

Amjad Almusaed



Biophilic and Bioclimatic Architecture

Analytical Therapy for the
Next Generation of Passive Sustainable
Architecture

 Springer

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Dr. Amjad Almusaed
Archcrea Institute
Søndervangen 38-2TV
8260 Viby J
Denmark
e-mail: amjad_almusaed@yahoo.com

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Preface

The architectural product, being a creation of a human work, a long time user produce, like any other product it has not only to be produced but also to get the user's disposal. A true architecture is that where thinking and human feelings come into play, creates an entire harmonic, which ensembles structure and possesses significance.

Architecture is always a response to tradition and culture of its time. It reflects the pulse of the society, environment action, life style of inhabitants and their aesthetic value as well as their building technology. Today several specialists in architecture and building design believes that, it is necessary to carry out an innovative creation of architectural produce, which keeps up a correspondence to the new demands of a full useful architecture but no more building.

As soon as we talk about passive and low energy building, many suppose that we talk about a machinery-building, a building without human sentiment. Others believe that passive and low energy building is an ugly creature.

Many engineers, designers, agriculturists, etc. wrote about low energy buildings, green buildings, etc. Although a few of them reached the right concept of passive and low energy building in concordance with the architectural conjecture. Therefore, we can identify the technical nature of these concepts. Passive and low energy building represents one of the most consistent concepts in sustainable building. A high quality of building model brings the thermal comfort primarily up-to-date to the user of the building with lowest energy costs. In this vision; all buildings can be one of the three conceptual categories relating to; *energy, natural and physical surrounding, and building design*:

- *The indifference conception*: energy used for heating, cooling, lighting, etc. is uncontrollable (this concept is clearly used in industrial and agriculture buildings).
- *The exclusive conception*: energy employed in building design is controlled by means of building materials, passive heat systems, etc. The building is isolated

from their surroundings (this concept is clearly used in passive and low energy buildings).

- *The selective conception*: all habitant factors such as human comfort, environment and surroundings, indoor and outdoor energy, local climate, architectural hypothesis, etc. should be employed in building conception. The environment behaves as such a selective filter with dynamic energy action to environmental incidents. That can be done by spatial configuration and optimal constructive solution to set up in detail and then through the fitting techniques that captures and convert free energy from the environment (this concept is the main aim of this book).

It is the difference between the term of “*Building*” as a policy and the term of “*Architecture*” as a strategy. “*Building and its component*” is a policy of human design, which admits the terms of passive and low energy concepts, while “*Architecture*” is a strategy, which include a large diversion of policies.

Presently it becomes an incorrect work manner when we take the building phenomenon and detached it from the large concept of architecture. Energy in passive and low energy building is an important factor; but it has an abstract act without human sentiments.

The human comfort is the vital aim of architecture where the interaction appears between the energy such an abstract act and the human feeling and comfort in which the balancing is extremely complex. The main aim of this book is to establish the commune working area by means of architectural hypothesis upon a low energy building design and friendly environment.

Actually, the problem is between the innovative architectural notion and the traditional concept of architecture. We need a clear response to the following questions:

- What can a architect do after a traditional education route?
 - Where is the creation status in our artificial life?
 - Is the remediation process affected by postgraduate route capable to build a competent architect?
 - Where is our responsibility to nature demolishing process and climate change?
- The procedure of a traditional education becomes more diminutive to include all new requirements. We have to improve our life by an adaptive human creation fitting for our future sociality and nature.

The Academic Sphere

This book is in charge for phrasing and pursuing strategies for planning politics and spatiality for the development of an operative architectural orientation, throughout innovative interpretation of the architectural conjecture that combines stimulates the existing environment with human requirements.

This book extends the study of passive and sustainable building policy, in concordance with biophilic and bioclimatic architectural concept, in a global interpretation. The viewpoint of this book is both tactic and strategic.

Central District of this Book

1. Architectural theory and hypothesis

It is an act of thinking, designing and creating a habitable space which is covering by a high performance human creation and not a buildings material. Where every architectural creation can be described by a building form, but not every building figure can be described by architectural creation.

2. Biophilic architecture

It is a part of an innovative view in architecture, where nature, life and architectural theory combine to create a lively habitable building competent to satisfy the demands, constraints and respect for both people and the environment.

3. Bioclimatic architecture

This notion refers to the idea of creating buildings and manipulating the environment within buildings by functioning with natural forces around the building rather than against them to create optimal physical human comfort.

4. Passive and low energy building

This perception is a comprehensive approach to energy conservation which is usually requires high class insulation as well as a healthy ventilation system, that should be able to prevent the heat loss and increasing the energy efficiency outline to get the highest building performance in exploiters.

5. Sustainable devolvement strategy

Sustainable development is a development that meets the requirements of the present without compromising the ability of our future generation to meet their own requirements.

