

The strategies of Pekalongan fishing port development, Indonesia

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Abstract. Fishing port has an important role in developing fishery and significant impact. Sophisticated activities and the increasing fishery production can be optimized by reviewing and analyzing the condition of port facilities which are then obtained by the development strategies at the port. The research purpose was to analyze strategies for developing Pekalongan fishing port. The research method applied was descriptive survey method. It applies the analysis of existing conditions with satisfaction surveys (Likert Scale), analysis of facilities usage rating, and analysis of facilities completeness level, as well as SWOT analysis to analyze the factors systematically to formulate the development strategy. This research resulted a Likert scale score of 165.2 and score of 3 for facilities completeness level which stated that Pekalongan fishing port facilities are in good and complete condition. The usage rate of facilities at Pekalongan fishing port in port pond are 132.15%, ship channel 112.8%, wharf of ship docks >30 GT 98.94%, and <30 GT 108.14%, and fish auction place 33.26%. The development strategies obtained at Pekalongan fishing port include making integrated and sustainable fishing industry centers from handling to processing; improving the quality of port management in terms of service and operations; improved communication between the port and the government.

1. Introduction

Fishing Ports are important part in fishery management improvement; thus fishing port is an infrastructure which has been considered one of the important role in fishery businesses. The existence of fishing ports will boost the fishery activities be well-managed and restrained [1]. Fishing ports also turn out not only for ship landing, distributing and processing, but also as optimal facility for the fishermen in doing their activities.

Pekalongan is located at 6°50'42" - 6°55'44" (South Latitude) and 109°37'55" - 109°42'19" (East Longitude). The northside is bordered with Java Sea, Eastside bordered with Pekalongan fishing port, Southside bordered with Pekalongan Regency and Pekalongan fishing port, and Westside bordered with Pekalongan Regency. Fishery capture is one of the main sub-sector of Pekalongan agricultural development. Fishery subsector had the highest value compared with other agricultural subsectors. In semester 1st of 2016, fisheries reached 10,693.52 ton, with the monetary value of IDR 155.67 billions; 40.23% higher than 2015 that was 7,625.68 tons and economic valued for IDR 90.38 billions [2].

The increase of fishery production will be highly influenced by the fishing port condition, especially with the ports facilities. The fishing port facilities in Pekalongan fishing port are facilities that support the performance of the port and other related parties. Pekalongan fishing port has facilities that meet the standards, but this doesn't mean that the facilities at Pekalongan fishing port have been managed and utilized properly by the port or related parties. Therefore, it is necessary to



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study the condition of the fishing port and determine the level of utilization of facilities contained in Pekalongan fishing port.

In this research, its not only analyzes the condition of port facilities, but also analyzes how many facilities have been used and knows various aspects in the port in terms of the strengths, weaknesses, opportunities, and threats that exist, so that it can be known whether Pekalongan fishing port requires development or not. If it is known that Pekalongan fishing port requires development, a strategy is needed for optimization and development so that the existing fishing port can function properly. The right development strategy will be able to provide optimal contribution to various activities that exist in Pekalongan fishing port to provide the best technical and operational services for fishermen and other users. The purpose of this research was to analyze the harbor's facilities and establish development strategy of Pekalongan fishing port.

2. Methodology

Method applied in this research is survey-based descriptive method. The valid data implemented in this research were primary and secondary data. Primary data were the data collected and compiled straight from the location, using observation, survey dan interviews. Secondary data was compiled from institution. Sample extraction method will apply purposive sampling (SWOT analysis) with 12 respondent and simple random sampling (satisfaction analysis) with 45 respondent. The reason behind these method was because these technique provides controlled qualitative data and randomized data that intentionally different from resources of data, (SWOT and random sampling respectively).

2.1. Data analysis

2.1.1. Analysis of Existing Condition

The facility condition in Pekalongan fishing port were revealed from recent data which is based on the survey of fishermen's satisfaction and fish traders as the user of the facilities. The asumption will be based of Likert's scale method, which measure the respondent answer in scoring system regarding the port available facilities.

