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# ASSESSING THE SUSTAINABILITY OF BLUE TOURISM IN TOURIST DESTINATIONS AND PORTS: A CASE STUDY OF KARIMUNJAWA

Ibnu Fauzi[1]✉, Maria Nooza Airawati[2]✉

[1] ORCID: 0000-0002-0396-8928
[2] ORCID: 0000-0003-0522-5340
[1,2] National Research and Innovation Agency of Indonesia, Science and Technologi Complex B.J. Habibie South Tangerang, Banten, 15314, **Indonesia**

## ABSTRACT

**Motives:** The rapid expansion of marine tourism in Karimunjawa has triggered critical ecological degradation and socio-economic pressures. Despite its strategic alignment with the Sustainable Development Goals (SDGs), the implementation of "Blue Tourism" is currently undermined by fragmented governance, weak regulatory enforcement, and a lack of synergy between port infrastructure and destination management.
**Aim:** This study seeks to evaluate the sustainability of Blue Tourism by assessing the operational performance and stakeholder expectations within Karimunjawa. It aims to bridge the gap between policy and practice by utilizing a multi-dimensional framework – integrating Importance-Performance Analysis (IPA), SWOT, and Regulatory Impact Analysis (RIA) to provide a comprehensive roadmap for resilient coastal governance.
**Results:** The analysis reveals significant performance deficits in environmental education, digital infrastructure, and government support. Findings from the RIA highlight that regulatory overlaps and suboptimal monitoring hinder conservation efforts. To resolve these issues, the study recommends the standardization of "green ports," the harmonization of inter-agency policies, and the adoption of community-led digital transformations. These results offer a scalable model for balancing economic growth with environmental integrity in archipelagic tourism hubs.

**Keywords:** integrated coastal zone management, environmental performance assessment, stakeholder engagement in tourism, green port development, marine spatial planning

## INTRODUCTION

Marine tourism in Indonesia has evolved into a strategic economic sector, serving as a catalyst for economic growth and job creation, particularly in coastal regions endowed with abundant natural resources (Lukman et al., 2022). As an archipelagic nation, Indonesia possesses immense marine tourism potential, exemplified by the Karimunjawa Islands. Located between Central Java and Kalimantan, Karimunjawa is renowned for its pristine beaches and coral reefs, positioning it as an increasingly prominent tourist destination (Aldyan et al., 2023; Hafsaridewi et al., 2018). Visitor arrivals to Karimunjawa National Park have surged dramatically, from 5,617 in 2019 to 41,437 in 2024, with the highest annual growth rate

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

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reaching 115.7% between 2021 and 2022 (Karimunjawa National Park Authority, 2025). However, this rapid tourism expansion has introduced a range of environmental and social challenges, including ecosystem degradation, shifts in economic structures, and transformations in local identity (Fafurida et al., 2020; Sulisyati & Tarigan, 2021). These issues are closely aligned with the Sustainable Development Goals (SDGs), particularly SDG 14 (Life Below Water) and SDG 8 (Decent Work and Economic Growth), which emphasize the importance of balancing marine conservation with inclusive and sustainable economic development.

Scientifically, the concept of the blue economy has emerged as a critical paradigm for sustainable development, advocating for the responsible utilization of marine resources without compromising ecological integrity (Elston et al., 2024; Youssef, 2023). Within this framework, blue tourism has been promoted as a sustainable alternative to conventional tourism, prioritizing environmentally friendly activities such as ecotourism, coral reef rehabilitation, and community empowerment (Wilks, 2023). Nevertheless, various studies indicate that the implementation of blue tourism in small island destinations like Karimunjawa faces significant challenges, including ecosystem pressures from mass tourism, limited institutional capacity, and infrastructure constraints (Azzahra et al., 2023; Ghazali et al., 2023). Furthermore, the effectiveness of marine protected areas (MPAs) is often hampered by weak regulatory enforcement and low community participation (Khuu et al., 2023; Zhao et al., 2022). Ports, as critical logistical hubs, further exacerbate environmental pressures through activities such as dredging and water pollution – issues that remain underexplored in the literature (Agarwala & Saengsupavanich, 2023).

Although substantial research has been conducted on marine tourism and conservation in Karimunjawa, two primary gaps persist in the literature: (1) a lack of holistic analyses integrating the role of ports within blue tourism ecosystems, and (2) a scarcity of quantitative studies systematically measuring operational impacts or multi-stakeholder perceptions (Awaloedin et al., 2024). To date, studies that combine Importance-Performance Analysis (IPA) and SWOT Analysis to map the gap between tourist expectations and the actual performance of destinations and ports in Karimunjawa remain limited (Allen et al., 2021; Feng et al., 2014). Moreover, adapting Integrated Coastal Zone Management (ICZM) to Indonesia's archipelagic context requires innovative approaches in multi-sectoral governance, particularly regarding port management and stakeholder collaboration (Gourmelon et al., 2014; Jiang et al., 2023).

Based on this background and the identified research gaps, this study aims to evaluate the implementation of blue tourism in Karimunjawa through a comprehensive approach that integrates Importance-Performance Analysis (IPA), SWOT Analysis, and Regulatory Impact Analysis (RIA). The research objects encompass major tourist destinations and ports, which serve as the primary gateways for visitors to Karimunjawa. The research objectives are: (1) to identify gaps between expectations and the actual performance of blue tourism attributes at destinations and ports; (2) to analyze strengths, weaknesses, opportunities, and threats in the management of sustainable tourism; and (3) to evaluate the effectiveness of policies and regulations from global to local levels. The main contribution of this research is the development of a holistic evaluation framework that can serve as a reference for policymakers, industry stakeholders, and local communities in optimizing blue tourism implementation, as well as a model for adaptation in other coastal destinations in Indonesia. Thus, this study not only addresses academic gaps but also provides evidence-based policy recommendations to support the sustainable development of marine tourism in the era of the blue economy.

## LITERATURE REVIEW

The concept of the blue economy has emerged as a critical paradigm in sustainable development, advocating for the responsible utilization of marine resources to drive economic growth without compromising ecological integrity (Elston et al.,

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

2024; Mistri & Mistry, 2023; Youssef, 2023). As a multidimensional governmental initiative, the blue economy not only establishes new policy frameworks but also legitimizes administrative approaches that integrate conservation with inclusive development (Choi, 2017; de Ycaza et al., 2024; Nagy & Nene, 2021). Within this context, marine tourism (blue tourism) is positioned as a key component, offering a sustainable alternative to conventional tourism practices through low-impact activities such as ecotourism, coral reef rehabilitation, and local community empowerment (Ressurreição et al., 2022; Wilks, 2023). This concept aligns with the United Nations Sustainable Development Goals (SDGs), particularly SDG 14 (Life Below Water) and SDG 8 (Decent Work and Economic Growth), which emphasize the dual objectives of protecting marine ecosystems and generating employment opportunities (Jackson, 2025; Lee et al., 2020). However, its implementation faces complex challenges, ranging from habitat degradation to social inequities, particularly in small-island destinations like Karimunjawa, where institutional capacity and infrastructure are often limited (Ghazali et al., 2023).

Empirical studies in Karimunjawa reveal a unique interplay of potential and vulnerability. As a Marine National Park, the region boasts coral reefs and mangrove ecosystems that serve as primary tourist attractions, yet these ecosystems face significant ecological pressures due to unmanaged tourism activities (Azzahra et al., 2023; Setiyanto et al., 2023). Research by Fajariyanto et al. (2024) demonstrates a correlation between rising tourist arrivals and coral bleaching, while Yu & Singh (2023) identifies plastic waste accumulation as a critical threat to marine biodiversity. Although Marine Protected Areas (MPAs) have been established, their effectiveness is hindered by weak regulatory enforcement and fragmented community participation (Khuu et al., 2023; Zhao et al., 2022). Socioeconomically, Community-Based Tourism (CBT) models hold potential for equitable distribution of tourism benefits, yet structural challenges such as seasonal income dependency and resource access conflicts persist (Ahsani et al., 2022; Jackson, 2025; Sutresna et al., 2019). Ports, as critical logistical nodes, exacerbate environmental challenges through dredging activities and water pollution issues that remain understudied in existing literature (Agarwala & Saengsupavanich, 2023; Roberts et al., 2023).

