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## Innovation as a Tool for Sustainable Development of the Hotel Industry

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**Halyna Ilnytska-Hykavchuk**

Candidate of Economic Sciences (Ph. D.), Docent,  
Associate Professor at the Department of Tourism,  
Lviv Polytechnic National University, Ukraine  
E-mail: [ilnytska81@gmail.com](mailto:ilnytska81@gmail.com)  
ORCID: <https://orcid.org/0000-0003-4176-2784>

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**Abstract.** Innovation can be considered a tool for achieving a balance between economic efficiency, social responsibility and environmental safety of the hotel. The integration of innovative technologies facilitates the optimisation of resource utilisation, enhancement of customer service quality, and mitigation of environmental impact. The objective of the present study is threefold: firstly, to highlight and systematise the main environmental innovations used in the hotel industry; secondly, to determine the principles of the hotel industry in the context of sustainable development; and thirdly, to identify measures to improve the implementation of environmental innovations in hotels. In order to achieve this objective, an analysis was conducted of the areas of influence of the hotel sector on the environment. The following principles were identified as being key to the sustainable development of the hotel industry: environmental responsibility; energy and resource efficiency; social responsibility; innovation; economic sustainability; responsible consumption and production; continuous improvement; and education. The ways in which the hotel industry is becoming more environmentally friendly are revealed, including the introduction of automated hotel management systems, mobile applications, the Internet of Things, energy-saving technologies, water-saving technologies, waste reduction and innovations in the food sector. Information is also provided about green hotels and environmental certification systems. The main obstacles to implementing environmental innovations have been identified as high financial costs, resistance to change and a lack of preparedness among hotel management, staff and clients. There is also imperfect state support. The following measures have been revealed to improve the implementation of environmental innovations in hotels: organisational and managerial; educational and informational; financial and economic; technical and technological; marketing; monitoring and improvement. Introducing environmental innovations into hotel practices will contribute to greener activities and increase economic efficiency and the quality of services while promoting social responsibility.

**Keywords:** innovations, hotel, sustainable development, greening, digitalisation, environmental hotel.

**JEL Classification:** L830, O32, Q01

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### 1 Introduction

The contemporary conditions underpinning the functioning of the hotel industry are characterised by dynamic changes in market requirements, growing competition, the need for environmental responsibility and the need to ensure sustainable development. In this context, innovations become a pivotal instrument for enhancing the competitiveness of hotel enterprises, while concurrently facilitating a harmonious balance between economic efficiency, social responsibility and environmental safety. The integration of innovative technologies, including energy-saving systems, "smart" rooms, digitalisation of services and automation of management processes, has been

demonstrated to facilitate the reduction of resource costs, enhance the quality of customer service and mitigate the adverse environmental impact. Furthermore, it is evident that innovations play a pivotal role in enabling the hotel industry to adapt to the challenges posed by globalisation, climate change, digital transformation and the evolving expectations of a new generation of consumers. Consequently, the study of innovations as a tool for sustainable development of the hotel industry is of paramount importance and has practical significance for the formulation of effective development strategies for hospitality industry enterprises in the context of contemporary global transformations.

The objective of the present study is threefold: firstly, to highlight and systematise the main environmental innovations used in the hotel industry; secondly, to determine the principles of the hotel industry in the context of sustainable development; and thirdly, to identify measures to improve the implementation of environmental innovations in hotels.

## **2 Principles of Sustainable Development of the Hotel Industry**

The hotel sector can have a significant positive or negative impact on the environment. In the context of sustainable development, the positive impact of the hotel sector is manifested as follows: funds are received, infrastructure is modernised, quality management is implemented, employment opportunities for the local population increase, tourist attractions are preserved, and environmental awareness in society improves. The deleterious impact of the hotel industry on the environment is multifaceted, encompassing the intensive utilisation of water resources, environmental degradation, and the deterioration of natural landscapes due to the construction of tourist infrastructure facilities. Furthermore, the proliferation of tourism in vulnerable areas, high energy consumption, substantial waste generation, and the disruption of biodiversity are additional contributors to this issue (Hanych & Hataliak, 2019).

The extent of the negative impact varies depending on the hotel category. Hotels in higher categories are more affected, as they provide a wider range of services, change their equipment and interior more often, have higher costs for laundry and cleaning, use more electricity, et cetera (Hranovska & Boiko, 2020). Concurrently, high-end hotels are implementing the latest environmentally friendly technologies. The extent of a hotel's adverse environmental impact is contingent on the environmental policy framework in place.

The sustainable development of the hotel industry is predicated on a tripartite concept that integrates the economic, social and environmental dimensions. The implementation of this concept in the hotel sector entails a reduction in natural resource consumption, cost optimisation, enhancement of service quality, and adherence to ethical standards for employees and customers. It is imperative to acknowledge the pivotal function of environmental innovations in facilitating the sustainable advancement of the hotel sector.

Modern principles of the functioning of the hotel industry in the context of sustainable development should be:

- The principle of environmental responsibility. Hotels should implement measures to reduce their negative environmental impact, such as conserving energy, sorting waste, reducing plastic use, and switching to environmentally friendly materials and "green" technologies.

