E-Journal of
Tourism
p-ISSN 2541-0857 # e-ISSN 2407-392X Volume 13, Number 1, March 2026

Assessing Tourist Satisfaction with Tourism Infrastructure in Sawangan and Kaliangkrik Sub-districts, Magelang Regency

Wahid Akhsin Budi Nur Sidiq[1], Inaya Sari Melati[1*], Asep Ginanjar[1], Siti Ekowati Rusdini[1], Fulia Aji Gustaman[1], Nasir Nayan[2], Yoris Adi Maretta[1]

[1] Universitas Negeri Semarang, Indonesia
[2] Sultan Idris Education University, Malaysia

*Corresponding author: inaya.sari@mail.unnes.ac.id

DOI: https://doi.org/10.24922/eot.v13i1.3324

Article Info

Submitted:
December 5th 2025
Revised:
February 28th 2026
Accepted:
March 30th 2026

Abstract

Infrastructure is a key driver of regional development that supports economic growth, social welfare, and the competitiveness of local tourist destinations. However, it is often not fully realized in various tourist destinations, such as in Magelang Regency. This study aims to measure the Tourism Infrastructure Service Satisfaction Index (IKLI) in Sawangan and Kaliangkrik Subdistricts, Magelang Regency. The research method employs a combination of quantitative and qualitative approaches, with the population consisting of residents, visitors, infrastructure users, and tourism managers. The sample was determined using purposive sampling, comprising 300 respondents across 17 tourist sites. Data collection involved questionnaires, interviews, and field surveys. The IKLI dimensions consist of four categories of satisfaction levels: accessibility, tourism facilities, public facilities, and supporting infrastructure. Data analysis used a 1–4 likert scale for each IKLI parameter. The IKLI scores indicated the highest satisfaction level for supporting infrastructure (3.04/C), while tourism facilities (2.67/C) and public facilities (2.64/C) had nearly identical scores (less satisfactory). Meanwhile, the lowest level of satisfaction was found in accessibility (2.55/D), caused by narrow roads and damaged road surfaces leading to several destinations, such as Nepal Van Java, Silancur Highland, Mangli Skyview, and Negeri Khayangan. These findings highlight the need for targeted infrastructure improvements, particularly in accessibility, public facilities, and tourism facilities, to support sustainable tourism development.

Keywords: tourist satisfaction; tourism infrastructure; public facilities; tourist destination

INTRODUCTION

Background

Infrastructure is no longer viewed merely as the cornerstone of regional economic development (Gansauer et al., 2023)(Shi et al., 2024), but rather as an absolute prerequisite that determines the competitiveness and sustainability of the tourism ecosystem (Wu et al., 2023). The availability of adequate supporting infrastructure plays a crucial role in ensuring smooth accessibility for tourists (Yhee et al., 2021) and reducing the development gap between primary and secondary destinations (Siatan et al., 2024). However, in rapidly developing secondary tourist destinations, aligning the growth of the tourism sector with infrastructure capacity remains a major challenge. The gap between the surge in visitor interest and the suboptimal physical reality of local infrastructure is highly likely to trigger user dissatisfaction. If not addressed promptly, tourist dissatisfaction with these infrastructure services could hinder the destination's growth and further exacerbate local economic disparities (Baporikar, 2024)(Nieuwkoop & Dias, 2026).

Evaluating the effectiveness and quality of infrastructure development is therefore essential for accountability, transparency, and fostering innovation in public service delivery (Leyte et al., 2023). Traditional evaluation methods often overlook user perceptions, which are critical for understanding real-world impacts and for guiding responsive policy interventions (Mavrot et al., 2025). The Infrastructure Service Satisfaction Index (Indeks Kepuasan Layanan Infrastruktur/ IKLI) emerges as a novel evaluation instrument by systematically capturing the satisfaction levels of infrastructure users both residents and tourism stakeholders across multiple dimensions such as accessibility, amenities, and public facilities (E. Kurniawan et al., 2023).

The IKLI not only provides a comprehensive performance assessment but also serves as a strategic tool for government planning, enabling data-driven decisions and enhancing public trust (Nurfindarti, 2020). Its application is particularly significant in regions like Sawangan and Kaliangkrik sub-districts of Magelang Regency, Central Java, Indonesia, which are characterized by high tourism and agricultural potential. These areas are at the forefront of regional development efforts yet face unique challenges in aligning infrastructure provision with the needs of a growing and diverse user base.