To address these complexities, scholars propose methodological innovations. Phadermrod et al., (2019) introduce the integration of SWOT analysis with Importance-Performance Analysis (IPA) to mitigate subjectivity bias in strategic planning. This approach enables the prioritization of stakeholder perceptions – for instance, quantifying gaps between tourist expectations (importance) and destination performance (performance) regarding aspects such as water quality or community engagement. This method has proven effective in global tourism contexts (Awaloedin et al., 2024; Faradiba et al., 2024; Lai & Hitchcock, 2015; Lubis et al., 2024; Nurfitri et al., 2025), yet its application in Karimunjawa remains limited. Furthermore, international literature on Integrated Coastal Zone Management (ICZM) offers valuable insights into balancing ecological and economic priorities, though its adaptation to Indonesian archipelagic contexts requires contextual modifications, particularly in port governance and multisectoral collaboration (Gourmelon et al., 2014; Jiang et al., 2023).

Collectively, this review highlights two major gaps in existing research: (1) the lack of holistic analyses integrating the role of ports in blue tourism ecosystems, and (2) the scarcity of quantitative studies measuring operational impacts (e.g., carbon footprints) or multi-stakeholder perceptions. By synthesizing blue economy principles, Karimunjawa's case study, and the SWOT-IPA framework, this study aims not only to address academic gaps but also to formulate evidence--based policy recommendations, such as modernizing green port infrastructure and strengthening data--driven CBT models. The findings are expected to serve as a reference for similar destinations in Southeast Asia grappling with the dilemma between economic development and ecological sustainability.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

## RESEARCH METHODOLOGY

This study evaluates the implementation of Blue Tourism in Karimunjawa using a systematic approach that integrates both primary and secondary data. Primary data were collected through in-depth interviews with tourists utilizing the Karimunjawa Ferry Port and visiting key destinations such as Menjangan Besar Island, Tanjung Gelam Beach, and Cilik Island. Secondary data comprise policy documents and relevant literature. A Blue Tourism Regulatory Analysis was conducted to map existing policy aspects, followed by the application of the Regulatory Impact Analysis (RIA) method. Importance-Performance Analysis (IPA) was employed to assess the gap between expectations and the performance of Blue Tourism attributes, complemented by a SWOT Analysis to formulate sustainable management strategies. The study focuses on key tourism destinations and ports as accessibility hubs to generate strategic recommendations for environmentally friendly and competitive management. The systematic research framework is illustrated in Fig. 1.

### Research Location

This study was conducted in the Karimunjawa National Park area, focusing on key tourist destinations managed by the Karimunjawa National Park Authority. The research locations (Fig. 2) include several ports that play a crucial role in supporting

