition; 2014



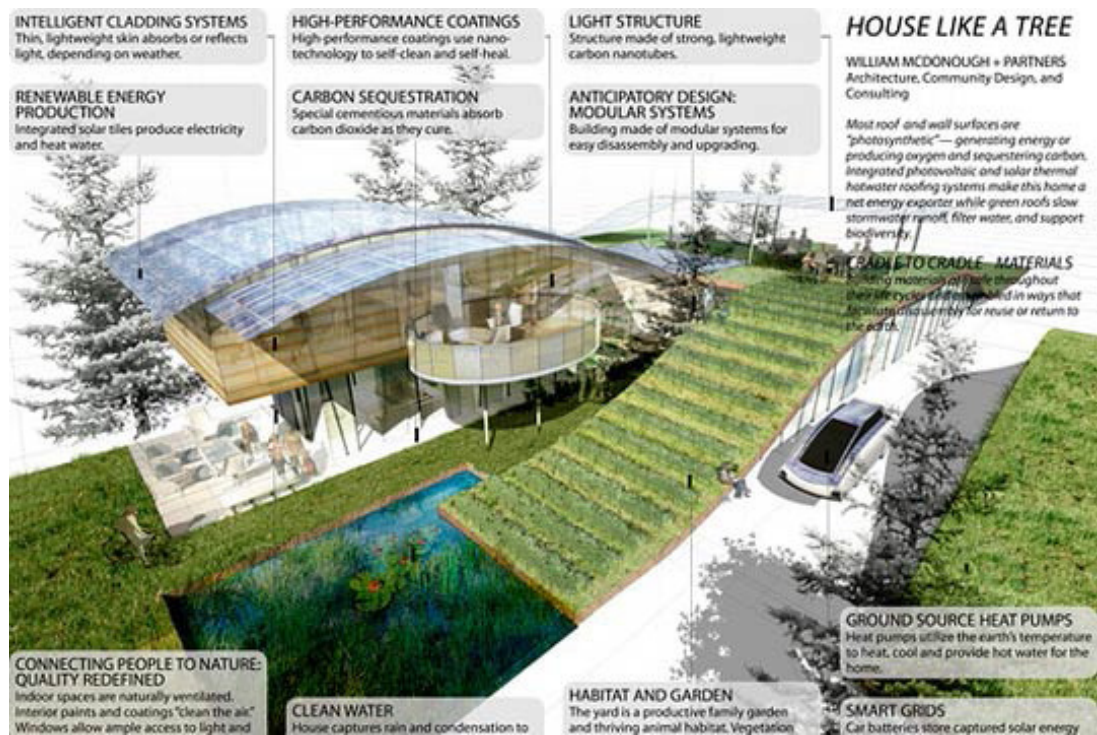
▲ Fig 2. Conceptual picture from sustainable house; source: author's archives.

Sustainable development should not be treated as a distraction and complication, but rather as a possibility of preparation to needs of the future. Awareness of sustainable values and necessity of sustainable actions and practical, rational involvement and contribution in sustainable development of material environment gives a sense of responsibility for the future. Ethics of responsibility of German philosopher Hans Jonas belongs to the most popular trends of global ethics. The most often it is treated as coherent with ethics of a sustainable development. He formulated the ecological imperative “Act so that the effects of your ac-

tion are compatible with the permanence of genuine human life” – Be aware of the responsibility for the consequences of their own actions. In this sense it is understanding of sustainable development regards the possibility of satisfying the needs of the present and, at the same time, maintaining a healthy, safe, livable and ready for existence, environment for future generations. It is about creating spaces of life, that are both ecologically compatible and economically acceptable and that give maximum priority to the needs and interests of users. In the hygienic-sanitary spaces, as in other areas of our life, sustainability is not

