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Beach Quality Evaluation as a Strategy for Sustainable Coastal Tourism Management

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Abstract: This study evaluates the quality and visitor satisfaction across Anyer Beach, Tanjung Lesung Beach, Carita Beach, and Sawarna Beach in Banten, Indonesia, using the Bath Area Registration and Evaluation (BARE) survey and Importance-Performance (I-P) Matrix analysis. Each beach's attributes, including security, water quality, facilities, litter management, and scenery, are assessed to identify strengths and areas for improvement. The findings reveal varying levels of performance and visitor satisfaction, highlighting notable gaps in safety, medical facilities, showers, waste facilities, and changing rooms. Recommendations include enhancing safety measures, upgrading medical and shower facilities, improving waste management practices, and preserving scenic beauty to enhance visitor experiences and support sustainable tourism practices.

Keywords: Beach quality assessment; Environmental; Importance-performance (I-P) Matrix; Visitor satisfaction

Introduction

Beaches are among the most popular tourist destinations worldwide (Dodds & Holmes, 2019; Teles da Mota et al., 2022). Their stunning natural beauty, scenic ocean views, and the variety of activities available make beaches a major attraction for both local and international tourists (Cumming et al., 2023; Williams, 2019). However, with its increasing popularity, especially in the era of globalization and technological advancement, beaches often face significant pressure from human activities, which can threaten the sustainability of coastal ecosystems (Muruganandam et al., 2023). This condition is also evident on beaches in Banten Province.

Banten Province, situated on the west coast of Java Island, Indonesia, holds significant potential for coastal tourism. Its extensive and diverse coastline attracts interest from both domestic and international tourists. Visitor data over the past three years indicate a yearly increase, with nearly 80% of tourists visiting beach attractions. However, rapid tourism growth is often not accompanied by effective management. Consequently, beaches in Banten face significant pressure from human activities, such as unplanned tourism infrastructure development, increased waste, and natural habitat degradation (Mutaqin et al., 2022; Solihuddin et al., 2020).

Uncontrolled tourism activities have caused significant environmental damage along the coastline of Banten Province. Issues such as mangrove deforestation for tourism infrastructure development, marine pollution from domestic and industrial waste, and coral reef degradation due to unregulated snorkeling and diving activities are of serious concern (Ikrar-Jamika et al., 2023).

In addition to environmental impacts, uncontrolled tourism growth also has negative effects on the social and economic sustainability of local communities. Significant investments in the tourism sector often do not provide substantial benefits to local residents, who face significant changes in their lifestyles and social structures (Baloch et al., 2023; Nguyen et al., 2024). Moreover, rising living costs and gentrification can

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marginalize local communities from the economic benefits generated by the tourism industry (García-Buades et al., 2022; Rahmat, 2021).

Sustainable beach tourism is closely related to the Sustainable Development Goals (SDGs), particularly SDG 14 (Life Below Water), which focuses on conserving marine and coastal resources. This includes assessing the impact of tourism activities on coastal and marine ecosystems, water quality, biodiversity, and habitats (Mustafa & Pengiran, 2021). SDG 15 (Life on Land), which concerns terrestrial life, is also significant, evaluating the protection and restoration of land ecosystems around beaches, as well as the impact of tourism traffic on local flora and fauna (Küfeoğlu, 2022). SDG 12 (Responsible Consumption and Production) focuses on waste management strategies in tourism, such as plastic waste and wastewater management (Küfeoğlu, 2022).

In the context of national programs, this research supports the Sustainable Tourism National Program by providing data and recommendations to enhance the sustainability of tourist beaches. Additionally, the research contributes to Indonesia's Environmental Protection Program by evaluating seawater quality, coastal vegetation, and the impacts of climate change on Indonesia's beaches (Tjiptono et al., 2022).

Several previous studies have been conducted on tourism management strategies, both for beach tourism and general tourism. These include assessing beach potential using the Integrated Beach Value Index method as a guideline for beach management (Kenedi et al., 2022); evaluating tourism carrying capacity in tourist areas using coupling methods to identify aspects for development (Laksana et al., 2023); assessing tourist expectations and perceptions based on beach characteristics as a foundation for beach development (Cabezas-Rabadán et al., 2019); highlighting the importance of non-use values in assessing beach tourism resources using the Willingness to Pay (WTP) method from tourists, finding that tourists are willing to pay to protect beaches (Liu et al., 2019); exploring how elements of Ecosystem-Based Management (EBM) influence Coastal Environmental Impact Assessment (EIA) processes through stakeholder perception assessments in tourism development areas (Andrade & Turra, 2021); evaluating beaches using the Coastal Scenic Evaluation System (CSES) as a coastal area management strategy (Rodella & Corbau, 2020). Furthermore, these studies involve mixed-methods and stakeholder engagement to investigate the sustainability of beach and marine tourism in Nordic regions (Dimitrovski et al., 2021); analyzing land use data to find sustainable solutions for transforming the East Midnapur coastal area into a tourist; and implementing holistic and sustainable beach management to mitigate the negative impacts of beach tourism on ecosystems and socio-economic disparities (Smith et al., 2023).