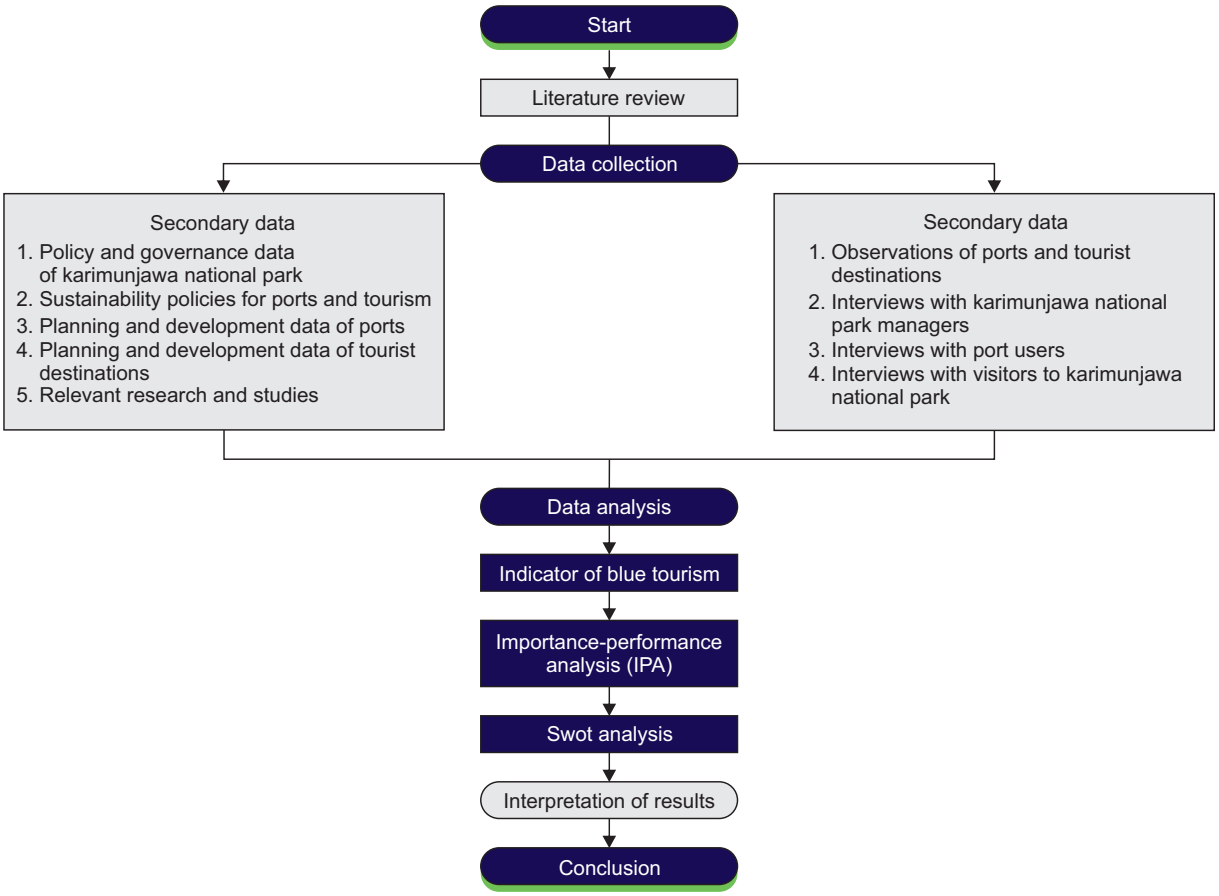



**Fig. 1.** Research flow
*Source*: own elaboration.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

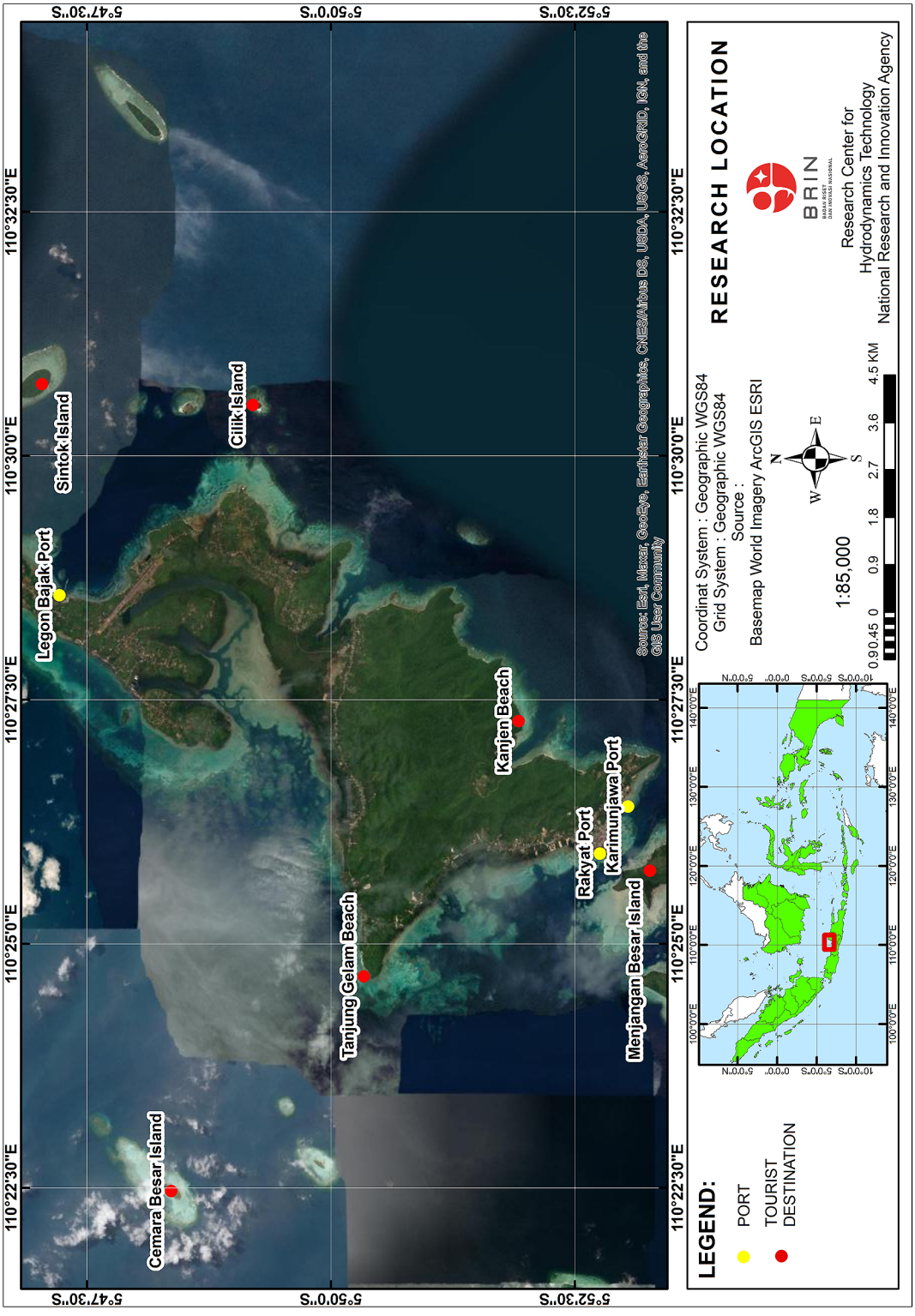



**Fig. 2.** Research location
*Source:* own elaboration.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

tourist accessibility, namely the Karimunjawa Ferry Port, managed by the Class III Karimunjawa Port Authority Unit, as well as the Pelabuhan Rakyat and Legonbajak Port. The surveyed tourist destinations include Menjangan Besar Island, Kanjen Beach, Tanjung Gelam Beach, Cilik Island, Cemara Besar Island, and Sintok Island, which are recognized as prime tourism areas with significant marine ecosystem potential.

## Data Collection

This study integrates both secondary and primary data to comprehensively evaluate the implementation of Blue Tourism in Karimunjawa. Secondary data include policies and governance of the Karimunjawa National Park, sustainability policies related to ports and tourism, port planning and development data, destination planning data, as well as previous studies and relevant research. These data are further complemented by field observations at ports and tourist destinations, along with interviews conducted with key managing authorities, namely the Karimunjawa National Park Authority, responsible for the management of the national park area, and the Class III Karimunjawa Port Authority, which oversees port operations in the region. The interview questions focused on policy issues related to various aspects of Blue Tourism, including conservation and zoning, environmental protection, tourism development, waste and pollution management, and sustainable port management. The integration of these data sources served as the basis for developing a questionnaire designed to assess key indicators in tourism management, port operations, and regulations related to the Blue Economy, as well as to identify challenges encountered in the field. The overall findings form the foundation for conducting the Regulatory Impact Analysis (RIA).

Additionally, primary data were also obtained through interviews with port users and visitors to Karimunjawa National Park, which were specifically designed to gather in-depth insights into their expectations and experiences. The interview questions were based on the attribute indicators of Blue Tourism implementation as outlined in Table 1. The data from these interviews were analyzed using the Importance--Performance Analysis (IPA) method, aiming to identify gaps between tourists' expectations regarding service attributes and their actual experiences (Halse et al., 2023; Wagner & Olson, 2018). Through this approach, the study generates precise and focused data, supporting the development of evidence-based management strategies to enhance the sustainability of tourism and port operations in Karimunjawa.

## Indicator of Blue Tourism

The Blue Tourism indicators were developed through a comprehensive approach that integrates literature reviews, benchmarking against best practices, and an analysis of regulations and international standards to ensure sustainability in marine resource-based tourism management. These indicators encompass two main contexts: ports and tourist destinations.

For ports, the indicators are based on the Directorate General of Sea Transportation Regulation No. KP-DJPL 689 of 2022 on Guidelines for Environmentally Sustainable Port Management (Ecoport), as well as international standards such as the Green Port Award, the European Sea Ports Organisation (ESPO) Green Guide 2012, and the World Association for Waterborne Transport Infrastructure (PIANC) Sustainable Port Guide. The assessed aspects include air quality management, water quality, energy efficiency, waste management, noise control, community engagement, and habitat protection (Stoica et al., 2022; Varelas & Tsoupros, 2024).

For tourist destinations, the Blue Tourism indicators focus on five key dimensions: economic, socio-cultural, environmental, infrastructure/technology, and governance, aiming to assess tourist satisfaction and the sustainability of tourism management, particularly in the Karimunjawa Islands (Bakri et al., 2023; Mayén Cañavate et al., 2019; Rumiati et al., 2019). These indicators are expected to support the effective and sustainable implementation of Blue Tourism at both local and global levels (Table 1) and serve as the basis for data collection in the Importance-Performance Analysis (IPA).

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

**Table 1.** Attribute Indicator of implementation Blue Tourism

| Attribute | Statement |
|---|---|
| Blue Tourism Implementation in Ports | |
| P 1 | Institutional Development and Ecoport Culture |
| P 2 | Management of Air Quality, Dust, and Odor Levels |
| P 3 | Management of Water Quality and Water Consumption |
| P 4 | Management of Ship Waste and Port Waste |
| P 5 | Management of Energy Consumption and Climate Change |
| P 6 | Management of Dredging Activities, Port Development, and Port Operations |
| P 7 | Management of Bunkering, Hazardous Cargo, and Contaminated Land |
| P 8 | Management of Traffic Flow and Noise |
| P 9 | Management of Relations with Local Communities |
| P 10 | Management of Habitats and Green Open Spaces |
| Blue Tourism pada Destinasi Wisata | |
| Economic Aspects | |
| D 1 | Destination Marketing Techniques |
| D 2 | Pricing of Offered Tourism Packages |
| D 3 | Variety of Available Tourism Activities |
| D 4 | Tourism Facilities and Accommodation |
| Social-Cultural Aspects | |
| D 5 | Attitudes and Behavior of Local Communities at Tourist Destinations |
| D 6 | Festivals and Cultural Events at Tourist Destinations |
| D 7 | Presence of Social Conflicts in Tourism Management |
| Environmental Aspects | |
| D 8 | Ecosystem Conditions of Coastal and Marine Areas |
| D 9 | Regulations and Activities for Environmental Conservation and Protection |
| D 10 | Attractions and Support for Beach/Snorkeling Tourism |
| D 11 | Environmental Education |
| D 12 | Biodiversity Types |
| Infrastructure/Technology Aspects | |
| D 13 | Tourism Facilities and Supporting Services at Tourist Destinations (Hotels, Restaurants) |
| D 14 | Communication Infrastructure |
| D 15 | Electrical Infrastructure |
| D 16 | Transportation Infrastructure |
| D 17 | Payment Technology Choices |
| Government Aspects | |
| D 18 | Government Policies on Tourism |
| D 19 | Government Investment Support |
| D 20 | Government Support for Sustainable Tourism Implementation through Investment (e.g., waste disposal, waste management, public awareness, sanitation, other supporting infrastructure) |

*Source*: own elaboration.