Although infrastructure evaluation is recognized as crucial, studies that specifically integrate user perspectives with local conditions in Indonesia's secondary tourist destinations remain very limited (Rindrasih et al., 2024)(Adiatma & Rukma, 2025). This study addresses this gap by focusing on the implementation of the IKLI in Sawangan and Kaliangkrik sub-districts as its primary contribution. The novelty of this study lies in the use of the IKLI not only as a technical measurement tool but also as a strategic instrument to bridge the gap between tourist experiences and regional planning policies. This study aims to evaluate user satisfaction with key infrastructure and identify priority areas for improvement. It is hoped that these findings will provide actionable recommendations to promote more targeted infrastructure investment, improve service quality, and directly strengthen the competitiveness of the sustainable tourism sector in Magelang Regency.

LITERATURE REVIEW

Infrastructure and Regional Development

Infrastructure is widely recognized as a key driver of regional economic growth and improvements in the Human Development Index. Theoretical frameworks in development economics emphasize the role of infrastructure, such as

transportation, utilities, and public facilities in boosting productivity, facilitating market access, and reducing interregional disparities (Foster et al., 2023)(Biswas & Shrama, 2025) The availability of this infrastructure is closely linked to improvements in the core dimensions of the Human Development Index, namely education, health, and economic well-being (Irshad et al., 2022). In Indonesia, this paradigm is reflected in the Regional Medium Term Development Plan (RPJMD) documents, which prioritize infrastructure to accelerate the development of regions with high tourism potential.

In contemporary tourism literature, the effectiveness of physical infrastructure availability must be measured through tourist satisfaction levels. This satisfaction is a crucial factor shaping the quality of visitors' experiences by reducing stress and enhancing comfort. These positive experiences subsequently catalyze a destination's competitiveness, characterized by high intentions to revisit and word-of-mouth. Ultimately, this causal chain leads to the optimization of tourism management outcomes, such as extended length of stay, increased local spending, and strengthened socio-economic resilience of the community.

Measurement of Infrastructure Satisfaction

Measuring user satisfaction with infrastructure is essential for guiding policy interventions. However, global measurement indices such as the Customer Satisfaction Index (Kumar et al., 2023) often fail to capture the unique characteristics of local tourism infrastructure services. To address this limitation, this study applies to the IKLI, which has proven to be far more relevant for tourism studies. Methodologically, the IKLI operates by integrating and weighting essential tourism indicators ranging from road accessibility and tourist facilities to public utilities (Ricardo de Moraes e Soares, 2025). This comprehensive approach makes the IKLI not merely a passive satisfaction measurement tool, but a sharp spatial planning evaluation instrument for identifying priority areas for destination development.

Previous applications of the IKLI and similar indices have demonstrated their value in identifying service gaps and informing infrastructure development priorities. For example, studies in other Indonesian regions have used satisfaction indices to evaluate the effectiveness of tourism infrastructure, highlighting the importance of user feedback in continuous improvement processes (A. Kurniawan et al., 2025). Internationally, satisfaction-based assessments have been employed to benchmark infrastructure quality and support evidence-based policymaking (Li et al., 2023).

Case Studies: Sawangan and Kaliangkrik

The selection of Sawangan and Kaliangkrik sub-districts was based on their status as emerging secondary nature tourism hubs in the rapidly developing Magelang Regency. Both areas are undergoing a socioeconomic transition from the agricultural sector to the tourism industry (Pravita & Pribudi, 2024). The massive surge in visits to popular destinations in Sawangan such as Negeri Kahyangan, Sendang Mudal, and Ketep Pass (Amiranti & Widyastuti, 2023) (Apisari et al., 2024) as well as in Kaliangkrik such as Silancur and Nepal Van Java (Saputra, 2022) (Kaunaen et al., 2024), has placed new pressures on public facilities. It is this dynamic spatial-economic transformation that makes it an ideal locus for evaluating the readiness of local infrastructure services through IKLI measurements.

