



Development of a Feeder Port of Tanjung Ringgit Facilities to Support Implementation of Sea Tollway

Windra Priatna Humang , Rakhmawati Natsir , Amiruddin Akbar Fisru

Faculty of Engineering, Departement of Civil Engineering,
Universitas Andi Djemma, Tandi Pau Road No.5 Palopo, South Sulawesi, Indonesia

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Abstract

Improvement of connectivity between islands known as the sea Tollway initiative has minimized pricing inequalities and improved connection in poor, remote, outer, and border areas. The biggest challenge to implementing the Program of Sea Tollway are port infrastructure readiness, collector and feeder ports for the movement of goods into a node. Tanjung Ringgit Port must serve as a feeder port for Makassar's main port to support the program. The approach used in this research is quantitative. Data collection consists of primary data through interviews, field observations and secondary data. This research used port performance analysis to analyze the needs of port performance facilities such as container field facilities, warehouses and jetty, and SWOT analysis to determine port development policies and strategies. The findings of the study show that more warehouse space will be required until 2035. The development strategy of port capacity and facilities is done by changing patterns of shipments, a dedicated terminal for large volume cargo, infrastructure development, equipment and container stevedoring, warehouse replacement truck losing systems.

Keywords: Sea Tollway, Port Infrastructure, Hinterland, Port Performance Analysis, SWOT.

Abstrak

Pengembangan Fasilitas Pelabuhan Pengumpan Tanjung Ringgit untuk Mendukung Implementasi Tol Laut; Program peningkatan konektivitas antar pulau yang dikenal dengan program tol laut telah dicanangkan dalam rangka mengurangi disparitas harga dan konektivitas di wilayah Tertinggal, Terpencil, Terluar, dan Perbatasan (3TP). Tantangan terbesar untuk melaksanakan Program Tol Laut adalah kesiapan infrastruktur pelabuhan, baik simpul pelabuhan pengumpul dan maupun pelabuhan pengumpan untuk perpindahan barang. Untuk mendukung program tol laut, pelabuhan Tanjung Ringgit menjadi feeder bagi pelabuhan Makassar. Pendekatan yang digunakan dalam penelitian ini adalah pendekatan kuantitatif. Pengumpulan data terdiri dari data primer melalui wawancara, observasi lapangan dan data sekunder. Penelitian ini menggunakan analisis kinerja pelabuhan dalam menghitung kebutuhan fasilitas pelabuhan seperti fasilitas lapangan peti kemas, gudang dan dermaga dan Analisis SWOT untuk menentukan kebijakan dan strategi pembangunan pelabuhan. Hasil analisis menunjukkan perlunya penambahan fasilitas gudang hingga tahun 2035. Strategi pengembangan kapasitas dan fasilitas pelabuhan dilakukan dengan mengubah pola pengiriman, penyediaan terminal khusus general cargo, pembangunan infrastruktur, pengadaan peralatan dan bongkar muat kontainer, sistem gudang untuk mengganti sistem *truck losing*.

Kata Kunci: Tol Laut, Infrastruktur Pelabuhan, Hinterland, Analisis Kinerja Pelabuhan, SWOT.

1. Introduction

Basic concept of the Sea Tollway is based on the unbalanced condition of the Indonesian territory in the development sector, economic disparities, and price disparities of logistics goods between Eastern and Western regions of Indonesia. Massive development took place on the island of Java, so that the industrial sector was only focused on the island of Java. There is a large gap between the load factor of logistics transportation in the eastern and western regions of Indonesia.

The big challenge for an archipelagic country like Indonesia is how to reduce national logistics costs and increase the competitiveness of national products by balancing the amount of cargo/commodity transportation between the East and West regions through the progressive development of new growth centers (Jinca, 2008) (Humang, et al., 2017) (Humang, et al., 2020). Strategies and policies for leading regional development (outside Java) must be different and specifically "not business as usual" (Humang, et al., 2013).

* Corresponding author 081355093353
E-mail: windrahumang@gmail.com

To guarantee this, the concept of the Sea Tollway by President Joko Widodo is one of the "Nawa Cita" of Indonesia's development. The Sea Tollway can be interpreted as effective sea connectivity in the form of regular and scheduled ships traveling from West to East Indonesia, as shown in Figure 1.



