

Original Article

Development Strategy for Marine Tourism Transportation in the Spermonde Islands Region (Case Study in Pangkep, South Sulawesi)

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Abstract - Pangkajene and Islands Regency has great potential in the marine tourism sector, especially in the island clusters in the L. Tupabbiring, L. Tupabbiring Utara, L. Kalmas, and L. Tangaya areas. However, the development of tourism in this region still faces obstacles due to the low performance of sea transportation. This research aims to assess the actual condition of the sea transportation system in supporting the connectivity and accessibility of island tourist destinations. The research method is descriptive, qualitative, and quantitative, through the application of IPA analysis to map improvements prioritized based on the level of importance and performance of marine tourism transportation indicators. Furthermore, a SWOT analysis was conducted to develop a development strategy based on strengths, weaknesses, opportunities, and threats. The variables analyzed included aspects of accessibility, connectivity, cruise schedules, service reliability, port infrastructure, and support for tourism activities. The results of the study show that limited port infrastructure, irregular shipping schedules, and the lack of integration of the inter-island transportation network are obstacles to mobility for the community and tourists. Therefore, an inclusive and planned marine transportation development strategy is needed to improve regional connectivity and encourage the growth of marine tourism in the islands of Pangkajene and Islands Regency.

Keywords - Sea Transportation, Islands Tourism, Accessibility, Connectivity, SWOT.

1. Introduction

Indonesia is an archipelago with 17,504 islands and a coastline of approximately 99,093 km² (Central Statistics Agency of Pangkajene and Islands Regency in 2024). With geographical characteristics dominated by water, the total area of water is estimated at around 5.8 million km², which means around 71% of the total area [1]. This geographical characteristic makes sea transportation the main mode that plays a strategic role in connecting separate areas, especially areas that do not have access to land transportation [2, 3]. Therefore, the existence of an effective, efficient, and reliable maritime transportation system is crucial in supporting population mobility and encouraging the growth of economic sectors, including tourism as one of the leading sectors of national development [4]. In the context of archipelagic development, maritime connectivity is not only a basic need but also the main foundation for integrating the region and expanding access to new sources of economic growth, such as ecotourism and marine tourism [5]. Coastal and marine areas constitute a large segment of the maritime economy, as well as the largest component of the tourism industry [6].

The success of tourism destination development is highly dependent on the transportation system, which is

closely related to regional transportation infrastructure and territorial accessibility [7-10]. In addition, accessibility to tourist destinations can be improved through transportation network connectivity and tourist facilities [11]. Transportation options are a key element in the decision-making process of tourists [12, 13]. Several studies show the impact of transportation on tourism development; in China, high-speed rail has had a major impact on tourism development and tourist flows [14]. In China, the accessibility of the high-speed rail network drives domestic tourism revenue and the number of domestic tourists [8]. The results of the study by [15] show the degree of correlation between railway accessibility and tourism economic connections.

In the context of island regions, an efficient, safe, comfortable, and affordable maritime transportation system is a key prerequisite for promoting inclusive and sustainable tourism, as outlined by the [16, 17]. and observed in the context of island tourism development in Bali [18] Reliable maritime transportation and quality port infrastructure play a central role in ensuring the smooth movement of tourists and inter-island logistics. Limitations in sailing frequency, lack of route integration, schedule uncertainty, and inadequate infrastructure are the main



obstacles to the growth of a sustainable maritime tourism sector [19- 21].

Issues such as the distance between islands, limited transportation fleets, inconsistent sailing schedules, and inadequate port facilities hinder the mobility of tourists and the community [5]. This situation has implications for low tourist visitation rates and limited participation of local communities in tourism activities [22]. In addition, the lack of integration between transportation information systems and tourism destination promotion also exacerbates disparities in access and distribution of tourists between islands [23].

Pangkajene Regency is strategically located close to Makassar City, the center of regional growth. It has complex and distinctive geographical characteristics, known as a “three-dimensional” area because it includes mountainous areas in the east, lowlands in the center, and a group of islands on the west side scattered across the Makassar Strait. Its land area is approximately 1,112 km², while its maritime area covers a much larger area, with a coastline of 250 km. The diversity of landforms creates a differentiation of tourism potential, ranging from land-based nature tourism, such as mountains, waterfalls, and karst caves, to marine tourism in the archipelago. The archipelago region of Pangkajene and Islands Regency consists of 115 islands located in four subdistricts, namely L. Tupabbiring, North L. Tupabbiring, L. Kalukuang Masalima (Kalmas), and L. Tangaya. Of these islands, 73 are inhabited, while the rest are uninhabited. The islands are spread over a vast area, from coastal areas close to the mainland to outer islands such as Sailus and Sapuka, which are more than 150 km away and can only be accessed by an 8-10 hour sea journey. The physical characteristics of the islands vary greatly, ranging from densely populated islands with coastal settlements to small islands based on coral ecosystems, which are widely used for fishing and marine tourism activities. These geographical conditions enable the development of the marine tourism sector, but are highly dependent on improvements in the performance of the maritime transportation system [17, 24].

Maritime transportation services in Pangkajene and Kepulauan Regency are currently still very poor in terms of accessibility, service frequency, and safety standards. This poses a significant obstacle to the development of tourism in Pangkajene and Kepulauan Regency. Therefore, inclusive maritime transportation planning that is adaptive to the characteristics of the region and involves the participation of the local community is key to realizing connectivity that supports sustainable tourism growth.

