Faculty of Engineering
Ain Shams University
Department of Architecture

Towards Application of Green Architecture Principles in Egypt

Presented by
Sara Samy Mahmoud
B.sc., Architecture
Faculty of Engineering, Ain Shams University, 2008

A Thesis
Submitted as a part of requirements to obtain the degree of Master of Science in Architectural Engineering

Supervisor Committee
Prof. Dr. Morad Abdelkader
Professor of Architecture & Environmental Control, Faculty of Engineering, Ain Shams University
Dr. Abeer Mohamed Mostafa
Assistant Professor of Architecture & Environmental Control, Faculty of Engineering, Ain Shams University

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Examiners Committee *Signature*

Prof. Dr. Morad Abdelkader
Professor of Architecture & Environmental Control, Faculty of Engineering, Ain Shams University

Prof. Dr. Mohamed Moemen Affify
Professor of Architecture and Environmental Design, Faculty of Engineering, Cairo University

Prof. Dr. Hanan Mostafa Sabry
Professor of Environmental Design and Control, Department of Architecture, Faculty of Engineering, Ain Shams University

Supervisor Committee

Prof. Dr. Morad Abdelkader
Professor of Architecture & Environmental Control, Faculty of Engineering, Ain Shams University

Dr. Abeer Mohamed Mostafa
Lecturer of Architecture & Environmental Control, Faculty of Engineering, Ain Shams University

2014

Statement

This thesis is submitted to Ain Shams University for the degree of Masters of Science in Architecture.
The work included in this thesis was accomplished by the author at the department of architecture, faculty of Engineering, Ain Shams University, during the period from 2009 to 2014.
No part of this thesis has been submitted for a degree or a qualification at any other university or institute.

Date:
Signature:
Name: Sara Samy Mahmoud
B.Sc. of Architecture- Ain Shams University- 2008

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Abstract

Green architecture practices in Egypt are very limited and their progress does not go with constant steps as required for mitigating local environmental problems.

The Research reviews the Egyptian context of green architecture practices to determine potentials and obstacles of applying green architecture principles in Egypt, hence suggesting recommendations that can pave a better way to increase the potentials on account of obstacles towards applying these principles in Egypt in the near future.

The research exclusively studies the obstacles of applying green architecture principle locally in Egypt, via examining the practices context.

The evaluation of Egypt's status in applying green architecture practices is achieved via reviewing the contextual factors of green architecture practices in the United States of America, India and Egypt.

A comparative study between the three countries is held to address the potentials and obstacles of the context of green architecture practices in Egypt. Finally local environmentally oriented projects are reviewed in terms of green architecture principles (using Green Pyramid Rating System (GPRS)) to determine potentials and obstacles of applying these principles in the Egyptian context. Additional data about the selected environmentally oriented projects is obtained through an open-ended interview with the designers of those projects.

Key Words

Green architecture, LEED, LEED-India, GPRS and green building practices.

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Introduction

After the industrial revolution most of the world countries turned to use non-renewable resources of energy until the start of energy crisis in 1970's caused mainly by the peaking of oil production in major industrial nations and 1973 oil crisis caused by an OPEC oil export embargo by many of the major Arab oil-producing states, in response to Western support of Israel.

In 1980's world turned to take a responsible approach towards nature through mitigating the effects of the human activities on the environment, reducing the non-renewable energy consumption and minimizing energy and water requirements without decreasing either comfort level or living standard. This new approach has appeared due to realization of energy depletion, increasing of pollution and global warming. These factors accelerated the steps towards environment conservation in most of countries of the world and urged the need for reconsidering the effects of the human activities on the environment.

Building sector is one of the most cost-effective sectors for reducing energy consumption, as buildings account for 40% of primary energy consumption of the world, and are also a significant source of carbon dioxide emissions. This led to the recognition that reducing overall energy demand, improving energy efficiency in buildings can significantly reduce Carbon Dioxide (CO_2) and other relevant emissions from the building sector.[1]

Realizing these facts helped in the emergence of a new green approach that represents a model shift in the way we understand, design and construction today. Green buildings aim to fundamentally change the built environment by creating energy efficient, healthy and productive buildings that mitigate the significant impacts of buildings on the local, regional and global environment.