Figure 1. Scenario of Sea Tollway by Bappenas (2015) in (Triantoro, 2020)

The basic elements of the Sea Tollway for container activities consist of 1). ports are reliable, 2). adequacy cargo of western-east, 3) shipping industry, 4). routine and scheduled services, 5). inland effective access. The main strategy of the Government for the period 2014-2019 (Jokowi-JK) is to reorient the national development that initiates the development of isolated periphery and suburbs. Infrastructure to be built in fiscal year 2015-2019 is the development of 24 strategic ports as a feeder of the main program "Sea Tollway" which establishes 6 major ports (Belawan, Batam, Tanjung Priok, Tanjung, Perak, Makassar and Sorong) which are then supported by collecting port such as Tanjung Ringgit Port in Palopo City.

Tanjung Ringgit Port has a strategic role as a port in the eastern part of South Sulawesi (Bone Gulf), being a node/outlet of distribution of goods, especially strategic goods (cement and other building materials) with hinterland areas including Luwu Regency, Palopo City, North Luwu Regency and East Luwu Regency. Tanjung Ringgit Port in Palopo City and other ports in Sulawesi Island in the policy of Sea Tollway as feeder for Makassar Main Port.

The geographical condition of Palopo City is the gateway in the eastern region of South Sulawesi, it has not been able to provide optimal impact for integrated goods movement. Palopo City with geographic and socio-economic characteristics that influence the selection of transportation modes to realize an efficient transportation system, transportation costs and production of goods to be minimum. The position of Tanjung Ringgit Port basically has a role in connecting the eastern region of South Sulawesi with the Port of Makassar as the Main Port in Eastern Indonesia which culminates in other major ports in Java Island.

To support a potential natural resource, adequate infrastructure is needed, so the economy can grow well (Hidayat, et al., 2015). Sea transportation becomes very important in supporting the distribution of commodities produced by a region as describe by Jinca in Sunarto (Sunarto, 2014). The availability of facilities and infrastructure in order to continuity of goods distribution become one of the strategic roles in supporting the economic development of the region and will ultimately have an impact on the increase of income and the economy of society (Sinaga, et al., 2018). Optimization of Tanjung Ringgit port is expected to support the implementation of sea tollway program to guarantee the distribution of goods (port to port). Therefore, this research will recommend policies and development programs to improve the Tanjung Ringgit port services.

2. Methods

The approach used in this study is the quantitative approach, primary data through interviews or field observations and secondary data (statistic data), using need analysis to obtain port facility such as container yard, warehouse and jetty. Furthermore, to obtain policy and strategy using Strength, Weakness, Opportunity dan Threat (SWOT) analysis.

The need for container yards & warehouses as mention by Triatmojo (Ambali, et al., 2020) and adjusted from (Timur, 2016) shown in equation (1).

$$A_{CY} = \frac{(\text{Loading \& Unloading} \times DT \times SF)}{SOR_{opt} \times \text{teer} \times \text{effective area} \times 365} \quad (1)$$

Where A is Area of container yard / warehouse, T is Cargo that through the container yard / storage area, DT (dwelling time) is 7 days, assuming a decline in the medium to long term to 6 days (2025) and 5 days (2030-2035), T

Effective is Effective working day of the year = 365 days, *SF* (stowage factor) is 29 m³ / Teus (container) and 0,67 m³/ton (general cargo), *Effective area* is 60% of the total area, *SOR optimal* is 70%.

The needs of jetty referred to in this case is the length of the jetty, which can be calculated using the formula by Triatmojo in Ambali et.al. shown in equation (2).

$$L_D = \frac{\Sigma (LOA + Clerenace) BT}{24 \times 365 \times BOR} \quad (2)$$

Where, L_D is the long of jetty, LOA is Length of ship served, BT is the time it takes the ship to moor and BOR is berth occupancy ratio (%), is the utilization rate of the jetty and its value depends on the number of moorings.

