BIS HUMANITIES AND SOCIAL SCIENCE

Volume 2 2025 | DOI: 10.31603/bishss.324
6th Borobudur International Symposium on Humanities and Social Science (BIS-HSS) 2024

UNIMMA PRESS
Universitas Muhammadiyah Magelang

Key factors in tourism infrastructure development in the era of high demand

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Abstract

The development of tourism service infrastructure plays a crucial role in supporting a sustainable tourism sector. Various factors such as land and port infrastructure, environmental sustainability, socioeconomic conditions, and the impact of tourism demand can affect the quality and effectiveness of this infrastructure. This study aims to identify and analyze the influence of these factors on tourism service infrastructure. Using multiple linear regression analysis, the research examined quantitative data to measure the relationship between independent variables (land and port infrastructure, environmental sustainability, socioeconomic conditions, and the impact of tourism demand) and the dependent variable, namely tourism service infrastructure. The results indicate that land and port infrastructure (β=0.326; p=0.005), socioeconomic conditions (β=0.474; p=0.000), and the impact of tourism demand (β=0.339; p=0.003) have a significant positive influence, while environmental sustainability exhibits a significant negative influence (β=-0.225; p=0.034). These findings emphasize the need for policymakers and stakeholders to integrate strategies that balance social, economic, and environmental factors to enhance sustainable tourism infrastructure. Practical measures such as improving port connectivity, fostering socioeconomic development, and managing tourism demand more effectively can significantly contribute to strengthening the infrastructure and ensuring long-term sustainability.

Published:
May 30, 2025

Selection and Peer-review under the responsibility of the 6th BIS-HSS 2024 Committee

Keywords

Tourism infrastructure, Environmental sustainability, Socio-economy, Tourism demand, Regression analysis

Introduction

Infrastructure development in tourism services plays an essential role in ensuring the creation of a sustainable tourism sector. Research has shown that infrastructure development, both land and port, significantly influences the quality of the tourist experience and generates substantial economic benefits for local communities. For instance, in the Osing Traditional Village, Banyuwangi, sustainable tourism initiatives

have resulted in increased employment opportunities for local residents while preserving traditional cultural practices. However, challenges persist in raising adequate environmental awareness and implementing effective environmental management strategies. A survey conducted in the village indicated that 76% of visitors appreciated the cultural preservation efforts, but 58% expressed concerns about inadequate waste management, highlighting the need for more robust infrastructure solutions [1].

Environmental sustainability remains a critical concern in tourism infrastructure development. Studies in various regions emphasize the pivotal role of government regulations in mitigating the adverse impacts of excessive tourism exploitation on natural ecosystems. For example, regions with stringent environmental policies experienced 35% less ecological degradation compared to those with lenient enforcement [2].

Despite these findings, significant gaps exist in the literature regarding the effectiveness of infrastructure development strategies that maximize socio-economic benefits while ensuring environmental sustainability. Specifically, there is limited analysis of how tourism infrastructure can be designed to balance these priorities effectively in the Indonesian context. This research aims to address these gaps by analyzing the interplay between infrastructure sustainability, socio-economic impact, and tourist demand. Furthermore, this study seeks to provide actionable policy recommendations to optimize tourism infrastructure management in Indonesia, ensuring a balance between economic growth and environmental preservation.

Literature Review

Sustainable tourism infrastructure development is one of the important pillars in supporting an environmentally friendly and inclusive tourism sector. Previous research has shown that environmental and socio-economic aspects are closely intertwined in ensuring sustainability. For illustration, tourism development in Osing Traditional Village, Banyuwangi, has shown success in creating job opportunities and maintaining traditional culture, although challenges such as low environmental awareness remain [1].

Furthermore, damaged local ecosystems are often the main obstacle to sustainable tourism development. Studies on microbiological pollution around the mouth of the Cimandiri River, West Java, reveal high levels of domestic pollution that can affect the quality of the coastal environment and local biota, which has a direct impact on its tourist attraction and long-term sustainability [3].

