

Conference Paper

Study of Water Transportation Development Prospects Along Mamberamo River

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Abstract

The Mamberamo River with a flow length of 670 meters divides into 2 administrative areas of the Mamberamo Regency, and passes through 7 of the 8 Districts. This caused it to become the main transportation route for the 20 villages located along the river. Mamberamo River has a Groove Depth Range between 10 S/D 40 Meters, and Varied Flow Width of 50 to 600 Meters The maximum current speed reaches > 1.2 m/s, with a maximum possible speed of 1.31 m/s. The existing community activities are very dependent on boats passing by on the river, representing the only mode of transportation available. The aim of this study is to consider the development of a river transportation network along the Mamberamo River which is integrated with the Regional Spatial Plan. This study uses a technical approach to consider the problems of transportation mode needs, the assessment of marine conditions, the population's socio-economic factors, the level of accessibility and demand, and other supporting factors. This study aims to identify the trends in demand and the availability of sea transportation services, and formulate various indicators of development and development trends based on supply and demand analysis, service levels and shipping service scale (local, regional, international). The results of this study are in the form of policy strategies.

Keywords: Transportation; River; Water.

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1. Introduction

Indonesia is the largest archipelagic country in the world, consisting of 17,504 large and small islands. The area of waters is a dominant component so that Indonesia is called a Maritime State with a sea area of approximately 7.9 million km² (including the Exclusive Economic Zone) or 81% of the total area of Indonesia. The length of rivers in Indonesia reaches 34,342 km from 214 rivers and the length of the rivers that can be navigated is 23,255 km, and even then it often decreases due to seasonal influences. River transportation is often the only alternative for those who do (Adisasmita, Raharjo. (2011). *Manajemen Transportasi Darat*. Yogyakarta: Graha Ilmu. p.22)

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Mamberamo Raya Regency is geographically located between 137 ° 46 - 140 ° 19 East Longitude (BT) and 01 ° 28 - 3 ° 50 South Latitude (LS). This district has an area of 31,136.85 km². (Bappeda, Kabupaten Mamberamo Raya. (2015). Rencana Tata Ruang Wilayah Kabupaten Mamberamo Raya 2015- 2030, Mamberamo Raya) Geologically, Mamberamo and the surrounding area are quite interesting because they are composed of sedimentary rock deposits that are thousands of meters thick and are chopped up by geological structures. The natural potential in this river is coal, natural gas, and gold, copper, bauxite and nickel. Based on the Agency for the Assessment and Application of Technology (BPPT), Mamberamo has a hydro power potential of 12,284 MW spread across 34 locations. The Indonesian government once planned to build a hydroelectric power plant (PLTA) in this area. The flora potential is also amazing, there are around 300,000 hectares of sago forest. This sago palm can be converted into bio ethanol, which will produce more than 4.5 million liters per year. (Ibid)

Mamberamo Raya Regency is one of the districts in the province of Papua, Indonesia with its capital located in Burmeso. This district is a division of Sarmi Regency, which was passed by Law no. 19 of 2007 dated 15 March 2007. The name "Mamberamo" is said to have originated from the Dani language - mambe means "big" and ramo means "water". The Mamberamo River is a 670 km long river located south of the Foja Mountains, Sarmi Regency, Province Papua. The name "Mamberamo" comes from the Dani language - mambe means 'big' and ramo means 'water'. Several isolated tribes live in this river valley which is rich in biodiversity, hence the nickname 'Amazon of Papua'. Mamberamo River is a river with the largest width in Indonesia. The Mamberamo River with a flow length of 670 meters divides into 2 administrative areas of the Mamberamo Regency, passes through almost all, 7 of the 8 existing Districts, and becomes the main transportation route for 20 villages along the Mamberamo River. (Beratha, I Nyoman. (1991). Masyarakat dan Pembangunan Desa. Jakarta: LP3ES.) Mamberamo River Has a Groove Depth Ranging Between 10 S/D 40 Meters And Varied Flow Width Of 50 to 600 Meters The maximum current speed reaches > 1.2 m/s, with the greatest speed occurring with a maximum speed reaching 1.31 m/s. The existing community activities are very dependent on ships passing by on the Mamberamo River, because almost only ships or wooden boats are the only mode of transportation available. The existence of Lapter (airfield) is also not evenly distributed in every district. To bring together the growing demand for river, lake and ferry transportation with the provision of infrastructure, funds for transportation facilities need to be supported by a planning system that considers the growing demand for transportation with the provision of facilities and infrastructure. The purpose of this activity is to prepare a study that is oriented towards the development

of the river transportation network on the Mamberamo River which is integrated and integrated with the Regional Spatial Plan. Meanwhile, the objectives of this activity are:

1. Identifying the network of river transportation facilities, infrastructure and services
2. Availability of the concept of river transportation network development;
3. Inventory of infrastructure requirements for the development of the above concept.
4. Availability of an integrated development phasing matrix.

