Maritime logistics reformation with the utilization of early warning system for the security and safety of Indonesian waters

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ABSTRACT

The idea of Indonesian maritime development to make Indonesia "the Global Maritime Axis" should be balanced with some concrete steps. One of them is applying the improvement in the Maritime Logistics System field through "the Maritime Logistics Reformation". Hopefully, it can push the high logistics cost nowadays and improve the efficiency of logistics services in Indonesia. The implementation of Maritime Logistics Reformation in the future should be supervised and monitored, especially in the aspect of maritime safety and security in Indonesian waters using the sea safety and security monitoring system. This supervision is particularly implemented through the Early Warning System which is supported by human resources that have competency in the field of monitoring equipments and maritime technology utilization as well as data collected by each radar station and ground station by providing information services throughout the waters area in Indonesia, especially along the ALKI (Indonesian Archipelago Sea Line Channel) areas in Indonesia. Besides that, it is necessary to provide the Indonesian maritime information source that always meets IMO (International Maritime Organization) standard, which always brings up the maritime security, navigation safety and *marine environmental protection* for people.

1. Introduction

It is the obligation of today's Government to carry on the Indonesian vision as the Global Maritime Axis that will "realize Indonesia as an independent, developed, powerful maritime country based on its national interest".

Indonesia has been ignorin its waters area for several decades and only assume as land development minded country, whereas, two third of Indonesia area consists of waters. Compared to other countries, their maritime potential is fully protected by their governments so that it is certain that the natural resources owned can be preserved its sustainability and give added values to their people.

Therefore, it's time for today's Government to consider maritime sector as the focus of development in the future, supported by 6 (six) constructive pillars: Economy, Defense & Security, Environment, Culture, Science & Technology, and Institutions. Besides the aforementioned, the further reason why we should reconsider the maritime sector is that Indonesia is the biggest archipelago country in the world with very strategic geo-economic position, in the middle of global sea lines of trade, where more than 75% goods and commodities traded are transported through the sea and 45% of them through ALKI (the Indonesian Archipelago Sea Line Channel). Actually, due to its very strategic position as mentioned, and the fact that Indonesia is located between the Pacific Ocean and Indian Ocean as well as between Asia and Australia continents, Indonesia should have the biggest advantages of its strategic maritime position. Moreover, by paying close attention, businesses in maritime economic sectors can generate highly profitable businesses absorbing a large numbers of workforce. Therefore, it is expected that these businesses can solve problems of unem-

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ployment, poverty, and social gap in Indonesia.

Indonesian maritime development, which will become one of the focus of development in the National Leadership of President Jokowi, is expected to be the contributing factor in increasing Indonesian economy growth that is targeted to reach 7%. According to (McKinsey Global Institute, 2012, [ALFI, 2014]), the increase of economy growth that is expected to reach 7% can be achieved by increasing Indonesian productivity rate; at least, it must be 60% higher than that of reached in the last decade. One of the important factors that can influence the increase of productivity rate in Indonesia is the reduction in logistics cost. It is widely known nowadays that the logistics cost of Indonesia is much higher than those of other ASEAN countries, which is about 25% of Gross Domestic Product (GDP), whereas, the average of ASEAN countries is around 18% (Media Indonesia, 21 August 2014). In comparison with some developed countries such as United States of America, Japan and South Korea, Indonesia's logistics cost is much higher. In 2011, Indonesia's logistics cost reached 24.6%, which means that 24.6% of the product final value resulted by various production units in Indonesia in one year is the logistics cost component. Whereas, US logistics cost is only 9.9%, Japan only 10.6%, and South Korea only 16.3%. Of course this becomes a challenge that must be faced by Indonesia in its efforts to increase the competitive advantage of its products against products of other ASEAN countries; that is by pushing such high logistics cost.

Today, Indonesian Government attempts to reduce logistics cost while increasing the domestic maritime transportation. Therefore, Indonesia is expected to be the Economic Archipelago when economic development is conducted integrally with maritime logistics reformation that can reduce logistics cost as well as increasing the efficiency of logistics services at the same time. The concrete steps necessary to be taken in these efforts is to efficiently connect all main ports to hub ports in fast-growing cities and towns.

