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# Analysis of the Long Needs of Container Dock in the Port of Sorong, Indonesia

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## Abstract:

The limited facilities and infrastructure, as well as the natural geographical conditions that do not support at the Port, will likely reduce the performance of the Port so that the services provided are not optimal. This study examines how to improve loading and unloading services, especially the need for container loading and unloading equipment needed to support container loading and unloading activities at this time and predictions for the next five years, besides also calculating how wide the stacking yard needed to accommodate the number of containers coming in Sorong Port in the next five years. This type of research is quantitative with data analysis techniques that are linear regression and calculation of the length of the container dock. From the research results obtained (1) Fulfillment of loading and unloading equipment needs include: a) Quay container crane 1 unit (capacity 20-25 boxes/hour), b) Rubber tired 1 unit (capacity 18-23 boxes/hour), c) Head unit and chassis 4 units, d) Forklift 2 units (capacity of 4 tons and capacity of 2 tons); (2) Construction of a wharf specifically for container ships with a length of 226 meters; (3) Rearrangement of space utilization in the area of the stacking field and the process of flow in and out of containers.

**Keywords:** long, container, dock, Sorong port

## INTRODUCTION

Sorong City is a city in West Papua Province, Indonesia. There are two meanings about the origin of the name Sorong, the first coming from the word Soren, the vocabulary of the Biak Numfor language which means the deep and wavy sea. Furthermore, by migrants such as Chinese traders, European missionaries or other ethnic migrants in the archipelago say the word Soren as Sorong, which is used as the name of the city to this day. From the second understanding, the name Sorong was taken from the name of a Dutch company which at that time was given the authority or authority to manage and exploit oil in the Sorong region, namely Seismic Ondersub Oil New Guinness or abbreviated as Sorong.

The city of Sorong around 1935 was opened as the base camp of the Bataafse Petroleum Maatschappij (BPM), which later changed its name to Nederlands Nieuw-Guinea Petroleum Maatschappij (NNGPM) while the government post takes location on Doom Island. Therefore, the city of Sorong is a city full of remnants of the history of the former Dutch oil company. One of the relics which is still being used is the port of petroleum export or now known as the Port of Sorong. Currently, Sorong Port is being targeted to become one of the central ports in Eastern Indonesia that aims to increase economic growth, elevate the potential of the Indonesian region of the Timuer, as well as be able to consolidate container potential for overseas destinations such as Australia, Papua New Guinea, and East Timor. Sorong Port will later become the

final destination for the development of inter-port sea transportation routes throughout Indonesia.

Sorong Port is a conventional port that has a length of 340 meters. And is a port that serves all shipping services, both passenger ships, container ships, and cargo ships. Until the end of 2012, the number of vessels served at this port reached 31,531 ships, or around 3 to 4 ships per day, with waiting time between 5 and 10 hours per day. The significant amount of waiting time is enough to make a significant loss to the port management company, which in this case is PT. Pelindo IV Sorong branch.

Aside from being a port with a large enough flow of ship visits, Sorong port needs to have special attention to the flow of passengers, which has an impact on the effectiveness and ineffectiveness of the use of passenger comfort facilities to date, one of which is the passenger terminal building which is a place of rest while passengers while waiting for the ship used for departure, as well as the arrival of passengers from the ship.

In late 2012, passenger departures reached 345,528 people or the equivalent of 947 people per day exceeding the planned passenger terminal building capacity of 900 people per day. As a conventional port, Sorong Port must also make maximum efforts to manage every container that has accumulated in the open yard (stacking yard). This is due to the accumulation of land that is not separate from the loading and unloading activities of passengers, thus causing ineffective loading and unloading activities at the pier and vice versa.

These problems are the first step towards developing the Sorong Port in a better direction. Arrangement of stacking land, evaluation of the growing number of ships, etc. are things that require significant attention if the Sorong Port is planned to become the main port in Eastern Indonesia.

Table 1. 2016 Sorong Port Data

No	Description	Unit	amount	Information
1	Land Faucet 25 tons	Unit	1	Broken
2	Mobile crane 4 tons	Unit	1	Broken
3	Forklift 5 tons	Unit	1	Good

4	Forklift 7 tons	Unit	2	Good
5	Tronton	Unit	6	Good
6	Reach stacker	Unit	2	Good

The absence of a proper layout arrangement of stacking, makes the container stacking field which has an area of 20,030 m should be able to accommodate the number of containers entering the port and there is no density. This can be seen in the number of containers that are unloaded at Sorong Port, which on average each day unloads 68 containers and contains 70 containers. This is due to the length of the stripping process by the owner of the goods, resulting in a high stack of containers up to 5 piles (tier).