Likert scale rating category:

Very Not Good	: 0.00 – 1.00
Not Good Enough	: 1.01 – 2.00
Moderate	: 2.01 – 3.00
Good	: 3.01 – 3.50
Very Good	: 3.51 – 4.00

2.1.2. Analysis of Facilities Completeness Level

Port facility condition can be observed by the completeness of the facilities itself. Analysis method applied to measure the completeness of the port is a reference from Ministry of Marine Affairs and Fisheries Regulation No. PER. 08/MEN/2012 obtained with scoring. Port is determined in not good facility, if the score 1.00 – 1.60; moderate 1.70 – 2.30; and good if score with 2.40 – 3.00.

2.1.3. Analysis of Facilities Usage Rating

The use of facilities can be seen in the level of usage analysis. The analysis of the facilities port can be measured with the formula [3]:

a. Width of Pond Port

$$Wp = St + (3 \times n \times l \times b)$$

Note :

Wp : width of pond area (m²)

St : ship turning area (m²)

n: number of maximum ship on fare
 l: average of ships length (m)
 b: biggest of ship width (m)

b. Ship Channel Depth

$$D = d + S + C$$

Note :

D : water depth at LWS (m)
 d : highest ship draft (m)
 S : squat or vertical movement of the ship because of waves (m)
 C : clearance or free space between hull and water base (m)

c. Wharf Length

$$L = \frac{[(l+s) \times n_s \times a \times h]}{(fp \times ft)}$$

Note :

L : wharf length (m)
 l : average of ships length (m)
 s : distance between ships (m)
 ft : average fishing trip (hours)
 ns : the number of ships using the port on average per day
 a : average ship weight (tons) h : long boat on the dock (hour)
 fp : fish production per day (tons)

d. Width of Fish Auction Place

$$W_a = \frac{(fp \times F)}{(fr \times R)}$$

Note :

W_a : width of fish auction place (m²)
 fp : average number of production per day (tons)
 F : space capacity factor for production (ton m²)
 fr : auction frequency per day (times)
 R: ratio between auctions and auction building (40%) Rating analysis using below formula [4]:

$$P = \frac{U_p}{U_t} \times 100 \%$$

Note :

P : Facility Usage Rating

U_p : Available Usage Facility Measurement

U_t : Available Facility Measurement

Which will be categorized:

- Usage percentage > 100%, efficiency rate of facility over capacity;
- Usage percentage = 100%, efficiency rate of facility in optimal condition;
- Usage percentage < 100%, efficiency rate of facility not yet in optimal condition.

2.1.4. SWOT Analysis

Processes have to be concerned in SWOT analysis are [5] :

- a. Data extraction phase, that is external and internal factor evaluation;
- b. Analysis phase, that is internal and eksternal SWOT matrix creation
- c. Decision-making phase.

Development strategy alternative gained by using TOWS matrix, that is by comparing between internal environments with external environments factor. Alternative strategy used are SO (Strengths-Opportunities), ST (Strengths-Treaths), WO (Weaknesses-Opportunities), dan WT (Weaknesses-Treaths) [6]

3. Result and Discussion

3.1. Basic Environments

Pekalongan City has four regents, North Pekalongan, South Pekalongan, West Pekalongan and East Pekalongan Regency. The coordinate is located at 6° 50' 42'' - 6° 55' 44'' LS and 109° 37' 55'' - 109° 42' 19'' BT. According to Ministry of Marine Affairs and Fisheries Number Per.08/Men/2012, fishing ports are place which consist of land and water in proportion of certain boundaries for governmental activities and fishery business activities which used as fishing ship harbor equipped with sailing safety equipment and support fishery peripherals and/or instruments [7].

Total product landed in fish auction place of Pekalongan fishing port is various, it depends on the amount of ships and trip. Production amount and fish production value in Pekalongan fishing port shown in Table 1.

