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# Environmental sustainability assessment of buildings in hot climates: the case of the UAE

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## Abstract

Sustainability has acquired great importance due to the negative impact of various developments on the environment. The rapid growth during the last decade has been accompanied by active construction which, in some instances, neglected the impact on the environment and human activities. The impact of developments on the traditional heritage has not been taken into consideration although the latter represents a rich resource for sustainable building practices. The study aims at examining these developments in the UAE using an assessment tool that measures the performance of buildings in terms of their sustainability. This study attempts to: (a) develop a comprehensive definition of sustainability to suit UAE needs; (b) classify sustainable building practices at international and regional levels; (c) assess building performance in the UAE; and (d) establish guidelines for future sustainable architecture. T-Sol software was used to predict the CO<sub>2</sub> emission level in selected buildings in the UAE. Results illustrate that average energy use/area in domestic buildings is high (213 kWh/m<sup>2</sup>) and public buildings showed less sustainable measures in terms of energy features, energy performance and environmental features. Issues considered in the assessment of buildings such as energy use per square metre and CO<sub>2</sub> emission are alarming. Traditional buildings in the UAE were more sustainable than contemporary buildings, however. © 2001 Elsevier Science Ltd. All rights reserved.

*Keywords:* Sustainable architecture; Environment; CO<sub>2</sub> emission; Energy use; Vernacular architecture; Cultural patterns; UAE

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## 1. Introduction

Within the last decade sustainable development and building practices have acquired great importance due to the negative impact of various development projects

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on the environment. In line with a sustainable development approach, it is critical for practitioners to create a healthy, sustainable built environment [1,2]. In Europe, 50% of material resources taken from nature are building-related, over 50% of national waste production comes from the building sector, and also 40% of energy consumption is building-related [3,4]. In the UAE, these figures are even higher. In addition, environmental and economical developments are potentially compatible and complementary. As the building industry in the UAE, particularly in Abu Dhabi Emirate, is forming a large portion of the economy, more attention should be directed towards establishing sustainable guidelines for practitioners. Furthermore, during the last two decades, the rapid growth within the Gulf area has witnessed active construction that, in some instances, neglected the impact on the environment and human activities. At the same time, the impact on the traditional heritage, an often neglected issue of sustainability, has not been taken into consideration, despite representing a rich resource for sustainable building practices.

Sustainability has been defined as the extent to which progress and development should meet the need of the present without compromising the ability of future generations to meet their own needs [5]. This encompasses a variety of levels and scales ranging from economic development, and agriculture, to the management of human settlements and building practices. This general definition was further developed to include sustainable building practices and management of human settlements. During the Rio Earth Summit in 1992 [6], the following issues were addressed:

- the use of local materials and indigenous building sources;
- incentive to promote the continuation of traditional techniques, with regional resources and self-help strategies;
- regulation of energy-efficient design principles;
- international information exchange on all aspects of construction related to the environment, among architects and contractors, particularly non-renewable resources; and
- exploration of methods to encourage and facilitate the recycling and reuse of building materials, especially those requiring intensive energy use during manufacturing; and the use of clean technologies.

A revised agenda developed by the AIA in collaboration with the UIA was published as part of the environmental resource guide. It was stated that there should be a return to well established methods of design that conserve energy and natural resources [7]. This study aims at examining these developments in the UAE through the establishment of an assessment tool that measures the performance of buildings in terms of their “sustainability”. In so doing, it seeks to operationalize the term thus enabling those involved in the construction field to assess the impact of their projects on the environment from a comprehensive perspective, which includes technological as well as socio-cultural dimensions.

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