

## Efforts to Increase the Digitalization of Navigation Services in the Sunda Strait Traffic Separation Scheme

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**ABSTRACT :** The shipping density that occurred in Sunda Strait with the existence of passing and crossing activities has prompted the Ministry of Transportation to propose International Maritime Organization (IMO) to validate the Traffic Separation Scheme (TSS). Although, VTS system has been used in the Sunda Strait TSS, this VTS still has problems in digitizing navigation services. VTS supervises the Sunda Strait TSS then records ship traffic data and analyzes the number of collisions to be reported as evaluation. However, reporting and exchanging ship data resulting from the supervision so far it is still done manually. Digital technologies and solutions are used to increase competitiveness and operational efficiency. This study aims to analyze the problems and identify the efforts made by the government in increasing the digitization of services in order to be able to keep up with technological developments in the increasingly advanced maritime world. This study uses a qualitative method. The results of the research carried out that the efforts made by the government in increasing the digitization of navigation services in the Sunda Strait TSS were the development of the Marine Command Center (MCC), in collaboration with Institutions to integration of navigation data, and development of E-Navigation and E-pilotage.

**KEYWORDS** – E-pilotage, Digitalization, Marine Command Center, Traffic Separation Scheme

### I. INTRODUCTION

The Sunda Strait is one of the shipping lanes located in the Indonesian Archipelagic Sea Lane I (ALKI I) and is one of the gateways for international shipping traffic so that the Sunda Strait is part of the international trade route. The Sunda Strait connects the waters of the Indian Ocean through the Karimata Strait to the South China Sea or vice versa. Besides being used as a route for international shipping, in the waters of the Sunda Strait there is also a crossing route from Java Island (Merak port) to Sumatra Island (Bakauheni port) which is operated by the Lake River Transportation and Crossing (ASDP) Ministry of Transportation of the Republic of Indonesia [1].

Based on data from [2] Vessel Traffic Services(VTS) Merak reported the number of ships passing and crossing from various directions, there were 85,929 ships. According to the type of ship, it is known that it consists of 4.74% tankers, 4.68% cargo ships, 1.53% tugs, 87.00% passenger/ro-ro ships, and 2.02% other types of ships. In addition, reporting based on the flag, it is known that 1008 passing ships came from foreign countries, with details of false track as many as 92 ships, crossing separation zone as many as 31 ships, crossing ITZ as many as 851 ships, and 34 others.

The shipping density that occurred in Sunda Strait with the existence of passing activities from South to North and vice versa as well as crossing activities for ferry crossings from Merak-Bakauheni has prompted the Ministry of Transportation to propose and garner support from member countries of the International Maritime Organization (IMO) to validate the Traffic Separation Scheme (TSS). TSS is a shipping lane separation scheme on a shipping lane, where the route has heavy traffic, narrow traffic and many obstacles in navigation problems [3].

Currently, the shipping lanes in the Sunda Strait have implemented the TSS system which will take effect on July 1, 2020. The Sunda Strait TSS has been approved by IMO and regulated in the 1972 COLREG regulation (International Regulations for Preventing Collisions at Sea). The Government of Indonesia stipulates through the Decree of the Minister of Transportation Number KM. 130 of 2020 concerning the Establishment of a Route System in the Sunda Strait. TSS is made to uniform the direction of the ship in a channel. This is usually applied in waters that have heavy traffic and aims to reduce the risk of ship collisions [2].

All ships sailing in the area using the Sunda Strait TSS are mandated to follow the TSS rules (unless otherwise stipulated). In COLREG 1972 Rule 10: Traffic Separation Scheme. Vessels sailing in the TSS must comply with the provisions relating to sailing in the proper direction of traffic, stay away from dividing lines/zones, enter/leave lanes at the end of lanes, avoid cutting traffic lanes, avoid anchoring, and avoid fishing. [4].

Maritime traffic lanes indicate the general direction of ships in the relevant zone and all ships under navigation from the TSS all sail in the same direction (regular)[5]. The implementation of TSS will reduce and manage traffic in opposite traffic flows, assist in the management of ships that are about to enter or leave the port area, provide guidance on safe distances between ships, and provide routes for deep draft vessels. In addition, TSS also provides guidelines regarding ships that want to pass and cut existing routes.

