Analysis of Efficiency Strategies For Four-Wheeled Fish Transport Facilities At Batulicin Fishing Port, South Kalimantan

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Abstract
Fish distribution requires efficient transportation facilities because fish are highly perishable commodities and are strongly affected by time, temperature, and logistics costs. This study aimed to analyze the efficiency of four-wheeled fish transport facilities and to formulate efficiency strategies for fish transportation at Batulicin Fishing Port, South Kalimantan. The study used a mixed-methods approach. Load factor analysis was applied to assess vehicle-capacity efficiency, while IFE, EFE, and SWOT analyses were used to formulate management strategies. Data were collected through observation, interviews, questionnaires, and port distribution documents. The results showed that the load factor reached 100%, indicating that four-wheeled fish transport facilities were in the efficient category. The IFE results showed total scores of 3.59 for fishers, 3.41 for agents, and 3.53 for transport drivers. The EFE results showed total scores of 3.65 for fishers, 3.13 for agents, and 3.77 for transport drivers. The priority strategies include strengthening coordination among distribution actors, improving cold chain facilities, adopting digital distribution technology, optimizing routes and loads, conducting regular vehicle maintenance, and providing emergency storage facilities. This study confirms that transport efficiency is determined not only by capacity utilization, but also by facility quality, distribution management, infrastructure support, and the ability of actors to respond to external risks.
Keywords: *fish transport, distribution efficiency, load factor, Batulicin Fishing Port and SWOT.*

I. INTRODUCTION

The fisheries sector requires an efficient marketing and distribution system because fish are perishable commodities whose value can change rapidly after landing. Fishing ports function as nodes for exchange, storage, transportation, financing, and market information within the marketing chain of captured fish. These functions require coordination among actors, particularly fishers, agents, and transport operators, so that fish can move from the port to the market at reasonable cost while maintaining product quality (Putri et al., 2018; Pratama et al., 2025).

Distribution is a key determinant of fisheries business performance because a product has economic value only when it is available at the time and place needed by consumers. A long distribution chain increases transaction costs and can affect the final price of fish at the consumer level. Therefore, the efficiency of four-wheeled transport facilities needs to be analyzed as part of logistics-cost control and efforts to improve the competitiveness of fishery products (Sengkey, 2020; Qodrunnada et al., 2023).

Four-wheeled fish transport facilities have a direct role in distribution speed, operating costs, and product quality. Vehicles that are not equipped with cooling facilities, poorly organized loading schedules, and low capacity utilization can cause quality loss, delays, and cost inefficiency. The application of cold chains, sanitation standards, and temperature control during distribution helps maintain fishery product quality and reduces the risk of market rejection (Asni & Tajuddin, 2022; Aminatuzzuhra et al., 2025; Mustafa et al., 2024).

Batulicin Fishing Port has experienced increases in both fish production and distribution. Production rose from 5,305,138 kg in 2023 to 5,953,683 kg in 2024. The number of shipments also increased from 1,919 trips to 2,183 trips, representing growth of 6.44%. This condition increases the need for efficient transport facilities, especially to prevent fish accumulation, delivery delays, and quality deterioration during distribution (Batulicin Fishing Port, 2025).

The analysis combined load factor indicators and SWOT analysis so that the study could not only show the level of vehicle-capacity utilization, but also explain the internal and external factors that determine transport-management strategies (Kusuma & Prasetyo, 2020; Priyono, 2021). This study aimed to analyze the efficiency of four-wheeled fish transport facilities and to formulate efficiency strategies for fish transportation at Batulicin Fishing Port.

II. METHODS

The study was conducted at Batulicin Fishing Port, Tanah Bumbu Regency, South Kalimantan. The location was selected purposively because this port is a center for fish landing and distribution serving local, regional, and interprovincial markets. The study used a mixed-methods approach because it required quantitative data to measure efficiency and qualitative data to explain distribution strategies contextually (Creswell & Plano Clark, 2018; Sugiyono, 2019).