Previous studies and regional development plans have highlighted the need for improved infrastructure to support tourism growth and enhance local livelihoods (Munanura et al., 2019) (Nepal et al., 2021) (Nepal et al., 2021). Assessments conducted in these areas have identified challenges related to accessibility, the

adequacy of public facilities, and the maintenance of tourism amenities. The application of the IKLI in Sawangan and Kaliangkrik sub-district provides a novel, user-centered perspective on infrastructure service quality, offering valuable insights for targeted development interventions and regional planning.

METHOD

Research Design

This study employs a mixed-methods approach that integrates quantitative and qualitative analysis. The objective is to understand users' perceptions and experiences regarding infrastructure services, while also evaluating the gap between expectations and the actual performance of these services. Quantitative primary data collection was conducted through the distribution of a questionnaire to 300 respondents, designed to measure satisfaction levels across specific dimensions such as accessibility, reliability, and speed of facilities. To deepen these quantitative findings, a qualitative approach was applied through in-depth interviews. The interviews were conducted in a semi-structured manner with a number of key informants and selected respondent representatives, with the aim of eliciting detailed narratives regarding the reasons behind their assessments as well as the specific challenges they faced in the field. Through the triangulation of data from these surveys and interviews, the study was able to comprehensively analyze the gap between what the community desires and what they actually receive.

Population and Sample

The study population included residents, tourists, infrastructure users, and managers in the Sawangan and Kaliangkrik sub-districts. A sample of 300 respondents was selected using purposive sampling with specific inclusion criteria, namely respondents who had firsthand experience using public facilities in those locations. To ensure regional representativeness, the sample was distributed proportionally across 17 tourist sites (9 in Sawangan and 8 in Kaliangkrik). The IKLI evaluation in this study was based on four key demographic characteristics age, gender, education level, and occupation. These four criteria were analyzed to map variations in physical mobility needs, perceptions of safety, expectations regarding standards of adequacy, and transportation preferences, thereby yielding insights sensitive to the diversity of user needs.

Data Collection

Primary data collection was conducted through the distribution of a structured questionnaire specifically developed based on the IKLI indicators. The questionnaire instrument consists of a total of 30 statements distributed across four main dimensions: (1) accessibility infrastructure, (2) tourism facility infrastructure, (3) public facility infrastructure, and (4) supporting infrastructure. Responses were measured using a 5 point likert scale, in which respondents were asked to rate their level of satisfaction with each item on a scale ranging from 1 (very dissatisfied), 2 (dissatisfied), 3 (somewhat satisfied/neutral), 4 (satisfied), to 5 (very satisfied). This field survey was conducted directly at selected tourist destinations and public facilities in both sub-districts. As a supplement and a means of triangulation, secondary data was also collected from local government reports and previous studies to validate the primary findings in the field.

Data Analysis

Quantitative data were analyzed to calculate specific and aggregate IKLI scores based on guidelines from the Magelang Regency Bappeda and Litbangda. Using descriptive and comparative statistics, this study evaluated overall satisfaction levels while comparing IKLI scores between Sawangan and Kaliangkrik sub-districts. This analysis also examines in depth the influence of respondents' demographic composition (age, gender, education, and

occupation) on variations in satisfaction, given that users' socioeconomic backgrounds significantly determine their expectations regarding public facilities. All findings were then visualized through tables and graphs to facilitate interpretation.

RESULTS AND DISCUSSION

Respondent Demographics

Based on the survey results, it was found that respondents were predominantly male, with 54% or 162 individuals being male, while the remaining 46% or 138 respondents were female. In terms of educational background, most respondents had completed high school, accounting for 57% of the total. This predominance of high school graduates can be attributed to many of them being university students on vacation at various tourist destinations in Kaliangkrik and Sawangan sub-districts. Furthermore, 21% of respondents held a bachelor's degree, 15% had completed junior high school, and 6% had an elementary school education. No respondents reported having a diploma-level education.

Regarding the age distribution, the largest proportion of respondents belonged to the 20-25 year old group, comprising 36% or 108 individuals. Meanwhile, the 26-30 and over 40 age groups each accounted for 19% or 57 respondents. The under 20 age group made up 12% of the respondents, totaling 36 individuals. The 31-35 age group comprised 8% or 24 respondents, and finally, the 36-40 age group was the smallest, with 6% or 18 respondents. This indicates that the tourist respondents were mainly dominated by the 20-25 year old age group. The predominance of this age group is influenced by the type of tourist attractions in the Sawangan and Kaliangkrik areas, which feature natural scenery that typically appeals to younger visitors.