The Decree of the Minister of Transportation Number KM 130 of 2020 concerning the Determination of the Route System in the Sunda Strait stipulates in the Tenth Dictum that the supervision of ships on the Route System, Traffic Procedures, and Ship Anchoring Areas in the Sunda Strait is carried out by the Merak VTS and reported to Director General of Sea Transportation. VTS is a shipping traffic monitoring system implemented by ports, or a shipping fleet management that is quite important in improving the security, safety, and effectiveness of shipping fleet operations with a monitoring system at any time (24 hours) [6].

In the field of ship security and safety, digitization can be used to monitor shipping activities in real time and non-stop, so that any threats and disturbances can be detected and handled as soon as possible. During the 2020 Cybersecurity Awareness Month digital discussion activity, IMO Secretary General Kitack Lim also highlighted the need for increased digitization, commenting that:

*“The COVID-19 pandemic has presented challenges. But we must take this opportunity to take advantage of the opportunities that increased digitalization can present in the maritime sector – to increase the resilience of the maritime supply chain, to support sustainable development and to enable recovery.”*

Furthermore, the digitization process is expected to reduce errors, improve the quality of information, and automate any process in the maritime sector. In fact, starting in 2019 IMO has required all ship data exchange to be done digitally, with the aim of facilitating cross-border trade and a more efficient logistics chain [7].

Although, the VTS system has been used in the Sunda Strait TSS, this VTS system still has problems in digitizing navigation services. VTS supervises the Sunda Strait TSS then records ship traffic data and analyzes the number of violations to be reported as evaluation material. However, in the process of reporting and exchanging ship data resulting from the supervision so far it is still done manually. Reports are made by VTS Merak and sent using Whatsapp or email. This condition is still an obstacle that hinders the absence of a data database that can be accessed when needed. In addition, there is no integration of data from various stakeholders related to TSS supervision such as weather data, bathymetry data, ship anomalies and so on.

The research on "Shipping digitalization management: conceptualization, typology and antecedents", [8] said that managing digitization is more complicated than acquiring, combining, and managing physical and digital resources. Strong collaboration is needed among maritime management actors, so that the strategy formulation process can be carried out through mixed interactions and actions.

The transition to digitization and automation is accelerating in the maritime industry. Digital technologies and solutions are used to increase competitiveness and operational efficiency [9]. They are also applied to spur industry along a decarbonization path to achieve zero emissions from international shipping by the middle of this century. Data streams from sensors and other information sources can be used for decision

making and improved monitoring, control, quality assurance, and verification. Along with the development of technological advances in the maritime world which is marked by digitalization and innovation on a wide scale, technological developments in the maritime world in the future are expected to be able to present a strong system and provide more effective solutions [10], especially in terms of security and safety ship in the water.

Based on the above, this study aims to analyze the problems in digitizing navigation services in the Sunda Strait TSS and identify the efforts made by the government in increasing the digitization of services in order to be able to keep up with technological developments in the increasingly advanced maritime world. It is hoped that the accelerated process of increasing the digitization of maritime navigation and traffic services can facilitate the activities of ships entering the port, loading and unloading activities and ships leaving the port, including passenger and cargo activities at the port, as well as related to electronic business processes and digitization at the port.

## II. RESEARCH METHODS

This study uses a qualitative method. Qualitative research is a type of research with findings without going through statistical testing and aims to reveal the symptoms in a holistic-contextual way [11]. Qualitative research allows researchers to explore problems in depth [12]. The research design is qualitative exploratory which aims to deepen knowledge and seek new ideas about a particular phenomenon, describe social phenomena, and explain how a social phenomenon occurs to formulate problems in more detail or develop hypotheses instead of testing hypotheses [13].