Based on the Final Report of the Marine Transportation and Tourism Accessibility Master Plan by the Pangkajene and Islands Regional Development Planning Agency in 2022. The focus of sea transportation development so far has been more directed at meeting logistical needs and basic mobility of the population, while aspects of tourism connectivity are still neglected [24]. Several previous studies related to the existence of a sea

transportation system in the Pangkajene and Islands Regency area but focused more on safety conditions [25, 26]. Research by [27] on maritime transport network patterns in supporting economic development and opening up isolated communities. [28] Discuss the performance of pioneer ships in connecting remote areas with economic centers. Research by [29] analyzed the needs of the sea transportation fleet in Liukan Tangayya and Liukang Kalmas sub-districts. Research by [30] analyzed the performance of sea transportation network services in Liukang Tupabbiring sub-district. [31] .The study identifies and provides an overview of the development of sea transportation services for the community in Pangkep Regency, especially those in the archipelago. Until now, there has been no systematic study that evaluates the performance of the sea transportation network in the Islands Cluster area of Pangkajene and Islands Regency in supporting the tourism sector. Lack of attention to the performance aspects of the transportation network within the framework of tourism development has the potential to hinder local governments’ vision for encouraging regional economic growth based on local potential [32].

In light of these problems, this research focuses on evaluating the performance of the maritime transportation network in Pangkajene Regency and the Islands in the context of tourism sector development. The evaluation focuses on affordability, operational efficiency, spatial connectivity between islands, and the quality of transportation services for tourists. The results of this research are expected to contribute academically and practically, both in the preparation of transportation policies and strategic planning for the development of marine tourism destinations in the islands in a more targeted and sustainable manner. The performance of the marine transportation network is not only about providing physical infrastructure, but also serves as a strategic instrument in accelerating the transformation of coastal areas and small islands into competitive economic growth centers [33].

2. Research Methods

The analysis method used is quantitative to analyze the performance of the sea transportation network in Pangkajene and the Islands in supporting tourism sector activities. Primary data collection was conducted by distributing questionnaires to a sample of 100 respondents, comprising service users, regulators, ship owners, tourism operators, and tourists. Sample selection was conducted using purposive sampling, and the criteria scores are shown in Table 1.

Table 1. Assessment criteria

Criteria	Score
Very important	5
Important	4
Moderately important	3
Less important	2
Not important	1

Secondary data from the Central Statistics Agency, Spatial Plan for Pangkep Regency, and the Pangkep Regency Youth and Sports Agency. Performance and importance assessments were based on respondents' perceptions of 30 variables representing six main indicators, namely accessibility, connectivity, shipping frequency, service reliability, port infrastructure, and support for tourism. The data analysis process used Importance Performance Analysis (IPA), followed by SWOT analysis. The IPA analysis was conducted by mapping the existing conditions of sea transportation in Pangkajene Regency and the Islands and assessing the suitability of the needs for developing the marine tourism sector in the region. Subsequently, a SWOT analysis was conducted to determine the strategy for the Development of Marine Tourism Transportation in the Spermonde Islands Region in Pangkep.

3. Discussion

3.1. Tourism Potential in the Island Cluster Area in Pangkajene and Islands Regency

Island regions often possess natural and cultural wealth that can attract domestic and international tourists, but their geographical remoteness often presents significant challenges, particularly in terms of accessibility and connectivity [10].

The tourism industry is one of the sectors that can be developed as a basic tool in accelerating development in small island clusters, and tourism is a powerful tool in alleviating poverty [33, 34]. Marine and coastal tourism is one of the dominant sectors in many marine economies, and the number of people employed [35]. Tourism is an

important business in contemporary developing societies and is an engine of economic growth and development, generating important values for many stakeholders around the world [36, 37].

Pangkajene and Islands Regency is an area that needs to prioritize the tourism sector as the main sector. Based on the 2018 Regional Tourism Development Master Plan, this region has a vision of "Pangkajene & Kepulauan Regency Tourism based on marine tourism and ecotourism that is competitive and has a global perspective by 2025". Pangkajene Regency has tourism potential that can have a positive impact on sustainable economic, social, and cultural development. Based on the Regent's decree in 2019, this area has 68 tourist objects that include marine, agro-tourism, river, cultural, religious, natural, and culinary tourism. These tourist attractions demonstrate the potential of natural and cultural riches. If properly managed, they can boost the economy and preserve the environment and cultural heritage. With proper development and promotion, the tourism sector is expected to improve community welfare and strengthen local cultural identity.

The distribution of tourism objects in Pangkajene and Islands Regency is 27 objects, and 24 objects are marine tourism spread in Liukang Tupabbiring Utara District (7 objects), Liukang Tupabbiring (15 objects), and Liukang Kalmas (2 objects). Furthermore, cultural tourism totals 3 objects, each with 2 objects in North Liukang Tupabbiring Sub-district and 1 object in Liukang Kalmas. Meanwhile, artificial tourism is not recorded in the islands. Table 2 below shows a number of tourism objects owned by Pangkajene and Islands Regency.

