Fishery Harbor Needs Analysis for Fishery Vessel Activities in Ocean Bungus Fishery, West Sumatra Province

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Abstract

The size of the harbor pool will affect the number of ships that will dock. The purpose of this research is to determine the size of the port pool needs and determine the depth of the port pool needed for smooth activities at PPS Bungus. Data collection is done directly in the field to see the maximum number of ships anchored the port pool area (m^2), the depth of the port pool (m), data on the width, length, and depth of the largest ship (m), the maximum tide in the port pool (m), and the *squat* or height of the oncoming ship (m). The results concluded that the existing harbor pool is no longer able to accommodate all ships that dock. The current harbor pool area is 40,000 m^2 with 348 vessels, requiring a pool area of 458,762.06 m^2. The current average harbor pool depth is 2.75 m, and it is safe for ships to anchor in the harbor pool

1. Introduction

Indonesia has 11 fisheries management areas (WPP), with 1139 fishing ports (KKP, 2014). There are only six fishing ports with PPS status based on the total number of all fishing ports in Indonesia, while the other nine fishing port units are planned to have PPS status within the next 10-20 years. The geographical location of Bungus Ocean Fishing Port (PPSB) is within the administrative area of Labuhan Tarok Village, Teluk Kabung Subdistrict (Bungus) Padang City, West Sumatra Province-position 01º02'15" LS and 100º 23'34" East. Labuhan Tarok Urban Village is 0-140 m above sea level with an area of 320 Ha, 16 km from Padang City. Bungus PPS is generally located on the west coast of West Sumatra Province, and the management area is in WPP 572.

The port pond is the main facility that has a major influence on the function of the fishing port. Research on the feasibility of the port pool area is deemed necessary to estimate whether the PPS Bungus pool area that has been built is currently able to keep up with the number of fishing vessels and the flow of loading and unloading vessels, especially vessels with a size >30 GT at PPS Bungus, forecasting is used as a quantitative value benchmark to estimate the situation in the next few years. The harbor pool is a port water area for the entry of ships that will lean on the dock. The port pool, according to its function, is divided into two, namely:

The shipping channel is the entrance of the harbor pool to the pier. The shipping channel is determined by several factors, including the size of the ship that will enter the channel (length, width, load, and speed), the direction of the traffic lane in the channel (unidirectional or bidirectional), the curved shape of the channel, the braking distance, the size of the ship's turning place, the influence of the direction and magnitude of the wind force or the direction and magnitude of hydrodynamic forces such as the direction of wave stability, determining the direction of the ship when docking at the pier.

The turning pool is the water area for rotating ships. The turning pool has a diameter equivalent to 2 times the ship's length for those using tugs and 3 or 5 times the length for ships without tugs. The supply pool is the water area in front of the dock the ship requires when

loading supplies. A mooring pond is the waters before a mooring dock where vessels moor or wait before returning to sea.

The mooring buoy is located in the harbor pool or the middle of the sea. Ships loading and unloading cannot always dock directly at the dock because the dock is being used, repaired, or otherwise. Thus, the ship must wait outside the dock and stop. When the ship is outside the protection of the breakwater, it can anchor by throwing out its anchor. Given the limited area in the breakwater protection, ships anchored using their anchors can interfere with other ships because the ship can rotate 360º, requiring a large area. To reduce this rotating motion, several anchoring buoys are needed. In addition to being a ship binder, the mooring buoy can also be a helper for rotating ships.

2. Methodology

2.1. Data Collection

Primary data is data obtained directly from the source, namely from direct observations such as measuring the depth of the harbor pond, observing ship samples, observing waves in the harbor pond, observing tides in the harbor pond, and observing water conditions directly.