From various studies, particularly in Indonesia, there remains a significant lack of evaluation of beach quality. To address the challenges faced by coastal tourism in Banten Province, it is essential to conduct a comprehensive assessment of beach quality. This evaluation will help identify areas vulnerable to damage, assess the impacts of existing tourism activities, and formulate sustainable management strategies (He et al., 2018). The study will employ the Bath Area Registration and Evaluation (BARE) method to assess the physical, biological, and social conditions of coastal ecosystems (Lukoseviciute & Panagopoulos, 2021)., covering aspects such as beach cleanliness, seawater quality, biodiversity, tourism infrastructure, service quality, and destination management. Through this thorough evaluation, authorities can pinpoint areas needing improvement and better management, while also identifying potential for sustainable tourism development.

Method

This research employs a quantitative approach with a survey method used to gather numerical or data-based responses from respondents representing a specific population. The aim of this approach is to systematically and objectively measure the relationships between variables or phenomena under study (Ponto, 2015).

The selection of beaches for this study is based on four classifications (Micallef & Williams, 2009): urban beach, resort-type beach, rural beach, and remote beach. Based on these classifications, four beaches were chosen: Anyer Beach, Tanjung Lesung Beach, Carita Beach, and Sawarna Beach.

Figure 1. Research location

The population in this study consists of tourists visiting Banten Province, which numbered 28,102,214 in 2023. The determination of the sample size uses the Slovin's formula.

$$\boldsymbol{n} = \frac{\boldsymbol{N}}{\boldsymbol{1+N(e^2)}} \quad (1)$$

Where:
$\boldsymbol{n}$ is the required sample size,
$\boldsymbol{N}$ is the population size,
$\boldsymbol{e}$ is the allowed error rate, set at 5%.

Therefore, the required sample size for each beach criteria is as follows:

$$n = \frac{28.102.214}{1+28.102.214(0.05^2)}$$
$$n = \frac{28.102.214}{70256,535}$$
$$n = 400$$

For evaluating beach quality, this research uses two methods. The first is the BARE (Bath Area Registration and Evaluation) method, which identifies beach management needs. This method includes five main parameters: safety, water quality, facilities, waste, and coastal scenery, with the following rating criteria: A (excellent), B (good), C (fair), and D (poor). Beach quality is classified on a scale of 1 to 5 stars based on the evaluation of these main parameters.

In addition to evaluating beach quality using the BARE method, the quality of beaches is also assessed based on tourists' perceptions using a validated questionnaire from previous research (Lai & Hitchcock, 2016; Wu & Jimura, 2019). The questionnaire comprises three parts: the socio-demographic profile of tourists, measured with nine questions; visitor behavior and expenditure; and an importance-performance (I-P) assessment.

Table 1. Beach Quality Classification Based on BARE Method

Classification	Description
*	All 5 parameters rated as D
**	Safety, Facilities, Scenery, and Water Quality rated no less than C, and Waste rated no less than D
***	All 5 parameters rated no less than C
****	Safety, Facilities, Scenery, and Water Quality rated no less than B, and Waste rated no less than C
*****	4 parameters rated as A and 1 parameter rated as B

The I-P section includes 25 indicators that assess beach environment, facilities, and services, rated on a Likert scale from -2 to 2. This aims to evaluate the relative importance of various beach attributes and visitor satisfaction. The 25 indicators used in tourists' evaluation of beach quality include: wildlife observation opportunities, vegetation health, biodiversity, sand dune restoration, multimodal mobility, information panels, accessibility for special needs, visitor density, trails and wooden bridges, safety, medical facilities, clean seawater, sunbathing facilities, waste facilities, changing rooms, showers, public toilets, restaurants, coffee shops, children's recreation, water sports, sand sports, parking facilities, renewable energy, and clean sand.

The results of the I-P attribute assessment are then presented in four quadrants. The first quadrant, labeled 'keep up the good work', highlights key strengths and potential competitive advantages of the services. The 'possible overkill' quadrant includes attributes considered less important to customers but with good performance, suggesting potential wastage of limited resources that could be inefficiently directed to other areas. The 'low priority' quadrant is deemed less important to customers, thus requiring less managerial concern for these attributes. Meanwhile, the 'concentrate here' quadrant identifies attributes that are unsatisfactory and represent significant weaknesses and threats. Therefore, these attributes are prioritized for improvement (Ahmed, 2021).

Additionally, parametric tests are employed to analyze the I-P assessment attributes. Subsequently, the four-point Likert scale was reclassified to a scale of one to four (with no negative values) to facilitate the calculation of the standard deviation coefficient. A paired sample t-test is applied to obtain mean values, standard deviations, and determine the average differences between the importance and performance of these attributes. The null hypothesis assumes no difference, indicating no gap between visitor satisfaction and the importance of these attributes. Meanwhile, the alternative hypothesis assumes that the difference is non-zero. The more significant the difference, the greater the need for management attention to develop strategies (Xu et al., 2017).