According to Priyambodo (2017) that the SWOT analysis is based on the logic that can maximize the strength and opportunities but can simultaneously minimize weakness and threats arranged in a diagram or matrix model composed of four boxes that illustrated in table 1 (Priyambodo, 2017).

Table 1. SWOT Matrix		
Internal factors External Factors	STRENGTH (S)	WEAKNESS (W)
	STRATEGY - SO	STRATEGY - WO
OPPORTUNITIES (O)		
THREATS (T)	STRATEGY - ST	STRATEGY - WT

There are four strategies that result from SWOT analysis (Kurniawan, et al., 2015), The first, SO strategy to use profit the opportunities available in the external environment. Second, WO strategies to improve internal weakness by taking advantage of opportunities from outside. Third, the ST strategy to use force to cope with threats and the last WT strategy to minimize weaknesses and address threats.

3. Results And Discussion

Characteristics of Cargo at Tanjung Ringgit Port

Cargo at Tanjung Ringgit Port consists of general cargo, container, and liquid bulk. Cargo prediction based on RIP of Tanjung Ringgit Port shows that the general cargo has increased with an average growth of 21% per year, as well as container that operating in 2015 also increased by 42%. The result of the analysis shows that 85% container is the goods of entry (unloading), the meaning is the goods transported by container at hinterland of Tanjung Ringgit Port is high enough but not followed by the amount of goods that come out (load).

It is estimated that there will be a change of packaging form from general cargo to container. This is seen from the trend of increasing GRDP in hinterland and improvement of port infrastructure to anticipate container load. It is assumed that in 2018 - 2020 there is 5% of the general cargo load is changed to container, then increased to 10% in 2025, 20% in 2030 and 35% in 2035. The amount of cargo due to the change of packaging form can be seen in Figure 2.

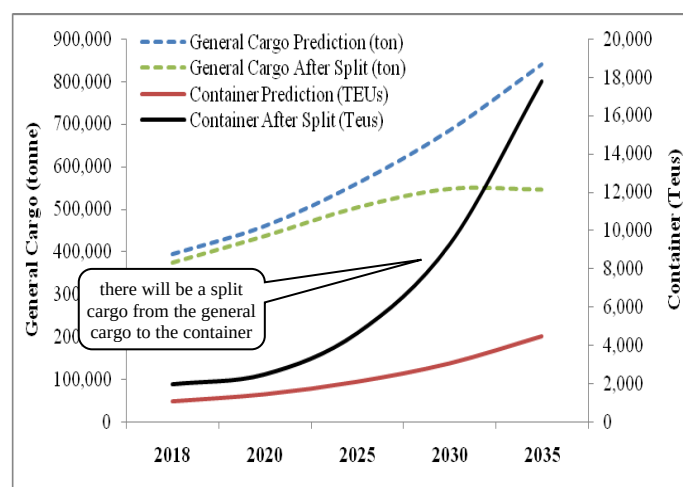


Figure 2. The Amount of General Cargo Transfers into Containers

Position of Tanjung Ringgit Port as Sea Tollway Feeder Port

Tanjung Ringgit Port's status as a collecting port from Makassar Port is determined by the National Port Master Plan. Therefore, in the Sea Tollway constellation, Tanjung Ringgit Port will be a feeder for Makassar Port (figure 1). The position of Tanjung Ringgit Port and other ports around Bone Gulf will be navigated regularly with the concept of short sea shipping (SSS) (Arof, 2018). In the concept, there will be a ship that sails regularly from Makassar Port - Bantaeng Port - Selayar Port - Murhum (Bau-Bau) Port - Kolaka Port - Tanjung Ringgit Port - Siwa Port - Bajoe Port (Bone) and ends back at Makassar Port, the frequency of shipping in 1 round voyage is expected about 2 times a month. The ship route is described as follows.

