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Port Nodes of Nunukan In Support Of Logistic Transport Network Systems in the Border Region of Nunukan Regency, Indonesia – Malaysia

Andi Muliama[1], M. Yamin Jinca[2], Ganding Sitepu[3]
[1]*Postgraduate Student, at Master Degree of Transportation, Faculty of Postgraduate, Hasanuddin University,*
[2]*Professor, for Infrastructure and Transportation Planning, Hasanuddin University,*
[3]*Lecturer, Transportation Engineering, Hasanuddin University,*
Makassar-Indonesia

Abstract: *This study aims to analyze the potential of natural resources, the infrastructure of transportation logistics, and strategy development of transport networks in support of logistics distribution. The results show that supply and demand influenced by the economic potential, characteristics of network systems and transportation infrastructure are currently dominated by water transport, but has yet to reach all areas of the logistics so that movement only up to the district or sub-district that has accessibility. Port infrastructure in water transport network is not fully utilized. Development priority is a region which has the characteristic shape of small and large islands have to directly adjacent to the Tawau-Malaysia. It is necessary to transport networks for connecting the vertices of the port in a transportation system both internally and externally integrated.*

Keywords: *Transport System, Infrastructure, Logistics*

I. INTRODUCTION

Nunukan regency is among the five regencies/municipalities in North Kalimantan Province lies the region of northernmost North Kalimantan immediately adjacent to the neighboring countries of Malaysia, exactly at between 3 ° 30 '00 "- 4° 24' 55" North Latitude and 115° 22 '30 "- 118° 44' 54", administrative boundaries as follows: North: Eastern Malaysia (Sabah), East: Sulawesi Sea, South: Bulungan and Malinau, West: Eastern Sarawak Malaysia. See in the Figure 1.

There are a number of problems of management of state borders, among others; Economic backwardness of North Kalimantan of border regions, especially Nunukan leading to high levels of inequality of development of this region as compared to the neighboring country borders (Sabah and Sarawak in Malaysia) [1,2]. Transportation Infrastructure networks are another factor to improving the economy of the region [3,16], but the problems of transport, especially freight transportation infrastructure network as a main issue that always gets more attention from the government.

Especially for remote areas and border areas, development of the transport sector is expected to become the driving force for promoting the development of specific sectors or regions such as creating ease of access, the smooth mobility of people and logistics, economic growth and increased prosperity [4]. In addition, infrastructures and means of transport in remote areas and border areas also contain strategic objectives to do with the political and social aspects in the context of national defense and security.

Mobility and community activities can not be separated from the need of transportation to the availability of transport facilities and infrastructure, especially of Sea Transport, rivers and crossing [5], during the 2014 domestic ships mooring in the port of Nunukan as many as 1,215 units, while the foreign ships were moored at the Port of Nunukan as many as 1,707 units, down 1.61% [6]. Despite having a fairly complete infrastructure, but the existing transport network system has so far not well integrated, so that the contribution to support the development of Nunukan Regency, as the center of fast-growing areas, are not yet optimal. Service performance transport system is strongly influenced by the integration and integration of the network to which various transportation services should be arranged so that the integrated and enable continuous transfer systems/seamless [7]. For that, it needs to be formulated a development strategy of the transport network node

of Nunukan reliable regency to support the development of this region as a fast growing area. The end goal is the realization of public welfare and quality of a good city in the state border as the front porch of Indonesia.

This research was done in Nunukan is the node movement of logistics ie internal ferry ports Sei Jepun in Nunukan South District, dock crossings of West Liang Bunyu Sebatik, Semaja pier ferry of Sei Manggaris District, dock of the people on the island of Nunukan (Sei Jepun, Inhutani and Sei Bolong), dock the people on the island of Sebatik (Mentikas and Bambangan) and the pier of the people on the island of Mainland Borneo (Sei Ular, Tabur Lestari, Sekitang Baru, Akibetawol and Atap) and the movement of logistics externally, namely Tonon Taka Port, Port Class III Sei Nyamuk, PLBL Liem Hie Djung and Sei Jepun ferry ports. This research is descriptive quantitative and qualitative. Research using field survey method is such as interviews with the questionnaire, documentation and collection of secondary data from relevant agencies.