From an economic point of view, another study highlights the need to strengthen microbusiness management that supports the sustainability of the local economy. For illustration, the preservation of traditional foods such as smoked etak in Kelantan, Malaysia, demonstrates the importance of capital support and restoration of local

ecosystems to protect cultural and ecological heritage while supporting sustainable commercialization [4].

Although many studies have discussed the positive impact of tourism infrastructure on local economies, research gaps remain regarding specific strategies to integrate environmental management, socio-economic strengthening, and technological innovation in the development of this infrastructure. Therefore, this study aims to answer the question: How can an integrated approach improve the effectiveness and sustainability of tourism infrastructure in Indonesia?

This research is also expected to explain policy strategies to create synergies between environmental sustainability, improving community welfare, and meeting the needs of today's tourists.

Method

This study utilizes secondary data from the 2024 Indonesia Tourism Development Index, encompassing 34 provinces in Indonesia. The data is highly relevant for evaluating the development of sustainable tourism infrastructure through an integrative approach that considers socio-economic aspects, environmental sustainability, and service quality. Purposive sampling was employed, as in prior studies, to focus on provinces meeting specific tourism development criteria, including economic, environmental, and social indicators. The data, sourced from the official Indonesian Tourism Development Index report [5], was analyzed quantitatively to identify relationships among the main variables. Potential biases in the data, such as variations in regional reporting standards or differences in the availability of tourism-related information across provinces, were mitigated by cross-referencing data with independent sources and utilizing validated indicators like the Environmental Sustainability Index and Economic Sustainability Index. Data triangulation was also applied to enhance reliability by comparing results with findings from similar studies on sustainable tourism management [1].

Statistical tools, including SPSS, were employed to conduct multiple regression analysis. For instance, the regression model evaluated the influence of variables such as infrastructure capacity, environmental impact, and local community involvement on overall tourism infrastructure development. Specific tests, such as variance inflation factor (VIF), were applied to assess multicollinearity among independent variables, ensuring the robustness of the model. Additionally, geographic tools were utilized for spatial analysis, such as mapping infrastructure capacity and environmental sustainability scores to visualize regional disparities. A notable example includes using spatial overlays to identify areas where infrastructure improvements align poorly with environmental sustainability goals, similar to methods employed in a study of the Natuna Geopark area [6]. This approach not only ensures the validity and reliability of the findings but also facilitates replication of the research across different regions. By addressing potential biases and employing robust statistical methods, this study

provides a comprehensive and evidence-based foundation for policymaking in sustainable tourism infrastructure development.

Results and Discussion

Results

The results of regression analysis show that the influence of independent variables on tourism service infrastructure is statistically significant, with an R Square value of 0.706, which means that 70.6% of the variation in the quality of tourism service infrastructure can be explained by the model (Table 1). The most dominant variables were resilience and socio-economic conditions, with a coefficient of β of 0.474 (p = 0.000). Furthermore, the impact and pressure of tourism demand had a significant contribution with a coefficient of β of 0.339 (p = 0.003), followed by land and port infrastructure, with a coefficient of β of 0.326 (p = 0.005). In contrast, environmental sustainability showed a significant negative relationship with tourism service infrastructure, with a β coefficient of -0.225 (p = 0.034). An F value of 17.409 (p = 0.000) indicates that the regression model as a whole is significant in explaining the relationship between variables. An error standard value of 0.60330 indicates a fairly low error rate in the model. In addition, no multicollinearity problems were found based on tolerance values ranging from 0.887 to 0.990 and VIF which was below the threshold of 10.

