JURNAL PERIKANAN
UNIVERSITAS GADJAH MADA
Terakreditasi Ristekdikti No: 158/E/KPT/2021

ISSN: 2502-5066 (Online)
ISSN: 0853-6384 (Print)
Vol. 25 (1), 31-40
DOI 10.22146/jfs.82811

Enhancing Fishing Port Services Quality to Support Fish Supply Chains of the Island Fisheries at the Belitung Island

Farisha Safrina Nur, Suadi Suadi* & Suwarman Partosuwiryo

Department of Fisheries, Faculty of Agriculture, Universitas Gadjah Mada, Sleman Regency, Special Region of Yogyakarta, Indonesia
*Corresponding Author, email: suadi@ugm.ac.id

Submitted: 05 March 2023; **Revised:** 23 March 2023; **Accepted :** 03 April 2023

ABSTRACT Fishing ports are crucial to the sustainable management of fisheries resources and enterprises that depend on the fishery. The objective of this study was to analyze the levels of facilities availability and service quality of fishing ports in the islands through a case study of Tanjungpandan Islands Fishing Port in Belitung Island. This study was conducted by combining survey methods, observation, as well as in-depth interviews with the port users and managers. Due to Covid-19 pandemic, field research was conducted in two periods: from September to October 2020 and from January to February 2022. Respondents were selected by applying the snowball sampling method and resulted in 70 selected respondents, consisting of fishermen, skippers, traders, factory managers or fish processing units, and port managers. Structured questionnaires were used for data collection. It proceeded into descriptive-qualitative analysis and combined with SERVQUAL and IPA (Importance Performance Analysis) methods. The study demonstrated that six port facilities failed to meet the Archipelago (inter-island) fishing port standards as outlined in the Minister of Marine Affairs and Fisheries' Regulation No. 8, year 2012. Eight port services that were considered important indicated low performance to support the island's fish supply chain. The total score of basic, functional, and supporting facilities was 60.46% (within 0 – 100% scale) and considered as relative "good". Therefore, given that the port is the main hub of marine fisheries activities on Belitung island, it is crucial to increase the accessibility, quality, and services of fishing port facilities in order to support the fish supply chain in the islands.

Keywords: Belitung; fishing port; importance performance analysis SERQUAL; service; Tanjungpandan

INTRODUCTION

Fishing ports play important role in providing facilities and services for fishing industry activities (Hutapea *et al*., 2017). A fishing port is a system that combines infrastructure, human resources, and management concept to serve the fishing fleets (Scheffczyk, 2009). They serve as anchoring locations for fishing vessels, fish landing stations, distribution centers, and marketing (Nurani *et al*., 2010). They have a strategic purpose as a location for immediate selling, storing, or sending the catch to market (Suadi & Kusano, 2019). The existence and development of fishing ports and coastal communities, territories, and national economies have significant forward and backward relationships (Israel, 2000). Therefore, appropriate fishing ports management can improve the community's, especially fishermen's, economy (Nugraheni *et al*., 2013).

Tanjungpandan archipelago fishing port (or Type B fishing port or so-called PPN Tanjungpandan) is a fishery activities center, especially as a source of fish raw materials in the Belitung Islands. Being the main and largest port in the islands, the port is the main hub for fisheries in surrounding islands. Moreover, fisheries statistics of the port show that fish coming from outside and entering the port reached 64.64% of total production volume and 69.71% of total production value (calculated from Table 3). Connectivity between fishing ports helps to evenly distribute the fish production that enables fish processing industry to meet the demand of raw materials (Srialdoko *et al*., 2021). Supply chain management is defined by Heizer *et al*. (2020) as coordination of all activities, starting from raw materials to finally reach satisfied customers which include suppliers, producers, and/or service providers, in addition to distributors who deliver products or services to end users to be facilitated through ports, within the context of fisheries. Fatoni *et al*. (2021) suggests in the supply chain concept that ports are seen as part of supply chain system consisting of fishermen, local traders, processing industries, exporters as well as final consumers. By increasing the value of the shipment while it is in the port region, the port further integrates into the value chain and plays a crucial role in the efficient management of the movement of goods and information across the fish supply chain (Thai, 2016).

In addition to excellent infrastructure, the management of fishing ports must also consider the importance of the service component. Customer loyalty will rise with good service (Quddus & Hudrasyah, 2014). According to Prakash & Mohanty (2012), improving the quality of good service is an asset that must be managed by service providers. If the quality of service is carried out successfully, it will create a longer durable competitive advantage. The quality of port services and their advancement can be tracked and measured using a variety of concrete indicators, just like an industry or organization. The indicators are derived from behaviors that can be observed and managed as numerical numbers (Gayathri *et al*., 2021). In addition to prices and logistics, service quality has a significant impact on the effectiveness of port

operations (Ma *et al.*, 2021).

The perishable nature of fish requires fast post-harvest handling process to avoid various losses such as physical, quality, and nutritional and economics losses (Kruijssen *et al.*, 2020). A weakness of the port experienced by fishermen and business actors was the minimum development of cold chain system for fish supply in the ports. Such condition has negative impact on fishery products and decreases the fish selling price (Budiyanto *et al.*, 2018). Therefore, fishing ports must be able to serve port users in aspects of fish landing up to distribution process (Farikin & Boesono, 2015). Information related to facilities and services conditions is useful for the fishing ports development (Fatoni *et al.*, 2021). The objective of this study was to explain the levels of facilities availability and services quality based on users' perspective by analyzing the importance and performance levels of port services by using SERQUAL model and Importance-Performance Analysis (IPA). This model was designed to provide improvement priority for fishing port services to support efficient and sustainable fish supply chain performance especially in Belitung Islands.

METHODS

The study applied a combination of survey and descriptive analytical methods used to minimize the impact of measurement errors (Marczyk *et al.*, 2005). Data collection was carried out through direct observation on various activities in the port, assessment of port functions and facilities by asking questions within a structured questionnaire, and in-depth interviews to key informants and active users of port facilities. Both primary and secondary data were used in this study. A systematic questionnaire was used to evaluate the port's operations and facilities, and in-depth interviews with key informants and frequent users of the port's services were conducted to gather primary data. Port statistics were acquired as secondary data from the administration office and the harbormaster office of PPN Tanjungpandan. Reports from related agencies and institutes served as another source of secondary data.

