



Evaluation of Bio-Eco Architecture In Terms Of Materials and Construction Technology

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By

Mona Mohamed Naguib Ahmed Abdelhamid

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ABSTRACT

A philosophy of ecological design will eventually have profound impact on architecture and technology. In the future, the built environment will be designed to function like living organisms, specifically adapted to place and able to draw all of their requirement for energy and water from the surrounding, while the main role of the architect will be how to design an “Ecomorphic buildings” buildings that mimic natural systems and have the capability to reconnect people to nature. To explore this idea of the living built environment in some depth, it is important to investigate the role of biological inspiration to be played for achieving regenerative sustainability. Thus, having a biological background will be very important for architects, but this is not enough as they must collaborate with biologists in the early stage of the design process to produce high quality and innovative ecological regenerative architectural design.

The main objective of the thesis is to explore the importance of the roles that Bio-inspiration plays in developing the concept of sustainable and ecological design in contemporary architecture, thereby, it helps providing some tips and guidelines on how to create new standards that can be used in evaluating Bio-Eco Regenerative architectural designs.

The research begins by presenting an overview of the importance of studying biology for sustainable architecture, as well as illustrating a set of definitions related to the bio-inspired ecological architectural design. Then, it proceeds to discuss the concept of biomimicry and biophilic design as 2 aspects of bio-inspired design solutions. The thesis also shows the role of building materials in the architectural industry which help in creating a regenerative architectural design by safe guarding the biodiversity of the natural environment. It also, pays attention to the importance of mimicking natural construction process to minimize building materials usage, consequently, reducing co2 emission.

The thesis consequently investigates a number of cases studies with various types of nature inspiration in order to present a comprehensive analysis of the bio-inspired role to be played in developing the concept of ecological sustainable design and construction. It also represents a comparative critical revision of a number of sustainable rating systems and regenerative checklists in order to reflect the changes in thinking that have affected sustainable design in the past 15 years as well as to combine all these concepts of sustainability to achieve the most efficient example which will not only help in creating a healthy environment without any harmful effects but will also provide positive environmental and social impacts.

After that, the research attempts to verify the deduced Bio-Eco Regenerative checklist through applying it to the discussed case studies that comprise the data of the thesis. Each of the 12 case studies will be analyzed according to the 16 check points of the deduced sustainable development checklist in order to find the applicability of those elements in each biologically inspired example as a living system building. The research shows that defining true sustainability for biologically inspired ecological buildings is very hardly acheived since it has a great relation to the place in which it belongs; however, it is not impossible if a post occupant evaluation is done after the building operation.

As a main conclusion the Bio-Eco Regenerative checklist (BERC) has been proposed for the future development of the concept of biological sustainable regenerative design.