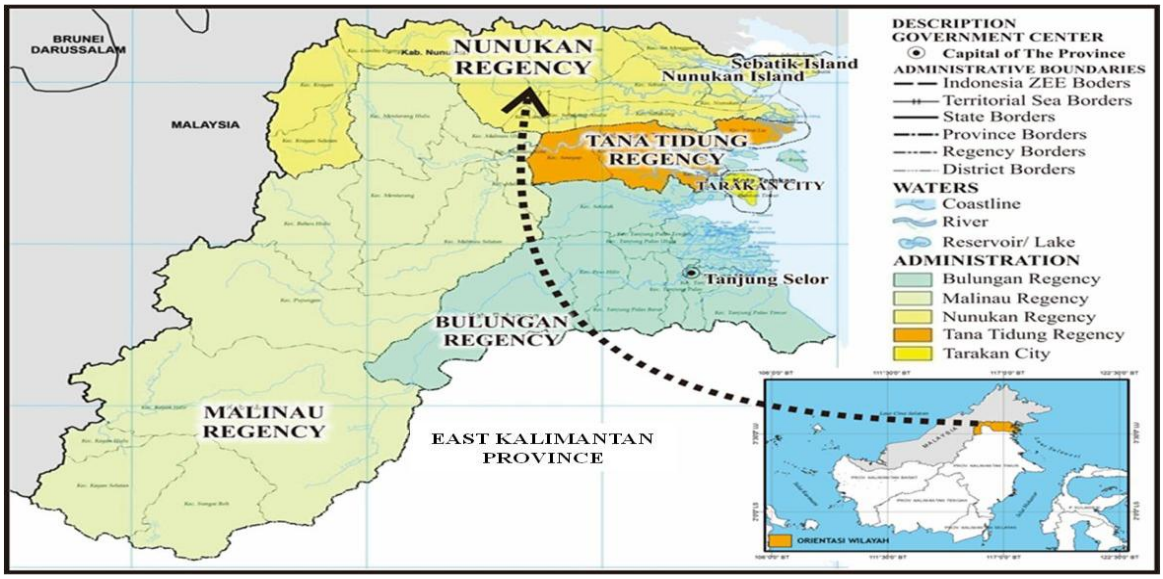

Figure 1. Research Sites

II. DISCUSSION

Potential of Natural Resources

Location Quotient (LQ) is used to determine the economic sectors which sectors including; base or export potential and which are included is not a sector basis [8]. This can be seen if LQ figures show more than one (LQ> 1) means that the sector is a sector basis. Then, if the results showed less than one (LQ <1) means that the sector is not a sector basis.

Nunukan Regency has two base sectors, namely agriculture, mining and excavation. Mining and excavation sector is a sector that has the greatest LQ index with an average value of 1.54. The development of mining and excavation in Nunukan Regency is supported by the development of mining areas which lead to Nunukan. The basic sector is the second largest agricultural sector with LQ index averages 1.20. The agricultural sector is a sector that has a pretty good economic strength in Nunukan because this sector is the main business activity, where the potential for extensive agricultural available land and the number of people working in this sector is quite a lot.

From it shows that both the base sectors are a sector that has a significant economic strength and influence on economic growth in Nunukan regency as well as the sector has been able to meet the needs of their own regions has even the potential for export.

During 2011 and 2015, there were 15 sectors namely LQ manufacturing sector with an average of 0.95; sector provision of accommodation and eating and drinking with an average LQ of 0.85; water supply sector, refineries rubbish, waste and recycling with LQ average of 0.80; the sector of information and communication, and other services by an average of 0.79; LQ real estate sector with an average of 0.66; LQ construction sector with an average of 0.64; LQ education services sector by an average of 0.58; sectors of wholesale and retail trade and repair of cars and motorcycles LQ average of 0.54 and administration sectors, defense and compulsory social security with LQ average of 0.44; transportation and warehousing sector with LQ average of 0.37; financial services and insurance sectors with LQ average of 0.31; LQ services company with an average of 0.15 and health services and social activities with LQ average of 0.03. Although the basic sector is the sector with the most potential to be developed and to spur economic growth of Nunukan, but the non base should also be developed to become the new base sectors supported by the existing sector basis.

Network Systems and Transport Logistics

This study shows that the characteristics of the transport infrastructure network system and port logistics node in the border region of Nunukan Indonesia-Malaysia is currently dominated by sea and river transport, but has yet to reach all areas of the logistics so that movement only up to the district or sub-district that has accessibility. Sea transportation infrastructure networks consist of nodes that tangible seaports and space tangible traffic shipping lanes. While sea transportation service network is in the form of stretch [9,17]. Inter island interaction of Nunukan and Sebatik Island is connected to the mode of transport crossing as well as Nunukan Island to the mainland island of Kalimantan.