Research site

The research was conducted at PPN Tanjungpandan, which was in the center of Tanjungpandan city, Belitung Regency, the Province of Bangka Belitung Islands. The distance between center of the city to Tanjungpandan Archipelagos Fishing Port is only about 650 m. The port is geographically located at 02º 30'- 03º 15' South Latitude – 107º 35' - 108º 18'E (Figure 1). It was built in 1975 and occupies an area of 5 ha.

Data collection

Respondents were determined by applying the snowball sampling method because the lack of information about target population. This method is useful for easier finding proper respondents on specific issues (Burns & Groove, 1993), in this context the suitable respondents when asking questions about particular problems with the tate of port infrastructure and services. The sample was selected in stages based on established criteria (Naderifar *et al.*, 2017). In this case, a target group of samples were identified first. Then, after data was collected, they were asked to recommend the next respondent. Thus, only subjects suitable with the criteria were selected until the required sample size was reached. With consideration on the Covid-19 pandemic, data collection was carried out in two periods: September to October 2020 and January to February 2022. There were 70 respondents were selected, consisting of 51 men and 19 women who were grouped into four: 6 port managers, 25 business owners, 24 fishermen, and 15 ship owners. The composition of respondents' education levels was elementary school, high school and undergraduate by 55.71%, 35.71%, and 8.57%, respectively. Most of the respondents were in their productive age.

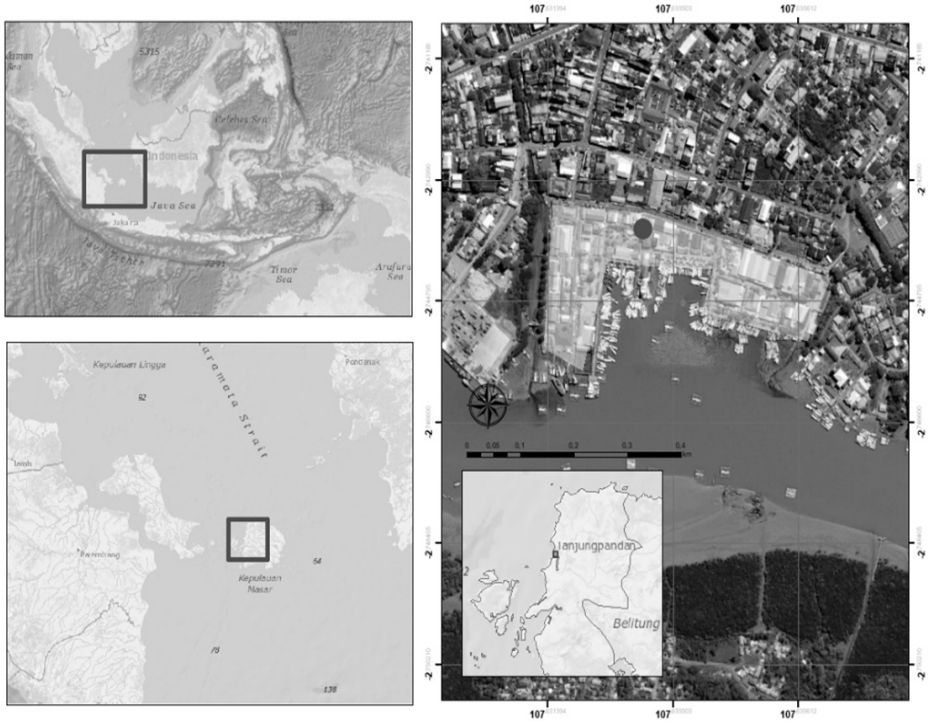

Figure 1. The location of Tanjungpandan Archipelago Fishing Port (Source: www.earthgoogle.com (2022)).

Data analysis

Assessment of port facilities and functions was carried out by applying a Likert scale (Likert, 1932). The quality of port facilities and functions was then analyzed based on cumulative calculations according to Rahardja *et al*. (2018) as follows:

1. There were 21 indicator statements (Qi) consisting of 6 indicators of basic facilities, 9 indicators of functional facilities and 6 indicators of supporting facilities based on the Regulation of Minister of Maritime Affairs and Fisheries Number 8 year 2012. Each statement was filled out by 70 respondents (St), which included assessment based on 1 to 5 scales (very poor to very good) on each statement (Table 1).

   Table1. Likert scale to measure users' response.

Answer scale	Scale value
Very Poor/Bad (STB)	1
Poor (TB)	2
Fairly Good (CB)	3
Good (B)	4
Very Good (SB)	5

2. The total response given by the respondents was calculated by multiplying the number of indicator statements (Qi), which was 21, with the number of respondents (St), which was 70 people, so that total value (Nt) of 1,470 responses were obtained.
3. The next calculation step was related to the maximum response score by all respondents (Ym). It was the value obtained from the multiplication result between highest Likert scale (scale 5) and the number of responses (Nt). Thus, obtained Ym was 5 x 1,470 = 7,350
4. The total facility score (Tf) was calculated under the formula of Tf = (R × Pn) or N = (T × P1) + (T × P2) + (T × P3) +... + (T × Pn), where Tf, R and Pn were total score of the facility, the number of respondents who chose certain scale score on the Likert scale and selected Likert scale value, respectively.
5. The determination of rating/category of level of facilities availability was made based on certain percentage values in various intervals (Rahardja *et al*., 2018). The interval calculation was based on the interval formula (I) equal to the highest category value (100) divided by the maximum number of Likert scale scores measured (in this case 5), thus (I) = 20. Table 2 presents the assessment interval of the facility availability category index:

   Table 2. Category levels of the Fishing Port facilities availability.

