Study Of The Potential Of The River To Become A Shipping Lanes In Palembang City

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Abstract. The role of river transportation in Palembang City can be seen from the activities of passenger and goods ships sailing along the Musi River. River transportation is alternative transportation for residents who live in isolated places to facilitate the flow of commodities in and out of an area and can reduce road transport loads continue to increase (Puriningsih, FS and KA, Safril. 2018). The focus of observation is the condition of shipping lanes and obstacles to shipping lanes on the Musi River, Palembang City. The characteristics of ships that can sail on the Bendung River are maximum ship dimensions with a draft of 0.4 m, ship width of 0.65, and a draft of 1.1 m. Goren draft 0.3 m, ship width 0.75, and air draft 0.3 m, Kedukan River draft 0.5 m, ship width 0.5 m and air draft 0.1 m, Patra River draft 0.06 m, the ship's width is 0.7 m and the air draft is 0.9 m, the Sekanak River draft is 0.3 m, the ship's width is 0.75 m and the air draft is 0.6 m. The characteristics of a safe river tributary between speedboats are the minimum dimensions that must be met, namely LLWL depth of 0.75 m, channel width of 16.4 m, free space height from HHWL of 2.05 m and horizontal clearance of 4.0 meters. The cargo ship depth is LLWL is 1.65 m, the width of the narrow shipping lane is 44.68 m, clearance from HHWL is 3.0 m, horizontal clearance is 10.8 meters

Keywords: Barriers to shipping, ships, tributaries..

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1 Background

River transportation is organized with the aim of realizing safe and secure river traffic and transportation, as a driver, driver and supporter of the development of rural and urban areas at a cost that is affordable for people's purchasing power. However, river transportation has not been used optimally and its utilization is still very minimal. Meanwhile, the opportunities for utilization for goods, passenger and tourism purposes are still very wide and very cheap for transporting goods in large quantities (Arianto, SB and Heriwibowo Dwi, 2014).

The role of river transport in Palembang City can be seen from the activities of passenger and goods ships sailing along the Musi River, where the mobility of passengers and goods occurs because there is no connecting road other than the Ampera Bridge which connects the areas across Ulu and across Ilir, this is because of the Musi Bridge II is located far outside the Palembang City area or on the western ring road about 10 km from the city center. River transportation is an alternative transportation for residents who live in isolated places and have no land access to get to where they live. The potential for river transportation needs to be developed in order to smooth the flow of commodities in and out of an area and can reduce the burden on road transport which continues to increase (Puriningsih, FS and KA, Safril. 2018).

Apart from the Musi River, there are also tributaries of the Musi River which cross into residential areas. The flow of the Musi River not only stretches to the villages of Palembang residents' homes, but also flows to neighboring districts, such as Banyuasin District, many of the tributaries of the Musi River are not maintained and quite a few have varying percentages of damage so that they cannot become shipping lanes.

2 Literature Review

2.1 Groove width

In general, the width of the shipping lane must have two lanes, so that it is possible for 2 ships to pass each other. The channel width (w) must be measured horizontally at the bottom line of the ship's hull which is twice the width of the ship's hull plus the space between the ship and other ships between the ship and the channel walls. Below is a reference table for determining the depth and width of inland water shipping lanes.

Table 1 Depth and Width of the Shipping Channel

Parameter	Objective	Reference for Cross-Sections		
		Normal	Narrow	Single
h/d	Ease of Keel n Clearance bottom erosion control	1,4 – 1,5	1,3 – 1,4	1,2 – 1,3

W/B	Crossing	4 – 4,5	3 – 4	2 – 3
V max*	Maximum speed	8,5 – 10	7 – 8	5 – 6
n	Blockage ratio	7 - 8	5 - 7	3,5 - 5

2.2. Track height

It is generally planned that during a certain percentage of time the highest ship cannot cross the bridge. It is recommended to take the design water level in excess of 1% of the time. The height of the track must be equal to the sum of the maximum draft height of the ship and the height of the clearance between the highest point of the ship and the bottom of the bridge. The height of the empty space must be no less than 0.2 meters due to inaccuracies in:

a). measuring the height of the ship

b). indication of the existing water level

2.2. Lebar lintasan

If for some reason, a bridge center pillar is necessary, then the pillar must be placed as close as possible to the center line of the shipping channel. The pole must be provided with adequate protection and have the smallest possible width.