The occupational characteristics of respondents were classified into eight groups: entrepreneurs, farmers, teachers, laborers, housewives, unemployed, private employees, and civil servants or public officials. According to the survey results, the largest group of respondents was the unemployed, comprising 28% of the sample. In this analysis, "unemployed" refers to individuals who have not yet secured employment or are still in school, which means they are students. The proportion of respondents working as private employees was 27% or 81 individuals. In addition, 15% (45 respondents) were entrepreneurs, 12% (36 people) were housewives, and 7% (21 individuals) were laborers. Farmers made up 6% (18 respondents), teachers accounted for 3% (9 respondents), and finally, civil servants or public officials made up the smallest group at 2% (6 respondents).

The high proportion of respondents who were unemployed or students is likely since data collection coincided with school and university holidays. As a result, many students or university-age tourists from Central Java and surrounding areas visited various tourist attractions in Sawangan and Kaliangkrik. Additionally, a significant number of tourists were entrepreneurs. Most of these entrepreneurial visitors came from cities such as Jakarta, Bekasi, and several regions in Sumatra.

IKLI Scores

The assessment for the IKLI in Sawangan and Kaliangkrik sub-districts, Magelang Regency was derived from respondents' answers to 30 questions, which were grouped into four categories: accessibility, tourism facilities, public facilities, and supporting infrastructure.

Accessibility Index

Based on the analysis of the IKLI, the accessibility component received a weighted average score of 2.55 (Table 1). This score was calculated as the average of the accessibility indicators multiplied by a weight of 0.10, and it falls into the lowest category (Category D), indicating poor service performance. This low aggregate score is specifically driven by respondents'

dissatisfaction with several critical items, particularly regarding narrow/potholed roads, insufficient street lighting, and a lack of directional signage. In tourism governance, this finding is highly critical. Accessibility is the first point of contact between tourists and a destination; physical barriers in this regard not only increase safety risks and travel stress but also instantly undermine the visitor experience. Consequently, no matter how beautiful the natural attractions in Sawangan and Kaliangkrik may be, poor accessibility will act as a deterrent that reduces the intention to revisit and weakens the destination's overall competitiveness.

Table 1. IKLI Score for Accessibility

No.	Indicator	Total Score	Average Score	Calculated Weight	Weighted Average Score
1.	Availability and condition of road networks to the location	866.00	2.89	0.10	0.29
2.	Travel time efficiency to the location	852.00	8.24	0.10	0.28
3.	Availability of public transportation modes	628.00	2.09	0.10	0.21
4.	Comfort (cleanliness) of public transportation modes	618.00	2.06	0.10	0.21
5.	Safety of transportation modes to the location	747.00	2.49	0.10	0.25
6.	Tariff of public transportation services	634.00	2.11	0.10	0.21
7.	Availability of directional road signage to the location	805.00	2.68	0.10	0.27
8.	Availability of road safety signs	830.00	2.77	0.10	0.28
9.	Availability of rest areas/facilities along the route to the location	846.00	2.82	0.10	0.28
10.	Ease of reserving/obtaining information about transport schedules and routes to the location	810.00	2.70	0.10	0.27
Infrastructure Service Satisfaction Index (IKLI)					**2.55**
Service Quality					**D**
Element Performance					**Poor**

Source: obtained from primary data (2025)

Tourist satisfaction with accessibility to tourism destinations is influenced by several factors closely related to the current state of infrastructure, which is generally perceived as inadequate. The study area's geographic conditions, located in highland regions, make accessibility infrastructure especially vulnerable to negative assessments. Poor road conditions characterized by damaged and narrow roads are evident in the field and are a particular concern for tourists who use these routes during their travels. Additionally, not all tourist sites are supported by adequate public transportation options. The lack of accessible public transport further lowers the

perceived quality of accessibility infrastructure, as visitors are unable to rely on regular public transit. Instead, they must depend on local transportation services such as vehicle rentals, motorcycle taxis (ojek), or shuttle services provided by the local community to reach various tourist destinations.