## Data Analysis

### Blue Tourism Regulatory Analysis

The regulatory analysis of Blue Tourism begins with the identification and classification of relevant regulations, encompassing international, national, and local laws related to marine tourism, environmental conservation, and coastal management. Regulations are categorized based on policy levels (international, national, regional) and types (licensing, conservation, investment, operational). Subsequently, regulatory implementation is analyzed using the Regulatory Impact Analysis (RIA) method to assess its effects on environmental sustainability, the tourism economy, and social aspects, such as coastal community participation and tourism accessibility (Kurniawan et al., 2018; OECD, 2020; Putri & Saputra, 2022; Simabura et al., 2023). The evaluation aims to identify policy gaps and implementation barriers through approaches such as legal document analysis, stakeholder surveys, and comparative policy analysis. The findings inform recommendations for policy improvements, including policy harmonization and enhancing regulatory effectiveness in supporting sustainable Blue Tourism.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

## Importance-Performance Analysis (IPA)

The Importance-Performance Analysis (IPA) is employed to assess the implementation of the Blue Tourism concept by mapping the relationship between the importance and performance of relevant attributes at tourism destinations and ports. This analysis aims to identify the gap between tourists' expectations of Blue Tourism attributes and the actual performance of these attributes. The method is crucial for evaluating the sustainability of destination management and port infrastructure in supporting environmentally friendly tourism (Allen et al., 2021; Fahri et al., 2020; Martín et al., 2019).

Through quadrant analysis, consumer responses to attributes are plotted based on their perceived importance and actual performance. Meanwhile, gap analysis is used to measure the discrepancy between an attribute's performance and consumer expectations (Ban et al., 2022; Wang et al., 2019). Performance is rated on a five-point scale with the following weightings:

1. Very good (5 points): Passengers are highly satisfied.
2. Good (4 points): Passengers are satisfied.
3. Fair (3 points): Passengers are moderately satisfied.
4. Poor (2 points): Passengers are dissatisfied.
5. Very poor (1 point): Passengers are highly dissatisfied.

In this study, two variables are represented by X and Y, where X denotes the company's performance level in satisfying customers, while Y represents the level of importance assigned by customers.

$$Tki = \frac{Xi}{Yi} \times 100\% \quad (1)$$

Where:

Tki = Respondent suitability level
Xi = Urban transport performance assessment score
Yi = Passenger importance assessment score

Next, the horizontal axis ($\bar{\bar{X}}$) represents the performance score, while the vertical axis ($\bar{\bar{Y}}$) represents the level of importance. To simplify the formula, each factor influencing customer satisfaction is analyzed using Equation 2.

$$\bar{X} = \frac{\Sigma Xi}{n} \quad \text{and} \quad \bar{Y} = \frac{\Sigma Yi}{n} \quad (2)$$

Where:

$\bar{X}$ = Average weight of the performance assessment for attribute i
$\bar{Y}$ = Average weight of the importance assessment for attribute i
n = Number of respondents

The next step is to calculate the average importance and performance levels for all attributes using Equation 3.

$$\bar{\bar{X}} = \frac{\Sigma \bar{X}i}{n} \quad \text{and} \quad \bar{\bar{Y}} = \frac{\Sigma \bar{Y}i}{n} \quad (3)$$

Where:

$\bar{\bar{X}}$ = Average performance score of the attributes
$\bar{\bar{Y}}$ = Average importance score of the attributes
K = Number of attributes

Subsequently, these elements will be analyzed and divided into four sections within a Cartesian diagram, as illustrated in Fig. 3.

The explanation for each quadrant is as follows:

1. High Importance – Low Performance (high priority)
   This quadrant represents factors or attributes that significantly influence customer satisfaction. These elements are considered highly important by customers, but management has not implemented them according to expectations, resulting in disappointment or dissatisfaction.
2. High Importance – High Performance (keep up the good work)
   This quadrant includes essential service elements that have been successfully implemented by urban transportation providers. These attributes are both highly important and highly satisfying, and thus, their performance must be maintained.
3. Low Importance – Low Performance (low priority)
   This quadrant consists of factors that have little influence on customer satisfaction. The company's implementation of these elements is relatively average, and they are perceived as both less important and less satisfying.

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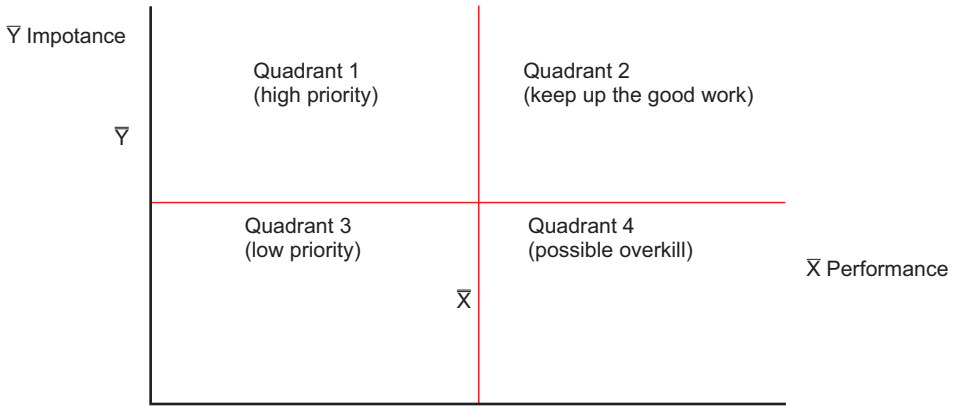



**Fig. 3.** Matrik importance-performance
*Source*: based on (Sever, 2015).

4. Low Importance – High Performance (possible overkill)
   This quadrant includes factors that have little importance to customers, yet their implementation is excessive. These attributes are considered less important but highly satisfying.

### SWOT Analysis

SWOT Analysis is a strategic analytical method used to evaluate internal and external factors influencing the implementation of Blue Tourism. This method consists of four key elements: Strengths, Weaknesses, Opportunities, and Threats. Its primary objective is to provide strategic guidance in understanding the positioning of tourist destinations while supporting sustainability-oriented planning. Through a systematic approach, SWOT Analysis helps maximize strengths and opportunities while minimizing weaknesses and threats in tourism destination management (Hendrati et al., 2024).

This process begins by integrating the results of the Importance-Performance Analysis (IPA), where attributes in Quadrants I and II serve as the primary focus. Data are collected through interviews with tourists and local communities, as well as a review of policy documents and relevant literature (Saragih et al., 2024).

In the context of Blue Tourism, SWOT Analysis provides a comprehensive framework for evaluating tourism destinations. Internal factors include strengths, such as natural resource potential, and weaknesses, such as infrastructure limitations. External factors encompass opportunities, such as government policy support, and threats, such as environmental degradation. The analysis yields strategies categorized into SO (Strength--Opportunities), WO (Weakness-Opportunities), ST (Strength-Threats), and WT (Weakness-Threats), enabling destinations to address challenges and leverage opportunities (Ali et al., 2024).

Furthermore, SWOT Analysis supports the formulation of sustainable strategies, such as marine ecosystem conservation and local community empowerment, aligning with global sustainable tourism trends and blue economy policies (Rindrasih et al., 2024; Satrianto et al., 2023). Thus, SWOT Analysis serves as an essential tool for data-driven strategic decision-making, fostering effective and adaptive tourism destination management.