Rating Interval (%)	Category
0 – 19.9	Very Poor
20 – 39.9	Poor
40 – 59.9	Fairly good
60 – 79.9	Good
80 – 100	Very good

To analyze the quality of port facilities and services, Important Performance Analysis or IPA was applied (Martilla & James, 1977). This method was built on a four-part matrix, known as Cartesian diagram (Figure 2). The values making up this diagram were obtained from the scores of the facility importance as well as the scores of the facility's existing condition. The X-axis was the performance level of port facilities rated by users in a Likert scale of 1 to 5 (Very Poor to Very Good). The Y axis was the importance level of the facility, which was also assessed based on the Likert scale of 1 to 5 (Very Unimportant to Very Important). Priority can be given to quality aspects that were considered important by respondents, but having less achievement or performance or located in the quadrant of "concentrate here" (Martilla & James, 1977).

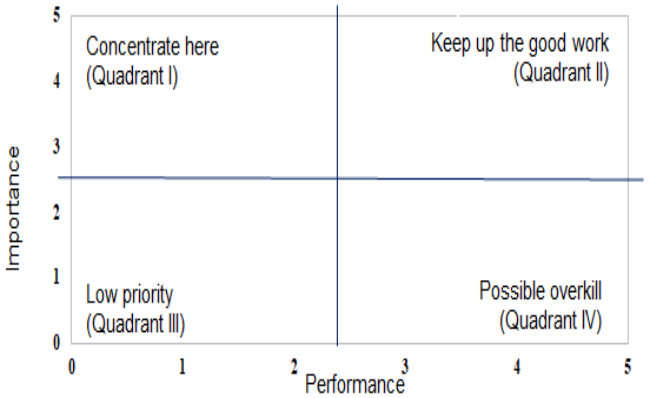

Figure 2. Importance performance analysis (Martilla & James, 1977).

After identifying the priorities based on measurements using the IPA method, the service quality analysis was continued with the SERVQUAL method, to measure how far the difference between users' reality and expectations upon the services received (Parasuraman *et al*., 1988). This method uses five dimensions of service quality: 1) direct evidence (tangible), 2) reliability, 3) responsiveness, 4) assurance, 5) empathy (Parasuraman *et al*, 1988; Kotler, 1994). It consists of 22 items regarding service attributes which were grouped into 5 dimensions (Ugboma *et al*., 2004). The SERVQUAL method is also used to measure service quality in certain contexts (Thai, 2016), for example banking and other corporations (Thai, 2014), as well as supply chains (Seth *et al*., 2006).

RESULTS AND DISCUSSION

Production and distribution of fishery products of Tanjungpandan Archipelago Fishing Port

The fisheries production of PPN Tanjungpandan was grouped into 2 (two) sources: (1) internal production which was fishery products landed directly by fishing vessels anchored at PPN, and (2) external production which was fishery products originating from areas around Tanjungpandan such as Tanjung Batu, Tanjung Binga, Hanging, Membalong and East Belitung that was transported by land transportation such as two-wheeled vehicles or four-wheeled trucks or other modes of transportation (Table 3). The port is the main network of fish supply chains in Belitung due to its integration into the fish market in the city. Hence, all fishery products around the island would be collected through this port.

Table 3. Fish production of Tanjungpandan Archipelago Fishing Port within 2017-2021.

Year	Internal Production		External Production		Total	
	Volume (Tons)	Value (Million IDR)	Volume (Tons)	Value (Million IDR)	Volume (Tons)	Value (Million IDR)
2017	2,860.71	95,522	2,058.47	73,942	4,919	169,464
2018	2,884.13	133,651	2,367.73	116,551	5,252	250,202
2019	3,000.73	113,386	6,413.34	284,075	9,414	397,461
2020	3,240.33	118,654	10,124.16	512,183	13,364	630,837
2021	1,237.48	50,200	3,213.48	190,189	4,451	240,389
mean	2,644.68	102,283	4,835.44	235,388	7,480	337,671

Source: Tanjungpandan Archipelago Fishing Port annual report.

Table 3 shows that within the last 5 years, the average annual fish production from the inside and outside of the port reached 2,644.68 tons and 4,835.44 tons, respectively. The highest fish production was achieved in 2020, reaching 3,240.33 tons and 10,124.16 tons of fish from inside and outside the port, respectively. Since 2017, both fish production from inside and outside of the port increased each year until 2020 and decreased in 2021. Total production within 2017-2021 reached 7,480.11 tons at production value of IDR 337,670.56 million.

Fishery products from Tanjungpandan Archipelago Fishing Port were distributed through 3 (three) main channels: (1) land transportation routes for the people of Belitung Island, (2) sea transportation and (3) air transportation routes for consumers outside Belitung Island. Thus, the market for fishery products was grouped into three: (1) local market, (2) domestic market, and (3) export market (Figure 2). Fish distributed through local markets, processing industry, traditional markets, household consumers, restaurants, as well as schools and hospitals were estimated at 44%, 29%, 12%, 9% and 6%, respectively. Therefore, land transportation and maritime ways should be the main target for improvement. Connectivity between port infrastructure and user needs is necessary to increase port service performance. Fish quality and delivery to consumers can be maintained via an effective fisheries logistics network (Wahyuni, 2020). For long-term sustainable growth, infrastructure and services must be used as effectively as possible (Padmasani & Tamilselvi, 2016). The Belitung Islands' productivity and seafood supply chain activities are expected to be significantly impacted by Tanjungpandan PPN's infrastructure and service efficiency. In this context, a port doubles as a distribution hub where value-added services like labeling, packaging, cross-docking, and others are offered in addition to being a location where cargo is loaded or unloaded onto or off ships. If they are well-managed, adequate port services and facilities can improve performance for ports and other associated parties.

Fish commodities for the domestic and export markets mostly consisted of blue swimming crabs, common squids, and red snappers. The results of in-depth interviews with fish processing entrepreneurs and port managers found destination cities for domestic market included Bangka, Pontianak, Palembang, and Jakarta.