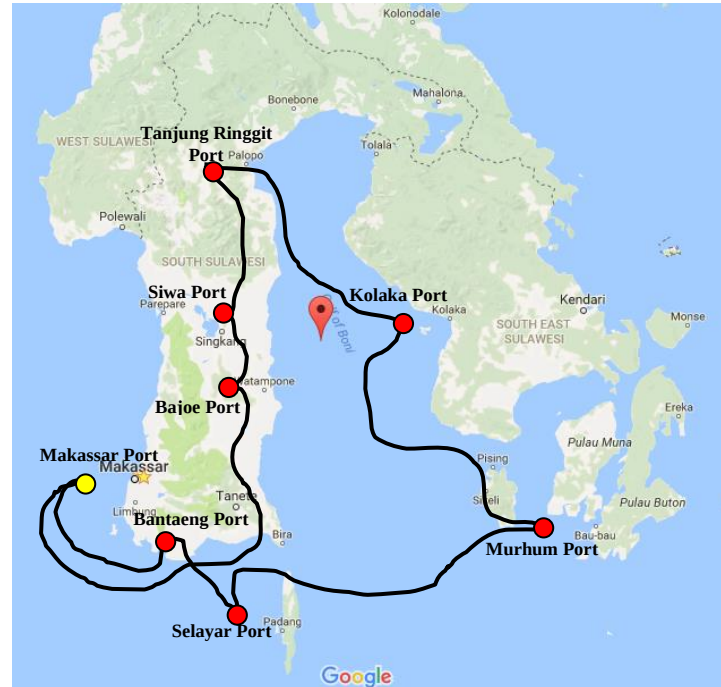


Figure 3. Short Sea Shipping (SSS) Ship Routes in Bone Gulf

The SSS route will be navigated by a container ship of varying sizes. The ship is predicted to operate in loading and unloading activities of container on the route such as sister ship of KM. Savior and KM. Mentari Perdana. The size and capacity of these ship can be seen in the table 2.

Table 2. Data on the size and capacity of container ship

No	Parameter	unit	KM. Saviour	KM. Mentari Perdana
1	DWT	ton	7,121	4,985
2	GRT	ton	4,980	4,180
3	LOA	m	101.10	108.63
4	LBP	m	94.35	100.40
5	T	m	7.30	6.25



Figure 4. Ship overview of Mentari Perdana and Savior

Changes in the type of packaging from general cargo to containers at the Tanjung Ringgit Port will directly increase the movement of containers that used to be road transportation and then switched to sea transportation. Some of the benefits received are reduced road loads, and large ship loading capacity will result in lower transportation costs, but the disadvantage is the long delivery time of goods. Economic calculations under these conditions have not been analyzed in this paper, but it is hoped that the separation of container transport modes will have a greater economic impact.

Needs of Container Yard and General Cargo Warehouse

The process of loading and unloading of goods for general cargo at Tanjung Ringgit Port is directly from ship to truck to haul to the destination location and otherwise cargo from the origin is directly transported to the ship. There is also a charge stored in the warehouse which is generally the content of seaweed. Based on the projection of the cargo then the percentage of direct and transit at the port can be calculated and the results can be seen in the table 3.

Table 3. Direct cargo through warehouse at Tanjung Ringgit Port

Year	Total Cargo of General Cargo (ton)	Direct Cargo (ton) 70%	Transit Cargo (ton) 30%
2020	459.735	321.815	137.920
2025	559.894	391.925	167.968
2030	684.485	479.139	205.346
2035	839.940	587.958	251.982

Source: Result of analysis, 2020

By using the values above, the warehouse needs for general cargo can be seen in the following table 3. Calculation of warehouse area requirement by assuming dwelling time does not change until year 2035 shown in table 4. From result of calculation seen that until year 2035 need addition of warehouse area 800 m².

Table 4. Needs of warehouse area at Tanjung Ringgit Port

Year	Unloading and loading (ton)	DT (day)	SF (m ³ /ton)	SOR	Needs (m ²)	Availability (m ²)	Additional (m ²)
2020	459,735	7	0,67	0,7	350	300	50
2025	559,894	7	0,67	0,7	450	300	150
2030	684,485	7	0,67	0,7	550	300	250
2035	839,940	7	0,67	0,7	650	300	350

Source: Result of analysis, 2020

In the event of a performance improvement resulting in a decrease of goods time accumulate in the warehouse, assuming that until 2020 dwelling time = 7 days, 2025 to 6 days, and 2030 until 2035 to 5 days, then until 2035 warehouse facilities at Tanjung Ringgit Port only need to increase the warehouse area is 350 m² as shown in table 5.