Tourist Facilities Index

Based on the results of the IKLI analysis, the tourism facilities component which reflects the availability of core support facilities for tourist activities at the location received a weighted average score of 2.67 (Table 2). This score was derived from the average of indicators multiplied by a weighting factor of 0.17 and, by classification, falls into Category C (less satisfactory). Performance stagnating at this level primarily reflects a deficit in meeting tourists' basic needs, such as inadequate parking capacity and a shortage of clean public restrooms. For destination managers, these findings carry serious managerial implications. The lack of essential facilities will directly shorten tourists' length of stay and reduce opportunities for local spending. If not addressed immediately, these inconveniences risk triggering negative reviews; therefore, the priority of destination management must be shifted from mere marketing promotion toward the standardization and maintenance of basic physical facilities.

Table 2. IKLI Score for Tourism Facilities

No.	Indicator	Total Score	Average Score	Calculated Weight	Weighted Average Score
1.	Availability and condition of accommodation (hotels, homestays, camping grounds)	861.00	2.87	0.17	0.48
2.	Availability and condition of dining facilities	787.00	2.62	0.17	0.44
3.	Availability and condition of tourism information centers	843.00	2.81	0.17	0.47
4.	Availability of security units or tourism police	798.00	2.66	0.17	0.44
5.	Availability and condition of souvenir shops	679.00	2.26	0.17	0.38
6.	Availability and condition of directional or information signs within the tourist area	844.00	2.81	0.17	0.47
Infrastructure Service Satisfaction Index (IKLI)					**2.67**
Service Quality					**C**
Element Performance					**Less Satisfactory**

Source: obtained from primary data (2025)

Public Facilities Infrastructure Index

Based on the results of the infrastructure service satisfaction index analysis, the section on public facility infrastructure largely reflects the availability of supporting infrastructure for tourism activities. This assessment is derived from the calculation of the Average Score for the public facilities infrastructure indicator, multiplied by a weight value of 0.09 (calculated from 1/11). As a result, the Weighted Average Score is 2.64, which, when classified, falls into the second category, indicating a grade of C or poor performance (Table 3).

Table 3. IKLI Score for Public Facilities Infrastructure

No.	Indicator	Total Score	Average Score	Calculated Weight	Weighted Average Score
1.	Availability and condition of security facilities (e.g., security posts, CCTV)	855.00	2.85	0.09	0.26
2.	Availability and condition of disaster preparedness facilities (e.g., evacuation signs, meeting points, fire extinguishers)	804.00	2.68	0.09	0.24
3.	Availability and condition of financial and banking facilities (e.g., ATMs, money changers)	563.00	1.88	0.09	0.17
4.	Availability and condition of business facilities (e.g., small shops, mini markets)	796.00	2.65	0.09	0.24
5.	Availability and condition of toilet facilities	830.00	2.77	0.09	0.25
6.	Availability and condition of waste disposal facilities	807.00	2.69	0.09	0.24
7.	Availability and condition of special (inclusive) facilities for persons with disabilities and the elderly	601.00	2.00	0.09	0.18
8.	Availability and condition of rest area facilities	856.00	2.85	0.09	0.26
9.	Availability and condition of pedestrian facilities	850.00	2.83	0.09	0.26
10.	Availability and condition of parking area facilities	862.00	2.87	0.09	0.26
11.	Availability and condition of worship facilities	904.00	3.01	0.09	0.27
Infrastructure Service Satisfaction Index (IKLI)					**2.64**
Service Quality					**C**
Service Element Performance					**Less Satisfactory**

Source: obtained from primary data (2025)

This study reveals a series of challenges related to public facilities in tourist destinations, stemming from a lack of basic amenities and insufficient inclusive infrastructure. As a fundamental service for visitors, the availability of banking services such as ATM has become a major source of complaint due to their absence at these locations. Tourists' frustration at being hindered in conducting cash transactions directly calls for the accelerated adoption of digital payment methods across the entire ecosystem of tourist attractions and local UMKM. Beyond financial accessibility, the adequacy of physical infrastructure is also a key concern; the number of resting areas, such as gazebos, is deemed insufficient to support the comfort of extended visits. These physical issues are further exacerbated by critical findings regarding the lack of support facilities for people with disabilities, such as the absence of

dedicated wheelchair paths or accessible restrooms. This situation reflects that the spatial design and destination service management have not yet been fully oriented toward ensuring equal access for the entire spectrum of tourists.

