Towards an environmental approach for the sustainability of buildings in Algeria

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Abstract

Sustainable architecture (HQE in France, Green Buildings in the USA, Sustainable Buildings in Northern Europe) is a profound initiative whose objective is to achieve sustainability of buildings. This concept has spread throughout the world and each country worked to develop its approach (depending upon its physical and cultural conditions) to minimize the negative impacts of buildings on the natural environment and improving the comfort and quality of life. These international initiatives are characterized by multi-criteria vision, contextuality, flexibility and scalability. What strategy should be developed for sustainable buildings in Algeria? This is the fundamental question for which we try to provide some answers. On the basis of a thorough study of the Algerian context, we aim at the presentation of the foundations of an approach to the sustainability of buildings which would be adjustable to different regions of the country and whose peculiarity lies in the consideration of the major concerns of our country and its specificities. Including, for instance seismic risk, sociocultural practices of the population, as well as the diversity that characterizes the climatic and geographical data of the entire national territory, by following the existing national legislation, regulations and standards.

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Peer-review under responsibility of the Euro-Mediterranean Institute for Sustainable Development (EUMISD).

Keywords: sustainability; ecological building, green architecture; quality; environment; Algerie.

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1. Introduction

Unlike bioclimatic architecture that addresses only the energy aspect of the buildings in order to save the consumption of conventional fossil fuels and promote the use of the so-called renewable energy, sustainable architecture is an approach that aims to control the different dynamic relations between built space and its external environment and harmonize the internal space with the social, natural and architectural surroundings. Although various research topics in bioclimatic architecture have dealt with traditional techniques of adaptation [1-5], Stephan et al. [6] has shown that passive houses may not be energy efficient. They can have total energy consumption similar or more than a new standard building. It was shown that poorly insulated city apartments can use less energy than a very energy efficient passive house in the suburbs. The house size can significantly reduce the life cycle energy demand per capita. Current European building energy regulations and certifications do not always result in a lower overall energy consumption and greenhouse gas emissions. Their policies should adopt wider system boundaries including embodied, transport energy requirements and other environmental impacts. Scofield [7] criticized the question of to what extent do LEED-certified buildings save energy studied earlier by Newsham [8]. He wonders that energy consumption in larger buildings is dominated by plug-loads and operating practices-which are not even addressed by LEED. Rather than to utilize a non-physical averaging technique that under-weights large buildings, it would be better to change the LEED-certification process so that inefficient buildings do not gain LEED-certification-particularly large inefficient buildings. Blengini [9] has recently conducted a detailed life cycle analyses study on a low energy house built in northern Italy. He has confirmed that the initial goal of environmental sustainability is reached, but to a lower degree than initially believed. In comparison to a standard house, while the winter heat requirements reduced by 10:1, the life cycle energy was only reduced by 2.1:1 and the carbon footprint by 2.2:1. Perez-Lombard [10] analyses offered data concerning energy depletion in buildings linked to HVAC systems. They addressed the questions of the availability of the necessary information, the main building types and the end uses which should be considered in the failure. Comparison using commercial buildings for some countries (USA, UK, Spain, etc.) is presented. According to them, energy consumption of buildings in developed countries comprises 20–40% of total energy use and is above industry and transport figures in EU and USA. However, available data is not sufficient and not proportional to its importance. The lack of information makes it difficult to understand the basic changes that affect energy consumption in this sector. Lausten [11] presents an overview and analyses current approaches for enhancing energy efficiency in building codes for new buildings. He then outlines some valuable recommendations related to energy efficiency promotion for new buildings. According to Anderson et al. [12] the built environment is the dominant source of energy consumption (62%) and greenhouse gas emissions (55%). Achieving environmental goals, including climate change mitigation, has led to the development of robust methods to assess the impacts from this sector. These methods focus on either individual buildings or on the urban scale. Anderson et al. [12] shows that these topics are strongly divided between the scales of analysis: the building and the urban scale. They think that separation per scale is problematic as it ignores the actual pattern of construction: new buildings within existing cities. A new approach is therefore needed to link the knowledge gap between the building and urban scale. Fabbri et al. [13] presented an Energy Retrofit simulation about an Italian case study: one building typology that is supposed realized in several different periods, having different thermo-physic parameters. For each period, four energy retrofit actions will be applied, together with the software evaluation of energy performance. Gillingham et al. [14] reviews literature on several types of energy efficiency policies: appliance standards, financial incentive programs, information and voluntary programs, and management of government energy use. They provide an overview of the relevant programs, along with available existing estimates of energy savings, costs, and cost-effectiveness at a national level. The literature examining these estimates points to potential issues in determining the energy savings and costs, but recent evidence suggests that techniques for measuring both have improved. Kaoua and Bouchair [15] showed that it is possible to assess energy performance and environmental impacts of three hotel buildings having various envelope configurations built in different climates using a life cycle analysis approach. The assessment was performed using PLEIADES software tools.

Facing the environmental challenges of the early 21st century, the building sector is experiencing a real environmental revolution for the integration of eco- sustainable principles in the production process of the built environment. Some attempts were made by [16] to find a policy that addresses all the environmental challenges to gradually enter the era of multiple energy and sustainable developments, especially in the field of housing through a...
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