Table 5. Tanjung Ringgit Port Warehouse Needs with Dwelling Time Changes

Year	Unloading and loading (ton)	DT (day)	SF (m ³ /ton)	SOR	Needs (m ²)	Availability (m ²)	Additional (m ²)
2020	459,735	7	0,67	0,7	350	300	50
2025	559,894	6	0,67	0,7	370	300	70
2030	684,485	5	0,67	0,7	380	300	80
2035	839,940	5	0,67	0,7	460	300	160

Source: Result of analysis, 2020

While the needs of stacking field with an average dwelling time of 7 days, the height of pile is 2 teer, indicating up to 2035 has not needed additional stacking field as seen in table 6.

Table 6. Needs of Container Yard at Tanjung Ringgit Port with Dwelling Time Changes

Year	Unloading and loading (TEUs)	DT (day)	SF (m ³ /ton)	YOR*	Needs (m ²)	Availability (m ²)	Additional (m ²)
2020	1,454	7	29	0,7	1.500	19.500	-
2025	2,102	6	29	0,7	2.100	19.500	-
2030	3,053	5	29	0,7	3.000	19.500	-
2035	4,454	5	29	0,7	4.500	19.500	-

Source: Result of analysis, 2020

Needs Length of Jetty

In the calculation of the length of the common jetty, some of the assumptions used are 1) The length of general cargo ship (LOA) 115,4 m; 2) The amount of non-working time assumption for mooring preparation and departing for an average of 1 hour; and for 1 hour clock breaks for every 7 working hours (shift change); 3) Effective working hours per day and number of working days per year is assumed 7 hours x 3 shifts (21 hours) and 365 days; 4) Berth Occupancy Ratio (BOR) is assumed to be a maximum of 70%; and 5) For Berthing Time (BT) taken 2 days or 48 hours .

Table 7. The need for the length of the jetty at the Port of Tanjung Ringgit

Year	number of ships (unit)	LOA + clearence (m)	BT (hour)	BOR* (%)	Needs (m ²)	Availability (m ²)	Additional (m ²)
2020	306	130,4	48	99,99	200	190	-
2025	373	130,4	48	115,16	200	190	-
2030	456	130,4	48	135,55	250	190	60
2035	560	130,4	48	162,93	250	190	60

Source: Result of analysis, 2020

The need for additional jetty can be circumvented by utilizing the existing jetty in the form of the letter 'I' so that it can utilize both sides of the jetty as seen in table 7.

Development Policy of Tanjung Ringgit Port

Development policy of Tanjung Ringgit Port to support of Sea Tollway is directed to support the improvement of basic infrastructure with increasing port operations to strengthen its function as a collecting port for the main port (Makassar Port) to support the implementation of Sea Tollway.

The development of port infrastructure is adapted to the role and function of the port in national and regional trade, i.e., as a gateway for goods and passengers to and from an area where the port is located. The role and function of the port includes various aspects such as 1) The availability of port infrastructure and facilities to serve the loading and unloading goods activities and visit of ships, related to the rear areas connected by land transportation, investment, technology, management and service quality; 2) Linkage of Tanjung Ringgit port with other ports (in islands and inter-island), and the surrounding port, as the origin and destination of goods movement; and 3) The linkage of a port as the social, economic, and environmental aspects of port development to the surrounding area.

Based on SWOT analysis, it is formulated strategic policy with direction plan which is expected to be used as input of government policy to develop Tanjung Ringgit port based on consideration of strategy to be arranged into SWOT quadrant I-IV. The port development policy is oriented towards efforts to improve port facilities and capacity in supporting the economic development of the hinterland region. The economic sector relating to the transport sector, shows how the interactions between the economic sectors and transport sector.