Green building represents a model shift in the way we understand, design and construction today. This shift is sweeping across world's countries.

[1] International Energy Agency (EIA), 2014, accessed 12-04-2014, <https://www.iea.org/topics/sustainablebuildings/>

It's a revolution inspired by an awakened understanding of how buildings use resources, affect people, and harm the environment.[1]

On the local level, Egyptian architecture contains good examples of environmentally responsible buildings. Ancient Egyptian temples, tombs and residences represent the first energy efficient (EE) buildings in the world based on the current knowledge of bioclimatic, green, desert, passive and ecological building principles.

Islamic architecture also took into consideration the environmental issues and used architectural elements that promoted passive design of buildings such as wind catchers, inner courts, domes, and mashrabeyya.

Nubian architecture has depended on mud as main construction material because of its appropriateness for Nubian culture and low cost.

Vernacular architecture of Hassan Fathy is considered pioneering experiences of ecological architecture that promotes environmental architecture principles in addition to the human and local culture dimensions in desert or arid areas.

In addition to some examples of contemporary architecture which aimed to reach environmental aspects and to reduce effects on the environment.

Research Problem

Green architecture practices in Egypt are still at an experimental phase and the projects developed so far can be defined as environmental architecture rather than green architecture. These practices do not go with constant steps and did not appear as expected to mitigate the local environmental problems.

The research addresses the difficulties and obstacles that prevent the application of green architecture principles in Egypt.

Research Objectives

This research aims to determine potentials and obstacles of applying green architecture principles in Egypt, hence suggesting recommendations that can pave a better way to increase the potentials on account of obstacles towards applying green architecture principles in Egypt in the near future.

[1] J. Yudelson, Green Building Revolution, International and Pan Americans Copyright Conventions, 2008, P. xv, 2

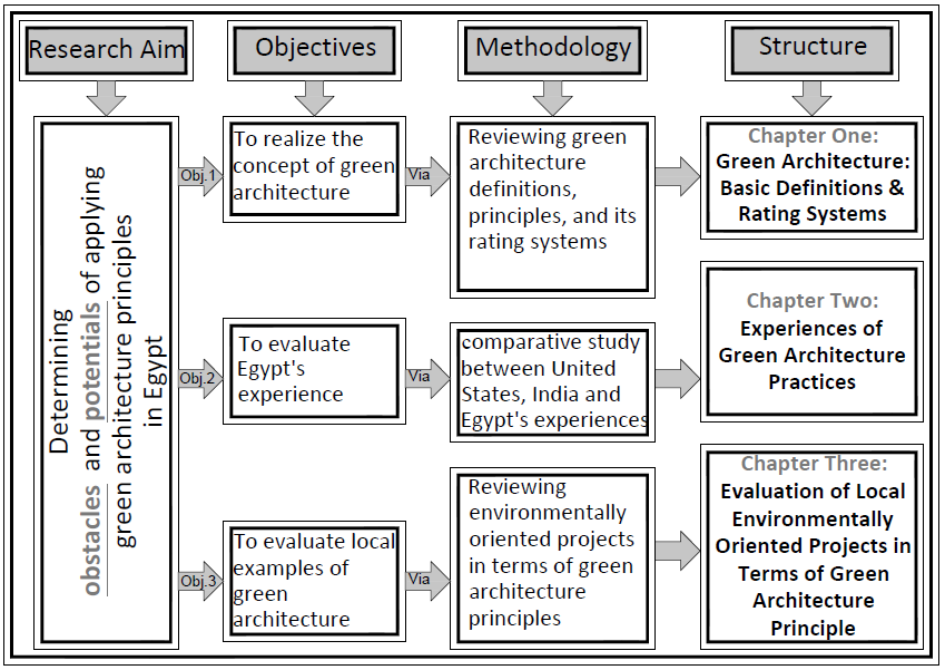


Figure 0-1: Research Objectives

Research Scope

The research exclusively studies the obstacles of applying green architecture principle locally in Egypt, via examining the practices context.