مدیریت شهری

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(ویژه نامه لاتین)  
Urban Management  
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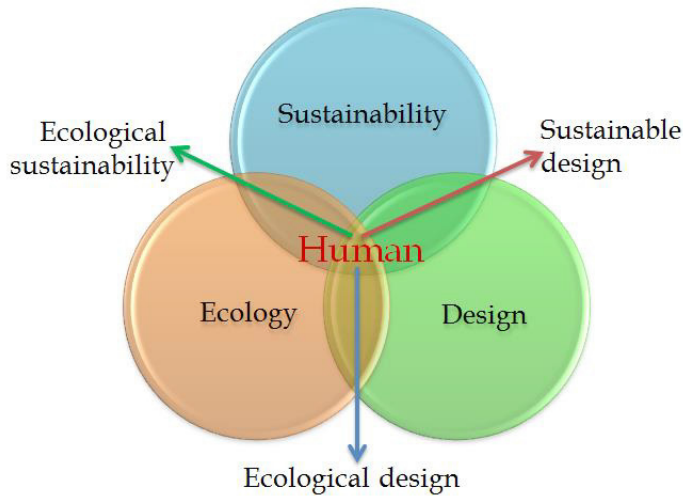
▲ Fig 3. House like a Tree and The relationship between ecology, sustainability and design

just about ecology and economy but it is also based on psychological, social and cultural factors, such as health and the comfort and social interaction of the respective users. Sustainable development is based on a holistic view of the ecological, economical and social impact of the material environment on man and nature.

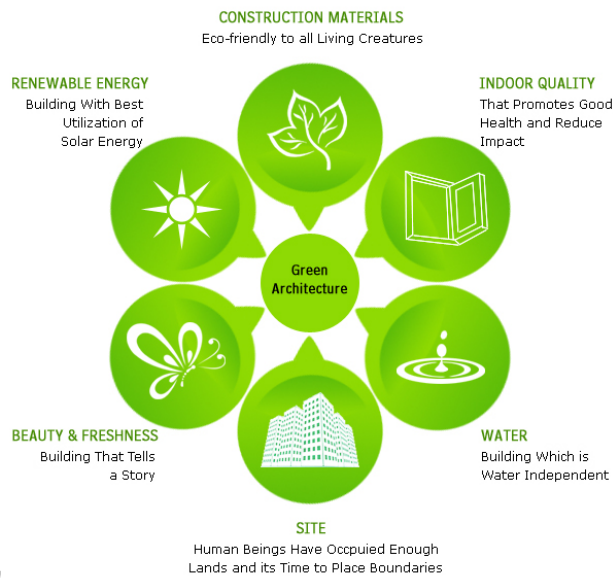
### Eco-city

Eco-city is defined as an umbrella metaphor that encompasses a wide range of urban-ecological proposals that aim to achieve urban sustainability. These approaches propose a Wide range of environmental, social, and institutional policies that are directed to managing urban spaces to achieve sustainability; This type promotes the ecological agenda and emphasizes the environmental management through a set of institutional and policy tools. Also, Eco-city is described as 'a city that provides an acceptable standard of living for its human occupants without depleting the ecosystems and biochemical cycles on which it depends'. When Livable city is described as an urban system that contributes

to the physical, social and mental well-being, and personal development of all its inhabitants, it is about delightful and desirable urban spaces that offer and reflect cultural and sacred enrichment. Key principles that give substance to this theme are equity, dignity, accessibility, conviviality, participation and empowerment. **Sustainability respecting Ecologic concept** Sustainability creates solutions that solve the economic, social and environmental challenges. Sustainability is studied and managed over many scales (levels or frames of reference) of time and space and in many contexts of environmental, social and economic organization. The focus ranges from the total carrying capacity (sustainability) of planet Earth to the sustainability of economic sectors, ecosystems, countries, municipalities, neighborhoods, home gardens, individual lives, individual goods and services, occupations, lifestyles, behavior patterns and so on. In short, it can entail the full compass of biological and human activity or any part of it (Kuppaswamy Lyengar, 2015).



▲ Fig 4. The relationship between ecology, sustainability and design



▲ Fig 5. Green Architecture; concept and meaning



▲ Fig 6. The prototype connected residential unit in Trento, N. Italy (left) is organized in 3 modules and 2 side elements (right).

