DEVELOPMENT OF MARITIME LOGISTICS SYSTEM TO SUPPORT MARINE AND FISHERIES INTEGRATED CENTRES IN SMALL ISLAND AND BOUNDARY AREAS

By Synthesa Praharani Ksatrya

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SUPERVISED BY:

Prof. David J Smith and Dr. Tom C. Cameron

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ABSTRACT

The geographical configuration of the Republic of Indonesia is an archipelago with most of its inhabitants living in the western region, especially in Java and Sumatra, on the contrary, the population in the eastern region, especially on the island of Papua, is quite low. This results in uneven development and economic access and high price disparities.

The Working Cabinet government wants to enable Indonesia to become the World Maritime Fulcrum and use the Sea Toll Program to facilitate the flow of goods from all regions and between small islands in Indonesia. One of the efforts made especially by the Ministry of Marine Affairs and Fisheries, is to develop Marine Fisheries Integrated Centres (MFICs) on small islands and boundary areas.

The data required in this thesis includes data and documents obtained from related institutions in Indonesia as well as virtual sources. Soft System Methodology (SSM) has been used to process the data.

The development of the maritime logistics system is also a provider of regional economic development services in the concept or idea of the maritime axis with the identification of the inner and front regions. In this idea, new economic growth is expected to occur in the front region, where the prerequisites for accessibility and connectivity must be properly fulfilled. Therefore, this research is expected to encourage equitable and economic development in the region, resulting in a balance between the western and eastern regions of Indonesia. Further research is needed, especially in the field of maritime security and protection of the marine environment and sustainability needs to be carried out to support these activities.

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LIST OF ABBREVIATION

ASEAN	Association of South East Asian Nations
Komnas Kajiskan	*Komisi Nasional Pengkajian Sumber Daya Ikan* National Commission on Assessment of Fish Resources
DWT	Dead Weight Ton : Capacity of a ship (in ton) to carry passengers, cargos, fuel, engines, supplies and equipment .
EEZ-I	Economic Exclusive Zone of Indonesia
Dekin	*Dewan Kelautan Indonesia* Indonesia Ocean Council
SiBa	Small Island Boundary Areas
MFIC	Marine Fisheries Integrated Centre
TEU /TeUS	TEU (Twenty Foot Equivalent Unit) is the unit of the capacity of a container ship, a container terminal and the statistics of the container transit in a port.
MMAF	Ministry of Marine Affairs and Fisheries
SSM	soft system methodology
CATWOE	(*Clients Actors Transformation Worldview Owners Environment)*
PPKT	*Pulau - pulau kecil terluar* (Small outer island)
RPJMN/NMTDP	*Rencana Pembangunan Jangka Menengah Nasional* National Medium-Term Development Plan
Nawacita	*in sancrit means nine*
PERMEN-KP	*Peraturan Menteri Kelautan Dan Perikanan* Minister Regulation of the Republic of Indonesia
PERPRES RI	*Peraturan Presiden Republik Indonesia* Presidential Regulation of the Republic of Indonesia
KEPMEN-KP	Keputusan Menteri Republik Indonesia Minister Degree of the Republic of Indonesia
LPI	Logistics Performance Index
GDP	Gross Domestic Product
LSPs	Logistics Service Providers
BUMN	*Badan Usaha Milik Negara* Indonesian State Owned Enterprises
PERINDO	*Perum Perikanan Indonesia* Indonesia fisheries company
PERINUS	*Perum Perikanan Nusantara* Nusantara Fisheries Company
PELNI	*Pelayaran Indonesia* *Indonesia Shipping*
NREEC MEMR	New Resources Energy and Energy Conversion Ministry of Energy and Mineral Resources
MP3EI	Master Plan for the Acceleration and Expansion of Indonesian Economic Development
DWT	Dwelling Time
GT	Gross Tonn
HP	Horse Power
SCM	Supply Chain Management
PPM	Education school for Training anad Manajemen Development
Asperindo,	*Asosiasi Perusahaan Jasa Pengiriman Ekspres Indonesia* (Indonesian Express Delivery Service Association)
INSW	Indonesian National Single Window
NLS	National Logistics System
NFLS	the National Fish Logistics System

CHAPTER 1. INTRODUCTION

1.1 Background

Indonesia is known as the largest archipelagic country in the world. The archipelago coastline is 108.000 km in length (Ambari, 2018). Two-thirds of Indonesian territory is sea; there are only three land borders, and the rest are sea borders. Indonesia's marine area is delimited by ten countries including Malaysia, Singapore, Philippines, India, Thailand, Vietnam, the Republic of Palau, Australia, Timor Leste, and Papua New Guinea. Indonesia's land borders are with Malaysia, Papua New Guinea, and Timor Leste with a total landline is 2914.1 km (Arsana, 2007). The territory consists of various islands. connected by various straits and seas, which standardized by the National Team for the Standardizations of Earth Names along with the registration with United Nation on the 13,466 islands (President Decree Number 112 the Year 2006). Most of the inhabitants live in the western region, particularly Java and Sumatera, whereas the smaller composition lives in the eastern part, such as the island of Papua. The unbalanced distribution of population with long-distance differences results in uneven development and economic access. Also, the difference in distance results in an unbalanced distribution of goods between the western, central, and eastern region of Indonesia, thus creating a tremendous disparity in their price. It is no longer a secret that the price of a bag of cement in Papua might reach 20 times the amount in Java. Likewise, in other items, both for basic household needs such as clothing, food also shelter which give impact to fulfil any supporting needing such as electronic, appliance, and entertainment.

The flow of trade in Indonesia is unequal. Dominated in the west with small control in the east (e.g., Papua or Maluku) results in high price disparities. There are several reasons why this happens. The first reason is that the haulage is dominated by traditional shipping, which can only accommodate small loads. Therefore, it is detrimental from an economic standpoint.

Moreover, most traditional ships do not insure the cargo, so that if there were an accident at sea, it would be very destructive for the clients of those ships. Secondly, ports and ship infrastructure are inadequate, there are also a lack of international-scale ports, difficulties in establishing connectivity for the movement of goods and services from large islands to small islands. Thirdly, the lack of availability on the goods delivered from the central and eastern

region doubles the cost of transport. Fourthly, the existing industrial locations are not sufficient in numbers in the eastern region. The impact leads to raw materials needing to be imported from the western region and severely increasing productions costs.

Indonesia's strategic position is at the heart of world economic growth, particularly the East Asia region (including Southeast Asia). There is a benefit from the demographic factor of the massive population in China, with nearly 1.3 billion people, India, approximately 1.2 billion people, and ASEAN around 600 million people. Indonesia is in a strategic position because 40% of it is through Indonesia's waters. The strategic position located between Asian and Australian Continent, as well as between the Indian Ocean and the Pacific Ocean. Distribution channels areas shown in Figure 1.1

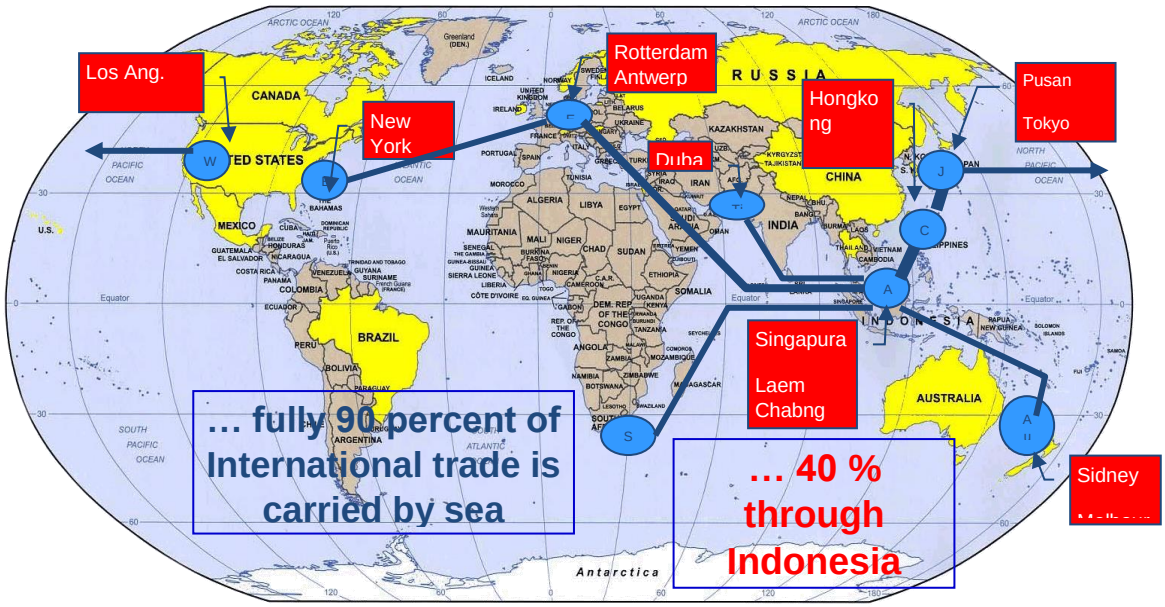


Figure 1.1 Distribution track (*source: Diamar, 2009*)

The potential for sustainable marine fish resources in Indonesia is estimated at 9.9 million tons/year spread in Indonesian waters (*ZEEI*) (*Komnas Kajiskan in* Ishartini et al., 2016a)). All the potential resources with the allowable catches of 7.92 million tons/year (around 80% of sustainable potential), is captured around 6.83 million tons in 2016 or 86.23% of the permitted catches. The diversity of marine flora and fauna has not yet been explored as a buffer for functional food in the future (Ministry of Marine Affairs and Fisheries Performance Report, 2018).

The coral reef area that has been mapped in Indonesia reaches 25,000km^2 (*Giyanto* et al., 2017). However, coral reefs in excellent condition are only around 5.30%, good conditions around 27.18%, quite good at 37.25%, and bad at 30.45% (*Ikawati and Setiawati*,

2016). Indonesia's ocean has around 8,500 species of fish, 555 species of seaweed, and 950 species of coral reef biota. Almost 37% of the world's fish species come from Indonesia. Some of the fish species have high economic value, such as tuna, shrimp, lobster, reef fish, various types of ornamental fish, and seaweed (*Novianti and Panjaitan*, 2016).

Moreover, Indonesian marine waters have high diversity for non-biological resources. There are still many Indonesia territorial waters that have economic value, yet are not adequately managed. The source of marine renewable energy, such as deep seawater is a challenge to be developed and utilized in the future. Not only marine renewable energy, but there are also high potential value marine sub-sector that have not yet been optimized. The marine sub-sectors are maritime industry, biotechnology, marine services, salt production and derivatives, marine bio pharmacology, seawater utilisation for energy, installation of pipes and sea cables, and the removal of objects and cargo of sinking ships. (Dewan Kelautan Indonesia, 2014).

Meanwhile, the total area of freshwater aquaculture is 2.8 million ha, representing the inland waters (rivers and lakes), which has an utilisation rate at around 10.7%. The total area of brackish is 2,964,331 ha, with an utilisation rate percentage at 21,9% (650,509 ha), and marine aquaculture area at 12,123,383 ha, with an utilisation rate percentage at only 2,7% (325,825 ha) including 9% of seaweed aquaculture area (1.1 million ha). However, more than twenty years after the MMAF was established, the maritime sector still contributes less to the National Gross Domestic Product (GDP) than the land farming sector (Directorate of Aquaculture, 2016).

There are 555 types of seaweed in Indonesia. Indonesia also has abundant natural resources for the development of fish feed. This action is necessary to reduce dependency on factory-made feed, which relies on imported raw materials, being fish meal in this case. The data on pellet feed production alone currently reaches 35,000 tons, which were 1.3 million tons (2.7%) of the total fish feed used to produce 2.6 million tons of freshwater fish. Predicted in 2019, with a target of 6.5 million tons of freshwater fish production, 592 thousand tons of pellet feed of total 5.92 million tons (10%) feed are needed (Directorate of Aquaculture, 2016).

Out of several reasons leads to government policies given by the legislature and the judiciary. Previously before on the government policy, Law Number 17 of 2007 concerning the National Long Term Development Plan, one of the development targets is to make known Indonesia become Strong, Advanced, and Independent as Maritime State. As an

effort to develop national competitiveness, the regulation was ratified by Presidential Regulation No. 26 of 2012 concerning the Blueprint for Development of the National Logistics Systems, as well as supporting the implementation of the Master plan for the Acceleration and Expansion of Indonesian Economic Development 2011-2025. The idea of maritime logistics concepts derived from the perspective of Archipelago that Indonesia consists of many islands and united by the sea so that those regulations become law base for maritime logistics concepts.

At the current leadership period of Presidential Cabinet of Joko Widodo-Jusuf Kalla 2015-2019, the government targets to make Indonesia a maritime country that is both competitive and the axis of the world's maritime. To implement the vision of Indonesia as the Global Maritime Fulcrum, in 2017 the Indonesian Maritime Policy was established. Some national flagship programs set up the priority in realising this vision, it being the concept of "sea highway" and development of Integrated Marine and Fisheries Centre on the outer islands of Indonesia. The development of the "sea highway" and integrated marine fisheries by the product-based business centre is an effort to facilitate the flow of goods distribution between regions while building a local market, thus supporting inter-islands connectivity and the regional economy itself. Moreover, with the existence of the "sea highway," it is expected that there will be a balance of product prices between the regions in Indonesia. However, there is hope to enhance the growth of the products and services industry, as well as the need of reliable international port and also improve existing infrastructure facilities.

1.2 Thesis Aims

Indonesia is unique in its disparate territories all of which are rich in natural resources, however, difficulties in logistics, as well as effective management mechanisms procedures, mean that there are difficulties in implementing effective policies to ensure the benefits achieved at the national level. If Indonesia is to reach its potential then it must capitalise on all resource potential, being both natural and human, and to do so in a way that recognises the key principles of long-term sustainability goals. The increasing wealth of individuals, communities, and regions will have a direct benefit to the nation and enable it to reach its potential and capacity to be a world-leading nation in terms of sustainable exploitation and management of its abundant natural resources.

There are some lost opportunities within Indonesia particularly through ineffective governance at the Archipelagic State. For example, there is a lack of coordination between

inter-agencies/institutions, an overlapping in regulations and also a lack of environmental awareness, but such states have a massive potential to significantly increase the economic benefits of marine resources to the nation of Indonesia. Therefore, the government, through the Ministry of Marine Affairs and Fisheries (MMAF), seeks to enforce the vision of President Joko Widodo, making Indonesia the Global maritime fulcrum. Since 2015, the MMAF has prioritised the development of small islands and bordering areas (SiBa) as the Marine Fishery Integrated Centre (MFIC). IMFC developed small islands and boundary areas with spatial bases and marine and fisheries sectors for the purpose of driving. The focus of this program is to ensure the development of supporting facilities, infrastructure, and fisheries resource management system. These actions are not only focusing on strengthening the downstream sector such as processing, but also on the upstream sector which provides raw materials to fisheries. This program is aimed at optimising fishing businesses, fish cultivation, salt pond businesses, processing and marketing of fishery products. In the end, the main players in the maritime and fishery business will profit from immense economic margins. Also, in turn it will improve the welfare of those involved in the maritime and fishery business, especially in small islands or border areas which are part of the MFIC as proclaimed by the Minister of Marine Affairs and Fisheries. The MFIC has become very strategic as the implementation of Nine Priority Agendas number 3 is "building Indonesia from the periphery by strengthening the regions and villages within the framework of the unitary state." (Republic of Indonesia, 2016)

Regarding to the construction of the "sea highway," the National Planning and Development Agency has mapped 24 ports to be built and developed throughout Indonesia, namely: Malahayati (Aceh), Belawan and Kuala Tanjung (North Sumatra), Dumai (Riau), Batam (Kepulauan Riau), Tanjung Pandan (Bangka-Belitung), Teluk Bayur (West Sumatra), Panjang (Lampung), Tanjung Priok (DKI Jakarta), Tanjung Perak (East Java), Tanjung Intan (West Java), Lembar Baru (Bali), Tenau (NTT), Kijing Beach (West Kalimantan), Bagendang (Central Kalimantan), Banjarmasin (East Kalimantan), Maloy (North Kalimantan), Makassar (South Sulawesi), Bitung (North Sulawesi), Ternate (North Maluku), Ambon (Maluku), Arar (West Papua), Jayapura and Merauke (Papua). The main route is navigating to the inland sea area, that is: Belawan-Tanjung Priok-Tanjung Perak-Makassar-Bitung-Makassar-Arar-Tanjung Perak-Tanjung Priok-Tanjung Pandan-Batam-Dumai-Belawan.

Out of the 24 ports, there are two international ports which are Kuala Tanjung Port and Bitung Port, which will be a transit dock for foreign vessels from various countries. Furthermore, the government has prepared 6 (six) significant ports that can be passed by large ships with a weight of 3,000-10,000 TEUs, called: Belawan Port, Tanjung Sauh, Tanjung Priok, Tanjung Perak, Makassar, and Sorong. Later on, the main port will be the main highway, while 24 ports from Belawan to Jayapura will be called collection ports.
Meanwhile, the Marine Fisheries Integrated Centre (MFIC), which are development programs as established by the MMAF, covers 20 areas across the outer islands of Simeulue, Sabang, Mentawai, North Bengkulu, Natuna, Anambas Islands, Nunukan, Talaud Islands, Sangihe, Southern Buton, Rote Ndao, East Sumba, Kota Tual, Southwest Maluku, Morotai Island, West Southeast Maluku, Biak Numfor, Sarmi, Mimika, and Merauke. These areas have been chosen to be the export centres for fishery and other marine products. The primary export destination countries are Thailand (Phuket), Malaysia (Penang, Klang and Kuala Lumpur), Singapore, Philippines (Davao), Hong Kong, Japan, Palau, USA (Hawaii), Australia (Brisbane, Perth, Cairns and Darwin).

One main obstacle in implementing marine policy is the low level of connectivity (physical and technological) between small islands and border areas (SiBa) to the existing trade and export centres. As a result, many of these islands act in independent economies; they do not contribute to or benefit from national economic production, and distribution mechanisms. This action has made the Indonesian maritime trade unable to reach its full potential, especially from SiBa. This nascent doctrine envisions that investment in the country's maritime infrastructure, including the development of better ports and ships, can turn Indonesia into an international maritime trade centre. Inter-island connectivity is expected to enable effective internal use or national resources while also reducing illegal fishing and other illegal activities.

Based on the explanation above, this thesis aims especially:

- To critically evaluate the progress of the Marine and Fisheries Integrated Centre (MFIC) site location through publish and unpublished report,
- Map the conditions and identifying marine logistics problems,
- Describe the relationship between variables in the maritime logistics system and also conduct routing analysis,
- Develop a conceptual model of the Marine Logistics System based on the National Logistics System.

Related research is needed on Indonesia's maritime logistics system to support the development programs of the Integrated Maritime and Fisheries Center in SiBa, and enhance regional economic development. In the end, the aim of establishing the Maritime Logistics System is to encourage equitable development and economic development in Indonesia, resulting in a balance between the western and eastern regions.

1.3 The Key Research Question

What is the most effective logistics system policy to support the Marine and Fisheries Integrated Centre?

1.4 Methodology

1.4.1 Approach

This thesis approach is carried out in several stages: (1) mapping of marine logistics conditions, which are preceded by an analysis of status or condition, (2) identification of problems, (3) depiction of the relationship between factors/variables in the marine logistics system, (4) routing analysis, (5) drafting a conceptual model of the Marine Logistics System based on the National Logistics System, (6) analysis of policy formulation and strategies for developing the model. The analytical framework is covered by the spirit of system development, requiring coordination and synergy between many sides, both government, private, and community, therefore elucidating the impression that it is not a single entity that describes all stages in the system controlled by a single party.

The analysis that will be carried out in this thesis is secondary data analysis (desk study), both on the existing conditions and status of national logistics as well as the development policies in the logistics sector that have been developed by the state and the government related to the marine logistics system. The approach scheme is shown in Figure 1.2

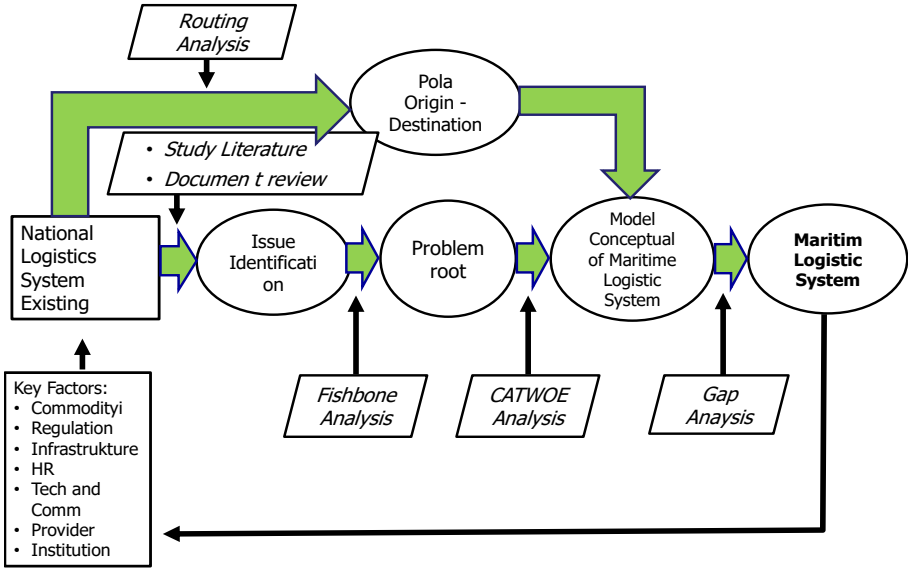


Figure 1.2. Approach Scheme

The flow of approach scheme is described through several analytical methods, which are: 1. Types and methods of data collection are carried out through literature studies and document review to determine the condition of the National Logistics System and identification of problems. 2. After identifying the problem, the data processing and analysis methods are carried out. The data processing method in this thesis uses soft system methodology (SSM) through 7 stages; the first stage understands the situation of unstructured problems and the second stage draws a picture of the problem situation; the first and second stages are carried out by routing analysis. The third stage traces the source of the problem using Fishbone Analysis and CATWOE Analysis; the fourth Stage creates a conceptual model; Stage 5 compares conceptual models with the real condition using gap analysis, Step 6 determines the desired changes; Stage 7 acts steps for improvement. The detailed explanation regarding the method used in this thesis will be explained in the following sub-chapters.

1.4.2 Data Types and Collection Methods

The data required in this thesis includes data and documents obtained from related institutions such as the Ministry of Maritime Affairs and Fisheries, Ministry of Trade, Ministry of Transportation, BAPPENAS, Statistic Agency of Indonesia, government offices, and other research institutions such as Research LIPI or other private research institutions

both domestic and foreign, as well as virtual sources with data collection methods through literature studies and document reviews.

1.4.3 Data Analysis and Processing Methods

The SSM analysis conducted in this thesis covers stages 1 through stage 7 and will pass the stages 5 and 6. Stage 6 is carried out after detailed stages from 1 to 5, then socialisation with stakeholders to provide input. However, due to time constraints, discussions and interviews were not conducted regarding this research. Stage 7 is a policy recommendation that will be carried out by sticking to the results of SSM stages 1 to 4. The explanation of each stage is as follows:

This thesis uses a soft system methodology (SSM) as its Data processing method. SSM is a problem-solving framework explicitly designed for situations where the nature of the problem is difficult to define. SSM was developed to address management problems that arise from human activity systems.

SSM is a cyclic learning system that never stops, it uses a model of human activity systems by actively involving actors with an interest in a situation through their perception and readiness in deciding directed actions by accommodating different actors' understandings, judgments, and values. SSM provides a coherent approach to group and individual thinking concerning the context, complexity, and ambiguity of policies (*Chapman* 2004). This method also has an interpretive paradigm, so the technique of applying it in the field depends very much on the context of the research, the problem situation, the behaviour of the actors, and the ability to analyse.

SSM has seven stages. These stages are real conditions and problems tracking, and problem-solving by using the system and re-implementing them to actual conditions. They include: (1) understanding unstructured problem situations; (2) compiling a picture of the problem situation; (3) compiling a root definition; (4) creating a conceptual model; (5) comparing conceptual models with field facts; (6) determining the desired changes; (7) taking action steps for improvement (*Checkland and Scholes*, 2000) Soft System Methodology Model as shown in Figure 1.3.