Beside the development of efficient and reliable Maritime Logistics System, the improvement of domestic sea transportation quality is also a crucial aspect, considering that Indonesia is an archipelago country that needs the support of good sea transportation to interconnect the islands. Furthermore, within ASEAN regional area, the trade facilities in ASEAN countries including Indonesia is dominated by sea transportation. It is proven that the percentage of ASEAN trade through the sea is 40% of global trade [jurnalmaritim.com, 2014]. It means that it is necessary to accelerate the improvement of maritime logistics system and domestic sea transportation quality to support global trade activities through the sea. Moreover, in 2015 we are facing the ASEAN free trade era. Of course Indonesia is required to improve its competitive advantage in ASEAN region.

The acceleration to strengthen national maritime logistics system can be achieved through an integrated Maritime Logistics Reformation. This reformation is expected to reduce logistics cost significantly as well as improve the logistics services efficiency. Of course the Maritime Logistics Reformation needs to focus on the improvement of some aspects as quoted from the Indonesian Logistics and Forwarders Association (ALFI) that the Indonesian Maritime Logistics Reformation should focus on some aspects, among others are aspects of harmonization and synchronization of regulation, infrastructure, fiscal policy, and human resources development. All of these are expected to improve the logistics performance in the framework of improving the national competitive advantage (jurnalmaritim.com, 2014).

In line with that, the Focus of Economic Development is in accordance with the vision of the Indonesian Government, which reads "The strengthening of maritime connectivity (sea toll road), [Munaf, D. R., 2014], development that includes ship fleet, port, and shipyard industry should immediately be built and restrengthened to support the National Maritime Logistics Reformation. Without reliable maritime connectivity and logistics, the economic competitive advantage of Indonesia will be poor".

Of course the implementation of Maritime Logistics Reformation should be well supervised and monitored, especially in the aspect of maritime safety and security in the Indonesian waters so that it can be implemented as expected. One of the supporting supervisions is in the form of maritime safety and security monitoring system. The Early Warning System of the Maritime Security and Safety can continuously monitor Indonesian waters 24 hours a day 7 days a week so that any accidents or illegal activities at the sea including maritime logistics activities can be detected earlier. The system that is believed to be able to support and monitor the implementation of Indonesian Maritime Logistics Reformation throughout Indonesian waters area, especially along the ALKI area in Indonesia relies on the Information and Communication Technology, among others are through equipment of RADAR, Automatic Identification System (AIS), *Long Range Camera* and Ground Station, both withing fixed stations located from Sabang to Merauke and those placed on ships.

2. Method

In the efforts to face all complex problems in the maritime sector as well as to ensure the maritime security and safety, it is necessary to conduct law enforcement at or though the sea by an institution that functions as a Multi-Tasked Single Agency, which is Badan Keamanan Laut (Bakamla, Maritime Security Agency) which was established based on the mandate of Law Number 32 of 2014 concerning Maritime and supported and followed up by the issuance of Presidential Regulation Number 178 of 2014 concerning Bakamla. One of the attraction and focus in those two legislations is the commencement of maritime security and safety patrol era that is more efficient and effective, especially in using non-renewable fuels, by maximal utilization of Early Warning System as the basis for patrol ship and aircraft movement. This system removes the duplication of patrol activity in one particular space, time, and function. This system is managed 24 hours a day 7 days a week, based on Information and Communications Technology (TIK), [FIFIP, 2014]. This system is believed to be able to supervise and monitor national maritime logistics line throughout Indonesian waters.

The Early Warning System has actually been built since 2007 by Bakorkamla (Maritime Security Coordinating Board) pursuant to Item I of Bakorkamla Roadmap of 2007-2014 that relies on satellite-based Information Technology utilization, functioning as Early Warning System of Security and Safety in Indonesian Waters. Now, this system is continuously being developed by Bakamla (Maritime Security Agency), which becomes one of the functions that should be performed by Bakamla pursuant to the mandate in Law Number 32 of 2014 concerning Maritime, Article 62 letter b that reads: "Managing Early Warning System for Security and Safety in Indonesian waters area and Indonesian jurisdiction territory".