Result and Discussion

A detailed analysis was conducted on 1,600 respondents to gain a comprehensive understanding of the demographic and behavioral characteristics of visitors to Anyer Beach, Tanjung Lesung Beach, Carita Beach, and Sawarna Beach. This analysis focuses on key demographic indicators such as gender, age, origin, education, and monthly income, alongside behavioral aspects including spending habits and accommodation preferences. By examining these characteristics, we aim to better understand the typical beachgoer's profile and

perceptions, thereby facilitating tailored services and marketing strategies to enhance their experience at these popular beach destinations.

Table 2. The Socio-demographic Profile of Beach Visitors

Items	Criteria	Proportion %
Gender	Female	56.0
	Male	44.0
Age	< 20	10.0
	21 - 30	40.5
	31 - 40	30.0
	41 - 50	15.0
	> 51	4.5
Origin	Local	90.0
	International	10.0
Education	University	45.0
	College	30.0
	Secondary	25.0
Monthly Income	> 5.000.000 IDR	64.0
	< 5.000.000 IDR	36.0
Spending on the Beach	Nothing	4.0
	< 500.000 IDR	31.5
	500.000 - 1.000.000 IDR	50.5
	> 1.000.000 IDR	14.0
Accommodation	Hotel	50.0
	Rent House	19.5
	Own House	10.0
	Day Trip	20.5

Base on table 2, the socio-demographic and spending profile of beach visitors to Anyer Beach, Tanjung Lesung Beach, Carita Beach, and Sawarna Beach reveals distinct trends. The gender distribution shows a higher proportion of female visitors (56%) compared to males (44%). Age-wise, most visitors are young adults, with 40.5% aged 21-30, followed by 30% aged 31-40. The younger (<20) and older (41-50 and >51) age groups comprise smaller segments, indicating a focus on beaches by the younger demographic. Predominantly, visitors are locals (90%), with only 10% being international tourists. Education levels are notably high, with 45% having a university degree, 30% with college education, and 25% with secondary education, reflecting a well-educated audience. Monthly income data highlights that 64% of visitors earn over 5,000,000 IDR, suggesting an affluent visitor base, while 36% earn less. Spending habits on the beach indicate that the largest segment (50.5%) spends between 500,000 and 1,000,000 IDR, 31.5% spend less than 500,000 IDR, 14% spend more than 1,000,000 IDR, and a small fraction (4%) spend nothing. Accommodation preferences show a clear inclination towards hotels (50%), followed by rent houses (19.5%), own houses (10%), and day trips (20.5%). This data suggests a visitor base that is financially capable and inclined towards convenience and quality, with significant spending on leisure activities. The information can guide service providers and marketers in tailoring offerings and strategies to meet the needs and preferences of this diverse and economically robust group, ensuring a more satisfying beach experience.

Bath Area Registration and Evaluation (BARE)

The Bath Area Registration and Evaluation (BARE) survey, conducted with input from 400 respondents for each beach, provides a comprehensive assessment of key factors influencing beach quality. This data-driven evaluation examines critical aspects such as security measures, water quality standards, facility conditions, litter management practices, and the overall scenic appeal of each beach. By analyzing these components, the BARE survey aims to offer valuable insights into the strengths and areas for improvement across various beaches, guiding efforts towards enhancing visitor experiences and environmental sustainability.

Table 3. The Star Ratings Awarded to The Case Study Beaches

Beach	Security	Water Quality	Facilities	Litter	Scenery	Grade
Anyer Beach	C	B	C	C	A	***
Tanjung Lesung Beach	B	A	A	B	A	****
Carita Beach	C	B	C	B	B	***
Sawarna Beach	C	B	B	C	A	***

Anyer Beach

Anyer Beach, with an overall grade of 3-star, presents a mixed profile across its evaluated attributes. Security is rated C, suggesting moderate safety measures in place, which may impact visitor confidence in the beach's safety protocols. Water quality scores a B, indicating generally acceptable conditions for swimming and water-related activities, although occasional fluctuations could occur. Facilities also rate C, pointing to adequate but potentially basic amenities that might benefit from enhancements to improve visitor comfort and convenience. Litter management is graded C, suggesting periodic challenges with waste control that could detract from the beach's cleanliness and appeal. Despite these concerns, Anyer Beach redeems itself with an A-grade scenery, highlighting its natural beauty and picturesque views that attract visitors seeking scenic environments (Dodds & Holmes, 2019). The beach's strengths lie in its attractive scenery, but there is room for improvement in security, facilities, and

litter management to enhance overall visitor satisfaction and ensure a more enjoyable beach experience. Efforts to bolster security measures, maintain water quality standards, upgrade facilities, and implement effective litter management practices could significantly elevate Anyer Beach's attractiveness as a destination, catering to both local beachgoers and tourists seeking a balanced beach environment with enhanced amenities and cleanliness.

