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Managers' views on renewable energy and ecological sustainability in tourism

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Abstract

The aim of this paper is to highlight the importance of efficient energy management in tourist facilities, with particular emphasis on hotel managers' views regarding the use of renewable energy sources and environmental sustainability. The research is based on a qualitative methodological approach, including semi-structured interviews with hotel managers in the Kvarner region. The collected data were analyzed using thematic analysis in order to identify key patterns, attitudes and barriers related to the implementation of energy efficiency measures and renewable energy solutions. Qualitative analysis of the research results indicates that smaller hotel facilities implement energy efficiency measures to a limited extent and rarely adopt renewable energy sources, primarily due to financial constraints and lack of information. Large hotel chains express a willingness to invest, but these investments are often postponed due to other investment priorities. The findings of this research have important practical implications: they highlight the need for stronger financial incentives, targeted education programs, and policy measures aimed at supporting smaller hotels in the transition toward renewable energy. Furthermore, the results provide a basis for destination-level strategic planning and contribute to the broader discussion on sustainable tourism development and energy transition in the hospitality sector.
***Keywords*:** *sustainable development, energy efficiency, renewable energy sources, hotel management*

1. Introduction

Despite its well-known and significant economic benefits, tourism exerts considerable pressure on the environment. This pressure is mainly evident through greenhouse gas emissions from tourist transport, energy consumption in tourist accommodation, and the intensive use of natural resources. It is estimated that tourism accounts for around 5% of total global greenhouse gas emissions, with 40% originating from air transport, 30% from road transport, and about 20% from tourist accommodation (Sun et al., 2024). For these reasons, energy efficiency and the use of renewable energy sources have become key issues for the sustainable development of tourism. Energy efficiency is now one of the fundamental principles of sustainable business in modern tourism. The European Union increasingly encourages companies to develop and introduce products and services with improved environmental performance, and the tourism sector holds a particularly important position in this regard (Rahman & Islam, 2023). Tourism and the hotel industry are significant energy consumers throughout the entire tourism chain – from the tourist's journey to the destination, their stay in accommodation facilities, the use of additional amenities, and their return home (Blažević & Krstinić Nižić, 2017). The aim of this paper is to highlight the importance of efficient energy management in tourist facilities, with particular emphasis on managers' attitudes towards the use of renewable energy sources and environmental sustainability. The paper seeks to answer whether more efficient energy use can simultaneously reduce operating costs, increase guest satisfaction, and contribute to environmental protection and the development of tourism within the framework of sustainability. Special attention is given to the analysis of energy efficiency measures in small and medium-sized tourist enterprises and large hotel chains, with emphasis on the role of management in implementing these measures.

The modern tourist is more environmentally aware and seeks to meet their needs with minimal negative impact on the environment, while considering price and value for money. Research shows that a growing number of tourists prefer environmentally friendly facilities and are willing to pay a higher price for services aligned with the principles of sustainable development (Nelson et al., 2021; Liu & Nguyen Hoang Thanh, 2025). These trends further increase the

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pressure on hotel and facility managers to incorporate energy efficiency measures and the use of renewable energy sources into their business strategies. Despite the recognised benefits, many tourism businesses remain hesitant to implement green policies. Key reason for this resistance is the perception that guests are demanding and expect a high level of comfort, such as daily bed linen changes, abundant hot water, luxurious wellness facilities, and intensive use of air conditioning. Managers fear that reducing resource consumption could negatively affect guest satisfaction and the facility's reputation (Patwary, 2025). Another challenge is employee resistance, as staff often view green policies as an additional administrative and operational burden. However, the concept of sustainable development is becoming increasingly embedded in the minds of consumers and businesses, making the implementation of energy efficiency measures inevitable in the long term. Sustainable development should therefore no longer be seen as a passing trend, but as an integral part of the business strategy of every tourism facility.