The study population consisted of fishers, agents, transport drivers, and port managers. The fisher sample was determined using the Slovin formula, while the transport-driver sample was selected using snowball sampling and the agent sample using purposive sampling. These techniques were appropriate for a heterogeneous population and for distribution actors with different roles in the fish supply chain (Amin et al., 2023; Sugiyono, 2019).

Primary data were collected through field observation, interviews, and questionnaires administered to distribution actors. Secondary data were obtained from production and distribution documents of Batulicin Fishing Port. Efficiency analysis used the load factor, which compares the actual load with the maximum vehicle capacity. Values below 60% were categorized as inefficient, 60-80% as moderately efficient, and above 80% as efficient (Aditia & Dewanti, 2020; Kusuma & Prasetyo, 2020).

Strategy analysis used the IFE, EFE, and SWOT matrices. The IFE matrix assessed internal strengths and weaknesses, while the EFE matrix assessed external opportunities and threats. The results of these two matrices were used to develop S-O, W-O, S-T, and W-T strategies. This approach is relevant for formulating distribution strategies because it links fleet operating conditions with market opportunities, policy support, weather risks, and changes in operating costs (Astuti, 2020; Priyono, 2021).

$$\text{Load Factor (\%)} = (\text{Actual load} / \text{Maximum vehicle capacity}) \times 100\%$$

III. RESULTS AND DISCUSSION

The analysis focuses on transportation efficiency based on load factor values, internal and external conditions through IFE and EFE matrices, and the formulation of efficiency strategies using the SWOT approach. The discussion connects the empirical findings with relevant logistics, fisheries distribution, and cold chain management concepts to identify practical strategies for improving fish transportation performance.

Table 1. Fish production and distribution at Batulicin Fishing Port

Indicator	Value
Fish production in 2023	5,305,138 kg
Fish production in 2024	5,953,683 kg
Production increase	5.76%
Fish shipments in 2023	1,919 trips
Fish shipments in 2024	2,183 trips
Shipment increase	6.44%

Source: Primary data processing, 2026.

Transport-facility efficiency based on load factor

The results showed that the load factor of four-wheeled fish transport facilities reached 100%. This value indicates that the entire vehicle-load capacity was fully used in the fish transportation process. Based on the efficiency criteria, this value is categorized as efficient because it exceeds the 80% threshold. Operationally, this condition shows that no loading space was wasted during fish distribution from the port to marketing destinations (Aditia & Dewanti, 2020; Kusuma & Prasetyo, 2020).

A high load factor can reduce fish distribution costs per kilogram because fuel, labor, and vehicle-maintenance costs are allocated across a larger load volume. This finding is consistent with studies on perishable-goods logistics, which show that load and route optimization can improve fleet productivity and reduce operating costs (Yılmaz et al., 2025; Said et al., 2026).

Internal conditions based on the IFE matrix

The IFE matrix results showed total internal scores of 3.59 for fishers, 3.41 for agents, and 3.53 for transport drivers. All scores were above 2.50, indicating that strengths were more dominant than weaknesses in the four-wheeled fish transport system at Batulicin Fishing Port. The main strengths included good relationships among distribution actors, smooth distribution activities, driving experience, relatively good vehicle condition, and broad agent marketing networks (Batuwael et al., 2017; Mulyadi et al., 2020).

The main weaknesses were limited cold chain facilities, high operating costs, suboptimal vehicle maintenance, dependence on transport availability, and potential fish damage during delivery. These weaknesses need priority attention because fishery products require controlled temperature, sanitation, and distribution time to maintain quality (Hasil et al., 2025; Selamoglu, 2021).

Table 2. Summary of IFE matrix scores

Respondent group	IFE score
Fishers	3.59 (S 1.80; W 1.79)
Agents	3.41 (S 1.70; W 1.71)
Transport drivers	3.53 (S 1.77; W 1.76)

Source: Primary data processing, 2026.