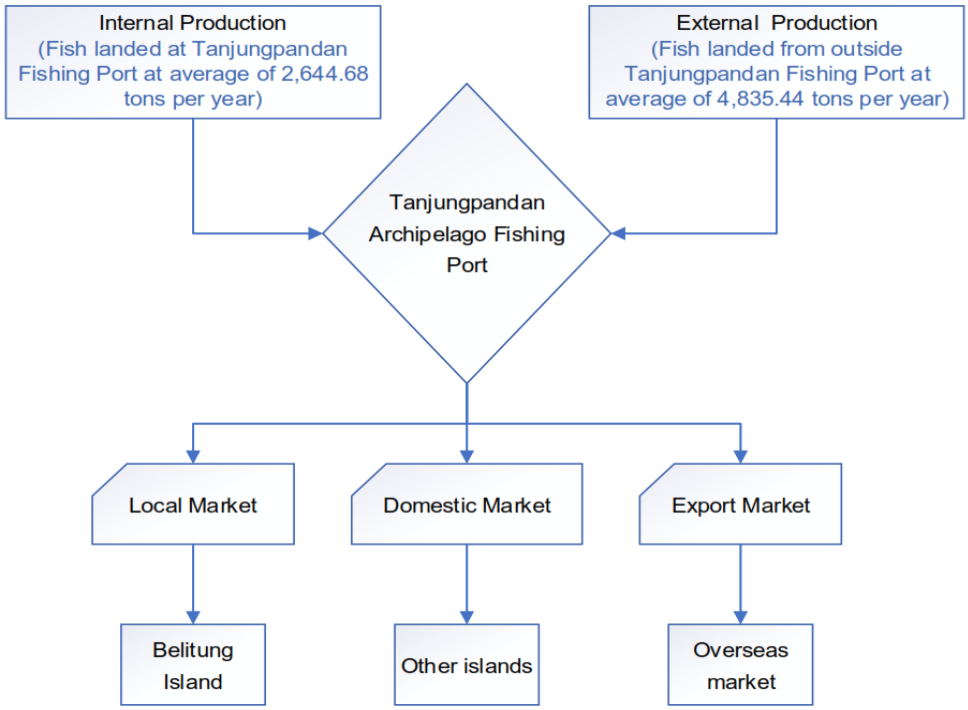

Figure 3. Fish supply chain pattern in Tanjungpandan Archipelago Fishing Port Belitung.

The handling and management of fish raw materials was carried out in various methods by each fish processing unit (UPI). There were six important issues related to raw material management at PPN Tanjungpandan (Table 4) which required proper management by business actors and port managers because good and regular internal control in managing raw material inventory can create control activities against companies that were effective in determining the optimal amount of inventory owned by business units (Naibaho, 2013). The inventory function involved the physical flow of goods and flow of related costs, therefore adequate management for both were required (Arens *et al*., 2014).

for the following three reasons: (1) the price of fish in Belitung is already high and generally stable; (2) the majority of caught have important economic value, such as squid, mackerel, and red snapper, and selling them at auction will lower the quality of fish because lack of cold chain facilities; and (3) the pool area of the port for unloading at TPI is not proportional to the number of fishing vessels engaging in unloading activities. Meanwhile, the fish trader highlighted facilities are thought to be extremely limited, and the only building that exists is the TPI building, which makes it impossible for the auction process to progress. Therefore, there had not been an auction system for managing fish transactions in the port. There had not

Table 4. Management of fish as raw materials by fishing port processing units (UPI) at Tanjungpandan Archipelago Fishing Port.

No	Raw material management	Description	Percentage of respond from UPI (%)
1	Raw material information	1. Subscribe 2. Certain people 3. Fisherman	54.2 4.1 41.7
2	Permanent supplier	1. Yes 2. No	95.7 4.3
3	Payment method	1. Cash 2. Credit	75 25
4	Fish needs from suppliers	1. All fish needs 2. Aver 2/3 fish needs 3. Up to fish needs 4. 1/3 up to fish needs 5. Less than 1/3 fish needs	73 4.3 13 4.3 4.3
5	Delivery of processed products	1. Owning business unit 2. Taken by industry 3. Taken by fish traders	57.8 40 2.2
6	Fish price	1. Including shipping cost 2. Shipping fee not included	35.6 64.4

Analysis of Tanjungpandan Archipelago Archipelago Fishing Port facilities

Based on fishing port management criteria established by the government in the Regulation of Minister of Maritime Affairs and Fisheries Number 8 year 2012, analysis of port facilities availability was carried out on basic, functional and supporting facilities. Unsuitable main facilities included was the port area, which was only 5 hectares. Archipelago Fishing Port criteria requires at least 10 hectares area. However, most facilities in Tanjungpandan Archipelago Fishing Port had been running well although the service provided had not been optimal (Nedi, 2005). Unsuitable functional facility areas included the location for carrying out product handling, placing the fish transportation equipment, carrying out fish auction and location of the Wastewater Treatment Plant (WWTP). Instead of carrying out the fish processing and handling in the port, these activities were done in private fish processing units due to the limited industrial area in the port.

Fishermen and fish traders also used their personal equipment to transport the catch due to less often available and improperly functioning amenities. The fish auction facility had not been operated since 2000 because of similar reasons. In addition, in-depth interview with the port manager indicated the TPI facility is no longer in use

WWTP facilities in the port, and the dump site was only temporary. Unsuitable supporting facilities included no raying rooms provided at the port that made most fishermen performed their praying/worship on their respective boats and the port users performed theirs in mosques and churches outside of the port area. One of the efforts to cope with these problems was to repair and rehabilitate the port facilities (Srialdoko *et al*., 2021).

Facility rating showed that functional facilities obtained the highest total score among basic and supporting facilities. Based on the index formula and interval scale formula, the quality values of basic, functional, supporting, and overall facilities were 57.29% (fairly good), 62.60% (good), 60.43% (good), and 60.46% (good), respectively. PPN has to strengthen its infrastructure in order to encourage the growth of the fisheries in the islands. Without adequate facilities, it is very challenging for these fisheries to grow and for fishery management to be effective, especially when it comes to preventing illegal fishing. As a regulator, the Indonesian government might concentrate on improving port management, particularly in fishery ports. By swiftly implementing port state measures, which may be combined with other compliance instruments, Indonesia can play a crucial role as a port state (Naibaho, 2017).

