

Smart Destination in Shaping Regenerative Tourism through Human Artificial Intelligence Collaboration

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ABSTRACT

Sustainable tourism faces the challenges of environmental degradation and an imbalance of economic benefits, so a smart destination approach that integrates human collaboration and artificial intelligence is needed to support regenerative tourism. This study aims to analyze the influence of smart destination integration and human-AI collaboration on the development of regenerative tourism and the relationship between variables. Quantitative methods were used by surveying 200 respondent tourists and destination managers, collected through a structured questionnaire and analyzed using multiple linear regression. The results show that smart destinations and human-AI collaboration have a significant effect on improving the quality of travel experiences, management efficiency, and destination regenerative practices. The conclusion of the study confirms that the synergistic integration of technology and human role makes a practical contribution to strengthening adaptive and sustainable regenerative tourism models

INTRODUCTION

Global tourism is undergoing a significant transformation in line with increasing digitalization, changes in tourist behavior, and pressure on environmental sustainability. The UNWTO report shows that the tourism sector is starting to recover after the pandemic with the growth of international tourism mobility increasing again in the 2023–2024 period, but at the same time challenges arise in the form of overtourism, environmental degradation, and inequality of economic benefits in tourist destinations (UNWTO, 2024). In this context, the concept of smart destination is a strategic approach that integrates digital technology, real-time data, and artificial intelligence to improve the quality of the tourist experience and the efficiency of destination management. In Indonesia, the implementation of smart tourism is also starting to develop in various leading destinations, although it still faces limitations in digital infrastructure and human resource capacity.

Theoretically, smart tourism is closely related to the use of digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), and big data analytics in supporting adaptive and responsive tourism decision-making (Buhalis, 2022). This concept then developed towards regenerative tourism that not only focuses on sustainability, but also the restoration of the social ecosystem and the environment of the destination. The study of Gretzel et al. (2022) confirms that AI in tourism not only serves as a tool for automation, but also as a decision-support system that strengthens human and technological collaboration. However, the integration between smart destinations and regenerative approaches is still limited in the empirical literature, particularly those that examine the direct relationship between these variables in the context of developing destinations.

Previous studies in Indonesia show that the development of smart tourism is still dominated by the aspects of digitization of services and destination promotion, not many have studied its impact on the transformation towards regenerative tourism. A study by Putra and Suryani (2023) in the *Journal of Applied Tourism* shows that the implementation of digital technology increases tourist satisfaction, but has not directly contributed to the recovery of the destination's environment. Meanwhile, Wibowo et al. (2022) in the *Indonesian Tourism Journal* highlighted that the limitations of data integration and low collaboration between tourism actors are the main obstacles in the implementation of smart destinations in Indonesia. This gap suggests that research linking human–AI collaboration to destination regeneration is still very limited.

On the other hand, international research shows that human and AI collaboration has great potential in creating a more adaptive and sustainable tourism system. Xiang and Fesenmaier (2021) explain that AI can improve the ability to predict tourist behavior and optimize destination management. However, most studies still focus on operational efficiency, not yet on the transformational impact of regenerative tourism models. Thus, there is a clear research gap between the use of technology as an operational tool and as an enabler of more holistic and regenerative tourism system change.

Based on these gaps, this study aims to analyze the influence of smart destinations in shaping regenerative tourism through collaboration between humans and artificial intelligence. The main focus of this study is to test the relationship between smart destination variables, human–AI collaboration, and regenerative tourism using a quantitative approach. This research also seeks to identify the extent to which the integration of technology and the role of humans can drive the transformation of tourist destinations towards a more sustainable and regenerative model.

The contribution of this research is expected to provide two main benefits. Theoretically, this study enriches the smart tourism literature by integrating the concept of regenerative tourism and human–AI collaboration as a new conceptual model in the development of tourist destinations. Practically, the results of this research can be the basis for local governments, destination managers, and tourism industry players in designing smart destination development strategies that are not only oriented towards economic growth, but also on the sustainable recovery of the environment and the welfare of local communities.