If the current speed under the bridge is less than 0.50 m/sec, the width of each two spans must be a minimum of 50% of the width of the shipping channel. However, if the current speed is between 0.5 – 1.50 m/sec, then the width of the passage under the bridge must be increased proportionally to 0.20 times the width of the ship (0.2 B)

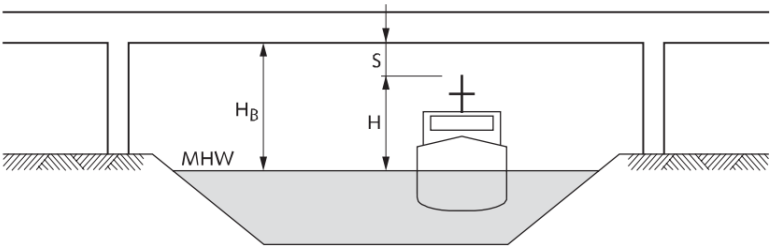

Figure 1 Track height under the bridge

3 Research Methods

The research was conducted in the Musi River, Palembang City, Bendung River, Goren River, Kedukan River, Patra River and Sekanak River. with the focus of observation being the condition of shipping lanes and obstacles to shipping lanes in the Musi River, Palembang City. Primary data collection is carried out by collecting data directly from facts or from respondents in the field. The data collection technique is carried out by direct observation.

3 Field activities consist of collecting Primary and Secondary Data which will be obtained from direct visits to the review location and from related agencies. These activities include:

(1) Field inspection and identification of problems;

(2) Interviews with related parties;

(3) Characteristics of river and lake shipping channels;

(4) Characteristics of river and lake ship traffic;

(5) Map of existing shipping channels; And

(6) Existing shipping manuals.

Processing and Analysis After collecting data from the field, both primary and secondary, data processing and analysis is then carried out, including:

(1) Characteristics of river and lake ship traffic;

(2) Characteristics of river and lake shipping channels;

4. Research Results

Determining the depth of the Musi River tributary is done by converting data based on tide applications and actual conditions. The following is the condition of the depth of the Musi River tributary

Table 2 Difference in Depth of Musi River Tributaries

No	River Name	The depth of the Musi River(m)	Tributary Depth (m)	Depth Difference (m)
1	Sungai Bendung	1,6	0,1	1,5
2	Sungai Goren	2,2	0,2	2
3	Sungai Kedukan	1,6	0,2	1,4
4	Sungai Patra	2,3	0,1	2,2
5	Sungai Sekanak	1,8	0,2	1,6

To determine the height of the free space under the bridge, convert the river depth results using tidal data from the Musi River with the Highest Water Level (HHWL) of 4.0 meters and the Average Water Level (MWL) of 2.0 meters per year. 2023 and bridge height in Table 4.11. The free space height uses the lowest bridge height in the tributary and is calculated from the bottom pillar of the bridge to the river bed/water surface.

Tabel 3 Height and Width of Free Space (*clearance*)

No	Nama Sungai	Free Space Height of (m)		Width of free space (m)
		Riverbed	MWL	
1	Sungai Bendung	1,7	1,2	1,3
2	Sungai Goren	1	0,5	1,5
3	Sungai Kedukan	1	0,3	1
4	Sungai Patra	1,2	1,1	1,4
5	Sungai Sekanak	1,3	0,8	1,5

To find the dimensions of ships that can operate on tributaries, you can use the middle water level (MWL). To find the depth of the Bendung River shipping channel, you can search by:

h = 1,5 x d
0,6 m = 1,5 x d
d = 0,4 meter

To find the maximum width of a ship (B) that can pass under the bridge, you can find::

Bridge width = 2,0 x B
1,3 m = 2,0 x B
B = 0,65 m

To find the maximum height of free space (clearance) that can pass under the bridge, you can find it by:

Height Free space = 0,2 m + Tinggi Sarat Udara Kapal
1,2 m = 0,2 m + Tinggi Sarat Udara Kapal
Height Free space = 1,1 m