Table 5. Analysis of level of facilities availability according to users and managers of Tanjungpandan Archipelago Fishing Port Belitung.

Respondent Category	Basic Facility Analysis					Total Score
	STB (RxPn)	TB (RxPn)	CB (RxPn)	B (RxPn)	SB (RxPn)	1203
Fisherman	7	146	111	196	40	
Shipowner	6	50	93	88	0	
Traders/Entrepreneurs	5	76	129	180	0	
Port Manager	2	30	24	20	0	
Total Score of Each Group	20	302	357	484	40	
Respondent Group	Functional Facility Analysis					
Fisherman	2	128	273	320	90	1972
Shipowner	1	54	147	176	25	
Traders/Entrepreneurs	6	68	222	316	0	
Port Manager	2	10	60	72	0	
Total Score of Each Group	11	260	702	884	115	
Respondent Group	Supporting Facility Analysis					
Fisherman	6	150	123	180	30	1269
Shipowner	8	4	111	108	15	
Traders/Entrepreneurs	5	44	147	208	20	
Port Manager	0	4	30	56	20	
Total Score of Each Group	19	202	411	552	85	
	Total					4444

(R= Frequency of selected response), (Pn = Selected Scale Value).

Analysis of Tanjungpandan Archipelago Fishing Port services

Table 6. Assessment of Tanjungpandan Archipelago Fishing Port services.

Variable	ID	Variable Indicator	Average value		gap	Rank
			Performance	Expectation		
Direct Evidence (tangible)	1	Cleanliness of Facilities	3.38	4.59	-1.22	7
	2	Completeness and Availability of Facilities	3.28	4.67	-1.39	6
	3	Condition of Administration Office	3.75	4.03	-0.28	22
	4	Port Entrance	3.17	4.75	-1.58	5
	5	Electric network	3.97	4.81	-0.84	15
Reliability (reliability)	6	Data collection on the number and types of fish	3.41	4.39	-0.98	10
	7	Means of transportation and parking	3.56	4.47	-0.91	13
	8	Fish loading and unloading service	2.84	4.73	-1.89	1
	9	Utilization of facilities and area	3.56	4.52	-0.95	11
	10	The martyrdom implementation	3.41	4.02	-0.61	19
Responsiveness	11	Facility Repair	3.03	4.63	-1.59	4
	12	Speed of Service Performance	3.47	4.39	-0.92	12
	13	Area monitoring	3.77	4.25	-0.48	20
	14	Logistics service	3.59	4.47	-0.88	14
	15	Environmental control	2.89	4.59	-1.70	3

Variable	ID	Variable Indicator	Average value		gap	Rank
			Performance	Expectation		
Guarantee (assurance)	16	Clean water supply	3.95	4.67	-0.72	17
	17	Ice supply	3.69	4.69	-1.00	9
	18	Secured catch distribution	4.14	4.75	-0.61	18
	19	Fuel Supply	3.41	4.55	-1.14	8
Empathy (empathy)	20	Service procedure	3.41	4.20	-0.80	16
	21	Relationship with the port and between fishermen	3.44	3.81	-0.38	21
	22	Response to suggestions and complaints	2.84	4.55	-1.70	2

Service criteria are used to explore service quality (Nguyen *et al*., 2022), logistics (Demirbas *et al*., 2014), and marketing (Ma *et al*., 2021). Service quality is the basis of customer satisfaction, and customer satisfaction has a greater influence on the intensity of service utility (Cronin & Taylor, 1992). Service performance information based on users' perspective is useful to help port managers in improving port performance and development (Ugboma *et al*., 2004). User ratings on the service quality in Tanjungpandan Archipelago Fishing Port are presented in Table 6.

Each user has assessment criteria to evaluate services (Wahyuni *et al*., 2020). Fishing ports not only offer facilities for landing, processing, and distributing catches but also provide the best service to fishermen who use the facilities depending on their intended uses (Puspitasari *et al*., 2013). The SERVQUAL calculation as presented on Table 5 shows a gap in each service. Significant indicators affecting the assessment included the fish loading and unloading services as well as the marketing. These two indicators greatly affected the assessment of Tanjungpandan Archipelago Fishing Port. Based on the service values, it identified the largest gap in the reliability dimension of (-1.89) in fish loading and unloading services.

Based on the ranking and division of quadrants, the followings are the 8 (eight) priority services subsequently from the largest gap: 1) fish loading and unloading services, 2) responses to suggestions and complaints, 3) environmental control, 4) facility improvement, 5) port entry access, 6) completeness and availability of facilities, 7) cleanliness of facilities, and 8) provision of fuel. Calculation under IPA method indicated service with the largest gap in quadrant I. The priority dimension based on the rank of 8 services with largest gap was the direct evidence. This was due to direct evidence dimension having 3 services in 1-8 ranks. The gap value closer to zero (0) indicated proper balance between performance and expectations (Vaggelas, 2019).

Supply chains are dynamic in nature but involve three constant flows: information, products, and finance (Chopra & Meindl, 2007). There are three constant flows in Tanjungpandan Archipelago Fishing Port. First is the flow of information about the people of Belitung Island having habits of busily buying either fresh or processed fish in Tanjungpandan Traditional Market. The fish sold by traders came from Tanjungpandan Fishing Port that was located only 200 m from the traditional market. Information of such habit was valuable for fishermen in many areas of Belitung Island to land their catch at Tanjungpandan Archipelago Fishing Port. The second flow is the flow of