Table 2. Tourism attraction objects of Pangkep Regency, Spermonde Islands region

Tourist Attractions	Attractions
Liukang Tupabbiring Utara district	
Cambang-Cambang Island	Snorkeling, diving, white sand beach, and coral reef view
Saugi Island	Fishing, snorkeling, marine tourism, and nature photo spots
Samatellu Pedda Island	Nalayan village, culinary tour, snorkeling
Bana-Banawang Island	White sand beach, coral reef, sunset view
Reang-Reang Island	Fishing spots, underwater tourism, and mangrove ecotourism
Salemo Island	Beach tourism, fishing village, snorkeling
Sabutung Island	Diving, snorkeling, and marine education tours
Puang Awali's Grave	<i>local figures</i>
Liukang Tupabbiring	
Meriam	Historical tourism, colonial heritage, photo spot
Kapoposang Island	Diving, camping area, turtle conservation, and fishing
Saranti Island	White sand beach, snorkeling, nature photo spots
Pammanggangan Island	Maritime tourism, fishing village, fishing
Langkadea Island	Snorkeling, diving, and underwater photography
Badi Island	Diving, snorkeling, and culinary tours
Pajenekang Island	White sand beach, family tourism, snorkeling
Cangke Island	Diving, fishing spots, and island hopping
Tambakulu Island	Beach, snorkeling, boat tours
Podang-Podang Island	Sunset spot, white sand beach, snorkeling
Kulambing Island	Natural beach, fishing, and marine tourism
Pannambungan Island	Diving, snorkeling, and nature photography

Bonto Sua Island	White sand beach, marine tourism
Balang Lompo Island	Spot diving, snorkeling, and marine education tours
Panambungan Island	Diving, camping area, beach tourism
Pajenekang Isand	White sand beach, snorkeling
Liukang Kalmas District	
Pulau Kalukalukuang Island	Beach, snorkeling, marine tourism
Pulau Pamantauang Island	Fishing, marine tourism, fishing village
Lipang Marasende's Grave	Religious tourism, pilgrimage, and local historical heritage

Source: Spatial Planning Plan for Pangkajene and Kepulauan Regency for the period 2022-2042

The potential for natural and marine tourism in Pangkajene and Islands Regency is reflected in the diversity of landscapes and the richness of coastal and marine ecosystems. Islands such as Kapoposang, Badi, Balang Lompo, and Cambang-Cambang are leading

destinations with high marine tourism potential, such as snorkeling, diving, and coastal tourism. This concentration of tourist attractions in the archipelago shows that the island group plays an important role in the development of the regional tourism sector.

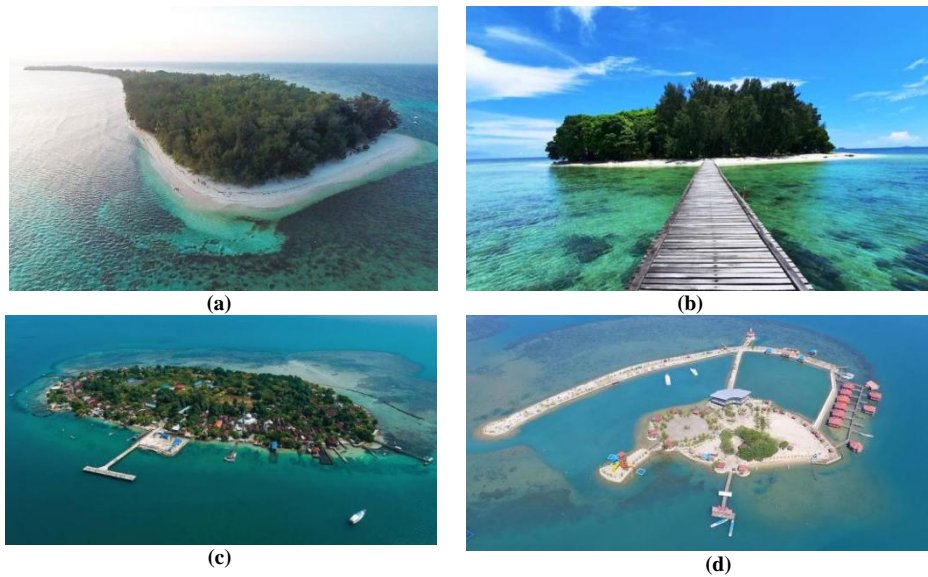


Fig. 1 (a) Kapoposang island, (b) Panambungan island, (c) Sabutung island, and (d) Cambang-cambang island. Source: Tourism, Youth and Sports Office of Pangkajene and Islands Regency, 2025

Table 3. Domestic and foreign tourist visits

Year	Domestic Tourists	Foreign Tourists	Average Length of Stay
	Number	Number	
2018	59,704	31	1
2019	34,970	75	3
2020	11,540	10	2
2021	14,590	0	1,22
2022	42,413	6	1,8

Sources: 1) Pangkajene and Kepulauan Regency Youth and Sports Office, 2024; 2) Pangkajene and Kepulauan Regency Youth and Sports Office (2024); and 3) Pangkajene and Kepulauan Regency Tourist Visit Statistics Report 2018–2022

Despite having a number of tourist attractions, the level of tourist visits over the past five years still shows fluctuating figures and is dominated by domestic tourists. The contribution of foreign tourists is very low, with an

average length of stay that tends to be short, thus indicating that the utilization of tourism potential is not yet fully optimal. Data on tourist visits to Pangkajene and Islands Regency in the period 2018 to 2022, as in Table 3.

Data on tourist visits in 2018-2022 shows the dominance of domestic tourists reaching above 99% each year, while foreign tourists are very minimal. The number of tourist visits declined in 2020 due to the COVID-19 pandemic, which caused tourism sector activities to be completely stopped. The average length of stay of tourists is relatively short, ranging from 1-3 days. In 2019, the average length of stay was the highest, with a total of 3 days, and a decline in subsequent years.