Tanjung Lesung Beach

Tanjung Lesung beach stands out with an impressive overall grade of 4-star, reflecting its exceptional attributes across various categories. Security is rated B, indicating good safety measures that contribute to a secure environment for visitors. Water quality earns an outstanding A grade, signifying pristine conditions suitable for swimming and recreational activities, enhancing the beach's appeal to tourists. Facilities also receive an A grade, highlighting well-maintained amenities that cater to the comfort and convenience of beachgoers. Litter management is rated B, indicating effective waste control practices that help maintain cleanliness and environmental stewardship. The beach's scenery is rated A, underscoring its breathtaking natural beauty and scenic vistas, which are major draws for visitors seeking picturesque landscapes (Chatterjee et al., 2022). Tanjung Lesung Beach's high ratings across security, water quality, facilities, litter management, and scenery collectively contribute to its reputation as a premier destination for relaxation and leisure activities. These attributes not only enhance visitor satisfaction but also support sustainable tourism practices, positioning Tanjung Lesung Beach as a top choice among travelers seeking a pristine and enjoyable beach experience.

Carita Beach

Carita Beach, with an overall grade of 3-star, presents a balanced profile across its evaluated criteria. Security is rated C, indicating standard safety measures in place, which may suffice but could benefit from enhancements to reassure visitors. Water quality scores a B, suggesting generally suitable conditions for swimming and water activities, although periodic checks are advisable to maintain standards. Facilities at Carita Beach also rate C, indicating adequate but potentially basic amenities that may require improvement to better accommodate visitor needs and expectations. Litter management earns a B, indicating decent waste control efforts that contribute to maintaining cleanliness and environmental sustainability. The beach's scenery is graded B, highlighting a moderately attractive natural environment that enhances its appeal to visitors seeking a relaxing beach experience. Carita Beach offers a viable option for beachgoers looking for a convenient and accessible destination, with strengths in water quality and litter management. However, to enhance overall visitor satisfaction, focusing on improving security measures, upgrading facilities, and potentially enhancing the natural scenery could further elevate Carita Beach's attractiveness as a preferred beach destination.

Sawarna Beach

Sawarna Beach, with an overall grade of 3-star, presents a profile that balances strengths and areas for improvement across its evaluated criteria. Security is rated C, suggesting a need for enhancements in safety measures to ensure a more secure environment for visitors. Water quality scores a B, indicating generally favorable conditions for swimming and water-related activities, though regular monitoring is recommended to maintain standards. Facilities at Sawarna Beach also rate B, providing adequate amenities that meet basic visitor needs but could benefit from upgrades to enhance comfort and convenience. Litter management is graded C, suggesting ongoing challenges with waste control that could affect cleanliness and environmental sustainability efforts. The beach's scenery is a standout feature, earning an A grade and showcasing stunning natural beauty that appeals to nature enthusiasts and photographers. Despite areas needing improvement in security and litter management, Sawarna Beach remains a picturesque destination known for its scenic landscapes. To enhance visitor satisfaction and attractiveness, Sawarna Beach could focus on improving security measures, implementing more effective litter management practices, and potentially upgrading facilities to better meet the needs of tourists seeking both natural beauty and comfort during their beach experience.

Importance – performance (I–P) Matrixes

The Importance-Performance (I-P) Matrix is a strategic tool used to assess and prioritize factors based on their importance and performance. In the context of a survey involving 400 respondents for each beach, the I-P Matrix provides valuable insights into which attributes or characteristics are most critical to stakeholders and how well these attributes are currently being delivered. By plotting importance against performance on a matrix, this analysis helps identify areas where improvements are most needed and where current efforts are already meeting expectations effectively. This systematic approach not only highlights strengths and weaknesses but also guides strategic decision-making by focusing resources on enhancing critical areas that have a significant impact on overall

satisfaction and success (Tailab, 2020). The I-P Matrix thus serves as a practical tool for organizations and decision-makers to align their efforts with stakeholder priorities, ensuring targeted improvements that enhance overall performance and stakeholder satisfaction (Rodriguez et al., 2022).

Anyer Beach (Urban Beach)

Anyer Beach, located on Banten's western coast, is a bustling urban beach known for its stunning scenery and vibrant atmosphere. Popular among locals and tourists, it offers diverse recreational activities and easy access to amenities. Analyzing the importance and performance of its attributes is essential for sustainable development and maintaining its appeal to visitors.

