DECARBONISATION AND GREEN CERTIFICATION TOWARDS SUSTAINABLE TOURISM: RATING THE ENERGY AND ENVIRONMENTAL EFFICIENCY UNDER THE BREEAM CERTIFICATION SCHEME

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ABSTRACT

The scope of the paper is to present the buildings evaluation process with tools and methodologies such as BREEAM certification schemes. Building environmental and energy assessment is a multidimensional problem, which has to be addressed in an interdisciplinary and multicriteria approach, in order to consider different parameters related. Buildings are complex systems which are analysed and evaluated based on energy, environmental, cost effectiveness, as well as social issues concerning the wellbeing of the building's occupants. Such a multidimensional problem needs adequate and suitable assessment tools and methods, efficient enough, to address this complexity and adaptiveness regarding environmental policies and legislation.

KEYWORDS

Decarbonisation; green certification schemes; environmental rating; sustainable tourism

1. INTRODUCTION

Building assessment tools keep constantly evolving, in order to improve their shortcomings and overcome their limitations and in order to have comparable results for the environmental and sustainability assessments of buildings always in compliance with policies and legislation.

There is a define legislation framework and EU policies for the energy reduction as well as CO2 emissions in the building sector. It is important therefor to get familiar with tools and methodologies which can rate the environmental impact of the systems and certify their sustainability and ecological feature.

Buildings have a considerable environmental impact that corresponds to almost 30% of the global carbon footprint, with a prediction for future growth. To a large extent, although not limited to it, this is due to their energy consumption; in the EU this accounts for some 40% of the total final energy consumption [1]. The EU therefore has set a goal to reduce primary energy use by 20% by 2020, which is one of the five headline targets of the European 2020 Strategy [1].

Moreover, the European Commission has established since 2002 a common policy for sustainable buildings [2] and low environmental impact materials, promoting energy efficiency and reduction of greenhouse gas emissions (GHG), expressed by means of a series of directives and regulations.

The Energy Performance of Buildings Directive (EPBD, 2010/31/EU) is the main tool considering energy efficiency and setting the goal for Nearly Zero Energy Buildings after 2020; The Construction Products Regulation (CPR, 205/2011) aims is to ensure reliable

information on construction products in relation to their performance on safety, quality and environmental issues [3,4].

This can only be achieved by providing a "common technical language", offering assessment methods for the performance of construction products. The legislative framework for GHG emissions is supported by a series of international standards such as the Greenhouse Gas Protocol Initiative [5] and the ISO 14064-65 series of standards [5] which are fully compatible with the GHG Protocol and the Intergovernmental Panel on Climate Change [6,7].

2. METHODOLOGY

Within the establishment of a successful energy management and labelling scheme, parameters such as water consumption, waste management, and environmental friendly approach towards material use, should also be considered.

Building rating systems are environmental and management tools that aid in focusing on the construction sector and aiming at sustainability, as well as at economic and social benefits. Rating systems for buildings have incorporated the expertise and knowledge from environmental methodologies, decision making and management tools, which have been used in other productive sectors and were therefore influenced by those. It is therefore only reasonable that a majority of the rating systems are based on the concept of life cycle analysis (LCA) methodology and demonstrate similarities with the Environmental Management Systems.

They also include the energy audit part and extend this philosophy to other environmental issues, such as water conservation, indoor air quality, materials' selection and waste management. In this sense, rating systems are scoring systems designed to evaluate new and existing buildings based on a selected standard of assessing environmental performance. The most popular certification schemes based on the number of certifications accredited are Building Research Establishment Environmental Assessment Method (BREEAM), U.S. Green Building Council (LEED), Deutsche Gesellschaft fur Nachhaltiges Bauen (DGNB), High Environmental Quality (HQE). [8]

All methods, even though to varying degrees, and despite their differences in structure and rating procedure, emphasize on the evaluation of the same environmental aspects, which include: energy consumption, water thriftiness, indoor environmental quality, materials' and resources' use and the building's operational management [9].

The differences mainly focus on the importance that each method attaches to the selective evaluation criteria. For instance, BREEAM considers transport and pollution as separate environmental aspects and evaluates them respectively, while LEED incorporates them into the energy efficiency and sustainable site management parameters.

Nevertheless, energy efficiency in all rating systems accounts for more than 20% of the total certification score. BREEAM's energy criteria are linked to the European legislation, namely the Energy Performance of Buildings Directive (2010/31/EC), while LEED's energy criteria are based on the standards ASHRAE 90.1 and 189.1.