One of the obstacles is accessibility to the islands. Although it is still very dependent on the availability and reliability of the sea transportation system, limited routes, erratic shipping schedules, and inadequate dock infrastructure are the main obstacles in reaching these destinations.

3.2. Existing Conditions of the Marine Transportation System

Tourism is closely related to regional transportation tools and infrastructure, and territorial accessibility. Tourist destinations that do not have efficient and sustainable transportation systems are a real problem [9]. Accessibility and security infrastructure are identified as essential in shaping the image of tourist destinations [38]. Increased tourist visits can be achieved through the development of networks, transportation infrastructure, and tourism facilities [11].

The shipping system that operates is divided into two main types, namely traditional shipping transportation 'Pelra' and National shipping service (Pelnas). Most Pelra transportation is operated by local actors using small to medium-sized vessels that have flexible service characteristics but do not operate on a fixed schedule. In contrast, Pelnas fleets such as KM Sabuk Nusantara vessels serve official routes with low cruise frequency and are limited to certain routes on a weekly basis (Pangkep Regency Transportation Agency in 2023).

The movement of the fleet of ships from the mainland of Pangkajene and the Islands mostly serves the areas of Liukang Tupabbiring and North Liukang Tupabbiring. There are 21 fleets that regularly serve the Pangkajene - Liukang Tupabbiring District route with a capacity of 1 - 4 GT, serving Balang Lompo Island, Lamputang Island, Sarappo Caddi Island, Pandang-pandang Island, and Podang Podang Island. North Liukang Tupabbiring District is served by 27 regular vessels with a capacity of 1-2 GT, traveling to Kulambing Island, Karanrang Island, Laiya Island, Samatelu Island, Sapuli Island, Saogi Island,

Salemo Island, Satando Island, and Camba Cambang Island [31]. For other islands that are tourist destinations not served by regular vessels, visitors can use traditional boats on a charter basis.

The current maritime transportation system is unable to reach all parts of the archipelago effectively and efficiently. Inter-island connectivity is also not yet systematically integrated because many shipping routes only serve one-way return routes without considering the need for inter-island connectivity and synchronization between routes (Pangkep Torism Board in 2024). This is further exacerbated by the west monsoon season with bad weather that poses a risk to the continuity of voyages [31]. In addition, irregular sailing schedules and low safety standards for small boats pose a risk to service users and reduce the reliability of sea transportation services in Pangkajene and Kepulauan Regency, especially in supporting tourism. The lack of sea transportation services specifically designed to support tourism activities also limits the participation of local communities in the service and tourism sectors and hinders inter-island logistics distribution (Pangkep Regency Torism Office in 2024).

In terms of infrastructure, most of the docks on the islands are temporary, made of wooden materials that are easily damaged and are not equipped with supporting facilities such as adequate waiting rooms, lighting, or information boards for ship departure schedules. Maccini Baji Port on the mainland is an exception with relatively decent facilities and functions as the main collecting port (Report of the South Sulawesi Province Transportation Service in 2023).



(a)



(b)



(c)



(d)

Fig. 2 (a) Sailus harbor, (b) Bawasalo Kalukue pier, (c) Pangkajene pier, and (d) Jennae dock.

Source: Media daring, dokumentasi pribadi, 20024

Figure 2 above shows the actual condition of ports and jetties in Pangkajene and the islands, ranging from managed main ports to simple wooden jetties that are severely damaged. The different conditions indicate the need for policy intervention and infrastructure strengthening to ensure equitable access to sea transportation that is safe, efficient, and supports sustainable tourism growth.

The lack of sea transportation services specifically directed to support tourism activities also limits the participation of local communities in the service and tourism sectors, and hampers inter-island logistics distribution (Report of the Pangkep Regency Tourism Office in 2024).

Thus, the current state of the maritime transportation system is unable to optimally meet the connectivity needs of the islands, both for the daily mobility of the community and for the development of a sustainable maritime tourism sector.

3.3. Performance Evaluation of the Marine Transportation System

3.3.1. Measurement of Performance and Importance of the Marine Transportation Network

Measurement of performance and importance to assess the extent to which the marine transportation system in the Pangkajene Islands cluster is able to meet user needs, and the extent to which the marine transportation network is considered important by users, especially in the context of marine tourism development in the Pangkajene Islands cluster. To measure the performance of maritime transportation services with service users and crew members using IPA [39]. The data from the Measurement of the level of importance will be combined with the results of performance measurement in the Importance Performance Analysis (IPA) analysis, so that priority aspects that require improvement, aspects that need to be maintained, and areas that can be allocated resources efficiently for the development of marine transportation that supports sustainable tourism can be identified. The evaluation of performance and the importance of the maritime transportation system is shown in Table 4.

