

Flow Pattern in the Estuary of Musi River Using MIKE-21 Flow Model

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Abstract

Musi river is the largest river in Palembang with a length of more than 750 kilometers and an average width of 540 meters where the maximum width of 1,350 meters is located around the Kemaro island. Basically, sedimentation in the Musi river does include sedimentation due to the high level meeting between the Musi river currents and ocean currents in the Bangka Strait. The silting condition of Musi river is getting more severe because of the sludge that reaches about 40 cm per month. In fact, the volume of sludge could reach 2.5 million meter. There are 13 silting points along the Musi river shipping channel from the Boom Baru port to Bangka Strait. Four points are already very vulnerable because of the silting reaches up to 4 meters. The location which is quite compressis from the northern Payung Island to the estuary, while the location of the worst silting among others is on the outside verge of the Jaran Strait and the water groove of the southern part of the Payung island sedimentation reaches 7 km, so the boat that crosses the groove of Musi river should be guided against the tide that occurs. This research was conducted by using the approach of software models MIKE 21 Flow Model and the results obtained from this study is the pattern of movement of the flow between the other directions and speed of currents and hydrodynamic model of the depth of the river starting from the outside verge to the Musi river which affected the down tide.

Keywords : *Pflow pattern, Musi River, Mike-21, Flow model*

1 INTRODUCTION

Musi river is the largest river in Palembang with a length of more than 750 kilometers and an average width of 540 meters where the maximum width of 1,350 meters is located around the Kemaro island and the minimum width of 250 meters is located around the Musi II Bridge. Musi river has two islands, namely Kembaro (Kemaro) and Kerto islands. The three other major rivers are the Ogan river with an average width of 236 meters, Ogan river with an average width of 211 meters and the Keramasan river with an average width of 103 meters [1].

Musiriver is not only used by people around the course but also by big companies located along the Musi river. They use the Musiriver to deliver the products and bring in the raw material through the vessel. There are so many big ships and even very large pacing in the Musi river. Some companies located along the Musiriver are PT. Pertamina, PT. Sriwijaya fertilizer (PUSRI), WilmarGroup and the Port of Boom Baru, and Port at 35 ilir. The role of the Musiriver is very vital and this so called pulse of Palembang city is now haunted by various problems. One of the problems is the river silting which continues to increase every year. Of course this is very detrimental to the Government of South Sumatra Province, especially at this time of South Sumatra province being intensively attracts investors to invest in the business sector. Basically, sedimentation in the Musiriver does include a high level of sedimentation caused by the current meeting between Musi river and ocean currents in the Bangka Strait.

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2 RESEARCH METHODOLOGY

This study was carried out with the modeling and simulation of flow patterns and sediment transport in water area of the Bangka Strait in position 2.07 - 2.38 of South Latitude and 104.85 - 105.17 of East Longitude. The research location [2, 3] is in figure 1.

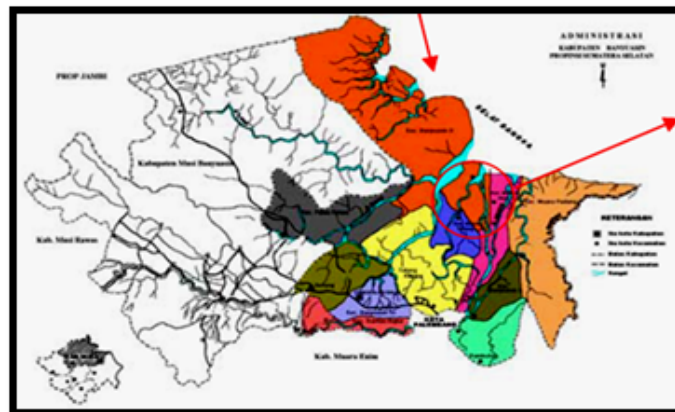


Figure 1: Map of Research Location.

2.1 Tools and Materials

The tools used in this research are as in Table 1 below

Table 1: List of tools used in the study

No	Name of Tools	Number of Uses
1	Stationery 2 pieces	Writing to recording data
2	Computer (RAM 2 GB) 1 unit	Performing general modeling
3	Printer 1 unit	Displaying form of report
4	Software MIKE-21 Model, MS-Excel	Performing modeling and data processing
5	Dongle (licensed program) 1 pieces	Activating the software MIKE-21 FM
6	Laptop and Printer 1 pieces	Assisting to preparing reports

The data used in the analysis are as shown in Table 2.