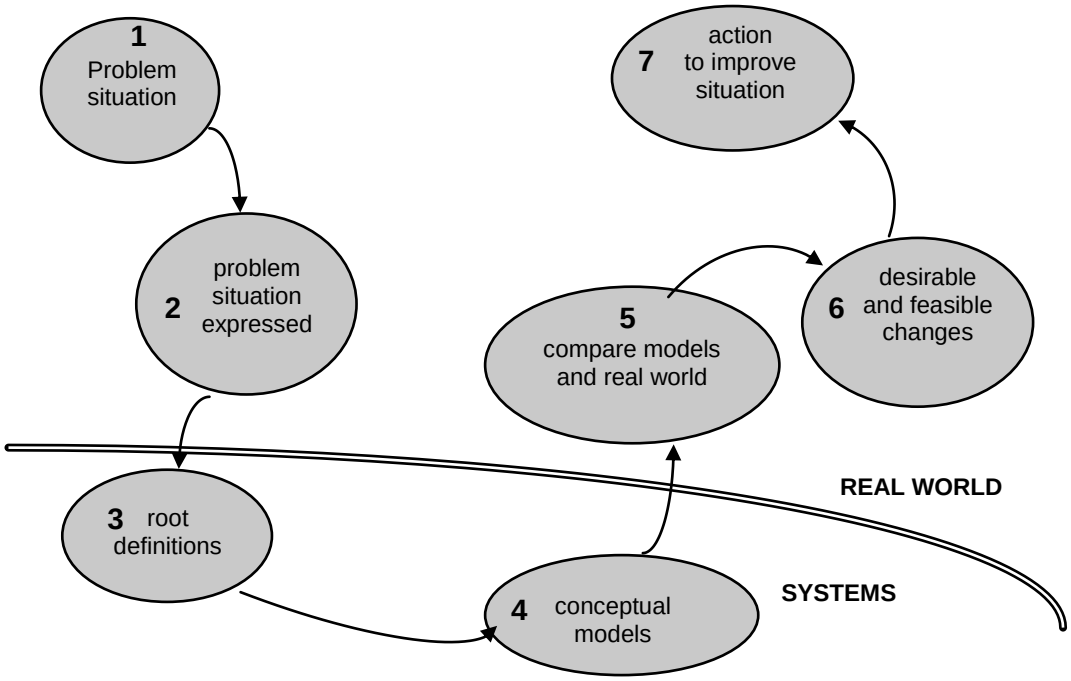


Figure 1.3. Soft System Methodology Model (*Checkland and Scholes*, 2000)

The explanation of each stage is as follows:

1) *Analysis of the condition/situation and problems of marine logistics* is used to see the marine logistics conditions. The points that will be carried out include: (1) production in the upstream sector in the marine sector, (2) transportation and distribution, (3) warehousing, (4) information systems, (5) marketing. This status will describe the conditions in each aspect, as well as the factors that influence it, including the problems faced by marine logistics. Condition/status analysis is carried out by collecting data through tracking reports or documents, regulations, and policies related to the fisheries logistics system.

2) Arranging an overview of problems with Routing Analysis.

The second stage in SSM is a problem situation expressed in a structured manner with three analysis's. *Source problems searching using Fishbone Analysis and CATWOE Analysis*

The third stage in SSM is the preparation of problem definitions. The problem's root will be traced in detail by covering views on the situation according to the relevant perspective. In this stage, two types of data analysis will be used. They are the fishbone diagram and CATWOE analysis.

The Cause and Effect Diagram is also called Fishbone Charts, which is a diagram that shows the cause and effect, useful for locating the causes of problems and solving them. The following are the use of Cause and Effect Analysis: to recognise important causes; to understand all the consequences and causes; comparing work procedures; finding the right solution; solving procedures; and developing the process. To know the cause and effect in a tangible form, we can illustrate it with a cause and effect diagram, since it is the same as a factor, and the effect is the same as the quality characteristic. In a general form, factors must be written in more detail to make the diagram useful Fish Bone Diagram as shown in Figure 1.4. (*Ishikawa*, 1989 *in Donndelinger and Barbara*, 1996)The steps to create a causal diagram are as follows:

Step 1: Draw a horizontal line with an arrow at the right end with a box in front of it. The result or problem to analyse is placed in a box,

Step 2: Write the main causes (human, material, machine, and method) in a parallel box which are spaced from the main arrow line. Relate the box to the arrow line that is tilted towards the main arrow line. It may be necessary to add more than four main causes,

Step 3: Write a small cause in the diagram around the primary cause, the small cause of which has an influence on the main cause. Connect the small cause with an arrow line from the main cause in question Human–Machine–Machine–Method–Method–Machine–Human–Machine–Method–Method.

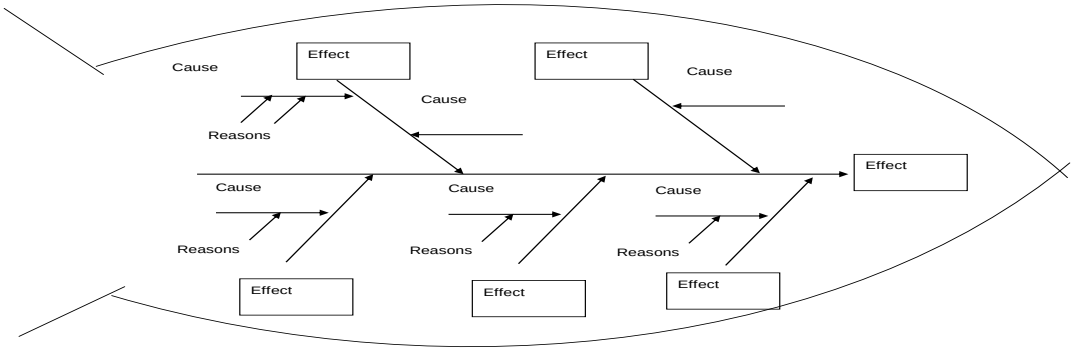


Figure 1.4. Fish Bone Diagram (Ishikawa, 1989)

After all the causes and effects are presented in fishbone analysis, the CATWOE analysis is done by making a list of simple systems that are used to identify the main problems and

formulate the solution. CATWOE analysis is a systemic approach that looks at the parties involved, which include:

a) *Clients* – the ones affected by the system,

b) *Actors* – the ones being part of the system,

c) *Transformation* – processed by the system,

d) *Worldview* – the overall macro picture of the system,

e) *Owners* – people or parties who can influence or even shut down the system, and

f) *Environment* – the surrounding which affects the system.

CATWOE analysis will be clarified by the 3E criteria to determine the root definition. When guidelines for CATWOE analysis are prepared, the system performance measurement criteria are also established. System performance measurement includes:

- *Efficacy* (criteria/ways whether transformation T works in producing desired goals);
- *Efficiency* (criteria whether T transformation is achieved with minimal resources);
- *Effectivity* (criteria whether T transformation contributes towards making better and long-term achievements).

3) Model Development Concept

The conceptual model is based on root definition, and the verb structure refers to the logic base. The development of a conceptual model is a simplification of the phenomena or real conditions in the logistics process that occur so that it requires strong assumptions. This can be done if the understanding of the real conditions is done well before. *Analysis of Models Comparison with Real Conditions (Gap Analysis).*

The conceptual model that has been determined is compared to the real conditions to find gaps, resulting in a debate about the perception and discussion of changes that are considered beneficial to solve to problem. *Checkland and Poulter* (2006) describes four ways to compare models with real conditions, the actions could be done by (1) formal discussion, (2) formal questions, (3) creating scenarios based on model operations, and (4) trying models in real conditions that are within the same structure with a conceptual model.

When the concept model does not describe the condition of the real world, there are two things can be done, which : (1) what is not found in reality can be a recommendation for change, and (2) what is not found in reality, and the analyser feels dissatisfied because it does not answer the research question, then returns to the second stage to return to the

data collection process, followed by the next steps. The Gap Analysis of Current Situation and Ideal Situation shown in Figure 1.5

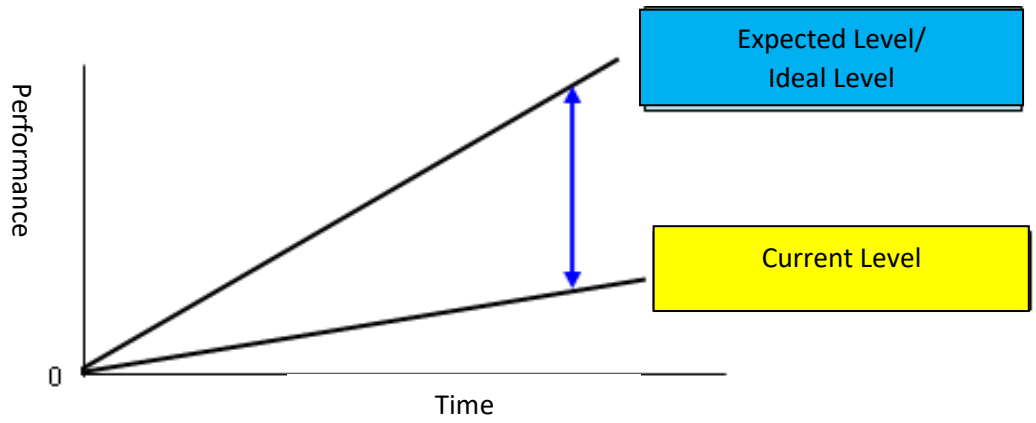


Figure 1.5. Gap Analysis of Current Situation and Ideal Situation

4) Analysis of Desired Changes

The formula of suggestions for desired changes are derived from managed discussions and accommodated views of various interested stakeholders. The changes made can be recommendations., such as policy recommendations and strategies for the development of marine logistics systems based on gap analysis between the policies applied and the ideal policies needed. The basis of this policy is marine logistics performance, issues and problems, influential factors, and the conceptual model developed.

Checkland and Poulter (2006) suggest three aspects that must be considered in making improvements, perfections or changes: (1) changes related to structure; (2) changes related to the process of the procedure; (3) changes related to attitude.

5) Analysis of Policy and Strategy Recommendation Implementations

The seventh analysis in SSM is an action to implement change actions, improve, perfect, or change problematic situations in the form of policy recommendations and strategies. The basis of implementation analysis is the result of the desired change analysis.

1.5 Thesis structure

Chapter 1 Introduction consists of Background, Thesis Aims, Methodology, and Thesis Structure

Chapter 2 A review of Marine Fisheries Integrated Centre (MFIC) and Concept of Logistic System; Issues and Problems.

Chapter 3 An Existing Condition of Indonesia Maritime Logistic; Marine Fisheries Integrated Centre (MFIC).

Chapter 4 Concept of Maritime Logistic System; General Discussion.

CHAPTER 2. REVIEW OF MARINE FISHERIES INTEGRATED CENTRES AND THE CONCEPT OF LOGISTIC SYSTEMS; ISSUES AND PROBLEMS.

2.1 Review of Marine Fisheries Integrated Centre (MFIC)

One of the leading programs of the Ministry of Marine Affairs and Fisheries (MMAF) in realising its Vision and Mission of Sovereignty, Sustainability and Welfare are to implement the Integrated Marine and Fisheries Integrated Centre (MFIC) development program based within small islands and/or boundaries areas. The emphasis is on supporting facilities and infrastructure development and fishery resource management systems, not only focuses on strengthening downstream sector such as processing catchment fish and upstream sectors which include provision of fishery raw materials but also the MFIC program will lead to further optimisation of the fishing industry so that all linked businesses will gain much higher economic value through increasing economic margins while driving a trickle-down effect to stimulate remote local economies.

The building and integration of people-based marine and fishery business through the optimisation of sustainable utilisation of marine and fishery resources in small islands and border areas is the primary purpose of the MFIC program. The aims of MFIC are: (1) To fulfil the nutrition needs of the locals; (2) To support national food security; and (3) To generate national foreign exchange through export activities as well as to accelerate the economy's local growth (Republic of Indonesia, 2015)

In the MFIC concept, the potential of marine and fishery resources in Small islands Boundary areas (SiBa) are highly possible for sustainable marine resource and business development for local community welfare. At SiBa, there will be a system developed that utilizes marine fisheries and human resources as the basis of integrated fisheries and marine centres. This system developed will represent a centre for the management of marine and fisheries resources, especially for harvesting, aquaculture, and technology parks in maintaining the sustainability of resources and the wider environment. However, coordination must be a major component of development in small islands and / or border areas in order to make this system work properly. According to the Decree of Minister of Marine Affairs and Fisheries of the Republic of Indonesia No.48/PERMENKP/2015, MFIC is consist of four principal components, are:

1. *Facilities and Infrastructure*

Construction and development of facilities and infrastructure built up to support the marine and fisheries business. Facilities and infrastructure will directly support the production

process of the marine and fisheries business, to enable efficiently; (i) ordering of raw materials, (ii) handling and processing, and (iii) its commercial aspect. Types of facilities and infrastructure used are: fleets of ships and fishing gear, cold chain systems (ice factories, freezers, and cold boxes), fish processing units, Solar Packed Fishermen Dealers, electricity, docks, hatchery, floating net cages, and vehicle carriers.

2. *Institutional Development*

Institutional development is directed to build a system for managing the marine and fisheries centres for the people. It is based on the role of fishermen and cultivators. Reinforcing the fishermen role to gain reliable access as well as providing a direct benefit to marine and fisheries businesses. Reinforcing the role is accompanied by an increase in human resources and corporatisation of fishermen businesses. In addition, business institutions that have been in the form of corporations are supported through a partnership-based management model between maritime and fisheries business and related stakeholders.

3. *Maritime and Fisheries Business Development*

Higher-income and enhance welfare for fishermen is the main achievement in a region so that the efforts will focus on an increasing scale, volume, and refined management models. The government will direct assist through modernising the fisheries industry and aquaculture businesses through capital aid and infrastructure, facilities, the introduction of science and technology, and the application approach for business systems to support fishing capture, aquaculture, construction of a techno-park, and development of marine services (i.e., marine tourism).

4. *Management of Sustainable Marine and Fisheries Resources*

Marine and fisheries resources are supposed to be the necessary capital for the economic development of Indonesia through its diversity. However, it is yet to be fully explored and utilised. One of the maritime and fisheries sector's most significant potential resource are marine fisheries with a sustainable and growing production output, as shown in figure 2.1 below. The fisheries production output is on a growth trend since 2011 with the highest output around 23.51 tons in 2016. This growth is expected to continue in 2017 and 2018 as the government supports by providing additional vessels of around 755 units. The potential resources of fisheries reached 6.5 million tons/year (MMAF, 2018). Other potential marine and fisheries resources that are also essential include aquaculture, marine tourism, and energy and mineral extraction. The accelerated development of marine and fishery resources

utilisation must be done optimally and sustainably, so as not to cause impacts in the form of overexploitation or overfishing.

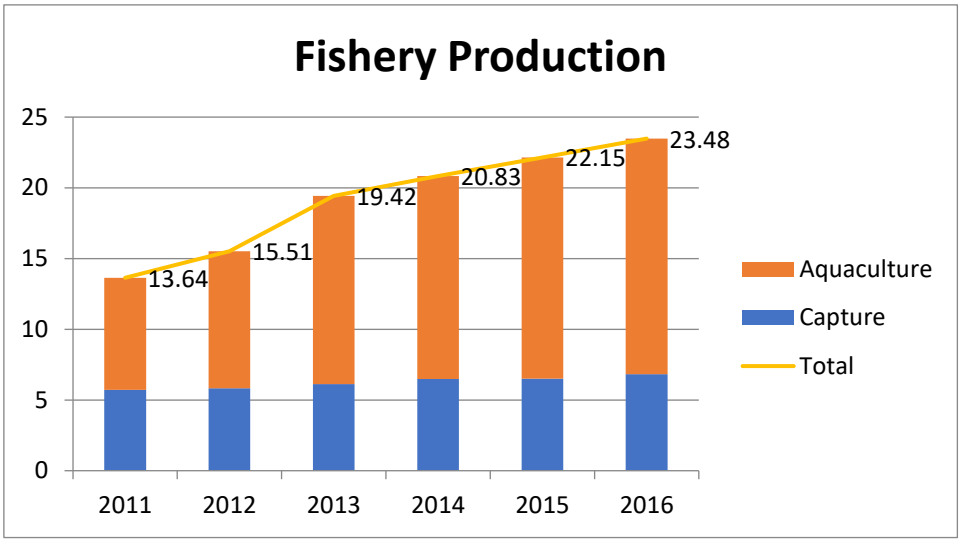


Figure 2.1 Fishery Production Trend from 2011 to 2016 (Republic of Indonesia, 2017)

Marine and fisheries resource management is needed to consider implementing the level of fisheries business applied at the MFIC location If the fisheries and marine resources potential are still likely to be expanded, then development actions can be carried out through increasing efforts to fish and to cultivate, while also identifying and utilising other resources. However, if the potential for marine and fisheries resources are identified as being overexploited, mitigation and direct interventions are needed. The arrangement of conservation areas is a vital part of the marine and fisheries centres community development. The success of the marine and fisheries business centres depends on the availability of natural resources within that region, especially reef fish and seaweed to ensure the long-term availability of these resources' protection and management of ecologically critical habitats. The focus of the development of integrated marine and fisheries areas must at least meet these requirements and criteria as follows:

1) Focus on value-added increases. Through MFIC establishment, it is expected that the value-added will increase, mainly from processed products that are increasingly diverse and of higher quality with higher selling value, to increase the community's income and encourage higher marine and fisheries-based economic growth.
2) Increasing competitiveness. MFIC is expected to be able to improve the competitiveness of marine and fisheries products through the development of efficient production systems,

that will increase productivity and produce quality at competitive prices to increase the national and global market share.

3) Modernisation and corporatisation of business. Modernisation is expected to increase efficiency, accelerate, and scale-up production while at the same time encouraging the development of higher value commodities and products to tackle increasingly competitive global markets. Modernisation is also expected to encourage changes in the upstream production system and explicitly focus on Small and Medium Micro Enterprises, increasing value-added, competitiveness, and rates of modernisation and corporatisation of businesses, as well as strengthening productivity by using technology and efficient business management systems.
4) Strengthening production and productivity of critical stakeholders in maritime and fisheries businesses requires a collaborative and integrated approach. The approach will increase the size and quality of the fishing industry; enhance relationships among industry partners (downstream and upstream, and large, medium, and small industries); as well as fostering the relationship between industry and consumers at all stages of the value chain. For this reason, the intensity and quality of relations between industry actors, especially between downstream and upstream components, need to receive individual attention and ensure the future of the supply chain, by strengthening the national raw material production system. In addition, fisheries industrialisation and investment policies need to be managed to encourage mutually beneficial business partnerships between micro, small, medium, and large-scale businesses. It is expected that small and medium scale industries will form networks of fisheries production systems to strengthen the national fisheries industry base.

   Implementation of the program to accelerate the development of small islands and borders is supported by cross-working units in MMAF. Organisationally, the Minister oversees 9 units: General Secretariat; General Inspectorate; General Directorate of Marine Spatial Management; General Directorate of Capture; General Directorate of Aquaculture; General Directorate of Strengthen the Competitiveness of Fisheries and Marine Products; General Directorate of Supervision of Fisheries and Marine Resources; Human Resources and Research Agency; Agency of Fish Quarantine, Fishery Product Quality, and Safety Control.

   The specific tasks that aim to support the implementation of the MFIC from each directorate are as follows:

1. **General Directorate of Marine Spatial Management**: preparation of planning documents; operationalisation of the MFIC secretariat at the central and regional levels; construction/revitalisation of necessary infrastructure (water, electricity, dock/jetty, Solar Packed Dealer Fisherman, Small Island Boundary Areas, operational vessel, Waste Water Treatment Plant, floating dock/landing point); integrated marine ecotourism; management of marine conservation areas to guarantee the sustainability of fish resources; coordination and cooperation across related sectors.
2. **General Directorate of Capture** carries out activities to provide assistance for fishing vessels and fishing equipment as well as fisheries business capital; structure development, port facilities, and infrastructure; facilitation of fisheries port operations.
3. **General Directorate of Aquaculture** conducts activities around aquaculture facilities and infrastructure rehabilitation; provides assistance for aquaculture facilities and infrastructures such as seeds, parent, feed, floating net cages, and other cultivation facilities; operationalisation of fisheries facilities and infrastructure, such as Fish Seed Centres; provides capital assistance for aquaculture business, Floating Net Cages, facilities and infrastructure for seaweed cultivation, seaweed seeds and excavators; mentoring management of Fish Seed Centres.
4. **General Directorate of Strengthen The Competitiveness of Fisheries and Marine Products** carries out the training for the trainer of Cold Chain system application; the capital of people's fisheries business; and fishery product marketing tools.
5. **General Directorate of Supervision of Fisheries and Marine Resources** construction of surveillance posts; provision of surveillance vessels; establishment of Community Watchdog Groups; and land office/work unit procurement.
6. **Human Resources and Research Agency** carries out Technopark development activities; institutional strengthening of the main actors as well as fisheries business actors; technical and managerial training; provision of tuition assistance; coaching, mentoring, and facilitating the main actors and fisheries business actors for banking access and other financing sources, conduct Research and Development (R&D)

activities; assesses maricultural development; evaluate the economic potential of marine and coastal resources.

7. **Agency of Fish Quarantine, Fishery Product Quality and Safety Control** carries out activities for the construction of fish quarantine facilities and infrastructure services for fish quarantine installations and quality laboratories.
8. **Provincial and District/City Governments** carry out coaching and assistance; provide support for the provision of facilities and infrastructure as well as policies and regulations. Providing training for trainer to enhance their capacity and capability in the specific skill in fisheries and aquaculture.

After establishing goals, objectives, activities, and job assignments internally at MMAF, ensuring the involvement of non-governmental agencies and institutions, the core MFIC sites undergo development. Even though Indonesia has 92 small islands and borders, not all of them are designated as MFIC locations. The determination of location depends on sites meeting the critical criteria which include:

a) being the Small Islands Boundary Areas or districts/cities that have PPKT and/or border areas or National Strategic Areas;
b) have superior commodities in the marine and fisheries sector that can be developed;
c) have high community dependence on marine and fisheries resources;
d) have the support and commitment of the regional government;
e) have human resources in the field of marine and fisheries; and
f) have access to facilities and infrastructure.

2.2 Concept of Logistic Systems

A. *The Supply Chain Concept*

"Supply Chain" is defined as a set of activities (in the form of entities/facilities) involved in the process of transformation and distribution of products, from raw materials to end-consumer products. A supply chain may consist of a) raw materials providers b) companies that transport raw materials c) companies that transform raw materials into intermediate products; d) suppliers of supporting products; e) assemblage companies; f) logistic agents; g) and retailers who sell goods; eventually passing on to f) the end consumer. The actors within the supply chain usually involved are as follows: 1. Suppliers, 2. Manufacturers, 3. Distributors, 4. Retailers Outlets, 5. Customers. (Macdonald J. R and T. M. Corsi. 2013)

Three critical components managed by the supply chain are:

1) The flow of goods from upstream to downstream (from raw material collection to the end consumer);

2) Effective and controlled downstream to the upstream flow of money;

3) Adequate, transparent information flow throughout the supply chain.

B. *Logistics System Concept*

1. System

The system is defined as an orderly arrangement of views, theories, principles, and in a business sense, it refers to several independent components or parts that are interconnected and therefore by efforts to achieve goals in diverse environments. In heterogeneous systems, effective communication and corporation between components of the system are key to ensure high efficiency and productivity in reaching a defined goal (Marimin, 2004).

2. Logistics System

Logistics refers to the management of systems activity involved with the flow of products, money, and information and includes the procurement process, storage, transportation, and delivery services. These vary by the type, quality, quantity, duration, and location of wider product delivery from the point of origin (Raw materials, for example) to the end destination. In the most basic terms "logistics" is not here limited to the movement of goods in the traditional sense (e.g., food produce), but may also include passenger logistics, disaster relief logistics, and even military logistics. However, the main logistic activities include procurement, production, warehousing, distribution, transportation, and delivery of goods.