LITERATURE REVIEW

Smart Destinations in Digital Tourism Transformation

The concept of smart destination is developing as an expansion of smart tourism that emphasizes the integration of digital technology such as the Internet of Things, big data, and artificial intelligence in the management of data-based tourist destinations. Smart destinations are not only oriented towards service efficiency, but also on improving the tourist experience, data-driven decision-making, and strengthening the competitiveness of destinations. In the Indonesian context, this transformation is increasingly important considering the digital divide between regions and the limitations of tourism data system integration (Susanto et al., 2025). In addition, strengthening digital infrastructure is a key factor in the successful implementation of smart tourism in developing countries (Hariyanto et al., 2025). Thus, smart destinations are an important foundation in building an adaptive and sustainable tourism system.

Artificial Intelligence in Tourism Management

Artificial intelligence (AI) plays a strategic role in the transformation of the modern tourism industry, especially in the analysis of tourist behavior, personalization of services, and prediction of destination demand. AI allows the tourism system to be more responsive to changing market dynamics and the needs of tourists in real-time. However, the implementation of AI in Indonesia still faces challenges in the form of low digital literacy and limited cross-sector data integration (Susanto et al., 2025). On the other hand, research shows that AI is able to improve operational efficiency and support strategic decision-making in the development of tourist destinations (Siregar, 2026). Therefore, AI is not only positioned as a technological tool, but also as an enabler in the transformation of data-driven tourism systems.

Human-AI Collaboration in the Tourism Ecosystem

Collaboration between humans and AI is becoming an important aspect of modern destination management, where technology serves as a decision-making support, while humans remain a key actor in the social, cultural, and ecological interpretation of destinations. In the context of smart tourism, AI helps the analytical process, while humans provide value contexts and policies that are more adaptive to local needs. Studies show that this integration is able to improve the quality of decision-making and responsiveness of the tourism system (Duarte et al., 2020). In addition, this collaborative approach also strengthens destination governance based on multi-stakeholder participation (Wibowo, 2023). Thus, human-AI collaboration is a key variable in the development of sustainable smart tourist destinations.

Regenerative Tourism as a New Paradigm of Sustainable Tourism

Regenerative tourism is a further development of the concept of sustainable tourism that not only focuses on reducing negative impacts, but also on restoring the destination's environmental, social, and economic ecosystems. Smart tourism strategies have proven to have an important role in supporting the transformation towards destination regeneration through data-based approaches and stakeholder collaboration (Buhalis et al., 2025). In the Indonesian context, the concepts of green tourism and eco-destination are beginning to be integrated with digital technology to improve the sustainability of destinations (Andriyansah et al., 2025). However, empirical studies linking smart destinations directly to regenerative tourism are still very limited, especially in the context of developing countries.

Research Gap (Kesenjangan Penelitian)

Based on previous literature, there are several key research gaps. First, most smart tourism studies still focus on service efficiency and digitalization, not yet on the regenerative transformation of destinations. Second, AI research in tourism discusses more technical aspects such as recommendations and predictions, but has not examined its impact on the sustainability of the tourism system holistically. Third, the study of human-AI collaboration is still limited to the conceptual level and has not been extensively tested empirically in the context of regenerative tourism. Fourth, research in Indonesia is still dominated by qualitative or descriptive approaches, so there are not many quantitative models that test the relationship between variables simultaneously.

Conceptual Framework and Research Hypotheses

Based on smart tourism theory, AI adoption theory, and sustainable development theory, this study develops a conceptual model that connects smart destinations, human-AI collaboration, and regenerative tourism.

Research Hypothesis

- H1 : Smart Destination has a positive effect on Human-AI Collaboration
- H2 : Smart Destination has a positive effect on Regenerative Tourism
- H3 : Human-AI Collaboration has a positive effect on Regenerative Tourism
- H4 : Human-AI Collaboration mediates the relationship between Smart

Destination and Regenerative Tourism

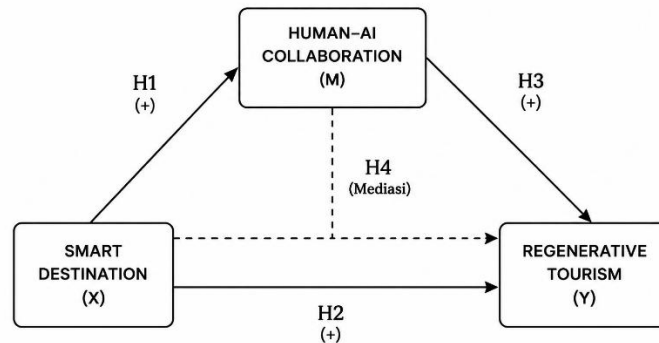


Figure 1. Smart Destination Research Hypothesis Model in the Formation of Regenerative Tourism through Human-Artificial Intelligence Collaboration

