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Artificial intelligence and sustainability in tourism and hospitality: A systematic literature review of promise and evidence (2023–2026)

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Abstract

Artificial intelligence (AI) is widely presented as a means of making tourism more sustainable, yet it is unclear how far this claim rests on evidence. This systematic literature review follows PRISMA 2020 and covers articles published from 2023 to 2026 in 62 Scimago Q1 and Q2 tourism and hospitality journals and 25 Indonesian journals accredited at SINTA 1 or 2. From 1,815 AI-related articles, 234 were screened and 114 included. Six themes were identified: tourist and guest pro-environmental behaviour (40 studies), AI as an analytical tool for sustainability assessment (18), firm adoption and green performance (17), destination management (16), conceptual papers and reviews (13), and resource efficiency and emissions (10). Experiments indicate that replacing human service with AI or robots tends to weaken pro-environmental behaviour, whereas deliberately designed AI messages can strengthen it. Firm-level studies link AI adoption to green outcomes mainly through surveys of employees and managers. Few studies report observed behaviour or resource use, and none of the accessible abstracts reports a measurement of the environmental cost of AI itself. Sustainability is treated mainly as environmental. The review rests on titles and abstracts, and 35 studies were classified from titles alone. A research agenda is proposed.

Keywords: *artificial intelligence; sustainability; pro-environmental behaviour; service robots; smart destinations; Sustainable Development Goals; tourism; hospitality; systematic literature review*

1. Introduction

Tourism is expected to reduce its environmental impact, manage crowding at popular places and deliver benefits to host communities. Over the same period the sector has adopted artificial intelligence (AI) in customer service, operations, marketing and destination management. The two developments are now routinely joined in a single claim, namely that AI can make tourism more sustainable. Perspective papers argue that robots and automation can contribute to several Sustainable Development Goals (SDGs) by reducing the consumption of resources and by nudging consumers toward responsible choices (Ivanov et al., 2023; Ivanov et al., 2025). Conceptual work presents AI as a force that can accelerate progress on the SDGs provided that it is implemented responsibly (Rahimi et al., 2026), and a review of 76 articles concludes that AI makes operations more efficient and sustainable (Alves et al., 2025).

Claims of this kind describe what AI could do. Whether AI does so in practice is a separate question that requires evidence on behaviour, resource use and the condition of destinations. Several reviews have already mapped the field. They cover intelligent automation (Majid et al., 2023), service automation and the SDGs (Yong et al., 2025), Industry 4.0 technologies in sustainable tourism and ecotourism (S. Y. Khan et al., 2026; Kuo et al., 2026), digital technologies in community-based tourism (Durrah et al., 2026) and AI and the SDGs (Alves et al., 2025). As far as their titles and abstracts indicate, these reviews organise the literature by technology or by goal. They do not separate studies that propose a contribution from studies that test one, and they say little about what is measured as an outcome.

This review addresses that gap. It examines research published from 2023 to 2026 in highly ranked international journals and in accredited Indonesian journals, and it asks three questions.

RQ1. What has been published on AI and sustainability in tourism and hospitality, and how is it distributed across themes, research designs and national contexts?

RQ2. What does this literature show about the contribution of AI to sustainable outcomes for tourists, firms and destinations?

RQ3. What remains unknown, and what should future research address?

The review makes three contributions. It places international and Indonesian journals in one corpus. It separates the promise of AI from the evidence, and identifies the kind of outcome on which each group of studies relies. It also shows that one side of the account, the environmental and social cost of AI itself, is almost absent from the literature examined.

2. Conceptual background

Sustainability in tourism is usually described in three dimensions. The environmental dimension concerns energy, water, waste, emissions and the condition of ecosystems. The social dimension concerns residents, workers, culture and inclusion. The economic dimension concerns the viability of firms and the distribution of income. The SDGs provide a common vocabulary for these dimensions and are used as a frame in several of the studies reviewed (Alves et al., 2025; Ivanov et al., 2023; Rahimi et al., 2026).

AI can relate to sustainability in four ways, and the distinction is used to organise this review. First, AI can act within the service encounter. Chatbots, service robots, voice assistants and generative AI tools speak to guests and may influence whether they reuse towels, waste food or choose a less crowded attraction. Second, AI can serve as an operational and managerial resource. Firms use it to forecast demand, manage energy and support human resource practices, and destinations use it to predict occupancy and to steer visitor flows. Third, AI can serve as a research instrument. Machine learning and language models are applied to reviews, images, websites and policy documents in order to measure sustainability or perceptions of it. Fourth, AI is itself a source of environmental and social costs. Robots require materials and energy (Ivanov et al., 2023), generative AI has a carbon footprint that is raised as an environmental concern (Kim et al., 2026), and automation may reduce the role of tourism as a source of inclusive work (Filimonau et al., 2026).