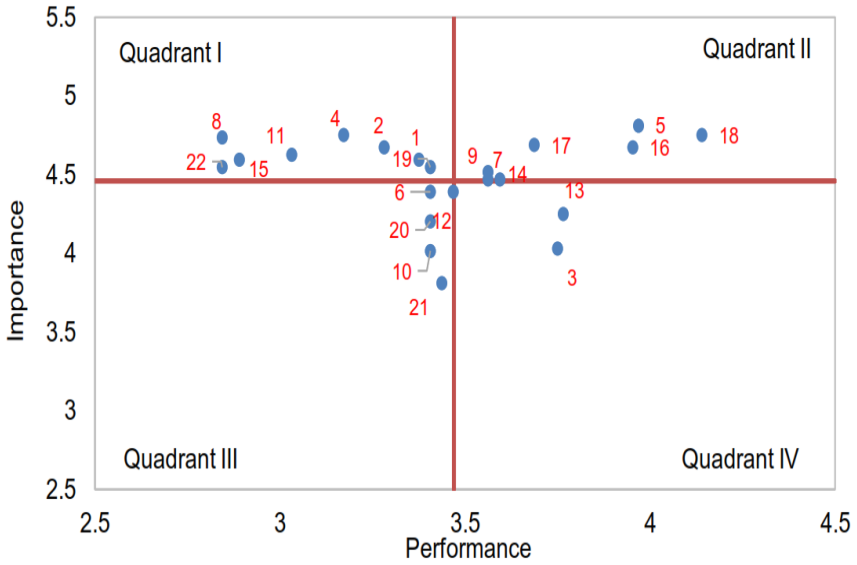

Figure 4. Cartesian diagram of service quality based on IPA in Tanjungpandan Archipelago Fishing Port.

goods or fish. Fishing ports serve as the main center for the movement of important fish commodities, as seen in Figure 3, which depicts three different patterns of fish supply chains. As previously described, the limitations of basic and functional port facilities are a challenge in the management of fishing ports in the archipelago. The third flow is the flow of money, that occurred between traders or fish processing units and fishermen regarding the catch transaction process. The cash method was applied in the transaction process. Fish commodities sold in Tanjungpandan Archipelago Fishing Port consisted of economically important fish species (Salim *et al*., 2019).

Based on SERVQUAL analysis, improving port service performance required connectivity between port infrastructure and user needs. An efficient fishery logistics chain should be able to maintain fish quality and timeliness to consumers (Wahyuni *et al*., 2020). Port authorities must adopt a strategy focusing more on the users' needs, especially in maintaining fish quality to consumers (Vaggelas, 2019). Varied assessment scores regarding these facilities and services were due to different levels of interest between groups of respondents (Hutapea *et al*., 2017). Speed, safety, cost-effectiveness, and adaptability are the most important factors to consider when servicing fishing vessels and fish transiting through ports (Scheffczyk, 2009). Fishing ports that are adaptive to changing infrastructure requirements will have better ability to assist local fishing operations and improve port efficiency (Speir *et al*., 2014).

Services with the largest gap and that fall into quadrant I require prompt improvement (Martilla & James, 1977). Analysis of Tanjungpandan Archipelago Fishing Port showed that the highest score of service performance was obtained by secured distribution of the catch in a guaranteed dimension value of 4.14 (Table 5). Service performance with lowest score was the suggestions and complaints response in an empathy dimension value of 2.84. Integrated services can speed up the process of shipping fishery products more efficiently (Lopez *et al*., 1998). It is important to have clear and agreed cooperation between service providers and service users. Information of good service quality can increase users' satisfaction in the aspects of service quality (Hemalatha *et al*., 2018). Since the Tanjungpandan Archipelago serves as the primary fishing hub for the Belitung Islands, it is crucial for port operators to upgrade their facilities and level of services. The port manager should give the utmost emphasis to eight areas of improvement, as depicted in Figure 4. These are: (1) services for loading and unloading fish, (2) responds to suggestions and grievances, (3) environmental control, (4) facility enhancement, (5) port entry access, (6) availability and completeness of facilities, (7) cleanliness of facilities, and (8) fuel supply. Similar findings were also some parts reported by Irham *et al*. (2020) at Bacan Beach Fishing Port in North Maluku, Fazri *et al*. (2021) in South Aceh, Nurfadillah *et al*. (2022) in Cilacap Central Java, and Lubis & Pane (2017) in several fish auctions in Indonesia. The issue of a lack of functional facilities has been highlighted. Thus, this study will most likely help policymakers, managers, and stakeholders in learning more about fishing port management.

CONCLUSION

Tanjungpandan Archipelago Fishing Port serves not only fishing activities based in the port area but also fishing from outside, as evidenced by the fact that 64.64% of the total volume and 69.71% of the total production value of fish production recorded at the port come from outside and enter the Tanjungpandan fishing port. There are three distribution routes for the fish, namely local, domestic, and international, and majorly targeting local fish consumers.

The study found that several government-established criteria for fishing port management do not meet the standards for Tanjungpandan as an archipelago fishing port, such as the port's area of only 5 hectares, whereas the criteria for Archipelago Fishing Port required at least 10 hectares of area; inappropriate functional facility areas, such as the location for carrying out product handling and placing the fish transportation equipment. Tanjungpandan PPN received a score of 60.46% (good) for the overall condition of the facilities, with 3 main facilities, 2 functional facilities, and 2 supporting facilities located in quadrant I (very important, low quality). All service deliveries made by the port management are valued less than what port consumers would reasonably expect.

As a center for the distribution of value-added services, there are still many services with a large gap between important value and performance. According to IPA and SERVQUAL analysis, eight areas that have significant gaps and are grouped together poor performance despite having high importance need. These eight areas are: (1) services for loading and unloading fish; (2) responses to complaints and suggestions; (3) environmental control; (4) facility enhancement; (5) port entry access; (6) availability and completeness of facilities; (7) cleanliness of facilities; and (8) fuel supply. These eight elements of service should be given priority for port management on the island fisheries. Delays in addressing current port management challenges, such as facility availability and quality, may cause fishing activity to decline as operational costs rise.