Within the context of this research, the logistics system is a system that describes the relationship between components (e.g., entities/actors) within a supply chain, from suppliers to consumers, and aims to drive high-quality products provision. Examples of components of the logistics system include finished goods, half-finished goods, or raw materials and must consider material processing, manufacturing, storage, marketing, and delivery. Consequently, to ensure efficiency of the supply chain, Logistic systems requires clear communication between all components and stages of the chain; e.g. manufacturing and assembly processes; warehousing; distribution; point of transfer; transportation terminals; retail sales; sorting centres; documents; destruction centres; and disposal of all industrial activities (*Ghinai* et al, 2004).

3. Marine Logistics

Marine logistics and transportation are key and centre to the future of Indonesia and its economic security as well as sustainability. The nation objective of marine logistic with

connecting islands is to create marine transportation as nation veins of economic, politic, social culture, national security, employment opportunity, and source of reserves. This initiative also encourages national unity.

Transportation infrastructure plays a significant role in the economic development of Indonesia. Efficiency transport networks, including sea transport and also land-based infrastructure to support these networks, are seen as a critical issue in ensuring that the full economic wealth of Indonesia is sustainably realised.

Based on the available data, more than 80% of the inter-island movement of products and services use sea transportation services. The rate at which economic status can develop across Indonesia and in particular within its boundaries islands is totally dependent on the transportation sector. Therefore, the development of transportation infrastructure is considered a key priority and is of urgent attention.

2.3 Legal Reference

A. *Marine Fisheries Integrated Centre*

The development of Marine Fisheries Integrated Centre is justified by legal law, so that this project has fundamental law in which related institutions must be involved as mandatory and have responsibility on this project. Below are the regulations regarding MFIC:

1. Presidential Regulation Number 2 of 2015 concerning the National Medium-Term Development Plan for 2015-2019 (State Gazette of the Republic of Indonesia of 2015 Number 3); In 2018the National Medium-Term Development Plan (NMTDP) for 2015-2019 is implemented in the fourth year, the NMTDP consists of Nine Programs called *Nawacita* as the guidance to the Indonesia development program included the development of marine and fisheries sectors. The President of Republic of Indonesia stated that, "The ocean is our future." and the MMAF implemented it as mandatory, further deriving it into the policy, the program, and activity in managing Indonesian marine and fisheries resources. Therefore, the MMAF stipulated a mission to create three pillars of fisheries and marine development, which include Sovereignty, Sustainability, and Prosperity. Those missions are stated in the MMAF Strategic Plan for years 2015 -2019.

2. Presidential Regulation of the Republic of Indonesia Number 3 of 2017 concerning Action Plans for Acceleration of National Fisheries Industry Development; the function of this regulation consists of an action plan conducted by the government and private companies to increase economic prosperity of aqua farmers, fishermen, fishery processing, and

distributors of fisheries products. These increase the absorption of manpower and foreign exchange.

3. Regulation of the Minister of Marine Affairs and Fisheries No. 48/PERMEN-KP/2015 concerning General Guidelines for the Development of Integrated Marine and Fisheries Centres in Small Islands and Boundary Areas (State Gazette of the Republic of Indonesia Number 410);

4. Decree of the Minister of Marine Affairs and Fisheries Number 51/KEPMEN-KP/2016 concerning the Site Location of Integrated Marine and Fisheries Centre in Small Islands and Boundary Areas;

5. Decree of the Minister of Marine Affairs and Fisheries Number 73/KEPMEN-KP/2016 concerning the Management of Integrated Marine and Fisheries Centres in Small Islands and Boundary Areas;

6. Regulation of the Minister of Marine Affairs and Fisheries Number 40/PERMEN-KP/2016 concerning the Assignment of the Implementation of Development of Integrated Marine and Fisheries Centres in Small Islands and Boundary Areas;

7. Regulation of the Minister of Marine Affairs and Fisheries Number 8/PERMEN-KP/2017 concerning the Revision of the Regulation of the Minister of Marine Affairs and Fisheries No. 40/PERMEN-KP/2016 concerning the Assignment of the Development of Integrated Marine and Fisheries Centres on Small Islands and Boundary Areas.

B. *Regulation related to Logistic System*

PERPRES RI (Presidential Regulation of the Republic of Indonesia) No. 26 of 2012 concerning the Blueprint for National Logistics System Development.

Presidential Regulation of the Republic of Indonesia number 26 of 2012 concerning the Blueprint for the national logistics system development is made to emphasise more on the direction and pattern of development of the National Logistics System at the policy in macro level. Therefore, with the issuance of the presidential regulation, it could help to achieve the goals of National Economic Development.

The purposes of the Blueprint for National Logistics System Development are:

1. As a guide and guidance in the development of the National Logistics System for stakeholders, both government and private, in:

a. determining the direction of national logistics policy in order to increase business capabilities and competitiveness in order to succeed in global competition;

b. Developing more detailed activities, both for the central government, local government, business actors, and other stakeholders;

c. Coordinating, synchronising, and integrating relevant parties in implementing national logistics policies;

d. Coordinating and empowering needed resources optimally in order to improve the competitiveness of the national economy, national security, and people's welfare.

e. Thus, the leading role of the Blueprint for National Logistics System is to provide direction and guidance for the government and the business world to build an effective and efficient National Logistics System. For the government, the Blueprint is expected to assist the central government and regional governments in composing development plans in the logistics sector, also increasing transparency and coordination across ministries and institutions at the central and regional levels. For the business world, the Blueprint is expected to help businesses to improve their competitiveness through higher added value with competitive costs; increasing investment opportunities for medium, small, and micro-businesses; and opening opportunities for the national logistic service providers to foster cooperation on a global scale.

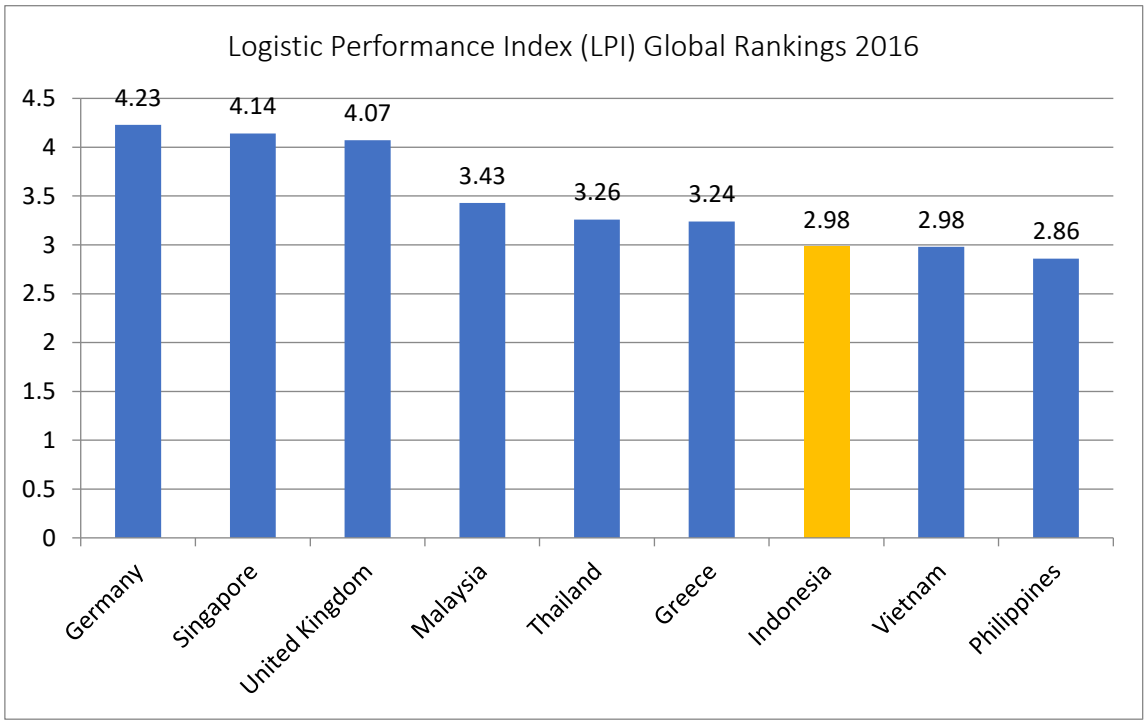
2.4 Issues and Problems with the logistic system in Indonesia

Generally, the logistics system in Indonesia at present doesn't have a unified vision that can support the improvement of business competitiveness and increase in people's welfare. Even the published guidance and relevant authorities related to logistics activities are partial and often sectorial being embedded within their relevant ministries or institutions and coordination is not sufficient. The high cost of suboptimal logistics and services affects the businesses global competitiveness.

Based on a survey conducted by the World Bank in 2012-2016 which was then outlined in the Logistics Performance Index (LPI), Indonesia's logistical performance in the period of 3 years seemed to slight decrease, along with the incline in Indonesia's LPI rating. Indonesia's LPI position is ranked 63 in 2016, decreasing from 53 of 160 countries (https://lpi.worldbank.org/international). The challenge in improving the logistics sector is the implementation of government programs that provide incentives and facilities in the logistics sector.

High logistics costs are a result of poor enforcement conditions, and costs associated with poor infrastructure. The high cost of domestic logistics fee in Indonesia is partly but not solely caused by the high costs of its land and sea transportation. However, it is also related

to inefficient regulatory factors, relatively low human resources, poor logistics processes and management, and the general lack of professionalism of its national logistics service providers, thus causing inefficient domestic freight services. The Logistic Performance Index (LPI) Global Rankings 2016 as shown in figure 2.2



Global Rank	1	5	8	32	45	47	63	64	71

Figure 2.2. Logistics Performance Index (LPI) in Global Rank and Indonesia in 2016) (Source: (https://lpi.worldbank.org/international/global/, 2016 Accessed September 25th 2018 – *proceed* data))

A. Key Commodities

The primary commodity factor as a logistic activity driver is not effectively coordinated, because there is less commitment from the stakeholder and a lack of focus in developing commodity and on export-import trading. Besides, corporations have a weak bargaining position in international trading to control trading system while Indonesia's shipping line act only as a supporting equipment.

Five priority commodities in maritime sectors contribute significantly to GDP. These are (1) Fisheries; (2) Marine Energy and Mineral Resources; (3) Shipping; (4) Maritime Tourism; (5) Maritime Industries and Services. All of these commodity sectors have high prospects, however they are not optimally treated.

Generally, the key problem with commodity mainstreams that there is no optimal transportation can deliver commodities between islands.

B. Logistics Infrastructure

Transportation infrastructure is inadequate, both in terms of quantity and quality due to the absence of hub ports that can be managed and fully nationally integrated, in an effective and efficient manner. Furthermore, logistical infrastructure between different components of the logistical system are suboptimal, reducing value with increasing costs.

The existing infrastructure conditions are still considered inadequate to support smooth logistical flow. The poor condition of road infrastructure severely impedes the development of the freight transport industry in Indonesia and limits the ability of small business owners to target and reach profitable national and international markets.

Likewise, the multimodal transportation system hasn't been capable of running precisely, due to limited quality access between key transportation and production centres, and centres of export (e.g., ports or airports); poor airport infrastructure has been a specific and historical problem. Poor logistics and ineffective running and coordination of logistics has increased costs of transportation and therefore, profitability. Specific issues within key transportation hubs include ports.

The general problem within ports involves three main issues: the unavailability of international hub ports; low port productivity and capacity; and no port integrity management.

1) Unavailability of International Hub-Port

A critical factor for the development of a country's logistics is the presence of international hub ports (for both sea and air), as they are centres that control the flow of national and international goods. The international hub port is one that functions as a "collection" port, where the primary vessel operated by the Main Line Operator (MLO) conducts a direct call to raise/lower the goods, to be forwarded to the feeder port by a feeder. Indonesia currently has several main ports, but, only a few international hub ports, whereas many countries in Asia have direct relationships with key international regions hub port. Although this is a significant factor in reducing realised GDP for Indonesia, it does represent a real opportunity for the government to capitalise on its abundant natural resources and potential for further global trade. Until 2012, it is estimated that ships with a carrying capacity of more than ten

thousand containers will cross the world shipping lanes for Asian and European routes. This requires the readiness of ports and supporting infrastructure to be able to serve larger vessels.

2) Low Port Productivity and Capacity

National port productivity and capacity are unable to keep up with the increase in the flow of goods, both domestic and international. Several major ports, such as Tanjung Priok, Tanjung Perak, Belawan, and Makassar are in dire need of developing the port area to anticipate the handling of the increasing flow of goods.

3) Non-Port Integrity Management

The handling of goods and documents is currently still based on transactions. This is caused by non-integrated logistics service between the port regulation, businesses, service users, quarantine, customs, and other relevant stakeholders that are oriented to the smooth flow of goods and customer satisfaction. Also, there is no system or mechanism for collaboration between port management authorities and industrial estates that are oriented towards the smooth flow of exported and imported goods for industrial purposes.

C. Transportation and Distribution

The logistics system concept can't be separated from the process of transportation and distribution of goods. Therefore, the maritime logistics system can't be separated from the process of transportation and distribution of fisheries, both production and production inputs. The transportation and distribution process are closely related to logistics infrastructure, both in the form of necessary infrastructure and commercial infrastructure. Basic infrastructure includes wharves, ports, airports, and terminals while commercial infrastructure includes frozen warehouses, transportation equipment, and other supporting tools.

As a matter of fact, in the process of distributing frozen, fresh, dry and wet goods, an important characteristic is that each condition of the goods has its prerequisites, so that appropriate infrastructure is needed.

In fresh, frozen products and wet products, the cold chain system is used in order to produce a product with the required food safety standards. By standard business practices fresh or frozen product transfer usually use transportation, which takes longer time. So, most of the transportation of fresh or frozen products use land and or sea transportation. In the transportation process with a longer time, it is necessary to use refrigerated containers or what is often known as a reefer container (Jolly *et al* , 2000)

One of the key issues in realising the full national potential is the availability of appropriate transport vessels and containers across the archipelago. Reefer containers, for example, tend to be in the western part of Indonesia where the value gains and profits can be greater received from this area. Within Eastern Indonesia, where there is a wealth of natural resources, ineffective management and funding have led to low levels of movement of goods from these regions into national markets or international export centres. This leads to the perceived low value of reefer container use within Eastern Indonesia and hence their lack of availability within that region. Consequently, containers tend to accumulate at destinations (ports) throughout western regions such as Tanjung Priok, Tanjung Emas, and Tanjung Perak. For those export products from Eastern Indonesia which need rapid delivery will need additional cost apply further decreasing profitability.

Another problem is the high cost of transportation from one port to another in Indonesia or other international ports. As an illustration, the transportation cost from the Port of Makassar to Tanjung Priok is Rp. 1,000/kg or 3,800-4,000 US dollars per 40 feet container (assuming the load is 38-40 tons). Transportation costs from Makassar to the US port amount to 8,900 US dollars, while from Singapore, Tanjung Pelepah (Port-Klang) Malaysia, or Rayong-Thailand is around 5,000 US dollars (*Tim Peneliti Kementerian Perhubungan*, 2010).

One factor suspected of having an effect on the efficiency of transportation costs are characteristics of sea transport (e.g., ships, fleet, and vessel size). Most of the Indonesian seaports can only dock ships under 2,000 TEUs (twenty feet equal units). Only Tanjung Priok port can dock ships above 3,000 TEUs while other ports on average can only be traversed by 1,700 TEUs. At present, the busiest routes are Jakarta – Belawan, and Surabaya – Makassar which can only use ships under 2,000 TEUs. The average container flow of Jakarta – Belawan, and Surabaya – Makassar has reached 3,000 TEUs per week, so it is enough to be transported with a 1,700 TEU capacity vessel (*Aprilianto et al.*, 2014). Main problems include unbalanced loads and the depth of the shipping channel combined with limited port facilities.

Fisheries logistics involves different transportation modes such as sea and land transportation, however they suffer from significant problems that reduce profitability and competitiveness. Land transportation issues are related to road infrastructure conditions (availability, condition, width, and quality of roads), and transportation capacity and facilities. E.g., the availability of refrigerated container facilities. Generally, land transportation infrastructure must be coordinated and combined with sea transportation

networks, therefore the status of land and sea logistics, as well as the link between the two, are crucial to the economic performance of Indonesia and provide added value to SiBa in national economic development. Another problem is the availability of roads of sufficient size and quality to enable freight transfer. Roads often have a width that is less than needed, with sharp turns or a substantial incline, so preventing truck-based transport of large (and profitable) containers. Roads are often spanned by many bridges which also cannot accommodate underlying traffic and transport needs as they are limited to a load-bearing of just 25 tons. Apart from the road issues, the actual quality of vehicles also reduces the local capacity for transportation. Many transport vehicles are old and underpowered, making it challenging to tackle moderate to steep gradients and this often causes extensive traffic hold-ps. This causes dwelling time for a container to be unloaded and then transported. As a result, the central government, through the Ministry of Transportation, has committed to reducing dwelling time from 6-7 days to 4 days. But, in April 2013, dwelling time reached 10-13 days, and in June 2013, it reached 13-17 days (*www.republika.co.id, 2013*). This is highly detrimental to the property owner, the truck driver, and the shipowner, which in turn leads to the swelling of transportation costs.

Overall, road growth still gets left far behind compared to the increase in vehicle number. For example, in East Java, the increase in vehicles reaches 11-14%/year, but the increase in road length is generally less than 2%/year. In addition, trucks with cooling facilities) are also very limited (Mangindaan, 2014)

D. Warehousing

Besides the problems of necessary infrastructure such as roads, ports, water, and electricity; the problem of fishery logistics also involves warehousing infrastructure. Warehousing infrastructure is mostly commercial infrastructure. However, the existence of this commercial infrastructure is highly dependent on necessary infrastructure readiness, especially electricity.

The warehouse has a vital role in a maritime logistics system. Considering Indonesia's vast geographical characteristics, it is necessary to build a warehousing system that is networked so that information about the products in the warehouse can be monitored. This information is crucial in supply chain management, in decision making concerning stocks and, in the need, to manage the demand and supply chain. Some operational constraints faced by the warehousing sector have been identified by Research Team Ministry of Transportation (*Tim*

Peneliti Kementerian Perhubungan 2010) and are directly related to logistics and supply chain networks:

1) Not all warehouses are equipped with the information technology Warehouse Management System (WMS), which allows the acquisition of inventory data in warehouses. WMS will be helpful in improving management efficiency because of the optimal use of space. The reception and the delivery process can also be done faster, and with the human resources needed efficiently.

2There are still complaints from industry (especially importers who are also producers of export goods) concerning the import process, for example with raw materials, where it is a common occurrence to experience severe delays. Handling costs are also heavily criticised, e.g., clearance services as well as general warehousing services.

E. Logistics Service Provider

In terms of logistics service providers, Indonesia is still dominated by multi-national companies or national companies affiliated with them. High levels of fragmentation also limit distribution capability, for example, transportation, warehousing, freight forwarding, cargo, courier, and shipping may all be handled separately. The ability of Indonesian logistics service providers is limited within capacity amount and international networks. Also, the administration is fragmented, for example, licensing permits for foreign LSPs in Indonesia are sometimes handled by the Ministry of Trade, some by the Ministry of Transportation, while others from the Ministry of Communication and Information.

F. Human Resources

Indonesia is still faced with the scarcity of experts, specialists, and professionals in the logistics field, both at managerial and operational levels in the private sector and the government. In general, the existing competence of human resources throughout the sector is low. Human resources in Indonesia's logistics sector are faced with two key challenges: increasing the number of workers and improving the quality; and competency of existing resources. To overcome these problems, the role of education and training institutions is essential. However, it is still constrained because there has been no recognition from the government c.q Ministry of National Education, that these issues exist and limit the capacity of Indonesia to grow economically.

Another problem is that there are still wide gaps between education and training programs in higher education institutions with real-world business application. Currently, education

and training implemented by different companies are mostly sporadic and unplanned, they are also not standardised and are ineffective in delivering a more skilled labour force.

G. Information and Communication Technology

Generally, it is seen that information related to the maritime logistics system is still partially and has yet to become a unified whole. This information includes data about fish supply chains, necessary infrastructure and commercial infrastructure as well as logistics service perpetrators. Information related to supply and demand, distribution, and transportation systems such as volume, type, price, channel, and time are also still limited and are located in different agencies and businesses.

Another problem lies in the data required for strategic planning, it varies from one agency to another, for example vary depending on the source. The disparity occurs because of a lack of coordination, communication, and data exchange between one institution and another, both within government and between the private sector and government.

H. Regulation and Policy

Regulations and policies are still partial and sectorial and followed by low and very variable levels of law enforcement. These drive ineffective coordination and integration between institutes, especially in resource and logistic-based activities which are incredibly complicated. In Indonesia, local regulations often contradict central regulations, which in turn confuse and cause an increase in costs for handling cross-regional routes and retribution permits.

Indonesia has made various efforts to improve domestic logistics; however, with increasingly intense global competition, the national logistics performance remains low. The poor performance of logistics is reflected in the very high cost of freight transport and one of the major obstacles to increasing the competitiveness of Indonesia's maritime industries and the proportion of international trade.

Vehicle operating costs (related to infrastructure, licensing, and levies) in Indonesia are higher than in other Asian countries (*Leung*, 2016). This is due both to poor management and administration but also poor road structure combined with geographical condition which consists of large and small island.

Consequently, the cost per transport mile per unit time is very high meaning that many small or medium enterprises cannot compete with larger multi-national companies. Overall, poor road quality in remote areas of Indonesia significantly increase the costs incurred by small businesses, transport companies, and consumers.

However, it is not just poor infrastructure and long transport times that increase the cost and reduce competitiveness, but both official and unofficial levies are also often high within Indonesia. During a single trip, drivers may be subjected to several and various types of levies, including retribution fees; official and unofficial levies on weigh stations; and levies by police as well as extortion. The combination of convoluted regulations and high domestic transportation costs has hampered Indonesia's trade competitiveness. Strong governance is needed to refine and improve coordination, in order to harmonise and integrate all policies for the development of marine logistics systems, which will lead to improvements of Indonesia's logistics. Within this chapter we have examined some of the key issues that have limited the ability of Indonesia, it being one of the largest archipelagic countries in the world, it has to realise its full potential, particularly from its natural resource wealthy outer islands. The key issues are lack of infrastructure, overlapping regulation and poor management of the system of supply chains, and in the following chapter, there will be a detailed progress of Marine Fisheries Integrated Centre as Indonesia's priority program along with a review of the existing condition of Indonesia's maritime logistics.

CHAPTER 3. DEVELOPMENT OF A MARINE FISHERIES INTEGRATED CENTRE (MFIC) AND A REVIEW OF EXISTING CONDITIONS OF INDONESIAN MARITIME LOGISTICS

3.1 Progress of Development on Marine Fisheries Integrated Centre

In early 2016 the Ministry of Marine Affairs and Fisheries (MMAF) established 15 Marine Fisheries Integrated Centre (MFIC) sites through the Decree of the Minister of Marine Affairs and Fisheries No. 17/KEPMEN-KP/2016 on the Establishment of an Integrated Marine Fishery Integrated Centre on Small Islands and Boundary Areas. At the end of 2016, the locations increased to 20, determined by the Decree of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia Number 51/KEPMEN-KP/20 16.

There are as many as 15 islands that have become the location of MFICs that reaches 100% of the target. Compared with 2015 with only five islands, achievement in 2016 will increase by 200%. When compared to the 2019 target of 25 islands, the achievement only reached 60%. The MFIC locations are as follows:

(1). Simeulue, Aceh Province, (2). Sabang City, Aceh Province, (3). Mentawai, West Sumatra Province, (4). Enggano Island, Bengkulu Province, (5). Natuna, Islands Province, (6). Anambas Islands District, Riau Islands Province, (7). Sebatik, North Kalimantan Province, (8). Talaud, North Sulawesi Province, (9). Tahuna, North Sulawesi Province, (10). South Buton Regency, Southeast Sulawesi Province, (11). Rote, East Nusa Tenggara Province; (12). East Sumba Regency, East Nusa Tenggara Province; (13). Tual, Maluku Province; (14). Moa, Maluku Province; (15). Morotai, North Maluku Province; (16). Saumlaki, Maluku Province; (17). Biak, Papua Province; (18). Sarmi Regency, Papua Province; (19). Timika, Papua Province; and (20). Merauke, Papua Province. For 2017, the MMAF has set 12 priority MFIC locations, as shown in Figure 3.1.