Besides that, the density of the stacking field is caused by stuffing and stripping activities which are still carried out in the stacking field which should be done by stuffing, outside the stacking field or depot outside the port. Therefore the authors are interested in research on improving the service of container loading and unloading activities at Sorong Port.

This study examines how to improve loading and unloading services, especially the need for container loading and unloading equipment needed to support container loading and unloading activities at this time and predictions for the next five years, besides also calculating how wide the stacking yard needed to accommodate the number of containers container that enters the Port of Sorong in the next five years, to provide loading and unloading services and the smooth flow of goods in and out of and to the Sorong Port hinterland area.

## THEORETICAL REVIEW

Based on Law No. 17 of 2008 concerning Shipping, Ports are places consisting of land and/or waters with certain boundaries as a place of business activities which are used as a place for ships to dock, berth, passenger boarding and/or loading and unloading of goods equipped with shipping safety facilities and port support activities and as a place for Intra and inter modes of transportation.

A container (container) is a package that is specifically designed with a certain size, can be used repeatedly, used to store, and at the same time transport the contents inside. The philosophy behind Container is to wrap or carry cargo in the same crates and make all vehicles able to transport it as a unit, whether the vehicle is in the form of ships, trains, trucks, or other transportation, and can carry it quickly, safely, and efficient or if possible, door to door (door to door).

Container operation can run well if all parties involved must agree that the container sizes must be the same and the same type and easily transported. The International Standards Organization (ISO) has set the following dimensions for containers:

1. Container 20 'Dry Freight (20 feet)  
Size: length = 6,058 m, width = 2,438 m and height = 2,591 m
2. 40 'Dry Freight (40 feet) container  
Size: length = 12,192 m, width = 2,438 m and height = 2,591 m
3. 40 'High Cube Dry Container  
Size: length = 12,192 m, width = 2,438 m and height = 2,926 m
4. Container 45 '(Available at TPKS, Pelindo III Semarang)  
Size: length = 13,544 m, width = 2,352 m and height = 2,698 m

Loading and unloading is the work of unloading goods from the ship to the dock/barge/truck depth of the ship until arranged in a ship hatch by using a crane or a land crane (Suryono, 2007). In carrying out the container stevedoring operation system, two types of status are known, namely:

(a) FCL status stands for full container load, which means that in a shipment of goods with a container, the sender of goods uses a full container that the contents of the container are owned by one sender.

The order is as follows:

- (1) Unloading FCL status containers from ships, lowering from ships to damage, moving/placing them in container yards, and stacking in container yards.

- (2) Lift on the FCL status container, in place it under the gantry crane portal and load it onto the ship.
- (b) LCL status is an abbreviation of Less Container Loading, which means that the shipment of goods does not reach one container, the goods sent can come from 1 Supplier can also be from various suppliers where the goods sent are a mixture of various commodities.
- (1) Unload container LCL status from the ship, unload from the ship to the dock, move/place to the stacking yard (CY), move to the container freight station (CFS), take out and arrange it at the stacking point of goods. Lift (lift on) LCL containers from the CFS area, move or place them in the stacking yard, lower (lift off), stack (move), move and place under the portal gantry crane, and load them onto the ship.

Indonesian Port IV of Sorong Branch mostly handles container loading and unloading activities. PT. Pelabuhan Indonesia IV Sorong Branch organizes various business fields including:

- a. Providing and commercializing waters and harbor ponds for shipping traffic and landing vessels.
- b. Providing and carrying out pilotage and postponing services in and out of the port, if the ship moves in the Port pond.
- c. Provide and operate warehousing facilities and goods stacking yard, loading and unloading equipment, and Port equipment.
- d. Providing and commercializing dock facilities for mooring vessels and loading and unloading terminal goods for passenger embarkation and debarkation.
- e. Providing and working on container terminals to service the loading and unloading of container seaports.
- f. Providing and carrying out loading and unloading services in conventional terminals.

**METHODOLOGY**

This type of research is quantitative. The research sample used was Sorong Port, Indonesia. The data used in this study are secondary, namely the recapitulation of the number of loading and unloading at Sorong Port from 2013 to 2017. The data analysis technique used is linear regression using SPSS software.

In measuring the performance of a port, the level of use of the pier will spearhead the size of a port's production. This is due to the increasing number of ships that dock at the port dock, so there will be more and more outflows of goods and passengers that will pass through the port. Therefore, the large number of incoming ships is an indicator of how much use of the pier is not only for ships docked but also for loading and unloading of goods and passengers and boarding.