External conditions based on the EFE matrix

The EFE matrix results showed total external scores of 3.65 for fishers, 3.13 for agents, and 3.77 for transport drivers. These values indicate that distribution actors had a fairly good ability to respond to opportunities and threats. The main opportunities included increasing market demand, market-area expansion, government support, developments in transportation technology, and the potential for drivers to increase income through route and load optimization (Pradana & Hasan, 2022; Widodo et al., 2021).

The main threats were fuel-price increases, bad weather, transport disruptions, road conditions, competition among actors, and fish-price fluctuations. These threats can affect distribution costs and punctuality. Therefore, strengthening route-information systems, scheduling, distribution contracts, and emergency storage facilities should be considered as part of an adaptive port strategy (Riyanto & Supriyadi, 2023; Pradana & Hasan, 2022).

Table 3. Summary of EFE matrix scores

Respondent group	EFE score
Fishers	3.65 (O 1.82; T 1.82)
Agents	3.13 (O 1.58; T 1.55)
Transport drivers	3.77 (O 1.88; T 1.89)

Source: Primary data processing, 2026.

Efficiency strategies based on SWOT analysis

The S-O strategy is directed toward using abundant catches, good relationships among actors, and marketing networks to expand distribution to regional and inter-island markets. This strategy needs to be supported by stronger cooperation among fishers, agents, and drivers through distribution contracts, market-information exchange, and more coordinated loading schedules. Cross-actor collaboration is an important prerequisite for fishery supply-chain efficiency (Batuwael et al., 2017; Said et al., 2026).

The W-O strategy emphasizes improving internal weaknesses by using policy and technology opportunities. The priorities are improving cold chain facilities, temporary storage, transport-ordering applications, and load-tracking systems. This strategy is important because distribution digitalization and capacity optimization can reduce costs, lower the risk of fish damage, and improve shipment-schedule transparency (Yılmaz et al., 2025; Widodo et al., 2021).

The S-T strategy uses driver experience, route mastery, and marketing networks to address bad weather, price fluctuations, and competition. The port needs to develop alternative routes based on weather and road-condition data and encourage contract-pricing mechanisms so that marketing networks can absorb market risks. This strategy is consistent with an adaptive approach to stabilizing fish distribution (Riyanto & Supriyadi, 2023; Mulyadi et al., 2020).

The W-T strategy is defensive. It focuses on vehicle renewal, regular maintenance, integrated distribution management systems, and buffer-stock facilities to address fuel-price increases, transport disruptions, and extreme weather. This strategy needs to be implemented so that load-factor efficiency remains high not only numerically, but also in terms of product quality, delivery punctuality, and operating costs (Pradana & Hasan, 2022; Selamoglu, 2021).

Table 4. Summary of efficiency strategies for four-wheeled fish transport facilities

Strategy	Priority actions
S-O	Regional market expansion, distribution contracts, and load scheduling
W-O	Cold chain improvement, distribution digitalization, and load optimization training
S-T	Alternative routes, market-network stabilization, and contract pricing mechanisms
W-T	Vehicle maintenance, integrated distribution management, and buffer stock

Source: Primary data processing, 2026.