The evidence that supports a claim about sustainability also differs in strength. An intention stated in a scenario is weaker evidence than behaviour observed in a hotel. A manager's rating of the firm's green performance is weaker evidence than metered energy consumption. A recommender that is designed to avoid crowding is not evidence that crowding has fallen. This review therefore records, as far as abstracts allow, which kind of outcome each study reports.

3. Method

3.1 Protocol and reporting

The review follows the PRISMA 2020 statement (Page et al., 2021). No protocol was registered in advance. The search was run on 3 October 2026 and screening for this review was completed on 4 October 2026.

3.2 Information sources

Records were retrieved from the Crossref REST API by journal ISSN. Two journal sets were defined in advance. The international set contains 62 journals ranked Q1 or Q2 in the Scimago category "Tourism, Leisure and Hospitality Management". Eight sport-specific journals in that category were left out. The national set contains 25 Indonesian journals whose own websites state accreditation at SINTA 1 or SINTA 2, comprising tourism journals and journals in management, information systems, law and regional studies that publish tourism research. Scopus and Web of Science were not available to the author for this search.

3.3 Search strategy

For each journal in the international set, Crossref was queried with a set of AI-related terms: artificial intelligence, AI, ChatGPT, generative AI, large language model, chatbot, robot, service robot, machine learning, deep learning, algorithm, automation, AI agent, agentic, smart tourism, intelligent, virtual assistant, human-robot, AI-powered and AI-generated. For the national set, English and Indonesian terms combining AI, digital technology and tourism were used. Records published from 2022 onward were retrieved so that articles first published online in 2022 and assigned to a 2023 issue would not be lost. The year used for eligibility is the year of the print issue or, where there is none, the year of online publication.

3.4 Eligibility criteria

Table 1 sets out the criteria. The focal criterion is that the relation between AI and sustainability is the central subject of the article.

Table 1. Eligibility Criteria

Criterion	Included	Excluded
Period	Published 2023 to 2026	Published before 2023
Source	Journals ranked Q1 or Q2 in the Scimago tourism, leisure and hospitality category; Indonesian journals accredited at SINTA 1 or 2	Other journals, books, conference papers and reports

Criterion	Included	Excluded
Document type	Journal articles, including conceptual papers, reviews and opinion papers	Retracted articles, retraction notices, corrections, editorials, special issue announcements and book reviews
Domain	Tourism, hospitality, travel or leisure	Other sectors
Focus	AI, robotics, machine learning or smart technology studied in relation to environmental, social or economic sustainability, pro-environmental behaviour, resource use, emissions, overtourism or the SDGs; machine learning used as the main instrument for assessing sustainability	Studies in which sustainability is a background motive or one variable among many; "sustainable" used in the sense of lasting, as in sustainable competitive advantage; forecasting and smart tourism studies without a sustainability outcome
Language	English or Indonesian	Other languages

3.5 Selection process

Records were first deduplicated by DOI and limited to 2023 to 2026. They were retained when the title or the abstract contained an AI-related term and, for general-interest journals, when the title or abstract referred to tourism, hospitality, travel or leisure. These steps produced a corpus of 1,815 AI-related tourism and hospitality articles. A keyword rule then flagged a record when its title contained a sustainability-related term, such as sustainable, environmental, carbon, emission, energy, climate, green, circular, waste, ESG, SDG, overtourism, crowding, resilience or footprint, or when its abstract contained at least two sustainability-related phrases. The rule flagged 200 records. A further search of titles containing related terms, such as nudging, prosocial, occupancy, smart destination, residents, rural and nature-based, and of abstracts obtained from publisher pages added 34 records. All 234 records were screened manually against the criteria in Table 1 using titles and, where available, abstracts. Screening was carried out by one reviewer.

3.6 Data extraction and synthesis

Each included study was assigned to one primary theme. The research design, sample, national context and type of outcome were coded from the abstract. Crossref provided abstracts for 60 of the included studies and publisher pages provided another 19. For the remaining 35 studies no abstract could be accessed, and they are classified from their titles only. Full texts were not read. The synthesis is thematic and narrative. No meta-analysis was attempted because the studies are heterogeneous, and no formal quality appraisal was carried out because the review did not have access to full texts.

4. Results

4.1 Selection of studies

Table 2 reports the flow of records. The 114 included studies represent 6.3% of the 1,815 AI-related articles in the corpus. Of the 34 records added by the further search, two met the criteria.