The Directorate General of Sea Transportation of the Ministry of Transportation in 2001 measured the level of port harbor utilization that could provide optimal service to ships entering the port, through a study of "optimal port size as port infrastructure. The BOR standard that can provide optimal services for ships at the port is as in the following table:

**Table 2 Optimal Level of Jetty Utilization (BOR)**

Number of docks	Dock utilization rate (BOR)
1	0.55
2	0.60
3	0.60
4	0.65
5	0.65
6	0.70
7	0.70
8	0.75
9	0.75
10	0.80

**Table 3. Unloading Facility at Sorong Port**

NO	DESCRIPTION	UNIT	AMOUNT	Information
1	Dock (long)	Meters	340	80%
2	Stacking Warehouse	M2	1,000	70%

Then the analysis of the calculation of container dock length requirements using steps as follows:

- a. The total length of the ship (Lenght overall, LOA) is the length of the ship calculated from the front (bow) to the rear end (stern)
- b. The width of the ship (beam) is the maximum distance between two sides of the ship
- c. *The draft* is the part of the ship submerged in water at the planned load with the lowest point of the ship

Elongated pier shape, where the face of the pier is parallel to the coastline (share line). The ships will be moored lengthwise, with the length of the pier, namely:

$$LP = n. LOA + (n-1) 15 + 50$$

with

LP: Pier length (meters)

LOA: Total Vessel Length

N: Number of ships planned

**RESULT AND DISCUSSION**

**Analysis of container loading and unloading equipment requirements**

In each port, loading and unloading facilities are the most important factor to smooth the loading and unloading flows. The more optimal loading and unloading equipment used, the stevedoring activity will be smoother at the port. Likewise with the Port of Sorong which requires loading and unloading equipment that can facilitate the flow of loading and unloading, especially containers so that the loading and unloading activities can go according to a predetermined schedule. With good facilities, the increase in productivity to be achieved by the company can be carried out without a hitch. In the following, the researchers listed the loading and unloading facilities at the port and their conditions:

3	Stacking Field	M2	24,664	70%
4	Faucet ashore 25 tons	Unit	1	Broken
5	Mobile Crane 4 Ton	Unit	1	Broken
6	Forklift 5 tons	Unit	1	Good
7	Forklift 7 tons	Unit	2	Good
8	Tronton	Unit	6	Good

The following is the container data that was unloaded at Sorong Port in 2013-2017.

**Table 4. Number of loading and unloading containers at Sorong Port**

No	Year	Number of unloading containers (Teu's)	Number of containers loaded (Teu's)
1	2013	19222	18442
2	2014	19188	20188
3	2015	18,766	19492
4	2016	19,547	18789
5	2017	19,459	18889

The number of containers unloaded at the Port of Sorong starting from 2013-2017 is increasing. The average contents of these containers are daily necessities for the people of Papua and surrounding areas, such as necessities and household equipment. Data on the number of containers loaded at Sorong Port, the main commodities at Sorong Port are fish, merbabu wood, scrap metal, kernels, and CPO. With the increasing number of container unloading, it is necessary to add equipment so that loading and unloading activities can be faster. So it does not cause harm to the owner of the goods or the company due to the length of time to unload.

From Table 4.2 we can determine the linear regression model of the number of unloading containers at Sorong port using SPSS as follows:

$$y = 19,201.5 + 40,3.6 = 19,443.3 \text{ teu's}$$

Furthermore, the linear regression model for the number of containers loaded at Sorong port uses SPSS as follows:

$$y = 14,889.4 + 1,002.6 = 20,901 \text{ teu's}$$

From the above calculation, it can be seen that the prediction of the number of containers coming in 2022 at Sorong Port is loading of 19,443 Teu's and loading of 20,901 Teu's. So that on average each day the number of containers unloaded and loaded at the Port of Sorong when working days 365 days per year is 53 TEU's unloading and 57 TEU's loading.

The choice of loading and unloading equipment to be used at the container terminal must be determined before the loading and unloading activities take place because the determination of the equipment used is highly dependent on the container terminal operating system to be built. For smooth loading and unloading of containers at the Port of Sorong as much as 110 Teu's per day or 7 Teu's per hour (operating hours of Sorong port = 18 hours). Since the arrival of the ship every 3 days, the number of containers that must be unloaded is 3 x 110 Teu's = 330 Teu's on the day of the ship's arrival or 23 Teu's per hour. Then the transtainer system used includes (Siswanto, H: 2010):

1. Quay container crane 1 unit (capacity of 20-25 boxes/hour)

2. Transtainer rubber-tired 1 unit (capacity 18-23 boxes/hour)
3. Head unit and chassis 4 units
4. Forklift 2 units (4 tons capacity and 2 tons capacity)

### Analysis of Container Pier Length Requirements

The current container stacking area at Sorong Port is 20,030 m<sup>2</sup> with container length = 6,058 m, width = 2,438, and height = 2,591 m. The number of containers that must be unloaded in one day is 550 TEU's. The duration of container stacking at Sorong port is 5 days and the height of the container stack (tier) at Sorong 3 port is stacking and the additional land area for loading and unloading operations is 30% of the total land.