So, what is the meaning of Early Warning System (EWS)? There are two types of EWS. The first one is EWS obtained from monitoring by using electronic equipments, especially the Equipments of Information and Communication Technology. The second one is EWS obtained from the result of intelligent activities monitoring. In this case, we focus on the first type of EWS that can be defined as 'a series of electronic equipment facilities that can monitor the whole Indonesian Waters and be analyzed by certain experts to produce early warning report on the potential illegal activities and dangers at the sea'. This EWS is aimed to perform analysis of some aspects relevant with security, safety and law enforcement at sea, to give early warning of a crisis threatening maritime security in particular and national security in general; to help handling crisis management at the sea, both at national and international scales by detecting the desire/movement of the enemy or any parties potential to become enemy/threatening against the maritime security and safety; to provide information to formulate maritime safety plan and to protect the confidential-classified information.

What are the EWS equipments and capacities owned by Bakamla to support the supervision of the National Maritime Logistics Reformation implementation? Up to now, Bakamla has built 11 (eleven) monitoring stations in some regions from Sabang to Merauke named Regional Coordinating Centers (RCC), 3 (three) Maritime Regional Coordinating Centers (MRCC) and 2 (two) Ground Stations (GS) or Ground Stations integrated from Aceh to Papua. This is in accordance with those stated in Bakorkamla Roadmap of 2007-2014 especially Item I, which is relying on Information and Communication Technology (TIK) system for Early Warning System of Maritime Security and Safety. Such Facilities and Infrastructures (sarpras) have been built by meeting standard of International Maritime Organization (IMO), in which at the least they must have Automatic Identification System (AIS), *Long Range Camera* (LRC), Radar Coastal Surveillance (RCS) and Global Maritime Distress Safety and Security System (GMDSS). Those facilities and infrastructures have served people until now in many forms, one of them is daily EWS report released at 8 AM and 4 PM Indonesia Western Time. It is also informed to Puskodal Mabes TNI (Command and Control Center of Headquarters of the Indonesian National Armed Forces) and Baharkam Polri (Security Maintenance Agency of the Indonesian National Police) and is directly disseminated to public through POSAL (the Indonesian Navy Post), LANAL (Military Base of the Indonesian Navy), ADPEL (Port Administration) and POLAIR (Sea Police). In

the future, this report is expected to be utilized to support the supervision of Maritime Logistics Reformation implementation in Indonesia.

In detail, the control technology owned by Bakamla today can be classified into:

Bakamla (Maritime Security Agency) has had monitoring stations in Kamla (Maritime Security) station of West Maritime Zone, Kamla station of Central Maritime Zone, and Kamla station of East Maritime Zone, which are divided into Maritime Regional Coordinating Center (MRCC) and Regional Coordinating Center (RCC) located in three waters area in Indonesia, especially in ALKI 1, 2, and 3, as follows:

- In ALKI 1 area, there are MRCC Batam, RCC Aceh, RCC Tg. Balai Karimun, RCC Natuna and RCC Sambas;

- In ALKI 2 area, there are MRCC Manado, RCC Kema, RCC Tarakan and RCC Bali;

- In ALKI 3 area, there are MRCC Ambon, RCC Tual, RCC Kupang, RCC Jayapura and RCC Merauke.

3. The Early Warning System of the Maritime Security and Safety

Bakamla as an institution handling maritime security and safety in Indonesian waters area and Indonesian jurisdiction territory always provides public services through supervising the Indonesian waters.

This includes supervising the logistics and goods distribution flow through the sea, supervising transhipment activity at the sea, monitoring vessel traffic system, and detecting Indonesian waters area, particularly in ALKI I, II and III areas. All of them support the activities of Maritime Logistics Reformation in Indonesia. These mandates are included in Bakamla functions as stated in the Law Number 32 of 2014, in which Bakamla has functions of guarding, monitoring, preventing and dealing with law violation within Indonesian waters area and Indonesian jurisdiction territory. The monitoring and supervising functions are implemented through the security and safety patrol in Indonesian waters area and Indonesian jurisdiction territory. In the framework of efficiently and effectively using fuel during the patrol duty, Bakamla is determined to optimally function the EWS as the basis movement for patrol ship and aircraft, particularly to hit the operation target. This is in line with other functions of Bakamla as stated in the Law Number 32 of 2014 that reads: "managing Early Warning System for Security and Safety in Indonesian waters area and Indonesian jurisdiction territory".