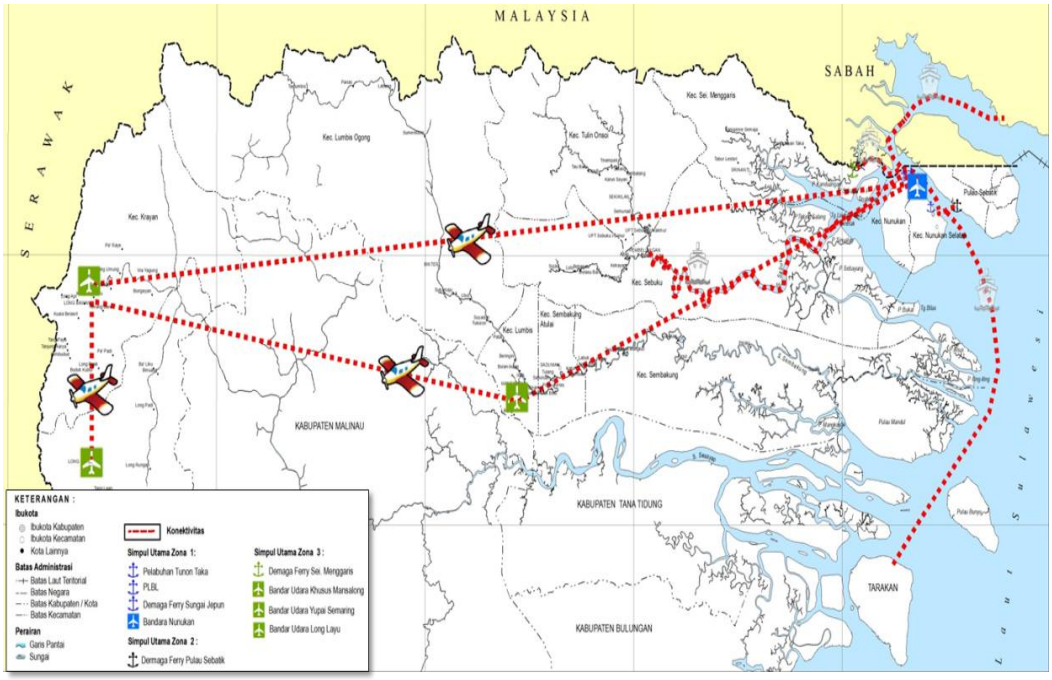

Figure 2. Map of the transport system in Nunukan Regency

Interaction between regions in the border area of Nunukan Regency, i.e., between regional distribution and local liaison, using air transportation have been linked yet only Krayan sub-districts and South Krayan District. Modes of road in the area of Nunukan Island and Sebatik Island are properly connected. However, mainland of Kalimantan is still constrained by infrastructure. Inter island interaction of Nunukan and Sebatik Island are connected to the mode of transport crossing as well as Nunukan Island to the mainland island of Kalimantan has been connected.

Model of Logistics Transportation Network

National Logistics System Development is explained that the integration of the vertices of logistics infrastructure, good logistics node and the interrelation between logistics node and linkages between logistics link that serves to drain the logistics from the point of origin to point of destination [10]. Logistics node integration and linkages between these nodes becomes the main foundation in realizing the connectivity of local, national and global towards national economic and security authority and the establishment of Indonesia as the Maritime State. Thus forming is a logistic network buffer that reaches the entire region of the Unitary State of the Republic of Indonesia in every province and district/city, as well as the Traditional Market managed modern as the spearhead of basic and strategic materials trade.

Level Transportation Local is structuring and planning of the local transport system in an integrated, which covers the entire transportation infrastructure as the operation of transport services and transport node starting point transport activity is based on the circulation of the movement of people and logistics in the hinterland [11,17], Patterns and node movement of logistics in Nunukan border can be seen in the Figure 3.