The interview results highlight the limited parking space for cars as the main complaint among visitors during certain times. For example, the maximum capacity of Ketep Pass (12 buses, 120 cars, and 300 motorcycles) is still sufficient to accommodate visitor volume on regular days. However, this capacity is often overloaded during the peak of the holiday season, which triggers dissatisfaction and ultimately leads to canceled visits. Given that the hilly topography with limited flat land makes it difficult to expand conventional parking, a study of vertical parking infrastructure could be considered as an alternative spatial solution to anticipate these seasonal surges in vehicle traffic without compromising the preservation of the landscape.

Supporting Infrastructure Index

Based on the results of the service satisfaction index analysis for infrastructure, the supporting infrastructure section will largely reflect the availability of supporting infrastructure for tourism facilities. This assessment is derived from the calculation of the Average Score for the accessibility service provision indicator, multiplied by a weight value of 0.33 (calculated from 1/3). As a result, the Weighted Average Score is 3.04, which, when classified, falls into the second category, indicating a grade of C or poor (Table 4).

Table 4. IKLI Score for Supporting Infrastructure

No.	Indicator	Total Score	Average Score	Calculated Weight	Weighted Average Score
1.	Availability and condition of electricity networks and lighting within the area	897.00	2.99	0.33	1.00
2.	Availability and condition of clean water networks within the area	940.00	3.13	0.33	1.04
3.	Availability and condition of telecommunications networks (Wi-Fi, mobile signal, internet)	901.00	3.00	0.33	1.00
Infrastructure Service Satisfaction Index (IKLI)					**3.04**
Service Quality					**C**
Element Performance					**Less Satisfactory**

Source: obtained from primary data (2025)

While the clean water network scored slightly higher with a weighted average of 1.04, indicating relatively better availability and condition, both the electricity and telecommunications networks received the same weighted average score of 1.00, suggesting consistent but mediocre performance across these critical infrastructure elements. The results reflect that although these basic facilities are generally available, they may not fully meet visitors' expectations in terms of quality, coverage, or reliability. Improvements in infrastructure maintenance, service consistency, and capacity particularly during peak tourist seasons are essential to elevate the overall service quality and enhance visitor satisfaction.

Intepretation of IKLI Result

The results of the evaluation of accessibility infrastructure confirm that the

comfort and safety of tourists in mountainous tourist destinations are highly dependent on physical road improvements. Narrow roads with minimal paving in locations such as Negeri Kahyangan, Grojogan Kapuhan, Nepal Van Java, and Silancur Highland were identified as the primary barriers to tourist mobility. These findings reinforce the arguments (Satrya & Muljono, 2022)(Yusri et al., 2024) emphasizing that the government's commitment to prioritizing road networks is key to mitigating geographical risks. The significance of road widening is also consistent with a study (Hanifah & Al-Fath, 2024) demonstrating that improved road access is directly correlated with positive visitor experiences in remote destinations. Furthermore, this analysis highlights the region's vulnerability to natural disasters. The absence of evacuation routes and early warning systems for floods and landslides constitutes a critical safety gap. The presence of such mitigation facilities is not merely a physical safety measure but a crucial means of building tourist confidence to achieve sustainable tourism.

In terms of tourism facilities, this study reveals a significant gap regarding the availability of accommodations, particularly in tourist attractions such as Inggit Strawberry and Wanamukti Sigeude. The lack of lodging facilities theoretically limits the length of stay for tourists. Referring to (Maheswari et al., 2023)(Ndaguba & Van Zyl, 2024), the provision of accommodation infrastructure is a key socio-economic determinant capable of strengthening the local economy through increased tourist spending. Without expansion of accommodation capacity and diversification of tourism products, the destination will struggle to optimally drive local economic growth (Yu, 2024).

In addition to accommodation, an analysis of comfort levels indicates that the proportion of rest facilities (such as gazebos) is insufficient to support a leisurely visit. More critically, field evaluations highlight the low level of infrastructure inclusivity for people with disabilities. In line with the assertion (Chwaja et al., 2025), socially inclusive infrastructures such as accessible ramps, accessible restrooms, tactile paving, and Braille signage is an absolute prerequisite for sustainable tourism. The absence of these facilities not only discriminate against visitors' physical accessibility but also diminishes the destination's competitiveness in positioning itself as a socially responsible and welcoming area.

