



ROBOTICS IN TOURISM AND SUSTAINABLE DEVELOPMENT: A VISION FOR THE FUTURE OF HOSPITALITY INDUSTRY

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Abstract:

The purpose of this paper is to discuss the integration of robotics in the tourism sector, focusing mainly on its contribution to facilitating sustainable development. It examines the growing application of robotic technology in hotels, restaurants, and tourist attractions — from automated check-in/check-out services to robotic tour guides. The merits and potential of robotics for the tourism sector are analyzed, with attention to key advantages such as resource efficiency, energy savings, and operational optimization, as well as major challenges including social acceptance, implementation costs, and workforce impact. Drawing on real-world cases and emerging trends, this paper provides a detailed review of how robotics can help make tourism more innovative, sustainable, and resilient, thereby supporting the shift toward more sustainable development.

Keywords:

Robotics in tourism, Hospitality industry, Sustainable development, Service automation, Tourism experience, Eco-innovation.

INTRODUCTION

The article “Robotics in Tourism and Sustainable Development: A Vision for the Future of Hospitality Industry” talks about how service robots and AI-driven automation might help make the tourism and hospitality industry more environmentally friendly. It starts with the idea that rapid global development has made climate change, resource depletion, and ecosystem degradation worse, and that tourism, which is one of the most dynamic economic sectors, both depends on and puts a lot of stress on the environment. In this context, the authors contend that robotics can improve operational efficiency, diminish environmental impact, and bolster resilience in the tourism and hospitality sectors, while also advancing the Sustainable Development Goals (SDGs).

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LITERATURE REVIEW

The conceptual framework is based on the Brundtland definition of sustainable development, which says that we should meet our needs now without making it harder for future generations to meet their own (United Nations Secretary-General & World Commission on Environment and Development, 1987). The UNWTO says that sustainable tourism is when the requirements of tourists and businesses are balanced with the conservation of the environment, cultural heritage, and local communities. The ideals of “do no harm,” empowerment, and meaningful experiences are at the heart of this type of tourism (UNWTO, 2022). The study connects this approach to the 2030 Agenda and important SDGs, such as SDG 8 (decent work and economic growth), SDG 9 (industry, innovation, and infrastructure), SDG 12 (responsible consumption and production), and SDG 13 (climate action).

The writers stress that the expansion of tourism has had both positive and bad repercussions on the economy and the environment. These include air pollution, which is mostly caused by transportation and motorized leisure activities; water pollution, which is caused by poorly managed waste and water-based recreation; soil degradation, which is caused by uncontrolled construction and deforestation; and resource depletion, which is mostly caused by tourist facilities using too much water and energy (Park & Kim, 2024). The paper uses a chart to show the main categories of pollution and their causes. It also points out that tourism relies heavily on the quality of the environment and is a major cause of environmental degradation. This dual role necessitates the urgent adoption of sustainable practices and innovative technologies (Siddik, 2025).

METHODOLOGY

The work is organized as a narrative and conceptual literature review in terms of its methodology. It brings together research publications, conference papers, and institutional reports on AI, robotics, tourism, hospitality, and sustainable development. We found literature by searching major databases including Google Scholar, Scopus, and Web of Science for terms like “robotics in tourism,” “service robots,” “hospitality automation,” and “sustainable tourism.” The analysis is structured around three themes: (1) conceptual and theoretical foundations, (2) contemporary uses of robots in tourism and hospitality, and (3) implications for sustainable development, future perspectives, and research needs (Tussyadiah, 2020; Wang, Xu, & Li, 2025).

RESULTS

A major section of the article looks at how robots are now being used in tourism. Robots are being used more and more in airports, hotels, restaurants, and attractions to greet and guide people, check them in and out automatically, give them information, deliver rooms, clean and maintain them, and even for entertainment and to make services more personal (Skubis, 2025; Wu, Park, & Chang, 2025). Some examples are reception and guide robots that help guests check in, cleaning robots that keep rooms and public areas clean, drones that give interactive aerial tours, and delivery robots that bring food and drinks to rooms. The paper talks on real-life examples including the FlyZoo Hotel in China and the Henn-na Hotel in Japan, as well as European airports where robots help with crowd control and passenger information (Chang, 2025).