There are several goals that must be met in order to achieve the goal, among others.

1. Identification of ASDP river transport infrastructure
2. Identification of means of transportation (ships) concerning the availability of means of transportation such as types of vessels, dimensions, number of existing vessels.
3. Identification of both cargo and passengers.
4. Concept analysis and identification of river transportation network development solutions that are integrated with other transportation networks
5. Activity Space Development Plan
6. Plan for Determining the Location of Transportation Nodes (Plan for the Location of River Waters)
7. Creating matrices & schemes

2. Research Methods

There are several things that must be met in order to achieve the goal, among others.

- a. Time and Place of Research

This Mamberamo River Water Transportation Study was conducted in Mamberamo Raya Regency, Papua Province in October - December 2017 where Mamberamo Raya Regency is geographically located between 137 ° 46 - 140 ° 19 East Longitude (BT) and 01 ° 28 - 3 ° 50 South Latitude (LS). This district has an area of 31,136.85 km². Administratively, Mamberamo Raya Regency is bordered by:

1. North side: Bordering the Pacific Ocean
2. East side: Bordering Sarmi Regency

3. South side: Bordering Puncak Jaya Regency and Tolikara Regency

4. West side: Bordering Waropen and Yapen Waropen Regencies.

b. Technical Approach

The technical approach in this proposal is adjusted to the scope of activities to be achieved in the terms of reference for the work. The technical approach method of this Mamberamo River water transportation study is: (Nasution, M.N. (1996). *Manajemen Transportasi*. Jakarta: Balai Akasara. p.21)

1) The background of the problem of the need for sea transportation modes includes:

- a) Transportation system development policies
- b) The state of economic development
- c) Current condition of sea transportation.

2) Assessment of marine conditions, socio-economic factors of the population, level of accessibility and needs (demand) and other supporting factors. This study is intended to see the potential and trends in demand development and the availability of sea transportation services.

3) Identify the supporting factors, see the trend of service developments, facilities and service levels as well as factors of safety, comfort and variations in travel destinations.

4) Formulating various development indicators and development trends based on supply and demand analysis, service levels and shipping service scale (local, regional, international). This formulation is used as material for the formulation of alternative marine transportation developments in physical, infrastructure, service, management and institutional aspects.

5) Development recommendations with various alternatives for the development and implementation of development programs and activities.

c. Projection Method

Flow of Storage and Goods the projection method for the flow of goods and passengers can be seen in the Figure below. Annual data consists of data on ship visits, volume of goods and number of passengers. Meanwhile, the data from the monthly report consists of ship visits, ship size (such as GT, LOA), berth time (BT), volume of goods and the number of passengers of each ship. (Koryati, Nyimas Dwi. (2004). *Kebijakan dan Manajemen Pembangunan Wilayah*. Yogyakarta: YPAPI. p.33) First, data from the annual report, namely GT, LOA, BT, volume of goods, and passengers are grouped separately based on ship size. Next, projections of cargo and passenger flows are carried out based

on annual data for the study area after being separated from surrounding landings. The third stage is the projection of the flow of goods and passengers for each target year,

d. Population Projection Method There are several ways or methods to project the future population of areas that are potential for marine transportation development.

1) Mathematical method a. Linear rate growth, which consists of i. Arithmetic Growth Rate $P_n = P_o (1 + rn)$ ii. Geometric Rate growth $P_n = P_o (1 + r)^n$ b. Exponential rate of growth: $P_n = P_o e^{rn}$ Where; P_o = total population in the initial year P_n = total population in the nth year R = population growth rate from the initial year to the nth year N = number of changes in years (Barata, A. A. (2013). *Dasar-Dasar Pelayanan Prima*. Jakarta: PT. Ellex Media Komputindo Kelompok Gramedia. P.22)

2) Component method. This method performs each component of the population separately and to obtain a projection of the total population, the projection results for each component are combined. This method requires the following data;