Table 2. Flow of records through the review (PRISMA 2020)

Stage	International set (Q1 and Q2)	National set (SINTA 1 and 2)	Total
Records retrieved from Crossref, deduplicated by DOI	17,463	2,066	19,529
Records published 2023 to 2026	15,811	1,636	17,447
Records mentioning AI in title or abstract	2,081	633	2,714
Records within tourism and hospitality scope (AI corpus)	1,780	35	1,815
Candidates flagged by keyword rule	196	4	200
Candidates added from a further search	34	0	34
Records screened on title and abstract	230	4	234
Records excluded: retracted article, retraction notice, correction, special issue announcement or book review	9	0	9
Records excluded: sustainability not the central subject, or term used in another sense	110	1	111
Studies included in the review	111	3	114

4.2 Profile of the literature

The literature has grown from six studies in 2023 to nine in 2024, 34 in 2025 and 65 in 2026. Eighty-three studies appeared in Q1 journals, 28 in Q2 journals and three in a SINTA 2 journal. The studies are spread over 31 journals. The Journal of Hospitality and Tourism Insights published 11, Current Issues in Tourism and the International Journal of Hospitality Management ten each, the Journal of Hospitality and Tourism Technology eight, and the International Journal of Contemporary Hospitality Management, Information Technology & Tourism and the Journal of Sustainable Tourism seven each.

Research designs could be coded for the 79 studies with an accessible abstract. Twenty-eight are surveys and 12 are experiments. Eleven analyse secondary data, ten build or evaluate a model or system, five are conceptual, five are reviews, four combine designs and two are qualitative. Two abstracts do not state the design. Table 3 shows that the designs are unevenly distributed across themes. Forty-three studies name a country, a place within a country or a multi-country region in the title or abstract. China appears in six, Spain and Vietnam in five each, Italy in four, and Egypt, Indonesia, Saudi Arabia, South Korea and the United States in three each. Robots are named in the title of 12 studies, chatbots in six and generative AI, ChatGPT, large language models or large AI models in eight. The full list of included studies is given in the supplementary table at the end of this article.

Table 3. Themes, years and research designs of the included studies (n = 114)

Theme	n	2023	2024	2025	2026	Designs of studies with an abstract
Conceptual papers, reviews and SDG agendas	13	2	0	5	6	Conceptual 5, review 5
Tourist and guest pro-environmental behaviour	40	2	1	11	26	Experiment 12, survey 10, mixed 2, qualitative 2, modelling 1, not stated 2
Firm adoption, green human resource management and performance	17	0	1	7	9	Survey 13, mixed 2
Resource efficiency, emissions and macro-level evidence	10	0	2	2	6	Secondary data 4, modelling 2, survey 2
Destination management, visitor flows and smart destinations	16	1	4	3	8	Modelling or system evaluation 6, survey 3, secondary data 1
AI as an analytical tool for sustainability assessment	18	1	1	6	10	Secondary data 6, system evaluation 1
Total	114	6	9	34	65	

4.3 Thematic synthesis

Theme 1. Conceptual papers, reviews and SDG agendas

Thirteen studies set out what AI could contribute. Two perspective papers examine robots and automation against the SDGs. Ivanov et al. (2023) conclude that robots can reduce the consumption of resources and take over dangerous tasks, but that their manufacture relies on rare earth materials, that they demand energy and that their batteries create toxic waste. The authors state that the effects have not been measured empirically. Ivanov et al. (2025) expect automation to reduce waste and energy use on the supply side and to nudge consumers toward sustainable practices. Afaq et al. (2025) reflect on blockchain and AI and describe how AI can optimise energy use in hotels. Rahimi et al. (2026) propose that responsible use of AI for the SDGs requires fairness, accountability, transparency and ethics. Filimonau et al. (2026) add a social argument. They hold that the agent-to-agent economy creates a paradox, because agentic AI optimises organisational performance while reconfiguring employment in a sector that is assumed to provide inclusive work.

Five reviews have an accessible abstract. Alves et al. (2025) review 76 articles and conclude that AI makes operations more efficient and sustainable and contributes to SDGs 8, 9, 11, 12 and 13. S. Y. Khan et al. (2026) map 1,037 articles on Industry 4.0 technologies and sustainable tourism. Kuo et al. (2026) review 163 articles on ecotourism and find that adoption remains limited by infrastructure and cost. Durrah et al. (2026) review 85 papers on community-based tourism and identify low digital competence and insufficient digitisation as threats. In the national set, Prasetyo and Irawati (2025) map 627 documents on smart tourism. Three further studies are known only by their titles, which indicate two reviews (Majid et al., 2023; Yong et al., 2025) and an assessment of risks and opportunities for the SDGs (Gössling & Mei, 2026). Taken together, this theme describes potential. Its reviews report the

technologies and topics that have been studied, and the abstracts do not report how often sustainable outcomes were measured.