Table 1. Production and dan Production Value of Pekalongan Fishing Port

Year	Production (Kg)	Production Value (Rp)
2013	17.751.430	164.554.681.000
2014	20.790.950	199.907.092.000
2015	17.583.691	204.862.823.000
2016	19.680.576	255.131.648.000
2017	12.847.936	211.834.156.000

Amount annual production will increase when the ships landing the catches into Pekalongan fishing port are many, on the contrary the reduction will happen if the ships landing the catches are reduced. Fluctuation of production value happened because there are several factors such as change in landing production amount, fishing ship amount, fishing gear amount, equipment price, and fish price in the market. If the fish production is high, then the price of the fish will rise, and vice versa. The increase of average fish price is based of some factors, i.e., kind of fish, quality, and catch season. Decreased production yields that are significant can cause a scarcity of products, so as to increase the price of market demand. Increase the price of demand because there is no stock going up, the product price is getting higher [8].

The ships docked in trip to Pekalongan fishing port are dominated the kind of purse seines. Pekalongan Archipelago Fisheries Port (PPN) is a "fish base" from the fleet of purse seine fishing. The size of the Gross Tonnage (GT) purse seine meets 69-125 GT. Location of arrest in areas 712 and 713 WPP NKRI. The average of CPUE purse seine per year in Pekalongan fishing port is 18,712 kg (18.7 tons) per trip for each vessel [9]. Ships dock to the port not only doing trip but repairing the engines and net, filling up supplies, and loading the stock as well. The amount of the fishing ship unit based of type of fishing gear in Pekalongan fishing port 2013 until 2017 shown in Table 2 and based on the size of the ship (GT) shown in Table 3.

Table 2. Amount of Fishing Ship Based of Types of Fishing Gear in Pekalongan Fishing Port

Year	<i>Purse</i>	<i>Mini Purse</i>	<i>Gill Net</i>	<i>Others</i>
	<i>Seine</i>	<i>Seine</i>		
2013	116	200	60	0
2014	116	148	50	25
2015	198	146	25	65
2016	133	111	47	11
2017	84	91	71	164

Table 3. Amount of Fishing Ship Based of Ship Size (GT) in Pekalongan Fishing Port

Year	<10GT	10-30 GT	31-50 GT	51-100 GT	101-200 GT
2013	200	60	11	97	8
2014	25	198	9	98	9
2015	82	116	42	125	69
2016	39	126	8	98	31
2017	214	112	3	71	10

3.2. Analysis of Existing Condition

Pekalongan fishing port data 2018 is the data implemented by researcher as reference several facilities that are quite significant in operational activities in Pekalongan fishing port for satisfaction test in Likert Scale, and the result gained will reveal the existing condition of port facilities. Scoring result of satisfaction survey of facilities' user (fishermen and fish trader) shown in Table 4.

Table 4. Scoring Result in Likert Scale

No	Facilities	Total Score	Condition
1	Breakwater	172	Good
2	Dock	194	Very Good
3	Pond	114	Not Good
4	Channel	115	Not Good
5	Drainase	139	Moderate
6	Complex highway	179	Good
7	Lands	184	Good
8	Navigation Lamps	172	Good
9	Ports Office	195	Very Good
10	Maritime tourism spot	172	Good
11	Fisherment Hall	172	Good
12	Fish Auction	187	Good
13	Net Repairment Zone	148	Moderate
14	Generator House	162	Good
15	Fishery Resting Building	164	Good
16	Mini Lab Building	163	Good
17	Harbormaster	187	Good
18	Fresh Water Tower	183	Good
19	Parking Zone	155	Good
20	Fence	168	Good
21	Official Residence	168	Good
22	Outpost	180	Good
23	Mess Operator	160	Good
24	Toilets	113	Not Good
25	Fishery Depo	145	Moderate
26	Maritime Tourism Building	203	Very Good
Average		165.2	Good

Data Table 4 with 45 respondents that includes fishermen and fish trader of Pekalongan fishing port can be known that satisfaction score with the port facility are around 113 – 203 with total average

score 165.2. Based on table score of Likert scale that on chapter 3 table 13, it relates good . It can be said that the port facility condition of Pekalongan fishing port is satisfied category for the users in supporting operational activities of Pekalongan fishing port.

