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Sustainability and Energy Use in Small Scale Greek Hotels: Energy Saving Strategies and Environmental Policies

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Abstract

In the era of climate change, with global interest focused more and more on renewable energy sources and environmental protection, this paper focuses on a building type with increased energy use: hotels. Initially, global tourism facts and international case studies are presented, illustrating sustainable strategies employed in hotel design to reduce energy consumption. Several decisions/actions taken are presented, illustrating the benefits of a more sustainable tourist product throughout the world, and the effect that has on the guest and the environment. The paper then focuses on Greece, where tourism is the most important industry of the country's economy. Through the presentation of successful case studies, the research presents a list of strategies that are often used in Greek hotels. By discussing compatible and environmentally conscious alternatives, the need for an increased use of Renewable Energy Technologies (RET) combined with sustainable design is emphasized. This work concludes with tables of available strategies per category for new and existing buildings, which can be used by environmental engineers, designers as well as hotel owners in order to draw a plan of actions towards energy conservation and thus the upgrading of the tourist product. The aim of this research is to illustrate that following an energy audit, every hotel owner can decide upon a series of actions with a short payback period, resulting in financial savings and an attractive and, most importantly, sustainable tourist product.

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Keywords: hotel energy use; sustainable tourist development; renewable energy systems (RES) and technologies (RET); energy saving.

1. Introduction: Energy use in tourist accommodation

As a result of human activity, billions of tons of CO_2 and other greenhouse gases, pollute the atmosphere and result in global warming. Recent calculations suggest that if human activities continue to produce greenhouse gases in today's rate, the average temperature on the earth's surface will rise from 2 to 6°C in the next 100 years [1]. In the Mediterranean region, temperatures are expected to rise from 1-3°C between 2031 and 2060. This will affect water

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levels, coastal zones, biodiversity and of course all related economic activities such as tourism. The climate change problem is principally an energy problem [2] because CO_2 emissions, associated with the use of electricity and fossil fuels in buildings, are highly correlated with the level of energy use [3]. According to the US Energy Information Administration (EIA) and the European Union, buildings are responsible for approximately 44% of the total energy consumption [4]. Hotel facilities are among the top 5 in terms of energy consumption in the tertiary building sector [5]. Energy is used intensively in hotels, due to the diverse range of services offered, the clients' request for more and more quality amenities and the fact that they operate 24 hours a day and often all year round.

According to the World Tourism Organization (UNWTO), figures in terms of international arrivals illustrate clearly that tourism, despite occasional shocks, has shown virtually uninterrupted growth (Fig. 1a). International tourist arrivals have increased from 25 million in 1950, to a record 1133 million in 2014. Furthermore, arrivals are expected to increase by 3.3% a year between 2010 and 2030, reaching 1.8 billion according to UNWTO's long term forecast [6]. Tourism's dynamic character may have a significant positive impact on global economy, but on the other hand, major challenges need to be addressed [7]. The boom in the hospitality industry, puts pressure on the natural and built environment [8]. Tourism activities result in increased production and demand for energy, as well as the disruption of ecosystems, because of the buildings and infrastructure it requires. According to the Hotel Energy Solutions project [9], the total energy consumption by end use in a typical hotel is shown in Figure 1b. Space conditioning, which includes heating/cooling, ventilation and air-conditioning, is the largest single end-user of energy accounting for approximately half of the total consumption in hotels. Domestic hot water is the second largest user accounting for 17% of the total energy demand, and lighting is the third, fluctuating from 12-18%.

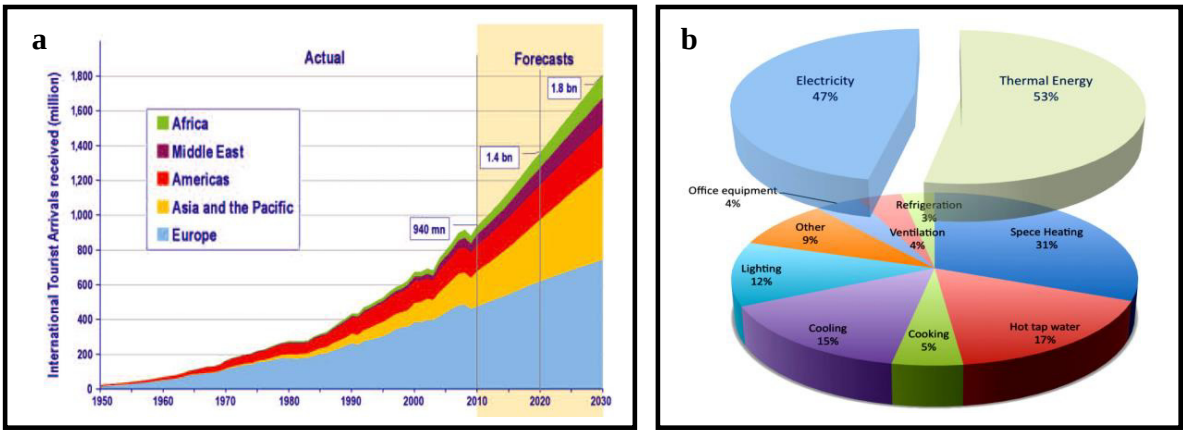

Fig. 1. (a) International tourist arrivals from 1950-2030: actual trend and forecast [10]; (b) Total energy consumption by end use in a hotel [9].

The energy saving potential of a hotel is significant. Often a large part of the energy used is due to unnecessary wastage and uncontrolled use. A typical example is a guest that adjusts thermostat controls much higher than his/her thermal comfort requires, or often leaves the water running in the shower without thinking of the waste. These problems occur when there are no energy control systems installed and because guests, knowing that there is no connection between the cost of room per night and energy consumption, they use energy and water without thinking (as opposed to when they are at home).

Various studies [5] reveal that hotels have the potential to save at least 10-15% of the energy they consume depending on the parameters previously noted. For southern European hotels, this percentage becomes 25-30% especially for those hotels with high annual energy consumption [8]. There are a significant amount of sustainable strategies that can be applied in hotels and which have a benevolent effect on energy use, water use and waste management [5, 9, 11-16].