The overall driver of human impact on Earth systems is the destruction of biophysical resources, and especially, the Earth's ecosystems. The total environmental impact of a commu-

nity or of humankind as a whole depends both on population and impact per person, which in turn depends in complex ways on what resources are being used, whether or not those



▲ Fig 7. Life style and environment; the changes in sustainability and earth;

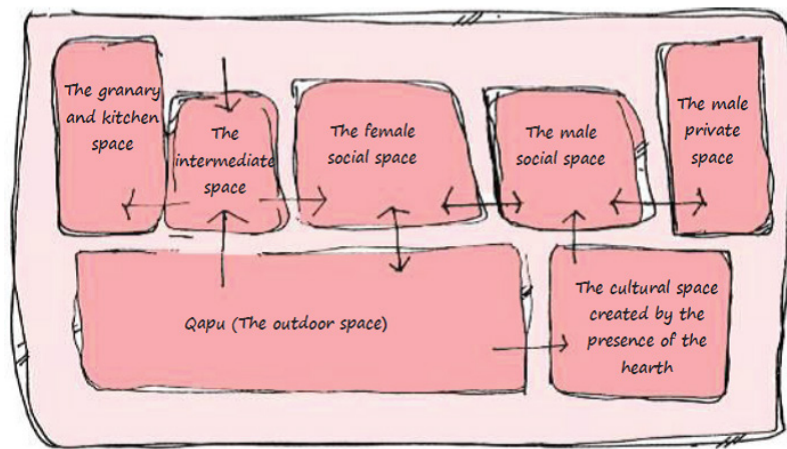
## مدیریت شهری

فصلنامه مدیریت شهری  
(ویژه نامه لاتین)  
Urban Management  
No.43 Summer 2016

218



▲ Fig 8. Green house; the relationship between ecology, sustainability and design



▲ Fig 9. A pattern drawn from functional model of nomad's life based on black tent's inner space for practical design.

resources are renewable, and the scale of the human activity relative to the carrying capacity of the ecosystems involved. Careful resource management can be applied at many scales, from economic sectors like agriculture, manufacturing and industry, to work organizations, the consumption patterns of households and individuals and to the resource demands of individual goods and services (Michael Brower, & Warren Leon, 1999).

### The Rise of Eco Awareness in Sustainable Design

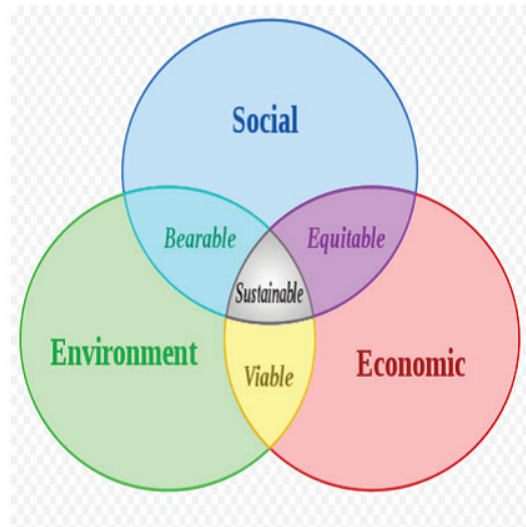
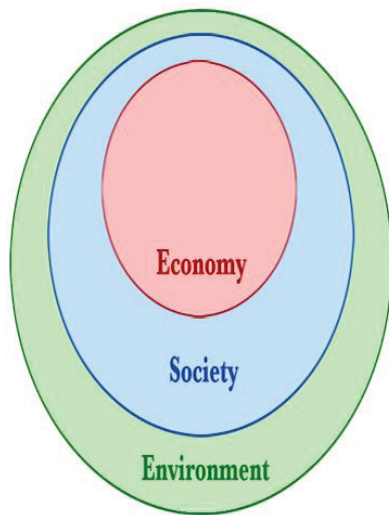
Ecology is the study of relationship of plants and animals to their environment. The flow of material and energy between things within their environment is the spatial context, their community; it is the study of that spatial connectivity between organism and environment that makes ecology an excellent model for sustainable design (David Bergman, 2012). By ecology we mean the body of knowledge concerning the economy of nature, the investigation of the total relations of the animal both to its inorganic and its organic environment; including above all, in a word, ecology is the study of all those complex interrelations referred to by Darwin as the conditions of the struggle for existence. This science of ecology, often inaccurately referred to as 'biology' in a narrow sense, has thus far formed the principal component of what is commonly referred