Table 4 Dimensions of Ships That Can Operate in MWL Conditions

No	River Name	MWL (m)	Clear-ance (m)	Width of free space (m)	Maximum Operational Ship Dimensions		
					d(m)	B(m)	clearance (m)
1	Sungai Bendung	0,5	1,2	1,3	0,4	0,65	1,1
2	Sungai Goren	0,1	0,5	1,5	0,3	0,75	0,3
3	Sungai Kedukan	0,6	0,3	1	0,5	0,5	0,1
4	Sungai Patra	0,1	1,1	1,4	0,06	0,7	0,9
5	Sungai Sekanak	0,4	0,8	1,5	0,3	0,75	0,6

In order for ships to cross tributary channels, channel engineering is required.

1. Depth of Shipping Channel

The channel is only specifically intended for transporting passengers using speedboats

h = 1,5 x d
h = 1,5 x 0,5
h = 0,75 meter

From the calculation results, the minimum channel depth is 0.75 meters from the lowest water level (LLWL).

The channel is specifically for transporting goods using jukung ships

h = 1,5 x d
h = 1,5 x 1,1
h = 1,65 meter dari muka air yang paling rendah (LLWL)

From the calculation results, it is found that the minimum channel depth is 1.65 meters from the lowest water level (LLWL)

1. Height of Free Space under the BridgeClearance)

The channel is only specifically intended for transporting passengers using speedboats with the maximum air load dimensions of the vessels in operation, namely 1,8 m

Free Space Height = 0,2 m + Tinggi Sarat Udara Kapal
= 0,2 m + 1,85 m
Free Space Height = 2,05 m

From the calculation results, it is found that the height of the bridge's clearance is 2.05 meters from the highest water level (HHWL).

The channel is only specifically intended for transporting passengers using jukung vessels with a maximum air load dimension of the vessels in operation, namly 2.8 m

Free Space Height = 0,2 m + Tinggi Sarat Udara Kapal
= 0,2 m + 2,8 m
Free Space Height = 3,0 m

2. Clearance under the bridge (Clearance)

The channel is only specifically intended for transporting passengers using speedboats with the maximum width dimensions of the vessels in operation, namely 2.0 m

Bridge width = 2,0 x B
= 2,0 x 2
Bridge width = 4 m

From the calculation results, it is found that the width of the bridge's clearance is 4 meters

The channel is only specifically intended for transporting passengers using jukung vessels with the maximum width dimensions of the vessels in operation, namely 5.4 m

Bridge width = 2,0 x B
= 2,0 x 5,4
Bridge width = 10,8 m

3. Shipping Channel Width (Wk)

The channel is only specifically intended for transporting passengers using speedboats and jukung boats. Shipping Channel Width (Wk) required if planned as a narrow channel.

Table 5 Minimum Channel Dimensions Required for Speedboat Passenger Transport

No	River Name	h dari LLWL (m)	Wk Alur Sempit (m)	Wk Alur Tunggal (m)	Clearance dari HHWL (m)	Lebar Ruang Bebas (m)
1	Sungai Bendung	0,75	16,4	10,2	2,05	4,0
2	Sungai Goren	0,75	16,4	10,2	2,05	4,0
3	Sungai Kedukan	0,75	16,4	10,2	2,05	4,0
4	Sungai Patra	0,75	16,4	10,2	2,05	4,0
5	Sungai Sekanak	0,75	16,4	10,2	2,05	4,0

Table 6 Minimum Channel Dimensions Required for Transporting Jukung Goods

No	River Name	h dari LLWL (m)	WkAlur Sempit (m)	Wk Alur Tunggal (m)	Clear-ance dari HHWL (m)	Lebar Ru-ang Bebas (m)
1	Sungai Bendung	1,65	44,68	27,12	3,0	10,8
2	Sungai Goren	1,65	44,68	27,12	3,0	10,8
3	Sungai Kedukan	1,65	44,68	27,12	3,0	10,8
4	Sungai Patra	1,65	44,68	27,12	3,0	10,8
5	Sungai Sekanak	1,65	44,68	27,12	3,0	10,8