Several facilities such pond, channel, and toilets catagorized important points, the indicator on this point shows low score, under 117, and it is on fair level. Ponds and channel often get shallowing. Eventhough the dredging has been done but it was fully oportunate. The shallowing occurs because there are some factors such as garbage (organics and inorganics), narrowing of the river, and reduction of water debit. In addition, the water comes in dirty condition, black, and smelly. Toilets in Pekalongan fishing port, especially at the fish markets are lack, so the users claim that toilets are not good level. Other facilities such as drainage, nets repairment place, and fishermen depo should give more attention to gain more productive operational activities of Pekalongan fishing port. The inadequate terms and conditions of fishing port facilities are one of the factors that influence the activities of fishing ports in Indonesia. Great effort is needed to fix the fishing port. If the fishery port is managed well in terms of facilities and activities, it will advance the economy in an area, improve community welfare and local revenue, so that improving fisheries in Indonesia needs to be developed [10].

3.3. Analysis of Facilities Completeness Level

Based of observation in Pekalongan fishing port the results are:

1. Main Facilities

The main facilities are basic facilities required by the port from natural problems and also for shipping safety aspects, including berths and moorings and loading and unloading [11]. Pekalongan fishing port is in good category because it has 7 facilities criterias of Marine and Fishery Ministry Number Per.08/Men/2012 requirement, i.e. breakwater; wharf; pond; channel; highway area and drainage; and lands. (Score 3)

2. Functional Facilities

The success of activity at the port depends on functional facilities, because the basic facilities are running as the functional facilities. Fungional facilities that move activities from a fishing port from the ship will go to sea until the ship returns with the catch [12]. Pekalongan fishing port is categorized in good level, for the institution has more than nine functional must-have facilities deal with Ministry of Marine and Fishery Per.08/Men/2012, i.e. factories, slipway, net place, parking zone, water installation, artesis well, electric installation and genset house, fish auction place, fishermen resting building, fish market, office, meeting hall, garbage place, fences, equipment building, fuel station, fish basket building, harbormaster, mini laboratory, and navigation sign. (Score 3)

3. Support Facilities

Support facilities are facilities that indirectly support and enhance the role of fishing ports [13]. Pekalongan fishing port is categorized in good criteria, because it has more than six support facility deal with Ministry of Marine and Fishery Number Per.08/Men/2012, i.e. official residence, maritime tourism building, canteen, store, meeting hall, aquarium building, mess operator, fishermen depo building, toilets, and guardpost. (Score 3)

Method applied for obtaning formula in measurement to gain the number is *pair comparison*. Score PP = (0.50 x main facilities) + (0.33 x fungtional facilities) + (0.17 x supportive facilities)

From the calculation, the score for port facilities is 3. It means that the facilities of Pekalongan fishing port are good.

3.4. Analysis of Facilities Usage Rating

1. Pond Area

Pond is the water area which is used for landing caught fish, supplies, and ship channel as the gate to enter the port to wharf. Pond in Pekalongan fishing port has 3.4 Ha area measured by using satellite imagery digitation.

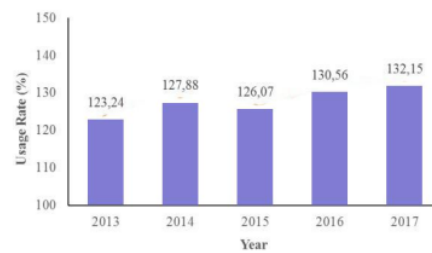


Figure 1. Pekalongan Fishing Port Pond Facilities Usage Rate Graphic

Based on calculation of area of pond, the result shown year 2013 – 2017 is the highest rate; 132.15% and 4.4 Ha area, it states that the rate of facility usage ratio exceeds over the optimal condition. The condition occurs because of several factors, ship size – length and the adequate width of pond size. Thus, there will be necessary in improving of port's pond facilities. The pond area is a basic facility that has a major influence on function of fishing port. The ideal area of port ponds can be used to move the ship in carrying out activities easily [14].