to as "Natural History" (Daniel E. Williams & Faia, 2007).

The physical environment includes the sun, water, wind, oxygen, carbon dioxide, soil, atmosphere, and many other elements and processes. Ecological study connects many fields and areas of expertise, and in so doing illustrates holistic aspects of components and their relationships to one another within their spatial community. The relationship between design and ecology is a very close one, and makes for some unexpected complexities. Ecology explains how the natural world is and how it behaves, and design is also the key intervention point for making sustainability in ecology. The knowledge gained from ecology can influence any design.

### Ecologic Architecture

Architecture is a reflection of our society in attitudes, costumes, desires, needs, and technology. In our society it is an expectation that runs counter to ecologic coherence and sustainability. Architecture shapes and conditions our attitudes and relationship of people with people. It also bears a relationship to community and to the built environment and its attendant infrastructure (Richard I. Crowther, Faia, 1998). All of the foregoing attributes rest within the conventions and traditions of architecture, but a new inspiration is needed to accord with the



▲ Fig 10. (a) Definitions of sustainability often refer to the “three pillars”; (b) A representation of sustainability showing how both economy and society are constrained by environmental limits.

natural forces and regenerative vigor of our planet. From Frank Lioyed: his living voice selected and edited by Bruce Brooks Pfeiffer, The Press at California State University:

“In Nature you will find everything exemplified, from the blade of grass to the tree, from the tree to the geological formations to the procession of eras beginning with the first from the sea downwards. And when you get a sense in your mind of that continuity and that elemental sense of process according to the nature of materials, you’ve got the basis for an Architect’s conceptions” (Fred A. Stitt, 1999)

### Livability

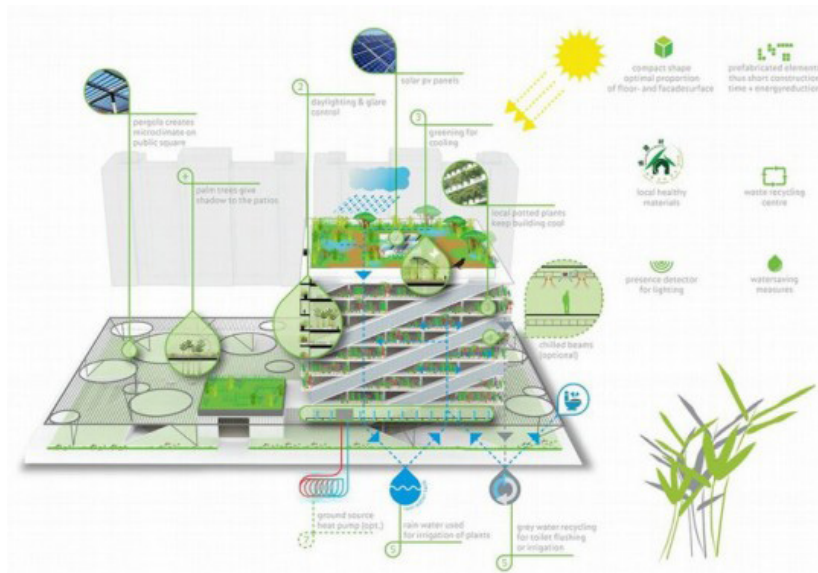
The concept of livability should encompass those elements of home, neighborhood, and metropolitan area that all contribute to safety, economic opportunities and welfare, health, convenience, mobility, and recreation. The adjective livable for a city connotes a desirable quality of life for its citizens including social activities, attractive public places, provision of a certain level of privacy, as well as a sense of community. There are many approaches of sustainability including Green city, Eco city and Livable city. Each approach is focusing on specific issues of sustainability. Green cities are defined as the cities striving to lessen their environmental impacts by reducing waste, ex-

panding recycling, lowering emissions, increasing housing density while expanding open space, and encouraging the development of sustainable local businesses.