Research Methodology

The research addresses evaluation of Egypt's status in applying green architecture practices via:

- Analyzing the contextual factors of green architecture practices in the United States of America, India and Egypt through a comparative study between the three countries to address the potentials and obstacles of the context of green architecture practices in Egypt.
- Reviewing some selected local environmentally oriented projects in terms of green architecture principles (using GPRS) to determine potentials and obstacles of applying these principles in the Egyptian context.

- Additional data about the selected environmentally oriented projects is obtained through an open-ended interview with key persons in the design team of these projects.

Research Structure

The research is organized in three chapters, as follows:

Chapter One: Green Architecture Basic Definitions and Rating Systems

Chapter one introduces global environmental problems, including the depletion of non-renewable energy resources and relevant increases in GHGs' emissions that resulted in the climate change and the global warming phenomena.

It also discusses the significant role that buildings can play in mitigating environmental problems through adopting green architecture principles. This is also manifested through presenting the international rating systems of green buildings which have been developed to apply differently in different climates, geographical conditions, construction practices and regulations.

Chapter Two: Experiences of Green Building Practices and Rating Systems

Chapter Two presents an analysis of selected experiences of two countries that have successful green building practices to determine the challenges and potentials of applying these practices and how each country helped in implementing and mainstreaming of its rating system.

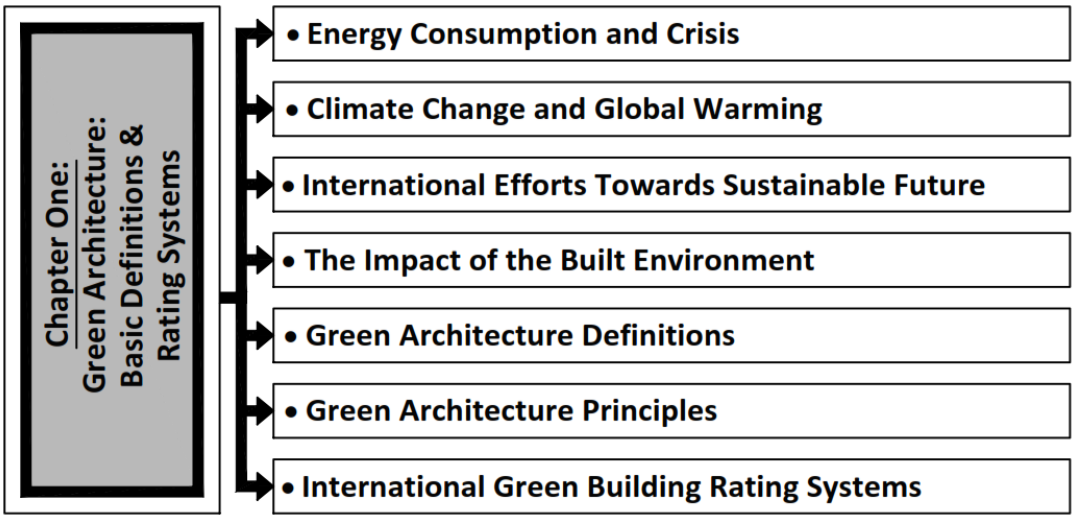
This analysis will be in the form of a comparative study between the selected experiences and the Egyptian experience.

Chapter Three: Evaluation of Local Environmentally Oriented Projects in Terms of Green Architecture Principles

This chapter reviews number of environmentally oriented projects in Egypt in terms of green architecture principle using GPRS; thus defining the main challenges of expanding the scope of creating green buildings in Egypt, and the incentives and potentials of scaling up the implementation of it in the Egyptian context.

Conclusions and Recommendations

Chapter One: Green Architecture Basic Definitions and Rating Systems


Chapter One:
Green Architecture:
Basic Definitions &
Rating Systems
• Energy Consumption and Crisis
• Climate Change and Global Warming
• International Efforts Towards Sustainable Future
• The Impact of the Built Environment
• Green Architecture Definitions
• Green Architecture Principles
• International Green Building Rating Systems