ACKNOWLEDGEMENT

This research was partly funded by the Research Grant of the Faculty of Agriculture UGM, No. 2117/PN/PT/2021. The research project's full title was Analysis of the Availability and Quality of Tanjungpandan Archipelago Fishing Port Facilities to Support the Fish Supply Chain on Belitung Island. We appreciate the administrators of the Tanjungpandan Fishing Port as well as each respondent for their willingness to participate and for providing sufficient data for this study. The first author used the study's results to support her final thesis at the Master Program in Fisheries at Department of Fisheries UGM.

REFERENCES

Arens, A.A., R.J. Elder & M.S. Beasley. 2014. Auditing And Assurance Services an Integrated Approach. In New Jersey : Prentice Hall Inc.

Budiyanto, E.H., R.O.S. Gurning & D. Cahyagi. 2018. The analysis of port integration on fishing cold chain: The

Case of collaboration between general port and fish operator. Proceeding of Marine Safety and Maritime Installation https://dx.doi.org/10.23977/msmi.2018.82614

Burns, N.G.S. 1993. Conduct Critique Utilization. The Practice of Nursing Researc., 4.

Chopra, S & P. Meindl. 2007. Supply Chain Management: Strategy, Planning and Operations. In New Jersey: Pearson Prentice Hall (Issue 3).

Cronin, J.J & S.A. Taylor. 1992. Measuring service quality: A reexamination and extension. Journal of Marketing. 56 (3): 55. https://doi.org/10.2307/1252296

Demirbas, D., H. Flint & D. Bennett. 2014. Supply chain interfaces between a port utilizing organisation and port operator. Supply Chain Management. 19 (1): 79-97. http://doi.org/10.1108/scm-04-2013-0137

Farikin, M., H. Boesono & D. wijayanto. 2015. Analisis pengembangan fasilitas pelabuhan perikanan nusantara prigi kabupaten trenggalek jawa timur ditinjau dari aspek produksi. Journal of Fisheries Resources Utilization Management and Technology. 4 (4): 87-96. https://ejournal3.undip.ac.id/index.php/jfrumt/article/view/9825

Fatoni, K., I. Solihin & R. Muninggar. 2021. Kinerja operasional pelabuhan perikanan di Perairan Teluk Semangka Kabupaten Tanggamus Lampung. Marine Fisheries : Journal of Marine Fisheries Technology and Management. 12 (2): 173-183. https://doi.org/10.29244/jmf.v12i2.36325

Fazri, K., I. Solihin & M. Mustaruddin. 2021. Fasilitas dan tingkat operasional Pelabuhan Perikanan di Kabupaten Aceh Selatan Provinsi Aceh. Albacore 5 (1): 007-016. https://doi.org/10.29244/core.5.1.007-016

Gayathri, C., V. Kamala, M.S. Gajanand & S. Yamini. 2021. Analysis of operational and financial performance of ports: an integrated fuzzy dematel-topsis approach. Benchmarking An International Journal. 29 (3): 1046-1066. https://doi.org/10.1108/BIJ-03-2020-0123

Heizer, J & R.C.M. Barry. 2020. Person Education Limited. In Operations Management: Sustainability and Supply Chain Management. 13.

Hemalatha, S., L. Dumpala & B. Balakrishna. 2018. Service quality evaluation and ranking of container terminal operators through hybrid multi-criteria decision making methods. Asian Journal of Shipping and Logistics. 34 (2): 137-144.

Hestyavida, N., A. Rosyid & H. Boesono. 2013. Analisis pengelolaan pelabuhan perikanan pantai tasikagung kabupaten rembang untuk peningkatan produksi perikanan tangkap. Journal of Fisheries Resources Utilization Management and Technology. 2: 85-94.

Hutapea, R.Y.F., I. Solihin & T.W. Nurani. 2017. Peran Pelabuhan Perikanan Samudera Nizam Zachman dalam mendukung industri tuna. Marine Fisheries : Journal of Marine Fisheries Technology and Management. 8 (2): 187-198. https://doi.org/10.29244/jmf.8.2.187-198

Irham, K.H., I. Iksan & H. Hardin. 2020. Evaluasi fasilitas fungsional Pelabuhan Perikanan Pantai Bacan. Jurnal Ilmu Kelautan Kepulauan. 3 (2): 238-248. http://dx.doi.org/10.33387/jikk.v3i2.2590

Israel, D.C. 2000. Analysis of Fishing Ports in the Philippines. Philippine Institute for Development Studies Discussion Paper. 4.

Kotler, P. 1994. Marketing Management Analysis, Planning, Implementatiom & Control: Prentice Hall International Editions: Eight Edition.

Kruijssen, F., I. Tedesco, A. Ward, L. Pincus, D. Love & A.L. Horne-Lyman. 2020. Loss and waste in fish value chains: A review of the evidence from low and middle-income countries. Global Food Security. 26: 100434. https://doi.org/10.1016/j.gfs.2020.100434

Likert, R.A. 1932. Archives of Psycology. Technique for the Measurement of Attitudes. 140:1-55.

Lopez, R.C & P. Nigel. 1998. Case study Quality assurance in the maritime port logistics chain : the case of Valencia Spain. Supply Chain Management. 3 (1): 33-44. https://doi.org/10.1108/13598549810200915

Lubis, E & A.B. Pane, 2017. Institutional model of fish auction refunctionalization in Indonesian Fishing Ports. Aacl Bioflux 10 (6): 1456-1465

Ma, P., N. Yao & X. Yang. 2021. Service quality evaluation of terminal express delivery based on an integrated SERVQUAL-AHP-TOPSIS approach. Mathematical Problems in Engineering. https://doi.org/10.1155/2021/8883370

Marczyk, G.R., D. DeMatteo & D.S. Festinger. 2005. Essentials of Research Design and Methodology. Published by John Wiley & Sons, Inc., Hoboken, New Jersey. Published simultaneously in Canada.