Table 5. SWOT Matrix

	STRENGTHS (S)	WEAKNESSES (W)
OPPORTUNITIES (O)	S-O Strategy: 1. Use abundant catches and good relationships among fishers, agents, and drivers to expand distribution networks to regional markets (Batuwael et al., 2017). 2. Optimize distribution speed by using government support to meet increasing market demand (Pradana & Hasan, 2022). 3. Strengthen agent-fisher cooperation to capture opportunities for market-area expansion (Said et al., 2026).	W-O Strategy: 1. Use government policy support to improve temporary storage and cold chain facilities at the port. 2. Adopt digital distribution technology to optimize transport management and reduce operating costs (Yılmaz et al., 2025). 3. Use opportunities to increase driver income through vehicle-load capacity optimization (Widodo et al., 2021).
THREATS (T)	S-T Strategy: 1. Use drivers' experience and route mastery to minimize distribution delays caused by bad weather and road conditions (Riyanto & Supriyadi, 2023). 2. Use agents' marketing networks to stabilize fish prices amid market fluctuations (Mulyadi et al., 2020). 3. Strengthen fast distribution as a competitive advantage in facing competition among fishers and agents (Said et al., 2026).	W-T Strategy: 1. Renew and maintain transport vehicles regularly to address fuel-price increases and ensure timely delivery (Yılmaz et al., 2025). 2. Develop an integrated distribution management system to reduce dependence on transport availability and minimize fish damage. 3. Establish buffer stock and emergency storage facilities to anticipate transport disruptions and extreme weather (Pradana & Hasan, 2022).

1) S-O Strategy (Strengths-Opportunities)

The S-O strategy uses internal strengths to maximize external opportunities (Pradana & Hasan, 2022; Yılmaz et al., 2025). First, abundant fish catches supported by good relationships among fishers, agents, and drivers should be synergized to expand distribution networks to regional and inter-island markets. Batuwael et al. (2017) emphasized that cross-actor collaboration in the fishery supply chain is the key to distribution efficiency. Second, the existing speed of distribution can be combined with government support in the form of port infrastructure to improve responsiveness to growing market demand. Third, agent-fisher cooperation should be strengthened through long-term distribution contracts to capture opportunities for market-area expansion (Said et al., 2026).

2) W-O Strategy (Weaknesses-Opportunities)

The W-O strategy is designed to overcome weaknesses by taking advantage of available opportunities. The main priority is to use government policy support to improve cold chain infrastructure and temporary storage facilities at the port, which have been major weak points. Investment in cold chain infrastructure can reduce losses of fishery products during distribution. Furthermore, the adoption of digital distribution technologies, such as transport-ordering applications and load-tracking systems, can optimize transport management and reduce operating costs. The opportunity to increase driver income can also be pursued through load-capacity optimization training (Widodo et al., 2021).

3) S-T Strategy (Strengths-Threats)

The S-T strategy uses internal strengths to minimize the effects of external threats. Drivers' experience and route mastery are important assets in addressing the risk of distribution delays caused by bad weather and suboptimal road conditions. Riyanto and Supriyadi (2023) recommended the development of alternative routes based on historical weather data to minimize distribution disruptions. In addition, agents' marketing networks can serve as a buffer when fish prices fluctuate through contract-pricing mechanisms with trading partners. Fast distribution is also a competitive advantage that must be maintained amid increasing competition among fisheries business actors.

4) W-T Strategy (Weaknesses-Threats)

The W-T strategy is a defensive strategy aimed at minimizing weaknesses while avoiding threats. Vehicle renewal and regular maintenance are crucial because already high operating costs will become more burdensome when fuel prices increase. The development of an integrated information-technology-based distribution management system is needed to reduce dependence on conventional transport availability and minimize fish damage during delivery. Finally, the establishment of buffer-stock and emergency storage facilities in the port area should be considered to anticipate unexpected transport disruptions caused by extreme weather (Pradana & Hasan, 2022).

IV. CONCLUSION

This study showed that four-wheeled fish transport facilities at Batulicin Fishing Port were in the efficient category based on a load factor of 100%. Full utilization of vehicle capacity supports lower distribution costs per load unit and strengthens the smooth delivery of fish to target markets. The IFE and EFE results indicate that the distribution system has strong internal factors and good external-response capability, although it still faces weaknesses related to cold chain facilities, operating costs, vehicle maintenance, and weather-related disruption risks. The recommended priority strategies include strengthening coordination among actors, improving cold chain facilities, adopting distribution technology, optimizing routes and loads, and providing buffer stock to manage distribution disruptions.

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