Theme 2. Tourist and guest pro-environmental behaviour

This is the largest theme, with 40 studies, and it contains most of the causal evidence. A first group of experiments compares AI or robot service with human service. The results are consistent. Across four experiments with 748 participants in the United States, the United Kingdom and China, Guan et al. (2025) find that AI services reduce social arousal and thereby diminish pro-environmental behaviour. Guan, Li, et al. (2026) report that AI-robot service lowers public self-awareness and reduces sustainable food consumption among 1,019 participants in the United States and the United Kingdom. Song et al. (2026) find across four experiments that human service enhances pro-environmental behaviour more than robot service, through lower social distance and stronger personal norms. L. Su et al. (2026) show in four scenario experiments and a field experiment that AI service agents increase moral disengagement and weaken pro-environmental intentions and behaviour. Wen and Huang (2026) find in six experiments that consumers are more likely to waste food when served by robot chefs, who are perceived to exert less effort than human chefs. Five papers by four first authors therefore point in the same direction. When a human is replaced by a machine, the social and moral cues that support responsible behaviour become weaker. The abstracts also report conditions that change the size of the effect, such as the consumer's philosophical stance toward AI (Guan et al., 2025) and the type of interaction and destination support (Song et al., 2026).

A second group of studies shows that this effect is not fixed, because the design of the agent and of its message matters. Childlike anthropomorphism brings responses to AI agents close to responses to human providers (L. Su et al., 2026), and a proactive interaction style attenuates the negative effect of robots on sustainable food consumption (Guan, Li, et al., 2026). Pro-environmental messages are more effective when delivered by AI providers perceived as cute (C. Lee et al., 2026), by AI speaking with a local accent, although only among tourists from large cities in China (Yang et al., 2025), and by a green-coloured robotic dog using a socially framed message (Y. Xu et al., 2026). Zhao et al. (2026) find that robots are more persuasive with descriptive norms and humans with injunctive norms. Duan et al. (2025) report that greater human-robot interactivity raises guests' psychological ownership and their pro-environmental behaviour. The strongest evidence comes from Alboqami and Agag (2026), who combine 46 interviews with a 12-week cluster-randomised field experiment in eight hotels in China. Guilt-framed messages from a robot concierge increased towel and linen reuse and housekeeping opt-out, measured in hotel operational records, relative to neutral messages. The authors note the inferential limits of an eight-hotel design.

A third group concerns chatbots and generative AI. Chatbots have been conceptualised and then tested as a means of carrying pro-environmental behaviour from the destination back to daily life. Majid, Tussyadiah, and Kim (2025) develop the concept with stakeholders in the Gili Islands, Indonesia, and Majid et al. (2026) report a six-week quasi-experiment in which reminders of past pro-environmental actions delivered by a chatbot strengthened the effect of environmental self-identity, with differences between treatment and control groups in self-reported behaviour. In two experiments, more advanced generative AI tools reduced information overload when travellers compared eco-certified options (Meyer-Waarden et al., 2026). Surveys associate perceived characteristics of chatbots or generative AI with the intention to choose eco-friendly accommodation among 371 Vietnamese travellers (Foroughi,

2026), with the brand image and authenticity of sustainable destinations among 508 respondents in Vietnam (Nguyen et al., 2026), and with willingness to take part in sustainable practices among 346 young hotel guests (Singh & Kunja, 2026). A. N. Khan et al. (2026) find that chatbot adoption by hotels reinforces the link between a green physical environment and sustainable practices. Kim et al. (2026) frame the use of ChatGPT as a trade-off between usefulness and risk and mention the carbon footprint of generative AI as an environmental concern. Among 600 South Korean travellers, perceived benefits outweighed privacy and conflict risks, and highly eco-conscious tourists overrode considerable perceived risk when informational utility was very high. Other studies examine AI-generated images of climate-conscious food (Chan, 2025), virtual influencers, which are generally less effective than human influencers in green marketing (Huang et al., 2026), and decoy options in recommender systems, which steer visitors more consistently across space than across time (Chvirova et al., 2026). Araña (2026) takes a different route and uses AI agents to pre-test hotel nudges. After calibration against 1,680 intercept surveys in four hotels in Gran Canaria, the simulated lift in towel reuse was 5.5 percentage points against a published field benchmark of 6.8.

The remaining surveys relate AI or smart tourism to broad sustainability constructs. AI is associated with green tourism in Egypt (Alaflak et al., 2025) and with tourist empowerment, engagement and perceived sustainable tourism development in Saudi Arabia (Rehman et al., 2026), and trust in AI is included in an extended value-belief-norm model of space tourist behaviour (Kim et al., 2024). Smart tourism experiences are linked to biospheric values and environmentally responsible behaviour among 1,172 visitors in Taiwan (T. H. Lee & Jan, 2023). One survey of 488 Korean consumers finds that perceived sustainability has no significant effect on the experiential value of robotic restaurants (Cha & Kim, 2026), and a qualitative study explores AI and human collaboration in responding to restaurant reviews (Orea-Giner et al., 2025). Eleven studies in this theme are known only by their titles. These refer to chatbots and green customer citizenship (Guan, Xiao, & Deng, 2026), AI disclosure in environmental communication (W. Han & Xue, 2026), voice assistants (Jiang et al., 2025), public transport in Korea (Kim et al., 2023), ChatGPT and sustainable tourism action (Kim et al., 2025), service robots and pro-environmental prompts (Lin et al., 2026; Z. Su et al., 2026; X. Xu et al., 2026), chatbots and behavioural spillover (Majid, Tussyadiah, et al., 2025), smart technologies as nudges (Pragha & Dhalmahapatra, 2026) and coastal tourism (Shaayesteh et al., 2025).