The controlling and supervising done by Bakamla are performed using facilities with satellite-based technology. Now, Bakamla has conducted control by utilizing satellite technology owned by Ground Station (GS) in Bangka-Belitung and Bitung, North Sulawesi Province. Data received from this satellite can be utilized to preserve and monitor marine natural resources. Besides that, the GS facility can preventively monitor

Figure 1: Monitoring Station Locations (MRCC, RCC And GS) of Bakamla.
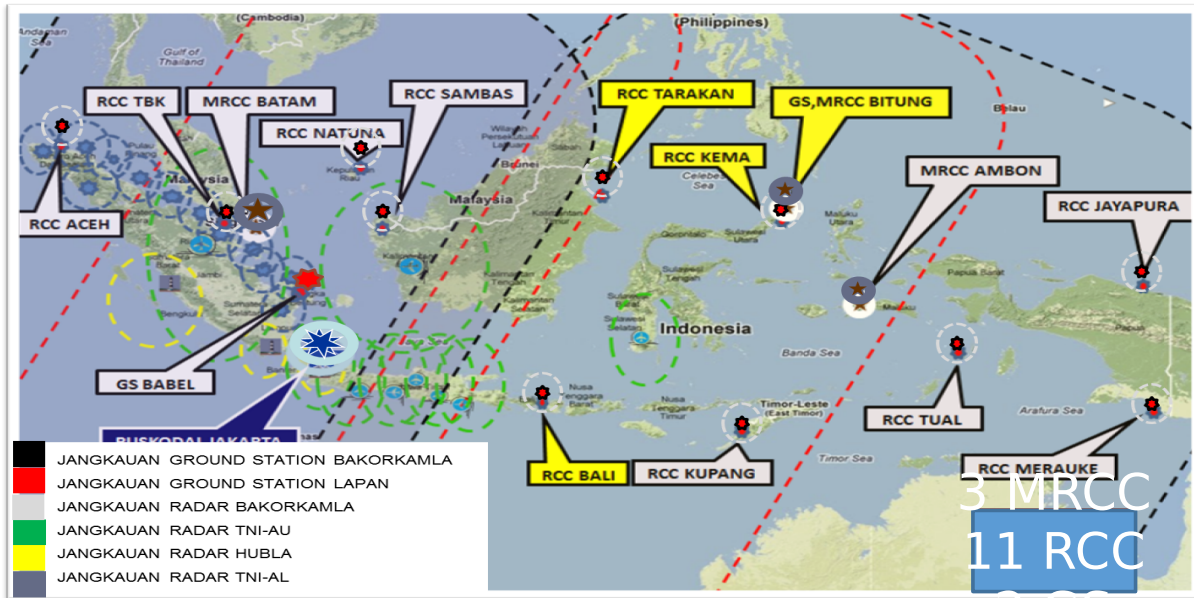
Source: Authors

every movement of vessels using Automatic Identification System (AIS) connected to satellite so that all vessels in Indonesian waters can be well detected. Monitoring vessel movement is very important to know any abnormality or anomaly of a vessel suspected doing transshipment in the middle of the sea, discarding waste, or taking any other suspicious actions. This is known as "anomaly analysis", which later can become the basis for patrol ship and aircraft movement. In addition to that, from the aspect of safety, this equipment can deliver a warning to vessels sailing near high wave area, or undergoing robbery, or even disappearing into the sea. Finally, it will help smoothen the maritime logistics flow in Indonesia, particularly in the aspect of maritime safety and security.