The survey is an activity to collect data with several objectives, including describing the current situation, identifying the current situation to be compared, and determining the relationship of something. The activities carried out are as follows: 1) Measurement of harbor pond area requirements, 2) port pond depth measurement, 3) observation of vessel activities in the harbor basin, 4) harbor Pond wave observation, and 5) harbor Pond bottom observation

2.2. Data Analysis

Data analysis is carried out by calculating the need for pool area, pool depth, largest ship size, maximum number of ships anchored, average ship length, largest ship length, and largest active ship width. The need for a port pool area can be calculated using the formula according to Zain et al. (2011):

$L = lt + (3.N.LOA.B)$

$lt = 3{,}14\ (1{,}5.LOA\ max)^2$

Description:

L = Harbor pond area required (m^2)
lt = Rotary pool area (m^2)
N = Maximum number of vessels docked (unit)
LOA = Average ship length (m)
LOA_{max} = Largest ship length (m)
B = Average ship width (m)

2.2.1. Harbor Pond Requirement Depth

The calculation of the depth of the port pool is based on the draft of the ship at full load, the tide in the port pool, the squat or nod height of the ship traveling in the port pool, and the safe distance of the ship's keel to the bottom of the waters, then determining the need for port pool depth can be calculated using the formula according to Zain et al. (2011):

$D = dmax + 1/2\ .\ H + S + C$

Description:

D = Depth of pond (m)
dmax = Draft of the ship at full load (m)
H = Maximum wave height in the pond (max 0.5 m)
S = Squat or nod height of an oncoming ship (m)
C = Clearance (safe distance of the ship's keel to the bottom of the water (0.25-1m)
½ = Constant

Data and information about the needs of the area and Depth of the port pool that have been analyzed previously will be tabulated to compare with the capacity or availability of the existing capacity of the pool area and Depth of the Bungus PPS pool and the impact caused for smooth activities in the port pool.

2.2.2. Queuing Model Data Analysis

The data obtained from data collection is then processed using the data processing method carried out as follows. In finding the optimal value of the service system to find the value of service time, the number of queues, and the number of services, use these four models (Retnaningsih et al., 2011):

The M/M/I model, or single line queuing model, shows that customer arrivals are poison distributed and service times are exponentially distributed based on the following formula:

Level of intensity of service facilities $p = \frac{\lambda}{\mu}$; Average number of customers expected in the system $l = \frac{p}{1-p}$; expected number of customers waiting in queue $lq = \frac{\lambda^2}{\mu(\mu-\lambda)}$; the time expected by customers in the queuing

system $w = \frac{1}{\mu-\lambda}$; customer's expected time while waiting in queue Wq = $\frac{\lambda}{\mu(\mu-\lambda)}$

3. Result and Discussion

3.1. PPS Bungus Pond Area

From the results of the analysis using the formula Zain et al. (2011), the area of the PPS Bungus rotary pool from the calculation results obtained is 4.144.388 m. This result is obtained by multiplying the length of the largest ship for the maximum number of ships anchored, namely during the January 2022 period, which is 348 units, and calculating the average length of the ship can be done by calculating the ship unit multiplied by the average LOA with the calculation result of 49.93 m, while to calculate the length of the largest ship, for the average largest ship is 24.22 m, to find the average ship width, namely the ship unit multiplied by the average ship width, the calculation result is 8,777.058 m. It can be seen that the current state of the Bungus PPS pool and the amount of the required port pool are based on the current PPS Bungus area needs. It can be seen the current state of the PPS Bungus pool and the amount of port pool requirements based on the current PPS Bungus area requirement of 40,000 m^2.

If we look at the current PPS Bungus pool area, it is still lacking and contrary to the needs of the ship, which should be 458,762.06 m^2 (Lubis & Mardiana, 2011). The Port Pond area is very important because it will affect the smooth running of capture fisheries activities. Information about the needs of the port pond needs to be known so that the port pond facility can function optimally. Based on the calculations that have been carried out, the area and depth requirements of the port pond can be seen in Table 2.

Table 2. Comparison of Pond Area and Depth Requirements

No.	Facility Type	Current Condition	Needs
1.	Port pond area	40.000 m^2	458,762,06 m^2
2.	Port pond depth	3 m	2,75 m

For the current harbor pond depth ranging from 3-7 m, of course, This depth can still accommodate ships with a larger GT size. In contrast, the current needs from the calculation results still do not require PPS Bungus to dredge the port pond, based on calculations with the dimensions of the largest draft size of 30 GT. The results of the calculation using the formula equation according to Zain et al. (2011), with the calculation of the draft on a fully loaded ship with the sample Tiar Jaya 01 Ship of 0.5 m and for wave height measurements, namely by using the equation from the formula Zain et al. (2011) PPS Bungus pool has a wave height of 0.5 m, while for the squat or nod of the oncoming ship using a meter unit of 1 m, for clearance or safe distance from the keel to the bottom of the waters of 1 m, then the Bungus PPS pool depth requirement is 2.75 m, so it is concluded that the depth of the port pool does not need to be dredged. That the depth of the port does not need to be dredged.