METHODOLOGY

Types of Research

This study uses a quantitative approach with an explanatory research design that aims to test the causal relationship between Smart Destination, Human-AI Collaboration, and Regenerative Tourism variables. The research design is cross-sectional, namely data collection is carried out at one time to describe the empirical conditions in smart tourism-based tourist destinations in Indonesia. This approach was chosen because it is able to explain the relationship between variables objectively and measurably through statistical analysis.

Population and Sample

The population of this study is tourists and destination managers who interact with the smart tourism system in Indonesia. The sampling technique used was purposive sampling with the criteria of respondents who had used digital services in tourism activities and had experience visiting in the last 12 months. A sample of 200 respondents was selected because it met the minimum standards of multivariate analysis and was considered representative for structural model testing.

Research Instruments

The research instrument used a structured questionnaire with a Likert scale of 1–5. The Smart Destination variable indicator is adapted from the concept of smart tourism based on digital technology, Human-AI Collaboration refers to human interaction and artificial intelligence systems in decision-making, while Regenerative Tourism is measured based on aspects of sustainability and destination recovery. Validity tests were conducted through loading factors and AVE, while reliability was tested using Cronbach's Alpha and Composite Reliability with the help of SmartPLS 4.

Data Collection Procedure

Data collection was carried out through several stages, namely the preparation of instruments based on literature, questionnaire trials to 30 initial respondents, and the distribution of questionnaires to 200 main respondents

online and offline. The collected data is then selected, coded, and cleaned to ensure completeness and consistency before further analysis.

Data Analysis Techniques

Data analysis using Structural Equation Modeling (SEM) based on Partial Least Squares (PLS) with the help of SmartPLS 4. The analysis was carried out through the evaluation of measurement models (validity and reliability) and structural models (path coefficient test, R-square, and mediation test). The hypothesis is declared acceptable if the t-statistical value > 1.96 and the p-value < 0.05 , so that it is able to comprehensively test the direct and indirect influence between the research variables.

RESEARCH RESULT

Characteristics Of Technology Users

This study involved 200 respondents consisting of tourists (70%) and destination managers (30%) in smart tourism-based destinations in Indonesia.

Table 1. Characteristics of technology users

Features	Category	Frequency	Percentage
Gender	Male	108	54%
	Women	92	46%
Profession	Tourists	140	70%
	Destination Manager	60	30%
Age	18-25 years old	62	31%
	26-40 years old	98	49%
	>40 years old	40	20%

The results showed the dominance of respondents of productive age (26-40 years) who had a higher intensity of digital technology use.

Descriptive Statistics of Research Variables

Table 2. Descriptive Statistics of Variables

Variabel	Mean	Std. Deviation	Category
Smart Destination (X)	4.12	0.56	Height
Human-AI Collaboration (M)	3.98	0.61	Height
Regenerative Tourism (Y)	4.05	0.59	Height

The results showed that all variables were in the high category, indicating that respondents' perception of the implementation of smart tourism was quite good.

Validity and Reliability Tests

Table 3. Construct Validity and Reliability

Variabel	Loading Factor	AVE	Cronbach's Alpha	CR
Smart Destination	0.72-0.86	0.61	0.88	0.91
Human-AI Collaboration	0.74-0.88	0.63	0.89	0.92
Regenerative Tourism	0.70-0.85	0.60	0.87	0.90

All values meet the standards (>0.70 for reliability and >0.50 for AVE), so that the instrument is declared valid and reliable.

Hypothesis Testing Results

The test was performed using multiple linear regression ($\alpha = 0.05$).