2. Ship Channel

The depth of channel has significant impact to ship draft on the port, as the port is deeper than the ship draft she may be able to pass the channel, and on the other hand if the port is narrower than the ship draft she may not be able to pass the channel. Channel Depth in Pekalongan fishing port is around 2,5 - 3 m.

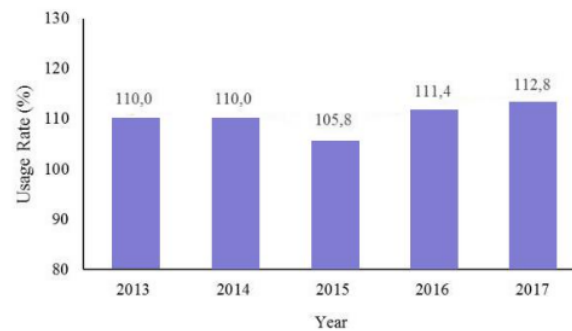


Figure 2. Pekalongan Fishing Port Channel Facilities Usage Rating Graph

Based on the calculation of the shipping flow depth, the highest usage rate from 2013 - 2017 has reached 112.8%, with the depth of -3.2 m before dredging, states that the usage rate exceed over the optimal condition. The condition comes off for some factors; one is the condition of the ship channel which is still shallow. Dredging of the port pond at the Pekalongan fishing port was carried out only 10 times in a year using a rake tool. It is necessary to improve port harbor facilities. The ship channel is the center of the ship's entry and exit to and from the port which must be adjusted to the size of the ship anchored at the port. The level of utilization of the ship channel can be calculated to determine whether it is necessary to add depth or not [15].

3. Wharf

Wharf is the main facility has quiet important part to accomodate ships anchored. The daily

wharf operation is very effective. Beyond the use for docking, the other function of the wharf is loading and unloading place for caught fish, and a place to prepare supplies for fishing in the sea. The length of the wharf of the Pekalongan fishing port is 340 m which consists of a ship dock > 30 GT 150 m and a ship dock <30 GT 190 m.

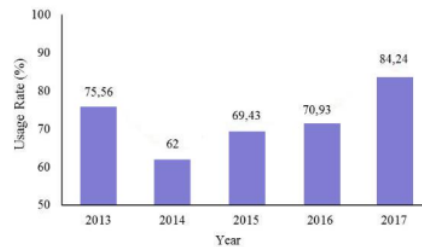


Figure 3. Pekalongan Fishing Port Wharf Facilities Usage Rating (>30GT) Graph

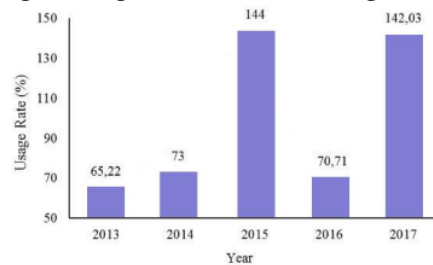


Figure 4. Pekalongan Fishing Port Wharf Facilities Usage Rating (<30GT) Graph

Based on the results of the calculation of the wharf length, the results of the usage of the ship dock >30 GT states the highest level from 2013 - 2017 as much as 84.24%, which states that the usage of the ship dock facility >30 GT is near the optimal conditions. Usage rates for ship dock facilities <30 GT gains the highest level from 2013 - 2017 as much as 144%, which states that the usage rate of ship dock facilities <30 GT has exceeded optimal conditions with the length of port 216.6 m. This condition makes the Pekalongan fishing port is less optimal to facilitate the number of fishing vessels that rely on the wharf. Therefore, it is necessary to develop wharf lengths to anticipate the growth of fishing vessels each year, especially for ship docks <30. There is an area in Pekalongan fishing port called “jamban” is used to accommodate fishing ships managed by the company. The increase in production volume and the number of vessels not followed by the addition of the wharf size resulted in problems with the ship queue. The trend of increasing production of catches has led to an increase in the number of ships [16].