2. Perspectives on renewable energy sources in tourism

Renewable energy sources are a key element in the sustainable development of modern tourist destinations. Their main characteristic is that they are based on natural processes that are continually renewed, although their availability is not unlimited and depends on the ecosystem's capacity for regeneration (Jiménez-Islas et al., 2024). This connection with natural cycles makes renewable energy sources particularly relevant for tourism, which relies heavily on a preserved environment as a fundamental resource for a destination's competitiveness. In recent decades, renewable energy sources have played an increasingly important role in global energy production. Although some forms, such as wind and water energy, have historically been used through windmills and watermills, it is the contemporary challenges of climate change, rising fossil fuel prices, and the need for energy security that have prompted their accelerated development and wider application. Increasing the share of renewable energy sources contributes to the overall sustainability of national economies and individual tourist destinations, reducing the negative impact of tourism on the environment and strengthening its long-term development potential. The main types of renewable energy sources relevant to the tourism sector are wind energy, hydropower, solar energy, biomass energy and geothermal energy (Tverijonaite & Sæþórsdóttir, 2024; Shan & Ren, 2023). Some technologies, particularly wind farms, small hydropower, biomass systems, and solar systems, are already economically competitive and technically suitable for use in tourist destinations. However, despite the availability of these technologies, the adoption of renewable energy sources in tourism is often slow, mainly due to high initial investment costs and long payback periods.

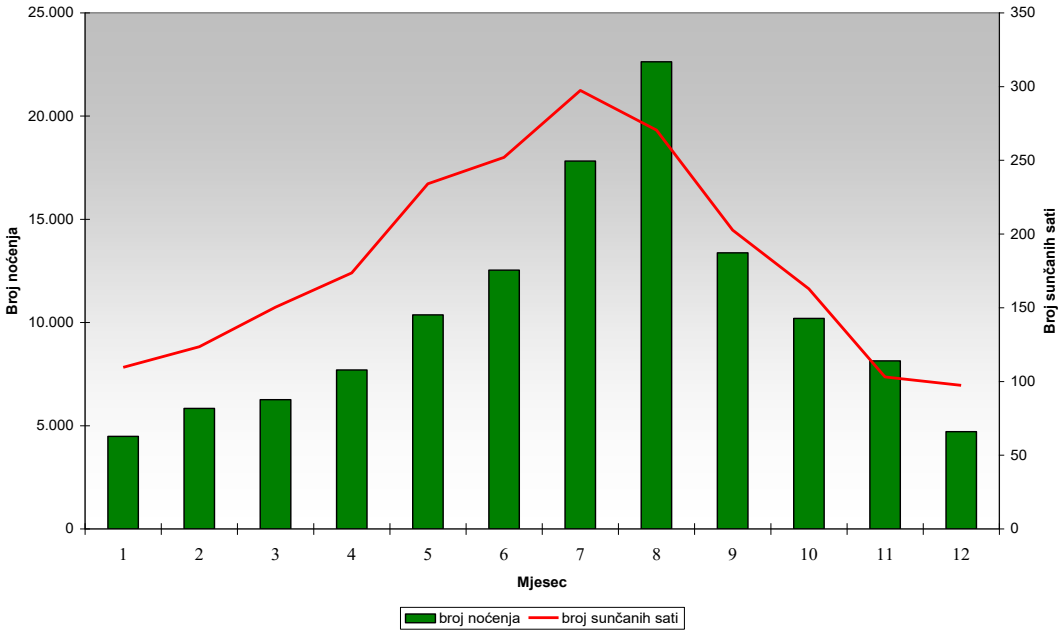
Wind energy is one of the fastest-growing renewable energy sources globally. Since 1990, installed wind power capacity has increased continuously, with the growth rate significantly exceeding that of electricity production from fossil and nuclear sources. According to the European Wind Energy Association, the European Union exceeded its planned target for installed capacity in 2005, achieving more than 40 GW of wind energy well ahead of schedule (EWEA, 2025). In tourism, the use of wind energy requires particular caution due to the spatial sensitivity of tourist destinations. Space in tourism is an extremely valuable economic asset, as it directly affects the creation of tourist rent and the overall experience of the destination (Nunna, 2022). Therefore, spatial planning is necessary to prevent landscape disruption and the degradation of attractive tourist locations.