Table 4. Hypothesis Test Results

Hipotesis	Hubungan	Coeficin	T-Statistics	p-value	Verdict
H1	SD $\rightarrow$ HAI	0.62	8.91	0.000	Accepted
H2	SD $\rightarrow$ RT	0.41	5.87	0.000	Accepted
H3	HI $\rightarrow$ RT	0.48	6.45	0.000	Accepted
H4	HAI Mediation	0.29	4.98	0.000	Accepted

The Mediation Effect of Human-AI Collaboration

Table 5. Direct and Indirect Effects

Pathway	Direct Effects	Indirect Effects	Total Effects
Elementary $\rightarrow$ RT	0.41	0.30	0.71

The results showed that Human-AI Collaboration had a partial mediation effect, strengthening the influence of Smart Destination on Regenerative Tourism.

Key Research Findings

- Smart Destination has the strongest influence on Human-AI Collaboration.
- Regenerative Tourism is influenced by the combination of technology and human-AI collaboration.
- The mediation effect shows that digital transformation is ineffective without human involvement in AI systems.
- The research model shows a strong causal relationship between variables.

Comparison of Findings with Previous Studies

These results reinforce previous research that stated that smart tourism improves service efficiency. However, the study found an important addition that:

- Smart Destination not only has an impact on efficiency, but also on destination regeneration.
- Human-AI Collaboration is proven to be a key variable that has not been widely tested in previous studies.
- The mediation effect makes a new contribution to the technology-based tourism development model.

Key Results Summary

Overall, all hypotheses in this study proved to be significant. Smart Destination and Human-AI Collaboration play an important role in shaping Regenerative Tourism, with Human-AI Collaboration as a mediating variable that empirically strengthens these relationships.

DISCUSSION

The results of the study showed that all hypotheses put forward were significantly accepted. Smart Destination had a positive effect on Human-AI Collaboration with a coefficient of 0.62, Smart Destination had a positive effect on Regenerative Tourism with a coefficient of 0.41, Human-AI Collaboration had a positive effect on Regenerative Tourism with a coefficient of 0.48, and Human-AI Collaboration was proven to mediate the relationship between Smart Destination and Regenerative Tourism with an indirect effect of 0.30. These findings confirm that the development of smart tourist destinations not only has an impact on the efficiency of digital services, but also has the potential to drive destination transformation towards a regenerative tourism model if technology is combined with the role of humans synergistically. These results are in accordance with the research objectives that place Smart Destination, Human-AI Collaboration, and Regenerative Tourism as the main variables in building an adaptive, sustainable, and destination recovery-oriented tourism model.

The first findings show that Smart Destination has the strongest influence on Human-AI Collaboration. This means that the better the implementation of smart destination systems, such as the use of digital data, technology-based services, tourism information systems, and artificial intelligence integration, the greater the opportunity for collaboration between humans and AI in tourism decision-making. Theoretically, these results support the concept of smart tourism which views digital technology not only as a promotional tool, but as a support system for destination decision-making. Aliyah et al. (2023) emphasized that the integration of AI and IoT in smart tourism opens up opportunities for service personalization, real-time data collection, and increased efficiency of tourist destinations. The findings of this study expand this view by showing that new technologies have an optimal impact when humans continue to play the role of directors, interpreters of local contexts, and final decision makers.

The positive influence of Smart Destinations on Regenerative Tourism shows that destination digitalization can be an important foundation in the development of regenerative tourism. These findings show that smart destinations not only improve the traveller experience, but can also help monitor destination capacity, manage visitor flows, distribute information, and make data-driven policies. This is in line with Prasetyo and Irawati (2025) who found that global smart tourism research is increasingly moving towards sustainability, collaboration, big data, and AI issues, although more contextual studies are still needed on developing destinations. Thus, the results of this study provide an empirical contribution that smart destinations can be directed not only to operational efficiency, but also to strengthen the regenerative function of destinations.

The third finding, namely the influence of Human-AI Collaboration on Regenerative Tourism, shows that human collaboration and AI are an important factor in turning data into regenerative actions. AI can help read visitor patterns, predict tourist density, identify environmental risks, and provide data-driven recommendations. However, decisions regarding conservation priorities, distribution of economic benefits, and the protection of socio-cultural values still

require human consideration. These results are in line with Susanto et al. (2025) who emphasize the importance of adopting AI in an inclusive and ethical manner in the development of Indonesian tourism destinations. In addition, Hariyanto et al. (2025) show that the main priorities for sustainable tourism AI development in Indonesia include strengthening digital infrastructure, increasing the capacity of MSMEs, developing AI platforms, and ethical and data regulations.