Table 4. Sea transportation system in Pangkajene and the Islands

Indicators	Code	Performance		Importance	
		Total	Average	Total	Average
Ease of object reach	P1	427	4,27	446	4,46
Port of origin & destination	P2	408	4,08	438	4,38
Cruise distance	P3	428	4,28	452	4,52
Mode of transportation used	P4	349	3,49	368	3,68
Availability of facilities to achieve the goal	P5	246	2,46	322	3,22
Connectivity between ports	P6	279	2,79	415	4,15
Ship services (National shipping, traditional shipping)	P7	418	4,18	429	4,29
Transit port	P8	246	2,46	460	4,6
Time and cost	P9	375	3,75	464	4,64
Service frequency	P10	288	2,88	380	3,8
Low service (regular & non-regular)	P11	330	3,3	290	2,9
Operating system	P12	322	3,22	388	3,88
Weather/nature conditions	P13	358	3,58	450	4,5
National Service/Frequency	P14	371	3,71	392	3,92
Dependence on passengers	P15	212	2,12	330	3,3
Level of ease to arrive at tourist attractions	P16	242	2,42	328	3,28
Safety standards	P17	156	1,56	310	3,1
Facility/SBNP	P18	170	1,7	314	3,14
Supervision SOP	P19	392	3,92	312	3,12
Fleet safety level	P20	119	1,19	344	3,44
Port standard	P21	402	4,02	447	4,47
Port safety	P22	391	3,91	455	4,55
Public areas & public facilities	P23	401	4,01	452	4,52
Waiting room	P24	392	3,92	439	4,39
Port construction	P25	383	3,83	451	4,51
Tourism transportation concept	P26	394	3,94	440	4,4
Tourist-only ship	P27	399	3,99	448	4,48

Services to tourist destinations	P28	404	4,04	443	4,43
Information system	P29	394	3,94	449	4,49
Development efforts	P30	404	4,04	449	4,49

Source: results of data analysis, 2025

After the assessment of the level of performance and importance, calculate the score by taking the average level of conformity, which amounted to 79.35. This score is then compared with the suitability level of each attribute, and if the suitability level value is <79.35, then that attribute

needs improvement (Action). Conversely, if the suitability level value is >79.35, then that attribute needs to be maintained (Hold). Table 5 below presents the details of the suitability level results.

Table 5. Level of conformity of performance and importance

Code	Total score		Suitability (%)	Decision Score	Hold/action
	Xi	Yi			
P1	4.27	4.46	95.74	79.35	H
P2	4.08	4.38	93.15	79.35	H
P3	4.28	4.52	94.69	79.35	H
P4	3.49	3.68	94.84	79.35	H
P5	2.46	3.22	76.40	79.35	A
P6	2.79	4.15	67.23	79.35	A
P7	4.18	4.29	97.44	79.35	H
P8	2.46	4.60	53.48	79.35	A
P9	3.75	4.64	80.82	79.35	H
P10	2.88	3.80	75.79	79.35	A
P11	2.42	3.28	73.78	79.35	A
P12	1.56	3.10	50.32	79.35	A
P13	1.7	3.14	54.14	79.35	A
P14	3.92	3.12	125.64	79.35	H
P15	1.19	3.44	34.59	79.35	A
P16	3.3	2.90	113.79	79.35	H
P17	3.22	3.88	82.99	79.35	H
P18	3.58	4.50	79.56	79.35	H
P19	3.71	3.92	94.64	79.35	H
P20	2.12	3.30	64.24	79.35	A
P21	2.42	3.28	73.78	79.35	A
P22	1.56	3.10	50.32	79.35	A
P23	1.7	3.14	54.14	79.35	A
P24	3.92	3.12	125.64	79.35	H
P25	1.19	3.44	34.59	79.35	A
P26	4.02	4.47	89.93	79.35	H
P27	3.91	4.55	85.93	79.35	H
P28	4.01	4.52	88.72	79.35	H
P29	3.92	4.39	89.29	79.35	H
P30	3.83	4.51	84.92	79.35	H

Based on the results of measuring the performance (Xi) and level of importance (Yi) of 30 assessment variables, the value of the Conformity Score (%) and the division of the decision score into two categories, namely hold (H) and action (A).

Hold Categories (H)

The variables that fall into this category have above-average conformity (79.35%) and indicate that their

performance has met respondents' expectations. In this category, aspects that need to be maintained because they are already working well include: P1-P4, P7, P9, P14, P16-P19, P24, P26-P29, and P30.

Most of the indicators in this category have a suitability score above 85%, and some of them even exceed 100% (P14 and P24), which means that their performance has exceeded user expectations.

Action Categories (A)

The variables in this category have a suitability far below 79.35%, namely P8 = 53.48%, P12 = 50.32%, P15 & P25 = 34.59%, which indicates a significant gap between actual performance and user expectations.

The results of this quantitative analysis provide an overview of the aspects that should be focused on for more targeted maritime transportation development, both in terms of service improvement and infrastructure development.