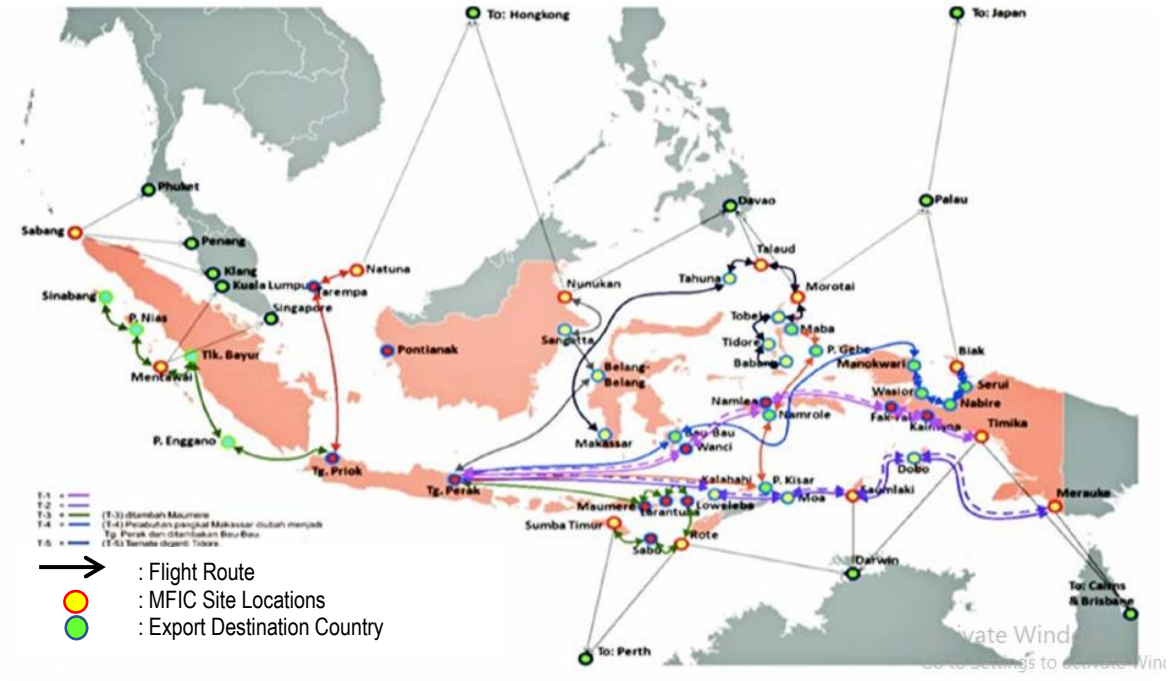


Figure 3.1. Site Location of Marine Fisheries Integrated Centres
(*Source*: Ishartini et *al*, 2016)

Some of those site locations were developed in multiyear projects, 2 – 5 years at maximum (Table 3.1). It depended on the existing resources and infrastructure which were established before this project begun.

Table 3.1 Development of Marine Fisheries Integrated Centres (by year)

No	Location	2015	2016	2017	2018
1.	Natuna	✓	✓		
2.	Simeleu	✓	✓	✓	✓
3.	Tahuna	✓	✓		
4.	Saumlaki	✓	✓	✓	✓
5.	Merauke	✓	✓	✓	✓
6.	Nunukan		✓	✓	✓
7.	Mentawai		✓	✓	✓
8.	Morotai		✓	✓	✓
9.	Talaud		✓	✓	✓
10.	Biak Numfor		✓	✓	✓
11.	Mimika		✓	✓	✓
12.	Rote Ndao		✓	✓	✓
13.	Moa		✓		
14.	Sarmi		✓		
15.	Tual		✓		
16.	Sumba Timur			✓	✓
17.	Sabang			✓	✓

(Source: *Ishartini, et al*, 2017)

To support the establishment of the MFIC program, involving internal agencies of the Ministry of Maritime Affairs and Fisheries, as well as technical institutions and other

ministries that have the following roles. Integrated Institutions and Stakeholders as shown in Figure 3.2 :

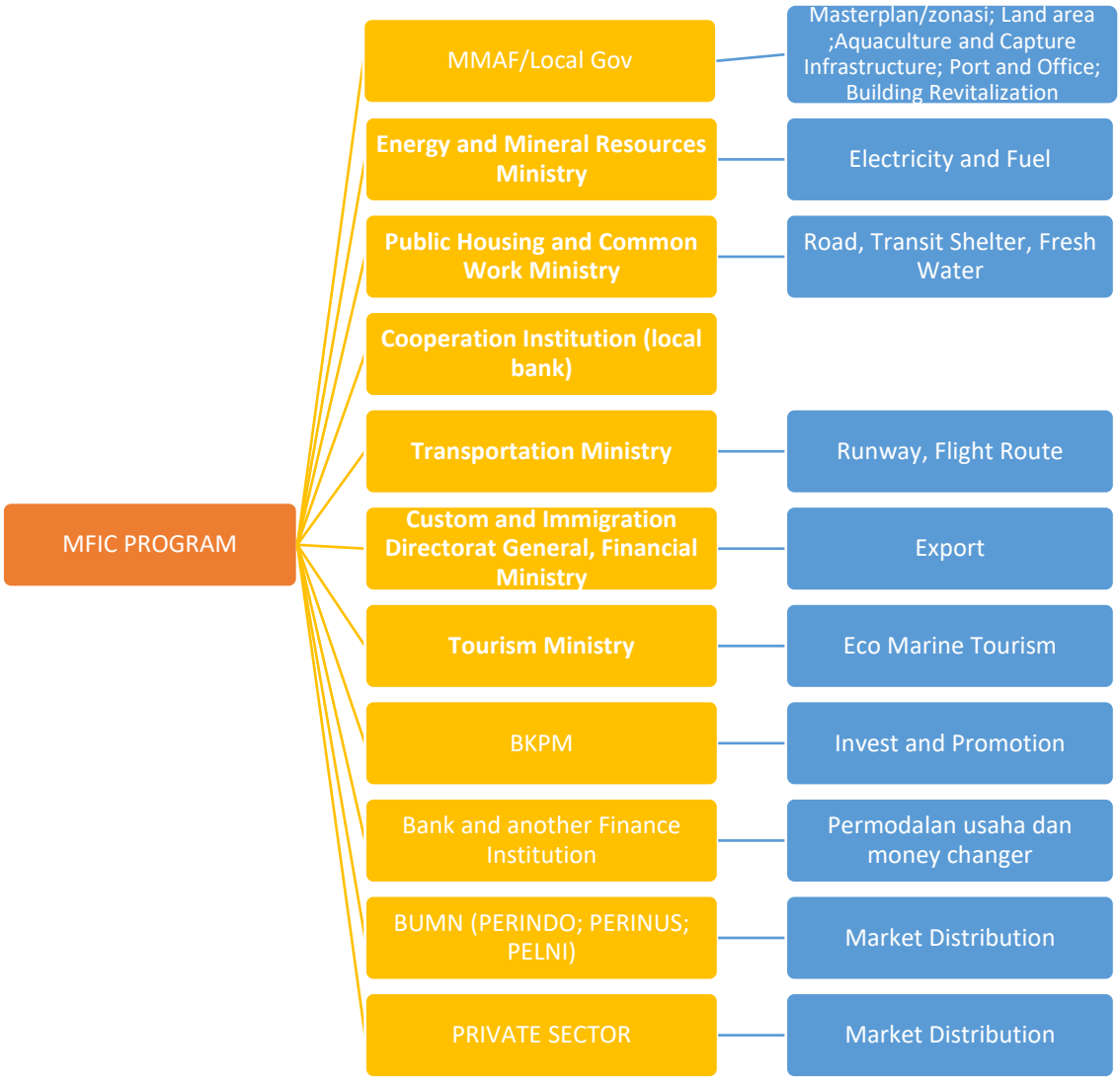


Figure 3.2 Integrated Institutions and Stakeholders

Legend:

= Marine and Fisheries Integrated Program

= Institutions

= Job description/Responsibility

MFICs aim to encourage the reinforcing of industrial structure, such as increasing the quantity and quality of the fishery industry; fostering the relationship between different maritime industries (downstream and upstream industries, large, medium and small

industries); and the relationship between industry and consumers at all stages of the value chain of marine products. Therefore, the intensity and quality of relationships between industry actors, especially downstream and upstream (from harvesting, production, processing distribution and marketing) require special attention, i.e. financial support not only coming from the government but also participation from the private sector, adequate infrastructure adapted to local conditions, capable human resources and regulation which can be implemented in an integrated and balanced manner to ensure a sustainability of supply chain, while strengthening the national raw material production system to sustain the needs of the fisheries processing industry on an ongoing basis. Besides, the policy of fisheries and investment in industrialisation will be directed to foster mutually beneficial business partnerships between micro, small and medium scale enterprises with large scale enterprises throughout the development of national commodities and innovative and competitive products in global markets. It is expected that small and medium scale industries will develop into a broader network of fisheries production systems to strengthen the national fisheries industry base. The development program of marine and fishery integrated centres in small islands and boundaries areas show a different progress on each locations. The Overview of MFIC Government Budget Allocation and Outcome Projection is shown in Table 3.2. From the overview of the budget allocation set for 2015 – 2014 the results of the evaluation revealed that in the current year some activities were not reached the target. Evaluation of Physical Aspect on the progress of MFIC Development in 2015 - 2017 and Plan 2019 is shown in Table 3.3

Table 3.2 Overview of MFIC Government Budget Allocation and Outcome Projection

No	STATUS [2] / SITE LOCATIONS	STATE BUDGET ALLOCATION[1]				OUTCOME PROJECTION		
		2015	2016	2017	2018	Capture Production (tons)	Aquaculture Production (tons)	Fisherman Added (people)
1.	Simeulue, Sabang Regency, Aceh Province	Rp. 0	Rp. 0	Rp.115,79 M (£6.087.280)	Rp. 26,00 M (£1.366.865)	5.150	9,50 [6]	2.623
2.	Sikakap, Mentawai Islands, West Sumatera Province	Rp. 0	Rp12.01 M (£631.386)	Rp. 24,51 M (£1.288.533)	Rp. 11,72 M (£616.140)	6.024	460,89	3.157
3.	Selat Lampa, Natuna Regency, Riau Island Province	Rp76.65 M (£4.029.623)	Rp45.25 M (£2.378.870)	Rp. 106,99 M (£5.624.990)	Rp. 21,25 M (£1.117.149)	22.093	866,47	14.124
4.	Sebatik, Nunukan Regency North Kalimantan Province	Rp. 0	Rp.13.17 M (£692.369)	Rp. 75.36 M (£3.961.805)	Rp. 31.62 M (£1.662.318)	5.616	257.008,19	2.043
5.	Pelabuhan Perikanan Salibabu Talaud Islands Regency, North Sulawesi Province [4]	Rp. 0	Rp.44.84 M (£2.257.316)	Rp.44.32 M (£2.329.979)	Rp.29.66 M (£1.559.277)	15.197	0	9.370
6.	Rote Rote Ndao Regency East Nusa Tenggara	Rp. 0	Rp32,83 M (£1.725.929)	Rp45,85 M (£2.410.413)	Rp39,24 M (£2.062.914)	3.000	158.827,14	2.555
7.	Nangamesi East Sumba Regency East Nusa Tenggara Province	Rp. 0	Rp.0	Rp41,39 M (£2.175.944)	Rp49,95 M (£2.625.958)	12.433	18.024,43	997
8.	Pantai Tiakur Moa Maluku Barat Daya Regency Maluku Province	Rp. 0	Rp.0	Rp0,10 M (£5.257)	Rp4,00 M (£210.286)	0	0	0
9.	Morotai, Pulau Morotai Regency North Maluku Province	Rp. 0	Rp72,52 M (£3.812.502)	Rp54,25 M (£2.852,016)	Rp35,00 M(£1.840.010)	9.108		1.307
10.	Saumlaki, Maluku Tenggara Barat Regency Maluku Province	Rp. 47,15 M (£2.478.757)	Rp 19,44 M (£1.021.994)	Rp6,53 M(£343.293)	Rp14,08 M (£740.210)	9.649	85.752,29	10.538
11.	PPI Fandoi, Biak Numfor Regency, Papua Province	Rp. 0	Rp11,36M (£597.214)	Rp57,31 M (£3.012.886)	Rp20,00 M (£1.051.434)	22.093	866,47	14.124
12.	PPI Poumako [5] Mimika Regency, Papua Province	Rp. 0	Rp. 9.02 M (£474.197)	Rp11,57 M (£608.254)	Rp20,00 M (£1.051.434)	21.561	80.50	11.180
13.	Merauke. Merauke Regency Papua Province	Rp. 72,72M (£3.823.016)	Rp. 21,78 M (£1.145.012)	Rp41,42 M (£2.177.521)	Rp39,26 M (£2.063.966)	55.684	99.14	12.057

Note: £ 1 = Rp. 19.021 (per July 20th 2018) by XE App

[4] MFIC Talaud Island is on of National Strategic Project according to President Decree No. 58/2017 about changing the President Decree No. 3/2016 about The Acceleration of National Strategic Project (Attached Perpres, Nomor 245)

[5] Export Realization: Crab from January – December 2017 is 66,70 ton (US $495.713)

[6] Floating Net Cages : Production target on white grouper 700 tons/ holes with harvest size 600 grams/each

Source: 1) Financial Bureau MMAF Yearly Worksheet Report, 2017; 2) Planning Bureau MMAF Yearly Worksheet Report, 2017

Table 3.3 Evaluation of Physical Aspect on the progress of MFIC Development in 2015 - 2017 and Plan 2019

No.	MFIC Site	Capture Vessel (Target = 100 Units)[1)]		Carrying Vessel (Target = 2 Units) [1)]		Excavators (Target = 2 units) [2)]		Seaweed sarpras : Seaweed Farm (Target = 10; 10 units) [2)]		Integrated Cold Storaged (Target = 1 Unit) [3)]		Ice Flake Machine (IFM) 1,5 ton/day (Target = 5 units) [3)]		IFM 10 ton (Target = 1 Unit) [3)]	
		2015 -2018	2019	2015 -2018	2019	2015 -2018	2019	2015 -2018	2019	2015 -2018	2019	2015 -2018	2019	2015 -2018	2019
1	Biak	53	47	1	1	0	2	5;1	5 ; 9	0	1	2	3	0	1
2	Mimika	50	50	1	1	0	2	0	10 ;10	1	Done	1	4	0	1
3	Merauke	109	Done	0	2	1	1	0	10 ;10	1	Done	2	3	0	1
4	Rote Ndao	108	Done	0	2	0	2	524;70	Done	0	1	3	2	0	1
5	Saumlaki	109	Done	2	Done	0	2	40;0	Done ;10	0	1	0	5	0	1
6	Morotai	162	Done	1	1	0	2	9;0	1 ; 10	1	Done	5	Done	0	1
7	Talaud	110	Done	1	1	0	2	0	10 ; 10	1	Done	8	Done	0	1
8	Nunukan / Sebatik	68	32	0	2	0	2	3;32	7 ; Done	1	Done	0	5	0	1
9	Natuna	82	18	2	Done	0	2	30; 4	Done ; 6	1	Done	5	Done	0	1
10	Sabang	66	34	1	1	0	2	0	10 ; 10	1	Done	1	4	1	Done
11	Mentawai	15	85	2	Done	0	2	0	10 ; 10	1 (50 ton)	Done	0	5	0	1
12	Sumba Timur	110	Done	1	1	1	1	260;75	Done ;10	1 (50 ton)	Done	0	5	0	1
13	Moa	0	100	0	2	0	2	0	10 ; 10	0	1	0	5	0	1

Source(s):

1. General Directorate of Capture, Progress Report and Redesign of MIFC as presented on March 21st 2018
2. General Directorate of Aquaculture, Progress Report and Redesign of MIFC as presented on March 21st 2018
3. General Directorate of Processing and Marketing, Progress Report and Redesign of MIFC as presented on March 21st 2018

Notes :

Each colour represent the progress of every indicator in each location, as below :

: Incomplete
: On progress
: Finished

3.2 A Review of Existing Condition of Indonesian Maritime Logistics

The analysis stage in this thesis begins with the mapping of marine logistics conditions, which are preceded by an analysis of a status of marine logistics. Before mapping the problem, it is necessary to distinguish definitions and characteristics between maritime logistics and transportation.The correlation between maritime logistics and transportation also the paradigm of Indonesia's Maritime Logistics System Development will be explain furthermore.

3.2.1 Maritime Logistics and Transportation

Logistics is inseparable from every business activity, both large (national and trans-national) businesses up to small businesses, which means there are no businesses without logistics (*Lee and Dok*, 2012). Logistics has become the primary concern in business and global management and is seen as a means to improve company performance and outcomes (*Grant et al.*, 2006 *in Lee, Nam and Dok*, 2012). The importance of logistics has increased drastically by attesting to the enormous attention from practitioners and academics alike because of the enormous influence of internal and external factors such as globalisation; changes in consumer demand; technological development; and deregulation in the industrial sector. Logistics and supply chain management is needed to control the flow of materials, goods, information, and other resources that have a revolving relationship between the production centre and the consumption centre.

Since its introduction in the early 1960s, the role of logistics as an essential component in reducing the costs of corporate activity and its consequence of increasing the position of competition in today's market has become increasingly important in global business (*Rushton et al.* 2006 *in Lee and Song*, 2012). The main purpose of logistics is to reduce costs and to increase customer satisfaction by coordinating the flow of materials and information in the most efficient way, and by providing services to customers faster at acceptable prices (*O'Leary-Kelly and Flores*, 2002; *Coyle et al.*, 1999 in *Song and Panayides* 2012). Maritime logistics is closely related to maritime transport as Lee and Song (2010) stated that maritime transportation is the backbone of maritime logistics. Maritime transportation is one of the key components in the maritime logistics system responsible for carrying and handling cargo across the sea and consequently connecting the global transportation network that is spread between the sender and receiver. Maritime transportation matters are related to the transportation of goods or passengers to two or more seaports (*Song and Panayides*, 2012).

The integration of maritime transportation demand has rolled out the concept of maritime logistics (*Panayide*, 2006). Maritime logistics relates to the processes of planning, implementing, and managing the movement of goods and information involving sea transport. In summary, The Difference Between Maritime Transportation And Maritime Logistics are shown in table 3.4.

Table 3.4. The Differences between Maritime Logistics and Maritime Transportation.

	Maritime Logistics	**Maritime Transportation**
Concept	The process of planning, implementing, and managing the movement of goods/materials and information involving sea transportation.	The process of transporting and handling cargo across the sea.
Centre Point	Maritime logistics focuses only on sea transportation functions but includes an efficient flow of logistics as a unified system of integrated logistics systems.	Focusing on one individual function related to sea transportation. Each function aims to achieve its own goals or competitiveness.
Managerial Function	Marine transportation activities such as contracts, shipping, sea travel, towing and moving cargo, and loading and dropping goods. Additional functions of logistics services such as preparation, storage, warehousing, providing distribution centres, quality control, testing, assembly, packaging, repacking, repairs, land connections, and reuse.	Marine transportation activities such as contracts, shipping, sea travel, transporting and moving cargo, and loading and dropping goods.

Source: Modified from Lee and Song (2010).

Maritime logistics is a derivative of maritime transportation. There are three stakeholders in the related maritime logistics: shipping, port operations, and freight forwarders. These three main components have different primary functions and additional functions, as shown in Table 3.5.

Table 3.5 Main Functions and Supporting Activities of Maritime Logistics

	Shipping	**Terminal/Port Operations**	**EMKL (freight forwarding)**
Main Function	Transporting cargo between ports.	Accepting shipping units; loading and unloading; stevedoring; and connecting with land transportation.	Order ships, preparing documents for sea transportation and trade on behalf of shippers.

Logistics supporting activities	Documentation related to sea trade, tracing and container information, intermodal services.	Warehousing: providing distribution centres; testing; assembly; repair; connection with land transportation systems.	Inventory management; packing and warehousing.

Source: Modified from Lee, Nam and Song (2012).

3.2.2 The paradigm of Indonesia's Maritime Logistics System Development

Transportation and logistics issue have become one of the factors that determine the competitiveness of the national economy in terms of the efficiency of domestic and export market competitiveness. However, maritime logistics also have an essential role in supporting the direction of government policy to make Indonesia a maritime country.

Policies towards a maritime country require connectivity between regions (in the form of islands), so all regions can develop their economies due to the connectivity of raw materials and products. Maritime logistics play an enormous role in supporting regional connectivity and economic activity. Therefore, the development of maritime logistics system is carried out with a complementary paradigm which is as stated below:

a. Ship follow the trade

When the economy and connectivity between regions are well developed, the maritime logistics system facilitates the increase of the potentials of distribution to improve the efficiency and competitiveness of the regional economy. In the end, the products produced will have high competitiveness, both in the domestic and export markets.

b. Ship promotes the trade

Each region has a unique economic potential following its resources. Frequently, this potential economy does not develop because it is faced with weak connectivity with other regions, which causes a decline in economic competitiveness and production. In such cases, the maritime logistics system has a role in supporting the potential economic development of the region or even stimulating regional economic development. So, the role of the maritime logistics system is as one component to grow a new economy in a previously undeveloped area.

The role of maritime logistics system in the whole logistics system is very elementary. Therefore, maritime logistics will be directly related to the physical distribution of goods,

which receives operational and systemic support from critical stakeholders in shipping activities, port operations, and ship loading freight forwarding service providers. The role of maritime logistics, as described previously, is broad, as shown in Figure 3.3.

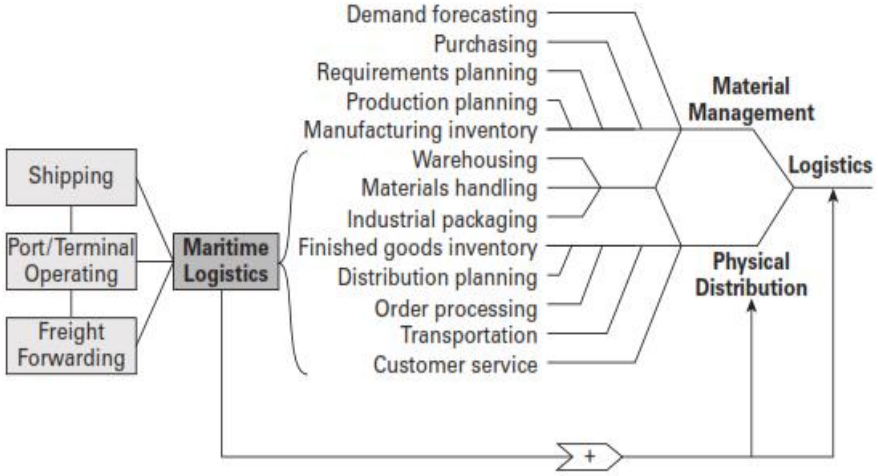


Figure 3.3 Position of Maritime Logistics Systems in the Overall Logistics System (*Source*: Coyle, et al.1999 in Song and Panayides 2012)

The description in the micro concept at the commodity level is nothing much. The concept of the National Fish Logistics System is one of them. In contrast to the NLS concept that is still macro in terms of the operativemicro oncept, logistics begins with procurement that is not stated by the source; hence in the NFLS concept, procurement is prioritised from domestic production, therefore the on-farm conditions become part of the built system, both aquaculture, and fish-capture. The operational concept of NFLS is shown in Figure 3.4.