Measurements were made using a meter and makeshift tools because the port did not provide navigation tools like an echosounder. These measurements were made at only a few points and could not be a benchmark for depth if measured several meters ahead of the measurement location.

3.2. Queuing Model Data Analysis

M / M / I model or single-line queuing model. This model shows the arrival of poison-distributed customers and exponentially distributed service times (Ratnaningsih et al., 2011).

Level of intensity of service facilities (0,48). The figure shows that the syahbandar service will be busy serving 48% of the time. While 52% of the time, or (1-p) or (1-0.48), often called idle time, will be used by servers to rest or do other activities. The average number of customers expected in the system, l=p/(1-p)=0,48/(1-0,48) = 1ship.

The number shows that the average vehicle is expected to be one vehicle only because this calculation is based on units of days. The expected number of customers waiting in the queue is 0.44.

Ships that are waiting while the ship is being served unloading result in only one ship, which is the maximum. The time expected by customers while in the queuing system is 0.07.

The average amount of time a vehicle waits in the system for 5 minutes. The customer's expected time while waiting in queue is 0,06

The number above shows that the average time the ship waits in the queue is 4 minutes. The data above shows the number of ships queuing as many as 0.48 units. This number indicates that the service process requires a range of 48%. In comparison, 52% of the time or (1-P) or (1-48), which is often called idle time, will be used for rest time or other activities and its relation to the capacity of the pool area needs when viewed from the queue, the PPS Bungus pool can still accommodate a certain number of ships if the measurement of the PPS Bungus pool area needs is seen from the unloading activity alone (Siswanto, 2007). At the mouth of the trap, there is an injep (the funnel) in the form of a wall which functions to herd the fish in and it is difficult for it to get out of the trap.

The rectangular body of the trap serves to confine the fish that enter the trap. Inside the body of the trap, there is a place for bait using a net tied above and below so that it hangs in the middle of the body of the trap. Inside the trap's body, there is also a float in the form of 4-5 bottles which functions so that the trap's parts are not completely submerged into the water. The types of fish that dominate in public waters are relatively small groups of fish in rivers, swamps, and lakes. Mostly from the Cyprinidae family with the dominance of small-sized group fish, there is pressure in the aquatic environment (Asyari et al., 2002).

4. Conclusion

The result of the research that has been done is that the existing pool can only accommodate some ships that dock. The current required pool area is 458,762.06 m^2, and the total area of the port pool that has been built is 40,000 m^2. The current average depth of the port pond at PPS Bungus is 3-7 m, the required depth of the port pond at PPS Bungus is 2.75 m, and the depth of the port pond as a whole is sufficient.

References

[KKP] Kementerian Kelautan dan Perikanan. 2014. Keputusan Menteri Kelautan dan Perikanan Republik Indonesia Nomor 45/Kepmen Kp/2014 tentang Rencana Induk Pelabuhan Perikanan Nasional. Jakarta.

Lubis, E., & Mardiana, N. (2011). Peranan fasilitas PPI terhadap kelancaran aktivitas pendaratan ikan di Cituis Tangerang. *Jurnal Teknologi Perikanan dan Kelautan*, 2(1): 1-10.

Ratnaningsih, R., Mumpuni, S., & Irhamah. (2011). *Riset Operasi.* Surabaya: Its Press.

Siswanto. (2007). *Operations Research*. Bogor: Penerbit Erlangga.

Zain, J., Syaifudin, S., & Yani, A.H. (2011). *Pelabuhan Perikanan*. Pusat Pengembangan Pendidikan Universitas Riau. Universitas Riau. Pekanbaru.