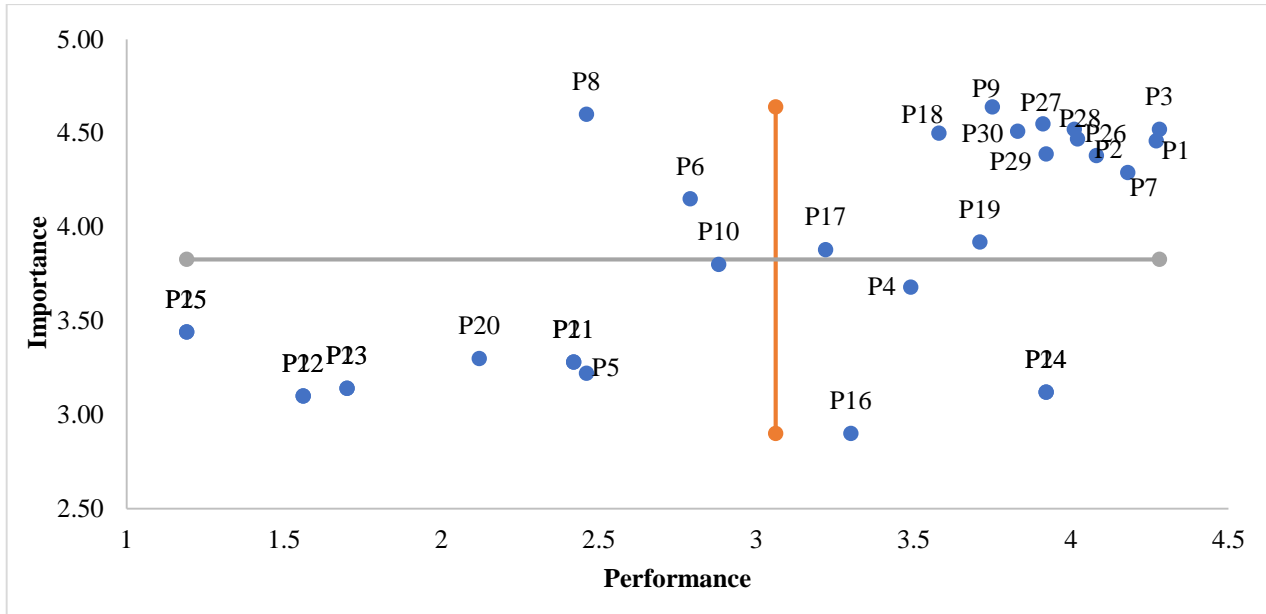


Fig. 3 IPA quadrant

3.3.2. IPA Quadrant Analysis

To identify priorities for service development and improvement in relation to auto transportation performance in supporting tourism activities. IPA analysis determines indicators into 4 Cartesian quadrants, and each quadrant shows the position of performance and importance. Performance (Xi) and importance (Yi) are used as the intersection points on the vertical and horizontal axes of the diagram. Quadrant I is the top priority, covering indicators with high importance and low performance that require attention and improvement. Quadrant II consists of indicators with high importance and high performance that need to be maintained. Quadrant III, with low priority, consists of indicators with low importance and low performance that are not the focus of improvement. Meanwhile, Quadrant IV (excessive) shows indicators with low importance but high performance, which indicates potential inefficiencies in the use of resources. Table 6 below shows the level of performance and importance in each quadrant.

Quadrant I means indicators with high importance and performance, indicating that these aspects have been running optimally and contributing significantly to the achievement of objectives. Indicators in this quadrant need to be maintained and managed consistently so that their quality is maintained and they are able to provide maximum benefits. The right strategy is to maintain the performance that has been achieved, while ensuring the sustainability of services and infrastructure that support both indicators.

Quadrant II indicators indicate top priorities for attention and improvement, as deficiencies in these aspects can have a significant impact on reducing service quality and user satisfaction and experience. It can be seen that many important aspects, such as ease of object reach, time and cost, accessibility, and port information systems, still require significant improvement.

Strategies that can be applied include improving infrastructure, adding disability-friendly facilities, optimizing ship services, strengthening information systems, and developing a more integrated tourism transportation concept. Improvements in these indicators are expected to meet user expectations while increasing port competitiveness.

Indicators in Quadrant III show that aspects are still not optimal, but the level of importance is relatively low for users. The aspects in this quadrant are not a top priority for improvement in the short term, but still require attention so that the quality does not decline further. Gradual

Table 6. IPA quadrant analysis

IPA quadrant	Indicators
I. High Importance and Performance	P1-P3, P7, P9, P17-P19, P26-P30)
II high importance and low performance	P6, P8
III Low importance and performance	P4, P14, P16, P24
IV Low importance and high performance	P5, P10-P13, P15, P20-P23, P25

Source: Results of data processing 2025

improvement is still recommended to maintain overall service standards and prevent problems from arising in the future, especially in aspects that can have an impact on user satisfaction.

Indicators in Quadrant IV indicate the potential for excess resources on aspects that are less of a priority for users. Despite the achievement of good performance, the allocation of resources on this indicator can be considered to be diverted to other aspects that need more improvement. Indicators in Quadrant IV, such as the mode of transportation used, availability of comfort support facilities on board, safety signs, and frequency of pelnas/pelra services, show good performance despite their relatively low importance. The right strategy is to maintain the current quality, but still pay attention to the excessive allocation of resources, so that it can be more focused on indicators with high importance but low performance in other quadrants.

3.4. Development Strategy for Maritime Tourism Transportation

The development of maritime transportation in the Pangkajene Islands plays a strategic role in improving connectivity between island tourist destinations and strengthening the appeal of the regional maritime tourism sector. Sea transportation is the main mode of transportation that provides access to the island group, given the limitations of land transportation and the absence of significant air transportation in the archipelago [40]. Passenger ships managed by both local ‘Pelra’ and national (Pelnas) shipping companies can make an important

contribution to tourist movement. However, in terms of connectivity and service, ships perform poorly. This condition creates barriers to tourist accessibility to leading destinations, reduces travel comfort, and has a negative impact on tourist interest and visitation volume. Therefore, a strategy is needed to develop sea transportation services in order to increase transportation accessibility to support tourism activities.

The strengths of sea transportation in the region lie in its ability to connect destinations that are not accessible by other modes of transportation, as well as relatively competitive travel fares for short inter-island routes. However, weaknesses include low vessel safety standards, a lack of tourism support facilities at ports, and suboptimal service quality provided by shipping operators. Opportunities include the increasing trend of marine tourism, the growing interest in maritime culture-based tourism, and the support of government policies and programs in developing tourist destinations. Meanwhile, threats that need to be watched out for include the risk of extreme weather that can disrupt shipping operations, the potential for degradation of the marine environment due to poorly managed tourism activities, and competition with other marine tourism destinations that have more advanced infrastructure [28, 41].