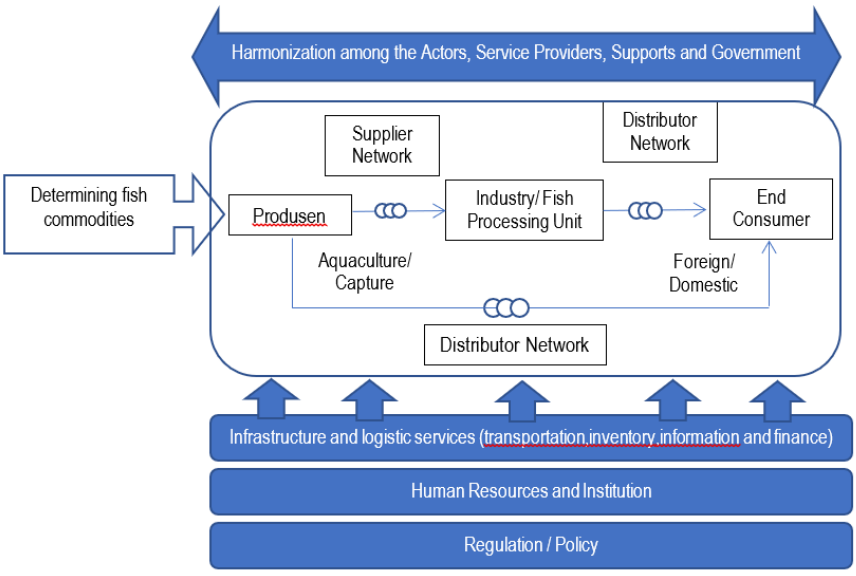


Figure 3.4 Operational Concept of Fisheries Logistics System (*Source*: *Republic of Indonesia*, 2014)

Based on maritime logistics conditions, several identified problems were divided into Key Commodities, Logistic Infrastructure, Logistics providers, Human resources, Information, and Communication Technology, which are as described below.

3.3 Identified Problems

3.3.1 Key Commodities

As an archipelago state, the role of logistics in the movement of products within and between countries plays an important role, not only to meet the basic needs of the citizen, but also as a vehicle to deliver agricultural, mining, and industrial production so that it can be used and marketed both domestically and internationally. The maritime sector has a direct contribution to the final demand for marine fishing; crude petroleum and natural gas production, canning, preserving, fish processing, petroleum refineries, manufacture of miscellaneous petrol and coal products, manufacture of marine engines, manufacture of fishing equipment and its requisites, the shipbuilding and repairing industry, pipeline transport, shipping, ocean and coastal water transport, support service to water transport, marine insurance, marine administration and maritime education.

At least six sectors are affected and yet contribute significantly to Indonesia's gross domestic product (GDP). The service sector contributes the highest, which is 33.60%, this service includes marine services. Agriculture, forestry, and fisheries contribute 15% of GDP, while the mining and quarrying sectors contribute 10.40%. Indonesia's key GDP sectors are presented in Table 3.6.

Table 3.6 Key Sectors of Indonesian GDP

Key Sector	GDP Constibution (%)	Value (US$ billion)
Other services	33.60	311.23
Manufacture	23.80	221.01
Agriculture, forestry, fisheries	15.00	138.94
Mining and quarrying materials	10.40	96.33
Construction	10.30	95.40
Transportation and warehousing	3.60	33.34
Communication	3.30	30.56

Source: *Statistics Indonesia*, 2014

a) Fisheries Sector

In the capture fisheries sector, Indonesia is rich in pelagic fish, including large and small pelagic fish. Tuna, which is a fast swimming and migrating fish, also passes through Indonesian waters. Large pelagic fish species that have high economic value and are found

in Indonesia are yellowfin, cob, skipjack tuna, and mackerel. The types of small pelagic fish that are commonly found are sardinella, anchovies, flying fish, and long-jawed mackerel. Demersal fish resources are also found mainly in areas that have coral reefs with good conditions, demersal fish species that are commonly found are snapper, grouper, rabbitfish, swordfish, stingray, and sardine.

In the aquaculture sector, there are also a lot of methods of aquaculture in freshwater, brackish, and seawater. Currently, seaweed aquaculture is one of the primary cultivations in Indonesia. Also, there are also shrimp and fish aquaculture such as milkfish, tilapia, catfish, etc.

Indonesia's fisheries production trends have increased by an average of 18.67% from 2009 – 2014. The most significant increase occurred in 2012-2013 at 25.23%. The contribution of capture fisheries to national fisheries production in 2013 was 31.50%, while the contribution of aquaculture was 68.50%. The contribution of aquaculture has increased since 2009 with a contribution of 9.34% and an average contribution of 5 years of 58.16%. Indonesian fisheries production for the period 2009 – 2014 are shown in Table 3.7.

Table 3.7 Indonesia Fisheries Production between 2009 – 2014

Item		Year						Increasing Average (%)	
		2009	2010	2011	2012	2013	2014	2009-2014	2013-2014
Production Volume (in thousand tons)		9.816	11.662	12.388	15.505	19.416	20.722	18.67	6.72
Capture	Sub Total	5.108	5.384	5.714	5.829	6.115	6.200	3.97	1.39
	Marine Fisheries	4.812	5.039	5.346	5.436	5.707	5.780	3.75	1.28
	Inland Openwater Fisheries	296	345	396	396	408	420	7.39	2.94
Aquaculture	Sub Total	4.708	6.278	7.929	9.676	13.303	14.521	58.16	9.15

Source: Data, Statistic and Information Centre, 2015.

Based on data above, Indonesia has a high fishery production position compared to other countries in the world. Currently, Indonesia is ranked with having the second highest fishery production in the world after China. Along with such large fisheries production, it is necessary to distribute products from potential locations such as eastern Indonesia to fishery processing areas in western Indonesia, such as Java and Sumatra. In addition to the countries mentioned above, many emerging markets and exporters, such as Brazil and India, have

gained importance, in part thanks to improved distribution systems and increasing production (SOFIA FAO 2018). Marine capture production for each country of origin is presented in Table 3.8.

Table 3.8 Marine Capture Production: Major Producer Countries

Country	Production (tonnes)			% Variation		Variation 2015 - 2016 (tonnes)
	Average 2005 – 2014	2015	2016	2005- 2014 (avrg) -2016	2015 to 2016	
China	13.189.273	15.314.000	15.246.234	15.6	–0.4	–67.766
Indonesia	5.074.932	6.216.777	6.109.783	20.4	–1.7	–106.994
USA	4.757.179	5.019.399	4.897.322	2.9	–2.4	–122.077
Russian Federation	3.601.031	4.172.073	4.466.503	24.0	7.1	294.430
Peru Total	6.438.839	4.786.551	3.774.887	–41.4	–21.1	–1.011.664
Excluding anchoveta	989.918	1.016.631	919.847	–7.1	–9.5	–96.784
India	3.218.050	3.497.284	3.599.693	11.9	2.9	2.9
Japan[a]	3.992.458	3.423.099	3.167.610	–20.7	–7.5	–255.489
Vietnam	2.081.551	2.607.214	2.678.406	28.7	2.7	71.192
Norway	2.348.154	2.293.462	2.033.560	–13.4	–11.3	–259.902
Philippines	2.155.951	1.948.101	1.865.213	–13.5	–4.3	–82.888
Malaysia	1 387 577	1 486 050	1 574 443	13.5	5.9	88.393
Chile Total	3 157 946	1 786 249	1 499 531	–52.5	–16.1	–286 718
Excluding anchoveta	2 109 785	1 246 154	1 162 095	–44.9	–6.7	–84 059
Morocco	1 074 063	1 349 937	1 431 518	33.3	6.0	81 581
Republic of Korea	1 746 579	1 640 669	1 377 343	–21.1	–16.0	–263 326
Thailand	1 830 315	1 317 217	1 343 283	–26.6	2.0	26 066
Mexico	1 401 294	1 315 851	1 311 089	–6.4	–0.4	–4 762
Myanmar	1 159 708	1 107 020	1 185 610	2.2	7.1	78 590
Iceland	1 281 597	1 318 916	1 067 015	–16.7	–19.1	–251 901
Spain	939 384	967 240	905 638	–3.6	–6.4	–61 602
Canada	914 371	823 155	831 614	–9.1	1.0	8 459
Taiwan, Province of China	960 193	989 311	750 021	–21.9	–24.2	–239 290
Argentina	879 839 7	795 415	736 337	–16.3	–7.4	–59 078
Ecuador	493 858	643 176	715 357	44.9	11.2	72 181
United Kingdom	631 398	506 701	749 11.1	11.1	–0.4	–2 753
Denmark	735 966	868 892	670 207	–8.9	–22.9	–198 685
Total 25 major countries	**65 451 506**	**66 391 560**	**63 939 966**	**–2.3**	**–3.7**	**–2 451 594**
Total other 170 countries	**14 326 675**	**14 856 282**	**15 336 882**	**7.1**	**3.2**	**480 600**
World Total	**79 778 181**	**81 247 842**	**79 276 848**	**–0.6**	**–2.4**	**–1 970 994**
Share of 25 major countries	**82.0%**	**81.7%**	**80.7%**			

*) Production figures for 2015 and 2016 are FAO estimates. *Source*: FAO, 2018

b) Potential of Renewable Energy

Oil and natural gas resources are an essential sector in national development, both in terms of meeting the needs of energy and raw materials for industries in the country, as well as for

foreign exchange-earners (*Energy and Mineral Resource*, 2018). Unfortunately, the primary source of oil and gas formed by fossil energy has been in decline. Therefore, this condition has encouraged the government to put NRE as an alternative energy and as a hope in the future as the main priority energy supply. Indonesia keeps enormous marine energy resources which have not been utilised optimally (*Djonan* et al., 2016). NRE development policies in Indonesia have been supported in the last 5 years through Government Regulation No. 79 of 2014 concerning the National Energy Policy, The New and Renewable Energy Resources are as shown in Table 3.9.

Table 3.9 New and Renewable Energy Resources

Energy Source	Resources	Installed Capacity	Utilization (%)
Hydro	94.476 MW[1)]	5.024 MW[1)]	5.3%
Geothermal	29.544 MW[1)]	1.403,5[4)]	4.8%
Bioenergy	32.000MW	1.740,4 MW[4)]	5.4%
Solar	4.80 kWh/m^2/day ~207.9 GW[1)]	78,5 MW[1)]	
Wind and Hybrid	3 – 6 m/s ~60 GW[1)]	3.1 MW[1)]	
Marine Energy	61 GW[2)] Wave: 1.995 MW[4)] Ocean Thermal (OTEC): 41.001 MW[4)] Ocean Wave: 17.989 MW[4]	0.01 MW[3)]	
Shale Gas	574 TSCF[4)]		
Coal Bed Methane (CBM)	456,7[4)]		

Note:
1) Potential Number from RUEN draft, 2016
2) Ratification data between the Ministry of Energy and Mineral Resources (MEMR) and Indonesia Energy Association (ASELI), 2014
3) The prototype of Research and Technology Application Agency (BPPT), 2010
4) Directorate General of New Resources Energy and Energy Conversion, 2014

The potential energy of Hydro, Wind power, Solar, Tidal and bioenergy are mapped by Directorate General of New Resources Energy and Energy Conversion, Ministry of Energy and Mineral Resources. The Hydro Power Generation and Micro Hydro Power Generation from Hydro potential are distributed around 75.000 MW as predicted. However, its utilisation is less than 11% of the total potential, map of Potential Hydro Power Large Scale is shown in Figure 3.5.

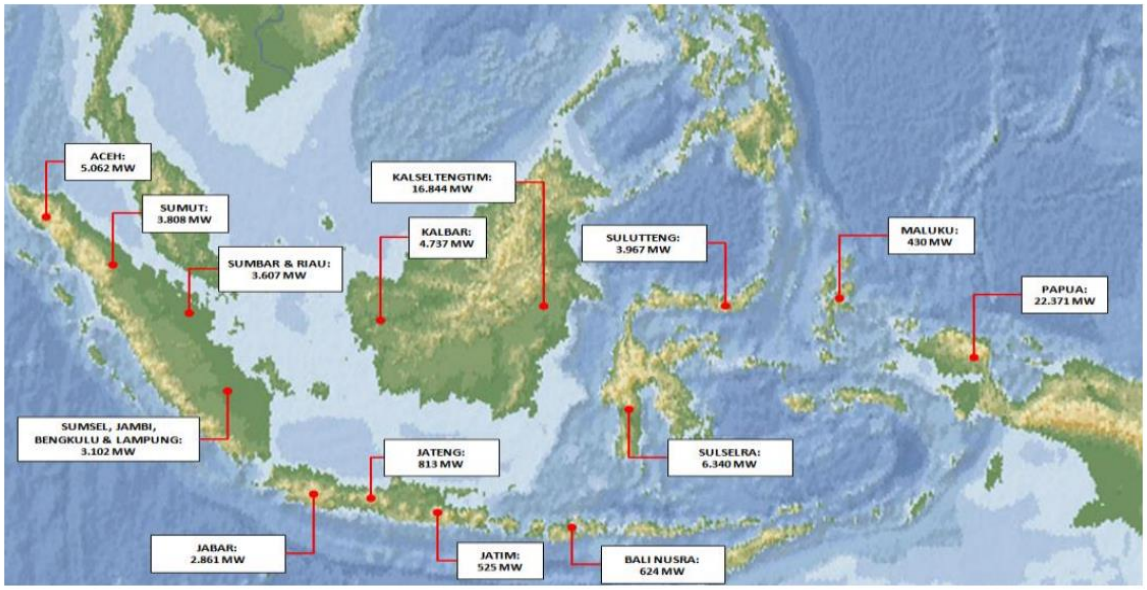


Figure 3.5 Map of Potential Hydro Power Large Scale
(Source: *Directorate General of New Resources Energy and Energy Conversion.* 2015)

Meanwhile, the Research and Development Centre for Electricity and NREEC MEMR (2014) stated that wind power potential is spread in Java and Sulawesi reaching at about 950 MW.

Renewable Marine Energy Resources

In general, ocean energy potential as renewable marine energy and marine minerals that can generate electricity can be divided into three types of physical energy potential: tidal energy, ocean wave energy, and ocean thermal energy. Tidal energy is energy generated from the movement of seawater due to differences in tides. Ocean wave energy is energy generated from the movement of ocean waves towards land and vice versa while ocean heat energy utilises differences in seawater temperatures on the surface and at sea depth. Although these types of energy use in Indonesia still requires a variety of in-depth research, in simple terms, the probability of finding and utilising ocean wave energy potential and ocean heat energy is more significant than tidal energy. The Distribution of Ocean Heat Energy is shown in Figure 3.6

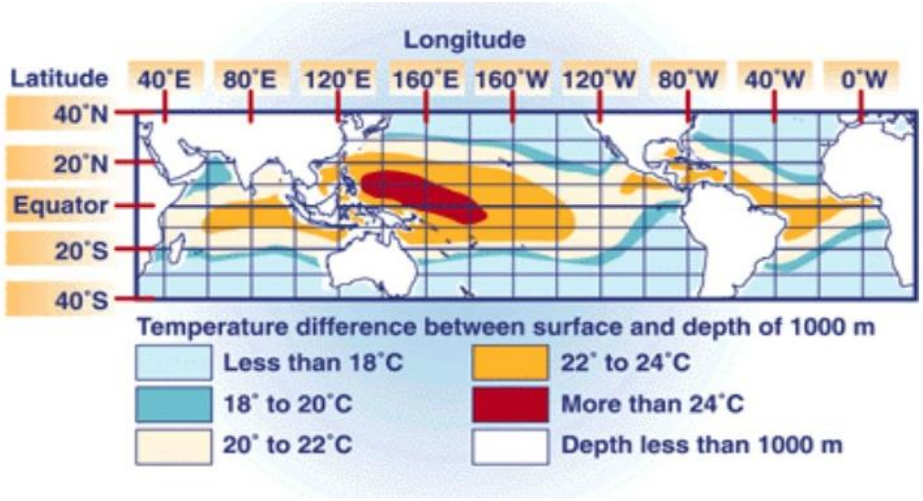


Figure 3.6 Distribution of Ocean Heat Energy
(*Source: National Energy Council*, 2015)

For Indonesia, the potential energy is the energy of ocean currents mainly because Indonesia has many islands and straits, so those ocean currents due to the interaction of the earth-moon-sun are accelerating as they pass through the straits.

In Indonesia, ocean energy potential is vast because Indonesia is an archipelago consisting of deep seas and shallow seas. Investment costs are not known yet but based on trials in several advanced industrial countries, it ranges from 9 cents/kWh to 15 cents/kWh. Unfortunately, the development of ocean heat energy conversion technology in Indonesia has only reached research status.

Indonesia has tidal power potential in ten potential straits namely in Riau Strait, Sunda Strait, Toyapakeh Strait, Lombok Strait, Alas Strait, Molo Strait, Larantuka Strait, Pantar Strait, Boleng Strait and Mansuar Raja Ampat Strait (Research and Development Centre for Electricity and NREEC MEMR, 2014). The marine energy potential and resources include 17.9 GW of tidal power potential, 1.9 GW of potential wave energy, and 41 GW of ocean thermal potential. The local potential of Indonesia tidal resources mapping is shown in Figure 3.7.

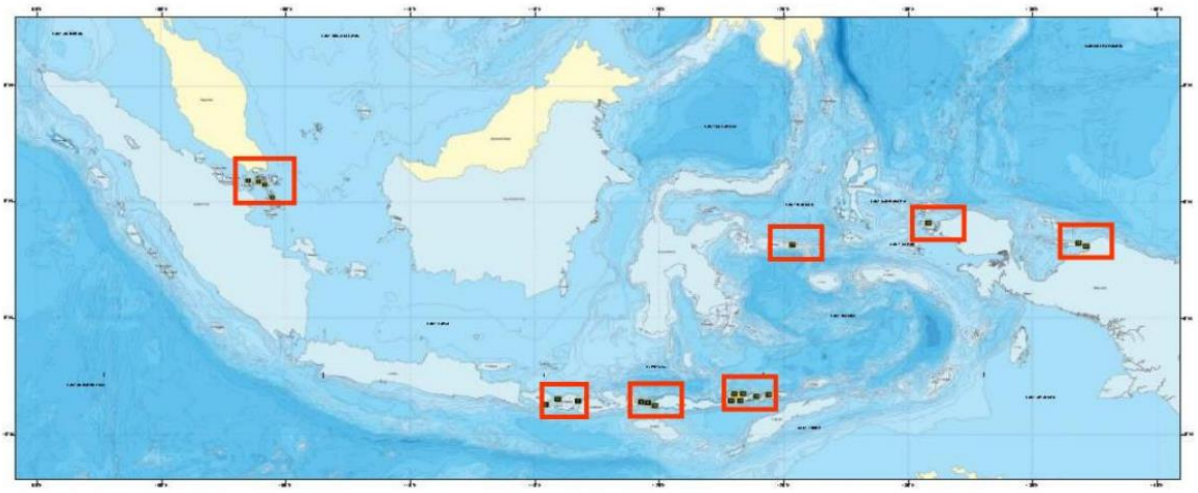


Figure 3.7 Tidal Power Potential Map
(Source: ASELI in Djonan et al, 2016)

c). National Ship Fleet Capacity

The development of total size fleet capacity of the national particular sea transport companies' fleet for four years (2010-2013), in each size capacity unit i.e., Dead Weight Tonnage (DWT), Gross Tonnage (GT), and Horse Power (HP) shows the following developments:

a. The capacity of the sea transport companies' fleet in terms of DWT size, shows an average annual growth of 9.50%.

b. The capacity of the sea transport companies' fleet in terms of GT size, shows an average annual growth of 25.72%.

c. The capacity of the sea transport companies' fleet in terms of HP size, shows an average annual growth of 53.06%.

The development of the special sea transport companies' fleet status in 2010-2013 is presented in Table 3.10.

Table 3.10 Development of Sea Transport Companies Fleet Status

No	Year	Fleet size capacity			Capacity development		
		Dead Weight Tonnage (DWT)	Gross Tonnage (GT)	Horse Power (HP)	DWT	GT	HP
1	2010	2.009.364	1.852.169	719.729			
2	2011	2.218.737	2.454.678	1.311.434	209.373	602.509	591.705
3	2012	2.428.110	3.058.616	1.905.374	209.373	603.938	593.940
4	2013	2.638.079	3.670.872	2.508.829	209.969	612.256	603.552
Cumulative development					628.715	1.818.7083	1.789.197
Average development per year					209.572	606.234	596.399

Source: Mangindaan, 2014

The capacity of Indonesia's national fleet is still far behind Singapore. National vessel capacity development was quite encouraging from 2005 – 2013. In 2005 the national fleet capacity was 3.66 DWT, below Malaysia and the Philippines, however, in 2013 Indonesia' national fleet capacity increased to 12.88 million DWT, putting Indonesia above Malaysia and the Philippines. This indicates that the shipping and logistics industry is still growing and is expected to increase with the growth of under construction international-scale ports . The capacity development of the ASEAN fleet in 2005 – 2013 is presented in Figure 3.8.

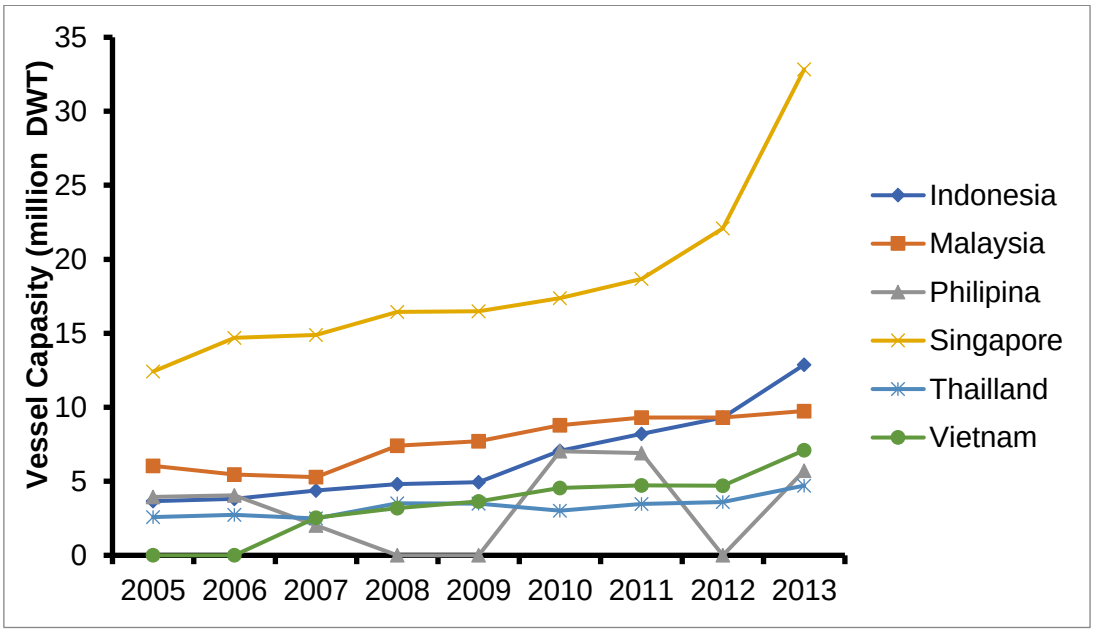


Figure 3.8 Capacity Development of ASEAN Country Fleet from 2005 – 2013 (*Source*: *UNCTAD*, 2017)

3.3.2 Logistics Infrastructure

The current infrastructure conditions in ports, airports, roads, and railways are inadequate to support sustainable growth in marine traffic. The condition is similar with the intermodal or multimodal transportation system that hasn't been able to work appropriately (Republic of Indonesia, 2012), because access to transportation from production centres to ports and airports or vice versa hasn't been able to run smoothly, and the port and airport infrastructure hasn't been optimal. This lessens service quality and causes service fees to be expensive (Attachment 2, President Decree Number 26 the Year 2012).

A. Ports

Currently, there are 4 national main ports, namely Tanjung Priok, Tanjung Perak, Belawan, and Makassar, all of which control freight transportation through containers for

export and import. The biggest port in Tanjung Priok, has a total of 78 berths for ships and 14 containers. The amount of freight traffic in Tanjung Priok is 36 MT, half of which are for domestic use, and the capacity for container operations is 3.6 million TEUs. Transportation of goods through inter-island shipping far exceeds the volume of international freight transport. While the development of global cargo transportation is currently around 80% that is transported using containers, with the capacity of ships continuing to increase from the size of 1,500TEUs to 9,000 TEUs. Ships with a size of 9,000TEUs require a minimum depth of 13 meters. Even in 2013, container transport vessels measuring 12,000 TEUs were expected to operate, requiring a minimum depth of 18 meters. In order to accommodate the cargo and ship traffic requirements as mentioned above, Indonesia must increase its national port capacity, including building international hub ports. The current national port description is based on the National Port System Arrangement in the National Spatial Plan, there are 25 major strategic ports, which include8 ports in Sumatera;6 ports in Java / Bali;4 ports in Kalimantan;3 ports in Sulawesi1 port in Nusa Tenggara;1 port in Maluku;2 ports in Papua. 25 Strategic Ports and Indonesian Islands Sea Lines (ALKI) in Indonesia. Is shown in Figure 3.9.