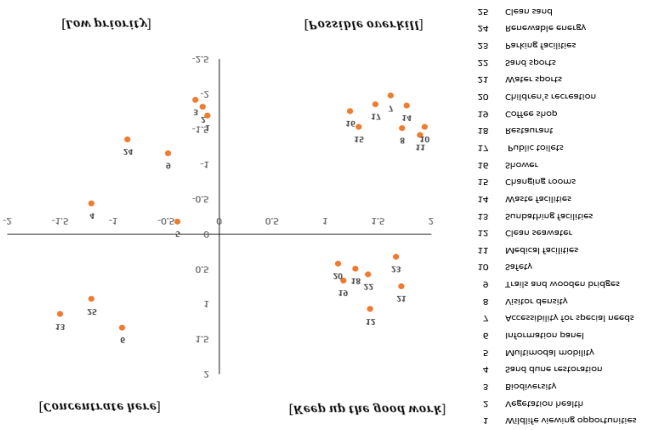

Figure 2. Importance – performance matrix of Anyer Beach (Urban Beach)

Figure 2 represents an Importance-Performance (I-P) Matrix, categorizing 25 attributes into four quadrants: "Concentrate Here," "Keep Up the Good Work," "Low Priority," and "Possible Overkill." In the "Concentrate Here" quadrant, attributes like clean sand (-1.2, 0.93), Sunbathing facilities (-1.5, 1.14), and Information panel (-0.91, 1.33) have low importance and relatively high performance, suggesting resources could be better allocated elsewhere. Conversely, the "Keep Up the Good Work" quadrant, encompassing clean seawater (1.43, 1.07), Restaurant (1.29, 0.49), Water sports (1.72, 0.74), Sand sports (1.41, 0.57), Parking area (1.67, 0.32), Coffee shop (1.17, 0.66), and Children's recreation (1.12, 0.42), highlights attributes with high importance and high performance, requiring continued investment for sustained visitor satisfaction. The "Low Priority" quadrant includes Dune restoration (-1.2, -0.44), Multimodal mobility (-0.39, -0.18), Renewable energy (-0.86, -1.36), Trails and wooden bridges (-0.48, -1.16), Biodiversity (-0.22, -1.92), Vegetation health (-0.15, -1.82), and Wildlife viewing opportunities (-0.11, -1.7), which exhibit low importance and low performance, suggesting minimal immediate investment unless priorities shift. Most crucially, the "Possible Overkill" quadrant, featuring Waste facilities (1.77, -1.84), Accessibility for special needs (1.62, -1.98), Medical facilities (1.9, -1.42), Visitor density (1.73, -1.52), Safety (1.94, -1.54), Shower (1.24, -1.76), Public toilets (1.48, -1.86), and Changing facilities (1.32, -1.54), includes attributes with high importance but poor performance, indicating a critical need for improvement to enhance visitor experience and satisfaction.

Tanjung Lesung Beach (Resort-type Beach)

Tanjung Lesung Beach, situated on the western tip of Java in Banten, Indonesia, is a luxurious resort-type beach renowned for its pristine white sands, crystal-clear waters, and tranquil ambiance. Ideal for tourists seeking a serene getaway, it offers upscale accommodations, water sports, and cultural experiences. The beach's exclusivity and well-maintained facilities make it a premier destination. Analyzing its importance and performance attributes ensures its continued appeal and sustainable growth as a top-tier resort destination.

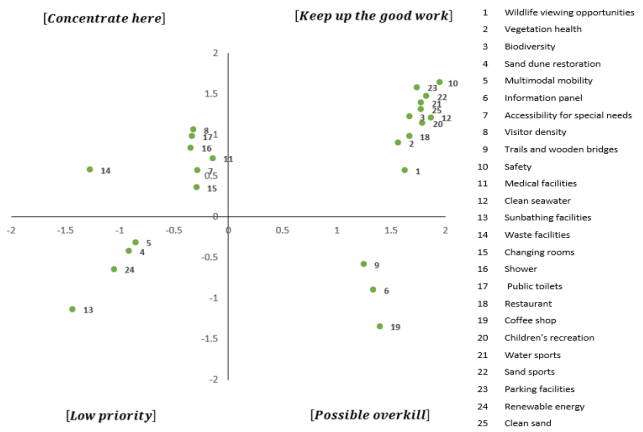

Figure 3. Importance – performance matrix of Tanjung Lesung Beach (Resort-type Beach)

The Importance-Performance (I-P) Matrix for Tanjung Lesung Beach categorizes 25 indicators into four quadrants, highlighting areas requiring different levels of attention. In the "Concentrate Here" quadrant, attributes like medical facilities (-0.14, 0.71), Accessibility for special needs (-0.28, 0.56), and Changing rooms (-0.29, 0.35) show moderate importance but below-average performance, indicating a need for improvement to enhance visitor comfort and accessibility. Waste facilities (-1.27, 0.57), while low in importance, should be maintained to meet basic hygiene standards. The "Keep Up the Good Work" quadrant includes high-performing, highly important attributes such as Biodiversity (1.67, 1.22), Clean seawater (1.87, 1.21), and Safety (1.95, 1.64). These elements are crucial for visitor satisfaction and should continue to be

prioritized and well-maintained. Additionally, recreational activities like Water sports (1.78, 1.39) and Sand sports (1.83, 1.47), as well as facilities like Restaurants (1.67, 0.98) and Children's recreation (1.79, 1.14), contribute significantly to the beach's appeal and should receive ongoing support. In the "Low Priority" quadrant, attributes such as Sand dune restoration (-0.91, -0.43) and Renewable energy (-1.05, -0.65) show low importance and performance, suggesting they do not require immediate attention unless future priorities change. Finally, the "Possible Overkill" quadrant includes Trails and wooden bridges (1.25, -0.59), Information panel (1.34, -0.9), and Coffee shop (1.4, -1.35), which are highly important but underperforming. Addressing these areas can significantly enhance the overall visitor experience by providing better information, convenient amenities, and improved infrastructure. By focusing on these key areas, Tanjung Lesung Beach can optimize its resources and enhance both the ecological and visitor satisfaction aspects, ensuring a sustainable and enjoyable environment for all.