Theme 3. Firm adoption, green human resource management and performance

Seventeen studies examine firms, and 13 of the 15 with an abstract are surveys of employees, managers or firm representatives. Their common finding is a positive association between AI-related variables and green outcomes, usually through a mediator such as human resource practices, innovation, resource optimisation or resilience. In Vietnam, three surveys of hotel staff by overlapping author teams, with 569, 668 and 1,256 respondents, link AI to green human resource management, green innovation, low-carbon behaviour and sustainable performance (Dinh, Nguyen, & Nguyen, 2026; Dinh, Nguyen, et al., 2026a; Dinh, Nguyen, et al., 2026b). Comparable associations between AI-related variables and green or sustainability outcomes are reported for hotel managers in Pakistan (Azhar et al., 2025), middle managers in Egypt (Khairy et al., 2025), 367 hotel firms in Spain (Baquero et al., 2026), 253 hotel managers in Hainan (K. Wang et al., 2026), employees of green hotels in Turkey (Irani, 2025) and 1,600 employees of independent hotels in the United States (Jerez-Jerez, 2025).

Hao et al. (2025) find that avatar-led green training increases environmental citizenship behaviour among 724 hotel employees through workplace spirituality. Two studies treat AI as a moderator. AI-enabled recruitment and performance management strengthen the effect of ecocentric leadership on employee engagement in Saudi Arabian hotels, whereas AI-enabled training does not (Al-Obaidly et al., 2026), and responsible AI moderates the relation between corporate digital responsibility and sustainable performance (Abou-Shouk et al., 2025). Zaki (2025) relates Industry 4.0 innovations to circular economy practices in green hotels in Saudi Arabia and Egypt.

Two mixed-method studies add managers' views. Hotel managers in Turkey rank the reduction of energy consumption as the most important criterion for a green and smart hotel (Akel & Noyan, 2024). Among professionals in the meetings and events sector in Southeast Asia, relative advantage, compatibility, trialability and coercive pressure shape the intention to adopt business process automation for sustainability (Ramadhan et al., 2026). Two studies are known by title only (Alos-Simo et al., 2026; Shi et al., 2026). As far as the abstracts indicate, the performance outcomes in this theme are reported by respondents. None of the abstracts mentions metered energy, water or waste data.

Theme 4. Resource efficiency, emissions and macro-level evidence

Ten studies address resource use and emissions, and this theme holds most of the measured outcomes. Three concern food waste. Chan et al. (2025) build a machine learning model from 1,784 transactions and leftover records observed in a dim sum restaurant and identify group size, age and ordering patterns among the predictors of leftovers. Gómez-Talal et al. (2024) apply unsupervised machine learning to restaurant tickets to guide purchasing and the sale of perishable products. Vukolić et al. (2025) survey 234 managers and head chefs in Serbia and Montenegro, who report that AI reduces food waste through inventory control, menu planning and waste tracking. One study uses operational records of energy and water consumption. Wong and Loo (2026) analyse monthly data from 2013 to 2020 for a hotel that integrates 19 sustainable building features with six smart management systems, and report that energy consumption fell by 55.5% and that water consumption per guest was 69.4% below the industry average. The abstract does not separate the contribution of the smart management systems from that of the building features, and it does not mention AI by name. A survey of 418 participants links awareness of carbon emissions to the intention to choose autonomous delivery robots (J. Han et al., 2024).

Three studies work at the level of countries or markets. Tiwari and Mohammed (2026) find that AI is negatively associated with greenhouse gas emissions from tourism transport in leading tourism economies between 1995 and 2020. A correction to this article was later published and was not examined here. Işık et al. (2026) report for 27 European countries that an indicator of environmental, social and governance burden per tourist is negatively related to income per capita and that the interaction with AI makes the relation more favourable. Kocak and Alnour (2026) find that AI and green technology innovation depress tourism stock returns in the short run and raise them in the long run. These studies establish associations at an aggregate level and do not identify the mechanism by which AI would reduce emissions. Two studies are known by title only (Islam et al., 2026; Z. Zhang et al., 2026).