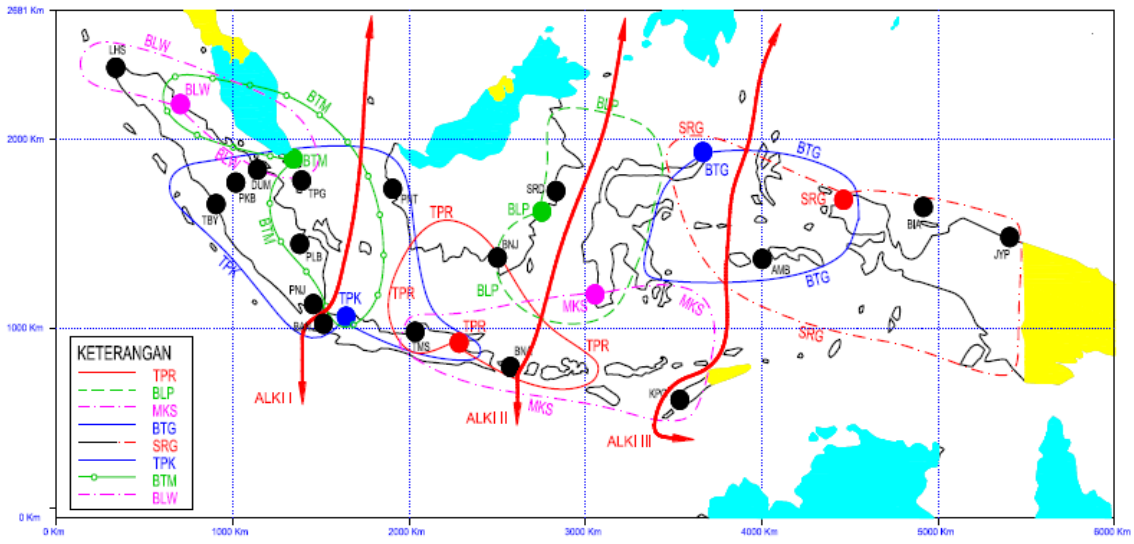


Figure 3.9 25 Strategic Ports and Indonesian Islands Sea Lines (ALKI) in Indonesia. (*Source: Republic of Indonesia*, 2016b)

The existence of international hub ports is a prerequisite for improving national competitiveness. The government plans to establish two alternative international hub ports in the western region and the eastern region of Indonesia. In the MP3EI, Kuala Tanjung will

become an international hub port in the western region and Bitung as an international hub port in the eastern region.

Sea Transportation Facilities: Ships dominate international transportation, which is estimated to be around 90% (ninety percent) of the total volume of products transported, with the remaining using air and land transportation. All cargo, both large and small size, ranging from flour, bulk, grain, can be transported by sea. The high frequency of crossing traffic with small port waiting times makes this transportation a preferred choice.

There are currently 2154 ports in Indonesia which are divided into three categories of 111 commercial ports, 1129 non-commercial ports, and 914 Private Terminals. Sea transportation shipping has reached remote areas. The traditional boat is still crucially needed, where there are currently 84 routes to the remote areas and 181 crossing routes within remote areas.

B. Shipping Fleet

The national shipping fleet is dominated by 32.87% barge ships, 30.80% tug boats, and 19.31% general cargo, followed by tankers (5.37%), LCT (3.99%), passengers (3.93%), and other types. Barge ships domination in Indonesian waters is due to the minimum requirement for a Marine Transport Business Permit, which is 175 gross tonnage (GT) ships. Indonesian territory consists of many islands and is highly suitable for this type of ship. The barge ship is used as it has sea transportation facilities for goods which are usually heavy and in large quantities such as logs, various machinery, coal, containers containing various kinds of goods, and crude oil. Barge ships have economic value in their large carrying capacity even though their speed is slow.

Tug boats are towing vessels or pushing vessels, which it is why tug boats are often found paired with barge ships. Tug boats are used to pull or push other vessels, such as damaged ships, barges, and other equipment, to provide services to vessels that have a length of more than 80m, whether the ship will dock or leave the port in the obligatory waters.

The number of national fleet vessels experienced a very significant increase from 2005 to 2014. In 2005 the national fleet was recorded at 6,041 vessels, and in 2014 there was an increase of 7,995 units (132%) to 14,036 units. This increase was due to the enactment of the cabotage principle by Law No. 17 of 2008 concerning shipping regulated in articles eight that stated: (1) Domestic sea transport activities carried out by sea transportation companies

nationally using ship sit the Indonesian flag and manned by a ship crew of Indonesian citizens. (2) Foreign vessels are prohibited from transporting passengers and/goods between islands or between the ports in Indonesian territorial waters. The aims of this regulation are for the Government to require shipping companies domestically to have Indonesia flagged ships and use the services of the origin crew's country known as Cabotage law. Furthermore, the implementation of Cabotage law is expected to protect national sovereignty and to provide business opportunities to national shippers. The number of national fleets is presented in Figure 3.10.

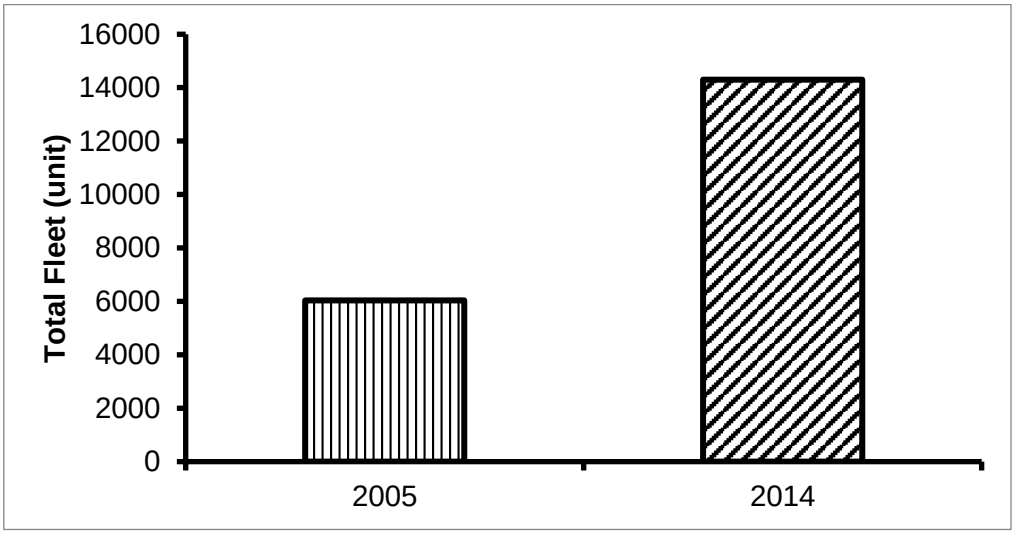


Figure 3.10 National Ship Fleet (*Source: Jonan*, 2015)

D. Sea Transport Distribution

Distribution of Domestic Oil Fuel Transportation

Indonesia is one of the countries with the most abundant biological and non-biological natural resources in the world. Natural resources and the economic level of a country have a significant connection, and the natural resource wealth will theoretically support rapid economic growth. Natural resources such as mining products have a variety of functions for human life, like necessary materials for infrastructure, motor vehicles, as well as being an energy source (Dahuri, 2003).

One of the accelerations and expansion in national economic development is to prioritise the concept of inter-island connectivity, especially the outer islands. This connectivity can only be realised if sea transportation in the archipelago is played out significantly. Sea transportation is vital as an archipelago bridge and can't be replaced by air or land transportation.

The distribution of domestic fuel transported by tankers is classified into four major groups: (1) crude oil, (2) white oil, (3) black oil, (4) non-fuel. The number of tankers in 2013 totalled 46 units = 7,249,467 DWT which were divided into two groups: the tanker fleet of 7 units (1,245,864 DWT), and the charter tanker fleet of 39 units (6,003,604 DWT) (Ministry of Transportation 2013). The type of fuel load is presented in Table 3.11.

Table 3.11 Types of fuel loads in 2013

No	Type of load	Amount of load (Ton)	DWT
1	Crude oil	4,081,673	4,013,852
2	White oil	2,297,679	2,254,800
3	Black oil	623,121	538,573
4	Non fuel	449,342	442,242
		7,451,815	7,249,467

(Source: *Mangindaan*, 2013)

Distribution of Import Export Sea Transportation

The distribution of export and import transport development carried out by national and foreign fleets in 2009 – 2013 shows an average annual growth of 48,449,578 tons or 8.16%. The most significant increase occurred in 2013 at 32.7%. The development of import and export charges is presented in Table 3.12.

Table 3.12 Distribution of Export and Import Transportation Development in 2009 – 2013

No	Year	Amount of Unit (Export – import)	Growth (%) Amount in Ton	
1.	2009	550.955.103	0	0
2.	2010	567.208.278	16.253.175	2.9
3.	2011	580.877.997	13.669.719	2.4
4.	2012	579.665.371	16.787.374	2.8
5.	2013	793.220.992	195.555.621	32.7
Cumulative development			242.265.899	40.2
Average development per year			48.449.578	8.2

Source: Mangindaan, 2014

The development of export distribution from Indonesia to Asia, Australia, and Africa experienced an increase, whereas the development of export distribution to America and Europe experienced a significant export deficit. The export to Asia experienced an increase of 803,180,127 tons (433.63%), export to Australia increased by 6,178,989 tons (92.23%), and export to Africa increased by 3,561,644 tons (324%). While the export to America experienced a decline of 15,461,179 tons (763.89), export to Europe decreased by 14,890,681 tons (518.16%).

Distribution of Staple and Strategic Material

Transport load of staple and strategic material consists of 3 essential commodities which are produced - rice, fertiliser, and cement. The total amount of staple and strategic material in 2009 - 2013 shows an increase in the number of freight charges amounting to 5,060,244 tons or 15.63%. However, when viewed cumulatively, the average growth rate of staple and strategic material transportation for five years has grown by 18.99%. The growth of staple and strategic material transportation load is presented in Table 3.13.

Table 3.13 Staple and Strategic Material Transport Growth

No	Year	Amount of Unit	Amount in Ton	Growth (%)
1	2009	19.208.917	1.638.532	8.53
2	2010	20.847.449	1.631.657	7.83
3	2011	22.479.106	9.886.129	43.98
4	2012	32.365.235	5.060.244	15.63
5	2013	37.425.479	18.216.562	4.554.141
Cumulative development				18.99
Average development rate per year				

Source: Mangindaan, 2014

3.3 Logistics Service Provider

Indonesia has an unequal population distribution in each region. Meanwhile, natural resource production in each region also varies. For example, the Eastern Indonesia region has relatively high fish resources, but the population is small so that its production becomes abundant whereas the existing production in Java can't meet the needs, especially in processed fish production. This has led to the need for a transportation system to distribute fishery products in one area to another.

In this condition, there are two main choices: (1) bringing the raw material resources closer to the industry, or; (2) bringing the industry closer to the resource centre. These two things still need a good transportation and distribution system. Transportation on land that can be operated depends on the condition of the road, if the road conditions are adverse, then transportation can't be done in large capacity, so a more considerable operational cost is needed because the fishery products are distributed in small amounts sea transportation for fishery products are carried out by a cargo shipping company. However, shipping ports in Indonesia are relatively close to fishing ports, so land transportation is still needed in the distribution process. Meanwhile, air transportation for fishery products is more widely used

to distribute economically significant fresh fish products, such as shrimp and tuna that will be exported. This is related to the need for fast distribution time and high cost.

For the distribution of goods within the country, sea transportation is needed because of the vast waters in Indonesia. Sea transportation is closely related to cargo shipping companies in Indonesia. The following table is a list of names of cargo shipping companies in Indonesia. There are at least 94 ship names listed in the cargo shipping list in Indonesia, as for the Cargo Shipping List table in Indonesia as seen in Appendix 1.

In addition to cargo companies needing a proper port, sea transportation requires it too. For now, only few port in Indonesia trusted by foreign vessels,. The trusted ports include Belawan, Tanjung Mas, Tanjung Priok, Tanjung Perak, and Makassar. Besides, there are also problems with the depth of water ponds which are too low on Indonesian ports, with depths around -8m. While the need for a pond for large vessels is around -14m, this causes sizeable foreign cargo ships to be unable to dock.

From the total domestic container transport activities, there are several route segments that are dense, namely from Tanjung Priok – Belawan with a total of 55 ships and 4,487 calls and Tanjung Priok – Makassar has as many as 57 ships with a total of 4,103 calls. Data regarding the list of the most populated sections passed by containers is presented in Table 3.14.

Table 3.14 List of the Most Integrated passing Container Segments

No	Route Section	Number of Call	Number of Ship
1.	Tg. Priok – Tg. Perak	3.908	64
2.	Tg. Perak – Samarinda	3.437	44
3.	Tg. Perak – Banjarmasin	3.002	54
4.	Tg. Priok – Pontianak	3.089	20
5.	Tg. Priok – Belawan	4.487	55
6.	Tg. Perak – Tg. Priok	2.962	45
7.	Tg. Perak – Makassar	4.103	57
8.	Tg. Priok – Banjarmasin	2.614	54
9.	Tg.Priok – Makassar	2.913	42
10.	Tg.Perak – Batulicin	1.614	14

Source: Mangindaan, 2014

Many cargo shipping companies are often used in the logistics industry, Meratus, Tanto, and Temas. These ships transport fish from one region to another. The main shipping centres are located at Tanjung Priok – Jakarta and Tanjung Perak – Surabaya whereas Makassar is the main transit point for ships heading to eastern Indonesia (KTI).

The Tanto Line is a shipping cargo that has routes in both western and eastern Indonesia. The Tanto Line has a route from Balikpapan to Jakarta as well as a route to

Surabaya and vice versa. Among the two other shipping cargoes, only the Tanto Line has a route from and to Perawang and Ternate and Nabire. Table 3.15 shows the Tanto Line shipping route from Jakarta and Surabaya while Figure 3.11 shows the Tanto Line cargo shipping route.

Table 3.15 Tanto Shipping Routes from Jakarta and Surabaya

Route from Jakarta	Route from Surabaya
Jakarta-Balikpapan	Surabaya-Balikpapan
Jakarta-Batam	Surabaya-Balikpapan-Samarinda
Jakarta-Makassar	Surabaya-Bitung
Jakarta-Medan	Surabaya-Gorontalo
Jakarta-Perawang	Surabaya-Kendari
Jakarta-Pontianak	Surabaya-Luwuk
Jakarta-Samarinda	Surabaya-Makassar
Jakarta-Surabaya	Surabaya-Makassar-Ambon
Jakarta-Surabaya-Bitung	Surabaya-Makassar-Bitung
	Surabaya-Makassar-Manokwari-Jayapura
	Surabaya-Makassar-Nabire-Sorong
	Surabaya-Makassar-Ternate
	Surabaya-Medan
	Surabaya-Samarinda
	Surabaya-Ternate

Source : modified from tantonet.com/our-schedule/

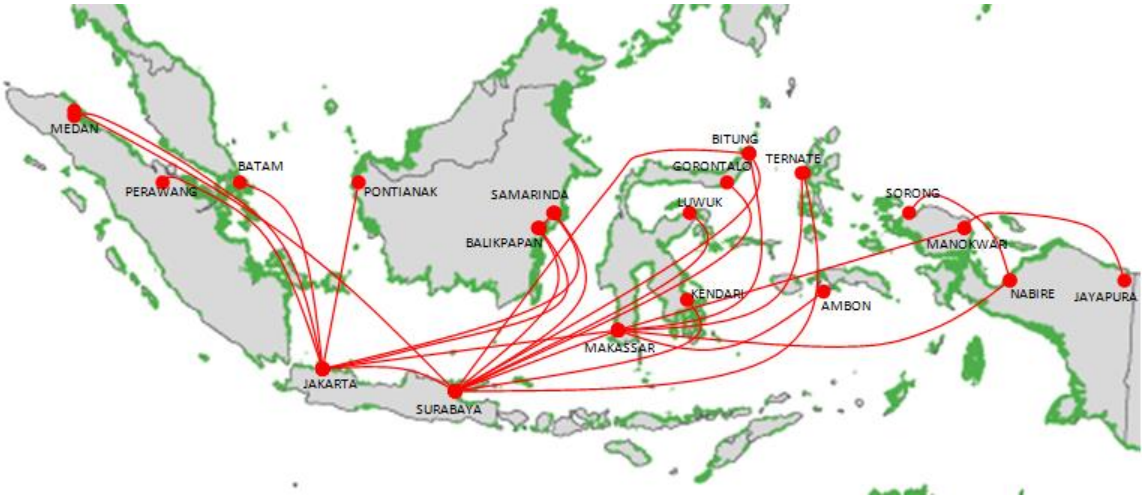


Figure 3.11 Tanto Line Cargo Shipping Route.
Source : modified from tantonet.com/service-route/

The TEMAS Line is supported by three subsidiaries, including 1. PT. Pelayaran Tirtamas Express, based in Jakarta, is engaged in shipping services; 2. PT. The Trisari Services Company Unloading and Unloading Services, based in Jakarta, is involved in

loading and unloading activities; 3. Anemi Maritime Co. Ltd, based in Malta, is involved in container rental. The company's business network has branch offices and agents, each in Ambon, Banjarmasin, Belawan, Bitung, Jayapura, Makassar, Pekanbaru, Pontianak, Surabaya, Sorong, Batam, Biak, Palembang, and Manokwari. The TEMAS Line has a shipping route similar to the Tanto Line, but the TEMAS Line has a route to Banjarmasin from both Surabaya and Jakarta. Also, TEMAS has a shipping route that is not owned by two other lines: to Pekanbaru, Palembang, and Biak. Table 3.16 is the TEMAS Line's shipping route from Jakarta, Surabaya, and Makassar, TEMAS Line Cargo Shipping Route shown in Figure 3.12.

Table 3.16 TEMAS Line Shipping Routes from Jakarta, Surabaya, and Makassar

Route from Jakarta	Route from Surabaya	Makassar Route
Jakarta - Pekanbaru – Jakarta	Surabaya - Banjarmasin - Surabaya	Makasar - Kupang - Makasar
Jakarta - Pontianak - Jakarta	Surabaya - Makassar - Ambon - Surabaya	Makasar - Banjarmasin - Makasar
Jakarta - Banjarmasin - Jakarta	Surabaya - Makassar - Bitung - Bitung	Biak - Manokwari - Surabaya
Jakarta - Palembang - Jakarta	Surabaya - Jayapura - Surabaya	
Jakarta - Belawan - Jakarta	Surabaya - Makassar - Jayapura – Surabaya	
Jakarta - Batam - Jakarta		
Jakarta - Samarinda - Bitung- Jakarta		
Jakarta - Makassar - Surabaya- Jakarta		

Source: modified from temasline.com/schedule/

Figure 3.12 TEMAS Line Cargo Shipping Route
(*Source: modified from temasline.com/temas-network.html*)

The Meratus Line is a shipping cargo route has a reasonably complete shipping route compared to Tanto and TEMAS Line. However, the shipping route hasn't reached the island of Papua. There are routes to Sibolga, Padang, and Bengkulu for Sumatera area. For the Nusa Tenggara area there are destinations to Benoa – Bali, Benete – NTB, Maumere, Kupang, and Dili in NTT. For the Kalimantan area, the Meratus Line has several destinations which can't be found on the other two lines, destinations to Kumai, Sampit, Bontang, and Tarakan. For the Sulawesi area, the Meratus Line destination, which is not owned by the other two companies is to Tolitoli, Pantoloan, and Kendari. Figure 3.13 is an illustration of the shipping route from the Meratus Line.

Figure 3.13 Meratus Line Shipping Route
(Source : modified from meratusline.com/eng/container-liner-vessel-amp-service-schedule/)

3.4 Human Resource

Global industry trends show that the role of supply chain management and logistics within the company are vital in maintaining overall corporate profits. After Indonesia experienced a financial crisis in the late 1990s, businesses in supply chain and logistics management grew. Many companies focused on supply chain and logistics management and at the same time, the need for qualified professionals in the field of supply chain and logistics management also increased. However, business growth in supply chain and logistics management is not accompanied by adequate professional human resource (HR) growth. Human resources working in the field of supply chain and logistics management generally enter "accidentally," caused by the company needs and not in order to build their competencies from the start. Professions in supply chain and logistics management are not a popular subject for young people and fresh graduates.

Generally, the logistics sector in Indonesia is still part of the Industrial Engineering subjects or Economics courses and not as a particular study program. Also, education providers do not see supply chain management and logistics study programs as an exciting program. Universities in Indonesia have conducted study programs (including Bachelor's and Master's degree) with Logistics Management and Supply Chain Management as one of the study fields and the course includes: Trisakti College of Transport Management, University of Gajah Mada, University of Indonesia, Bandung Institute of Technology, Sepuluh Nopember Institute of Technology, Widyatama University, Andalas University, and Bogor Agricultural Institute School of Business in accordance with the dynamics of the development of lectures and the study of logistics and SCM.

On the other hand, especially overseas, there are many specific Supply Chain Management study programs in the form of degrees or Professional Certification. There is no official certification program in Indonesia because there is no Professional Certification Institute for Supply Chain and Logistics Management. During this time in Indonesia, the programs offered were generally in the form of training, seminars, and workshops periodically by PPM, INFA Institute, Asperindo, ALI, and KADIN, in collaboration with several universities in Indonesia. Human Resource Development in the logistics sector is crucial for the development of a logistics business in Indonesia. Therefore, the need for professional experts is expected to increase significantly in the future.

3.5 Information and Communication Technology

Supply chain management is closely related to product flow and information between supply chain member organisations. The latest developments in technology allow organisations to utilise information from their company efficiently. This technology is crucially needed in helping coordination activities to manage the supply chain. Information costs are decreasing due to technological improvements, in an integrated supply chain where materials and information flow in two directions.

In terms of network availability, the connectivity of fibre-based communication and information network systems has now reached the whole of Indonesia. Even international connectivity has been and is being built by authorities and communication network providers such as the Indonesia Telecommunication Company, the Development of Indonesia Telecommunication Company's Optical Fibre Backbone Network shown in Figure 3.14.

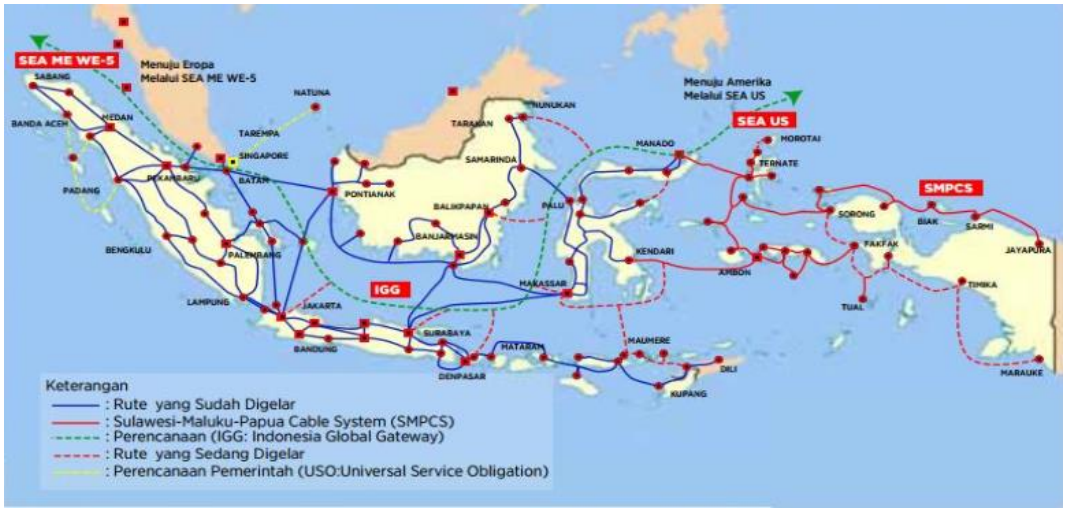


Figure 3.14 Development of Indonesia Telecommunication Company's Optical Fibre Backbone Network
(*Source*: PT. Telkom, 2017)

To achieve the goal of domestic and international communication connectivity, PT. Telkom is also currently carrying out underwater optics deployments to strengthen Telkom International Optical Transport Network. In this concept, besides the underwater fibre-optic deployment for domestic information connectivity, it is also intended to bridge international connectivity, connected the European Union through SEAMEWE 5 to France and SEA-US with America. The alternative network that has been built with Singapore's service base, as shown in Figure 3.15.