Regarding public facilities, limited telecommunications and banking infrastructure have emerged as the primary challenges in remote areas. The need for free Wi-Fi access points is considered essential for supporting modern tourism experiences and visitors' digital interactions (Gorete et al., 2024). Meanwhile, complaints regarding the difficulty of cash transactions due to the absence of physical ATM highlight the urgency of payment transformation. In the face of the digitalization era, the provision of conventional ATM is beginning to lose its relevance. This aligns with findings (S et al., 2024) highlighting a massive shift toward cardless transaction technology. This phenomenon indicates that rather than building physical ATM, tourist destinations need to accelerate the development of a smartphone-based digital (contactless) payment ecosystem to overcome the geographical constraints of banking services while minimizing security risks.

The environmental feasibility assessment also noted shortcomings in sanitation and waste management. The limited availability of communal toilets that meet hygiene standards remains a point of dissatisfaction for visitors (Nielsen, 2024). This is exacerbated by suboptimal waste management infrastructure, which, according to (Perkumienė et al., 2023), requires additional trash bins and regular collection schedules to maintain ecological sustainability. Additionally, the lack of street lighting limits the safe time window for tourist activities in the early morning or at night

(Jurševska & Vugule, 2022). This analysis also identifies the need for the integration of vegetation and green open spaces to create natural shade that enhances tourists' thermal comfort (Ijatuyi et al., 2025).

An analysis of basic infrastructure reveals structural challenges in meeting vital utility needs. In locations such as Gunung Gupak, the instability of the clean water supply has been shown to hinder daily tourism operations. Regarding electricity, the low grid capacity (e.g., 900 watts) is no longer sufficient to support the demands of modern tourist facilities. Given the destination's geographical isolation from public utility networks, the findings (Čekrlija, 2024) hold strong relevance; the implementation of renewable off-grid or hybrid electrical systems emerges as the most rational intervention to achieve tourism energy self-sufficiency. In line with this, spatial management, particularly parking systems that are often overwhelmed by surges in vehicle traffic and the provision of wayfinding systems (wayfinding/trail markers) have been identified as critical elements that must be evaluated immediately. Optimizing this basic infrastructure is a crucial foundation for preventing traffic congestion, ensuring visitor navigation safety, and ultimately maintaining sustainable levels of tourist satisfaction.

CONCLUSION

Overall, the Infrastructure Service Satisfaction Index (IKLI) ratings in Sawangan and Kaliangkrik subdistricts fall within the range of the "less satisfactory" (C) to "poor" (D) categories. An evaluation of the four main dimensions reveals disparities in service performance; supporting infrastructure recorded the relatively highest satisfaction level (3.04/C), although parking area management still needs to be optimized. Furthermore, tourism facilities (2.67/C) and public facilities (2.64/C) recorded marginal performance driven by a lack of essential amenities such as public restrooms, resting areas, directional signage, and waste management systems. Meanwhile, the most critical weakness lies in the aspect of accessibility, which received the lowest score (2.55/D), due to narrow and damaged roads leading to major destinations such as Nepal Van Java, Silancur Highland, and Negeri Khayangan. These findings underscore the urgency of a holistic and balanced infrastructure development strategy across these four sectors to create a safe, comfortable, and sustainable tourism ecosystem.

This research contributes to both theory and practice by demonstrating the value of the IKLI as a comprehensive, user-centered tool for evaluating infrastructure services in secondary tourism destinations. The study provides actionable insights for local policymakers, enabling more targeted and transparent infrastructure planning and resource allocation. Nevertheless, the research is limited by its cross-sectional design and reliance on self-reported perceptions, which may not capture seasonal or long-term changes in satisfaction. Future research should consider longitudinal approaches, expand to other regions, and integrate qualitative methods to gain deeper insight into user needs and expectations, thereby supporting more adaptive and sustainable infrastructure development in Magelang and beyond.

AI USE STATEMENT

This article was not written using artificial intelligence (AI). No AI tools were used in the writing, editing, language improvement, data analysis, figure generation, or preparation of this manuscript. The authors take full responsibility for the accuracy, integrity, and originality of the content.

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