

A Study on the Container Yard Utilization of the Major Ports in Indonesia Eastern Region

Misliah Idrus, Lawalenna Samang, Rahardjo Adisasmita, Ganding Sitepu, and M. Isran Ramli

Abstract—This paper attempts to analyze the utilization of container yards of major ports in Indonesian Eastern Region for current condition. In this regard, the study focused on ten major ports available in the region. The yard occupation ratio (YOR), a performance indicator of the container yard utilization is calculated using a general standard model. Furthermore, the paper forecasts the demand of the container yard using the growth method in order to evaluate the container yards capacity in the future. The analysis results show that the utilization of the container yards is not optimal in serving the container throughput. In considering the current and future growth of the demand, most of the container yards of the major ports in the region need improvement and development efforts in order to increase their serving in the future.

Keywords—Container yard, utilization, yard occupation ratio (YOR), major port, Indonesia Eastern Region

I. INTRODUCTION

NOWADAYS, a port plays important role on the sea transportation system [1, 2, 3] for archipelago countries such Indonesia [3]. A port is node between the sea transportation system and the land system in order to support [4, 5] and actuate economic developments of a region or country [6]. It is also a place for loading and unloading activities of trade commodities [7, 8]; and the embarkation or debarkation of ship passenger [8]. Therefore, planning of the sea transportation system need to consider and integrate many aspects, such as ship services, port infrastructures such the container yard, the potency of region and the network of land transportation to hinterland region, etc [6].

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In Indonesia, mostly ports are managed by PT. Pelabuhan Indonesia (PELINDO), a port agency that owned by Indonesia Government. Particularly in Indonesia eastern region, the ports are managed by PT.PELINDO IV. The company has been managing 19 ports that available on ten provinces in the region [9-14]. In this regard, the total wide area of the region is 45.76% of Indonesia's wide area [14]. The annual growth rate of commodities flow on the ports during 2005 – 2010 increased averagely 9.66% [9-14]. Particularly, the container throughput has annual growth 13.42% averagely during the period [14]. In case of Makassar port, the biggest port in the region, the container throughput increase from 23.83% to 39.84% [9-14].

In serving the above ports activities, the container yard facility is one of primary facilities that used to storage the container throughput from or to ships. It is needed to prevent delay risk of ships that will cause the production of loading-unloading activity decrease, also the stay or waiting time of ships or commodities become long.

Regarding the background, this paper attempts to analyze utilization of the container yards of the major ports in Indonesia eastern region that managed by PT. PELINDO IV. Furthermore, the study conducts a forecasting of the container throughput in order to evaluate the serving capacity of the container yard in the future.

The rest of this paper is organized as follows. Section 2 describes calculation model of container yard utilization. Section 3 explains the study method, then, Section 4 presents the calculation result and discussion. The final section, Section 5 provides the conclusion of this study.

II. CALCULATION MODEL OF CONTAINER YARD UTILIZATION

The utilization of the container yard is one of performance indicators of port that is important tool for the port management in evaluation, monitoring, improvement and development planning of a port. The general standard model [15] that is used in analyzing the container yard utilization are given by Equation (1), Equation (2), Equation (3), and Equation (4), respectively.

First of all, the standard model estimates the dwelling time (DT) of a container storage using the Equation (1) as follows.

$$DT = \frac{V_p \cdot x T_p}{V_t} \quad (1)$$

Where V_p is number of cargo party in ton or m^3 ; T_p is storage time of each cargo party in day unit; an V_t is number of cargo storage in a certain time period in ton or m^3 .

In order to describe the flow rate of the container throughput in the container yard, the shed throughput (STP) is calculated using Equation (2) as follows.

$$STP = \frac{V_t}{A_s} \quad (2)$$

Where V_t is a number of cargo in a certain time period in ton or m^3 ; A_e is the effective wide of the container yard.

Then, the effective capacity (C_{ef}) of the container yard is calculated using Equation (3) as follows.

$$C_{ef} = \frac{\frac{W_c}{W_e} \times N_s}{DY \times T_s} \quad (3)$$

Where W_e is the effective wide of the container yard in m^2 ; W_c is the wide of the container yard in m^2 ; N_s is a number of the container storage in TEUS; DY is a number of day in a year; T_a is the storage time of a container.