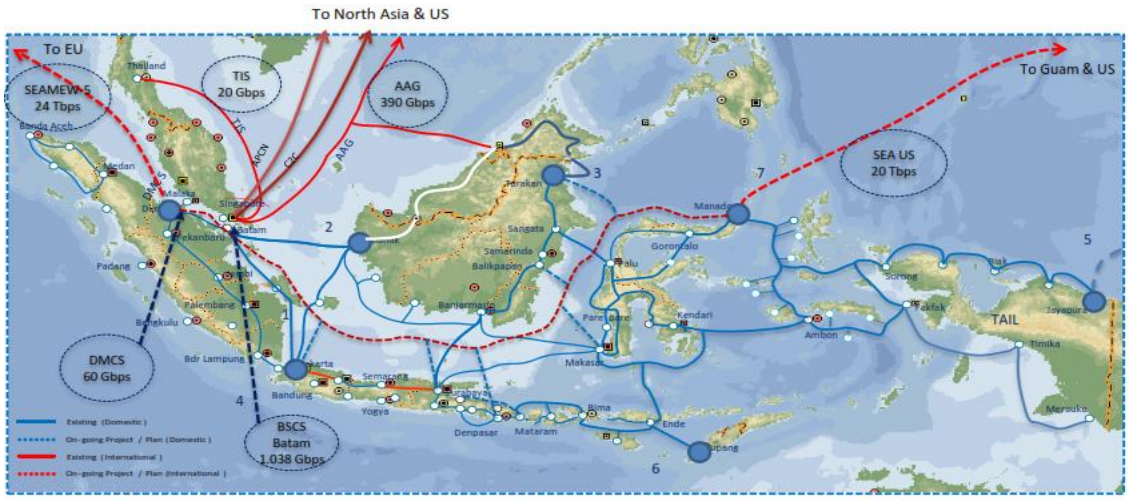


Figure 3.15 Fibre Optic Network of Telkom International Optical Transport Network
(*Source*: PT. Telkom, 2017)

Through the aspect of information and communication technology, some progress has been achieved by Indonesia in the field of information, communication, and technology (ICT).

One example is the establishment and implementation of the National Single Window (NSW) system. It is the integration of a customs service system with trade systems and services port systems for managing exports and imports. However, the connectivity of information and communication systems between port infrastructure with intermodal and multimodal transportation is not well developed yet, considering that the Indonesian National Single Window (INSW) only implemented in 5 seaports and 2 (two) airports. Therefore, there are still many ports and airports that have not implemented INSW. This chapter explained the details progress the development of Marine Fisheries Integrated Centre that reached 60% of the total output target in terms of infrastructure development. The development progress in each site location is different; this is determined mainly by the availability of infrastructure and other supporting resources that already exist. While the current condition of maritime logistics has experienced proper development, especially in terms of regulation. Several regulations have been established to support logistics activities.t Unfortunately, this system applies nationally, whereas based on the data described in this chapter, It is realized that the ocean is also an essential goods distribution channel for Indonesia, not just as a domestic supply chain, between islands and even to remote areas that are not accessible by land and air transportation mode, but also deemed useful as a channel for the foreign logistics supply chain. The following chapter will explain the design of a maritime logistics system which is a derivative of the national logistics system and in line with the established fish logistics system.

CHAPTER 4. GENERAL CONCLUSION AND DISCUSSION

In this chapter, the main findings concerning the aims and research questions are summarised, and general conclusions based on the findings of the studies presented in this thesis are described. Furthermore, the strengths and limitations of this thesis are considered, and suggestions for further research are presented.

4.1 Findings regards to the thesis aims:

- *To critically evaluate the progress of the Marine and Fisheries Integrated Centre (MFIC) site location through publish and unpublished report.*

  The result of this study is review the implementation of MFIC as described in chapter 2, while the Progress of Development on Marine Fisheries Integrated Centre described in Chapter 3 emphases that Integration between Institution and Stakeholder in figure 3.2 show the number of actors involved in developing the MFIC, however many policies overlap between agencies. The development of integrated marine and fisheries should meet the following requirements: Focus on value-added increases, increasing competitiveness, Modernisation and corporatisation of business, strengthening production and productivity of critical stakeholders in maritime and fisheries businesses as it requires a collaborative and integrated approach. From Table 3.2 Overview of MFIC State Budget Allocation and Outcome Projection is shown that these projects take an amount of budgeting with consideration table 3.3 Evaluation of Physical Aspect on the progress of MFIC Development in 2015 - 2017 and Plan 2019, the development progress is slower than expected. It should be completed in a 5-year term, but until 2019, from the 20 targeted locations, only 13 location are projected to finish and 7 of those are nearly finished, with 1 location functioning well.

- *Mapped the conditions and identifying marine logistics problems using analysis of the condition/situation and problems.*

  The marine sector includes diverse economic activity, and various factors that influence the dynamics of the marine sector in Indonesia which include:

  1) Condition of natural resources and commodities.
  2) Transportation infrastructure, in the form of facilities and infrastructure.

The infrastructure includes ports, grooves, lanes, signs, information systems, warehousing, clean water, and fuel. While facilities include transportation such as ships, equipment in ports, and containers.

3) Human Resources – Human resources have play an important role, they act as actors and managers, supervisors, and regulators of marine resources utilisation.

4) Communication and Information Technology.

   Communication and information technology are one of the factors that significantly influence the capacity and pattern of marine resources utilisation in Indonesia. Communication and information technology will determine the process of demand transfer and production technology in the economic sector that utilises marine resources. Therefore, the dynamics and global economic system will propagate through the facilitation of communication and information technology into the domestic economy that utilises Indonesia's marine resources.

5) Institutionalisation

   The institution covers both the rules of the game aspects and the players of the game, this includes both individuals and organisations. These two elements together will build patterns and forms of marine resources utilisation in Indonesia.

   Rigid explanation as a result of mapping marine logistics conditions, which are preceded by an analysis of status or condition have been carried out in chapter 3.2, this includes: 1) production in the upstream sector in the marine sector, which focuses in three essential commodities, fisheries and renewable marine energy resources, and shipping which give a massive input to the GDP among other marine sectors. 2) Transportation and distribution, 3) warehousing, 4) information systems, and 5) human resources.

- *Describe the relationship between variables in the maritime logistics system, also conduct Routing Analysis*

  1) Arranging an overview of problems with Routing Analysis

     Marine resource is a wealthy resource, including elements of bio-physical-chemistry, but also includes the resources contained therein. The marine sector

is not a single sector, and it includes several economic sectors. Therefore, the marine sector has several distinctive characteristics. Among these characteristics are:

a) Multi-sector stakeholders.

b) Having diverse commodities (multi-commodity).

Marine commodities are highly diverse and have different characteristics. In the context of logistics, some of these commodities have different prerequisites in the distribution process.

c) The magnitude of the relationship between the use of the area, both as a locus and input.

Some marine sectors need marine resources as a locus, for example, cruising. However, some do use these resources as inputs in the production process such as oil and gas, mineral mining, fisheries (such as capture and aquaculture), and marine tourism. Each economic sector that utilises marine resources will eventually be interrelated and have implications for both the business practices and the ecosystem of marine resources.

d) The magnitude of the linkages and potential externalities.

Each utilisation has connectivity, both reversible and irreversible. This connection has the potential for both positive and negative externalities to occur in the production process. This also has implications for the logistics process, which affects the availability of commodities.

e) The disparity between regions.

Disparities between regions include the intensity and type of economy that utilises marine resources. However, this disparity can also be a consequence of the disparity in the availability of infrastructure, especially the necessary infrastructure (electrification, connectivity, accessibility, and clean water). This condition is an essential implication of the policies that have been taken in the past. This disparity has implications for the economic sector that uses the sea in all or part of the distribution process of goods (for input and output).

6) The magnitude influence of dynamics system and the global economy.

The economic sector based on marine resources is a sector which is strongly influenced by the system and economy global. Those sectors are maritime

transportation, oil and gas, mining, tourism, fisheries, and marine buildings; significantly affected by the dynamics of the system and the global economy. Changes to the system and economy will have a dynamic impact for the domestic maritime sector, both directly and indirectly through demand and price transmission (input and output transaction).

An important issue from the maritime logistics aspect is that the maritime sector's economic activities generally develop in the western region. In the context of logistics, the distribution load and cargo between regions is unequal, which disrupts the balance of the logistics process. This has significant implications for the efficiency of the processes in logistics.

2) Source problems searching using Fishbone diagram and CATWOE Analysis

The problem's root will be traced in detail by covering particular views on the situation according to the relevant perspective for preparation of problem definitions conducted with fishbone diagram and CATWOE analysis, as resulted below:

a) Stakeholders

Stakeholders of the maritime logistics system are all parties who concern in it, directly and indirectly. Direct stakeholders are all parties that interact as both users and providers. While indirect stakeholders are parties, who have a role to become regulators, provide input, or research so that the maritime logistics system can function smoothly. Stakeholders in the maritime logistics system involve: Consumers, Logistics agents: Producers or owners of goods, intermediaries; Logistics Service Providers; Logistics Supplier: associations, consultants, training, and research; Government as the regulator.

b) Key Driver

Every system built requires vital drivers that drives the enabling factors of the system. Maritime logistics systems also require key drivers that support the successful implementation of this system. Following the initial concept of the maritime logistics system (MLS) that refers to the national logistics system (NLS), the key drivers of the maritime logistics system are also in line with the key drivers of national logistics which are as follows:

i. Maritime Logistics Commodities

The critical commodities of maritime logistics are multi-commodity, both in the form of mining and mineral goods; oil and gas agricultural and marine products; ingredients; and people. Some commodities can be put together in the form of three-in-one transports, but some products require their transportation characteristics and specific transportation requirements. The logistics system must encourage commodity integration to achieve parallel inbound-outbound conditions. For example, when a transport vessel departs from a place carrying locally produced commodities, when it arrives at the location, it should carry the commodities needed by the local area so that the logistics system will be efficient..

ii. Maritime Logistics Infrastructure

Maritime logistics infrastructure includes a very diverse type also related to necessary infrastructure (water, electricity, communication, and accessibility). In principle, each typical commodity requires a specific logistics infrastructure. Therefore, it is also possible to develop sites or locations for the placement of different logistics infrastructure. Infrastructure in maritime logistics includes sea transportation (ports, ships, containers, cranes); warehousing; distribution centres; packing and repacking; quality control; and inland connection.

iii. Information and Communication Technology

The availability of accurate information systems and communication is one of the essential prerequisites for maritime logistics effectiveness. In line with the development of information and communication technology, most information and communication networks have been running well, which includes both domestic and international networks. However, not only network availability is needed, it must also contain accurate, real-time, simultaneous, accessible, and complete information. To produce these information characteristics, it requires cooperation and contribution from the stakeholders, both from actors and service providers, as well as the government.

In terms of network availability, the connectivity of fibre-based communication and information network systems has now reached the

entirety of Indonesia. Even international connectivity has been and is being built by authorities and communication network providers such as the Indonesia Telecommunication Company.

iv. Actors and Providers of Maritime Logistics Services

The design network and hardware were built on the logistics service system will not be useful when the logistic service providers and actors are not interested to use it. On the other hand, the performance of logistics service providers and actors will also be very decisive. The actors and providers of maritime logistics services must have sufficient support with adequate quality, resulting in an intense and competitive environment that encourages an efficient logistics system. Therefore, the logistic service providers and actors should develop professionalism towards the better standard.

Logistics processes in the maritime logistics system provided must also be efficient and safe. So that the services performed can reach the prime service point, which includes: sea transportation; warehousing; distribution centres; packing and repacking; quality control; and inland connection in the form of land transportation.

In the end, the expected characteristics of actors and providers of logistics services are at sufficient amounts; adequate quality; efficient; professional; safe and comfortable; and oriented to excellent service.

v. Human Resources and Maritime Logistics Management

The availability of adequate hardware and software cannot guarantee that the maritime logistics system runs as expected. A management authority needs to be established in order to a support reliable management system. The main function of the management authority is to ensure the processes and activities carried out by each component of the maritime logistics system efficiently. This authority will carry out the necessary management actions that will affect the consumers, actors, and providers of logistics services, as well as increasing the participation of logistical supporters (associations, researchers, consultants, training and research institutions). The logistics system managers also provide input or produce regulations

related to the maritime logistics system. Therefore, the manager must at least meet these capacities or characteristics as follow:

- Implement adaptive and efficient management.
- Carry out the essential facilities of all stakeholders (large-sized private sector, small, medium-sized private sector, government, academia, and public),
- Having the capacity to integrate both horizontal integration (modes of transportation, commodities, regions) and vertical integration within the National Logistic System framework.

vi. Maritime Logistics Regulations and Policies

Comprehensive and strong maritime logistics policies and regulations are efficient key drivers for developing a maritime logistics system in Indonesia, a policy with the following characteristics is needed:

a. A single and comprehensive policy for all Indonesian territories.

b. Maintain national integrity.

c. Further integration:

- Physical integration (intermodal or multimodal),
- Economic/strategic integration (vertical integration, governance structure),
- Institutional integration (organisational) (relational integration, people, and processes through organisations).

d. Not dichotomous (modern-traditional; large-SME, central-regional, outside-Java, etc.).

e. Encourage the development of maritime logistics business.

f. Encourage the involvement of all stakeholders (central government, regional government, private parties, and community).

- *Develop a conceptual model of the Maritime Logistics System based on the National Logistics System*.

1). Indonesian Maritime Logistics System Design

Conceptually, several concepts or ideas of marine-based development have been issued or at least utilise marine resources. Those concepts or ideas include the concept of the Indonesian Maritime Continent; the Master Plan for the Acceleration and Expansion of Indonesian Economic Development;

In the following period, several concepts have been issued, such as the National Logistics System (NLS); the National Fish Logistics System (NFLS); Global Maritime Fulcrum; and Sea Highways. Some of the concepts or ideas have been set up in a legal document. However, some of them are still in the process of preparation. It is noted that whether the idea or concept is a systemic concept or not, the government as a policy maker needs to integrative assess the idea. Systemic and integrative concepts are the necessary prerequisites for the development of effective and efficient use of marine resources.

The term systemic form is the concept of perceiving connectivity between sectors that utilise marine resources. Issues and problems due to linkages become crucial. However, it must also be integrative in its implementation process. Especially in the distribution conception which will give a higher impact to the values and benefits of the resources.

The National Logistics System's Blueprint on Presidential Regulation Number 26/2012 concern for the development of the logistics system in every sector in Indonesia. However, to be considered related to the concept of developing sectorial logistics. First, conceptually, the NLS is aimed at products transport, not including passenger and mail delivery. One of the reasons it’s not included is because mail delivery has been handled and regulated explicitly in Law Number 38 of 2009 concerning Goods Delivery. Secondly, the concept of logistics development in NLS is focused on strategic logistic commodities and export commodities, so disaster relief and military logistics will be regulated separately. Thirdly, logistics activities include transportation, warehousing, and distribution excluding procurement activities, especially government goods, because they are regulated and handled by the Government's Goods and Services Procurement Policy Agency, and production activities handled by other related ministries or institutions.

The development of Indonesia's maritime logistics is part of Indonesia's NLS concept. The concept of the NLS is classified into the macro level and micro level. The macro-level is a general term which includes more significant ideas to ensure the distribution of goods from producers to consumers. While the

micro-level is an operative term to ensure the processes in logistics are running effectively and efficiently. More operational logistics processes include activities from suppliers to consumers with procurement activities; product systems; production and distribution. This concept is shown in figure 4.1.

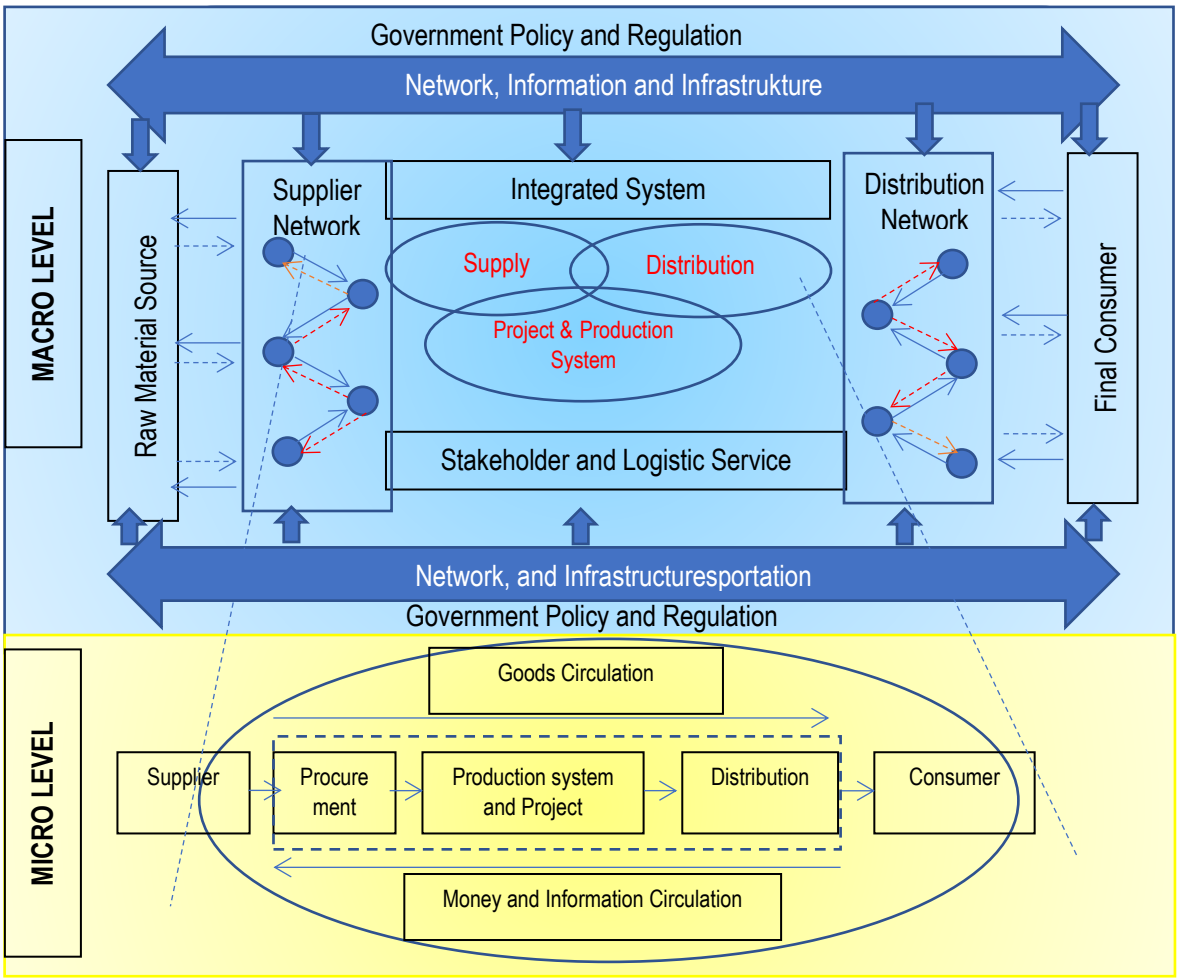


Figure 4.1 Concept of Logistics Systems in NLS

The description in the micro concept at the commodity level is rarely done. One of the concepts is the National Fish Logistics System (NFLS), which, contradicts to the NLS concept. NFLS conducted in macro terms of the operative micro concept, and logistics begins with the procurement that are not stated by the source; hence in the NFLS concept procurement is prioritised from domestic production. Therefore, the on-farm conditions become part of the built system, both aquaculture, and capture. to meet the needs of goods in

a certain amount of domestic production (on-farm) requires a certain period of time. However, if the system does not accommodate the on-farm sector, excess demand will likely occur at one time and excess production will occur at another.

An efficient maritime logistics system that supports the distribution of goods from suppliers to end consumers must involve these three flows, they are goods, information, and financial.

In term of the goods flow, the maritime logistics system built must be able to support or have the characteristics as follow:

1. able to integrate cargo, mode, economy, and organization;
2. develop inbound-outbound balance;
3. have the proper supporting infrastructure;
4. have the equipment that is sufficiently related to many activities such as loading and unloading, tracking and tracing, and transportation mode connectivity;
5. encourage professionalism of all parties concerned;
6. encourage optimal dwelling time;
7. encourage processes in an efficient system;
8. support connectivity between the regions in Indonesia.

In the flow of information, the logistics system must encourage information flow processes that support the efficiency of logistics processes include accurate, real-time, simultaneous, spatial base, accessible, and comprehensive.

Operationally, the support of perfect information flow an efficient material distribution process, will not work without financial support. So that the logistics system is expected to drive the cash flow process which is on time, secure, cheap, enough, and accessible.

2. Indonesian Maritime Logistics System (IMLS) Conceptual Model

As concept, the Indonesian Maritime Logistics System (IMLS) model adopts NLS as one of the legal references. Thus, this framework was built by reducing the modified NLS framework for the maritime sector as described previously, both in the theoretical and regulatory concepts. The logistics

system is related to the process of material flow in both input and product, information, and money flow. However, the process is covered by internal and external conditions. Both internal and external conditions can no longer be insulated, considering that not all physical barriers can effectively function. Internal and external conditions that surround Indonesia's maritime logistics system provide opportunities and challenges, as well as strengths and weaknesses. These factors determine the performance of the effectiveness of the design of the logistics system.

The maritime logistics system model is similar to the national logistics system model, in that is also covers macro and micro aspects. Macro aspects are generally involved in more fundamental and comprehensive needs, while at the implementation or operational level, directed to the way of distributing one commodity from a producer to consumer.

Macro Model

The macro model describes more macro linkages between components. Influential factors key drivers re conditions that must be fulfilled in order for this model to run well. Besides, the operation of the maritime logistics system model is also influenced by the political, economic, social, and cultural environment in domestic or international environment.

In principle, the Indonesian maritime logistics system is influenced by the challenges and opportunities of domestic and global dynamics as well as strengths and weaknesses. Global dynamics likewise, politic and economic will considerably affect domestic conditions in term of boundary areas with the neighbouring countries. To summarise, the macro model can be seen in Figure 4.2

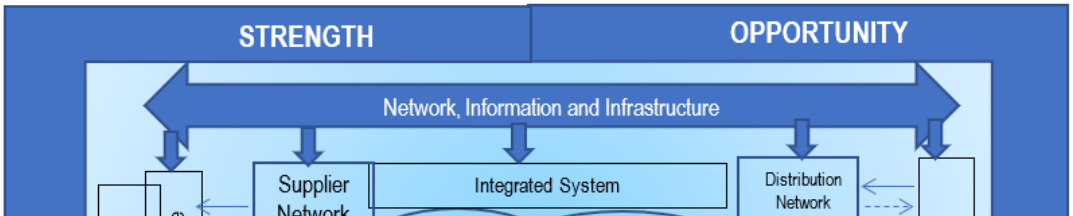


Figure 4.2 Conceptual Macro Model of Indonesian Maritime Logistics System

Economic globalisation is one of the factors that determine the need for a logistics system globally. The main issue of global logistics is that the process of economic globalisation is triggered by efforts to eliminate or reduce trade barriers in both rates and non-rates, and a sharp decline costs in transportation and communication. The decline and barriers to trade in both rates and non-rates and the decrease in transportation costs are the factors that attract globalisation.

However, this condition also occurs due to the development of increasingly efficient information and communication technology as well as transportation technology, thus making the two of them the primary factors driving economic globalization. Improved information technology increases the capacity, function, and speed of transportation modes in distributing goods, on land, sea, or air. This ultimately affects the decrease in transportation and distribution costs. The development of information technology combined with communication technology development brings the world closer. Thus, it allows the management and coordination of logistics and supply chain to function well.