Carita Beach (Rural Beach)

Carita Beach, located on the western coast of Banten, Indonesia, offers a tranquil rural beach experience that contrasts with the bustling urban settings of other nearby beaches. Known for its serene environment, lush natural landscapes, and clear waters, Carita Beach is a haven for those seeking a peaceful retreat. The beach is popular for its natural beauty, local culture, and various outdoor activities such as snorkeling, fishing, and beachcombing. Understanding and evaluating the importance and performance of various attributes at Carita Beach is essential for ensuring its sustainable development while maintaining its rustic charm and natural appeal. The following analysis employs the Importance-Performance (I-P) Matrix to identify key areas for improvement and investment, ensuring that Carita Beach remains an attractive destination for both locals and tourists.

The Importance-Performance (I-P) Matrix for Carita Beach categorizes 25 indicators into four quadrants, providing insights into where improvements or maintenance efforts should be focused. In the "Concentrate Here" quadrant, attributes such as Changing rooms (-0.34, 0.32), Shower (-0.11, 0.15), Public toilets (-0.25, 0.47), and Children's recreation (-0.16, 0.56) demonstrate low importance but relatively low performance, indicating areas that need attention to enhance visitor comfort and satisfaction. The "Keep Up the Good Work" quadrant includes high-performing, highly important attributes such as clean seawater (1.14, 0.89), Restaurant (1.2, 0.97), Water sports (1.58, 1.37), and Sand sports (1.53, 1.32). These elements are crucial for maintaining high visitor satisfaction and should continue to be prioritized and well-maintained. Additionally, while the Coffee shop (0.46, 0.2) performs moderately well, it is still important for enhancing visitor experience. In the "Low Priority" quadrant, attributes such as Sand dune restoration (-0.12, -1.3), Multimodal mobility (-0.99, -1.45), Clean sand (-0.2, -0.51), Renewable energy (-0.92, -1.29), and Sunbathing facilities (-0.81, -1.45) show low importance and performance, suggesting that these areas do not require immediate attention unless strategic priorities change. The "Possible Overkill" quadrant highlights highly important but poorly performing attributes like Biodiversity (1.44, -1.27), Wildlife viewing opportunities (1.52, -1.3), Medical facilities (1.62, -1.49), Trails and wooden bridges (0.82, -0.49), and Information panel (1.16, -0.19). Addressing these areas can significantly enhance the overall visitor experience by providing better information, infrastructure, and accessibility. Additionally, essential amenities such as Parking facilities (1.86, -0.8), Waste facilities (1.48, -0.86), Accessibility for special needs (1.75, -0.73), Visitor density (1.9, -1.55), and Safety (1.82, -1.4) also fall into this quadrant, emphasizing the need for significant improvements to meet visitor expectations. By focusing on improving critical areas while maintaining high-performing attributes, Carita Beach can enhance its visitor experience, ensuring both comfort and sustainability.

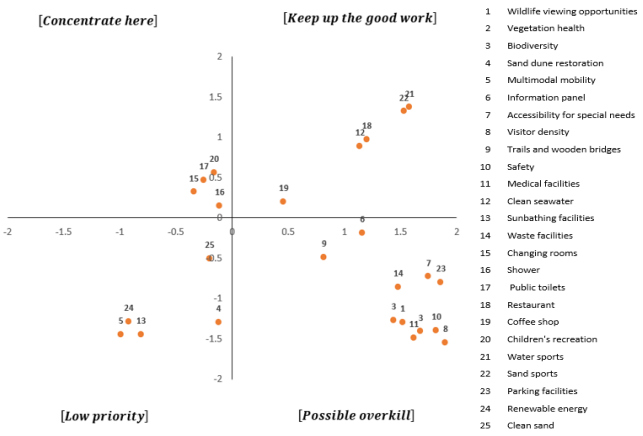

Figure 4. Importance – performance matrix of Carita Beach (Rural Beach)

Sawarna Beach (Remote Beach)

Sawarna Beach, located on the southern coast of Banten, Indonesia, is a picturesque remote beach known for its pristine natural beauty and seclusion. Far from the hustle and bustle of urban life, Sawarna Beach offers a tranquil escape for nature lovers and adventure seekers. With its stunning white sands, crystal-clear waters, and dramatic coastal landscapes, the beach is an ideal destination for activities such as surfing, hiking, and

exploring local caves. The remoteness of Sawarna Beach adds to its charm, providing visitors with an unspoiled environment and a sense of serenity. To ensure the sustainable development and continued appeal of Sawarna Beach, it is crucial to evaluate the importance and performance of its various attributes. The following analysis employs the Importance-Performance (I-P) Matrix to identify key areas for improvement and investment, ensuring that Sawarna Beach remains a pristine and desirable destination for all visitors.