Tributaries have other obstacles when used as a shipping route plan, among others :

Tabel 7 Recapitulation and Action Plan for Problems with Shipping Route Plans

No	Permasalahan	Rencana Aksi
1	Availability of water sources used for ship-ping. So far, the only available water source comes from the tidal waters of the Musi River and residents' household waste.	It is necessary to construct a struc-ture to retain the water level (lock and dam) so that the water discharge level can be regulated
2	The water has a smell because it comes from residents' household waste	There is a need to manage residents' household waste which is dumped in tributaries
3	The large number of residential bridges and pipes that cross over tributaries will have an impact on shipping lane plans.	There needs to be a rearrangement of bridges and pipes that cross the river flow in accordance with previous analysis
4	The depth of the channel is very shallow when the dry season arrives, which will have an impact on shipping channel plans.	It is necessary to dredge the tributar-ies so that they reach the desired depth according to the results of the analysis and to build locks and dams to regulate the water level
5	The large amount of community waste that comes from residents' houses around the tributaries will have an impact on shipping lane plans.	There needs to be socialization, provision of supporting infrastruc-ture and a ban on building houses for residents in areas of interest to ship-ping lanes
6	The large number of water hyacinths around the Musi River tributaries will have an im-pact on shipping lane plans.	There needs to be regular cleaning of shipping lane plans.

4. Conclusion

5.1 Conclusion

1. Characteristics of ships that can sail on the Musi River, Palembang City with maximum ship dimensions that can operate at average water level (MWL), in-cluding:
   a. Sungai Bendung is a maximum ship dimension with a draft of 0.4 m, a ship width of 0.65 and a draft of 1.1 m.

b. Sungai Goren, namely the maximum ship dimensions with a draft of 0.3 m, a ship width of 0.75 and a draft of 0.3 m,
c. Kedukan River, namely the maximum ship dimensions with a draft of 0.5 m, a ship width of 0.5 m and a draft of 0.1 m,
d. The Patra River is the maximum ship dimensions with a draft of 0.06 m, a ship width of 0.7 m and a draft of 0.9 m,
e. The Sekanak River is a maximum ship dimension with a draft of 0.3 m, a ship width of 0.75 m and a draft of 0.6 m.

2. The characteristics of river tributaries that are needed so that ships can sail safely include, among others
   a. For Passenger Ships (Speedboats), the minimum dimensions that must be met are the lowest low tide depth (LLWL), namely 0.75 m, Channel Width if planned as a narrow shipping channel (two ships can overtake each other) namely 16.4 m, Channel Width if planned as a single shipping channel, namely 10.2 m, the height of the free space (clearance) from the highest water level (HHWL) is 2.05 m and the width of the free space (horizontal clearance) 4.0 meters
   b. For cargo ships (Jukung), the minimum dimensions that must be met are the lowest low tide depth (LLWL), namely 1.65 m, the width of the channel if planned as a narrow shipping channel (two ships can overtake each other) namely 44.68 m, The width of the channel if planned as a single shipping channel is 27.12 m, the height of the free space (clearance) from the highest water level (HHWL) is 3.0 m and the width of the free space (horizontal clearance) is 10.8 meters

3. The Musi River tributary has other obstacles if it is designated as a shipping channel, so to overcome it the following steps are needed:
   a. It is necessary to construct a structure to retain the water level (lock and dam) so that the water discharge level can be regulated
   b. There is a need to manage residents' household waste which is dumped in tributaries
   c. There needs to be a rearrangement of bridges and pipes that cross the river flow in accordance with previous analysis
   d. It is necessary to dredge the tributaries so that they reach the desired depth according to the analysis results
   e. There needs to be socialization, provision of supporting infrastructure and a ban on building houses for residents in areas of interest to shipping lanes
   f. There needs to be regular cleaning of shipping lane plans.

5.2. Suggestion

1. There is a need to increase the dimensions of shipping lanes on the Bendung River, Goren River, Kedukan River, Patra River and Sekanak River so that shipping lanes can be navigable by ships
2. It is necessary to construct a structure to retain the water level (lock and dam) so that the water discharge level can be regulated
3. There is a need to manage residents' household waste which is disposed of in tributarie

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