## DISCUSSION ANALYSIS

### Regulatory Aspects of Blue Tourism in Indonesia and Karimunjawa

Blue Tourism in Indonesia is governed by various regulations aimed at integrating the tourism sector with environmental sustainability principles. These regulations encompass coastal ecosystem protection,

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

marine area management, and the development of eco-friendly tourism infrastructure. As one of Indonesia's premier marine tourism destinations, Karimunjawa has also adopted local policies that align national regulations with regional conditions. Regulations at both national and local levels play a crucial role in maintaining the balance between conservation and the sustainable utilization of marine resources. To provide a comprehensive understanding of regulatory frameworks, Table 2 presents an overview

**Table 2**. Regulatory Aspects of Blue Tourism from Global, National, and Karimunjawa Perspectives

| Aspect | International Regulations | Regulations in Indonesia | Regulations in Karimunjawa |
|---|---|---|---|
| Conservation and Zoning | UNCLOS (United Nations Convention on the Law of the Sea) 1982 | Law No. 32 of 2014 on Marine Affairs | Directorate General of KSDAE Decree No. SK 48/KSDAE/RKK/KSA.0/2/2024 on Karimunjawa National Park Management Zones |
| | – Article 192: States have an obligation to protect and preserve the marine environment. | – Article 5: States that marine area management must consider conservation and sustainability aspects. | Regional Regulation of Jepara Regency No. 2 of 2011 – Zoning utilization of coastal and marine areas for tourism. |
| | – Article 194: Regulates measures to prevent, reduce, and control marine pollution. | – Article 23: Regulates marine area zoning for conservation, tourism, and other activities. | Regional Regulation of Jepara Regency No. 4 of 2023 on the Spatial Planning of Jepara Regency for 2023–2043. |
| | – Article 197: Emphasizes international cooperation in marine resource conservation and management. | Government Regulation No. 32 of 2019 on Marine Spatial Planning | |
| | CBD (Convention on Biological Diversity) 1992 | – Article 6: Establishes zoning for marine conservation areas, including core zones, limited-use zones, and general-use zones. | |
| | – Article 8: Regulates biodiversity conservation, including the establishment of protected areas and zoning. | – Article 7: Regulates zoning allocation for sustainable tourism (blue tourism). | |
| | – Aichi Target 11: Requires at least 10% of marine and coastal areas to be protected through a zoning system. | Minister of Marine Affairs and Fisheries Regulation No. 23 of 2021 on Conservation Area Management | |
| | | – Article 4: Defines marine biodiversity conservation objectives. | |
| | | – Article 10: Regulates conservation area zoning, including core zones, utilization zones, and others. | |
| | | Minister of Tourism and Creative Economy Regulation No. 7 of 2021 on Sustainable Tourism Guidelines | |
| | | – Article 3: Emphasizes sustainability principles in tourism development, including blue tourism. | |

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| Aspect | International Regulations | Regulations in Indonesia | Regulations in Karimunjawa |
|---|---|---|---|
| | | – Article 5: Regulates the integration of conservation and zoning in tourism destination development. | |
| Environmental Protection | UNCLOS 1982 | Law No. 32 of 2009 on Environmental Protection and Management | Central Java Governor Regulation No. 10 of 2017 – Sustainability-based environmental management in Karimunjawa. |
| | – Article 192: Obligates states to protect and preserve the marine environment. | – Article 20: Regulates the obligation to maintain environmental sustainability. | Regional Regulation of Central Java Province No. 4 of 2023 on Environmental Protection and Management. |
| | – Article 194: Regulates measures to prevent, reduce, and control marine pollution from all sources. | – Article 21: Emphasizes the importance of pollution and environmental damage control. | |
| | Agenda 21 (UNCED, 1992) | Government Regulation No. 22 of 2021 on Environmental Protection and Management | |
| | – Chapter 17: Regulates marine and coastal protection, including sustainable marine resource management and pollution prevention. | – Article 59: Regulates the control of marine water pollution. | |
| | Sustainable Development Goals (SDGs) 2015 | – Article 60: Emphasizes the importance of monitoring and evaluating marine environmental quality. | |
| | – Goal 14: "Life Below Water" aims to conserve and sustainably use marine resources. | | |
| Tourism Development | United Nations Sustainable Development Goals (SDGs) 2030 | Law No. 10 of 2009 on Tourism | Strategic Tourism Plan of Karimunjawa – Community-based and conservation-oriented ecotourism development. |
| | – Goal 14: Conservation and sustainable use of marine resources align with blue tourism principles. | – Article 4: States that tourism development must be sustainable, environmentally friendly, and empower communities. | Regional Regulation of Jepara Regency No. 6 of 2018 on the Regional Tourism Development Master Plan 2018–2033. |
| | – Goal 8: Supports sustainable tourism development that creates jobs and economic growth. | – Article 20: Regulates tourism destination development, considering environmental and cultural carrying capacity. | |
| | International Maritime Organization (IMO) – MARPOL Convention | Government Regulation No. 50 of 2011 on the National Tourism Development Master Plan (RIPARNAS) 2010–2025 | |
| | – Regulates marine pollution prevention from ships, relevant to marine tourism activities. | – Article 7: Emphasizes sustainable and community-based marine tourism development. | |

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

| Aspect | International Regulations | Regulations in Indonesia | Regulations in Karimunjawa |
|---|---|---|---|
| Waste and Pollution Management | MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships) | Law No. 18 of 2008 on Waste Management | Regional Regulation of Jepara Regency No. 10 of 2019 on Waste Management in Jepara Regency. |
| | – Annex V: Regulates ship waste disposal, including plastic waste bans. | – Article 20: Requires individuals to reduce and manage waste in an environmentally friendly manner. | Central Java Governor Regulation No. 11 of 2019 on Waste Management Policy and Strategy. |
| | – Annex VI: Regulates ship emissions, including fuel waste and exhaust gases. | – Article 22: Requires tourism area managers to provide waste management facilities. | |
| | UNCLOS (1982) | | |
| | – Article 194: States the obligation of countries to prevent, reduce, and control marine pollution from land-based sources. | | |
| Sustainable Port Management | International Maritime Organization (IMO) – MARPOL 73/78 | Law No. 17 of 2008 on Shipping | Central Java Governor Regulation No. 10 of 2017 – Karimunjawa Port Master Plan with sustainability principles. |
| | – Annex VI: Regulates ship exhaust emissions to reduce environmental impact. | – Article 178: Obligates port operators to maintain environmental sustainability. | Regional Regulation of Central Java Province No. 6 of 2024 on the Long-Term Regional Development Plan 2025–2045. |
| | UNCLOS 1982 | – Article 179: Requires ports to have waste management systems. | |
| | – Article 194: States the obligation to prevent, reduce, and control marine pollution from port activities. | Minister of Transportation Regulation No. 51 of 2015 on Green Ports | |
| | Ballast Water Management Convention (BWM) 2004 | – Regulates sustainable port management standards, including emission reduction and waste management. | |
| | – Regulates ship ballast water management to prevent invasive species spread. | | |

*Source*: own elaboration.

of Blue Tourism regulations from global, national, and Karimunjawa perspectives. This table highlights key policies, their objectives, and their implications for sustainable tourism management.

The regulation of Blue Tourism in Indonesia, including in Karimunjawa, has been comprehensively structured through various legal instruments outlined in the Blue Tourism Regulatory Aspects Table. These regulations encompass conservation, environmental protection, and the sustainable management of marine tourism. International legal frameworks such as the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1992 Convention on Biological Diversity (CBD) have been incorporated into national regulations, including Law No. 32 of 2014 on Maritime Affairs and Government Regulation No. 32 of 2019 on Marine Spatial Planning, which establishes zoning for tourism and conservation purposes (UNCLOS, 1982; CBD, 1992; Law No. 32/2014; Government Regulation No. 32/2019). At the regional level, Jepara Regency

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

Regulation No. 9 of 2018 on Coastal and Marine Zoning Plan (RZWP3K) adapts national policies by delineating core zones, limited-use zones, and other designated areas to align with the ecological carrying capacity of Karimunjawa (Jepara Regulation No. 9/2018).

However, the implementation of these regulations faces challenges due to conflicts between conservation efforts and economic growth. The increasing influx of tourists has intensified pressure on coral reefs and coastal ecosystems, particularly due to uncontrolled snorkeling and diving activities (Satya et al., 2023; Wijaya et al., 2021). Another persistent issue is suboptimal waste management, despite the existence of regulations such as Government Regulation No. 22 of 2021, which mandates marine pollution prevention (Article 26) (Setiyanto et al., 2023). Additionally, overlapping authority among central, regional, and national park management agencies hampers regulatory effectiveness due to weak coordination and oversight (Campbell et al., 2013; Lukman et al., 2022).