Micro Model

Maritime logistics is a multi-commodity because maritime transportation as its backbone is also a multi-commodity. The transportation process in a single-vehicle can be categorised as a single commodity, such as mining and mineral transportation, oil and gas transportation, dry and frozen containers. However, it can also be mixed according to the characteristics and requirements of the transportation of each commodity.

One of the primary keys in maritime logistics is integration. Therefore, in the micro conceptual model, the maritime logistics system must be integrative between commodities. This is needed to support a decrease in transportation costs, which in turn will significantly affect the competitiveness of the economy. Operationally, within the micro model, the Maritime Logistics System (MLS) can be seen in Figure 4.3.

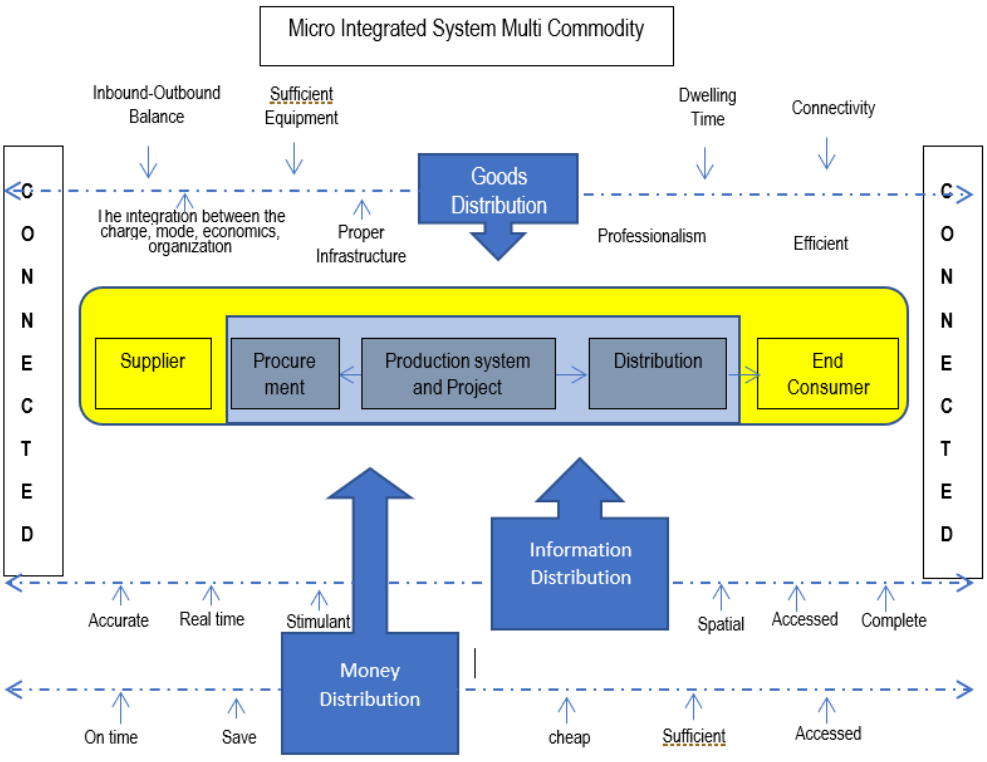
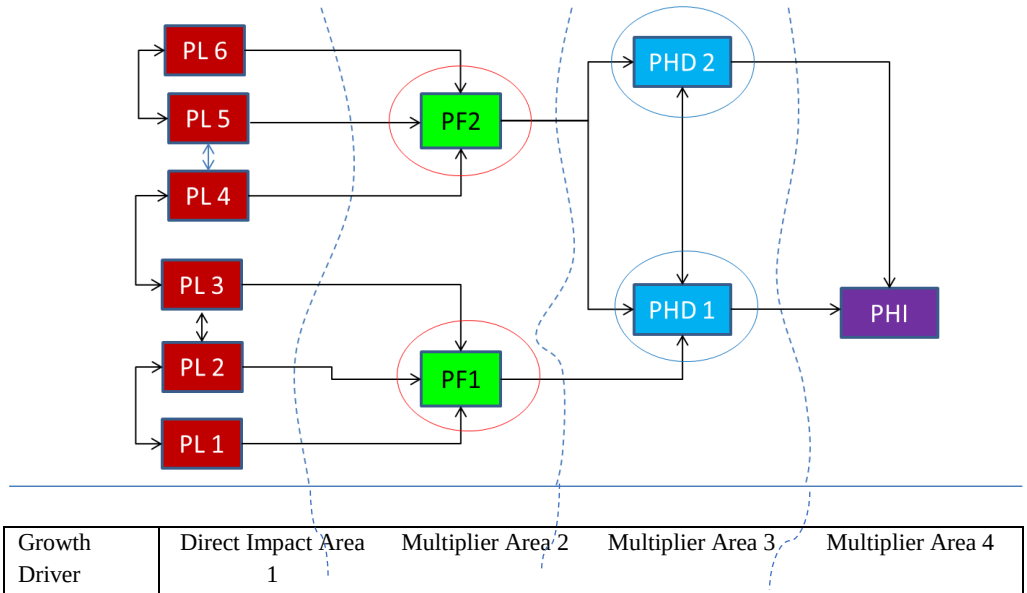


Figure 4.3 Conceptual Micro Model Operational Systems of Indonesian Maritime Logistics Systems

3). Indonesian Maritime Logistics System (MLS) for Regional Economic Development

Logistics processes in the maritime logistics system are expected to drive the regional economy through the multiplier effect of economic production. Economic mobilisation is expected to be collected through the process of regional economic development, both because of the role of the logistics system in enhancing the existing economic capacity (ships follow the trade), and moving the local economy (ships promote the trade). Meanwhile, the local economic mobilisation is expected both because of the direct impact of the economic development in the upstream area of the product with the availability of a logistics system, as well as the impact of multipliers in other regions that are not considered producing regions due to logistical processes as shown in Figure 4.4.



Growth Driver	Direct Impact Area 1	Multiplier Area 2	Multiplier Area 3	Multiplier Area 4
Area	Local Port	Feeder Port	Domestic Hub Port	International Hub Port
Connectivity	K1	K2	K3	

Figure 4.4 The Role of Maritime Logistics Systems in Local Economic Generation

Based on Figure 4.4, connectivity (K1, K2, and K3) will vary by region with typical or grouping patterns as seen above. The missing link is that K1 connectivity also has complicated and crucial problems because the logistics system efficiency is determined from the system and logistical efficiency on

primary connectivity (K1). For example, in the case of fish transportation and distribution, transport costs at the level of primary logistics connectivity (from the local point collection to the centre collection), can be the same transportation cost between the collection centre as the feed port (PF) to other ports as distribution centres. In the case, as portrayed in the figure above, the K1 connectivity costs that connect Local Ports (LP) to Feeder Ports (FP) can be prohibitive than those from (FP) to hub ports, both Domestic Hub Ports (DHP) and International Hub Port (IHP), even the distance is much closer.

4.2 Findings regarding the research questions

What is the most effective logistics system policy to support Marine and Fisheries Integrated Centre?

The exploration of the research literature about maritime logistics system described in Chapter 2 shows that the concept of Maritime logistics system is still in a developmental stage, however, based on the concept model there are some inputs that are being considered for developing legislation to build a maritime logistics system, these are:

1. The development of integrated marine and fisheries areas in small islands and boundary areascan be implemented, not only by applying maritime logistics systems but also by considering the development of marine and fisheries facilities and infrastructure. It should be carried out in an integrated manner to sustain the traditional fisher's economic efforts and conventional cultivators, in order to develop an economy and market-oriented marine and fisheries business. Strengthening human resources and institutions as well to enhance the capacity and competence of fishermen, is proven by the increase of productivity and fisheries processing. Aan essential factor to build the MFIC program is encouraging the fisherman using modern business systems and standards within categorisation so that the profits can be higher obtained.
2. Externally, strengthened partnership development needs to support and empower the implementation of the fisherman and aquaculture in marine and fisheries business production chain. From upstream to downstream, through partnerships with business actors and relevant stakeholders, providing proper guidance and supervision will be needed to implement maritime and fisheries business on small

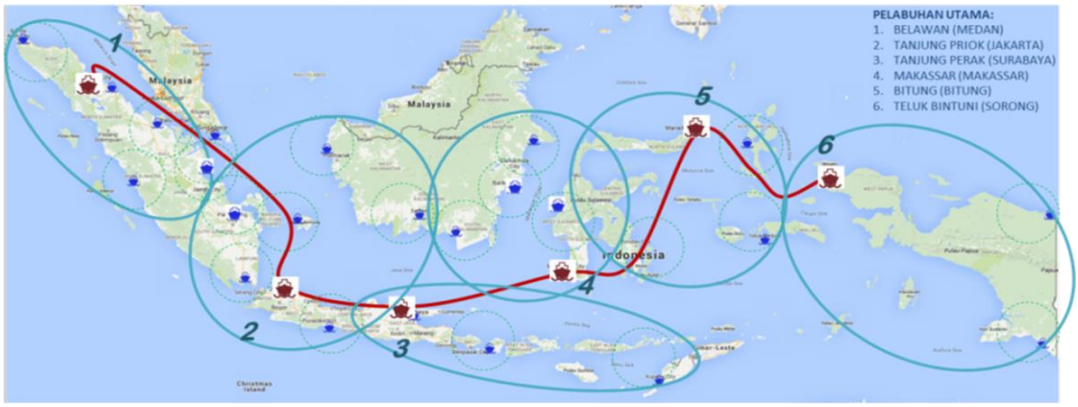
islands and boundary areas. Guidance and supervision are carried out by placing facilitators in charge of providing technical aid for fishers. Therefore, the fishermen learn better management and technical capacity related to the developed marine and fisheries business, thus making the business institutions more effective. The best products from each integrated business centre can be distributed well, across provinces, between cities, and even the international market if a good maritime logistics system is developed.

3. The establishment of the Indonesian Maritime Logistics System (MLS) is an integral part of the concept of Indonesia as a State and Maritime Axis. The formation of MLS is part of the National Logistics System Architecture. The MLS design includes operational macro and micro conceptual models. The main components of MLS include the flow of goods commodities; information flow; and money flow, that need to get proportional attention. MLS key drivers include commodities that are not singular; logistics infrastructure; information and communication technology; logistics actors and providers; resources and management; as well as regulation and policy services. Maritime transportation is the backbone of MLS, but MLS requires the support of social, economic, and political aspects. MLS stakeholders include consumers; logistics actors; logistics service providers; logistics supporters; and government.
4. The development of MLS needs to build the logistics system efficiency starting from the production centres which are at the level of upstream connectivity that connects the local port (PL) with the feed port (PF), but the downstream connectivity level of the feed port (PF) to either the domestic storage ports (PHD) or international storage ports (PHI). It is a necessity to build basic industrial that support products needed in the central and western regions of Indonesia. The development of MLS is needed to develop the regional economy through both direct and multiplier impacts. The economic development of the related regions with MLS has an essential role in the development of Marine and Fisheries Integrated Centres.

4.3 Strengths and limitations of the studies

1) Strengths

This thesis will contribute to the development of MFIC as well as maritime logistics system to support the vision of Indonesia becoming World Maritime Fulcrum. The idea of sea highways that are expected to bridge the disparity of connectivity between eastern and western transportation have not touched this issue. The sea highways now only connect to the main port, which is the feeder port, as shown in Figure 4.5.



= Main Route Sea Highway

X

= Local Service Belt

1. Service Belt of Belawan Port
2. Service Belt of Tanjuk Priok Port
3. Service Belt of Tanjung Perak Port
4. Service Belt of Makasar Port
5. Service Belt of Bitung Port
6. Service Belt of Bintuni Gulf Port

Services :

1.Passanger Transport > PT. Pelni and River vessel
2.Agriculture Commodity Transport (non-durable goods)
3.Raw material /mineral commodity transport (durable goods)
4. Final goods transport > Cargo and Container

Figure 4.5 Basic Scenario of the Indonesia Sea Highways
(*Source: Prihartono*, 2015)

The basic scenario of the sea highways was then developed and refined by the identification of the east and west sea highways lanes with a two-corridor alternative. However, this conception remains within the framework of the feeder port corridor and the hub port, as shown in Figure 4.6.

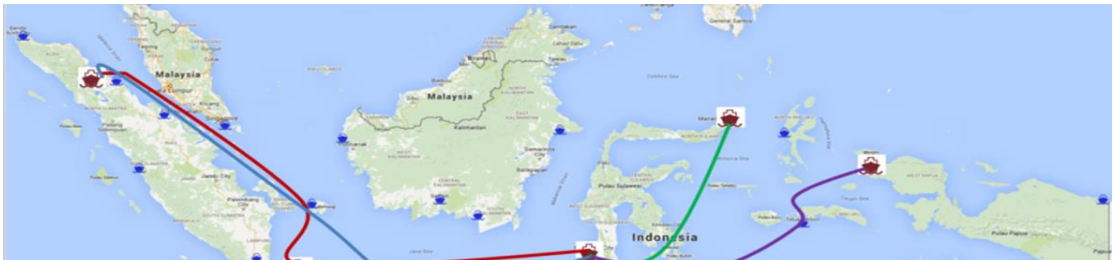


Figure 4.6 Proposed Sea Highways Lane of Indonesian East-West Connectivity (Source: Jusuf et al., 2016)

The development of the maritime logistics system is also as a provider of regional economic development services for the concept of maritime fulcrum with the identification of the inner (hinterland) and front (foreland) regions. Through this idea, new economic growth is expected to occur in the front region (boundary areas), where the prerequisites for accessibility and connectivity must be appropriately fulfilled (Figure 4.7).

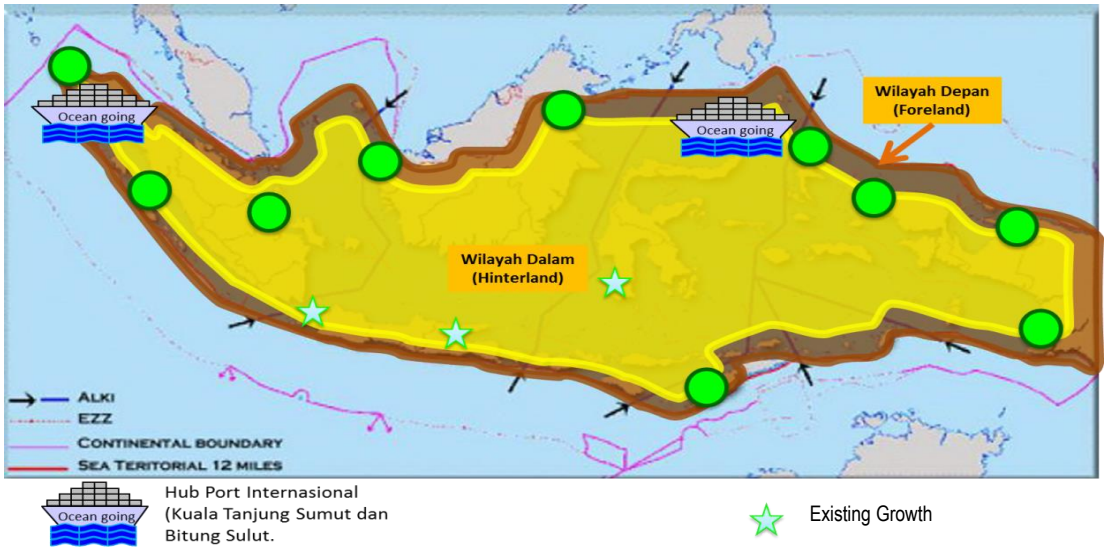


Figure 4.7 Concept of Frontier Region (foreland) and Inner Region (hinterland) towards Maritime Fulcrum (*Source: Prihartono*, 2015)

2) Limitations

In the thesis Analysis of Models Comparison with Real Conditions (Gap Analysis) cannot be conducted due to limited time. Therefore, Analysis of Desired Changes cannot be finished as part of this research. However, those models in macro and micro can be used as input in determining Policy, Strategy, Recommendation, and Implementation on Maritime Logistics. Meanwhile, the difficulties in finding primary data in the MFIC project and consideration as civil service holds to cover the information publicly.

4.4 Suggestions for further research into higher education

Suggestions for further research, theories, and modelling that have been carried out in this thesis need to be further discussed by experts, especially in the field of maritime, logistics, and marine resources. Based on the input and results of the experts' discussion, besides that, it needs to be tested in the field to find out the success rate of this modelling. This research can be continued to produce maritime logistical policy recommendations, which can then be submitted to the Indonesian government to be stipulated as regulations and implemented nationally.

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Appendix 1. List of Cargo Shipping in Indonesia

List of Cargo Shipping in Indonesia

No	Ship Name	Company Name
1	Abadi Inti Lines	PT. Pelayaran Abadi Inti Lines
2	Admiral Lines	PT. Admiral Lines
3	Advance Container Lines (ACL)	PT. Pelayaran Samudera Selatan
4	Alianca	Ben Line Agencies (Indonesia)
5	American President Line (APL)	PT. APL Indonesia
6	ANL (Australian National Lines)	PT. Samudera Pacific Maju (To/From Asia/Europe/USA) PT. Container Mmaritime Activities (To/From AUST/NZ/PNG)
7	Austral Asia Line (AAL)	PT. Jardine Tangguh Transport Services
8	Bahtera Adhiguna	PT. Bahtera Adhiguna (Persero)
9	Balaji Shipping (UK) LTD	PT. Global Freight Semesta
10	Brointermed Lines LTD	PT. Ahlers Thoeng Satya
11	Cahaya Samudera Shipping	PT. PT. Pelayaran Wang Jaya Samudera
12	CCNI (Compania Chilena De Navegacion Interoceanica)	PT. Newship Nusabersama
13	China Navigation Co., Ltd (Swire Shipping)	PT. Jardine Tangguh Transport Services Ben Line Agencies (Indonesia)
14	China Shipping Container Lines (CSCL)	PT. Zhonghai Indo Shipping
15	CNC Line	PT. Container Maritime Activities
16	Compagnie Generale Maritime (CMA CGM)	PT. Container Maritime Activities
17	Cosco Container Line	PT. Ocean Global Shipping
18	Compania Sud Americana De Vapores (CSAV)	PT. Jardine Tanguh Transport Services
19	CTP Line	PT. Pelayaran Caraka Tirta Perkasa
20	DAL (Deutsche Afrika-Linien)	PT. Tirta Samudera Caraka
21	Delmas	PT. Container Maritime Activities
22	Djakarta Lloyd	PT. Djakarta Lloyd (Persero)
23	Eastern Car Liner, LTD	PT. Karana Line PT. ECL Logistics Indonesia
24	Econ Container Line	PT. Econship Container Line
25	Emirates Shipping Lines	PT. Newship Nusabersama
26	Evergreen Line	PT. Evergreen Shipping Agency Indonesia
27	Far Eastern Lines PTE LTD	Ben Line Agencies (Indonesia)
28	Gold Star Line, Ltd	PT. Layar Sentosa Shipping Corporation
29	Grand China Container Lines	PT. GPI Shipping Indonesia
30	Hamburg SUD	Ben Line Agencies (Indonesia)
31	Hangli Shipping	PT. Premier Shipping
32	Hanjin Shipping	PT. Bumi Laut Shipping
33	Hapag Lloyd	PT. Samudera Indonesia (Tbk)
34	Hatsu Marine (Evergreen Line)	PT. Evergreen Shipping Agency Indonesia
35	Heung-A Shipping	PT. Haspul International Indonesia
36	Hub Lines	PT. Hub Logistics Indonesia
37	Hyundai Merchant Marine (HMM)	PT. Arpeni Pratama Ocean Line (APOL)
38	Italia Marittima S.P.A	PT. Evergreen Shipping Agency Indonesia
39	Interasia Lines LTD	PT. Trenamuda Sejati
40	IRISL (Islamic Republic of Iran Shipping Line)	PT. Bintang Tatabahari
41	Kawasaki Kisen Kaisha., LTD (K-LINE)	PT. “K” Line Indonesia
42	KCA Lines	PT. Kcargo Agencies

43	Korea Marine Transport CO.,LTD (KMTC Line)	PT. Samudera Indonesia Tbk
44	Laurel Navigation Line (LNL)	PT. Layar Sentosa Shipping Corp
45	Malaysia International Shipping Corporation	PT. Jaya Niaga Shipping
46	Maersk Line	PT. Maersk Indonesia
47	Marfret Compagnie Maritime	PT. Tirta Samudera Caraka/Barwil Unitor Ships Services
48	Maxicon Container Line	PT. Freight Liner Indonesia
49	MCC Transport	PT. Pelayaran Bintang Putih
50	Mediterranean Shipping Company S.A	PT. Pelayaran Nusantara Panurjwan
51	Meratus Line	PT. Pelayaran Meratus
52	MOL (Mitsui O.S.K Lines)	PT. Mitsui OSK Lines Indonesia
53	New Guinea Pasific Lines	Ben Line Agencies (Indonesia)
54	Niledutch	PT. Serasi Shipping Indonesia
55	Nippon Yusen Kaisha Lines (NYK Lines)	PT. NYK Indonesia
56	Nirint Shipping	PT. Ahlers Thoeng Satya
57	Norasia (CSAV Norasia)	PT. Jardine Tangguh Transport Services
58	Nortrans Shipping Agencies	PT. Srijaya Segara Utama
59	NYK-Hinode Lines	PT. Samudera Indonesia Tbk
60	Ocean World Lines	PT. Samudera Pacific Maju PT. Savvy Logistics
61	Orient Express Lines (OEL)	PT. Global Freight Semesta
62	Orient Pacific Container Line (OPCL LINE) / Reef Shipping	PT. Jardine Tangguh Transport Services
63	Orient Overseas Container Line, LTD. (OOCL)	PT. OOCL Indonesia
64	Pacc Container Line PTE., LTD	PT. Jasatama Kemasindo
65	Pasific Eagle Lines PTE., LTD. (PEL)	PT. Transportama Selatan Indonesia
66	Pacific International Lines PTE., LTD. (PIL)	PT. Pelayaran Samudera
67	PDZ Lines	PT. Freight Liner Indonesia
68	Polish Ocean Lines	PT. Escorindo Ogrus Shiping
69	Portline-Transportes Maritimos Internacionais, SA	PT. Ahlers Thoeng Satya
70	QC Line	PT. Inter Oceanindo Logistiktama
71	Regional Container Lines (RCL)	PT. Bhum Mulia Prima
72	Reef Shipping	PT. Jardine Tangguh Transport Service
73	Rickmers-Line	PT. Samudera Indonesia Tbk
74	Safmarine	PT. Maersk Indonesia
75	Salam Pacific Indonesia Lines (SPIL)	PT. Salam Pacific Indonesia Lines
76	Samudera Shipping Lines	PT. Samudera Indonesia Tbk
77	Shanghai Puhai Shipping	PT. Zhonghai Indo Shipping
78	Shipping Corporation of India	PT. Bumi Laut Shipping Services
79	Seth Shipping	PT. Layar Sentosa Shippng Corporation
80	Sinokor Merchant Marine	PT. SKR International
81	Sinotrans Shipping	PT. Translindo Nusa Pacific
82	STX Pan Ocean	PT. Andal Lautan Niaga
83	Tanto	PT. Tanto Intim Lines
84	TEMAS Line	PT. Pelayaran Tempuran Emas Tbk
85	T.S. Line LTD.	Ben Line Agencies (Indonesia)
86	The Ethiopian Shipping Lines	PT. Freight Liner Indonesia
87	Tokyo Senpaku Kaisha Lines (T.S.K Lines)	PT. NYK Indonesia
88	Trikora Lloyd	PT. Perusahaan Pelayaran Samudera Trikora Lloyd
89	TMS Lines	PT. Tresnamuda Sejati
90	United Arab Shipping CO., S.A.G (UASC)	PT. Samudera Indonesia Tbk
91	Wallenius Wilhelmsen Logistics	PT. Arpeni Pratama Ocean Line Tbk
92	Wan Hai Lines	PT. Global Putra Indonesia Maritime
93	X-Press Feeders	Ben Line Agencies (Indonesia)
94	Yang Ming Line	PT. Pilindo Megah Selatan

Source : http://www.infopelayaran.com/2012/04/daftar-pelayaran-kargo-indonesia-2.htm