These things are the concerns for Bakamla in monitoring every movement of vessels passing through Indonesian waters. Besides that, data from satellite can provide information services for public, which can help those who use the sea/fishermen to earn a living easier. For example chlorophyll data that can detect the position of fish within a particular waters area. Moreover, Bakamla by using its supervising equipments also focuses on the control of Potential Fishing Zone (ZPPI) within Indonesian waters. The data can be useful for Indonesian fishermen to make fishing easier and also useful for the law enforcement officers at sea as the operational area of controlling foreign vessels that conduct illegal fishing.

Furthermore, these equipments can also be used to monitor vessels having accident due to high wave. This equipment can also monitor vessels undergoing robbery or disappearing in the middle of the sea by observing the tracking record of the vessels using the controlling equipments owned by Bakamla.

4. Early Warning System (EWS) Equipment Owned by Bakamla and its Development

Equipments located at MRCC, RCC and GS as mentioned above are facilities to collect monitoring data on vessel traffic and to detect waters in each ALKI area and Indonesian waters. Such equipments certainly has already met the requirement standards of the International Maritime Organization (IMO) consisting five basic potencies of maritime security and safety station. The five basic potencies are as follows:

Maritime SAR The minimum facilities and infrastructures that must be available are Global Maritime Distress Security and Safety System (GMDSS).

Traffic Monitoring The minimum facilities and infrastructures that must be available are *Automatic Identification System* (AIS) Base Station, *Long Range Camera* (LRC), and *Radar Coastal Surveillance* (RCS).

Fisheries Protection The minimum facilities and infrastructures that must be available are Fishing Vessel Monitoring System (VMS) and Ground Station (GS).

Marine Safety Broadcast The minimum facilities and infrastructures that must be available are communication tool at a radius around the area of the *Maritime Regional Coordinating Center* (MRCC) and *Regional Coordinating Center (RCC) radius*.

Marine Pollution Monitoring The minimum facilities and infrastructures that must be available are the manual *portable* tool to measure the pH scale in seawater *for Marine Pollution Monitoring*.

The equipments available at MRCC and RCC among others are:

- ENC *(Electronic Navigation Chart)* as the formal database made by the National Hydrographic Center to be utilized with *Electronic Chart Display and Information System* (ECDIS). ENC contains all map information that is needed for the safety of sailing and completes information from paper maps that is needed for the safety of vessel navigation passing through Indonesian waters.

- AIS database functions as data to monitor vessels over 300 GT. AIS at Bakamla uses the *Integrated Maritime Surveillance System* principle integrated with *Maritime Radar with Long Range Camera*. Regarding AIS, currently Bakamla has used two types of AIS technologies: AIS *Base Station* and AIS Satellite. Regarding AIS Base Station, Bakamla has used this equipment at 11 RCC stations, which are: RCC Banda Aceh, RCC TBK, RCC Natuna, RCC Sambas, RCC Tarakan, RCC Bali, RCC Kupang, RCC Kema, RCC Tual, RCC Jayapura and RCC Merauke. All RCCs are already connected to Puskodal office in Jakarta. Therefore, it is possible to directly monitor vessel movement from AIS locations in *real time*. Regarding AIS Satellite, Bakamla uses this AIS technology to monitor all vessel movements in Indonesian waters. This technology is also able to monitor vessels specifically, such as data on the line of travel 24 hours before and to predict vessel movement until the next 10 hours.

- *Ground Station* (GS) for Remote Sensing Satellite Bakamla currently has already owned 2 (two) GS located in Bangka Belitung (Sumatera) and Bitung (Sulawesi). The GS functions to receive imaging result from satellite that can be used for various necessities of controlling at sea, such as controlling marine resources, controlling marine pollution, and of mapping the operational area of maritime patrol.

- RADAR as a tool to monitor objects on water surface. The data is used to detect small vessels and over 300 GT vessels that do not activate AIS.

- *Long Range Camera* that can be used to perform visual observation of any vessels and occurrences around the locations of MRCC and RCC detected by AIS and RADAR so that the accuracy of observation is more guaranteed.

- GMDSS is a communication system to support monitoring on the safety of vessels passing through Indonesian water area that is integrated with satellite and terrestrial radio communication.