Hydropower and small hydropower plants are the most important renewable energy source worldwide and the only one fully competitive with fossil fuels and nuclear energy. In sustainable tourism, special emphasis is placed on small hydropower plants with a capacity of 5–10 MW, which have a significantly lower negative environmental impact compared to large hydropower systems (Klein & Fox, 2022., Pavlakovič et al., 2022). Large hydropower plants often cause major changes in the landscape, including the submergence of valleys and settlements, methane emissions, and changes in the local climate. In contrast, small hydropower plants can be successfully integrated into the landscape of tourist destinations, especially if they are based on the restoration of existing water systems, such as abandoned mills, which can also serve an additional tourist function. The multifunctional role of reservoirs is particularly important, as they are used not only for energy production but also for recreation, sports, fishing, and the development of selective forms of tourism.

Solar energy is the most widespread and practically inexhaustible renewable energy source. In tourism, it is most often used for the production of thermal energy (preparation of domestic hot water, heating of spaces and swimming pools), while photovoltaic systems are used for electricity generation (Li & Cao, 2024). Due to their favourable geographical location and climatic conditions, Mediterranean countries have exceptionally large, but insufficiently exploited, potential for solar energy, especially in coastal and island tourist destinations. Replacing fossil fuels with solar systems is particularly profitable economically, especially in the summer months, which aligns with the needs of the hotel and catering sector. Graph 1 shows the correlation between the number of overnight stays and hours of sunshine for the City of Opatija but can be compared to anyone Mediterranean tourist destination. According to data from the Tourist Board of the City of Opatija, the number of overnight stays was correlated with data from the Croatian Meteorological and Hydrological Service on capacity utilisation, specifically the number of recorded sunshine hours (July 2025). It is clear that solar energy can be used for domestic hot water heating due to the high level of insolation along the coast. Energy planning should adopt a long-term perspective and energy efficiency should be considered during the design and construction phases. Capacity utilisation, measured by the number of overnight stays, is monitored in relation to sunshine

hours. The sun is most abundant during the tourist season, when tourist numbers are at their highest. In the summer months (June, July, August), occupancy peaks, and this upward trend is mirrored by the sunshine hours curve.

Graph 1. Correlation of number of overnight stays with sunshine hours



Source: Author's analysis based on estimated data on the number of overnight stays and sunshine hours in the City of Opatija

Biomass includes energy obtained from plant materials and by-products of agriculture, forestry, and the wood industry (Konstantinavičienė & Vitunskienė, 2023). Its advantages over fossil fuels include lower emissions of harmful gases, the utilisation of waste and production residues, and reduced dependence on energy imports. Approximately 1.5 million tonnes of municipal waste and about 7 million tonnes of waste from agriculture and the wood industry are produced annually, which could be used for energy purposes (Pathak, 2023). In tourist destinations, biomass can play an important role in developing local energy systems, especially in rural and continental tourism.

Geothermal energy involves using heat from the Earth's interior in the form of hot water or steam. In addition to electricity generation, it is highly suitable for space and water heating, as well as for the development of health and wellness tourism (Jocić et al., 2025). Geothermal sources are used in numerous spas, but the potential remains greater than current exploitation. Geothermal energy provides a stable and reliable energy supply, independent of weather conditions, making it particularly suitable for tourist facilities operating year-round.

The outlook for renewable energy sources is more favourable today than ever before, primarily due to economic factors (rising fossil fuel prices), environmental concerns (reduction of greenhouse gas emissions), and security considerations (diversification and decentralisation of energy sources). Despite significant potential, their application in tourism in the Republic of Croatia remains limited due to insufficiently stimulating economic measures and inconsistent state policy. For stronger development of renewable energy sources in tourism, it is necessary to provide fiscal incentives, favourable credit lines, and active involvement of domestic industry in equipment production, which would further stimulate employment and regional development.

