Architectural Engineering

Harmonization between architectural identity and energy efficiency in residential sector (case of North-West coast of Egypt)

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A B S T R A C T

Environmental design concept is a significant factor, regionally and locally. Architectural formation will be applied on the North-West coast of Egypt. The research keeps an eye on the relationship between architectural identity and energy efficiency of housing sector in Marsa Matrouh, where architecture identity has must be respected to achieving environmental requirements, conserving energy, and reaching users environmental and functional comfort.

The purpose of this research is to promote environmental design concepts in residential sectors using building design tool such as Ecotect software; as a visual design modeling concerning with energy performance simulation.

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1. Introduction

Architectural Design Strategies are applied three fundamental areas: environment, climate and energy, that require respecting and integrating many determinants like: (regional climate, architectural identity, saving resources and energy conservation). Whereas vernacular architecture is often succeeded via integrating many standards such as: (architectural concepts, local identity and energy saving through cross interaction between local architecture design and regional environment constrains). These principles produced comfortable houses due to: (improving indoor conditions, reducing energy loads, respecting sustainability principles and provided valuable ideas) – which are seemingly neglected in current architecture [1]. In view of recent rises in energy costs; the eyes of the world turn towards embracing regionalism and traditional architecture, by studying traditional design concepts in order to achieve energy conservation and desired sustainability. Accordingly; the focus of this research is to attracting the attention of the government and architects towards increasing the efficiency of architectural saving energy design of the North-West coast of Egypt, as one of the most promising regions that has not been exploited and develop optimally for now. On the other level, the problem search on “Most of the present residential sectors in North Coast region lack the awareness about the importance of saving energy with respecting the Architectural Identity”. The causes of the problem return to: the strong influence of globalization force on local design concepts, the lack of interest in the field of architectural environmental design and energy saving strategies, the inability to cope with creeping random architecture, and uncertainties of the positive impact of local architectural identity on energy efficiency [2]. As a result; while the World nowadays recognizing the importance of respect and rescue traditional identity within architectural and urban development processes; current Egyptian architecture concepts could not reflecting neither local identity specifications, Egyptian historic culture, local climatic conditions, socioeconomic contexts nor saving energy. Accordingly, contemporary design concepts do not only achieve architectural sustainable principles but also not financially sustainable, especially within residential sector- where could not meet both user requirements and save energy- Which represents a challenge for both the professional and academic community. Therefore, it is necessary to reduce the gap between the theoretical concepts of sustainability and development implementation [3]. The objective of this paper is to highlight the importance of achieving
harmonization between architectural identity and energy efficiency in housing sector.

Therefore, the methodology goes through a sequence of five main parts: (sustainable development in North Coast region, the importance of Marsa Matrouh Governorate, Matrouh architectural environmental identity, energy consumption in residential sector, and the reflection of architectural identity on energy efficiency).

2. Sustainable development in North Coast Region (NCR) in Egypt

The North Western coastal region represents a new development corridor for future expansion of urban areas in Egypt (established by: the planned Strategic National Housing Development as the third national project for developing the Northwest Coast and its Desert Hinterland). Along with mega projects like Suez Canal expansion and the Golden Triangle of mining in the eastern desert [4]. Moreover, it is expected that this area could absorb a huge part of the population in Egypt in the coming decades based on: the Ministry of Housing, Utilities and Urban Developments and the General Organization for Physical Planning. Studies and reports have mentioned that northwest coastal region of Egypt embraces (60 km of the Mediterranean coastline) with (an average depth of 20 km), located between: (latitude; north 31°00–27°45 & longitude; 27°45–28°00). Divided geographically into three sectors: (Al Hammam- Matrouh – Salum) [Fig. 1], while administratively Matrouh Governorate is divided into: (8 centers), these are from east to west: (El-Hammam, Al Alamein, El-Dabaa, Matrouh, Siwa, El Negeela, Sidi Barani, and El-Salloum), also it covers: [8 cities, 270 villages, and 182 sub villages (kafr)] [5]. Each region has its special vernacular architecture, traditional identity and local environment, characterized by several resources that can create the attention of investors to make several economic activities. The methodology of simulation is on the most popular architectural design concepts in Matrouh residential buildings (Case study on Sector B). The Egyptian government and the Egyptian Environmental Affairs Agency (EEAA) passed new environmental law-which had the greatest impact on the strategic coastal development plan- that certainly requires applying an Integrated Coastal Zone Management (ICZM) to achieve hopeful sustainability [5].

Recently, there is a general orientation around developing North Coast region whereas efforts are directed extremely into establishing many seasonal occupancy tourist villages without considering their impact on local architectural identity, environmental respect and energy efficiency. Although, the overarching objective of sustainable development is to preserve architectural identity towards respecting environmental sustainability, achieving users comfort and improving energy efficiency. These goals are based primarily on community development and strengthening the local architectural identity to conserve, rehabilitate and use their natural resources in a sustainable manner. Accordingly, research provides a comparative study of the most popular architectural design concepts in Matrouh residential sectors and its impact on energy conservation- in order to achieve cultural heritage preservation, socioeconomic development and architectural identity.

3. The strategic importance of Marsa Matrouh Governorate

Fact of the matter, Marsa Matrouh is one of Egypt’s magical governorates; God has granted such lovely governorate all the: (magic, calm, blue sea, local sceneries, and empty streets), where represents the main components of the strategic city. Besides the moderate temperature all through the year, it has a mild Mediterranean climate characterized by a long warm summer, (clear sky and high radiation from May to September) but the picture changes in October when a windy and relatively rainy winter begins. As well it is considered as one of the largest governorates regards to its total area around (212,112) km². It is situated in the west sector of the North Coast overlooking the shores of the Mediterranean Sea as the gate of both the east and the west characterized by unique location, hosting more than 22 different beaches. Therefore, Matrouh is called deservedly - the bride of the beaches- In the same context, the historical and archaeological assets scattered over the region besides the religious sites. There are many places are attracting huge numbers of tourists all the time: (Siwa Oasis, Qattara Depression, The British Cemetery, Rumelle Museum, Marina Monastery, Ramses II Temple, Bath of Cleopatra, Sayeed Soliman Mosque and Ameed Natural Protected Area). These are together representing the famous landmarks and tourist attractions in Matrouh [6]. Add to this, the governorate has a deep-rooted history and a promising future can be a shrine for different types of tourism attraction for: (its natural environment, historical sites, religious potentials, cultural heritage, handicrafts, eco-tourism, tourist resorts, and therapeutic tourism). On the other hand, the traditional culture of Matrouh shows many features characterized by: upholding customs; traditions and heritage vary slightly from one governorate to another for both: geographical and historical conditions. Presently, government-sponsored development projects directed its attention to merging the Bedouins into the Egyptian state, economy, and culture. As well as, the stress on their participation in the development projects with respecting customs, traditions and characteristic identity. This is done by attaching local housing requirements with the new development plan towards: (respecting architectural identity, achieving environmental sustainability, saving resource, recycling wastes, achieving energy conservation and improving the use of renewable
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