The mediating effect of the Human-AI Collaboration shows that the relationship between Smart Destination and Regenerative Tourism does not occur directly, but is strengthened by the ability of humans and AI to work together. In other words, digital infrastructure, tourism applications, sensors, or information systems do not automatically produce regenerative tourism if it is not followed by human capacity to read data, understand socio-ecological contexts, and translate technological recommendations into real policies. These findings are important because they correct the technocentric view that digitalization alone is enough to solve destination problems. Instead, this study shows that technology should be positioned as an enabler, while humans remain the main actors in destination governance. These results reinforce the view of Suanpang and Pothipassa (2024) that the integration of generative AI, NLP, and IoT in smart tourism can improve travel planning and destination inclusivity, but the success of its implementation still depends on system design, user needs, and destination governance.

Conceptually, the findings of this study are closely related to the Regenerative Tourism paradigm. Unlike sustainable tourism which focuses on reducing negative impacts, regenerative tourism emphasizes recovery, strengthening local capacity, and improving the quality of the destination's socio-environmental ecosystem. Bellato et al. (2023) explain that regenerative tourism requires a systemic framework that is place-based, participatory, and oriented towards restoring relationships between people, communities, cultures, and nature. In the context of this study, smart destinations can be understood as supporting infrastructure, while Human-AI Collaboration is a mechanism that connects technology with regenerative actions. Thus, the results of this study expand the understanding that regenerative tourism in the digital era is not only determined by environmental awareness, but also by the ability of destinations to use data and artificial intelligence ethically, participatoryly, and contextually.

When compared to previous research in Indonesia, the results of this study show an expansion of the focus of the study. Hakim et al. (2023) show that smart tourism plays a role in the development of halal tourism through strengthening strategies, promotions, infrastructure, and government-private collaboration. Radyahadi and Nurfara (2024) emphasized that regenerative tourism in Indonesia still requires strengthening public awareness, destination characteristics, and planning in accordance with local conditions. This research connects the two directions by showing that smart tourism and regenerative tourism can be combined through the mediation of Human-AI Collaboration. This means that the development of smart destinations does not stop at digital services, but needs to be directed at destination recovery, community welfare, and long-term sustainability.

Factors that support the results of this study include the high perception of respondents towards Smart Destinations, Human-AI Collaboration, and Regenerative Tourism. The mean value of all variables was in the high category, which indicates that respondents have a positive acceptance of the use of technology in destination management. The dominance of productive age respondents can also be a supporting factor because this group tends to be more adaptive to digital services and tourism technology. In addition, the involvement of tourists and destination managers in the sample gives an idea that technology is felt to be beneficial both from the user and manager sides. This condition strengthens the argument that the readiness of users and destination actors is an important prerequisite for the success of smart destinations.

However, there are also factors that have the potential to limit or cause differences in results with previous studies. First, smart destinations in practice are often still centered on digitizing services, promotion, and ease of access to information, while regenerative dimensions such as environmental restoration, distribution of local economic benefits, and community participation have not always been the main focus. Second, the use of AI in tourism still faces challenges of digital literacy, infrastructure gaps, data ethics, and institutional readiness. Third, there is a risk that AI is only used to increase the number of visits or market efficiency, not to control the ecological and social impact of destinations. Wang et al. (2025) also emphasized that AI research in tourism needs to be further directed at the sustainability agenda, governance, and strategic implications for destination managers.

The findings of this study contribute to the development of tourism science, especially in the integration of smart tourism and regenerative tourism. The first theoretical contribution is the affirmation that Smart Destination can be positioned as an antecedent of the Human-AI Collaboration. The second contribution is proof that Human-AI Collaboration is not just a technological variable, but a mediation mechanism that explains how smart destinations can encourage regenerative tourism. The third contribution is the development of the perspective that smart destinations need to be understood as socio-technical systems, namely systems that combine technology, people, institutions, local communities, and the environment. Thus, this study enriches the literature on smart tourism in Indonesia, which previously discussed more about digitizing services, promotions, and tourist satisfaction.