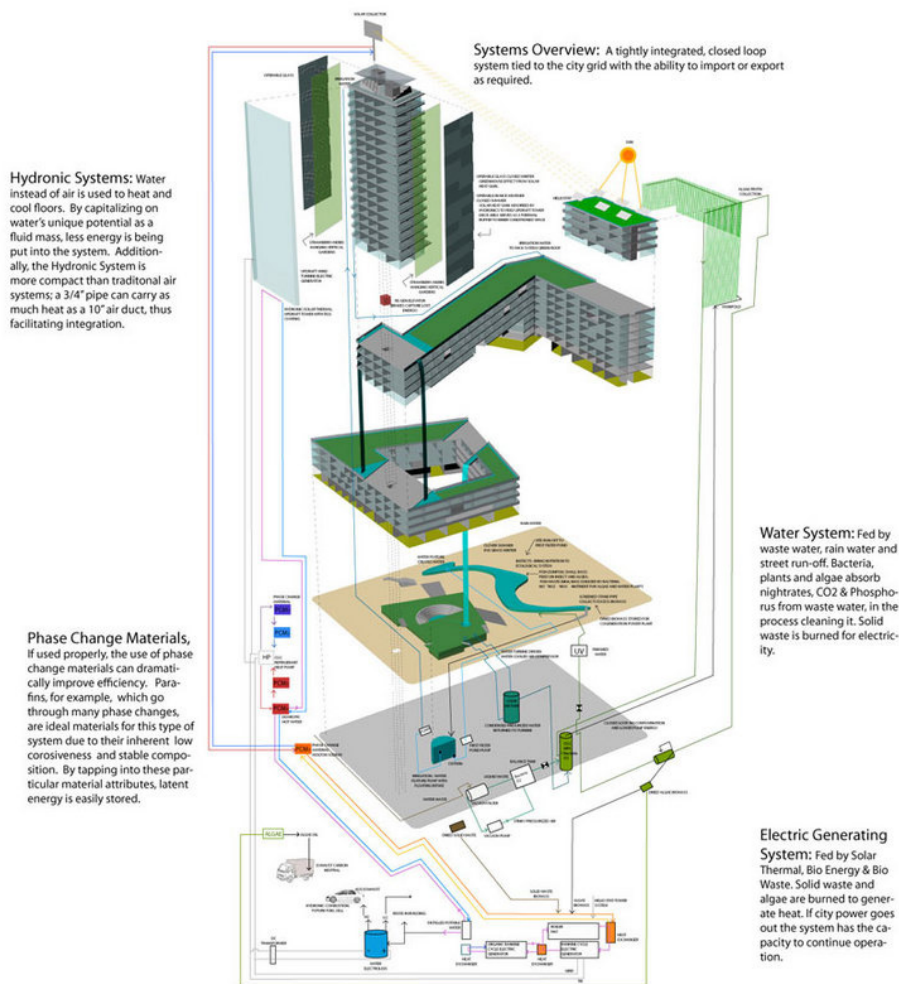
### Necessity of Ecologic Architecture

An ecologic context embodies not only that of nature but also of us. Our present technologic, artificial environs are counter to nature. Our coming age will fill in terms of constructive social meaning, sustainability and vitality unless a revolutionary restructuring is brought into being, so time is against us as our present sociologic, ecologic and psycho-physiologic form and environs must be re-planned to be coherent with sustained global Habitability (Fred A. Stitt, 1999); Architecture will have to be viewed from an entirely new perspective consistent with ecologic and societal values and equity our own expanding population and that of our planet is a provocative and prime problem. Unless we can soon develop heroic measures to stabilize our global population, our prospects of a less livable world will dramatically increase, nature’s ecosystems have considerable resiliency and ability to recover. Cosmic unifying force that flows through our planet’s dynamic, systemic order with ecologic balance has made us what we are, our beginning within the provisionary





▲ Fig 11. Eco- city and environment conditions: The relationship between ecology, sustainability and design.