3. The role of management in energy management

The hotel industry is one of the largest energy consumers within the commercial sector, which directly affects operating costs. Unlike many other expenses, energy costs can be effectively controlled, and their reduction directly increases the profitability and competitiveness of hotel operations. The benefits of efficient energy use include increased guest satisfaction, improved aesthetics and functionality of facilities, reduced maintenance costs and system failures, increased value of equipment and buildings, development of corporate culture, and reduced emissions of harmful gases (Karvounidi, 2024). To achieve these benefits, it is essential that managers at all levels are familiar with the basics of energy management and actively participate in planning and implementing energy efficiency measures. The empirical research was conducted in October 2025 to avoid the summer months when hotel managers are at full capacity. It was considered that during the summer, management is less interested in discussing sustainability in their facilities due to workload. Data were collected through personal interviews in the field. Open-ended questions were used, and a qualitative analysis was

conducted. The empirical research was conducted in Primorje-Gorski Kotar County, Croatia, in the Kvarner region, during October 2025. The sample includes 17 managers from hotels of various sizes and destinations: 3 from Lovran, 5 from Opatija, 3 from Rijeka, 3 from Crikvenica, and 3 from the island of Krk. The research provided detailed insight into the attitudes and practices of hotel managers regarding energy management, the use of renewable energy sources, and the overall level of environmental sustainability in tourist facilities. Qualitative analysis of responses obtained through personal interviews indicated significant differences between small and medium-sized hotel companies and large hotel chains, both in the level of implementation of energy measures and in the perception of their importance. The results show that managers of smaller hotel facilities generally have a limited application of renewable energy sources. Although most respondents express general awareness of the importance of energy efficiency and reducing negative environmental impact, in practice, measures most often amount to basic forms of energy saving, such as replacing lighting with LED technology, more rational use of air conditioning systems, or occasional employee training. The implementation of more complex solutions, such as solar panels, heat pumps, or energy management systems, is rarely present. The main reasons cited are lack of financial resources, high initial investment costs, and insufficient information about available support and long-term economic benefits. Conversely, interviews with managers of large hotel chains indicate a more pronounced strategic awareness of the importance of renewable energy sources and sustainable business. Respondents from this group recognise the potential of energy efficiency in reducing operating costs, strengthening brand image, and increasing competitiveness in the tourism market. However, despite the expressed willingness to invest in renewable energy sources, such investments are often postponed due to other priorities in facility maintenance. The most frequently highlighted needs are rehabilitation of facilities, renovation of façades, modernisation of accommodation capacities, and infrastructure interventions that are perceived as more urgent for maintaining service quality and guest satisfaction.

Analysis of the responses shows that managers, regardless of facility size, recognise the link between efficient energy management and reduced operating costs. Most respondents believe that rational use of energy can positively impact the business's financial results in the long term, but the level of concrete implementation of such measures remains insufficient. A growing interest among guests in environmentally responsible facilities was also observed, which managers see as an additional incentive for future investments in sustainability. Special attention was paid during the research to management's awareness of climate change. The results indicate a moderate level of knowledge, with managers of larger systems being better acquainted with global trends and regulations, while managers of smaller facilities most often receive information unsystematically and without strategic planning. In conclusion, the research confirms that there is awareness of the importance of energy efficiency and renewable energy sources in the hotel sector in Kvarner, but the implementation of these measures largely depends on facility size, financial capacity, and management priorities. The role of managers has proven crucial in the decision-making process, highlighting the need for additional education, strategic planning, and institutional support to more effectively integrate energy sustainability into the operations of tourist facilities. Energy management in hotels is a complex process due to the specifics of the hotel business. Hotels operate continuously, providing a wide range of services through various departments, such as accommodation, catering, wellness, conference facilities, administration, laundry, and technical services. Such complexity requires a systematic approach to energy management. A number of measures can be implemented without significant capital investment (Azhgaliyeva et al., 2023). These include optimising room and water temperatures, adjusting equipment operating hours, controlling lighting, turning off systems in unoccupied rooms, and avoiding simultaneous heating and cooling. Low- to moderate-cost measures include installing thermostatic valves, photocells, energy-efficient lighting fixtures, improving insulation, and gradually replacing outdated equipment with more efficient alternatives. Experience shows that successful energy efficiency programmes require changes in employee and guest behaviour, adaptation of organisational procedures, and continuous education. Small, gradual changes often bring significant savings, especially when they are coordinated and supported by management. Energy costs in hotels are distributed among heating and cooling (43%), hot water (15%), kitchen (10%), lighting (22%), and other consumers (10%) (Bohdanowicz et al., 2001; Menegaki, 2025). Managing these costs requires a combination of technological, organisational, and behavioural changes. Technological changes include improvements to lighting systems, HVAC systems, energy controls, building insulation, and the introduction of renewable energy sources such as solar collectors and heat pumps. Behavioural changes involve educating employees and guests about rational energy use, while organisational changes include forming energy teams, defining consumption reduction goals, and regularly monitoring and reporting on energy costs. Investments in energy efficiency not only provide financial benefits, but also increase the value of the facility, strengthen the ecological image of the hotel and destination, and contribute to the long-term sustainability of tourism. It is important to implement investments gradually, prioritising projects with a shorter payback period, which creates the prerequisites for financing longer-term investments.