Table 1. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.840[a]	.706	.665	.60330

a. Predictors: (Constant), Impact and Pressure on Tourism Demand, Environmental Sustainability, Resilience and Socio-Economic Conditions, Land and Port Infrastructure

	ANOVA	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.345	4	6.336	17.409	.000[b]
	Residual	10.555	29	.364		
	Total	35.900	33			

a. Dependent Variable: Tourism Service Infrastructure

b. Predictors: (Constant), Impact and Pressure of Tourism Demand, Environmental Sustainability, Resilience and Socio-Economic Conditions, Land and Port Infrastructure

	Coefficients[a]	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.990	.956		-1.035	.309		
	Land and Port Infrastructure	.354	.116	.326	3.047	.005	.887	1.128
	Environmental Sustainability	-.380	.171	-.225	-2.228	.034	.990	1.010
	Resilience and Socioeconomic Conditions	.647	.141	.474	4.583	.000	.948	1.055
	Impact and Pressure of Tourism Demand	.462	.145	.339	3.182	.003	.893	1.120

a. Dependent Variable: Tourism Service Infrastructure

These results indicate that strengthening socio-economic resilience and managing tourist demand pressures are essential to support the development of sustainable tourism service infrastructure, while special attention is needed to mitigate negative impacts on environmental sustainability.

Discussion

The results of the study show that there is a significant influence of socio-economic factors, tourist demand pressure, and physical infrastructure on the quality of tourism

infrastructure services, while environmental sustainability makes a significant negative contribution. These findings are in line with previous research that shows the importance of land and port infrastructure in supporting accessibility and tourist experience. [7] emphasized that quality infrastructure can increase the competitiveness of tourist destinations in Southeast Asia, especially in the context of integrated destination management. However, the negative contribution of environmental sustainability shows that infrastructure development is often done at the expense of local ecosystems. The research of [2] highlights the impact of tourism exploitation that causes environmental pollution, which ultimately reduces the attractiveness and sustainability of tourist destinations. These findings are also reinforced by the study of [1], which shows that the participation of local communities in tourism management can minimize environmental impacts while increasing socio-economic benefits. These findings show that the management of tourism service infrastructure must integrate social, economic, and environmental dynamics. Development strategies should include stricter regulations to maintain environmental sustainability, as proposed by [2]. In addition, a community-based approach is needed to amplify socio-economic impacts, as suggested in the [1] study. Practically, the use of green technology in infrastructure development can be an innovative solution to reduce negative environmental impacts without reducing the operational efficiency of tourism infrastructure.

A holistic, evidence-based policy strategy is needed to ensure the long-term sustainability of the tourism sector, which not only increases the competitiveness of destinations but also protects natural resources and the well-being of local communities. Further research that integrates these various dimensions is urgently needed to guide more effective and sustainable policy implementation.

Conclusion

This study shows that land and port infrastructure, socio-economic resilience, and tourist demand pressure have a significant influence on the quality of tourism service infrastructure, with an R Square value of 0.706, which shows that 70.6% variability in the quality of tourism service infrastructure can be explained by the model. The most dominant variable is socio-economic resilience with a β coefficient of 0.474 ($p = 0.000$), followed by tourist demand pressure with a β of 0.339 ($p = 0.003$), and land and port infrastructure with a β of 0.326 ($p = 0.005$). Meanwhile, environmental sustainability has a significant negative influence with a β of -0.225 ($p = 0.034$), indicating that there are challenges in balancing infrastructure development with environmental conservation. The statistical results also show that the regression model as a whole is significant, with an F-value of 17.409 ($p = 0.000$), and a standard error of 0.60330, which reflects a fairly high level of prediction accuracy. In addition, no indication of multicollinearity was found based on tolerance values (0.887–0.990) and VIF (below 10).

These findings underscore the importance of integrating development strategies that take into account social, economic, and environmental dynamics to create sustainable

tourism infrastructure. Stricter regulations to maintain environmental sustainability, the use of green technology, and the involvement of local communities in tourism planning and management can be strategic steps to achieve these goals. Further research is needed to examine more deeply the synergy mechanism between infrastructure development, ecological sustainability, and improving the socio-economic welfare of local communities.

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