- The Command and Control Center, Puskodal Bakamla, which is located in Jakarta, is the main office that coordinates data from each MRCC and RCC. At Puskodal, data

obtained from each MRCC and RCC Bakamla is collected and the results are accessible to public and stakeholders. The data is in the forms of early warning for vessels directing towards high wave areas; data on security and law enforcement violation at sea –both domestic and overseas data– that are recapitulated weekly by Puskodal Bakamla; and daily AIS data in the form of AIS monitoring result on any vessels passing through ALKI areas that are detected by RCC and MRCC Bakamla. Furthermore, there is also data resulting from AIS and Long Range Camera integration that is used to detect violation and security information at sea that is published by Bakamla portal named Indokamla, which is one of the public services of Bakamla accessible to public. It contains data of n vessels sailing and information on wave height and weather forecast in Indonesian waters.

5. Strengthening Plan of MRCC, RCC & GS Bakamla through Equipment Development of OTH Radar, LRC and GDMSS.

In the framework of strengthening plan or existing equipment development at MRCC, RCC and GS Bakamla, in 2015 Bakamla will develop the equipment prototype of *Over The Horizon RADAR* (OTH Radar), Forward Looking Infra Red Camera (FLIR Camera/*Long Range Camera*) and GMDSS that involve domestic industries in the development process.

This equipment development plan must not be technologically hijacked and jammed as satellite-based facilities and infrastructure. To deal with such matter, it is necessary to utilize electronic facilities and infrastructures that cannot be reflected to other countries, but can reach up to 200 Nm for OTH Radar and 20 Nm for *Long Range Camera*.

Besides the technical requirements for procurement of OTH Radar and *Long Range Camera* (*FLIR Camera*), other issue that becomes a consideration is the paradigm of not only buying but guaranteeing the technical equality and continuity between Indonesia and the producer country; and also in the framework of *Transfer of Technology* (TOT); as well as in the framework of technology development to the future to the stage of equipment maintenance in our own country.

As planned, the equipment development will be placed to strengthen RCC and MRCC as it is predicted to have an impact on expelling or preventing potential threat that may come from Conflict in South China Sea, as well as detecting foreign vessels passing through Indonesian boundaries (at busy sea lanes), preventing potential illegal gun entering, preventing potential illegal fishing by KIA ships and foreign Tramper, monitoring criminal actions by illegal immigrants, monitoring border areas between Indonesia and its neighboring countries, strengthening monitoring stations located at the outermost locations/border areas of the Unitary State of the Republic of Indonesia (NKRI), and monitoring locations with high potential of other maritime safety issues.