Theme 5. Destination management, visitor flows and smart destinations

Sixteen studies concern destinations. Six build or evaluate systems, all published in Information Technology & Tourism or the International Journal of Tourism Research. Bollenbach et al. (2024) predict occupancy at an open point of interest and find that tree-based models perform best and that accuracy improves as the prediction horizon shortens. Neubig et al. (2026) give a large language model access to occupancy data through a tourism ontology. On 19 realistic questions the agent reached 42% accuracy, which was higher than the text-to-SQL systems tested. Recommender systems are designed to reduce crowding by proposing whole itineraries (Dalla Vecchia et al., 2024), by adding emissions, popularity and seasonality to city trip recommendations (Banerjee et al., 2025), by predicting museum visits in Florence as a basis for flow management (Masini et al., 2026) and by simulating promotion campaigns in South Tyrol (Piliponyte et al., 2024). These studies report prediction accuracy, simulated distributions and expert or user evaluations. The abstracts do not report a change in actual visitor flows.

Four studies assess smart destinations more broadly. Aguirre et al. (2023) use open data and time series analysis and conclude that the transformation of Benidorm into a smart destination contributed to the sustainability of the city, while noting that the weighting of indicators is subjective. Andrianto et al. (2026) survey 668 travellers in Southeast Asia and find that data security and trust predict tourist experience more strongly than technical performance, and that community engagement and cultural inclusivity drive sustainable value creation. The national set contributes two studies. Gunawan et al. (2025) survey 380 tourists in six Indonesian destinations and find that technology service quality and omnichannel communication raise satisfaction, which in turn predicts perceived sustainability. Hariyanto et al. (2025) ask experts to rank strategies for AI-driven sustainable tourism in Indonesia with the analytic hierarchy process. Digital infrastructure ranks first and AI literacy among micro, small and medium enterprises second, ahead of a national platform, governance frameworks and the promotion of sustainable AI use.

Six studies are known only by their titles. Two of them raise the opposite possibility, that AI travel recommendations may add to overtourism (Mellors, 2026; Najafi & Costa, 2026). The others concern the governance of overtourism in cities (Ghaderi, 2026), AI as a strategic resource for tourism cities (Zeqiri & Ben Youssef, 2026) and the measurement of sustainability in smart destinations (Azimi et al., 2026; Wu et al., 2024).

Theme 6. AI as an analytical tool for sustainability assessment

In 18 studies AI is the instrument of research and sustainability is the object. The seven studies with an abstract apply machine learning or language models to existing text, images or spatial data. Salazar et al. (2026) classify 207,706 reviews of attractions in Spain with a language model and find that references to cultural and environmental sustainability are associated with higher ratings and references to social and economic sustainability with lower ratings. Perez-Aranda et al. (2025) apply deep learning sentiment analysis to 2,655 hotel reviews from the Costa del Sol and describe their sustainability results as exploratory. Nilsson Vestola (2025) combines machine learning with thematic analysis of Reddit discussions and finds low self-efficacy and at least ten barriers to climate change mitigation in travel. Basirati and Laachach (2026) cluster Instagram images of sustainable destinations in Morocco, and Blasi et al. (2024) use web scraping and machine learning to identify networks of sustainable accommodation providers in the Veneto region. B. Wang et al.

(2026) combine spatial analysis with explainable machine learning to screen sites for tourism development under ecological constraints. Carić et al. (2026) use a generative AI model with expert validation to assess the coherence between the Croatian sustainable tourism strategy and European Union policy documents, and conclude that expert oversight remains indispensable.

The 11 studies known by title apply similar methods to ecological resilience in cities affected by viral overtourism (Chang et al., 2026), tourist responses to overtourism (Sun et al., 2025), sustainability features of natural heritage sites (Cheng et al., 2025), disclosure and sustainability practices in hotels (Gunasiri et al., 2026; Pérez López et al., 2025; Ray et al., 2023), the SDGs and competitiveness (Köseoglu & Arici, 2026), land use under climate change (Yuan et al., 2026) and other topics (Behbahani & Shahbandarzadeh, 2026; Gupta & Jaiswal, 2026; Y. Zhang et al., 2025). This theme treats AI as a method. It adds to knowledge about sustainability, and it does not show that AI makes tourism more sustainable.

5. Discussion

5.1 The promise is ahead of the evidence

The conceptual papers and reviews describe AI as a contributor to the SDGs. The empirical studies give a narrower picture. Among the 79 studies with an abstract, 28 are surveys, including one expert panel, in which respondents report perceptions, intentions, priorities or their firm's performance. Of the 12 studies coded as experiments, three mention a field, longitudinal or time-lagged component in their abstracts (Majid et al., 2026; L. Su et al., 2026; Y. Xu et al., 2026). Outcomes observed in operating businesses are reported in a small number of studies, namely a field experiment with hotel operational records (Alboqami & Agag, 2026), seven years of operational data from one hotel (Wong & Loo, 2026) and observed leftovers in one restaurant (Chan et al., 2025). Destination studies use observed visit and occupancy data as inputs to models, and report simulations and prediction accuracy. The claim that AI makes tourism more sustainable is therefore supported mainly by associations among perceptions and by designs that have not yet been tested in the field. This reading rests on abstracts, and full texts may contain further behavioural measures.