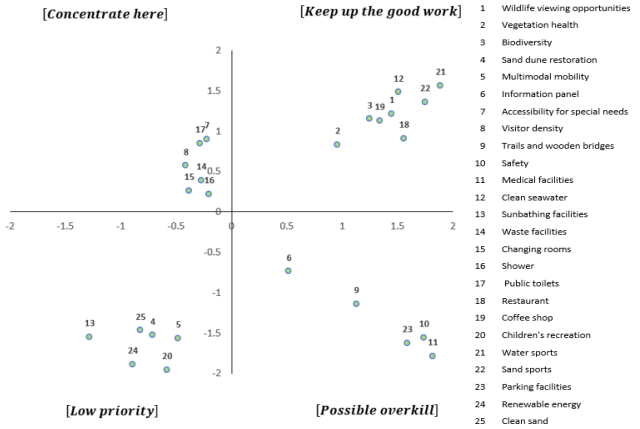

Figure 5. Importance – performance matrix of Sawarna Beach (Remote Beach)

The Importance-Performance (I-P) Matrix analysis for Sawarna Beach highlights key areas that require immediate attention and maintenance to enhance visitor satisfaction and sustainability. In the "Concentrate Here" quadrant, indicators such as Waste facilities (-0.27, 0.39), Accessibility for special needs (-0.22, 0.9), Visitor density (-0.41, 0.57), Changing rooms (-0.38, 0.26), Shower (-0.2, 0.22), and public toilets (-0.28, 0.85) show low importance but underperformance. These facilities are essential for basic visitor comfort and accessibility, indicating the need for significant improvements to meet basic visitor expectations. In the "Keep Up the Good Work" quadrant, high-performing and highly important indicators such as Biodiversity (1.25, 1.15), Wildlife viewing opportunities (1.45, 1.21), Vegetation health (0.96, 0.83), Clean seawater (1.51, 1.48), Restaurant (1.56, 0.91), Water sports (1.89, 1.56), Sand sports (1.75, 1.36), and Coffee shop (1.34, 1.13) reflect the beach's strength in providing a quality natural and recreational experience. These areas should be maintained at their current high standards to continue attracting and satisfying visitors. In the "Low Priority" quadrant, indicators such as Sand dune restoration (-0.71, -1.53), Multimodal mobility (-0.48, -1.57), Clean sand (-0.82, -1.47), Renewable energy (-0.89, -1.89), Sunbathing facilities (-1.28, -1.55), and Children's recreation (-0.58, -1.96) exhibit low importance and poor performance. These areas do not currently warrant immediate resource allocation but may be considered for future improvements. The "Possible Overkill" quadrant includes indicators like Trails and wooden bridges (1.13, -1.14), Information panel (0.52, -0.74), Parking facilities (1.59, -1.63), Medical facilities (1.82, -1.79), and Safety (1.74, -1.56), which are highly important but underperforming. Enhancing these attributes can significantly improve the visitor experience by ensuring safety, better accessibility, and comprehensive visitor information. By focusing on improving critical areas while maintaining high-performing attributes, Sawarna Beach can enhance its visitor experience, ensuring both comfort and sustainability.

An Analysis of Beach Users' Preferences and Satisfaction

The overall results of the importance-performance analysis are presented in Table 4. This analysis indicates that, out of the 25 indicators used, greater attention should be directed towards those indicators that show a statistically significant difference between performance values and importance values.

The analysis of importance-performance matrixes for four beaches reveals significant gaps in various indicators, emphasizing the need for substantial improvements. Safety and medical facilities exhibit the largest negative differences (-0.99 and -1.19, respectively), indicating critical underperformance. Environmental aspects such as wildlife viewing opportunities, vegetation health, and biodiversity also show significant gaps (-0.57, -0.50, and -0.42). Infrastructure elements like trails and wooden bridges (-0.57) and sunbathing facilities (-0.57), along with visitor amenities such as showers (-1.14), waste facilities (-0.62), and changing rooms (-0.60), are notably lacking. Recreational facilities, including children's recreation (-0.69) and sand sports (-0.53), do not meet visitor expectations, while public toilets, restaurants, and coffee shops exhibit smaller yet significant gaps. Overall, the findings highlight that numerous critical areas require attention to improve visitor satisfaction and enhance overall beach experiences.