To enhance the effectiveness of Blue Tourism governance, policy harmonization between international, national, and local regulations is essential, along with an incentive-based approach for the tourism industry. Comparative studies indicate that countries like Norway have successfully implemented visitor quotas and conservation taxes to sustain marine ecosystems (Gallegati et al., 2025; Gössling et al., 2023). A similar approach could be adapted in Indonesia to balance tourism development with environmental preservation by strengthening technology-based monitoring and enforcing stricter policy reforms (Hermosa Del Vasto & Peñaloza, 2025).

## Result Regulatory Impact Analysis (RIA)

Based on field observations and interviews with Karimunjawa National Park management, port authorities, tourism industry stakeholders, and visitors, a Regulatory Impact Assessment (RIA) was conducted to evaluate the effectiveness of regulations in implementing Blue Tourism in Karimunjawa. This analysis examines the policy impacts on environmental, tourism economic, and social aspects, aiming to identify gaps between the established regulations and their actual implementation on the ground.

### Regulatory Impact on the Environment

Conservation and zoning regulations in Karimunjawa have been implemented through various policies, such as the Coastal and Small Islands Zoning Plan (RZWP3K), aimed at protecting marine and coastal ecosystems. However, several challenges remain in their implementation:

1. Zoning and conservation violations
   Despite the zoning system being in place, tourism activities continue to take place in conservation areas where they are not permitted. Weak enforcement and inadequate monitoring have led to violations, including snorkeling and diving in protected zones.
2. Waste and marine pollution management
   Regulations based on MARPOL and Law No. 18 of 2008 on Waste Management have not been fully effective in reducing marine pollution. The persistent presence of plastic waste in coastal waters indicates that the waste management system requires further optimization.
3. Energy efficiency and eco-friendly technology in ports
   The implementation of Green Port standards in Karimunjawa's port remains limited. Waste management infrastructure for vessels and energy efficiency measures have yet to meet sustainability standards, necessitating further investment in environmentally friendly technology.

### Regulatory Impact on the Tourism Economy

From an economic perspective, policies supporting ecotourism development have positively contributed to increasing tourist arrivals. However, challenges persist in their implementation:

Positive impact on economic growth. The implementation of ecotourism has resulted in a notable annual increase in tourist arrivals, contributing significantly to local economic growth by generating higher incomes for communities involved in the tourism sector.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

1. Regulatory barriers in business licensing
   Bureaucratic hurdles in obtaining business permits remain an obstacle for small and medium enterprises (SMEs). Complex regulations and lengthy licensing procedures hinder investment in sustainable tourism infrastructure.
2. Disparities in facilities and infrastructure
   There is a noticeable gap between the amenities available in major tourist destinations and those in less developed areas. More equitable investment is needed to ensure that economic benefits are distributed across the entire Karimunjawa region.

### Regulatory Impact on Social Aspects

Blue Tourism regulations have also had significant social impacts on local communities, particularly regarding engagement and well-being:

1. Increased community participation
   Policies promoting community-based tourism have enhanced local participation in tourism management, including conservation programs and waste management initiatives.
2. Inequitable economic benefit
   Revenue distribution from the tourism sector remains imbalanced, with larger businesses dominating earnings while small enterprises and local communities receive a smaller share. Fairer regulations are needed to ensure a more equitable distribution of benefits.
3. Limited tourism accessibility
   High transportation and accommodation costs restrict access for domestic tourists from lower-income groups. Subsidy policies or affordable tourism programs could be potential solutions to improve accessibility to Karimunjawa.

## Importance Performance Analysis (IPA) Blue Tourism

Data collection was conducted using an in-depth interview method over a six-month period. The respondents included port users and tourists visiting selected tourist destinations, with a total of 80 participants. Prior to completing the questionnaire, each respondent received a comprehensive explanation of the concept and implementation of Blue Tourism to ensure a uniform understanding of the research context. An analysis of respondent characteristics indicated that 45.00% were male and 55.00% were female. In terms of educational background, the majority of respondents (57.50%) held a D4

**Table 3.** Performance-Importance Appraisal of Blue Tourism Attributes

| Attribute | Performance | Importance | Gap | Conformity Rate (%) |
|---|---|---|---|---|
| P1 | 3,11 | 3,95 | 0,84 | 78,80 |
| P2 | 3,14 | 4,04 | 0,90 | 77,71 |
| P3 | 3,15 | 3,99 | 0,84 | 79,00 |
| P4 | 3,03 | 3,99 | 0,96 | 75,86 |
| P5 | 3,06 | 4,00 | 0,94 | 76,56 |
| P6 | 3,03 | 3,85 | 0,83 | 78,57 |
| P7 | 3,01 | 3,93 | 0,91 | 76,75 |
| P8 | 3,18 | 4,00 | 0,83 | 79,38 |
| P9 | 3,38 | 4,15 | 0,78 | 81,33 |
| P10 | 3,25 | 4,18 | 0,93 | 77,84 |
| D1 | 3,45 | 4,25 | 0,80 | 81,18 |
| D2 | 3,30 | 4,13 | 0,83 | 80,00 |
| D3 | 3,48 | 4,23 | 0,75 | 82,25 |
| D4 | 3,35 | 4,28 | 0,93 | 78,36 |
| D5 | 3,50 | 4,15 | 0,65 | 84,34 |
| D6 | 2,90 | 3,95 | 1,05 | 73,42 |
| D7 | 3,15 | 3,78 | 0,63 | 83,44 |
| D8 | 3,35 | 4,25 | 0,90 | 78,82 |
| D9 | 3,43 | 4,20 | 0,78 | 81,55 |
| D10 | 3,63 | 4,28 | 0,65 | 84,80 |
| D11 | 3,15 | 4,18 | 1,03 | 75,45 |
| D12 | 3,55 | 4,28 | 0,73 | 83,04 |
| D13 | 3,20 | 4,13 | 0,93 | 77,58 |
| D14 | 3,00 | 4,08 | 1,08 | 73,62 |
| D15 | 3,43 | 4,18 | 0,75 | 82,04 |
| D16 | 3,10 | 3,98 | 0,88 | 77,99 |
| D17 | 3,03 | 3,95 | 0,93 | 76,58 |
| D18 | 2,98 | 3,93 | 0,95 | 75,80 |
| D19 | 3,08 | 3,98 | 0,90 | 77,36 |
| D20 | 2,98 | 4,05 | 1,08 | 73,46 |

*Source*: own elaboration.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

or bachelor's degree, while 42.50% were high school or vocational school graduates. The data collected from these interviews were then processed and analyzed to produce findings presented in Table 3.

The Importance-Performance Analysis (IPA) results regarding the implementation of the Blue Tourism concept in tourist destinations and ports in Karimunjawa provide a detailed overview of the gap between tourist expectations and actual performance across various attributes. Certain attributes, such as Habitat Management and Green Open Space (P10) and Environmental Education (D11), exhibit significant performance gaps, with compliance levels of 77.84% and 75.45%, respectively, highlighting the need for improvements in environmental sustainability management. Additionally, attributes such as Ship and Port Waste Management (P4) and Energy and Climate Change Management (P5) also show gaps that require attention to enhance environmental management quality.

Regarding destination facilities, attributes such as Support for Beach Tourism/Snorkeling (D10) and Local Community Attitudes and Behavior (D5) demonstrate the highest compliance levels, at 84.80% and 84.34%, respectively, reflecting tourists' appreciation of the provided tourism experience. However, certain attributes, including Communication Infrastructure (D14) and Government Support for Sustainable Tourism (D20), exhibit the largest gaps, with compliance levels of 73.62% and 73.46%, respectively, indicating the need for improvements in infrastructure support and government policies.

Overall, this analysis highlights strategic priorities for enhancing sustainability, infrastructure, and services, serving as a guideline for more effective and sustainable destination management. The IPA modeling was conducted using IBM SPSS 25 software to generate more structured and accurate results. This modeling process enables a quantitative evaluation of the performance and importance of Blue Tourism attributes, producing a clearer classification within the Cartesian quadrant analysis, as illustrated in Fig. 4.