Both schemes have been modified for international application and their requirements can therefore become compatible with national pieces of legislation and standards. Moreover, the assessment methods can be compared based on the types of the buildings examined, the certification benchmarking, the life cycle phases covered during the evaluation procedure and the audit reviews before the certification. It is also important to mention that most of the environmental assessment methods discussed, namely BREEAM, LEED, HQE and DGNB, are commercial tools, developed within an academic framework and supported by government agencies or authorities and by industrial associations.

Therefore, and apart from the ultimate goal

which is fostering sustainability in the building sector, all these tools focus on economic and financial motivation as means of achieving increased energy efficiency. For instance, lower and off- peak energy consumption, water thriftiness or optimized waste management, contribute to lower operational costs, while the building's market value increases, due to building's certified environmental sustainable profile.

Finally, but not the least important, the certification also assesses indoor air quality and thermal comfort aspects. In that sense green certification aims to improve the quality of living and the productivity of the buildings' users, having an indirect but very specific impact on financial and social issues. [9,10]

More specific and as far as the tourism sector more than 70% of the five star hotels is Europe implement green certification tools and methodologies. These efforts improve the environmental profile of the hotels and increase their competitiveness in global market. It is evident, that ISO 14001 is winning the preference as it is a standard that evaluates and improves all the environmental impacts and it also cost effective. Still LEED and BREEAM certification schemes are less widespread, although they evaluate comprehensively all the environmental impacts; they are however significantly more complex and expensive to implement. One should also not overlook that the ISO group of certification standards (9000, 14000, 45000 and 50000) are a family of standards that offers homogeneity and economies of scales to the companies and organizations [10].

3. CASE STUDY-RESULTS AND DISCUSSION

This study focuses on two areas of interest:

- The environmental assessment by applying the BREEAM In Use assessment system to the existing hotel unit.

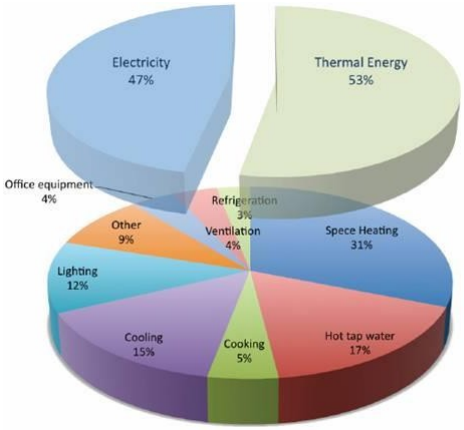
- The energy upgrade of the existing hotel unit in a building of almost zero energy consumption using Renewable Energy Sources and the reduction of the consumption of water resources, while maintaining high levels of thermal comfort and high quality of living.

3.1 Case study: Environmental evaluation of hotel building in Greece

The hotel unit studied (8.238,64m^2) is located in Santorini island in Greece, it is a five star hotel open in summer as well as in winter.

3.1 Hotel unit and surrounding areas [11]

The annual energy consumption is 231.030,68kWh and the energy indicator per surface is 398,33kWh/m^2. So it is evitable that reducing energy is a key target for the hotel unit studied and other similar systems not only in terms of energy but also for CO_2 emissions as well as operational costs.



3.1 Energy contribution per process [11]

Hot water consumption, heating and cooling are the most energy intensive processes in a hotel system. Another also crucial parameter in the environmental evaluation of hotels is the water consumption.

Table 1. BREEAM in use rating [11]

Impact Category	*Evaluation result*
Management	2,61%
Health and wellbeing	7,3%
Energy	12,6%
Water	1,48%
Materials – Waste	4,5%
Pollution	8,67%
Total BREEAM Score	37,15
BREEAM rating	PASS

It is obvious from the total score achieved that there is essential to implement measure and interventions in order to reduce energy consumption so Renewable Energy Sources would be an acceptable solution in order to reduce electricity consumption and CO2 emissions. Water management is also a key factor to improve environmental rating in a hotel unit. Interventions and improvements can also be implemented in the area of waste management and the materials use.

Concluding and taking into consideration the overall environmental rating applying environmental management schemes and implementing sustainability policies, helps to reduce energy consumption as well as the use of raw and auxiliary materials, and can therefore lead to a cleaner, leaner and more cost-efficient production; a recognition that is mirrored in the continual increase of the energy and environmental management certificates. In that sense, sustainability is essential for the hotel industry as well, for two main reasons: (a) as a means for the improvement of the quality of services (b) as a major tool for marketing and promoting.

4. CONCLUSIONS

Environmental sustainability in the built environment has emerged as a key issue amongst governments, policymakers, researchers and public. Increasing efforts and resources have been devoted to research and environmental policies in order to identify, evaluate and assess harmful environment impacts and try to reduce them.

In this line of approach the role of tourism is of particular importance for two reasons: they are the landmarks of contemporary landscapes and they are ideal demonstration projects for the Propagation of environmental consciousness as well as economic growth.

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