The study outlines numerous significant advantages of implementing robotics from an operational standpoint. Automating processes that have to be done again and over again can cut down on wait times, make service more reliable, and let human workers focus on more valuable, relationship-building jobs (Wu, Park, & Chang, 2025). Robots can work all the time, which makes service more reliable, and their accuracy helps raise hygiene standards, which was especially crucial during and after the Covid-19 pandemic (Mandić *et al.*, 2024). From a sustainability standpoint, robots and AI-driven systems can enhance the efficiency of energy and water consumption, minimize waste, and facilitate improved resource management in the accommodation and food service sectors, thereby diminishing the ecological footprint of the industry (Song & Chen, 2025; Sousa, Cardoso, & Dias, 2024). The authors say that robotics can make tourism more efficient, creative, and good for the environment overall.



The essay also talks about big problems and risks, though. Robots are easier for big companies to buy and keep up than for small and medium-sized businesses, which raises worries about unfairness in the industry (Mandić *et al.*, 2024). Another problem is social acceptance. Some tourists don't like interacting with machines, and employees may worry about losing their jobs or losing their skills, which can make them less trusting of service robots (Milohnić & Kapeš, 2024; Park *et al.*, 2025). Research indicates that employee acceptability is influenced by factors including perceived job stability, training, and organizational communication (Xu *et al.*, 2023; Staudt, Mosedale, & Ben Dakon, 2024). The report also talks about the moral and legal problems that come with protecting data and cybersecurity. It also says that robots still can't show empathy, creativity, or flexibility like people can. In fact, robots that are particularly "attentive" may even have the opposite effect and make tourists less likely to employ them (Wang *et al.*, 2026).

One of the most important things the paper does is make a clear connection between robotics and the SDGs in tourism. For SDG 8, robots can make people more productive and competitive, but they can also make it necessary for people to learn new skills and move to new jobs fairly. For SDG 9, robotics is an example of eco-innovation that updates the infrastructure for tourism. For SDG 12, robotics and AI systems assist keep an eye on how much resources are being used, cut down on waste, and encourage hotels and restaurants to make things more responsibly. Finally, for SDG 13, robots can help fight climate change by keeping an eye on the environment and making sure energy is used efficiently, which will lead to decreased carbon emissions (Song & Chen, 2025; Gössling & Mei, 2025). The paper emphasizes pragmatic approaches, including the utilization of robots and drones for the surveillance of air, water, and soil quality at tourist sites, the automation of lighting and climate control to reduce energy consumption, and the deployment of robots as "green educators" to elucidate natural and cultural heritage while promoting sustainable tourist practices (Skubis, 2025; Siddik, 2025).

The authors talk about a few trends that will happen in the future. First, better integration of robotics with AI will make robots that can talk to people in normal language, recognize faces and voices, and make decisions that adapt to the situation. This will make interactions smoother and more personal. Second, using robotics with augmented and virtual reality will make experiences more immersive by using virtual guides, drones for panoramic tours, and smart settings that can change how tourists interact with places. Third, in the next 10 to 20 years, the tourism industry may see the rise of hotels that are almost completely automated, self-driving tourist transport, and airports that are completely digitalized. This would change how tourism works and how it is structured (Naranjo, 2025; Wang *et al.*, 2026). However, these changes need a lot of money to be spent on long-lasting technology, strong ethical and regulatory frameworks, and a lot of training and upskilling (Kim & Kim, 2024).

CONCLUSIONS AND DISCUSSION

In conclusion, the study contends that robots in tourism ought not to be perceived merely as a mechanism for economic rationalization or cost reduction, but rather as a strategic instrument for cultivating a more robust and sustainable tourism sector. In times of economic or climate disaster, robots can help businesses stay open, but using them comes with large expenses, problems with societal acceptance, and big legislative changes (Milohnić & Kapeš, 2024; Xu *et al.*, 2023). The authors suggest that hotel managers use robots mostly for tasks that are repetitive and use a lot of resources, while keeping important human connection at important stages in the visitor journey. They advocate for further investigation into cross-regional analyses of robot adoption, the psychological impacts of human-robot contact, and hybrid hospitality frameworks where technology enhances rather than supplants human service. Ultimately, the successful integration of robotics in tourism depends on finding the right balance between innovation, consumer expectations and environmental protection, in line with the Tourism Agenda 2030 and the SDGs (Ivanov, Duglio, & Beltramo, 2023; Acharya & Mahapatra, 2024).



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