- The principle of energy and resource efficiency. Automated energy consumption control systems and the use of renewable energy sources reduce operating costs and the burden on resources, as does water reuse for irrigation.

- The principle of social responsibility. Hotels support local communities by creating jobs, co-operating with local manufacturers, adhering to fair labour principles, and providing an inclusive environment.

- The principle of innovation. The introduction of the latest technologies, such as smart rooms, mobile applications for guests and contactless check-in/out, as well as the digital transformation and automation of services, improves the customer experience and increases efficiency.

- The principle of economic sustainability. Rational financial management, investment in long-term environmental projects, focus on reputation, not just short-term profit.

- The principle of responsible consumption and production. Reducing food waste, introducing buffets with limited portions, working with suppliers who adhere to the principles of environmental friendliness.

- The principle of continuous improvement and education. Training staff in the principles of sustainable development, involving guests in environmental initiatives (towel reuse programs), and constantly monitoring and updating management practices.

## **3 Environmental Innovations in Hotels**

Innovations in the hotel industry include the digitalisation and automation of services, the use of CRM systems and mobile applications, robotic services, and innovations in hotel design and concepts, such as smart room technologies and biophilic design, which combine comfort with environmental friendliness. Other innovations include the use of energy-efficient technologies and environmentally friendly materials, the minimisation of plastic waste, and the use of local eco-products (Paska et al., 2025).

As Dyshkantiuk et al. (2020) observe, the hotel industry is undergoing a process of "greening" in which the implementation of automated hotel management systems (PMS – Property Management Systems) is one of the key directions. These systems facilitate the management of

reservations, pricing, room availability, the creation of customer databases, the conducting of analytics, the generation of reports, and the implementation of environmental initiatives. The utilisation of automated hotel management systems has been demonstrated to assist in mitigating the adverse environmental impact by optimising internal processes, ensuring efficient resource utilisation, and the implementation of digital solutions that reduce the necessity for paper documentation and energy consumption.

The main environmental benefits of using PMS:

- Energy saving. PMS systems can be integrated with "smart" lighting and climate control systems. For example, they can be programmed to automatically turn off the electricity in a room after a guest leaves, or to control the air conditioning depending on the temperature and occupancy of the hotel.

- Optimisation of cleaning and laundry. Thanks to the PMS system, information about guests' preferences regarding cleaning frequency is received, enabling a reduction in water, detergent and electricity usage. Guests can opt out of daily towel and bed linen changes via a mobile application.

- Reduction of paper document flow. PMS enables electronic guest registration, invoicing and reporting, as well as internal communication between departments. This reduces paper usage and disposal costs.

- Cost control and reporting. PMS systems provide detailed monitoring of resource consumption, such as water and electricity usage. This allows overspending to be identified promptly and corrective measures to be taken.

- Informing guests. Integrating PMS with mobile applications enables to inform customers about the hotel's green initiatives, encouraging them to consume responsibly and participate in environmental programmes.

The Internet of Things (IoT) is a tool that can make a hotel more competitive, improve the level of service and help save resources (e.g., turning off lights when there is no one in the room and adjusting the heating depending on the internal and external temperature). Additionally, clients can use a smartphone to turn on the lights and TV in their room, adjust the microclimate parameters and open their room without a key, and so forth (Povorozniuk, 2024).

Other digital innovations include the introduction of mobile applications for guests instead of printed materials such as menus, instructions and brochures. Guests can also order services via the app, eliminating the need for contact. Contactless

check-in and check-out reduces the burden on staff and cuts paper costs.

Advisable energy-saving technologies for hotels include solar panels, LED lighting and household appliances with the highest energy-saving rating, as well as "smart" energy management systems (EMS). The latter automatically adjusts the lighting, heating and air conditioning depending on whether guests are in the room.

Examples of water-saving technologies used in hotels include aerators for taps and showers, which reduce water consumption without compromising comfort, and water reuse systems, which purify and reuse water for technical purposes, particularly for watering outdoor areas. Other technologies include sensor mixers and touchless flushing systems.

The following measures are being implemented to reduce waste: waste sorting (integration of separate containers in rooms and on the hotel territory); organic composting (transformation of food waste into fertiliser); digital invoices and online document management (allowing to reduce paper use); purchasing products in large packages, as well as reusable materials; refusal of plastic.

Innovative technologies in the field of green construction and materials: new generation insulation materials (reduce heating/cooling costs); furniture and finishing materials certified for environmental friendliness; green roofs and balconies.

Innovative environmental initiatives in hotels may include: excursions to nature reserves and national parks, tree planting, games and competitions on environmental topics, master classes on making eco-friendly products, cleaning the surrounding area, and so forth (Drobotova & Krasnomovets, 2024).

Eco-innovations in the food sector include: partnerships with local suppliers (reduces the logistical footprint), food waste reduction systems, eco-packaging from biodegradable packaging and the rejection of single-use plastic, organic local food products.