Finally, the container yard utilization in term of shed occupancy ratio (SOR) or yard occupancy ratio (YOR) can be calculated using Equation (4) as follows.

$$SOR / YOR = \frac{V_p \times DT}{C_{ef}} \quad (4)$$

III. STUDY METHOD

A. The Selected Sampling of the Ports

In this study, we selected eight major ports that located in Indonesia eastern region and managed by PT. PELINDO IV. The eight ports are Makassar port, Balikpapan port, Samarinda port, Bitung port, Ambon port, Jayapura port, Sorong port, and Biak port. The first port is located in Makassar, a capital city of the Sulawesi Island; the next two are located in the Kalimantan Island; the fourth port is located in the northern Sulawesi Island; the fifth port is located in Ambon, a capital city of Maluku Island; the last three are ports that located in Papua Island. All of the ports are categorized as twenty five strategies ports in Indonesia.

B. The Data Collection

The data in this study consists of two categories, the primary and the secondary data. The primary includes the stay time and the method of the container storage. The data are collected through an observation in the field. Meanwhile, the secondary data that include the demand data, and characteristics of the ports and container yard facilities, etc., are collected from many source of technical reports of PT. PELINDO IV [9-14].

C. The Data Analysis

Using the primary and secondary data, this study analyzes operational characteristics of the container yards such as dwelling time, shed throughput (STP), and utilized capacity, using Equation (1), Equation (2), and Equation (3) respectively. In further, we analyze the utilization of the container yard in term yard occupancy ratio (YOR) using Equation (4). In order to evaluate the yard capacity in the future, this study also forecasts the container yard demand using the growth method approach through repeating the application of those equations.

IV. RESULT AND DISCUSSION

A. The Number and Growth Rate of Cargo

The number of cargo on the eight major ports in 2010 is shown in Figure1, and the growth rate of the cargo is shown in Figure 2. Figure 1 shows that most of the ports have demand cargo in 2010 from 50,000 TEUS until 100,000 TEUS. However, Balikpapan port has number of cargo achieved 200,000 TEUS. Figure 2 shows that the growth rate of the cargo during 1998 until 2010 is 10% until 20%, except Jayapura port has growth rate about slightly more than 30%. Generally, the growth rate of cargo is averagely 15.61%.

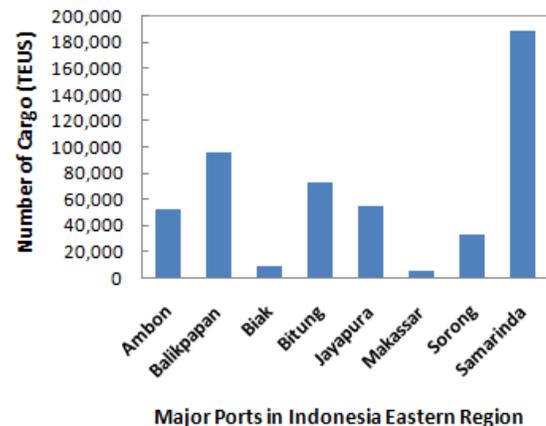


Fig.1 Number of Cargo in 2010

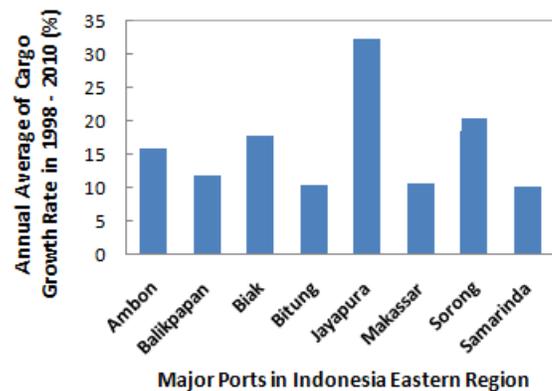


Fig.2 Annual Average of Cargo Growth Rate in 1998 - 2010

B. The Change of Cargo Share based on Containerization

The change of cargo share based on containerization during the last decade, 2000 – 2010, from the general cargo to the container cargo is enough large. The phenomena of the eight major ports are shown in Figure 3 and Figure 4 for the number of general cargo and number of container cargo, respectively.

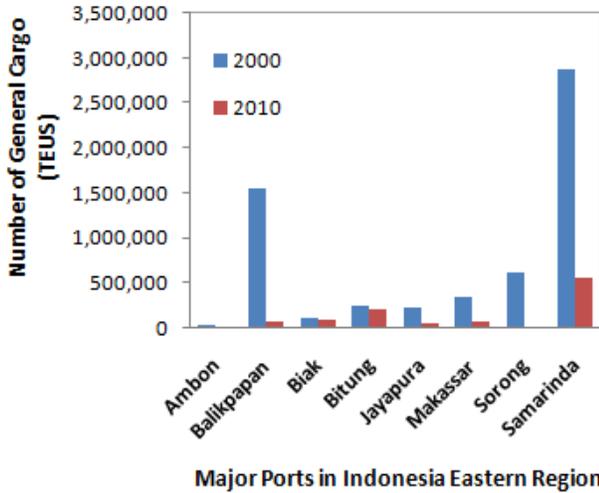


Fig.3 Number of General Cargo

Figure 3 shows that the general cargo has decreased amount 26.75%. In other side, Figure 4 shows that the container cargo have increased about 30.73%.