▲ Fig 12. Diagram of The relationship between ecology, sustainability and architectural design

miracle of life has sustained us but our divisive minds and sophisticated technologies have and continue to deplete the life giving and sustaining ecosystems. We threaten ourselves within how we think, specify and act (James Steele, 2005).

### Conclusion

Sustainable architecture is a category of architecture based on localized requirements and building materials, and reflecting local traditions. Sustainable architecture behaviors evolve over time to reflect the environmental, cultural, technological, and historical context in which it exists. It has often been dismissed as crude and unrefined, but also has proponents who highlight its importance in current design. Earth architecture is a type of sustainable architecture. It is important to note that sustainability is not a “thing we do” or a “program we carry-out”. Instead, it is a process by which we reason and a way we choose to live, a process that uses common sense and intuition as a baseline. Sustainability should be viewed as a philosophy, or ethic, affording people the ability to consider long-term consequences of actions and to think broadly across issues, disciplines, and boundaries. As a process, sustainable community development exposes citizens to the ramifications of their thoughts and actions on others, their local environment, and the surrounding landscape, as well as motivating and organizing people to direct change within the context of a responsible and shared vision for a collective future. Toward sustainable urban form, a compact, high density, and mixed-use are critical, along with ensuring that the city protects and enhances its green and open spaces. City’s urban uses and economic activities should be highly demanded and should be distributed in a way that eliminates distances and curbs automobile dependence. Changes in transportation systems to make it more sustainable and livable should not only give people the option of waking, biking and using public transit, in addition to driving, but also reduces traffic congestion, protects the

environment, and encourages physical activities. Low carbon architecture which is responsive to developing of low carbon economy has been defined as a sustainable architecture with sustainable development of economy, society, environment and architecture itself simultaneously. Sustainability in architecture comes from sustainable design which is a dynamic and living process. A three rings model of sustainability proposed by author is useful for understanding the mechanism of sustainable design process, rather than a more complicated model. Principles and factors to be considered in sustainable design have been investigated in this paper. Sustainable design had much difference from traditional design may be carried forward intensive design, efficient design, smart design, suitable design and interdisciplinary cooperation. The unintended consequence of industrialization is now evident, consequences that result from exceeding sustainable levels of raw material extraction, emissions and waste and the linear business model of take-make-use-waste. It is predicted manufacturing is set to enter a dynamic new phase, driven by rapid changes in technology, new ways of doing business, and potential volatility around the price and availability of resources. Sustainability applies to the materials, devices and installations used in the bathroom, their sustainable design, construction and production methods that enable sustainable use. It means the economical use of resources, lightweight construction, minimizing energy consumption and emissions, the ability to return built components to natural or technical cycles, namely the possibility of dismantling or disassembly phase, or the ability to identify the used materials at a later stage as a necessary prerequisite for reintroducing them into biological or technical cycles so that nothing is lost. Some objects and forms last longer and have a longer appeal. But ongoing study and search for optimum solutions the sustainability turns out not to be a matter of chance. It is decided in advance, from the outset, at

development. Designers and producers focus on water-saving and energy-efficient solutions, environmentally friendly

Manufacture, timeless forms that retain their appeal for years and simple product assembly.

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مدیریت شهری

فصلنامه مدیریت شهری  
(ویژه نامه لاتین)

Urban Management  
No.43 Summer 2016

■ 223 ■

مدیریت شهری

فصلنامه مدیریت شهری  
(ویژه نامه لاتین)  
Urban Management  
No.43 Summer 2016

■ 224 ■

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