From the analysis, five key areas have emerged as critical priorities for improvement at the beaches: safety, which exhibits the largest negative difference (-0.99), indicating a significant deficiency in current measures necessitating enhanced safety infrastructure, regular audits, and improved visitor education; medical facilities, revealing a gap of -1.19, highlighting the need for enhanced healthcare support with well-equipped stations and trained personnel for timely emergency response; showers, with a negative difference of -1.14, indicating insufficient maintenance and availability, necessitating increased and regular servicing for improved hygiene and comfort; waste facilities, reflecting a gap of -0.62, pointing to inadequate waste

management practices that diminish aesthetic and environmental quality, requiring more frequent collection, sufficient bins, and public awareness campaigns; and changing rooms, with a negative difference of -0.60, underscoring the need for clean, well-maintained, and accessible facilities to enhance visitor satisfaction, particularly for families and water activity enthusiasts. Addressing these priorities comprehensively is crucial to significantly enhancing the overall beach experience and promoting sustainable tourism practices.

Table 4. Analysis of Importance-Performance Matrixes for Four Beaches

Indicator	Paired Sample Test					p-value
	Importance		Performance		Difference	
	Value	SD	Value	SD	(P-I)	
Wildlife viewing opportunities	3.1	0.28	2.53	0.301	-0.57	0.000***
Vegetation health	3.02	0.26	2.52	0.302	-0.50	0.000***
Biodiversity	3.27	0.23	2.85	0.35	-0.42	0.000***
Sand dune restoration	2.8	0.22	2.56	0.23	-0.24	0.001***
Multimodal mobility	2.96	0.23	2.77	0.19	-0.19	0.010**
Information panel	3.08	0.17	2.93	0.16	-0.15	0.006***
Accessibility for special needs	3.24	0.14	3	0.177	-0.24	0.000***
Visitor density	3.4	0.13	3.04	0.15	-0.36	0.000***
Trails and wooden bridges	2.38	0.25	1.81	0.28	-0.57	0.000***
Safety	3.59	0.13	2.6	0.2	-0.99	0.000***
Medical facilities	3.43	0.13	2.24	0.24	-1.19	0.000***
Clean seawater	3.68	0.12	3.5	0.11	-0.18	0.000***
Sunbathing facilities	2.31	0.12	1.74	0.13	-0.57	0.000***
Waste facilities	3.41	0.13	2.79	0.22	-0.62	0.000***
Changing rooms	3.4	0.17	2.8	0.13	-0.6	0.000***
Shower	3.28	0.17	2.14	0.24	-1.14	0.000***
Public toilets	3.45	0.15	3.25	0.16	-0.2	0.000***
Restaurant	3.54	0.15	3.31	0.14	-0.23	0.000***
Coffee shop	3.47	0.14	3.22	0.15	-0.25	0.000***
Children's recreation	3.6	0.12	2.91	0.18	-0.69	0.000***
Water sports	3.68	0.12	3.52	0.11	-0.16	0.000***
Sand sports	3.6	0.11	3.4	0.12	-0.2	0.000***
Parking facilities	3.41	0.12	2.83	0.15	-0.58	0.000***
Renewable energy	2.67	0.18	2.33	0.21	-0.34	0.000***
Clean sand	3.67	0.09	3.06	0.16	-0.61	0.000***

Note: Items classified in 4-point Likert scale from 1 – *not important* to 4 – *very important* and 1 – *low performance* to 4 – *high performance*. SD: Standard Deviation; Significant levels: ***p < 0.01; **p < 0.05.

Overall, the findings underscore the critical need for beach managers and local authorities to prioritize these indicators to improve visitor satisfaction and enhance the overall beach experience. Addressing these gaps requires concerted efforts such as infrastructure upgrades, enhanced healthcare provisions, environmental conservation initiatives, and improved visitor amenities (Cabioch & Robert, 2022). By implementing these measures, beaches can not only meet but exceed visitor expectations, fostering sustainable tourism practices and ensuring the long-term environmental and economic viability of these coastal destinations (Xavier et al., 2023).

Conclusion

The assessment of Anyer, Tanjung Lesung, Carita, and Sawarna Beaches reveals a diverse range of strengths and areas for enhancement in beach quality. Each beach offers unique attractions, from breathtaking scenery to varied recreational amenities, yet substantial deficiencies in safety protocols, medical services, waste management, and infrastructure upkeep are evident. These shortcomings underscore the urgent need to implement comprehensive safety enhancements, upgrade medical facilities, optimize waste disposal practices, enhance visitor amenities such as showers and changing rooms, prioritize environmental conservation efforts, and strategically invest in infrastructure improvements. Addressing these priorities will not only elevate visitor satisfaction but also foster sustainable tourism practices crucial for the long-term attractiveness and environmental health of these coastal destinations. By focusing on these areas, beach managers and local authorities can effectively mitigate current challenges, ensuring that these beaches continue to captivate visitors

with their natural beauty while meeting the expectations of a growing tourism industry. Such proactive measures are essential for preserving these coastal ecosystems and maintaining their allure as cherished leisure destinations for both local communities and international travelers alike.

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Conflicts of Interest
The authors declare no conflict of interest.

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