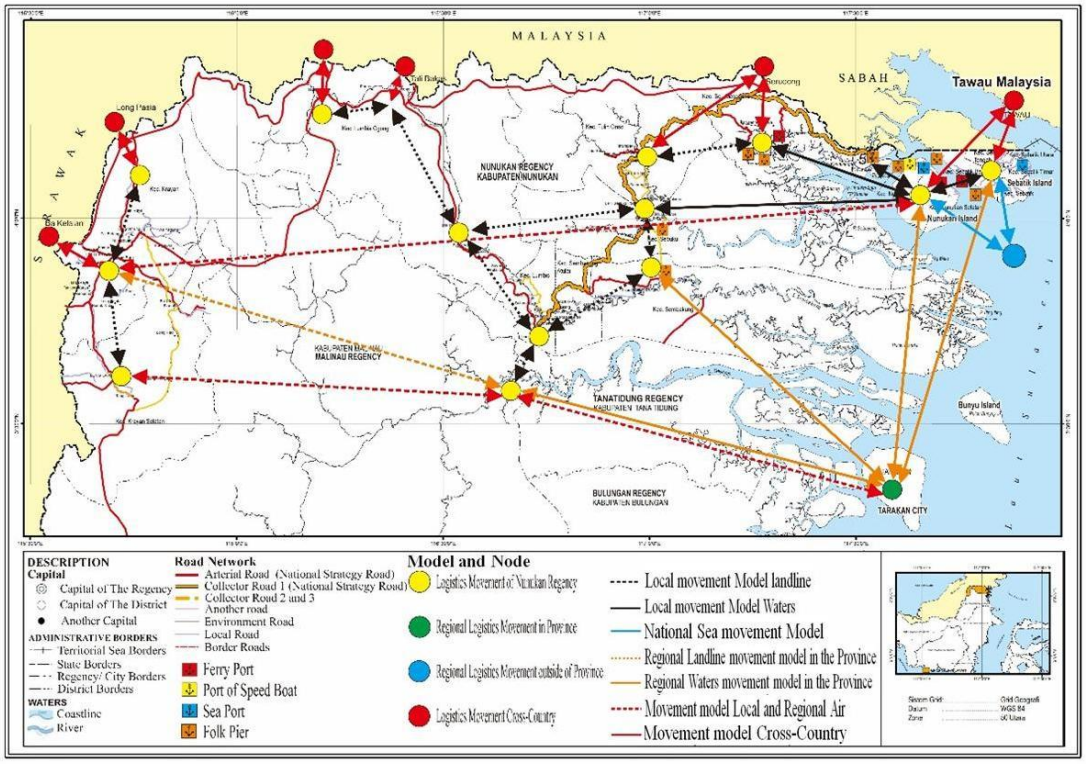

Figure 3. Model of Logistic Movement Node in Nunukan Regency

Transportation of Flow Logistics

Measuring the level of service in transport node using flow forecasting logistics transport of logistics with simple regression [12], then forecasting results as a basis for forecasting the determination node and network ports.

The flow of cargo at the Port of Tunon Taka tends to decrease. Where the average growth for the cargo unloaded from 2011 to 2015 is 3.48% and the average growth of the cargo loaded is 33.22%. Projected number loading and unloading logistics flow using multiple regression with the independent variable is the number of inhabitants and the GDP, where the number of the flow of logistics in 2020 amounted to 5.703.538 tonnes unloading and loading of 239.424 tonnes, in 2025 amounted to 10.784.717 tonnes loading and unloading of 345.071 tons, 2030 amounted to 15.865.896 tonnes loading and unloading of 450.717 tonnes and in 2035 amounted to 20.947.074 tonnes loading and unloading of 556 364 tonnes. Logistics Flow Projection (Unloading and Load) Tononta ka Nunukan port can be seen in the Figure 4.

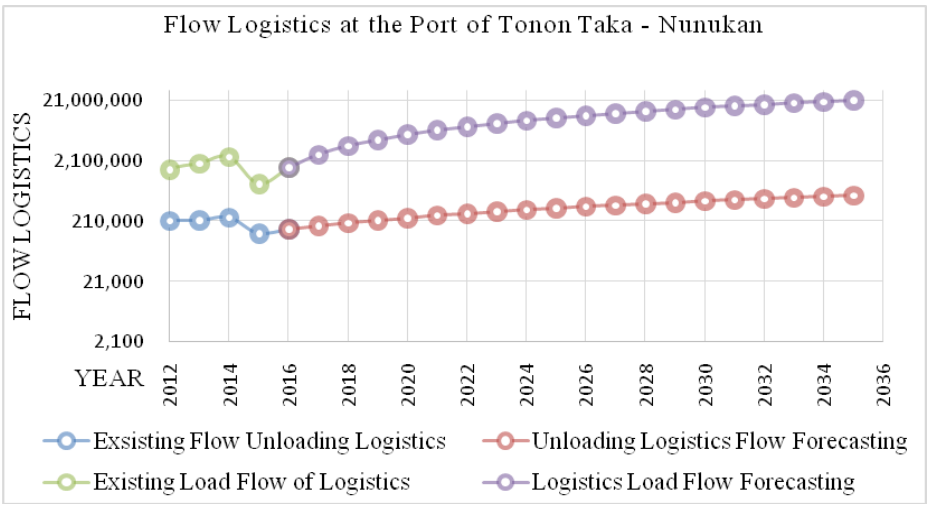

Figure 4. The growth of logistics flow in Tonon Taka port, 2016 to 2035

As for the projected amount of the flow of logistics loading and unloading of containers using simple regression with the independent variable is the number of the population, where the number of the flow of logistics in 2020 and unloading of 39 884 tonnes and unloading of 34 815 tonnes, in 2025 and unloading of 40 484 tonnes and unloading of 36 135 tonnes, year in 2030 amounted to 40.990 tonnes of load and unloading of 37.455 tonnes and in 2035 amounted to 41.427 tonnes of load and unloading of 38.775 tonnes.

The port Class III Sei Nyamuk from the years 2011 to 2015 have increased. For cargo unloaded have an average growth rate of 2.38% and an average growth of cargo at the port fell by 18.68%. The projected amount of the flow of loading and unloading logistics are using multiple regression with the independent variable is the number of inhabitants and the GDP, where the number of the flow of logistics in 2020 and unloading of 42.831 tonnes and unloading of 35. 705 tonnes, in 2025 and loading of 57.576 tonnes and unloading of 40.551 tonnes, 2030 loading and unloading of 72.321 tonnes by 45.398 tonnes and in 2035 amounted to 87.066 tonnes of load and unloading of 50.244 tonnes. Logistics flow projection (unloading and loading) the Port Class III of Sei Nyamuk can be seen in the Figure 5.