With monitoring equipments and data collected by each MRCC, RCC and Puskodal Bakamla, Bakamla can and is able to provide information regarding all water areas along ALKI areas in
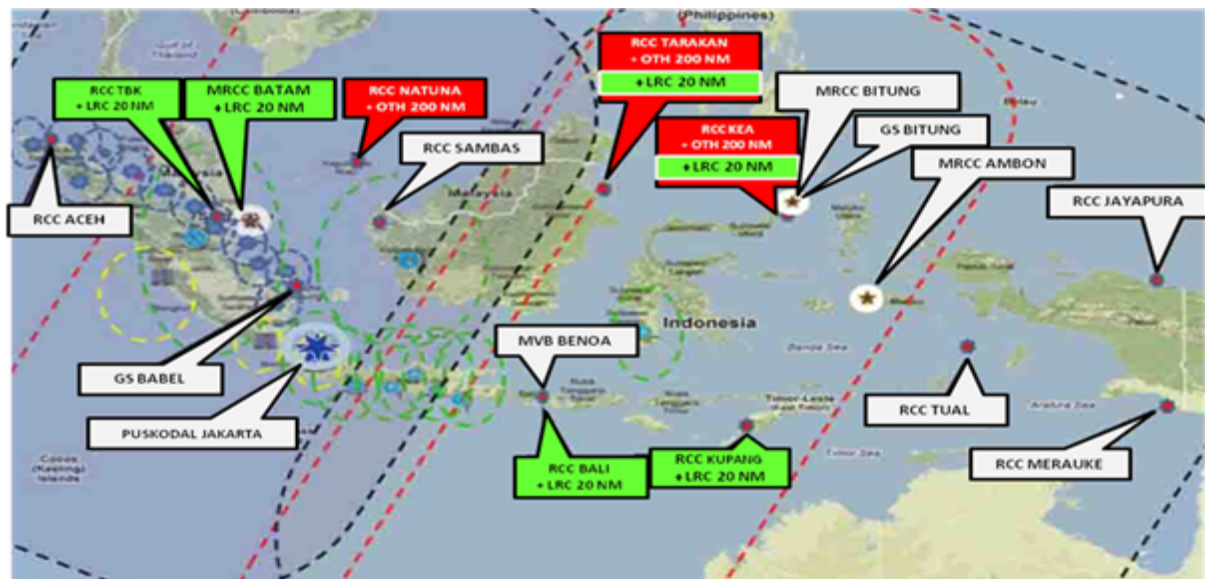
Figure 2: Detection Facilities owned by MRCC, RCC, and GS Bakamla nowadays.
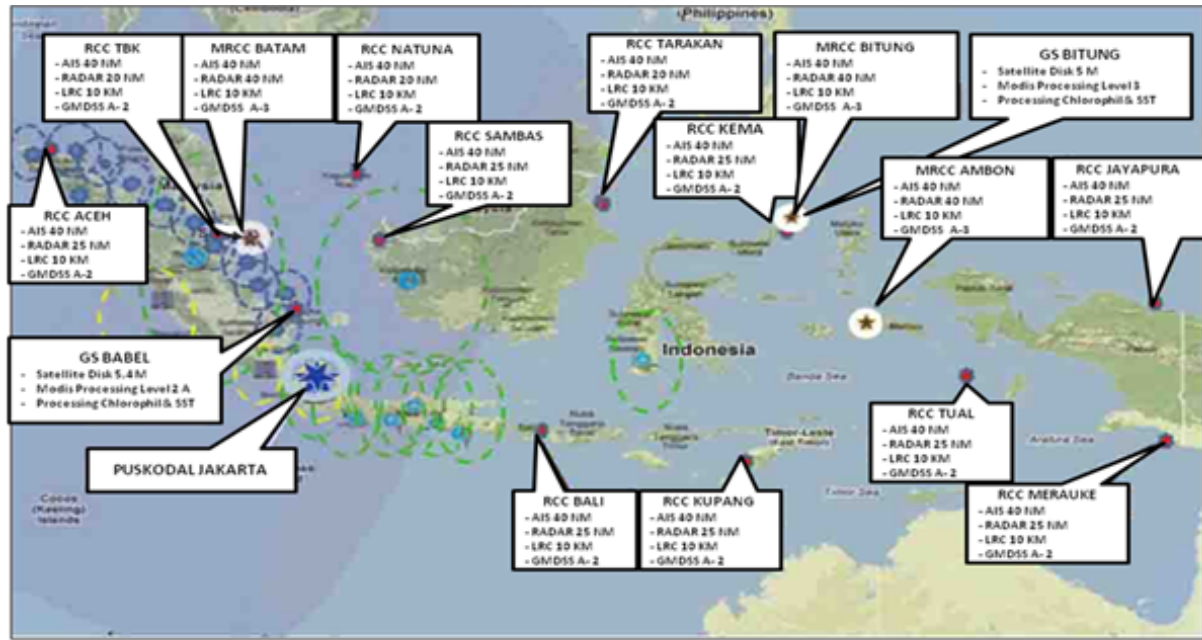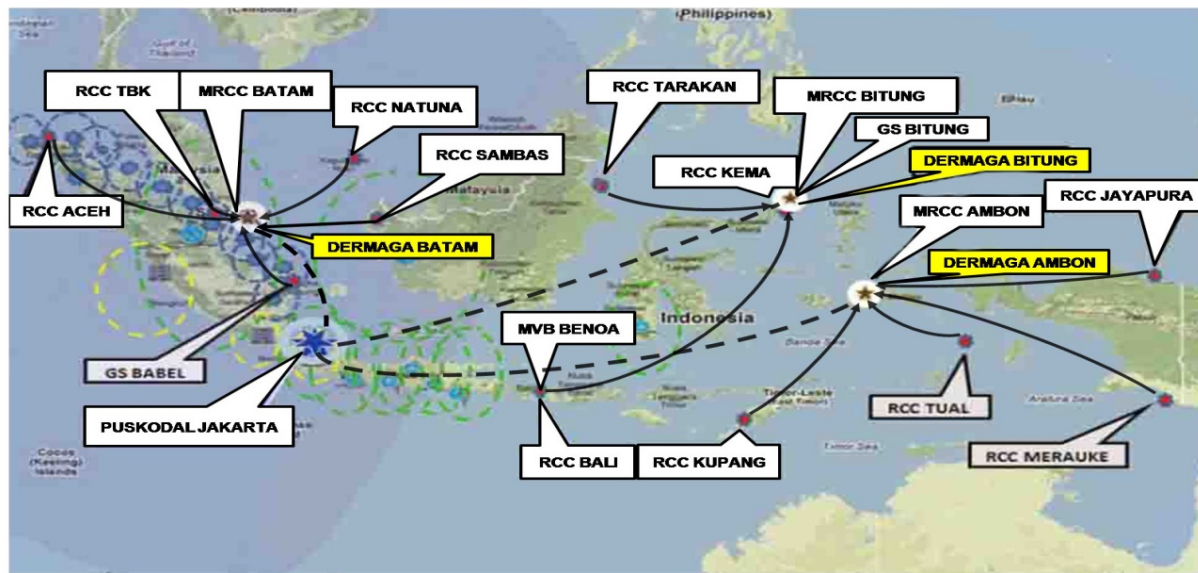