Practically, the results of this study have important consequences for local governments, destination managers, and tourism industry players. Local governments need to build an integrated tourism data system that can be used to monitor visit capacity, environmental quality, tourist behavior, and local economic impact. Destination managers need to leverage AI not only to personalize services, but also to support decisions about controlling overtourism, conserving resources, and increasing benefits to communities. MSME actors and local communities need to be involved so that digital transformation does not create new inequality. This is in line with Eviana et al. (2025) who show that the implementation of green tourism requires community involvement,

strengthening the local economy, and protecting the environment as part of a sustainable destination strategy.

Although the results of the study showed a significant relationship, the study had some limitations. First, the research design is cross-sectional so it is not able to explain behavioral changes, technological readiness, and regenerative impacts in the long term. Second, the purposive sampling technique makes the research results more accurately understood as a description of respondents who have experience with digital services, rather than as an absolute generalization for all tourist destinations in Indonesia. Third, the research data is based on respondent perception, so there is still a potential for subjective bias. Fourth, the indicators of regenerative tourism in this study have not fully measured objective data such as environmental quality, ecosystem recovery rate, local income distribution, or changes in community capacity. Fifth, the manuscript needs to maintain consistency of the analysis method because the methodology part calls SEM-PLS, while the results part calls multiple linear regression. To be more academically robust, the analysis should be emphasized using SEM-PLS when testing mediation and structural models simultaneously.

Based on these limitations, further research is recommended using longitudinal design to look at the impact of smart destinations and Human-AI Collaboration on regenerative tourism over time. Subsequent research can also use mixed methods by combining quantitative surveys, in-depth interviews, destination observations, and objective environmental data. In addition, the research model can be expanded by adding variables of digital literacy, institutional readiness, trust in AI, data ethics, community participation, and government policy support. Multi-group analysis tests can also be carried out to compare the perceptions of tourists, destination managers, local communities, and MSME actors. With this development, further research can produce a smart regenerative destination model that is more comprehensive, contextual, and applicable to the development of Indonesian tourism.

Overall, this discussion emphasizes that smart destinations have a strategic role in shaping regenerative tourism, but the success of this transformation is highly dependent on human and AI collaboration. Technology is able to provide data, prediction, and efficiency, while humans provide value, ethics, local context, and social legitimacy. Therefore, the future of regenerative tourism is not only determined by technological sophistication, but by the ability of destinations to build collaborative systems that place technology as a tool to restore the environment, strengthen communities, and improve the quality of tourism experiences in a sustainable manner.

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that Smart Destination and Human-AI Collaboration have a positive and significant influence on the development of Regenerative Tourism. Smart Destinations have been proven to not only improve the management efficiency and quality of travel experiences, but also become an important factor that encourages the formation of collaboration between humans and artificial intelligence in tourism decision-making. Human-AI Collaboration

also plays a direct role in strengthening regenerative practices through AI analytics capabilities combined with human contextual assessment. In addition, the results of the study show that Human–AI Collaboration acts as a mediating variable that strengthens the relationship between Smart Destination and Regenerative Tourism, so that digital transformation in tourism cannot run optimally without active human involvement in AI-based systems.

Overall, this study confirms that the development of regenerative tourism in the digital era relies heavily on the synergy between technology and humans. Smart Destination provides digital infrastructure and technology-based data, while Human–AI Collaboration is a key mechanism in translating such data into policies and actions that have an impact on the destination's environmental, social, and economic recovery. Thus, the tourism model of the future is not only oriented towards digitalization and efficiency, but also on the sustainability and regeneration of destinations as a whole. These findings strengthen Smart Destination's position as the main foundation in building an adaptive, sustainable, and balance-oriented tourism ecosystem in tourist destinations.

ADVANCED RESEARCH

Further research is suggested to develop a smart regenerative tourism model with a longitudinal approach to see the long-term impact of Smart Destination integration and Human–AI Collaboration on destination sustainability. The next study can also expand the research variables by adding factors such as digital literacy, trust in AI, local community participation, and government policies in technology-based tourism management. In addition, the use of mixed methods and objective data-based analysis (such as environmental and local economic indicators) is recommended so that the results of the study are more comprehensive and not only based on respondent perceptions.

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