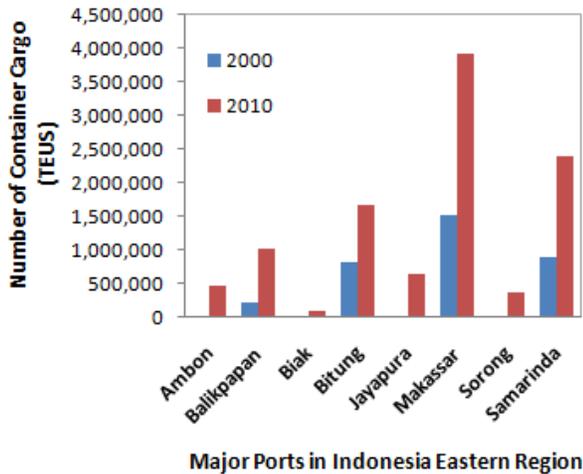


Fig.4 Number of Container Cargo

C. Operational Characteristics of the Container Yards

There are three operational characteristics of the container yards that play important role in evaluation of the container yards utilization. The three are the wide of container yard, the storage time, and the capacity of the container yard. Figure 5, Figure 6, and Figure 7 show the performances of the three characteristics of the eight major ports, respectively.

Figure 5 shows that Bitung and Makassar ports are the first two the widest container yards. Both ports have wide around 60,000 m². Samarinda port is the second widest that has 40,000 m². The others ports have only less than 20,000 m².

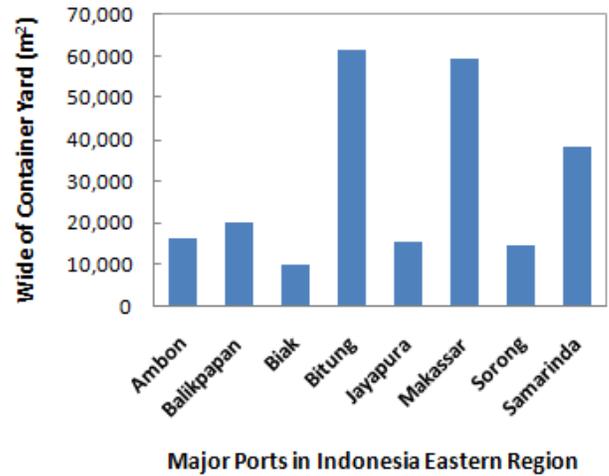


Fig.5 Wide of Container Yard

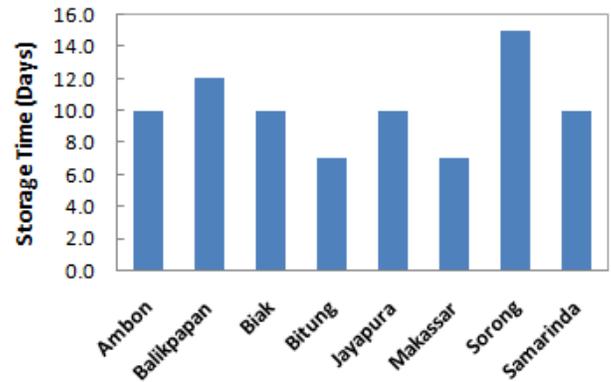


Fig.6 Storage Time

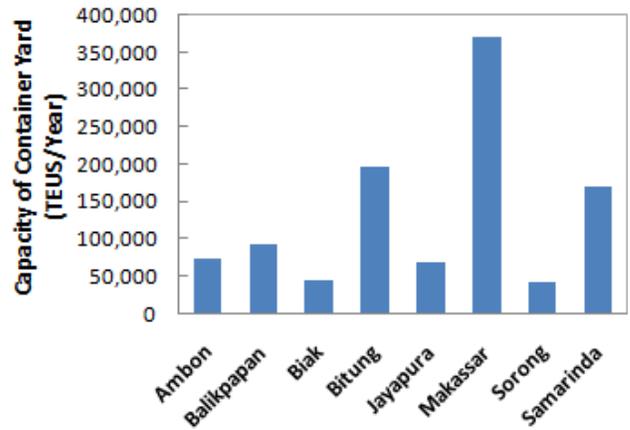


Fig.7 Capacity of Container Yard

Figure 6 shows that the storage times of almost container yards are around 10 days until 12 days, except Sorong port has storage time about 15 days. However, Bitung and Makassar ports have storage time about 7days. It means that both ports, Bitung and Makassar ports, have operating performance better than the others.