Martilla, J.A & J.C. James. 1977. Importance-performance analysis. Journal of Marketing 41 (1): 77-79. https://doi.org/10.2307/1250495

Naderifar, M., H. Goli & F. Ghaljaei. 2017. Snowball Sampling : A Purposeful Method of Sampling in Qualitative Research Snowball Sampling : A Purposeful Method of Sampling in Qualitative. https://doi.org/10.5812/sdme.67670

Naibaho, A.T. 2013. Analisis Pengendalian internal persediaan bahan baku terhadap efektifitas pengelolaan persediaan bahan baku. Jurnal EMBA. 1 (3): 63-70. https://doi.org/10.35794/emba.1.3.2013.1373

Naibaho, A.T. 2017. Strengthening the Role of Ports in Combating Illegal, Unreported and Unregulated Fishing in Indonesia. Division For Ocean Affairs And The Law Of The Sea Office Of Legal Affairs, The United Nations. New York.

Nedi, A. 2005. Ringkasan Eksekutif. Pascasarjana Manajemen Dan Bisnis IPB.

Nguyen, T.Q., L.T.T. Ngo, N.T. Huynh, T. Le Quoc & L. van Hoang. 2022. Assessing port service quality: An application of the extension fuzzy AHP and importance-performance analysis. PLoS ONE.17 (2): 1-24. https://doi.org/10.1371/journal.pone.0264590

Nur, F.S., 2022, Analisis Fasilitas dan Kualitas Pelayanan Pelabuhan Perikanan Nusantara Tanjungpandan Untuk Mendukung Rantai Pasok Ikan di Pulau Belitung, Fakultas Pertanian UGM. Yogyakarta (unpublished thesis)

Nurani, T.W., E. Lubis, J. Haluan & S. Saad. 2010. Analysis of fishing ports to support the development of tuna fisheries in the South Coast of Java. Indonesian Fisheries Research Journal. 16 (2): 69. http://dx.doi.org/10.15578/ifrj.16.2.2010.69-78

Nurfadillah, S.A.D.S., A. Suherman & A.K., Mudzakir. 2022. Strategy for development of fish auction place at

Cilacap Oceanic Fishing Port, Cilacap Regency, Central Java. Marine Fisheries. 13 (1): 101-111. https://doi.org/10.29244/jmf.v13i1.39666

Padmasani, K & T. Tamilselvi. 2016. An assessment of Indian major sea ports performance and efficiency. International Journal of Multidisciplinary Research and Development. 3 (6): 323-327.

Parasuraman, A., L.L & V.A.Z. Berry. 1988. Servqual : a multiple-item scale for measuring consumer perceptions of service quality. Journal of Retailing. 64 (1).

Prakash, A & R.P. Mohanty. 2012. Understanding service quality. Production Planning & Control: The Management of Operations. Taylor and Francis Group.

Puspitasari, N & A.S.R. Irnawati. 2013. Strategi pengembangan Pelabuhan Perikanan Nusantara Karangantu Kota Serang Provinsi Banten. 2 (2): 159-169.

Rahardja, U., N. Lutfiani & R. Rahmawati. 2018. APTISI student perception to the News on the APTISI website. 8 (2): 117-27. http://dx.doi.org/10.30700/jst.v8i2.400

Quddus, F.S.A & H. Hudrasyah. 2014. The influence of service quality dimensions on customer satisfaction and customer loyalty in pt. jne north bandung area. Journal of Business and Management. 3 (5): 546-556.

Salim, K., A. Rita & O. Supratman. 2019. Identifikasi jenis ikan (Penamaan Lokal, Nasional Dan Ilmiah) hasil tangkapan utama (Htu) nelayan Dan Klasifikasi alat penangkap ikan di Pulau Bangka Provinsi Kepulauan Bangka Belitung. Akuatik: Jurnal Sumberdaya Perairan. 13(1):42-51.https://doi.org/10.33019/akuatik.v13i1.1107

Scheffczyk, R.B. 2009. Fishing port management, the forgotten subject. Fisheries and Aquaculture. 1: 1-28.

Seth, N., S.G. Deshmukh & P. Vrat. 2006. A framework for measurement of quality of service in supply chains. Supply Chain Management: An International Journal. 11 (1): 82-94. https://doi.org/10.1108/13598540610642501

Speir, C., C. Pomeroy & J.G. Sutinen. 2014. Port level fi shing dynamics : Assessing changes in the distribution of fi shing activity over time. 46: 171-191. https://doi.org/10.1016/j.marpol.2014.01.014

Srialdoko, J., A. Supriatna & H. Hendrawan. 2021. Determination of hub and feeder: As a concept to integrate fishing ports in Indonesia. IOP Conference Series: Earth and Environmental Science. 1033 (1): 1-10. https://doi.org/10.1088/1755-1315/1033/1/012027

Suadi, S & E. Kusano. 2019. Indonesia seafood supply chain. Food Value Chain in ASEAN: Case Studies Focusing on Local Producers. FY2018. 5:134-163. https://www.eria.org/uploads/media/RPR_FY2018_05.pdf

Thai, V.V. 2016. The impact of port service quality on customer satisfaction: The case of Singapore. Maritime Economics and Logistics. 18 (4): 458-475. https://doi.org/10.1057/mel.2015.19

Thai, V.V. 2014. Service quality in maritime transport : conceptual model and empirical evidence. https://doi.org/10.1108/13555850810909777

Ugboma, C., C. Ibe & I.C. Ogwude. 2004. Service quality measurements in ports of a developing economy: Nigerian ports survey. Managing Service Quality: An International Journal. 14 (6): 487-495. https://doi.org/10.1108/09604520410569829

Vaggelas, G.K. 2019. Measurement of port performance from users' perspective. Maritime Business Review. 4 (2): 130-150. https://doi.org/10.1108/mabr-08-2018-0024

Wahyuni, S., A.A. Taufik & F.K.P Hui. 2020. Exploring key variables of port competitiveness: evidence from Indonesian ports. Competitiveness Review. 30 (5): 529-553. https://doi.org/10.1108/CR-11-2018-0077

How to cite this article Nur, F.S., S. Suadi & S. Partosuwiryo. 2023. Enhancing Fishing Port services quality to support fish supply chains of the island fisheries at the Belitung Island. Jurnal Perikanan Universitas Gadjah Mada. 25 (1): 31-40. DOI https://doi.org/10.22146/jfs.82811