The swot analysis carried out is based on the results of quadrant mapping in IPA analysis—the relationship between the position of the IPA quadrant and the SWOT category is shown in Table 7.

Table 7. Mapping of indicators to SWOT based on IPA quadrants

IPA quadrant	SWOT criteria	Indicators
Quadrant I: high importance and performance	<i>Strength (S)</i>	P1-P3, P7, P9, P17-19, P26-P30
Quadrant II: high importance and low performance	<i>Weakness (W)</i>	P6, P8
Quadrant III: Low importance and performance	<i>Threat (T)</i>	P4, P14, P16, P24
Quadrant IV: Low importance and high performance	<i>Opportunity (O)</i>	P5, P10-P13, P15, P20-P23, P25

Table 7 above shows that Quadrant I indicators have performed well in line with user expectations and have become the main capital for strategy development. Indicators in Quadrant II are categorized as Weakness (W), indicating that immediate improvement priorities are required to close the gap between interests and performance. Meanwhile, Quadrant III is categorized as Threat (T), which is an indicator whose performance is low

and the level of importance is also low, but still has the potential to become a threat if ignored. Finally, Quadrant IV includes Opportunity (O), which is an indicator that, despite its low importance, already exhibits good performance, making it a valuable opportunity to support the achievement of other strategic goals. exhibits good performance, making it valuable. SWOT quadrant results based on IPA analysis, as shown in Table 8.

Table 8. Development of marine tourism transportation in the Spermonde Islands region

Quadrant I – SO (<i>Strength-Opportunity</i>)	Quadrant II – ST (<i>Strength-Threat</i>)
SO1. Integration of superior routes and services (P1-P3, P7, P9, P17, P19, P26-P30) with potential innovations in opportunity indicators (P4, P14, P16, P24) is an important strategy to create a holistic integrated marine tourism package. This approach is expected to improve coordination between modes and destinations, and enrich	ST1. Optimizing the use of superior fleets and routes (P1-P3, P7, P9, P17-P19, P26-P30) as a strategic effort to anticipate and mitigate operational disruptions identified in the threat indicators (P5, P10-P13, P15, P20-P23, P25).

the variety of tourism products offered to tourists.	
SO2. Utilizing the already high standard of service as an asset to expand marine tourism promotion activities on routes with good accessibility can strengthen the destination's position in regional and international tourism markets. Focused promotion will increase tourist arrivals and support local economic growth.	ST2. Minimize the risk of accidents by establishing and implementing standard operating safety procedures at the port.
SO3. The development of close synergies between ports and tourist attractions in high-performance areas is a strategic aspect to increase destination attractiveness, especially for foreign tourists. This collaboration can be realized through the integration of supporting services, coordinated tour packages, and improved supporting facilities.	ST3. Adding shipping routes for areas with low accessibility to strengthen inter-island connectivity.
SO4. Strengthening the marine transportation branding program that prioritizes safety and comfort as the main value to improve marine transportation services while strengthening the attractiveness of marine tourism in the archipelago. This effort is expected to increase tourist confidence and encourage service user loyalty.	ST4. Improvement of port facilities to increase the quality of sea transportation services, especially for routes experiencing a decline in service.
Quadrant III – WO (Weakness – Opportunity)	Quadrant IV – WT (Weakness – Threat)
WO1. Investment support for port facility improvements to facilitate the traditional shipping and national shipping fleets' docking/transit at islands with tourist attractions. Furthermore, improvements to the frequency and schedule of sea transportation will facilitate travel planning.	WT1. Improvements to basic port infrastructure for transit will improve inter-island connectivity, and schedules and frequency increases will be established. Furthermore, improvements to port construction and fleet and human resource training will be necessary to enhance safety.
WO2. Utilizing funding sources to create a port development program to improve connectivity between tourist destinations and in addition, improving service schedules and frequencies to increase accessibility to marine tourism.	WT2. Provision of subsidies and incentive funds for shipping routes and ports that are vulnerable to decline in order to maintain operational continuity in critical areas.
WO3. To avoid shipping delays and improve port efficiency, information technology is needed. A transparent information system is needed to ensure shipping schedule certainty and operational efficiency at the port.	WT3. Investment in improving emergency facilities at ports will reduce the risk of accidents and increase preparedness for incidents. This strategy is crucial for enhancing safety assurance for service users.
WO4. Allocate resources to high-performing and low-importance indicators, to strengthen low-performing indicators, in order to reduce the gap.	WT4. Integration of cruise and service schedule information systems in a digital platform to improve schedule certainty and transparency in areas prone to service disruptions. Integrated information technology is expected to improve communication between operators, ports, and service users, thereby increasing the level of trust and service convenience.

The results of IPA analysis of 30 indicators (P1-P30) have been classified into four SWOT quadrants, which reflect the strategic position of each indicator based on actual performance conditions and relative importance. This division is the basis for formulating a marine tourism transportation development strategy in the *Spermonde* Islands region.

3.4.1. Quadrant I – SO (Strength–Opportunity)

A number of indicators that have high importance and performance are P1-P3, P7, P9, P17-P19, P26-P30, with support for external opportunities, namely P4, P14, P16,

P24. In order to ensure connectivity between islands and increase tourism attractiveness, it is necessary to have tourism promotion, schedule and route improvements, collaboration between ports and tourist destinations, and strengthening safe and comfortable sea transportation services.