Calculation of land area requirements:

Number of containers in base = 550: 3 = 184 teu's (containers in 3 tiers)

Stable land area = 184 x 2,478 x 6,058 = 2,762.15 m<sup>2</sup>

Space requirements for tool operations = 30% x 2,762.15 = 828.65 m<sup>2</sup>.

So the needs of the accumulation field area needed are: 2,762.15 + 828.65 = 3,590.80 m<sup>2</sup>. From these calculations, it can be seen that the existing container stacking field which covers an area of 20,030 m<sup>2</sup> is sufficient to accommodate containers that will enter in 2022.

However, due to the stacking field management system which is still united in its location between the location of the container that will be loaded onto the ship and the container to be unloaded, as well as the location of the empty container stacking in the container stacking field, there will be chaos from the vehicles carrying the containers. a container according to their respective interests.

Stuffing and stripping activities that are still carried out inside the piling yard, as well as truck drivers who do not regularly, park their vehicles, cause the piling yard to become more congested. For this reason, it is necessary to conduct field management by the applied rules.

From the calculations that have been done, the comparison between conditions is obtained existing and expected conditions at the port of Sorong.

**Table 5. Comparison of existing conditions with expected conditions**

No	Description	Existing conditions	The expected conditions
1	DRILL	88%	60 - 70%
2	Container crane	There is no	At least 1 unit of capacity 11-15 boxes/hour
3	Pier length	340 meters	417 meters
4	Crane crane quay	There is no	Minimum 1 unit capacity of 20-25 boxes
5	Transtainer	There is no	At least 1 unit of capacity 18-23 boxes/hour
6	Headtruck	6 units	7 units
7	Forklift	3 units	4 units

From the table shown in the table, it can be seen that the need to increase loading and unloading services, to support operational activities at the Port, by constructing loading and unloading equipment facilities.

To solve the problem of suboptimal loading and unloading services at the Port of Sorong, especially

loading and unloading of containers, the following things need to be done:

1. Adding loading and unloading equipment

With the addition of container loading and unloading equipment, it will increase loading and unloading productivity. For cloudy smooth loading and unloading currents, the equipment needed is:

- a) Quay container crane 1 unit (capacity of 20-25 boxes/hour)
- b) Rubber tired trainner 1 unit (capacity of 18-23 boxes/hour)
- c) Addition of Forklift 1 unit (4 tons capacity and 2 tons capacity).
- d) The addition of a special container dock along 226 meters.
- e) Add 1 truck head

## 2. Conduct stacking field

The need for a stacking field arrangement by dividing container storage areas, each for the container area to be loaded, the container are being demolished and the container area empty, so that container transport traffic does not experience clutter, and the need for coordination from all parties to support the activity. Instead, the company needs to make updates to the allocation of container stacking, by applying the correct container terminal layout, such as placement for imported, export, transit, and empty containers. The container storage for import cargo should be located far from the port, while the export container is located around the side of the dock and for empty containers placed in a place where it does not interfere with the traffic of container activities and can move at any time. The need for the installation of warning signs or road markings in the container stacking field, so that truck drivers can be orderly in carrying out operational activities smoothly.

## CONCLUSION

Efforts are being made to improve loading and unloading services, especially the need for container loading and unloading equipment at present and the prediction of the next five years at the Port of Sorong, namely:

1. Meeting the loading and unloading equipment needs to include:
  - a. Quay container crane 1 unit (capacity of 20-25 boxes/hour)
  - b. Transtainer rubber-tired 1 unit (capacity 18-23 boxes/hour)

- c. Head unit and chassis 4 units
  - d. Forklift 2 units (4 tons capacity and 2 tons capacity)
2. Construction of a special pier for container ships along 226 meters.
  3. The need for a container stacking area is 3,590.80 m<sup>2</sup>, while the existing stacking field is 20,030 m<sup>2</sup>, then all that is needed is to rearrange the space utilization in the stacking area and the process of flow in and out of the container.

To complete the effort to improve container loading and unloading services at Sorong port, things that can be done include:

1. The port should plan the development of a special pier for containers, so that the process of loading and unloading of containers, both imports and exports can be handled better and more efficiently.

Briefing of port security officers to help secure every corner of the port, especially to bring the transport trucks to comply with existing regulations and road markings set by the Port operator, and provide administrative sanctions to expedition companies that do not obey the owner of the transport trucks who violate company regulations that have been complied with made and agreed.

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