Source: Authors

Figure 3: Strengthening Plan of MRCC, RCC and GS Bakamla (OTH Radar, LRC, and GMDSS)

Source: Authors

Figure 4: The locations of GMDSS owned by RCC, MRCC and GS Bakamla and the Establishment Plan of Maritime Disaster Management Center as a GMDSS Integration that already exists at RCC, MRCC and GS Bakamla.

Source: Authors

Indonesia. In other words, Bakamla can act as the information source on Indonesian maritime that is ready to supervise the implementation of Maritime Logistics Reformation in Indonesia in terms of maritime security and safety. Certainly, the monitoring equipments owned by Bakamla has already met IMO standard, which is to prioritize the aspects of maritime security, navigation safety, and *marine environmental protection.*

Besides that, the development of GMDSS owned by Bakamla, in which the location is spread all over MRCC, RCC, and GS Bakamla, as planned, will be integrated to Batam Pier, Bitung Pier, and Ambon Pier. Those piers will function as *sub nodes* in which the *software*, including *panic button*, will be installed. The GMDSS is also equipped with quick response, which is a part of GDMSS system, where quick response is a type of console equipment, in which after receiving distress, will inform the nearest vessels of the danger areas. It is expected that maritime disaster management can be managed faster and more responsive.

6. Conclusion

The focus of maritime development by Government should be supported with improvement in all maritime sectors. In the future, in line with the Government's vision to make Indonesia as the Global Maritime Axis that will "realize Indonesia as an independent, developed, and powerful maritime country based on the national interest", it should be balanced with several concrete steps. One of them is implementing improvement in maritime logistics system through Maritime Logistics Reformation

that is expected to push today's high logistics cost and increase the efficiency of logistics service in Indonesia. The implementation of Maritime Logistics Reformation in the future should be supervised in the aspect of maritime safety and security in Indonesian waters using the sea safety and security monitoring system. In this case, Bakamla is ready to supervise using a system they develop, called Bakamla Early Warning System.

Supported by human resources who have competence in the utilization of maritime technology, monitoring equipments, and data collection by each MRCC, RCC and Puskodal, Bakamla is ready to supervise the implementation of Maritime Logistics Reformation in Indonesia by providing information service on all water areas in Indonesia, particularly along ALKI areas. Bakamla can also act as the information source of Indonesian maritime that meets IMO standard and always prioritizes aspects of maritime security, navigation safety and *marine environmental protection.*

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