- a) Population composition according to age and sex that has been tidied up
- b) The pattern of mortality according to age
- c) Fertility patterns by age
- d) Sex ratio at birth
- e) Proportion of migration by general

3) Questionnaire Method The method of using the questionnaire is a way to collect data. Questionnaires or questionnaires do have many advantages as a data collection instrument. Some of the procedures that must be followed in preparing the questionnaire are;

- a) Formulate goals to be achieved with a questionnaire
- b) Identifying the variables that will be the target of the questionnaire
- c) Adding each variable to a more specific sub variable and

d) Determine the type of data to be collected, as well as to determine the analysis technique. To obtain a questionnaire with steady results is a trial process. The sample taken for testing purposes must be a sample from the population where the research sample will be taken. In the trial, the respondents were given the opportunity to provide suggestions for improvements to the tested questionnaire. The situation in which the pilot is conducted should be the same as the situation in which the actual research was carried out a. One of the weaknesses of the questionnaire method is that it is difficult to return. If this is the case, the researcher should send a letter to the respondent that seems to believe that the questionnaire will actually be filled in but does not have time. The letter sent was just a reminder

3. Results and Discussion

Knowledge of tides is important in port planning, the highest water level is very important in determining the crest elevation of coastal structures and port facilities. Meanwhile, the depth of the shipping channel/port is determined by the low tide. Each cluster has a transportation node in the form of a port/dock that supports river water activities. In this analysis, we will discuss the port development of each transportation node in each cluster in the Mamberamo River Area.

Port development in Mamberamo Raya Regency is based on the Minister of Transportation Decree No. KP 414 of 2013 concerning the national port master plan. In addition, based on KM 53 of 2002 concerning the national port arrangement, it is used to explain the classification of ports in Mamberamo Raya Regency. To explain the level of port services, government regulation no. 61 of 2009.

Classification is carried out to determine development plans and port development priorities. The classification of ports is based on the number of movements, the potential for movement and the location of the port. Locally, is the port in a strategic position, for example between several other ports, easy accessibility and conditions of the bathymetry contour. Based on the classification and criteria of ports stipulated in KM 53 of 2002, ports in Mamberamo Raya Regency are grouped into regional and local ports. Meanwhile, according to the hierarchy of port service levels in Mamberamo Raya Regency, it is classified into regional feeder ports and local feeder ports. Along with the regional development plan of Mamberamo Raya Regency and the increasing demand for movement, the development and improvement of port functions in Mamberamo Raya Regency also need to be carried out. Based on the large demand for movement, port location and potential for water development, several ports were developed into regional feeder ports and local feeder ports. The development of port functions based on PP 61 of 2009, is carried out to classify ports in Mamberamo Raya Regency based on their roles and functions.

The details related to the port development analysis component are described as follows. Port Development in the Upstream Mamberamo River Water Transportation Cluster/Group of ports contained in this transportation group are Dabra Port and Sikari Port. These two ports serve the movement of people and goods, mostly agricultural products in the Upper Mamberamo region. Not too much intensity of activity occurred in the two ports in this region. (Tamin, Ofyar Z. (1997). *Perencanaan dan Pemodelan Transportasi*. Bandung: ITB. p.27)

Besides that, the carrying capacity and carrying capacity of the area around this port tends to be small. So that in the planning, the ports in this transportation group are directed to become local feeder ports. Port and Wharf Development Currently, the condition of the port is in the form of boat moorings with the capacity of vessels that can enter are motor boats with small dimensions. To become a local feeder port with more adequate servants.

Development of Supporting Facilities The next development is supporting facilities for local feeder ports. Port supporting facilities include passenger service offices, waiting rooms, parking lots, access to ports, management offices, fuel stations, fire engines, etc. For this reason, a wider port area is needed. In addition, if this port is planned to be an ASDP Port, it will require a dock to get on and off motor vehicles. (LPM ITB. (1997). Modul Pelatihan Perencanaan Sistem Angkutan Umum KBK. Bandung.: Rekayasa Transportasi, Jurusan Teknik Sipil ITB p.35)

Port development in the Middle Mamberamo River and Lower Mamberamo River Water Transportation Clusters. Teba Port is one of the ports serving activities in the Mamberamo Hilir District. The location of Teba port is very strategic because it directly faces the Pacific Ocean and has the potential to be developed as an ocean port capable of serving national and even international scale movements. This port serves the movement of people around Teba and Warembori Village which is used for the transportation of goods and people. The water conditions in Teba Port experience high sedimentation so that several points around the area have low contours.