5.2 Automation by default and persuasion by design

The experiments in Theme 2 lead to a distinction with practical consequences. When AI or robots replace human staff and nothing else is changed, pro-environmental behaviour tends to fall, because guests feel less socially aroused, less observed, less socially close and less morally engaged, and because robots are seen as putting in less effort (Guan, Li, et al., 2026; Guan et al., 2025; Song et al., 2026; L. Su et al., 2026; Wen & Huang, 2026). When the agent and its message are designed for persuasion, behaviour can rise, and in one case it did so in hotel records (Alboqami & Agag, 2026). The two findings are compatible. They imply that the environmental effect of service automation depends on design choices that operators can control, and that automation adopted only to reduce labour cost may carry an unintended environmental cost. The persuasive effects have boundary conditions that deserve attention. One effect held only for tourists from large cities (Yang et al., 2025), one depended on the type of norm (Zhao et al., 2026), and virtual endorsers were less effective than human ones in general (Huang et al., 2026). Beyond a 48-hour follow-up (Y. Xu et al., 2026) and a 12-week field period (Alboqami & Agag, 2026), it is not known whether guilt appeals, cuteness or colour cues keep their effect after repeated exposure.

5.3 Firm-level claims rest on reported performance

The firm theme is internally consistent and methodologically narrow. Thirteen surveys relate AI-related variables, such as adoption, capabilities, trust in AI, leader competence and AI-enabled human resource practices, to green human resource management, green creativity or sustainable performance. In two of them AI is a moderator. No abstract in this theme reports a multi-source or time-lagged design, and one states that it is cross-sectional (K. Wang et al., 2026). The AI variable and the outcome therefore appear to be rated by the same respondents. Such designs cannot separate the effect of AI from the general tendency of well-managed firms to rate themselves highly on several dimensions. The single study with operational records reports large savings, but for one hotel and for a package of building and management technologies (Wong & Loo, 2026). The proposition that AI improves the environmental performance of hospitality firms is plausible and remains to be tested with measured consumption.

5.4 The cost side of AI is missing

A full account of AI and sustainability would set savings against the energy, water and materials that AI systems and robots consume. In the corpus examined this side is almost empty. Three abstracts raise it. One perspective paper lists the material and energy demands of robots (Ivanov et al., 2023), one survey abstract mentions the carbon footprint of generative AI as an environmental concern (Kim et al., 2026), and one study of human-robot interactivity notes that the impact of new technology on hotel energy consumption remains debated (Duan et al., 2025). None of the 79 abstracts reports a measurement of the footprint of an AI application in tourism. Two studies known only by title may address the issue (Gössling & Mei, 2026; Z. Zhang et al., 2026). Until such measurements exist, statements about the net environmental contribution of AI in tourism cannot be verified. The same holds for rebound effects. A recommender that makes trips easier to plan, or a robot that lowers the price of a service, may increase total consumption, and none of the abstracts examines this.

5.5 Sustainability is treated mainly as environmental

Most studies define sustainability through pro-environmental behaviour, green performance, waste, energy or emissions. The social dimension appears in fewer studies. It is addressed most directly through labour and inclusive work (Filimonau et al., 2026), community engagement and cultural inclusivity (Andrianto et al., 2026), community-based tourism (Durrah et al., 2026) and tourist empowerment (Rehman et al., 2026). It is touched on through decent work and employment (Ivanov et al., 2023), staff retention (Wong & Loo, 2026) and the digital divide and community empowerment in Indonesia (Hariyanto et al., 2025). Workers affected by automation are rarely the subject, and no abstract reports a study of residents. The overtourism studies with an abstract are concerned with the distribution of visitors, which affects residents, but they evaluate systems and do not report residents' experience. The economic dimension appears mainly as firm performance, and the distribution of benefits between large and small enterprises is not examined.

5.6 The national evidence base

The national set contributes three studies, all from one SINTA 2 journal and all published in 2025. One is a bibliometric study of smart tourism (Prasetyo & Irawati, 2025), one is a survey of tourists (Gunawan et al., 2025) and one is an expert ranking of strategies

(Hariyanto et al., 2025). Only the last has AI as its main subject. An Indonesian context also appears in an international journal, in the qualitative work on a chatbot for the Gili Islands (Majid, Tussyadiah, & Kim, 2025). Two further studies draw respondents from Southeast Asia without naming the countries in their abstracts (Andrianto et al., 2026; Ramadhan et al., 2026). The Indonesian evidence identifies preconditions, namely digital infrastructure and the AI literacy of micro, small and medium enterprises, and does not yet include a test of an AI application against a sustainability outcome.