4. Conclusion

Managers' attitudes towards renewable energy sources and environmental sustainability play a key role in the development of sustainable tourism. Effective energy management simultaneously reduces costs, increases competitiveness and guest satisfaction, and lessens the negative impact of tourism on the environment. Given the growing market demands and regulatory frameworks, sustainability and energy efficiency are no longer optional, but necessary for the long-term success of the tourism sector. The tourism sector faces intensifying competition caused by globalisation, the emergence of new destinations, and the entry of new brands into the market. As labour costs, according to UNWTO indicators, are continuously increasing and difficult to rationalise, increasing energy efficiency is emerging as one of the

key instruments for reducing the operating costs of tourism facilities. In addition to economic effects, energy efficiency also brings significant positive impacts on the environment, which is a fundamental resource for tourism development. Therefore, it is of utmost importance to reduce energy needs already in the design, construction, and reconstruction phases of tourism facilities, by applying passive concepts and zero-emission facilities, such as zero energy hotels. The examples of hotels analysed in this paper confirm that significant energy savings can be achieved by combining technical measures, the use of renewable energy sources, and continuous education and involvement of staff and guests. The results indicate the need to remove institutional, financial, and informational barriers in the implementation of energy efficiency measures, especially in existing facilities. Although large hotel chains have greater financial capacity, the research shows that small and medium-sized enterprises can also achieve significant improvements, with the owner or manager of the facility standing out as a key actor in the decision-making process. Their role is further strengthened by systematic employee education, which brings benefits to the company, guests, and the entire tourist destination. The research makes a theoretical contribution to understanding the attitudes of hotel management and has significant applied value in the context of introducing and implementing energy measures for sustainable development. Despite formal education and work experience, respondents show an insufficient level of knowledge about energy issues in tourism, which confirms the need for continuous education and stronger institutional support at national, regional, and local levels. In addition, the research results provide a relevant basis for selecting optimal energy management models and defining guidelines for their implementation in individual tourist facilities and destinations. The application of measures such as the rational use of natural lighting and ventilation, water consumption control, waste recycling, the use of ecological materials, and green transport contributes to increasing the energy and overall sustainability of tourism. Although larger tourism systems are at the forefront of implementing these measures due to financial capabilities and the need to maintain an image of social responsibility, sustainability is also being confirmed as a tool for increasing business efficiency and reducing costs. In conclusion, it is necessary for all stakeholders in the tourism system to work together to raise awareness and disseminate information about the importance of energy issues, thereby ensuring the long-term sustainable development of both the facility and the destination as a whole. The limitations of this paper are evident in the small sample of managers interviewed, the limited spatial coverage and the methodology used. For future analyses, it is recommended to increase the sample size and conduct a quantitative analysis. This paper contributes to the literature by deepening the theoretical understanding of hotel managers' attitudes towards renewable energy sources and environmental sustainability as key determinants of sustainable tourism development. It provides empirical evidence that effective energy management – through a combination of technical measures, renewable energy use, and stakeholder education – simultaneously reduces operating costs, enhances competitiveness and guest satisfaction, and mitigates environmental impacts. Furthermore, the study offers practical guidelines for overcoming institutional, financial, and informational barriers, and supports the selection of optimal energy management models at both facility and destination levels, thereby contributing to the long-term sustainable development of the tourism sector.

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