Besides that, the existing capacity of Teba Port tends to be low because there are not too many ships accessing this port within a short period of time. Based on this, to accommodate the needs of ships and facilitate potential future movements, port development is deemed necessary. The upcoming Teba Port is planned as a collection port. The location and role of the Teba port is very important for movement/transportation activities and trade services for the Mamberamo Hilir District area.

As a regional feeder port for the activities of nearby local feeder ports, the role of the Teba port will increase. Later, the port of Teba, apart from serving the movement of people and goods, is also expected to play a role as a transportation port for rivers, lakes and crossings. Motorbikes and cars can be crossed from Teba port to outside Mamberamo Regency. Port and Wharf Development Currently, Teba Port is a public port with a vessel capacity that can enter motorized vessels with medium dimensions.

To become a regional feeder port, later serving ships with large dimensions, the development of the Teba port needs to be carried out in the aspects of the ship dock and port complex. Shipping Route Development The next development plan that needs

to be developed is shipping routes to and from Teba Harbor. Because the types of ships that will enter Teba Port are quite large, especially for regional shipping, the selection of shipping routes is adjusted to the depth of the waters around Teba Port. As for shipping routes to and from Teba Port for local shipping, Teba Port is the largest regional feeder port in the waters of the Mamberamo River. (Sinambela, L. P. (2011). Reformasi Pelayanan Publik: Teori, Kebijakan, dan Implementasi. Bumi Aksara.p.87)

Development of Supporting Facilities The next development is supporting facilities for regional feeder ports. In addition, if the Teba Port is also planned as an ASDP Port, it will require a dock to get on and off motor vehicles. The development of the Port Cluster/Water Transportation group of Sudetan Mamberamo River, Bagusa Port and Poiwai Port, is a port that will be developed as a regional feeder port that serves the movement of passengers and goods at the movement node of Lake Warembori and the Pendi corner. The location of the Bagusa port is very strategic because it connects Teba Port with the capital of the Mamberamo Hilir district in Trimuris. In addition, it is possible to develop a shipping route that could potentially be developed that connects Bagusa Port with Poiwai Port in Sawai District. Poiwai Port in its development plan is a regional feeder port for the movement of goods and people on a local and national scale.

This port is on the north corridor linking Sarmi - Mamberamo Raya - Yapen Waropen - Biak. This area has strength in the industrial sector, especially marine fishery processing, has port facilities. On this basis, if later a new shipping route is developed that connects Poiwai Port and Bagusa Port through the Pendi sudetan, of course it will have the potential to shorten access to main access and develop areas around the route, which of course is still very rarely traversed by shipping lanes.. The consideration of developing this new shipping route is supported by the plan to open access from Bagusa Port to the main access that connects the regional shipping.

As a regional feeder port for the activities of local feeder ports around it, the role of the Bagusa port will certainly increase. Like Teba Port, later Bagusa Port will not only serve the movement of people and goods, but it is also expected to play a role as a transportation port for rivers, lakes and crossings. Motorbikes and cars can be crossed from Bagusa port to other ports. Port and Pier Development Currently, the condition of Bagusa port is a public port with a capacity of vessels that can enter are motorized ships with medium to small dimensions.

To become a regional feeder port with a wider service scale, which will later serve ships with a large enough dimension, the development of the Bagusa port needs to be carried out in the aspect of the ship dock and port complex. Shipping Route

Development The next development plan that needs to be developed is the shipping route from and to Bagusa Port. In addition, if the Bagusa Port is planned also as an ASDP Port, it is needed (Arief, M. (2006). *Pemasaran Jasa dan Kualitas Pelayanan “Bagaimana mengelola kualitas pelayanan agar memuaskan pelanggan”*. Malang: Bayumedia Publishing. p.21).

4. Conclusion

Based on the results of the discussion in achieving the objectives of this study, the conclusions of the study results of the Mamberamo River Water Transportation in Mamberamo Raya Regency are in the form of a development strategy as follows; Port Development Plan in the Upper Mamberamo River Water Transportation Cluster/Group (Dabra - Sikari), Port Development Plan in the Water Transportation Cluster/Group of the Middle and Lower Mamberamo Rivers (Burmeseo - Teba) and Plan for the Development of the Port Cluster/Water Transportation Group of the Sudetan Mamberamo River (Pendi - Poiwai).

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