Denmark, 2010

Amjad Almusaed

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Part I
Architectural Hypothesis and Theory

Chapter 1

Overview

The earth is our sustainer, the chain of the ecologic survival. Renew ability is the key to our human continuum and to our prime resource for architecture. Earth sheltering, earth handling and earth escaping are more clearly pronounced in the vocabulary of architectural planning and design (Zaki 2005). Architects can timepiece many new negative effects generated from a wrong usage of earth resource and a wrong correlation among the three components of human existing in the earth; these are environment, architecture and human being. Bearing in mind, the present forms of human building response to his environment and several of the problems produced by them, confident questions are raised regarding the lack of respect that many of these traditional responses have for the conservation of the environment and its intrinsic natural processes. We have over-used and over-abused every material, every resource and every environmental attributes originally available for us, to the area that many are at present scurrying about trying to find a gimmick or a quick and easy solution to the problem (Al-musaed 2007).

The problem, though, seems to stem from a lack of appropriate knowledge about the nature of our given environment. However, the solution does not involve gimmicks, only understanding. All that which is necessary to exist in unison with our surroundings is a clear and objective analysis of the intricacies of the environment in which we live, and an honest reaction to those factors, which strongly influence the nature of that environment. Sustainable development's emphasis on limiting infrastructure and the materials used, helps contribute to affordability during the construction of a project by eliminating some costs altogether. In the longer term, sustainable design's principles of energy and healthy architectural spaces and material durability would help to make a habitat affordable. Renew ability is the key to our human range and our prime resource for architecture. Every site is definite as to its location, natural relief, local vegetation and its local macro-microclimate. Today, upon reflecting on the various settings and experiences of our lives, we should be able to find some fairly close matches between characteristics we like and characteristics that would have improve our chances of survival. The natural contiguous keeps us healthy and in turn, probably promotes physical

performance as well. Occupants of built environments do not want simply to work, play, eat or sleep in a functional building. They need to be inspired, invigorated, comforted and reassured by their surroundings. They require spaces that will make them more appropriate, comfortable and healthy. The book will take in evidence the challenges and the goals of human objectives for a healthy human architecture.

1.1 The Challenges

Hyper used of earth prime resources contribute to evolution of big energy and earth pollution. The troubles that require attentions are decides in following subsection.

1.1.1 Energy Crisis

Energy crisis is a situation in which the nation suffers from a disruption of energy supplies accompanied by rapidly increasing energy prices that threaten economic and national security. As we all know, that energy is essential to modern society, as we know it. Over 85% of our energy demands are met by the combustion of fossil fuels. This shows exactly how vital are the fuels to our society by showing how much of each energy resource is consumed (Bartok and Adel 1991).

We further recognize that new technological breakthroughs make it possible, for the first time, to reconfigure existing buildings and design and construct new buildings that create all of their own energy from locally available renewable energy sources, allowing us to re-conceptualize building as ‘power plants’ (Enric and Jeremy 2008).

1.1.2 Energy Pollution and Human Healthy

Energy pollution comes from the discharge of energy during some human activity that harms or interferes with human health or ecosystems. Almost all energy production and assumptions involves some form of pollution. Typical forms of energy pollution are noise pollution from subsonic testing by the navy or too many decibels from heavy traffic or large machines. Thermal discharges from power plants, radioactivity from building materials with concentrated radon or from nuclear power plants, light that interferes with astronomy or bird migration, and increased ultraviolet ray exposure from depletion of the ozonosphere (Wiser earth). Each different source of energy, from fossil fuels to nuclear, pollutes in a different way and to a different degree. As a resultant of energy pollution is given in following subsections.

1.1.3 The Greenhouse Effect

Where greenhouse gases naturally blankets the Earth and keeps it about 33°C warmer than it would be without these gases in the atmosphere (Bartok and Adel 1991). The ‘greenhouse effect’ is the heating of the Earth due to the presence of greenhouse gases.

1.1.4 Heat Climate Change

In 2007, the science of climate change achieved an unfortunate milestone: the Intergovernmental Panel on Climate Change reached an accord position that human-induced global warming. The most recent scientific effort demonstrates that changes in the climate system are occurring in the patterns that scientists had predicted, but the observed changes are happening earlier and faster than expected—again, unfortunate (Ebi 2007). Climate change cannot be stopped entirely, but it can be limited significantly through national and international action to reduce the amount of greenhouse gases emitted to the atmosphere over the next several decades and thereafter, thus limiting climate change impacts. This is already causing worldwide physical and biological impacts, where globally, the ten hottest years on record have all occurred since the beginning of 1990s.

Current climate models predict that global temperatures could warm from 1.4 to 5.8°C over the next 100 years, depending on the amounts of greenhouse gases emitted and the sensitivity of the climate system (Al-musaed 2004).

1.1.5 Urban Heat Island

The annual mean air temperature of a city with 1 million people or more can be 1–3°C warmer than its surroundings. In the evening, the difference can be as high as 12°C. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality and water quality (US EPA 2009). The reason that the city is warmer than the country comes down to a difference between the energy gains and losses of each region.

1.2 The Objectives

The biophilic and bioclimatic architecture provides us with the opportunity to reach extremely optimal human comfort and low levels of energy consumption by employing high quality, cost-efficient measures to general architectural