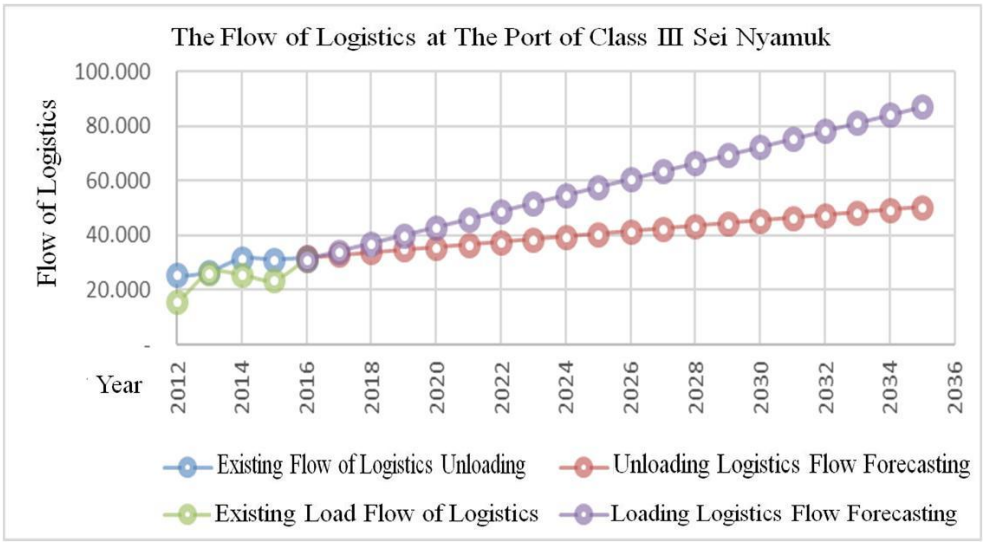

Figure 5. The Logistic flow growth at the Third-Class Port of Sei Nyamuk 2012-2035

Based on field data obtained in Sei Jepun ferry ports from March to September 2016, the largest flow of logistics in August 2016 amounted to 253 tons of logistics with a frequency of 17 round trip ship with value growth of 49%. Of the projected flow of logistics in the Ferry Port of Sei Japan, obtained projection in 2020 amounted to 8548 tons, 2025 amounted to 17.677 tonnes, in 2030 amounted to 26.806 tonnes and in 2035 amounted to 35 953 tonnes of freight. Logistics Flow Projection Seaport ferry of Sei Jepun can be seen in the Figure 6.

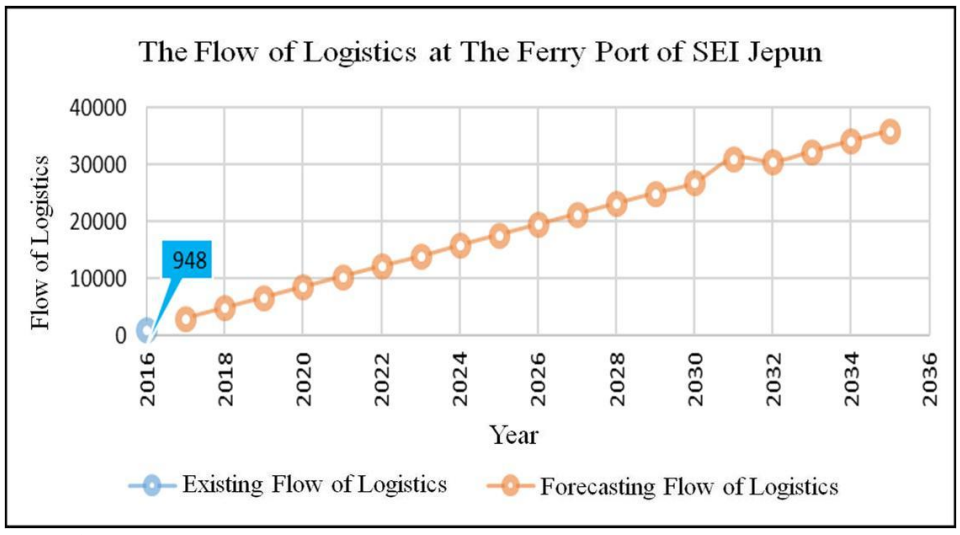

Figure 6. The Logistic flow growth at the Ferry Port of Sei Jepun, 2017 to 2035

Development of transport systems geared to support the development of an area and achieve greater efficiency in the system of collection and distribution of logistics and services traded. By considering this, the hierarchy of the port can be divided into three (3) based on coverage of service areas and the role of the port to economic developments. The river ports hierarchy, namely: Main Port, Gatherer Port, and Feeder Port [13,18].