The IPA modeling has classified the attributes related to Blue Tourism in Karimunjawa into four

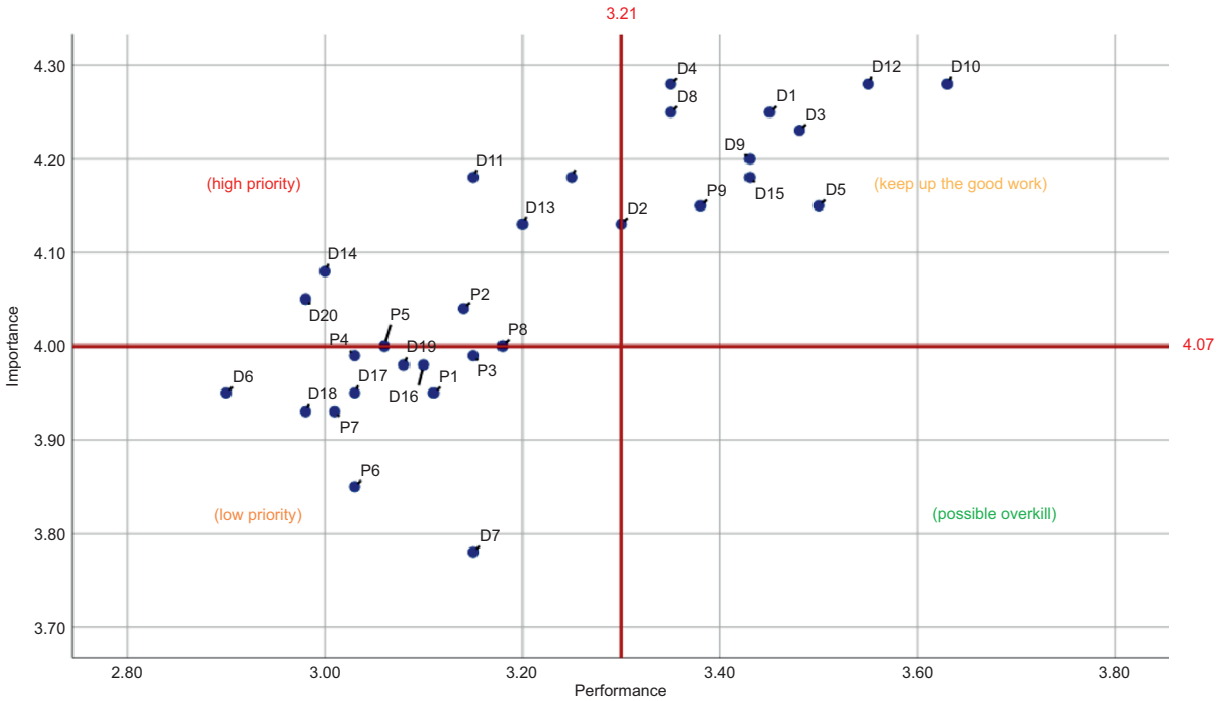



**Fig. 4**. IPA analysis result
*Source*: own elaboration.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

quadrants based on their levels of importance and performance. The first quadrant, High Priority, includes attributes that are considered highly important by tourists but exhibit low performance. These attributes require immediate attention for improvement. Management of Air Quality, Dust, and Odor Levels (P2) highlights the need for better air quality management at the port, with a gap of 0.90 and a conformity rate of 77.71%. Management of Habitats and Green Open Spaces (P10) requires measures to preserve habitats and green spaces, with a gap of 0.93 and a conformity rate of 77.84%. Additionally, Environmental Education (D11) has a gap of 1.03 and a conformity rate of 75.45%, reflecting the need for enhanced environmental education initiatives. Tourism Facilities and Supporting Services at Tourist Destinations (D13) and Communication Infrastructure (D14), with gaps of 0.93 and 1.08, respectively, indicate the necessity of improving tourism support facilities and communication infrastructure. Government Support for Sustainable Tourism Implementation (D20), with a gap of 1.08 and a conformity rate of 73.46%, underscores the need for increased government investment in sustainability efforts.

The second quadrant, Keep Up the Good Work, consists of attributes with high importance and good performance, which should be maintained. Institutional Development and Ecoport Culture (P1) reflect well-managed institutional development and ecoport culture, with a conformity rate of 78.80%. Management of Water Quality and Water Consumption (P3) also falls into this quadrant, indicating relatively good water quality management with a conformity rate of 79.00%. Management of Traffic Flow and Noise (P8), with a gap of 0.83 and a conformity rate of 79.38%, demonstrates successful traffic and noise management at the port area. Other attributes, such as Festivals and Cultural Events at Tourist Destinations (D6) and Presence of Social Conflicts in Tourism Management (D7), highlight efforts in cultural and social management that support sustainable tourism.

The third quadrant, Low Priority, includes attributes with lower importance but adequate performance, making them a secondary focus for resource allocation. These attributes include Destination Marketing Techniques (D1), which shows that the destination's marketing strategies are already effective, with a conformity rate of 81.18%. Pricing of Offered Tourism Packages (D2) and Attractions and Support for Beach/Snorkeling Tourism (D10), with conformity rates of 80.00% and 84.80%, respectively, indicate that the appeal of beach and snorkeling tourism meets tourist expectations. Attributes such as Ecosystem Conditions of Coastal and Marine Areas (D8) and Biodiversity Types (D12) also fall within this category, reflecting sufficient environmental management efforts despite not being a top priority.

In this analysis, no attributes fall into the fourth quadrant, Possible Overkill, indicating that no aspect of management is perceived as having excessive performance relative to its importance. This suggests an efficient resource management strategy that supports the effective implementation of Blue Tourism in Karimunjawa.

## Strategic Recommendations Based on SWOT Analysis

Based on the analysis of regulatory aspects of Blue Tourism in Indonesia and Karimunjawa, the results of the RIA and IPA indicate that attributes falling into the High Priority quadrant require special attention due to their high level of importance but relatively low actual performance. Using the SWOT analysis approach, strategic recommendations are formulated to address weaknesses, leverage strengths and opportunities, and anticipate potential threats in the management of Blue Tourism in Karimunjawa.

Based on the SWOT analysis, the following strategic recommendations are designed to address weaknesses, leverage strengths and opportunities, and mitigate threats to optimize Blue Tourism in Karimunjawa:

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

**Table 4**. SWOT Analysis of Blue Tourism

| Strengths | Weaknesses |
|---|---|
| 1. Rich Marine Biodiversity: Karimunjawa has a diverse marine ecosystem, including coral reefs, mangrove forests, and seagrass beds, which serve as major tourist attractions and hold high ecological value. | 1. Regulatory and Authority Overlap: Lack of coordination between central and local governments, as well as national park management, leads to ineffective policy implementation. |
| 2. Growth in Ecotourism: The implementation of ecotourism concepts has contributed to an increase in tourist arrivals by up to 15% per year, directly supporting local economic growth. | 2. Suboptimal Waste and Garbage Management: Inadequate waste management infrastructure in tourist areas results in marine pollution and poses threats to coastal ecosystems. |
| 3. Community Participation in Tourism Management: Community-based policies have increased local involvement in natural resource conservation and waste management. | 3. Weak Law Enforcement on Conservation Zoning: Tourism activities still violate conservation zoning due to weak monitoring and lack of strict sanctions. |
| 4. Established Conservation Zoning Regulations: Regulations such as the Marine Spatial Plan (RZWP3K) have been implemented to regulate tourism activities and preserve marine ecosystems. | 4. Unequal Tourism Infrastructure: Tourism facilities are not evenly distributed, with infrastructure development focusing more on major destinations than other areas in Karimunjawa. |
| 5. Potential for Environmentally Friendly Technology Development: The implementation of Green Port concepts and sustainable tourism infrastructure can improve energy efficiency and waste management. | 5. Limited Incentives for Sustainable Tourism Industry: The lack of economic incentives such as conservation taxes and subsidies results in low adoption of eco-friendly tourism practices by industry players. |
| **Opportunities** | **Threats** |
| 1. Global Trends Supporting Sustainable Tourism: Growing tourist awareness of ecotourism presents opportunities for developing the Blue Tourism concept in Karimunjawa. | 1. Ecosystem Pressure Due to Over-Tourism: An increase in tourist numbers without sustainable management could lead to ecosystem degradation, particularly coral reefs. |
| 2. Potential for Educational and Conservation Tourism Development: The lack of environmental education programs in tourism presents an opportunity to develop conservation and ecological education-based tourism. | 2. Climate Change and Rising Sea Levels: Climate change effects such as coral bleaching and rising sea levels pose threats to the attractiveness of tourism in Karimunjawa. |
| 3. Investment in Environmentally Friendly Infrastructure and Technology: Increased investment in waste treatment technology and energy efficiency can support the sustainability of tourism. | 3. Competition with Other Tourist Destinations: Other destinations adopting similar concepts could reduce Karimunjawa's competitiveness in the global tourism market. |
| 4. Government Subsidy or Incentive Policies: Regulations providing economic incentives can encourage tourism industry players to adopt sustainable practices in their operations. | 4. Economic Benefit Disparities: The dominance of large enterprises in the tourism industry may hinder the growth of small and medium-sized businesses and reduce local community welfare. |
| 5. Improved Transportation Accessibility and Digital Infrastructure: Development of transportation and communication infrastructure will enhance Karimunjawa's appeal to both domestic and international tourists. | 5. Complex Licensing Regulations: Lengthy and bureaucratic licensing processes remain a major obstacle for small and medium-sized enterprises in developing sustainable tourism businesses. |