Development Strategy of Tanjung Ringgit Port

The development of Tanjung Ringgit port as one of the ports that have the potential to be developed considering the amount of sea transportation that will utilize the port of Tanjung Ringgit as the goods distribution outlet. Some strategies in developing Tanjung Ringgit Port are 1) Making Tanjung Ringgit Port as the main gateway for Luwu Raya and surrounding areas through sea transportation mode; 2) Utilizing the strategic location of Tanjung Ringgit port and natural conditions and state assets in the port of Tanjung Ringgit; 3) Increasing capacity and efficiency of port facilities; 4) Encouraging the development of the region and economy of Palopo City and its hinterland regions; and 5) Encouraging the participation of local governments and the private sector in the construction and operation of the Tanjung Ringgit Port.

Table 8. Strategy and Policy to Developing Tanjung Ringgit Port

Policy alternatives	Policy	Development Strategy	Program
Policy 1: Condition of Port Facility and Demand is Good (+)	Development And Improvement Port Capacity	Improved port productivity and development of intermodal transport systems	Changes in shipment patterns (small bag to jumbo bag, bagging to bulk), optimization of existing equipment performance and performance improvement of loading / unloading / TKBM companies, increasing port operational time
Policy 2: Condition of Facility is Good (+), and Port Demand is Less (-)	Human Resource Development and Port Management	Improve Human Resources and stakeholder coordination in port systems and develop port IT management	Improved port facilities, Integration Planning, implementation of support (IT), and encouraging private investment
Policy 3: Condition of Port Facility and Demand is Less (-)	Development of Port Resources	Improvement of Public and Private Participation, synergy of government funding sources and improving the funds resources	Consistent implementation of rules or regulations, stakeholder coordination, standardization of facilities and equipment optimization of human resources and funds
Policy 4: Condition of Facilities is Less (-) and Port Demand is Good (+)	development and construction of facilities both land and water	development of port infrastructure, improving services at the port and improving study and planning of port	Dedicated terminals for large volume cargo, infrastructure development, procurement of loading and unloading equipment and containers, replacement truck warehouse system

As seen on table 8 the efforts to be done related to the development strategy of facilities and capacity of Tanjung Ringgit Port to supporting the implementation of the Sea Tollway are 1) Rearranging the harbor zonation with efficiency-oriented, service-oriented, environmentally-oriented to improve the continuity flow of in and out of cargo; 2) Establish zoning of port facilities that are oriented towards improving public and social services in a balanced way; 3) Developing existing terminal area at port is integrated in order to serve demand as well as the arrangement of ports with international service standards, including safety and security aspects; 4) Preparing access of land transportation network (access road) and sea access (sailing line, entrance flow) that can anticipate growth of 20 years upcoming; 5) Plan facilities and port equipment that managed by modern management that can anticipate technological developments in the field of information and technology as well as shipping and port technology; 6) Plan the phasing of port facility development flexibly in accordance with the needs and development of strategic environment; 7) Plan port facilities by maintaining commercial and non-commercial aspect comprehensively; and 8) Plan the main port facilities and supporting facilities for port activities that can encourage port services business by involving local government and private sector as well as port business entity.

4. Conclusion

The possibility of increasing the volume of general cargo and containers at Tanjung Ringgit Port will have an impact on the need for port facilities. Some things that can be done include repairs, additional facilities, and improving facility performance. The results of the analysis of facility needs indicate that the need for a stacking field until 2035 does not need to be added. It is necessary to add a warehouse facility of 350 m² by 2035 (assuming the dwelling time is seven days), but only needs to add a warehouse of 160 m² if the dwelling time is only 5 days. The need for the length of the jetty until 2035 is 250 meters, so it is necessary to add 60 meters by 2030.

The Tanjung Ringgit Port capacity and facility development strategy to support the Sea Tollway is carried out by Efficient port zoning arrangement; Integrated terminal area development; Prepare land transportation network access; Port facilities and equipment must be able to anticipate technological developments. Planning the development of port facilities flexibly in accordance with the needs and developments of the strategic environment; Maintaining comprehensive commercial and non-commercial aspects; Planning port facilities can encourage port service business actors by involving local governments and the private sector as well as port business entities.

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Author contribution

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Conflict of interest

The authors declare no conflict of interest.

Additional information

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