4. Fish Auction Place

Fish auction place is one of the main functions in fishery activities. Fish auction place is a facility that supports economic activities in fish auction from fishermen and orgaized by the regional fishery department or cooperation. The area of fish auction place in the Pekalongan fishing port is 3.704 m².



Figure 5. Pekalongan Fishing Port Fish Auction Place Facilities Usage Rating Graph

Based on the calculation of the fish auction place building area, the highest level in usage rate from 2013 - 2017 was 53.82% with an area of 1.993.5 m, it stated that the usage rate of the facility had not reached the optimal conditions. The size of production is smaller than fish auction place size is the main factor of fish auction place has not come to the optimal level of the fish auction place usage. It is necessary to increase the production volume in Pekalongan fishing port. In terms of quantity, the facilities and equipment available at fish auction place of Pekalongan are quite adequate, but the utilization rate has not been utilized optimally [17].

3.5. SWOT Analysis

Based on the formulation of the strategy as can be seen in Table 5, the strategic priorities of the SWOT matrix are as follows:

Table 5. Result SWOT Priority Strategy Scoring Analysis

	Strategy Priority	Score
SO1	Making integrated and sustainable fishing industry centers from handling to processing	3.58
WO1	Improving the quality of port management in terms of service and Operations	3.56
WT2	Improved good communication between the port and the government	3.49
ST4	Increased access to capital	3.47
SO2	Development of infrastructure, facilities and infrastructure that support port operations and the creation of fishing industry centers	3.45
ST2	Development of infrastructure, facilities and infrastructure that support port operations and the creation of fishing industry centers	3.27
WO2	Re-empower fish auction place Hygiene and socialization of knowledge regarding the functions and benefits of fish auction place Hygiene	3.07
WT1	Perform periodic repairs and maintenance of port facilities	2.82
ST1	Increased intensity of sediment dredging regularly using dredgers	2.80
SO3	Creating and developing fishing gear industry sector	2.77
ST3	Conduct market promotion and information system improvement for the purposes of marketing publications regarding Pekalongan fishing port production	2.68
WO3	Optimizing the function of WWTP (Waste Water Treatment Plant), Adding Green Open Space, and building Temporary Waste Disposal Sites in order to support environmentally sound ports	2.59

Based on several existing strategies, it is expected to be used to improve the management of Pekalongan fishing port. This strategy can be realized if implemented and supported by the local government related to port development and community participation in the Pekalongan fishing port area. The construction of the infrastructure must be acceptable to the community with various considerations such as environmental considerations, urban spatial planning and social economic aspects even though development costs become more expensive [18].

4. Conclusion

The existing condition of the Pekalongan fishing port facility is in good condition with a score of 165.2. The facilities available at Pekalongan fishing port are complete with a score of 3, basic facilities, functional facilities, supporting facilities that have fulfilled the criteria as type B of fishing ports. The level of the facilities use of Pekalongan fishing port has reached beyond optimal condition on the pond facilities 132.15%, ship channel 112.8%, and wharf of ship docks <30 GT 144%, almost reaching optimal conditions on ship dock facilities >30 GT 84.24%, and not optimal at fish auction place facilities at 53.82%.

The development strategy that can be implemented in Pekalongan fishing port is a mix of several combinations of internal and external factors with the results of twelve strategies obtained with three main strategies; making integrated and sustainable fishery industry centers from handling to processing; improving the quality of port management in terms of service and operations; and improving good communication between the port and the government.

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