Nunukan regency has 3 sea ports namely Nunukan Island and Sebatik Island as port collector, and 1 (one) International Port by agreement between the government of Indonesia and Malaysia through the Forum Sosekmalindo destined for the port of passengers and logistics that serve Nunukan-Tawau and 2016 have not been functioning International, only serve track regional namely Nunukan-Tarakan, and three ferry ports as port feeder namely seaport ferry of Sei Jepun, ferry pier of Liang Bunyu and ferry pier of Semaja and 10 folk piers spread across several islands and districts as a pier that serves the transport of people and logistics both in sea waters or river. Services Network Node of Nunukan border region can be seen in the Figure 7.

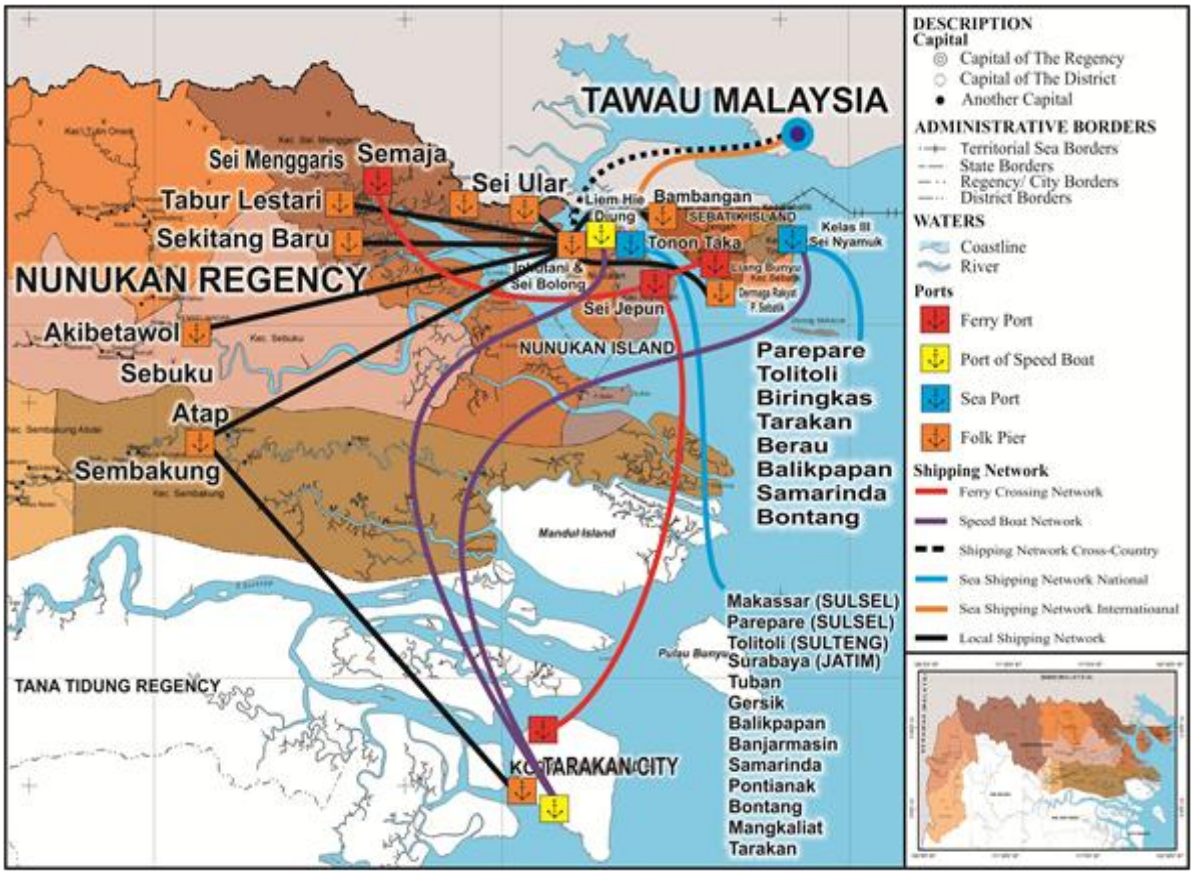

Figure 7. Network Node Existing Services

Origin-Destination of Cargo

Network Transport Service Waters in Nunukan Regency of North Kalimantan Province still the mainstay of public transport, due to the geographical conditions in the form of islands in addition to the majority of activity centers located around the river. This resulted in inter regional connectivity in connecting with other modes of transport water [18]. There are 3 modes of water transportation services in Nunukan Regency of North Kalimantan namely Folk Ship, Ferry Crossing and Sea Shipping.

Origin-destination movement of logistics in Sea port of Tonon Taka, sea port Class III of Sei Nyamuk, Sei Jepun ferry port, Liang Bunyu ferry pier of and Ferry Pier of Sei Manggaris, and folk pier of Nunukan Island, Sebatik Island and Mainland Kalimantan, the latter obtained by processing secondary data on each port and piers were there in Nunukan. Presentation of the original data of interest presented in tabular form per origin-destination of logistics at the port in Nunukan regency can be seen in the Table 1.