6. Research agenda

Table 4 sets out eight areas for future research, each of which follows from a gap identified above.

Table 4. Research agenda for AI and sustainability in tourism and hospitality

Area	Research questions	Suitable designs
Automation by default	Does replacing staff with robots or AI reduce conservation behaviour and increase waste in operating hotels and restaurants?	Field experiments using operational records of reuse, opt-out and waste
Persuasion by design	Which agent and message features produce lasting change, and do the effects persist after repeated exposure and across cultures?	Longitudinal field experiments; replication in several countries
Measured firm outcomes	Does AI adoption reduce metered energy, water and waste?	Panel data from properties before and after adoption; difference-in-differences designs
Footprint of AI	What energy, water and materials do AI services and robots in tourism consume, and do these costs offset the savings?	Life-cycle assessment; net-effect accounting at property level
Demand steering	Do recommenders and occupancy forecasts change actual visitor flows, and do general-purpose chatbots concentrate demand on popular places?	Field trials with destination organisations; audits of chatbot output; mobility data
Rebound effects	Do efficiency gains and easier planning lead to lower total resource use or to more consumption?	Panel econometrics with firm and destination data
Social sustainability	How does AI affect workers, residents, small enterprises and cultural inclusion?	Mixed-method studies with workers and residents; distributional analysis
Emerging destinations	What do AI applications achieve in Indonesia and Southeast Asia where infrastructure and digital skills are uneven?	Evaluation of deployed tools in small enterprises and community-based tourism

7. Implications for practice and policy

For hotels and restaurants, the experiments suggest that service automation should be planned together with sustainability measures. Where a robot or kiosk replaces a member of staff, the cues that prompt guests to conserve should be rebuilt into the interaction, for example through proactive prompts and messages framed around social norms. Managers should measure reuse, opt-out and waste before and after automation and should not assume that the change is neutral.

For destination organisations, recommenders and occupancy forecasts are promising instruments for distributing visitors, and they have so far been evaluated mainly by simulation and by tests on historical data. Pilot projects should include a measurement of actual flows. Destination organisations should also monitor what general-purpose AI assistants recommend about their area, because two recent studies raise the possibility that such recommendations concentrate demand.

For policy makers, three points follow. Claims that an AI investment is sustainable should be supported by measured outcomes and by an account of the energy and materials that the system consumes. Public programmes should attend to the social dimension, including effects on employment. In Indonesia, the expert ranking reported by Hariyanto et al. (2025) places digital infrastructure and the AI literacy of micro, small and medium enterprises ahead of a national platform, governance frameworks and the promotion of sustainable AI use, which suggests that the sequence of investment matters as much as its scale.

8. Limitations

This review has limitations that affect how its results should be used. First, the search used Crossref and not Scopus or Web of Science. Crossref matches queries approximately, so relevant records may have been missed, although a check against 26 known key articles on AI in tourism found all of them in the corpus. Second, journal rankings were taken from a secondary listing of Scimago data and from the websites of the national journals, and they should be confirmed against the primary sources. Third, screening and coding were done by one reviewer and relied on titles and abstracts. Full texts were not read, and 35 of the 114 studies are classified from their titles alone. This affects in particular the Journal of Sustainable Tourism and Current Issues in Tourism, whose abstracts could not be accessed. Statements about what the studies measure refer to what their abstracts report. Abstracts taken from publisher pages were retrieved with an automated reading tool and were not checked word for word against the source. Fourth, research on AI, energy and sustainability is also published in environmental, engineering and computer science journals that this review did not search, so the absence of footprint measurements applies to the tourism journals examined and not to the wider literature. Fifth, the boundary of the topic involves judgement. Studies in which sustainability was one variable among several, forecasting studies without a sustainability outcome and studies of smart tourism in general were excluded, and each study was assigned to one primary theme. Sixth, more than half of the studies appeared in the year of the search, so the profile of the literature is likely to change quickly.

9. Conclusion

Between 2023 and 2026 the journals searched published 114 studies with the relation between AI and sustainability as their central subject. The literature is growing fast and is optimistic. Its evidence is narrower than its claims. Experiments show that service by AI or robots tends to weaken pro-environmental behaviour unless the interaction is designed to support it, and that designed persuasion can work, in one case in hotel operations. Firm-level studies report favourable associations based on the ratings of employees and managers. Destination studies offer systems that could distribute visitors and have not yet shown that they do. Measurements of resource use are few, and the environmental cost of AI itself is not measured in the abstracts examined. The social dimension receives little attention, and the

national journals contribute three studies. The next step for the field is to replace statements of potential with measured outcomes, including the footprint of the technology.

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