Data was collected by interviewing officials at the Ministry of Transportation Office, especially at the Directorate General of Sea Transportation, Tanjung Priok Navigation District, Merak VTS. In addition, visits were made to observe the Merak VTS service process under the supervision of the Sunda Strait TSS. Furthermore, data processing is carried out by developing a description of the information obtained to draw conclusions. The qualitative data analysis method is carried out by drawing conclusions after verification by triangulation of sources to check the validity of the data so that it can answer the objectives of this study related to increasing the digitization of the Sunda Strait TSS.

## III. RESULT AND DISCUSSION

### 3.1 Result

Digitalization of data exchange is key to facilitating international maritime traffic as it makes it more efficient and resilient in the world, and accelerates technological progress as transnational disturbances increase [14]. The provisions for the use of digital systems in navigation on ships are based on several international rules, namely, IMO Resolution A19/Res.817, which regulates performance standards and the installation of ECDIS equipment. Safety of Life at Sea (SOLAS) Convention, regulation V/20 of the 1974, IHO Specification for Chart Content and Display of ECDIS (IHO S-52), which regulates the specification of colors and symbols on electronic maps, IHO Transfer Standard for Digital Hydrographic Data (IHO S-57), which regulates the standardization of digital hydrographic data transfer.

Facing the development of an increasingly sophisticated era with various technologies, of course, ship security and safety services are also required to continue to improve and develop their management system in order to implement a digitalization system so that supervision becomes more effective and efficient.

Researchers conducted interviews with informants from Merak VTS, by asking how the efforts or plans for developing Merak VTS technology in the future. Based on the results of interviews, obtained the following information.

*“We are planning e-pilotage at several ports in Indonesia. It is still in the testing phase, of course, when it is actually implemented, one of the conditions is that the devices in VTS must be optimized and digitized. While it has been digitized, but not yet for e-pilotage. E-pilotage is actually more to help reduce the guide on board the ship. The point is when the guide does not go up on the ship and the ship must be guided, the pilot is VTS. Because there are several ports whose routes are very long, so the guides have to be on the boat for hours.”*

This is in line with the information given by an informant from the Navigas District of Tanjung Priok, with the following interview results.

*“Currently, a system is being developed related to direct VTS operations, so a web-based digital system is currently being developed so that later all communications and data will be recorded directly into the database and can be directly accessed here. The system is currently under development. We are building on the topology, the procedures. So later will often exchange data. Now we are collaborating with BMKG. BMKG is already intense for data exchange. They send weather data for the waters for the ships. If there is a reposition on the ship to report weather data at sea, we will submit it to the BMKG to be processed again as input data. So that, the navigation mindset that is being built to make it more useful comes out.”*

Researchers also received information from informants at the Ministry of Transportation, regarding the efforts and hopes for the digitalization of shipping in the future. Because the full responsibility for this effort is of course in the Ministry of Transportation. Based on the results of interviews, researchers obtained the following information.

*“Digitalization related to reporting from VTS is still in the development stage of the Marine Command Center, a system that can integrate data from 23 VTS in Indonesia. The plan is this december for the system. In terms of the digitalization system, we also expect data integration, mutual synergy between Ministries/Agencies, to convey data so that supervision can be maximized.”*

Based on data collection, it is also known that as a step and effort the Ministry of Transportation has made an MoU of cooperation related to data integration. For now, the MoU is being carried out with seven Ministries/Agencies including the Ministry of Transportation, Air and Water Police (Polairud), Maritime Security Agency (BAKAMLA), Indonesian Navy, National Search and Rescue Agency (Basarnas), (National Aeronautics and Space Agency (LAPAN), Meteorological Agency , Climatology and Geophysics (BMKG). In the future there will be cooperation with the National Cyber and Crypto Agency (BSSN). Integrated data allows for data exchange, for example from Sea Transportation, which is obliged to submit AIS data. Pushidrosal is related to maps, determinations of routes and updates of marine maps.

### **3.2 Discussion**

Based on the findings, there are three main efforts made by the government in increasing the digitization of navigation services in the Sunda Strait TSS, namely the development of the Marine Command Center (MCC), collaboration with Ministries/Agencies for navigation data integration, and the development of E-pilotage. Although there are other related efforts, the researcher chose efforts related to digitalization management and also those carried out in the Sunda Strait TSS, while these efforts are explained as follows.