3.2.2. Quadrant II – ST (Strength–Threat)

Quadrant II, or threat strength, means maintaining well-performing indicators (P1-P3, P7, P9, P17-P19, P26-P30) from existing threats to maintain continuity and stability of service. Various existing threats such as facility

availability, service frequency, low regular service, operating system, and extreme weather. Strengthening service quality is needed as a strategy to anticipate these threats. To strengthen quality, fleet improvements are needed, route improvements to avoid isolated areas, establishing safety procedures at the port and on board

The development strategy is directed at overcoming internal weaknesses through the utilization of investment and infrastructure development programs, optimizing the use of shipping information technology to improve schedule certainty and response to delay complaints, as well as improving supporting facilities and increasing service frequency.

In addition, this strategy includes leveraging the strengths of indicators with high performance but relatively low importance to provide strengthening support to weak aspects.

3.4.4. *Quadrant IV – WT (Weakness–Threat)*

Indicators in this quadrant exhibit low performance and are faced with significant threats (P6, P8, P5, P10-P13, P15, P20-P23, P25). The strategies that need to be implemented are defensive and preventive in nature, with a focus on risk mitigation through intensive training programs to improve HR competencies, provision of emergency safety facilities at low-performing ports, and development of subsidy policies and special operational incentives for vulnerable routes and ports.

In addition, the integration and digitization of service schedule information systems is a priority to improve operational certainty and transparency of communication to service users.

4. Conclusion and Recommendations

4.1. Conclusion

- Strategy SO by strengthening tourism attraction and ensuring optimal inter-island connectivity sustainably.
- ST strategy through conservation and strengthening of service quality through optimization of fleet, routes, Port facilities, implementation of strict safety Standard Operating Procedures at all Ports
- Overcoming internal weaknesses (WO) through utilization of investment and infrastructure development programs, optimizing the use of shipping information technology to improve schedule certainty and response to delay complaints, as well as improving supporting facilities and increasing service frequency.
- Mitigation measures (WT) to improve human resource competency by providing continuous training, provision of emergency safety facilities at low-performing ports, and development of subsidy policies and special operational incentives for vulnerable routes and ports. In addition, integration and digitization of the service schedule information system is a priority to improve operational certainty and transparency of communication to service users.

ships, and using more adequate facilities throughout the port.

3.4.3. *Quadrant III – WO (Weakness–Opportunity)*

Quadrant III means low performance, high importance (P6, P8), so a strategy is needed to overcome weaknesses by utilizing existing opportunities (P4, P14, P16, P24).

4.2. Recommendation

Based on the results of the evaluation of the level of importance and the level of performance of the transportation system in the Spermonde Islands Region of Pangkep Regency, the author recommends the following strategic steps.

4.2.1. *Strengthening Tourism Port Infrastructure*

Improving port and jetty infrastructure at key tourist transit points, such as Maccini Baji, Kassi Kebo, as well as jetties on destination islands, such as Kapoposang, Badi, and Balang Lompo, are crucial steps in supporting the growth of marine tourism. These improvements should include the extension of jetties, the provision of representative passenger facilities, and the addition of supporting facilities such as tourist information centers, toilets, and proper waiting rooms. Improvement of these facilities is expected to increase comfort, safety, and the attractiveness of destinations for both domestic and foreign tourists.

4.2.2. *Modernization of Tourism Fleet and Improvement of Service Standards*

Modernization of the inter-island sea transportation fleet, especially boats and ships serving tourists, is a major priority to ensure aspects of travel comfort and safety. The rejuvenation of ships, procurement of modern tourist fleets, and the establishment of fixed cruise schedules will increase tourist confidence in sea transportation services and potentially increase interest in visiting island destinations in the region.

4.2.3. *Development of Sea Tourism Routes and Schedule Integration*

The development of a regular shipping system with scheduled and integrated routes between tourist islands, for example, through the concept of “island hopping”, needs to be systematically organized. Regular cruise schedules and integrated route information will provide time certainty and encourage tourists to explore more destinations efficiently.

4.2.4. *Implementation of National Marine Tourism Safety Standards*

Implementation of national standards of marine safety on all tourist ship services is necessary. This includes the provision of safety equipment such as life jackets, crew training, and the provision of communication systems and emergency response procedures to ensure the safety of all service users.

4.2.5. Utilization of Information Technology for Tourism Transportation

The development of an online-based digital platform that contains schedules, ticket availability, route information, and tourist destination profiles is considered to increase transparency, access to information, and efficiency in managing sea transportation services. The application of this information system also supports the digitization of tourism promotion in the archipelago.

4.2.6. Synergy Between Transportation and Tourism Sectors

Intensive coordination between the Department of Transportation and the Department of Tourism is needed to ensure that sea transportation policies are in line with the strategy for developing tour packages offered by tourism industry players. Synchronization of cruise schedules with the needs of peak tourist visits is a major factor in optimizing the movement of tourists.

4.2.7. Empowerment of Local Communities as Tourism Transportation Drivers

Empowerment of local communities as tour boat operators, travel guides, and small jetty managers will increase community participation and ownership of marine tourism development. Training programs and business capital support are needed to support the active role of the community in managing professional tourist transportation.

4.2.8. Development of Cross-Provincial Tourism Routes

Considering the geographical proximity of the Liukang Tangaya district to West Nusa Tenggara (NTB), the development of cross-provincial marine tourism routes is proposed to connect potential islands in Pangkep with NTB tourist destinations. This will expand the regional tourism network and open up opportunities for synergies with wider tourism markets.

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