Table 1. Area of Destination and Type of Cargo

No.	Ports	Destination	Cargo Type
1.	Sei Jepun	Sei Mengaris, Sei Bakis, Sei Buku	Nine staples (food), clothing,
		Sei Nyamuk, Aji Kuning, East Sebatik, West Sebatik	Cement, wood, glass, pipes, iron, sand, Nine staples (food)
		Tarakan	Mini buses (passenger)
2.	Sei Manggaris	Liem Hie Jung, Sei Jepun	Passenger, Empty truck
3.	Liang Bunyu	Sei Jepun	Empty truck
4.	Tonon Taka	Sei Nyamuk, Tarakan, Parepare, Biringkassi, Tarjun, Berau, Tuban, Batu licin, Bekasi, Gersik, Gorontalo, sei Nyamuk	Cigarettes, containers
5.	PLBL Liem Hie Djung	Sei Nyamuk, Sei Menggaris, Tarakan, Tawau	Passenger and luggage
6.	Port Class III of Sei Nyamuk	Tarakan, Parepare, Toli-Toli	Passenger and logistics
7.	Folk Pier of Nunukan Island (Inhutani, Sei Bolong, Yamaker and Sei Jepun	Sebatik, Sei Manggaris, Sebuku, Lumbis and Sembakung, and Tawau Malaysia	Passenger and logistics such as eggs, cooking oil, sugar, chicken, beef

Source: Survey Results, 2016

Table 2. Area of origin and type of cargo

No.	Ports	Origin	Type of Cargo
1.	Sei Jepun	Sei Mengaris, Sei Bakis, Sei Buku	Wood, empty truck
		Sei Nyamuk, Aji Kuning, Sebatik Timur, Sebatik Barat	Empty truck
		Tarakan	Mini buses (passenger)
2.	Sei Manggaris	Liem Hie Jung, Sei Jepun	Passenger, Nine Staples (food)
3.	Liang Bunyu	Sei Jepun	Nine Staples (food), cement, steel, glass, pipe, sand, wood
4.	Tonon Taka	Sei Nyamuk, Tarakan, Parepare, Biringkassi, Tarjun,	Rice, oil, cattle, semen
		Berau, Tuban, Batu Licin, Gersik, Gorontalo, Surabaya	Mixed logistics, containers
5.	PLBL Liem Hie Djung	Sei Nyamuk, Sei Menggaris, Tarakan, Tawau	Passenger and luggage
6.	Sea Port Class III of Sei Nyamuk	Tarakan, Parepare, Toli-toli	Nine Stapels (food), cement, steel, glass, pipe, sand, wood
7.	Folk Pier of Nunukan Island (Inhutani, Sei Bolong, Yamaker and Sei Jepun	Sebatik, Sei Manggaris, Sebuku, Lumbis and Sembakung, and Tawau Malaysia, Nunukan,Tarakan, Pare-Pere, Balikpapan, Toli-Toli and Surabaya	Passenger and logistics such as fish, cooking oil, onions, eggs, milo, LPG, fish, sugar, chicken, beef

Source: Survey Results, 2016

Based on the interaction of origin and destination of logistics and the flow of loading and unloading of logistics at each port in Nunukan Regency depicted a map of desire line movement of logistics, both from to Nunukan Regency (movement of logistics external) or from/to the District in Nunukan Regency (internal movement of logistics).

The thickness of the lines indicates that the interaction of the movement of a large volume occurs between the zones/regions Nunukan port hinterland [14,18]. Interaction movement of the external sea port is highest between the port of Tonon Taka with the ports of national and internal movement at the local pier/folk is highest between the island of Nunukan (dock Inhutani/Sei Bolong) to the port of Sebuku District, then Sei Manggaris District, and to highest ferry port on the route Sei Jepun - Liang Bunyu, more clearly seen in the desire line map the movement of logistics in the Figure 8.