Figure 7 shows that Makassar port has the largest capacity among the container yards. It has capacity about more than 350,000 TEUS/year. Then, Bitun and Samarinda ports are the second largest capacity. Both ports have capacity around 150,000 – 200,000 TEUS/year. Meanwhile, the others ports have only capacity about 50,000 – 100,000 TEUS/year.

D. The Utilization of the Container Yard

According the data analysis results, the utilization of the container yards of the eight major ports in Indonesia eastern region in 2010 is shown blue color of histogram in Figure 8.

The figure shows that the utilization of the container yards is slightly low. There are eight ports have YOR values that fluctuated between 20% until 80%. However, there are two ports, Balikpapan and Samarinda ports, have YOR values more than 100%.

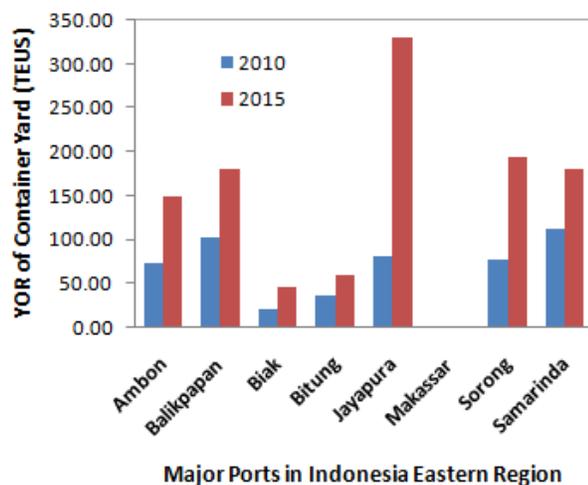


Fig.8 Utilization of Container Yard

By using the growth rate value of the cargo as provided in Figure 2, we forecast the number of container until 2015 as shown by the red color of histogram in Figure 9. Then, we continue to evaluate the container yards utilization until 2015 as shown by the red color of histogram in Figure 8.

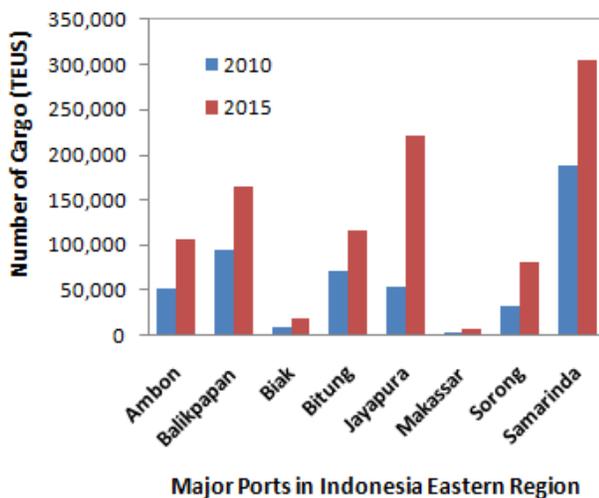


Fig.9 Forecasting of Number of Cargo

The forecasting results show that the average YOR values of the ten ports in 2015 are very high. There are five ports have YOR values more than 100%. However, there are three ports, Makassar port, Biak port, and Bitung port, have YOR values equal and less than 50%. These indicate that most of the major ports are need improvement and development in order to increase their capacity to serve the demand of the container throughput in the future.

V. CONCLUSION

This paper have studied the container yards utilization of eight major ports in Indonesia eastern region. By using the primary and secondary data, we attempted to grasp the container yards operating characteristics performances and demand of the container throughput such as wide and capacity of the container yards, the storage time at the container yards, the number and growth rate of cargo, and the change of the general cargo to container cargo. Then, as focus of this paper, we calculate the container yards utilization using the general standard model of yard occupancy ratio (YOR). In order to evaluate the container yard capacity in the future, the paper forecasts the demand of the container throughput and used it again to calculate the YOR.

The analysis results show that mostly container yards of the eight major ports have good operating characteristic performance. However, their utilization performance that indicated by YOR values are not yet optimal, due to the demand of container throughput are large enough. This condition may become worse when we evaluated the utilization of the container yard for the next few years through a forecasting method. Therefore, most of the container yards of the eight major ports are need capacity improvement and development in the future.

Finally, the result of this paper provides a basic input in analyzing of the container yards performance in others views, and we expect that it can be used in optimizing of the container yards capacities and modeling the demand in further studies.

ACKNOWLEDGMENT

We would like to thank the PT. PELINDO IV that allow us to access and utilize its data for the purpose of this paper, and also for the support and useful discussions in this paper. Without its cooperation, this paper would be possible to be arranged.

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