An innovative hospitality concept is constituted by the notion of an eco-hotel, which is defined as an environmentally certified accommodation facility located in an ecologically clean area that reduces its negative impact on the environment and ensures safety, non-toxicity and energy efficiency for its guests (Danilova et al., 2017).

The concept of an ecological hotel is characterised by a number of features (Pankiv & Hunko, 2017). Firstly, it is environmentally sustainable. Secondly, it is dependent on the natural environment. Thirdly, it contributes to environmental preservation. Fourthly, it supports

the environment. Fifthly, it considers local culture. Finally, it ensures economic benefits for the local community. In order to verify the environmental credentials of a hotel, it is necessary for it to undergo environmental certification. The following well-known hotel certification systems are recognised on a global scale: Green Globe (Great Britain), Touristik Union International (TUI) (Germany), and Green Key (Denmark) (Kalenska & Liubchenko, 2023).

A total of 7,500 enterprises from more than 80 countries worldwide received certification under the Green Key system in 2024. The implementation of environmental certification for hotel establishments in Ukraine will be conducted in accordance with the international environmental certification programme for hotels Green Key (Denmark). The number of hotels that have obtained such certification is, however, limited. The majority of these hotels are affiliated with the Reikartz, Radisson, and Maison chains, with the greatest concentration located in the cities of Kyiv and Lviv.

The strengths of eco-friendly hotels include a positive image among consumers, the local population and society; the introduction of environmental innovations; using locally produced products; promoting local traditions, crafts and products; using environmentally friendly food products and detergents; using renewable energy sources; and reducing costs through conserving resources (water and energy).

#### 4 Barriers and Measures for Implementing Eco-Innovation in Hotels

The implementation of environmental innovations is often impeded by several factors. These include the high financial costs associated with modernisation and the implementation of environmental measures, resistance to change, a lack of preparation among hotel management, staff and customers for environmental innovations, and imperfect state support for sustainable initiatives. Concurrently, the evolution of technologies, the escalating environmental consciousness among consumers, and the advent of novel digital solutions are collectively engendering a conducive milieu for the proactive integration of innovations in the forthcoming years.

Measures to improve the implementation of environmental innovations in hotels:

- Organisational and managerial measures. Developing an environmental strategy for the hotel, appointing a person responsible for sustainable development (eco-manager) to coordinate the implementation of environmental initiatives,

integrating environmental criteria into internal service standards and staff assessment.

- Educational and information measures. Training staff on the principles of sustainable development and the efficient use of resources; running internal training sessions and seminars on environmental behaviour and the latest technologies; and informing guests about environmental initiatives via mobile apps, room eco-labels and booklets.

- Financial and economic measures. Attracting investments or grants for environmental projects; supporting sustainable businesses with tax breaks and government programmes; and introducing a "reward-saving" system, such as offering discounts to guests who participate in green initiatives.

- Technical and technological measures (upgrading engineering systems; implementing digital solutions; installing waste sorting systems).

- Marketing measures. This involves participating in certification programmes such as Green Key, which increase customer trust, as well as partnering with local, environmentally responsible suppliers and promoting the hotel's eco-brand through social networks, booking sites and travel platforms.

- Monitoring and improvement. Conduct regular resource audits (water, electricity and waste) and evaluate the effectiveness of implemented measures. Collect feedback from guests and staff on eco-initiatives and adjust the strategy flexibly in accordance with changes in technology, legislation or the market.

#### 5 Conclusions

Innovations are a necessary condition for ensuring sustainable development of the hotel industry. The implementation of these measures has been demonstrated to contribute to the greening of activities, increased economic efficiency, social responsibility, and improved quality of services. It is imperative that contemporary hotels adopt a strategic approach to innovation, with a focus on environmental technologies as a fundamental element of their developmental agenda. The hotel industry is moving towards a more environmentally friendly approach by implementing automated hotel management systems (PMS), which optimise internal processes and the efficient use of resources, as well as digital solutions that minimise the need for paper documents and energy consumption. Using Internet of Things technology improves the level of service and helps save hotel resources. Digital innovations include the implementation of mobile applications for guests instead of printed materials and contactless check-in and check-out.

Various technologies for saving energy and water, reducing waste, and innovations in the food sector are also being implemented. Eco-friendly hotels that implement extensive environmental practices are becoming popular. Well-known hotel environmental certification systems around the world include Green Globe (Great Britain), Touristik Union International (Germany) and Green Key (Denmark). However, few hotels in Ukraine have achieved environmental certification. The majority of these are hotels belonging to the Reikartz, Radisson and Maison chains. The primary impediments to the implementation of environmental innovations within the hotel sector are as follows: high financial

costs, resistance to change, a lack of preparedness amongst hotel management, staff and customers for environmental innovations, and imperfect state support for sustainable initiatives. The following groups of measures can be distinguished in order to improve the implementation of environmental innovations in hotels: organisational and managerial; educational and informational; financial and economic; technical and technological; marketing; monitoring and improvement. The importance of state support, the raising of awareness among employees and the general public, and the implementation of the principles of sustainable development in the hotel sector, is paramount.

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