Ain Shams University
Faculty of Engineering

Environmental Solutions as Main Approach to Sustainable Neighborhood

Applied on New Settlements

A Thesis submitted in the Partial Fulfillment of the Requirement for the Degree of Master of Science in Architecture

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Disclaimer

This dissertation is submitted to Ain Shams University for the degree of master of science in Architecture. The work included in this thesis was carried out by the author in the Year 2014.

The researcher confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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Dedication

To my supportive Family

Abstract:

Societies faced serious environmental problems locally, regionally, nationally and globally, this is due to the wasteful consumption of the world's resources. All of these problems are already having negative impacts on human health, on the economy and will affect the quality of life today as well as the next generations. Moreover, cities are the focal points and drivers of societal development in all countries. They are responsible for lot of significant environmental challenges, as they are the largest consumers of natural resources and the biggest sources of pollution and greenhouse gas emissions on the planet. Thus, there is a need for a big shift in designing our cities to overcome all of these problems. Starting with the neighborhood design, which it is the beginning of any change in the cities. The actions and the decisions taken on this level are deeply in need to the integration with many variables such as design principles and technological solutions. Hence, this research is mainly attempting to apply the design principles in the sustainable neighborhood.

On the other hand, the rapid urbanization in Egypt is reflected in the increases in the percentage of the total population which is not expected to slow down. To meet these demands for housing, hundreds of integrated residential projects are being constructed all over Cairo's desert. As, the increasing demand on the housing units occurring in Cairo can only be met through horizontal expansion, which provides new cities for the next generations in order to accommodate with the population growth. But actually, with this expansion no regard was given towards the environmental impacts in general and the energy efficiency particularly. Hence, the research discusses the issue of planning future sustainable neighborhood, which fulfil the energy efficiency. It also evaluates the design principles that turn the residential neighborhoods to become self-sustain in order to achieve the concept of the sustainable development strategy. The design principles have been extracted through various literature sources which focusing on the design principles of energy efficiency, besides the practical solutions which have been extracted from the analyzing the different examples of eco-districts. Those principles are then used to evaluate a selected case study, which is one of the best integrated residential projects in Cairo called "AL Rehab City". The results showed that the selected case study does not meet most of the sustainable design principles from the environmental side although it is socially and economically succeeded. This underlines the necessity to develop the design principles and update the current urban planning regulations to achieve energy efficiency in every new residential project.

Summary:

In the last decades, the global changes in the environment have had important impacts on urban areas as well as have a direct close link with the over population of the cities. Simultaneously, decreasing carbon footprint and adapting to climate change are becoming the start of any sustainable development. Thus, there is a need for sustainable neighborhoods which fulfil the future energy efficiency requirements, which they are urban areas depend mainly on their design in applying energy conservation techniques and powered by renewable energy techniques. Those sustainable neighborhoods should also be ecologically designed to enhance the health and quality of life of their inhabitants. As, in the new millennium the important goals are to make all the existing and new urban areas more self-sufficient, sustainable and enjoyable places to live. This goal needs to be taken into consideration some different measures, such as the architecture, urban planning, wastewater disposal, mobility system, as well as energy production and consumption. All of these measures need to be interlocked with one another, in order to reach the overall concept of sustainable development which aiming to decrease the ecological footprint of any built environment.

From another perspective, many cities today are facing the problem of running out of fossil fuels, consequently the future of those cities is becoming limited because there is no longer enough energy to run them. As already it is widely known that, the rate of the energy consumption has become increasingly scarce and more expensive. This means that there is a big need to a preparation for this eventuality to prevent the future crisis in the supplies and demand. On the national level, Egypt is like any other country all over the world, where the scarcity of energy sources represents one of the most challenging issues for its sustainable development. As, it has already faced the problem of the energy crisis and increasing the emissions of greenhouse gases, which arising from the burning of fossil fuels. On the other side, it has been reported that, the residential projects are the main consumer of energy within the built environment. Hence, the research discusses the main design principles that outline energy efficiency in the residential projects in Cairo. It also discusses and evaluates the design principles that turn the neighborhoods to become self-sustain, thus by decreasing the energy consumption as well as use more renewable energy sources. The target mainly depends on reaching the sustainable life for every Egyptian citizen, while decreasing their effect on the environment and also in line with the country's economy.

Those design principles have been extracted through different literature sources which focusing on the design principles of energy efficiency and also through analyzing different practical solutions for national and international projects. After that, the research analysis a case study to evaluate the main principles that affect the development of energy efficient configurations within the recent projects in Cairo. Furthermore, the research draws attention to current urban planning regulations and its close link with the energy efficient design principles. The results show that, there are some deficiencies points in the existing laws, as well as there are also some deficiency points that lack the enforcements of the energy codes and the green laws in the new residential projects in Cairo. In addition to that, the result also shows that there is a pressing need for improving the urban governance and more comprehensive planning, which include system solutions for the environment. Thus, the Egyptian government should presents new programs for supporting sustainable urban development with a main focus on achieving the energy efficiency. The government should also begin the trend of creating strategies for the new cities, taking into consideration that there is a big need to stimulate the development of new good examples that take the new settlements further towards sustainability and can serve as an inspiration and sources of knowledge to others.

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