#### **3.2.1 Development of Marine Command Center**

Digitalization efforts related to reporting from VTS are still in the development stage of the Marine Command Center, a system that can integrate data from 23 VTS in Indonesia. Through the Marine Command Center, the reporting of VTS monitoring results can be directly seen by the center without waiting for the reporting process which has been done manually. The Marine Command Center has digital equipment capable of integrating various navigational data. In the future, it is expected to continue to develop and be managed properly so as to provide more optimal benefits of navigation services.



**Fig. 1. Marine Command Center Room at the Ministry of Transportation**

According to [15], the Marine Command Center is an operation control center at the Ministry of Transportation that can directly monitor the movement of ships. MCC uses various modern technologies including utilizing satellites. The technologies we use include LRIT (Long Range Identification Tracking System), Ship Reporting System, Marine Electronic Highway (MEH), and Vessel Traffic Service (VTS).

### 3.2.2 Cooperation of Ministries/Agencies for Navigation Data Integration

In a digitalized system, the Ministry of Transportation in this case the Directorate General of Hubla makes collaborative efforts to be able to synergize with Ministries/Institutions in the context of data integration so that the supervision of the Sunda Strait TSS can be maximized. This synergy is very much needed because each Ministry/Agency has its own special system. By synergizing, there will be at least one data gate that can assist VTS services and for monitoring the Sunda Strait TSS.

The form of cooperation with the Indonesian Navy's Puskodal, for example, is related to ship anomalies, the limited Navigation District to detect ship movement anomalies, can be overcome by integration in the SPARTAN application which has the ability to identify ship anomaly movements, it is hoped that data from the SPARTAN application can be integrated into VTS, so that we know that there is an Anomalous movement of ship A, so the VTS operator can monitor or call the ship.



**Fig. 2. Integration between Ministries and Institutions**

As a step and a collaborative effort, an MoU has been made regarding data integration. In this data integration, the Director General of Hubla is obliged to submit AIS data, Customs is responsible for report data related to, for example, freight transportation. If it is related to maps, determining routes and updating marine maps with Pushidrosal. So each one is adjusted to its main function. For now, the MoU is being carried out with seven Ministries/Agencies including the Ministry of Transportation, Polairud, Bakamla, Indonesian Navy,

Basarnas, LAPAN, BMKG. In the future there will be cooperation with BSSN. So all institutions working in the sea with the system they have in the future can be integrated with each other.

### **3.2.3 E-Pilotage Development**

E-pilotage is one of the government's efforts, in this case the Ministry of Transportation, to help reduce boarding activities on ships. The point is when the guide does not go up on the ship and the ship must be guided, the pilot is VTS. Because there are several ports whose routes are very long, so the guides have to ride on the boat for hours. The Ministry of Transportation is planning e-pilotage at several ports in Indonesia. Currently still in the testing phase. When the trial has been completed, then it can be implemented in VTS Merak.

According to [16], with the use of an e-pilotage called SIPANDU, it is hoped that all ship scout services have been carried out on a digital basis, meaning that handling from application submission to the end of the activity is carried out using the available application system, no longer using paper submissions (paperless), is done by avoiding face to face meetings. The existence of a tracked and recorded ship movement pattern, so that shipping safety is maintained, there is a guaranteed certainty of a measured execution time, lower operating costs, and faster and more accurate billing of service fees. Of course, service activities become real time, recorded and tracked, operational costs are cheaper, and fuel consumption is more efficient. Furthermore, the benefits from a financial perspective make billing faster, standardized, and accurate, where activities are safer.

## **IV. CONCLUSION**

Based on the research process carried out from obtaining research data to discussing the results of the research carried out, the researchers concluded that the efforts made by the government in increasing the digitization of navigation services in the Sunda Strait TSS were the development of the Marine Command Center (MCC), in collaboration with Institutions/Institutions to integration of navigation data, and development of E-Navigation and E-pilotage. Through the Marine Command Center, the reporting of VTS monitoring results can be directly seen by the center without waiting for the reporting process which has been done manually. The Ministry of Transportation has signed an MoU regarding data integration.

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