*Source*: own elaboration.

## S-O Strategy (Strengths – Opportunities): Leveraging Strengths to Seize Opportunities

This strategy aims to maximize Karimunjawa's advantages in capturing the potential for sustainable marine tourism growth. The proposed strategic actions include:

1. Strengthening the concept of sustainable ecotourism can be done through the development of conservation-based tourism programs that actively involve local communities and tourists in efforts to preserve coral reefs, mangroves, and other coastal ecosystems, as well as increasing the implementation of science-based conservation zoning regulations

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

to balance tourism activities and ecosystem sustainability.
2. Detailed improvements to environmentally friendly tourism infrastructure can be carried out through the method of developing tourism infrastructure that uses renewable energy sources, such as solar panels, and increasing the efficiency of waste management and encouraging the development of Green Ports as centers for sustainable and environmentally friendly tourism activities.
3. Optimizing branding and digital marketing by utilizing digital marketing strategies and social media platforms to increase the attractiveness of Karimunjawa as a leading blue tourism destination and utilizing global trends in ecotourism and sustainable tourism as a competitive advantage to attract international visitors.

### W-O Strategy (Weaknesses – Opportunities): Addressing Weaknesses by Leveraging Opportunities

This strategy seeks to eliminate weaknesses in Blue Tourism management by making use of available opportunities. Key actions include:
1. Reform the governance and regulatory framework by developing coordination mechanisms between the central government, local governments, and national park managers to reduce overlapping policies and jurisdictions and simplify business licensing regulations for local small and medium enterprises (SMEs) to encourage greater participation in the tourism sector.
2. Improving waste management infrastructure by building integrated waste processing facilities through public and private sector investment and encouraging the implementation of incentive policies for tourism business actors who implement sustainable waste management practices.

Ensure equitable tourism development by expanding tourism infrastructure and facilities in underdeveloped areas to reduce the accessibility gap in Karimunjawa and strengthen transportation networks and digital infrastructure to improve connectivity for domestic and international tourists.

### S-T Strategy (Strengths – Threats): Utilizing Strengths to Overcome Threats

This strategy ensures that Karimunjawa's strengths are effectively employed to counter external threats. The recommended measures include:
1. Managing tourist capacity to prevent overtourism by setting visitor quotas based on environmental carrying capacity to prevent marine ecosystem degradation and implementing an online reservation system to regulate the number of visitors and support structured tourism planning.
2. Marine ecosystem conservation for climate change mitigation with coastal ecosystem rehabilitation programs, such as coral reef restoration and mangrove reforestation, to increase resilience to the impacts of climate change and advance scientific research on the adaptation of marine ecosystems to global warming.
3. Increasing Karimunjawa's competitiveness in the global market by strengthening sustainability-based tourism service standards to be able to compete with other marine tourism destinations and establishing international partnerships in ecotourism management and environmental conservation to increase Karimunjawa's visibility in the global market.

### W-T Strategy (Weaknesses – Threats): Minimizing Weaknesses and Avoiding Threats

This strategy aims to mitigate the impact of internal weaknesses that may exacerbate external threats. Key strategic recommendations include:
1. Increasing monitoring and law enforcement capacity and strengthening supervision of illegal tourism activities in conservation areas by using monitoring technology such as GIS and drones and optimizing law enforcement by imposing stricter sanctions on tourism operators who violate conservation provisions.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

2. Diversify tourism products to reduce environmental pressure by developing digital experience-based tourism, such as virtual underwater tourism, to offer recreational alternatives without damaging marine ecosystems and promoting culture-based tourism and local wisdom to reduce dependence on resource-intensive tourism activities.
3. Promote local economic balance by providing economic incentives for local businesses to increase their competitiveness in the sustainable tourism industry and ensure fair distribution of tourism-related economic benefits to prevent domination by large companies.

## CONCLUSION

Based on a comprehensive analysis of the implementation of Blue Tourism in Karimunjawa, this study reveals significant discrepancies between tourists' expectations and the actual performance of tourism destinations and supporting ports. Utilizing the Importance-Performance Analysis (IPA), Regulatory Impact Analysis (RIA), and SWOT analysis frameworks, this research identifies key areas requiring strategic improvements to ensure the effective and inclusive sustainability of marine tourism.

The findings highlight critical performance gaps in key attributes, notably environmental education (gap: 1.03), communication infrastructure (gap: 1.08), and government support for sustainable tourism (gap: 1.08). While certain strengths are evident – such as water quality management (conformity rate: 79%) and local community engagement (81.33%) deficiencies persist in the management of habitats and green open spaces (gap: 0.93) and waste handling in ports and vessels (gap: 0.96). These issues underscore the necessity for strategic interventions through the adoption of environmentally friendly technologies and enhanced community involvement in marine ecosystem conservation.

From a regulatory standpoint, although various global to local legal instruments are in place, their implementation is impeded by overlapping authorities and weak law enforcement. RIA results indicate that tourism activities continue in protected zones, reflecting inadequate monitoring and a lack of punitive measures. Consequently, policy harmonization across governance levels and the application of performance-based incentives for tourism industry stakeholders are critical for strengthening policy execution.

SWOT analysis suggests substantial opportunities for Karimunjawa to leverage global trends in sustainable tourism, investment in green infrastructure, and the development of conservation-oriented tourism education. However, external threats – such as ecosystem degradation from overtourism, climate change impacts, and disparities in tourism accessibility – necessitate data-driven and science-based policy responses. SO strategies, including the enhancement of eco-friendly infrastructure and promotion of educational tourism, can help bolster Karimunjawa's competitiveness. Conversely, WT strategies such as diversifying digital tourism products and enforcing regulations through technological surveillance are crucial to mitigate structural weaknesses and environmental threats.

While this study contributes significantly to the development of an evidence-based evaluation framework for coastal tourism management, it is constrained by a limited geographic scope and sample size. Additionally, external variables, such as seasonal environmental carrying capacity, have not been fully integrated into the analysis. Future research should expand the study area, employ GIS-based environmental monitoring and IoT sensor technology, and explore policy strategies involving economic incentives to reinforce Blue Tourism implementation. The integration of carrying capacity models with machine learning approaches also holds promise for adaptive and sustainable marine tourism governance.

Through a multidisciplinary approach and robust empirical data, this study provides a substantive contribution to the formulation of a replicable model for Blue Tourism implementation, enhancing the competitiveness and resilience of coastal tourism destinations in Indonesia and the broader Southeast Asian region.

✉ibnu007@brin.go.id, ✉mari016@brin.go.id

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✉ibnu007@brin.go.id, ✉mari016@brin.go.id

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✉ibnu007@brin.go.id, ✉mari016@brin.go.id