Table 2: Factors and Willis Deutsch

No	Data properties	Data type	Sources	Units
1	Tidal	Primary	Field	m
2	Bathymetry	Secondary	Bakosurtanal/Pelindo	m
3	The direction and speed of current	Primary	Field	(o) & m/s
4	River capacity	Primary	Field	m ³ /s
5	The direction and speed of wind	Secondary	BMG	(o) & m/s
6	Base of Sediment	Primary	Field	mm or
7	The concentration of suspended sediment	Primary	Field	mm/l
8	Discharge of sediment from the river	Primary	Field	gram/s

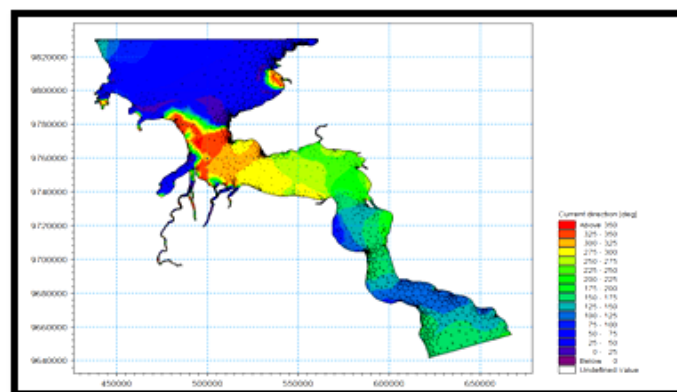


Figure 2: The hydrodynamic model of the river water velocity direction

2.2 MIKE-21 FM Simulation

MIKE-21 Hydrodynamic Module (HD Module) is a mathematical model to calculate the hydrodynamic behavior of the water against a wide variety of styles functions, for example, certain wind conditions and water levels are specified in the open model of the boundary. HD module simulates the water level and the current differences in the various styles function in lakes, estuaries, and beaches [4, 5].

3 RESULTS AND DISCUSSIONS

After all the boundary condition isdiscussed in the modeling, the results of global model output on the outside verge of the Musi river are as in figure 2, figure 3 and figure 4 below.

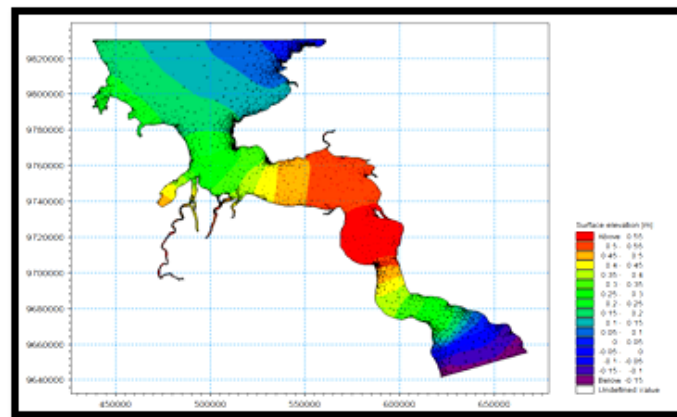


Figure 3: Model hydrodynamic surface elevation watersheds

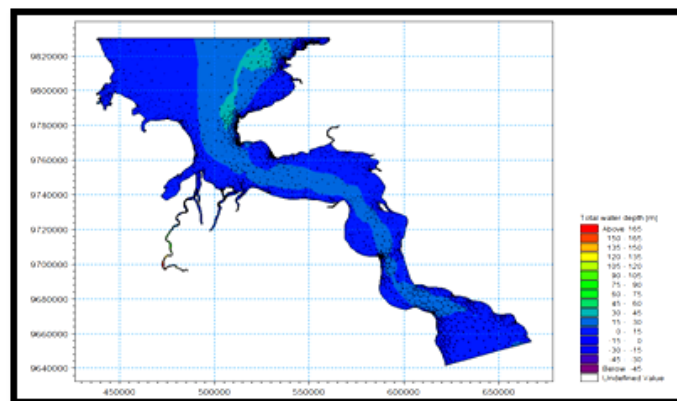


Figure 4: The total depth of the hydrodynamic model of river flow

4 CONCLUSSIONS AND RECOMMENDATIONS

From the analysis of the study, it can be summarized that:

1. Greatest speed direction occurred on the Musi river bank ranges between 300-350 degrees.
2. Threshold elevation of the outer surface of the Musi river ranges between 0.20 m - 0.40 m will affect the free area for ships to perform well and safe movement.
3. The total depth of water occurs at 15-30 m and therefore contributes to the flow of the ship movement into the Musi river as a whole.
4. As a recommendation of this study, it is necessary to study more detail about the correlation of sediment movement and move of the ship to the amount of sediment in the Musi river [6].

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