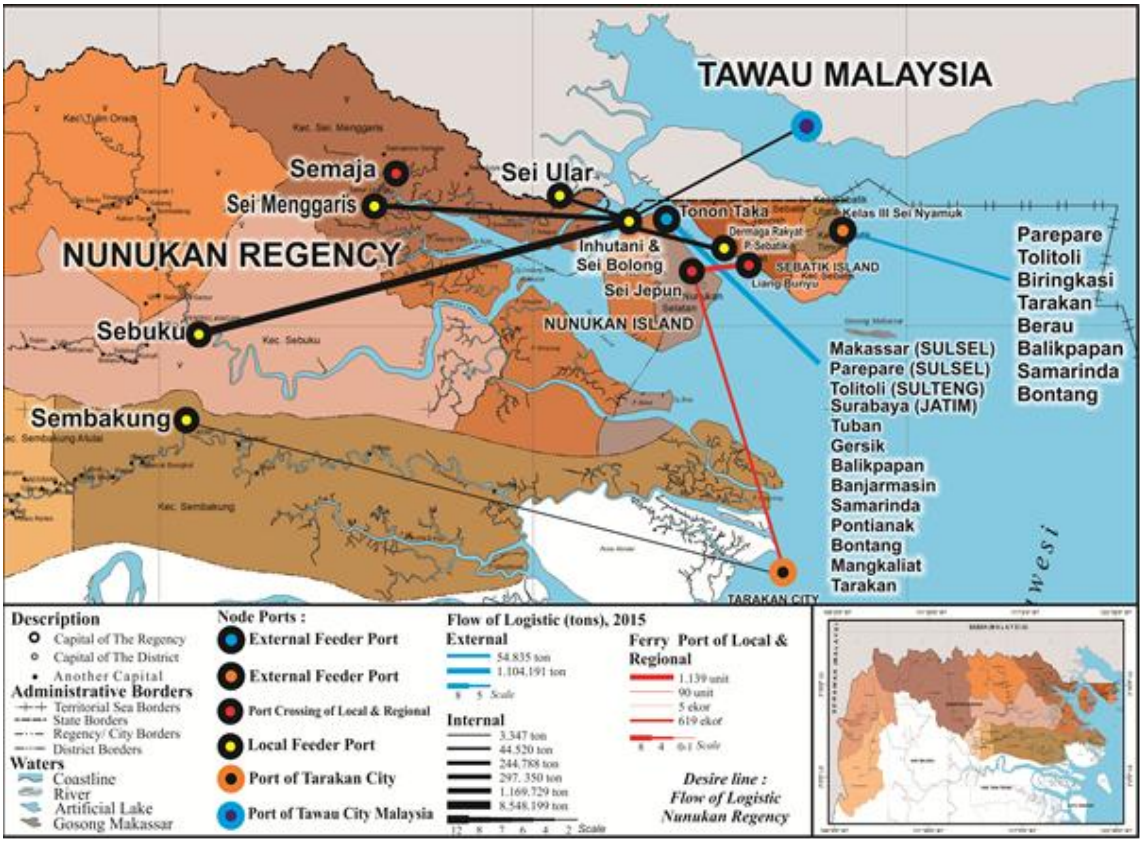

Figure 8. Desire line movement of logistics at the port node of Nunukan Regency

Strategy for Development of transportation logistics

The strategy to achieve the goal is to utilize internal strengths and capture external opportunities [15,18], it's a strategy of using force to seize the opportunities that exist. Based on the analysis of internal and external factors indicate the position of Nunukan port in support of logistic transportation system can be selected the key success factors in the Table 3.

Table 3. Key factors of success

No.	Strengths	No.	Weaknesses
1.	Potential Abundant Natural Resources	**1.**	The integration of infrastructure and facilities are low
2.	Strategic geographical location	**2.**	Socio-economic conditions of society are still low
No.	**Opportunities**	**No.**	**Threats**
1.	Nunukan Regency is the Centre National Strategic Areas	**1.**	The development of infrastructure in the Border Region requires a high budget
2.	Strong support of the Central Government and the Provincial	**2.**	Dependence on neighboring Malaysia

Source: Results Analysis, 2016

Based on the SWOT analysis as the matrix table above identified several strategies that can be done to do with the analysis of Nunukan port in Support Node Network System Transport Logistics in Border Area. The tendency the most appropriate strategies as bellow:

1. The development of economic growth center border area based on its characteristics, the local potential, and consider market opportunities with neighboring countries supported the development of transport infrastructure
2. Development of the Border Economic Center is as a National Strategic Activity Center/ PKSN
3. Encourage the accelerated increase in the quality and intensity of sea transport services, river and ferry transport as well as logistics node connectivity either for local, regional, national and international link with neighboring countries
4. Increasing the capacity of the transport infrastructure of the sea, river and ferry transport logistic services to support the border region based on local potential

III. CONCLUSION

Economic potential of each sub-district in Nunukan regency which is the Location Question (LQ) analyzed and shift share, then the economic prime-mover are agriculture, fisheries, industry, mining, trade and tourism. To support the production centers need transport network to distribute logistics produced, thus forming is connectivity between one and the other potential.

Based on the analysis, the flow of cargo at the Port of Tunon Taka tends to decrease. Cargo unloaded from 2011 to 2015 is 3.48% and growth of the cargo loaded is 33.22% and the port of Nyamuk cargo unloaded has growth rates of 2.38% and a growth of cargo loaded at 18.68%.

Characteristics of transport infrastructure at the port of Nunukan in generally served by river transport, sea and air transport. However, river transport, sea ferry has not reached all the border regions, so that the movement of logistics only up to the district or sub-district that has accessibility. Logistic transportation infrastructures on the main node of Tonon Taka port adequate to external services, but port nodes for internal movement of Nunukan regency are inadequate.

The strategy of logistic transportation system is needed transportation network to connect the nodes in a network system port both internal and external transport an integrated.

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